A systematic realist synthesis of digital interventions for enhancing mental health at work: contexts, mechanisms, and outcomes

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Abstract

Background Digital interventions (DIs) have emerged as promising tools for promoting mental health in the workplace. However, evidence on if, how, and under what circumstances they affect positive outcomes requires elucidation. This systematic realist review aimed to synthesize current knowledge on contexts, mechanisms, and outcomes of workplace DIs to enhance mental health at work.

Methods The review integrates elements of both systematic and realist review methodologies. Forty-four workplace mental health DIs studies were gathered through a systematic electronic search using PsycNet, Scopus, Web of Science, and PubPsych.

Results Results showed that demographics, previous mental health, and personal skills were the main individual context factors influencing the success of DIs. Key mechanisms were DIs usage, frequency, adherence, and relevance of content triggering positive perceptual shifts. Results showed improvements in psychological resources, wellbeing, and affect. Reduced ill-health symptoms were also evidenced. Five propositions were developed on the contexts and mechanisms under which digital interventions yield positive outcomes for mental health at work.

Conclusions This study highlights several areas where future research can expand our understanding of DIs in the workplace by examining interactions between mechanisms and cultural aspects influencing implementation.

Keywords Digital interventions, Mental health, Workplace, Working mechanisms

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Introduction

Background

In the realm of occupational safety and health, despite notable advances, significant psychosocial risks persist at both international and national levels, representing a concern for employers and workers alike [1]. The COVID-19 pandemic has further amplified these challenges, making promoting workers' mental health a critical priority [2]. Workplaces that successfully foster mental health benefit from enhanced productivity and satisfaction and avoid the detrimental effects of poor mental health, such as impaired job performance,

tarnished corporate reputation, increased absenteeism, and conflict [3]. The pandemic has particularly intensified mental health issues, leading to a rise in depression, anxiety, distress, and insomnia [4], underscoring the urgent need for effective interventions.

Amidst the evolution of information and communication technologies and the increasing digitalization of work [5], Digital Interventions (DIs) have emerged as a promising solution for addressing mental health issues in the workplace [6–8]. DIs, which are structured, science-based actions leveraging digital technologies , range from adapted physical interventions to those exclusively designed for digital platforms [10]. These interventions aim to promote healthy behaviors and enhance well-being, offering various benefits, including improved access to health information, community building, perception shifts around health, and improved communication with healthcare professionals [11]. As primary or secondary prevention strategies, DIs can prevent exposure to stressful work conditions or equip workers with skills to adapt to their environment, reducing mental health problems [6].

Several advantages of DIs over traditional interventions have been identified, including cost-effectiveness, convenience, user empowerment, reduced stigma, and increased accessibility [11–13]. Empirical studies have consistently demonstrated DIs' effectiveness in enhancing psychological well-being and work efficiency, reducing stress, depression, and anxiety, and achieving moderate treatment effects on various mental health conditions [7, 8, 14–16]. However, challenges such as the need for theoretical grounding, reliable study designs, and user engagement for effectiveness have been highlighted [17]. Moreover, the effectiveness of DIs may vary based on baseline mental health conditions [18].

Philippe et al. [19] conducted a systematic and meta-review of article reviews evaluating digital health interventions for mental health care delivery. Findings demonstrated the overall beneficial effects of digital interventions on various mental health outcomes, such as depression, anxiety, and stress. However, outcomes varied substantially based on intervention features and implementation methodology. The authors highlight important future research directions to advance our understanding of these interventions, clarifying essential implementation factors.

While DIs have been shown to be effective in promoting or improving mental health in the workplace, there is a paucity of research exploring the mechanisms behind their success in specific contexts. The adoption of DIs by employees and the facilitation of their implementation to positively impact workplace well-being may pose a considerable challenge in evaluating their effectiveness. Thus, there is a critical need in the literature for systematic analysis and synthesis of empirical evidence on DIs for mental health promotion at work, to comprehend and articulate how these interventions work, what contributes to their effectiveness, for whom they are effective, and under which circumstances, using a realist approach to evaluate workplace mental health interventions [20].

The realist approach

The context of a workplace mental health intervention influences its operational mechanisms which, in turn, determine the intervention outcomes. In workplace mental health interventions, it is crucial to examine the connections between changes in specific mechanisms within the intervention context, leading to distinct outcomes [20–24]. The Realist or Context-Mechanism-Outcome (CMO) approach offers a structured framework for evaluating digital interventions in the workplace, particularly for mental health and well-being. The concept of "Context" in intervention effectiveness refers to the conditions that influence the intervention and activate its working mechanisms. Nielsen and Abildgaard [25] differentiate context into two types: omnibus and discrete. Omnibus context includes pre-existing external factors that affect the intervention, like organizational culture, climate, and working conditions (e.g., work demands and resources). Discrete context, on the other hand, involves factors that arise during the intervention implementation, such as pandemics, financial crises, mergers, and organizational changes like restructuring, downsizing, or budget cuts [26].

"Mechanism" denotes the essential elements or components that make the intervention effective. These include specific content, activities, exercises, or tools used in the intervention. Mechanisms are categorized into (a) process – related to the design and execution of interventions (e.g., training transfer, support from peers or managers); (b) content – focused on the nature of changes in the intervention's action plans (e.g., modifying work procedures for better teamwork); and (c) perception – pertaining to participants' views about the process and content (e.g., shifts in attitudes towards managing mental health) [20].

Finally, "Outcomes" are the intervention's observable improvements or intended effects on working conditions, employee well-being, or performance. In line with psychosocial intervention literature, outcomes are divided into proximal (direct and immediate effects, such as changes in workers' knowledge, attitudes, and behaviors) and distal (indirect and long-term effects, like job satisfaction, subjective well-being, and performance) [20, 22, 27].

This CMO approach involves understanding the context in which the intervention is implemented,

identifying the mechanisms by which the intervention produces change, and examining the outcomes of the intervention. For instance, the effectiveness of digital interventions for psychological well-being in the workplace can be influenced by the organizational culture and technological infrastructure, which are part of the context [6]. The mechanisms include user engagement with the digital tool, the delivery method of the intervention (e.g., mobile app, web-based platform), and the contents' relevance to the users' needs. The outcomes are then evaluated regarding improvements in psychological well-being, productivity, or reduction in work-related stress. This holistic approach ensures that the evaluation of DIs is not just focused on the outcomes but also considers the underlying processes and environmental factors that contribute to these outcomes.

Therefore, the CMO configurations are typically formulated as testable realist propositions, also named realist program theories [24], structured in the format of "If. Then. As a result" [19, 20]. Consequently, realist propositions are conceptual frameworks that articulate the underlying assumptions about how a particular intervention or program is expected to bring about change in a given context [22, 23]. Rooted in the principles of realist evaluation, realist propositions or program theories focus on generative causation, emphasizing the generative mechanisms that produce change. The corresponding intervention mechanisms are activated if specific contextual conditions are present, leading to the desired changes. Thus, when evaluating workplace mental health interventions, it is crucial to consider not only the outcomes but also the contexts and working mechanisms. These hypothesized and tested propositions offer practical guidance for organizations, fostering a deeper comprehension of the mechanisms underlying effective interventions, their success or failure in certain contexts, and the conditions that enhance their effectiveness. This acknowledges the complex and context-specific nature of interventions in real-world workplace environments.

Multilevel approach

In the field of workplace health interventions, there have been numerous calls for adopting a multilevel approach, as advocated by Martin et al. [28]. Viewing the workplace from an ecological perspective, it is recognized as a complex system comprising various interconnected components. These include the interactions between workers and their work environments, with workers' mental health being a crucial aspect of this system. Therefore, interventions aimed at enhancing mental health should be applied at different levels within this workplace system to effectively address the factors that impact workers' mental health, either positively or negatively.

The present study utilized the frameworks of Macfarlane et al. [29] and Marchal et al. [30] to categorize the context factors and working mechanisms of DIs for mental health at work. According to these models, context factors can be examined at the individual (e.g., knowledge, values, skills, health, well-being), interpersonal (e.g., support, communication, networks), and organizational levels (e.g., organizational culture, rules, regulations, finance, infrastructure). Working mechanisms are also classified at these levels, with individual factors including readiness or resistance to change, interpersonal factors like social capital building or the impact of mergers on team composition, and organizational factors such as management behaviors [30].

Research objectives

Consistent with the realist evaluation and the multilevel approach, this study aimed to review the current literature to explore and identify how DIs may improve mental health and well-being at work, in which contexts, and for which group of employees. The specific objectives of this review were to (1) extract information regarding context factors, mechanisms, and outcomes, and (2) develop realist propositions corresponding to specific CMO configurations.

The realist review methodology has been previously employed in organizational psychology research to examine the impact of contexts and mechanisms on the outcomes of various health promotion interventions (as evidenced in studies by 22, 24, 31–35). The usefulness of this theoretical framework is also underpinned by the studies that rely on its implementation to assess face-to-face intervention designed to promote workers' mental health [36, 37] and the effectiveness of digital tools in promoting mental health and well-being in the general population [38]. However, to the best of our knowledge, this study constituted the first attempt to apply the realist methodology to DIs for mental health at work and translate empirical evidence from workplace mental health DIs into realist propositions.

Realist propositions or program theories will be highly beneficial for researchers and practitioners in designing, implementing, and evaluating DIs for mental health at work, as they facilitate the understanding of how, why, and under what circumstances DIs may improve employees' mental health [22]. This review will provide valuable information about the peculiarities of those DIs that are successful in promoting mental health at work, and the conditions and mechanisms that ensure that the DIs achieve the intended outcomes. The insights gained from this study are expected to shed light on aspects that facilitate the use of DIs and their implementation within organizations. Additionally, the findings will help

formulate pertinent research questions for subsequent studies in this field.

Methods

In realist review methodology, the search process is characterized by its iterative and interactive nature, engaging in a dynamic back-and-forth movement between the literature and the research questions and program theories. This iterative process often leads to the evolution of search strategies and terms as the researchers' understanding deepens, as described by Pawson et al. [39] and Nielsen & Miraglia [20]. Typically, a realist review search encompasses several distinct steps: firstly, an exploratory background search to acquaint oneself with the existing literature; secondly, a progressive focus to pinpoint key program theories or propositions, concurrently refining inclusion criteria based on emerging data; thirdly, purposive sampling is employed to test specific subsets of these theories, supplemented by 'snowball' sampling to probe new hypothesized propositions as they arise; and finally, a concluding search for additional studies as the review nears completion [39].

In the present study, we focused on highlighting context and mechanism factors that explain how DIs could lead to desired changes in outcomes. However, within the studies included in our review, only a few tested causal relationships. Some were cross-sectional, and others required indirect extrapolation of factors, thus not fully aligning with a traditional realist review approach. The variability among these studies, marked by differences in intervention methods, outcome metrics, and participant demographics, demanded a more nuanced analysis than typically possible in a straightforward comparison and synthesis of research findings. This heterogeneity was further compounded by a lack of a complete and detailed analysis of the interaction between context factors, mechanisms, and outcomes in most studies, an essential aspect of a pure realist synthesis.

Consequently, through the iterative process of engaging with the existing literature, our research team recognized the need for a hybrid approach. The current review integrated elements of both systematic [40] and realist review [20–41] methodologies. We combined the structured rigor of systematic reviews with the flexible, theory-driven nature of realist reviews. This combination was strategically adopted to mitigate potential limitations inherent in a strict realist synthesis approach, thereby enhancing the robustness and comprehensiveness of our research. Therefore, the method combines elements of systematic reviews, such as identifying factors that could be linked to hypothetical CMO configurations, with forming potential, theoretical realist propositions for future research. In other words, based on the available evidence and given the limitations that arise, we

systematically identified the contextual factors and mechanisms reported in the studies, highlighted their links with proximal or distal mental health outcomes and, based on the evidence gathered, proposed potential casual propositions to be tested in future studies. This approach aims to provide a more precise and comprehensive understanding of the mechanisms and contextual factors critical when implementing DI solutions to improve mental health in the workplace.

Defining research questions

The overarching research question for this realist review is: *What works, how, for whom, and in what contexts in relation to DIs for mental health at work?* To guide the review, and based on the objectives mentioned above, the specific research questions of this review are the four following:

1. What are the *context factors* that impact the effectiveness of DIs for mental health at work?
2. What are the *mechanisms* through which DIs bring about changes in mental health at work?
3. What are the *outcomes* of DIs in terms of improved mental health or reduced ill health?
4. Which *realist propositions* can be developed based on the available empirical evidence of DIs for mental health at work?

Procedure and eligible criteria

In this study, we adhered to the six-step framework outlined by the Realist and Meta-narrative Evidence Syntheses: Evolving Standards (RAMESES) for quality and publication standards proposed by Wong et al. [41]. The initial step involved formulating a preliminary proposition regarding the functionality of DIs in the workplace and the conditions under which they operate effectively. This proposition was intended to be refined into specific realist propositions informed by emerging evidence from studies on workplace mental health DIs. For this purpose, an initial literature review was conducted, focusing on meta-analyses and systematic reviews about workplace mental health DIs [e.g., 7, 8, 14–18] and the realist evaluation framework [e.g., 20–26, 39, 42]. The aim was to discern the context and mechanisms influencing work-related mental health outcomes. Concurrently, the co-authors engaged in parallel discussions to analyze these findings and develop initial propositions. Given the diversity in the formats, contents, contextual factors, mechanisms, and outcomes of the digital interventions examined, it became evident that specific effects could not be conclusively attributed to particular mechanisms. This observation aligns with previous synthesis reviews on organizational interventions [22]. Consequently, we postulated that DIs for mental health at work may lead

to a variety of well-being-related outcomes influenced by different working mechanisms under varying contextual conditions.

A systematic search strategy was employed to identify pertinent studies for inclusion in our review [40], consulting databases such as PsycNet, Scopus, Web of Science, and PubPsych. Our selection criteria encompassed papers published in English, Spanish, and Italian, focusing on articles from peer-reviewed scientific journals. We excluded conference papers, abstracts, doctoral theses, books, and unpublished research. Six authors among the two research teams independently performed the search for scientific articles. The search terms were focused on titles, abstracts, and keywords, using the Boolean operators' combination ("OR", "AND"). The keywords used for this search were "digital" OR "digital-based" OR "digital based" OR "smartphone*" OR "smartphone-based" OR "smartphone based" OR "app" OR "app-" OR "app-based" OR "app based" OR "web*" OR "web-based" OR "web based" OR "computer" OR "computer-based" OR "computer based" OR "on-line" OR "on line" OR "online" OR "on-line-based" OR "on line-based" OR "on line based" OR "on-line based" OR "internet" OR "internet-based" OR "internet based" OR "desktop*" OR "desktop-based" OR "desktop based" OR "game-based" OR "game based" OR "video-assisted" OR "video assisted" OR "video-based" OR "video based" / AND "intervention*" OR "training*" OR "program*" / AND "mental health" OR "m-health" OR "mhealth" OR "e-mental health" OR "e mental health" OR "well-being" OR "wellbeing" OR "psychological" OR "psychosocial" / AND "work*" OR "organisation*" OR "organization*" OR "occupation*" OR "employee*" OR "manager*" OR "leader*" OR "team*" OR "job*" OR "compan*" OR "enterprise*". Using this search strategy, 3,604 records were yielded. The last search was run in November 2022.

To be included in this study, we established four criteria. The first criterion required that the studies provide empirical evidence aligned with the objective of supporting evidence-based practice [43]. This encompassed quantitative and qualitative research, meta-analyses, and systematic reviews focusing on empirical studies. Secondly, the research had to be conducted within work settings, excluding studies outside the workplace or involving general populations or students. Thirdly, the focus of the DIs had to be on mental health in the workplace, including interventions targeting mental health disorders and psychological well-being [44] or work-related issues that promote fulfillment and goal achievement [45]. Studies not centered on promoting well-being or addressing distress (e.g., stress, anxiety, depression) were omitted, especially those with a strong rehabilitative or treatment focus. Finally, the studies needed to involve digital interventions delivered via the internet, mobile technology, or computer programs, excluding those solely for diagnosis or assessment without implementing an action plan for improvement.

In the initial screening phase, we used a spreadsheet to track titles and references, eliminating 428 duplicates from 3,604 records leaving 3,176 papers for further review. Based on our inclusion criteria, abstract screening narrowed this down to 152 papers. After a detailed full-text review, 81 papers remained eligible. Six authors independently screened these studies, with discrepancies resolved through discussion. Two additional authors using Rayyan software [46] made the final decisions for papers where consensus was not reached, leading to the selection of 44 studies for the review. The complete list of papers is available in Supplementary Material 1.

The 44 studies underwent a quality appraisal using the RAMESES realist synthesis methodology, focusing on their relevance in describing DIs' context factors, working mechanisms, and mental health outcomes to contribute to proposition development. This assessment, crucial for analyzing and synthesizing findings, was not an exclusion criterion. The review aimed to investigate the current state of DIs for mental health at work, including the strengths and limitations of the studies, to identify research gaps and frame future study questions on CMO configurations. The search and retrieval process are illustrated in Fig. 1.

Extraction, analysis, and synthesis

Five researchers participated in the data extraction process using a Microsoft Excel codebook. Data was categorized into study characteristics, intervention characteristics, context factors (omnibus and discrete), mechanisms (process, content, perception), outcomes (positive and negative), and realist propositions. The context, mechanisms, and outcomes were either explicitly proposed in the studies, or implicitly extracted by the authors of the current review. The CMO configurations were formulated as hypothesized and testable realist propositions, structured in the format "If. then. as a result" [21].

After independently categorizing and synthesizing context factors, mechanisms, and outcomes, the authors extracted data to identify how each mechanism operated and produced outcomes being triggered in specific contexts. This was conducted only in those studies that included all three elements and thus meaningfully contributed to theory testing. This information was then used for the development of realist propositions.

Results

The characteristics of the studies, including year, country, theoretical framework, sample, method, design, and analysis, are shown in Supplementary material 1. Almost
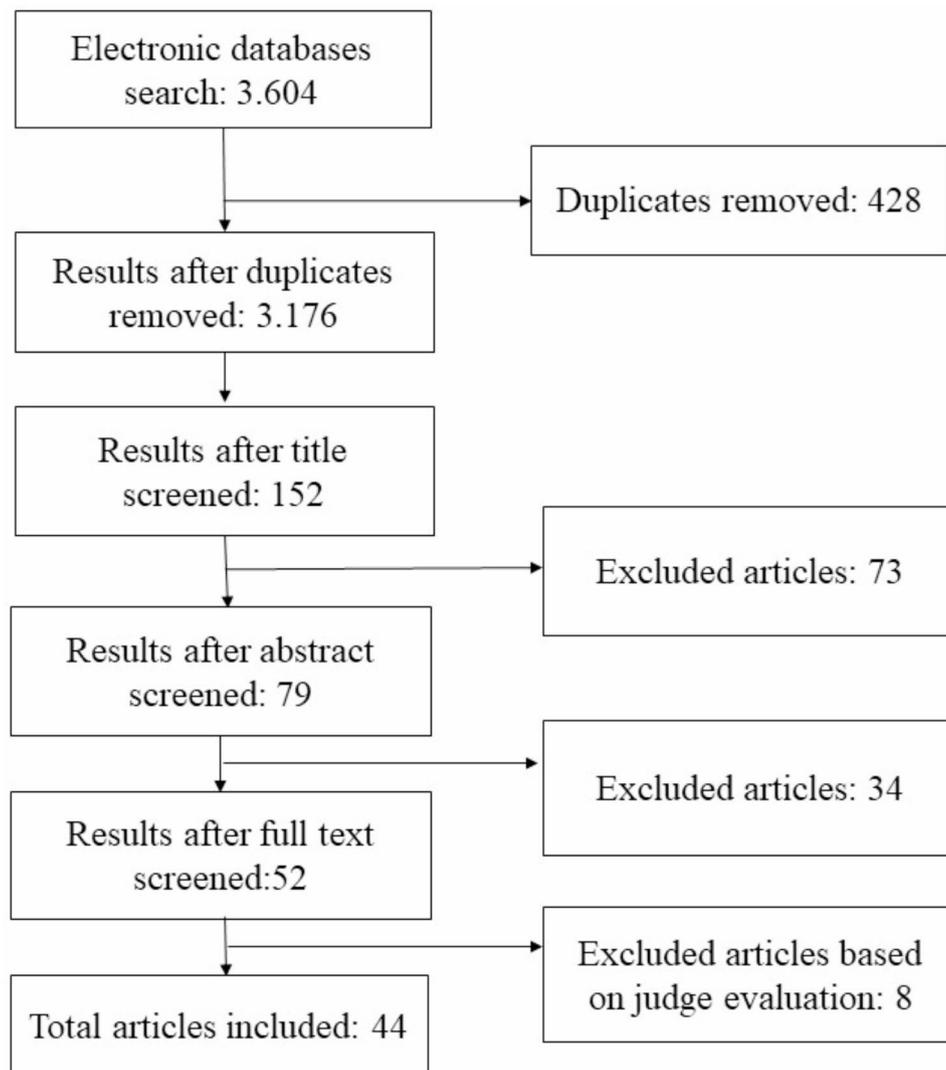
Fig. 1 Flow diagram of selected studies

all interventions examined in the studies were inherently digital, utilizing tools such as internet browsers, smartphone applications, and instant messaging platforms. However, two studies [47, 48] conducted comparative analyses between online and face-to-face formats of distinct interventions. The nature of these digital interventions varied considerably. Twenty-two interventions were exclusively web-based, employing internet browsers as the primary medium for delivery, encompassing websites and online platforms. Nine interventions were solely app-based, delivered through smartphone, tablet, or computer applications. Additionally, four interventions incorporated a hybrid of web- and app-based components. Two interventions leveraged instant messaging platforms compatible with both smartphones and computers. A minority of interventions featured facilitators delivering sessions in real-time via videoconferencing or other virtual meeting formats, exemplified

in instructor-led mindfulness sessions and on-demand online psychological support. However, the predominant mode of delivery for these interventions was self-administered. Most interventions were initially designed for digital delivery. Nonetheless, there were digital adaptations of previously validated face-to-face interventions, particularly evident in mindfulness-based interventions [e.g., 49] and those translated to online formats due to COVID-19 restrictions [e.g., 50].

Context factors of digital interventions
Table 1 shows the summary of Contexts, Mechanisms and Outcomes in our selected papers. Regarding the Context (C), at the individual level, the most frequent omnibus context factors related to employees' roles or job positions, gender, health and well-being, previous knowledge, and personal resources/skills. Most studies included employees from various occupations, *roles*, and

Table 1 Summary of contexts, mechanisms and outcomes of digital interventions in the workplace

Type	Category	Description
Context		
Omnibus	Roles/job types	Employees from various types of organizations and jobs with different levels of digital transformation at work
	Gender and age	Mainly females over 18 years old
	Health and well-being	Non-clinical population, Experience of work-related mental health issues (i.e., stress and insomnia and work-related rumination), No experience in mindfulness, Mental health stigma
	Previous knowledge on ICT	Prior use of ICT, Easy access to computers or device, lack of online activities overload
	Personal resources/skills	Readiness for change, Self-compassion-related traits, Low segmentation preferences, Performance standing
	Interaction/ Communication	Number of people whom they had contact with in person and via internet or phone during the Covid-19 pandemic
	Organizational culture	Organizational readiness to changes, Workplace activities and policies related to workplace mental health, Employee willingness to discuss mental health
	Organizational changes	Changes in policies, Changes in the work environment and working conditions
	Economic incentives	Gift vouchers, Continuing credits, Wellness points, Remuneration
	Societal and cultural issues	Public crisis, Cultural diversity, and stigma
Discrete	Leader and peer support	Support and commitment from supervisors and colleagues during implementation of DIs
	Voluntary participation	Voluntary participation in the digital intervention
Mechanisms		
Process	Usage	Use of digital solutions
	Frequency	Frequency of (self-)practice
	Adherence	Completion of the DI or number of sessions/modules attended
	Training transfer	Transfer of learning back to the workplace
	Modality	Method of intervention delivery, Use of secondary modalities, Elements of "persuasive technology"
	Duration	DI delivered over a longer/shorter time frame
	External support	External guidance (e.g., facilitator, coach) offered to users, Strength of the coach-client working relationship
Perception	Attitudes change	Sustainability of (positive) attitude change
	Relevance of content	Meaningfulness of ingredients of the DI in addressing mental health issues in the workplace
Content	Mechanisms of change	Facets of mindfulness (acting with awareness, describing, nonjudging, and nonreacting), Task crafting
Outcomes		
Positive Psychological Outcomes	Personal Growth and Well-being	Mindfulness, Resilience, Self-compassion, Self-efficacy, Purpose in life, Positive relationships, Positive affect, Spiritual well-being, Secondary post-traumatic growth, Empathy, Hope, Emotional intelligence, Flourishing, Satisfaction of basic psychological needs
	Health and Recovery	General health, Sleep quality, Recovery from stress.
	Workplace Skills and Attitudes	Job performance, Work effectiveness, Work engagement, Return to work, Resourcefulness, Coping style, Psychological flexibility, Goal-striving reasons, Workplace competencies.
Negative Psychological Outcomes	Mental Health Challenges	Stress or Psychological distress, Depression, Burnout (Emotional Exhaustion), Anxiety, Negative affect, Strain or Irritation, Perseverative thinking, Secondary traumatic stress, Social distance, Depression-related stigma, Fear of COVID-19
	Work-Related Challenges	Work–family conflict, Turnover intention, Work-related fatigue, Digital transformation stress.

areas within organizations, regardless of gender, age, or other sociodemographic factors. However, some research focused on specific sectors or *job positions*, including healthcare professionals and school system employees [51, 52] social workers [53], self-employed workers [54], IT employees [55], and manufacturing/sales company employees [56].

Also, the studies predominantly involved female participants and generally included individuals over 18 years of age (Supplementary material 1). Although *gender and age* were sometimes used as control variables, they often did not significantly relate to the outcomes, with few

exceptions, such as Keller et al. [57] who found age positively influenced self-efficacy and Pandya [58], who noted the DI's greater effectiveness among males in reducing emotional exhaustion and increasing resilience.

Of the 44 selected studies, 24 considered employees' prior *health and well-being* levels. These were divided into two categories: (a) studies targeting employees with specific baseline health conditions, such as high levels of burnout or work-related stress [e.g., 59–62] and (b) studies focusing on non-clinical populations without severe mental or physical disorders [e.g., 55–56, 63–64]. The remaining 29 studies targeted a universal population,

with some examining how baseline health or well-being affected DI outcomes [e.g., 48, 52, 65].

Eight studies considered participants' *previous knowledge and familiarity* with the DI's subject matter. Six studies excluded those with prior meditation experience from mindfulness-based DIs [52, 63, 66–69], while Nadler et al. [70] found mindfulness DIs beneficial even for those with prior experience. Makowska-Tłomak et al. [61] assessed prior Information and Communication Technology (ICT) use, noting its impact on engagement during the pandemic.

Five studies explored the influence of employees' *resources or skills* on DI outcomes. Makowska-Tłomak et al. [61] examined readiness for change; Bormann et al. [71] focused on attitudes toward religion/spirituality; Li et al. [63] investigated trait self-compassion; Althammer et al. [49] looked at segmentation preferences as a moderator; and Bazarco et al. [66] used nurses' performance standing as an inclusion criterion.

At the interpersonal level, two contextual factors were identified, one omnibus and another one discrete factor. Cantarero et al. [72] explored the impact of *interaction and communication types* on study outcomes as omnibus context factor. They examined the effect of the number of people participants had contact with during COVID-19, both in person and via internet/phone. The results indicated that employees who interacted via phone or the internet experienced greater satisfaction with basic psychological needs and well-being than those who had in-person interactions. On the opposite, as discrete context factor, three studies addressed the impact of *support from leaders/supervisors and colleagues* during the implementation of DIs. Shann et al. [73] found that support and commitment from other leaders in the workplace influenced training transfer during a digital leadership intervention. Ouweneel et al. [74] observed that the lack of support from supervisors and colleagues participating in similar interventions negatively influenced the content and effectiveness of the DI on work engagement. Tonkin et al. [75] demonstrated that organizations where senior managers encouraged participation and provided resources saw higher uptake and engagement in a well-being DI.

Several context factors at the organizational level were identified, which can be categorized into four groups, namely organizational culture, organizational change, economic incentives, and societal and cultural issues. As factors related to the *organizational culture*, participation in well-being-related interventions, considered as discrete context factor, was often voluntary. Neumeier et al. [54] found that self-selected employees in digital well-being interventions were more motivated and reported greater well-being gains. On the contrary, Shann et al. [73] identified the collective readiness and capability of the organization, as well as existing workplace activities and strategies related to mental health, as an omnibus context factor influencing training transfer.

Shann et al. [73] reported that training transfer was affected by *organizational changes* as variations in government and political priorities. Ijntema et al. [76] found that resilience improved in response to changes in the work environment and conditions due to governmental policies and during a merger process.

Five studies used *economic incentives* as a motivational strategy for DI participation. Examples include gift vouchers [48, 54, 75], monetary rewards [66, 67], continuing education credits, and wellness points [77]. However, Smith et al. [77] also required a $50 out-of-pocket fee for participation.

Finally, eight studies [47, 50, 52, 53, 61, 67, 72, 78] noted the influence of the *societal environment*, particularly during infectious disease outbreaks like the COVID-19 pandemic, on the implementation period of DIs.

Mechanisms of digital interventions

Out of 44 reviewed studies, 29 addressed the working mechanisms of interventions, with 20 testing their effects on outcomes. These mechanisms were primarily found at the individual level ($n = 9$), and one at the interpersonal level. No mechanisms were discerned at the organizational level. Of the nine mechanisms identified at the individual level, six correspond to process, two at perception and one at the content. The following *process mechanisms* were detected in the studies: DI usage, frequency of practice, implementation adherence, training transfer, modality, duration of the DI, and external support.

Examples of *DI usage* triggering the study outcomes include the use of a digital transformation stress intervention for coping with stress [61], DI usage behavior tested in the form of participants using the App once or twice a day, perusing videos and learning sessions, and self-practicing regularly [58], reading the psychoeducational content related to stress and management practice [79], the use of an activity tracker to collect and self-monitor health information such as daily number of steps or energy consumption [80] and the usability of the DI itself in the form of information to read, video clips about mental health in the workplace, interactive exercises, and action plan implementation [73].

Frequency of practice was mostly addressed as mindfulness meditation practice duration (i.e., amount of time) in using web or mobile apps interventions [59, 66–68, 71]. Other examples of frequency of practice were the number of recovery activities per week [51] and the time spent on well-being-related activities in day-to-day life [75].

A third process mechanism was *implementation adherence*. This mechanism was reported in terms of the dose

received by participants as compared to the dose delivered. Specifically, some of the studies assessed the number of sessions [50, 59, 64] or modules [51, 81] attended. In all studies, higher implementation adherence predicted post-intervention improvements in well-being and mental health outcomes.

Fourthly, *training transfer* was considered an important process mechanism in two studies. In one of these [73] the transfer of learning back to the workplace was activated by specific context factors (i.e., collective readiness, attitudes of others, organizational changes, low levels of stigma) and, as a result, mental health was promoted, and depression-related stigma reduced. In the other study [82] training transfer was addressed in the form of deploying knowledge and skills learned through resilience-building. Greater opportunities to put learned skills to use led to improvements in well-being-related outcomes (ibidem).

To a lesser extent, the mechanism of *modality* was also addressed. For example [82], assessed the method of program delivery (computer-based/group-based classroom/one-on-one/ train-the-trainer) and found that, while interventions employing a one-on-one format were the most effective, the computer-based delivery formats were the least effective in triggering well-being outcomes. Carolan et al. [14] conducted a systematic review and revealed that studies that utilize secondary modalities for delivering the DIs and engaging users (i.e., e-mails and text messages, SMS) and use elements of persuasive technology (i.e., self-monitoring and tailoring) may achieve greater engagement and adherence, which lead to increases in psychological well-being and work effectiveness.

The mechanism of *duration* of the DIs was also considered in Carolan and colleagues' [14] systematic review, in terms of DIs delivered over a shorter time frame (i.e., 6 to 7 weeks) leading to higher engagement and adherence than DIs of longer duration.

Finally, one process mechanism, namely *external support*, was identified at the interpersonal level and referred to the guidance or supervision provided by a facilitator during the intervention process. Two studies addressed this mechanism. Carolan and colleagues' [14] systematic review suggested that interventions that achieve the greatest engagement and adherence offer some form of guidance, such as therapist, coach, a coordinator or member of staff, and clinical psychologist. More recently, Ijntema and colleagues [76] tested the role of the strength of the coach-client working relationship and found that it was related to most of the immediate program effects. The intervention seemed most effective for employees who experienced a stronger coach-client working relationship.

Shann and colleagues [73] identified two perception mechanisms, namely *attitude change* and *relevance of (the DI) content*, which impact the study outcomes. Utilizing a qualitative method through interviews with a selected group of leaders, the authors explored which mechanisms were activated by the participants that influenced these outcomes. The results revealed that the sustainability of attitude change and the relevance of the implementation content (DI) during the implementation period assisted participants in overcoming workplace stigma and improving mental health.

Finally, one content mechanism was tested in one study [69] in which facets of mindfulness (acting with awareness, describing, nonjudging, and non-reacting) were assessed as *mechanisms of change*. The intervention's effect was primarily explained by increased levels of only one facet of mindfulness, that is, acting with awareness. Another content mechanism of change was addressed by Uglanova and Dettmers [83] where participants trained job crafting competencies on a single task to be able to apply this to other tasks. However, no changes in task crafting were observed over time. Thus, the authors were unable to explicitly demonstrate that task crafting skills were trained within the course of the intervention.

Outcomes of digital interventions

Thirty-three studies highlighted positive well-being outcomes, while thirty-six studies focused on reducing or preventing ill-health outcomes. All these outcomes were observed at the individual level.

Positive psychological outcomes were grouped in three categories. The first group was related to *personal growth and well-being*. DIs significantly enhanced various resources and aspects of psychological well-being. Prominent among these were mindfulness [i.e., 67], resilience [i.e., 78], self-compassion [i.e., 63], self-efficacy [i.e., 74], purpose in life [i.e., 52, 76], positive relationships [i.e., 84] and positive affect [i.e., 74]. Some studies reported additional benefits like spiritual well-being [i.e., 71], secondary posttraumatic growth [i.e., 60], hope [i.e., 76], empathy [i.e., 66], emotional intelligence [i.e., 70], flourishing [i.e., 81], and satisfaction of basic psychological needs [i.e., 72]. The second group of positive outcomes found among the included studies was related to *health and recovery* and included general health (i.e., [i.e., 80], sleep quality [i.e., 67, 69], and recovery from stress [i.e., 76]. A third group consisted of positive *work skills and attitudes* enhanced by DIs, and included job performance/effectiveness [i.e., 82], work engagement [i.e., 47], return to work [i.e., 85], resourcefulness and coping style [i.e., 47], psychological flexibility [i.e., 53], goal-striving reasons [i.e., 47], and work competences [i.e., 70].

Negative psychological outcomes were grouped into two categories. The first one was related to *mental health*

challenges. The adverse outcomes mitigated through participation in the DIs that were most frequently documented by the studies referred to stress [i.e., 65], depressive symptoms [i.e., 55], burnout [i.e., 62], anxiety [i.e., 56], and negative affect [i.e., 77]. Less frequently documented ill-being outcomes included perseverative thinking [i.e., 52], secondary traumatic stress symptoms [i.e., 60, 50], social distance [i.e., 84], depression-related stigma [i.e., 73], and fear of COVID-19 [i.e., 67]. The second group consisted of *work-related challenges* that were improved after participating in a DIs, such as work–family conflict [i.e., 49], turnover intention [i.e., 48], work-related fatigue [i.e., 69], and digital transformation stress [i.e., 61].

Realist propositions

Based on the findings from the previous sections, we first selected the mechanisms that were most used or addressed within the studies we included. Next, we identified contextual factors (C) linked to such mechanisms (M), and the outcomes they triggered. As a result, we developed the five CMO configurations that are expressed in the form of the following five realist propositions. The goal of these propositions is to guide future research and provide new theoretical and practical insights once they are tested.

Realist proposition 1: DI usage

DI usage was the most identified mechanism that influenced mental-health-related outcomes within the studies included. Three studies [i.e., 79] revealed contextual factors for operating the DI usage and five studies [i.e., 80] disclosed positive effects of this mechanism on several mental-health-related outcomes. For example, in Imamura et al. [79] study, a web-based intervention significantly improved participants knowledge of depression and psychological distress (O), through reading and understanding the psychoeducational content related to stress and management practice, and by using cognitive-behavioral skills (M). These mechanisms would only be triggered among employees with high-risk of depression (C).

Based on the above, we formulated the following realist proposition: *IF certain contextual factors exist (e.g., collective readiness, leadership support, employee prior levels of ill-health risk and willingness to discuss their own mental health), THEN DI usage (the mechanisms) improves mental health knowledge, decreases stress, and increases resilience.*

Realist proposition 2: frequency of practice

Frequency of practice was another important mechanism identified within the studies included. Six studies [i.e., 66] revealed pre-conditions for operating frequency

of practice, and five studies [i.e., 71] reported a positive impact of this mechanism triggering proximal and distal mental health outcomes. An example is Bazarko et al. [66] study, in which the high receptivity to a digital Mindfulness-based Stress Reduction program, high levels of engagement, low attrition, and practice over time (M) occurred in a context of managerial support and economic and other sources of incentives such as continuing education (C). As a result, participants improved their empathy, self-compassion, and decreased stress and burnout (O).

Based on the above, we formulated the following realist proposition: *IF certain preconditions exist (e.g., prior work-related illness, manager support, receiving incentives), THEN frequent practice of DI activities (the mechanisms, i.e., mindfulness meditations, recovery activities, and well-being-related activities) improves outcomes like empathy, mindfulness and decreases ill-being.*

Realist proposition 3: implementation adherence

Seven studies [i.e., 51] provided contextual factors for operating implementation adherence, and six studies [i.e., 50] reported proximal and distal mental health outcomes that were predicted by this mechanism. For example, in Tonkin et al. [i.e., 75] study, the uptake of the wellbeing intervention was higher (M) in the organization that had managers encouraging participation and providing resources, easy computer access for employees, and economic incentives (C). As a result of the intervention, resilience and well-being improved (O). Another study [i.e., 61] identified contextual mechanisms that might hinder the implementation adherence to an online intervention to reduce digital transformation stress. In the context of pandemic and resulting online activities overload (C), participants may hesitate to engage in the additional Internet initiative, like online meetings, workshops and trainings (M), and as a consequence, there might be high dropout rate and low activity (O).

Based on the above, we formulated the following realist proposition: *IF certain context factors exist (e.g., prior levels of work-related stress, readiness for change, manager encouragement, economic incentives, persuasive technology), THEN strong implementation adherence (the mechanism, in terms of the dose received by participants) improves outcomes like personal resources and psychological well-being. However, online overload may hinder engagement.*

Realist proposition 4: training transfer

Two studies [i.e., 73, 82] revealed contextual factors for operating training transfer and reported positive effects of this mechanism triggering mental health outcomes. For example, [i.e., 73] a mixed-method study concluded that training transfer, sustainability of attitude change,

and the usability of an online leadership intervention (M) to reduce depression-related stigma at work (O) were affected by context factors such as the collective readiness and capability of the organization to address these issues, the support and commitment of leaders in the workplace, and employee willingness to discuss their own mental health (C).

Based on the above, we formulated the following realist proposition: *IF certain context factors exist (e.g., collective readiness, leadership support, organizational strategies, and willingness to discuss mental health), THEN training transfer back to work (the mechanism) promotes mental health and reduces psychological difficulties.*

Realist proposition 5: modality

Two studies [i.e., 14, 82] revealed contextual factors for operating DI modality and reported positive effects of this mechanism triggering mental health outcomes. For example, Carolan et al. [14] study concluded that web-based psychological interventions that offer guidance, are delivered over a short time frame, utilize secondary modalities for delivering the interventions and engaging users (i.e., e-mails and text messages, SMS), and use elements of persuasive technology (i.e., self-monitoring and tailoring) (M), may achieve greater engagement and adherence, and therefore have a significant effect on psychological well-being and work effectiveness (O), for employees not targeted on extended sick leave or with complex mental health problems at pre-intervention (C).

Based on the above, we formulated the following realist proposition: *For at-risk employees experiencing stress and lacking core protective factors (context factor), one-on-one and technologically enhanced DIs (the mechanism) promote engagement, well-being, and work effectiveness.*

Discussion

This systematic review aimed to investigate how, why, and under which circumstances DIs can foster positive mental health and mitigate mental ill-health in the workplace. Utilizing the CMO framework [20] and a multilevel analytical perspective, the review identified key contextual factors influencing DIs' effectiveness, mechanisms that drive their success, and resultant outcomes.

Various context factors were identified at the individual (e.g., roles, baseline health), interpersonal (e.g., social interaction), and organizational (e.g., culture, economic incentives) levels, as well as societal impacts from the COVID-19 pandemic. Predominantly, individual-level context factors were linked to participant characteristics, with most studies involving a diverse range of female participants of varying ages, job positions, and organizational types. Particularly, discrete context factors like supervisor and peer support, emerged as significant before or during DI implementation. For instance,

the implementation adherence of a digital wellbeing intervention was higher in work settings with managers encouraging participation and providing resources [75]. Similarly, leaders support and commitment in the workplace was a key factor enabling transfer of training, sustainability of attitude change, and the usability of an online leadership intervention [73]. In another study, Ouweneel et al. [74] found that the lack of support from supervisors and colleagues negatively influenced the content and effectiveness of the DI on work engagement.

Prior health and well-being levels also emerged as a relevant context factor as a precondition for DIs implementation. Significantly, DIs were more beneficial for participants with pre-existing ill health levels, but no complex health conditions. While some studies excluded for participation employees with clinical mental disorders diagnosis [i.e., 14, 55, 59, 63], other studies found that intervention mechanisms were triggered among employees with a risk of ill-health or prior levels of stress. One example is Imamura et al. [79] study, in which the usage of the DI significantly decreased psychological distress only among employees with high-risk of depression. In another study [82], results revealed that the DI targeting employees with high levels of stress or lacking protective resources produced stronger effects transferring learning than of those provided universally. Findings from that study concluded that employees identified as being at elevated risk levels resulted in far greater opportunity to put learned skills into practice (training transfer).

At the organizational level, collective readiness for change emerged as a significant cultural context factor enabling intervention mechanisms or outcomes. For instance, Shan et al. [73] found that employees positive attitudes and high levels of knowledge were not enough to ensure the transfer of training of a digital leadership intervention. The collective readiness and capability of the organization to address the workplace mental health challenges and employee willingness to discuss their own mental health positively affected training transfer. Previous literature emphasizes the key success factor of leadership commitment to promoting a culture that supports and encourages employees' participation in mental health interventions. Employees are likely to engage in such initiatives if they feel that a supportive culture may encourage them in transferring learning to the workplace setting [21, 86]. On the contrary, a culture marked by stigma around mental health issues may hinder participation. However, except from Shan et al. [73], no other reviewed studies tested the causal link of this key context factor on the intervention mechanisms and outcomes. Finally, economic incentives, or other sources or incentives were also significant organizational-level context factors mentioned by some of the included studies. For example, in a study testing the impact of a digital

wellbeing intervention on employee resilience [75], the response rate and intervention adherence in the company with senior managers acting as the wellbeing champions and offering incentives was significantly higher compared to the other company with no such benefit. In another study [66], participants were offered economic and education incentives as compensation for their participation. Although the impact of offering such incentives on the success of the intervention was not tested, the authors suggest that the employees were eager to practice the skills acquired in the intervention for their own inherent reward, given the high amount of practice that continued after the program and incentives had ended. Our study shows how organizational and cultural aspects may play a pivotal role in the effective implementation of DIs for mental health in the workplace, significantly influencing employee receptiveness to such interventions. Despite interesting findings, more research is needed to test the causal effects of these organizational and cultural factors on triggering the intervention mechanisms and outcomes.

Mechanisms identified predominantly involved process-related aspects at individual (e.g., DI usage, practice frequency, adherence) and interpersonal (e.g., external support) levels. High adherence, frequent practice, and effective use of digital tools seem to be crucial for mental health improvements, under the presence of specific contextual conditions. For example, Knox & Franco [50] found that higher implementation adherence, in the form of the number of sessions attended, triggered self-compassion, leading to positive changes in mindfulness, resilience, secondary traumatic stress, burnout, and depression for healthcare workers in time of heightened isolation due to pandemic. In another study, Makowska-Tłomak et al. [61] tested a digital transformation stress intervention in coping with stress, and findings showed that the use of the DI helped decrease stress and negative emotions related to digital transformation. However, the authors acknowledged that in the context of pandemic and resulting online activities overload, participants may hesitate to engage in the additional digital initiative, like online meetings, workshops, and trainings, and consequently, there might have been high dropout rate and low activity of some participants. Findings from these studies align with prior research emphasizing the benefits and limitations of user adherence and technology adoption in DIs [51], as well as remark the relevance of the contextual and societal factors under which DIs can be more or least effective, acknowledging the intricate and context-dependent nature of real-world workplace settings [26]. Support from facilitators also emerged as a key interpersonal mechanism, corroborating studies on the positive impact of consultant support in organizational interventions [22, 87, 88].

The review highlights DIs' potential in improving psychological resources such as resilience, mindfulness, and self-compassion. These enhancements in personal resources contribute to better stress management, adaptability, and overall well-being. In terms of well-being, DIs have positively impacted subjective well-being and positive affect, while also effectively reducing symptoms of depression, stress, anxiety, and negative affect. They also show promise in reducing burnout risk. Significantly, this review underscores the critical role of DIs in promoting mental health in the workplace and the importance of understanding the multilevel factors and mechanisms that contribute to their effectiveness.

Selecting the mostly used mechanisms (DI usage, frequency of practice, implementation adherence, training transfer and modality) within the included studies, we formulated five CMOs configurations that were converted into hypothesized realist propositions that may be used by occupational researchers and practitioners for the design, implementation, and realist evaluation of DIs in the organizational field. Despite most of the reviewed studies have not tested causal links between contexts, mechanisms, and outcomes, we conducted a thorough analysis of the studies to identify the conditions or potential contextual factors under which the DIs mechanisms might or could have been activated to achieve the intended outcomes. Findings from these propositions hypothesize that, if there are certain context factors (e.g., collective readiness, leadership support, baseline levels of work- or digital-related stress but with non-clinical diagnosis, not engaging in regular training or practice, and receiving economic incentives) acting as preconditions, then components or ingredients that enable the intervention to function (e.g., high levels of usage, frequency of practice, implementation adherence, training transfer, and secondary modality of the DIs) may improve employees' resources (e.g., resilience, mindfulness, self-compassion), psychological well-being (e.g., subjective well-being, positive affect, job satisfaction), and work effectiveness, and decrease psychological deficits (e.g., depression, stress, anxiety, negative affect, burnout). These propositions also acknowledge the variability that the effectiveness of the DIs might have depending on the different contexts and populations (e.g., types of organizations, job positions, gender, age), thus not allowing generalization of such CMOs for all work settings.

Limitations, strengths, and implications

The present study has some limitations which should be considered. The variability across studies, evidenced by differences in intervention methods, outcome metrics, and participant demographics, presents a significant impediment to the effective comparison and synthesis of research findings. This heterogeneity, spanning a range of

study foci from mindfulness to job crafting, self-determination theory, and self-efficacy, complicates the interpretation of results and the conclusions that can be drawn. Moreover, the dynamic nature of DIs and the rapid pace of technological advancements introduce a temporal limitation, as the review might have failed to capture the most recent interventions or outcomes.

Particularly referring to the CMO target of our analysis, a limitation concerning context factors was that most of them were not explicitly mentioned as such, and we needed to implicitly identify and extract them from the studies. Moreover, our findings showed that the DI studies mainly lack details about how the contextual factors enabled or hindered the mechanisms and produce the desired outcomes. With only a few exceptions [e.g., 49, 58, 82], the studies did not focus on analyzing the interaction between context factors, mechanisms, and outcomes. Another limitation of most studies is that, although some of them articulated potential mechanisms, the mechanisms were tested empirically in only a few of them. Also, most of the mechanisms detected (e.g., training transfer, modality, duration, external support, attitudes change, relevance of content) were used in only one or two studies, making it difficult to extract conclusions about their impact on mental health outcomes. It is important to note that our realist propositions were not developed based on causal links among context, mechanisms, and outcomes, but mainly as hypotheses of how relevant intervention mechanisms might be enhanced or hindered by contextual factors in order to obtain the desired wellbeing related outcomes. The hypothesized propositions should therefore be considered in future studies testing the causal relationship on the CMOs contributing to a more realistic approach on what works and under which circumstances for workplace mental health DIs.

Another limitation is the potential for publication bias, as studies with positive outcomes are more likely to be published, leading to an overestimation of intervention effectiveness. This bias might have specifically impacted our understanding of contextual and mechanisms factors, potentially underrepresenting implementation challenges and barriers to DI success. Additionally, the exclusion of non-English, non-Italian, and non-Spanish studies as well as grey literature may result in the omission of relevant information, particularly regarding DI implementation in diverse cultural and organizational settings. On the other hand, the selected language scope remained sufficiently broad to capture relevant variations in workplace mental health interventions across a representative range of organizational contexts.

On the other hand, a systematic literature review on DIs for mental health at work possesses numerous strengths, making it a useful tool for researchers and practitioners in the field. Firstly, a review of this type ensures a comprehensive and rigorous examination of the available evidence by employing a systematic and predefined approach to search, select, and evaluate relevant studies. By following a predetermined set of criteria, this review method has minimized bias and enhanced the reliability and validity of the findings. Additionally, the inclusion of a wide range of studies allowed for a holistic understanding of DIs, capturing their diverse forms and effectiveness across different workplace settings.

Implications for both theory and practice can be considered. As for theoretical advancements, results from this review may allow to advance knowledge towards the operationalization of context factors and mechanisms for testing their influence on study outcomes. As for practical implications, the insights gained from this review can inform evidence-based decision-making, guide the development of effective interventions, and ultimately contribute to the enhancement of mental health support in work environments. Applying a realist perspective to this review provides an opportunity to gain a better understanding of how different DIs might improve mental health at work, under which circumstances and for whom [20]. The insights gained from applying CMO configurations can inform decision-makers about the likely effectiveness of DIs in specific contexts.

The present review has highlighted how the increasing number of digital technologies aim to improve workers' resources in managing their stress or distress levels. However, managing or decreasing the negative aspects have shown to be important outcomes of using digital technologies. Also, and even most prominent within the studies, enhancing well-being-related outcomes was crucial in assessing the effectiveness of the DIs. Therefore, when designing digital solutions specifically for promoting mental health in the workplace, it becomes crucial to provide workers with both the skills to cope with and manage work-related stress, as well as the strategies and skills to improve their overall health and wellbeing [17]. However, results from an in-depth analysis of the selected studies lead us to highlight that digital-based interventions might not always be effective for the specific population and under the circumstances faced during the implementation. An example is the resulting online activities overload during pandemic as an obstacle for employees' engagement and DIs usability [61]. In another study [65], no significant differences in decreased stress were found after participating on an App-based meditation program. Results from that study lead the authors to believe that the duration of the intervention was too short. While in some specific contexts a longer intervention and higher levels of usability could generate higher results, in other circumstances activities overload (i.e., daily vs. intermittent use of a digital tool) could lead to

negative experiences by the users [89]. This has implications for developers of digital tools that ought to make specific features customizable in terms of DIs design to enhance their usability, acceptability, satisfaction, and improvements on mental health.

As such, this synthesis review provides an important potential contribution to practitioners for the design, implementation, and evaluation of future mental health digital strategies. To summarize, the current review can help stakeholders make choices that are better aligned with the needs and realities of the target population by providing details about previous results on DIs effectiveness (see Supplementary material) and being aware of the conditions that might ensure their effectiveness and underlying working mechanisms (Table 1). Findings from previous systematic reviews highlighted the need for DIs to be designed, based on the context, in terms of the organizational preferences and target population (i.e., type of occupation) [90, 91]. Realist evaluation thus takes the form of a potential approach that can be integrated into the evaluation of the DIs' effectiveness to highlight and understand which of the digital solutions worked, for whom, and under what circumstances [20].

Directions for future research

This study identifies several areas where future research can expand our understanding of DIs in workplace mental health. These interventions, while promising, face several challenges and limitations. A key issue is their feasibility and the complexity of implementing these interventions effectively. Success rates can vary depending on numerous factors, including the organizational and individual context, but also technology design, accessibility, and user engagement [92]. While some of the reviewed studies provided insights on enhancing user engagement with DIs, further research is necessary to assess and develop strategies that prevent dropout, especially given the digital (particularly internet-based) and self-guided nature of these interventions [93]. Employees may hesitate to engage in additional digital initiatives either because of a resulting online activity overload or due to having received an optimum benefit and no longer feel the need to continue participation in the intervention [61]. We also need to point out the rapid evolution of these tools and the need for ongoing research to keep pace with technological advancements, particularly relevant in light of the numerous digital solutions that are designed to enhance the artificial intelligence capabilities in such field [94]. While DIs hold potential for improving mental health in the workplace, their success depends not only on contextual working conditions, but also on careful consideration of user needs, user interface design, and the dynamic nature of technology.

Furthermore, there is a need to explore leader-, group-, and organizational-level digital interventions more comprehensively. In addition, the incorporation of qualitative and mixed-method designs could provide a more multifaceted and in-depth understanding of the contextual factors that influence DI effectiveness. These methods can help identify which contextual factors may either support or inhibit the mechanisms leading to the desired mental health outcomes, similar as addressed by Shan et al. [73] in their mixed-method study.

Future studies should investigate context factors that are crucial in work-related DIs, such as leadership commitment to mental health, communication, and participation of employees on decision-making, work demands (e.g., workload, role ambiguity), and organizational changes during DIs. More studies are needed to understand how organizational and cultural aspects influence the successful implementation of DIs for promoting workplace mental health. A meta-synthesis by Yarker et al. [95] identifies barriers to implementation, such as organizational culture and employee resistance, which can hinder the acceptance and effectiveness of these interventions. Organizational structure and policies, such as flexible working hours and accessibility of digital tools, might also impact the effectiveness of DIs. Companies with rigid structures and limited digital access may struggle to integrate these interventions effectively. Additionally, cultural diversity within the workforce should be considered, as varying cultural backgrounds can influence perceptions and acceptance of mental health interventions. Tailoring DIs to resonate with diverse employee groups, considering language, cultural norms, and values, enhances their relevance and effectiveness. Thus, understanding and aligning with the organizational culture and structure are essential for the successful implementation of workplace mental health DIs.

While previous research has suggested mechanisms like intervention acceptability, consultant integrity, and guidance or support offered by facilitators to users through the implementation, these have not been thoroughly addressed in the included studies. According to Meske and Junglas [96], digital workplace transformation's success factors depend on eliciting workers' support. Enabling workers to expect being autonomous, competent, and connected at the workplace is not only vital for their expected future work performance and their well-being in the workplace, but also to increase their positive attitudes towards digital workplace transformation and, consequently, their intentions to support the necessary change process actively. Understanding how employees interact with DI activities is vital, and future research should explore these implementation measures.

Finally, the hypothesized realist propositions developed in this study offer practical guidance for researchers, practitioners, and organizations, fostering a deeper comprehension of the mechanisms that might underline effective interventions, their success or failure in certain contexts, and the conditions that might enhance their effectiveness. The goal of these propositions is to guide future research and provide new theoretical and practical insights once they are tested. Therefore, the present study aims to inspire future research to explore causal links on the role of specific mechanisms that, when activated under certain contextual factors, could elucidate the expected outcomes associated with the identified propositions. Understanding these relationships is crucial for designing and implementing DIs intended to enhance mental health in the workplace, thus exploiting their potential impact.

Conclusions

The increasing focus on DIs for mental health in the workplace is a positive development, offering credible strategies for organizations dedicated to employee well-being. However, it is important to acknowledge the potential challenges and limitations associated with these interventions. This review contributes to practical knowledge by not only highlighting contextual conditions that might enhance the effectiveness of digital interventions and the working mechanisms that can produce their intended outcomes but also by identifying the challenges and limitations that need to be addressed. Understanding both the facilitating factors and the potential barriers is crucial for practitioners who aim to design and implement these interventions effectively, with the goal of maximizing their impact on workplace mental health. Findings also show the need for tailored digital health interventions, suggesting that one-size-fits-all solutions may not adequately address the diverse needs of workplace populations.

Abbreviations
CMO   Context-Mechanism-Outcome
DI   Digital intervention
RAMESES   Realist and Meta-narrative Evidence Syntheses: Evolving Standards

Supplementary Information

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> Supplementary Material 1

Data availability
No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

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