Navigating workplace stress: a qualitative exploration of mental healthcare workers' lived experiences with STAPP@Work, a mobile stress management intervention

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Navigating workplace stress: a qualitative exploration of mental healthcare workers' lived experiences with STAPP@Work, a mobile stress management intervention

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Abstract

Background Mental health workers (MHWs) face ongoing challenges, including heavy workloads, staff shortages, and pressure due to long patient waiting lists. These factors contribute to high levels of stress, affecting both their well-being and the quality of patient care. Digital interventions have shown promising results in supporting stress management among healthcare professionals. However, little is known about MHWs' experiences with such interventions. This study aimed to explore the lived experiences of MHWs regarding their use of STAPP@Work, a self-monitoring stress management app designed for the workplace.

Methods A qualitative study was conducted using semi-structured interviews with MHWs ($n = 14$) who used STAPP@Work for two weeks. Thematic analysis was conducted to explore patterns in participants' experiences using the app in their daily work context, focusing on how they engaged with its functionalities, and how they perceived and responded to its use.

Results While most participants found the app useful and easy to use, they also experienced barriers, including time constraints, unpredictable schedules, and limited integration into work routines. The app increased self-awareness and early stress recognition, which facilitated timely intervention. By prompting "self-check-ins", it helped participants pause, evaluate their well-being, and notice stress throughout the day. This awareness led to actions such as reorganizing tasks, taking short breaks, and reframing thoughts, with some maintaining these behaviors and a heightened sense of self-awareness beyond the study period.

Conclusions STAPP@Work shows potential as a preventive self-management tool in the workplace by promoting self-awareness, stress recognition, and early intervention. However, sustained engagement remained a challenge. Future research should explore long-term use facilitators, workplace integration, and its applicability for other working populations.

Trial registration ClinicalTrials.gov NCT06991439, registered on 27 May 2025. Retrospectively registered.

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Keywords Mobile health (mHealth), Workplace stress, Health professional, Stress management, Self-monitoring app, Qualitative research, Ecological momentary assessment, User experience

Background

Work-related stress is a leading cause of burnout among mental health workers (MHWs), driven by high workloads, emotional demands, staff shortages, and pressure due to long waiting lists [1, 2]. From July 2023 to June 2024, stress-related absenteeism in Dutch sectors increased by 8%, with healthcare most affected [3]. Over five years, absenteeism increased by 30%, with emotional exhaustion higher in mental healthcare than in other areas [3]. Around 20% of Dutch therapists reported emotional exhaustion, compared to 12.4% of hospital workers [4]. Research shows that one in seven employees previously absent due to stress will experience another absence within three years, often within the first year of returning to work [4]. The 2021 Don't Forget Yourself study reported high stress among nearly half of Dutch MHWs, with 30% showing depressive symptoms, 14% experiencing anxiety, and 4.2% intending to leave the profession [5]. A follow-up study in 2023 showed improvement, but 36% of workers still reported elevated stress [6].

Workplace stress arises when job demands exceed an individual's capacity to cope. While short-term stress is useful for performance, prolonged stress without recovery leads to chronic stress. Chronic stress can cause physical, emotional, and cognitive impairments, impacting both individuals and organizations. It is linked to anxiety [7], depression [8], and burnout—a syndrome characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment [9]. Cognitive functions, like memory [10], decision-making [11, 12], and problem-solving, decline. Physically, prolonged stress disrupts bodily systems, leading to weakened immune function [13], gastrointestinal issues [14], hormonal imbalances [15], and persistent fatigue [16], increasing long-term health risks.

The consequences of chronic stress extend to organizations, through reduced productivity, increased absenteeism, and higher turnover rates [9]. These challenges result in substantial financial losses due to healthcare expenses [17] and lower efficiency [9]. Workforce shortage puts pressure on remaining staff, reduces care quality, and limit patient access to mental health services [18]. This highlights the need for effective workplace interventions to support MHWs in becoming more resilient to work stress. In recent years, mobile health interventions have gained recognition as tools for providing evidence-based, in-the-moment support during the workday [19]. They often require little time and effort, and can be used flexibly, which is especially valuable in high-pressure work sectors [19]. For organizations, such interventions are a cost-effective way to reach a broad workforce with scalable implementation [20].

Stress management apps incorporate various techniques including self-monitoring, mindfulness practices, cognitive-behavioral strategies, and psychoeducation [21]. Research shows such interventions can reduce stress and improve employee well-being [22–24]. Though limited, existing literature on these interventions among healthcare professionals also reported lower stress levels [25–29]. Earlier qualitative studies have shown that healthcare workers value features like mood tracking, personalized goals, and in-app resources [30]. Also, improvements in stress management were reported despite barriers like time constraints and low motivation [30, 31].

Building on the need for tailored self-directed interventions in managing daily work stress among MHWs, the STAPP@Work app was developed. This self-management app tracks daily stress levels and activities, provides personalized feedback, identifies stress patterns, and offers real-time coping strategies. Based on Ecological Momentary Assessment (EMA) principles [32], the app helps users recognize and address stress trends through visual overviews of stress levels across workdays and weeks. A prior quantitative study demonstrated the app's effectiveness in reducing perceived stress, improving problem-focused coping self-efficacy, and lowering burnout symptoms over time [33]. While promising, these findings left a critical gap in understanding users' experiences. This study adopts a qualitative approach to explore the lived experiences, perceptions, and attitudes of MHWs using STAPP@Work. By examining these experiences, this research aims to provide a richer understanding of the app's use in practice and how it interacts with daily work realities.

Methods

Design

This study followed a qualitative design using a phenomenological approach aimed at exploring the lived experiences and perspectives of MHWs who used the STAPP@Work app for two weeks. This approach provides insight into how participants experienced the app in their daily work lives, the meaning attributed to those experiences, and its perceived relevance within the context of workplace stress management [34, 35]. The COREQ (Consolidated Criteria for Reporting Qualitative Research) framework [36] was used to guide the reporting of this study (Supplementary File 1).

Setting

GGz Centraal is one of the largest mental healthcare organizations in the Netherlands and is located in the central region. The organization employs a multidisciplinary team across multiple locations, offering a broad spectrum of specialized inpatient and outpatient care.

Participants and recruitment

Participants were employees of GGz Centraal. Inclusion required active employment during the study period. Individuals involved in the development phase, or the effectiveness study of the STAPP@Work app were excluded.

This study aimed to reach data saturation, defined as the point at which no new themes or insights emerge, further coding becomes unfeasible, and the study can be reliably replicated [37]. A recent review found that saturation is typically achieved between 9 and 17 interviews, with a mean of 12–13 interviews, depending on the complexity of the topic and the richness of the data [38].

Purposeful sampling was used to ensure diversity in participants' roles. Recruitment involved distributing flyers throughout the organization, sharing them digitally with team leaders, and presenting the study during team meetings. All materials included a QR code for direct registration. Interested employees were contacted by phone or email.

Intervention: the STAPP@Work app

STAPP@Work is a self-management app designed to help employees monitor stress levels, receive personalized coping strategies, and visualize stress patterns over time. The app was co-developed with MHWs through iterative focus groups, ensuring alignment with their needs, experiences, and preferences. The app is rooted in the stress-signaling plan, a widely implemented tool in Dutch mental healthcare used to monitor stress levels and symptoms [39]. This framework divides stress into four phases—green (low stress), yellow, orange, and red (high stress), and helps individuals understand their stress triggers and how their stress evolves [39]. By integrating this signaling plan with EMA, the app facilitates real-time stress tracking and links stress levels to specific daily activities and situations.

App functionalities

STAPP@Work allows users to monitor their stress levels throughout the day by completing 2, 3 or 4 questionnaires at time intervals of 4 h. Users can set how many questionnaires to receive for each day and at what time points. Each questionnaire, available for one hour, asks about past activities and includes seven validated self-report stress questions related to emotional and physical stress indicators (Fig. 1A). Based on these answers, the app calculates a perceived stress level, categorizing it into one of four groups: "*no stress*", "*little stress*", "*stress*", or "*high stress*" (Fig. *1*B). The app provides coping strategies for managing stress at work or home from a predefined list that users can personalize. When a stress score is calculated, the app randomly selects and displays a coping suggestion from the user's tailored list. Additionally, the app links stress scores to recorded activities and generates a visual summary of these insights. This overview presents daily and weekly stress levels, highlighting activities and moments associated with high or low stress (Fig. 1C).

Data collection

Semi-structured interviews were used to collect data, combining structured questions with flexibility to enable open-ended responses and interactive dialogue [35]. The interview guide centered on the key functionalities of the app, including the stress questionnaire, stress score, visual overview, and in-app stress tips (Supplementary File 2). These were paired with open-ended and probing questions to elicit detailed narratives about how participants experienced these features, how they felt about using them, the meaning they attributed to them, and their perceived impact on the workday. This approach captured both positive and negative lived experiences, along with perceived benefits and limitations of app use.

The guide was reviewed by experts to ensure content validity and refined through pilot interviews with GGz Centraal employees who were not included in the main study [40]. Pilot testing assessed relevance and representativeness and informed revisions to improve consistency across interviews. The pilot trials also contributed to interviewer training.

Procedure

Participants received individual instructions on installing and using STAPP@Work during an online face-to-face meeting. During this session, they also agreed on a start date for the two-week use period and scheduled the follow-up interview. A helpdesk was available for any study- or app-related queries. Interviews were conducted at an agreed time and location. If an in-person meeting was not feasible, the interview was conducted via Microsoft Teams.

Interviews were conducted by a PhD researcher (SD) trained in qualitative methods, with experience in in-depth interviews and focus groups. No prior relationship existed between the interviewer and participants. At the start of each interview, the interviewer introduced herself and explained the study's purpose. A respectful, open attitude and active listening were maintained to create trust and understanding [41]. Interviews were conducted in Dutch at participants' workplaces, ranged from

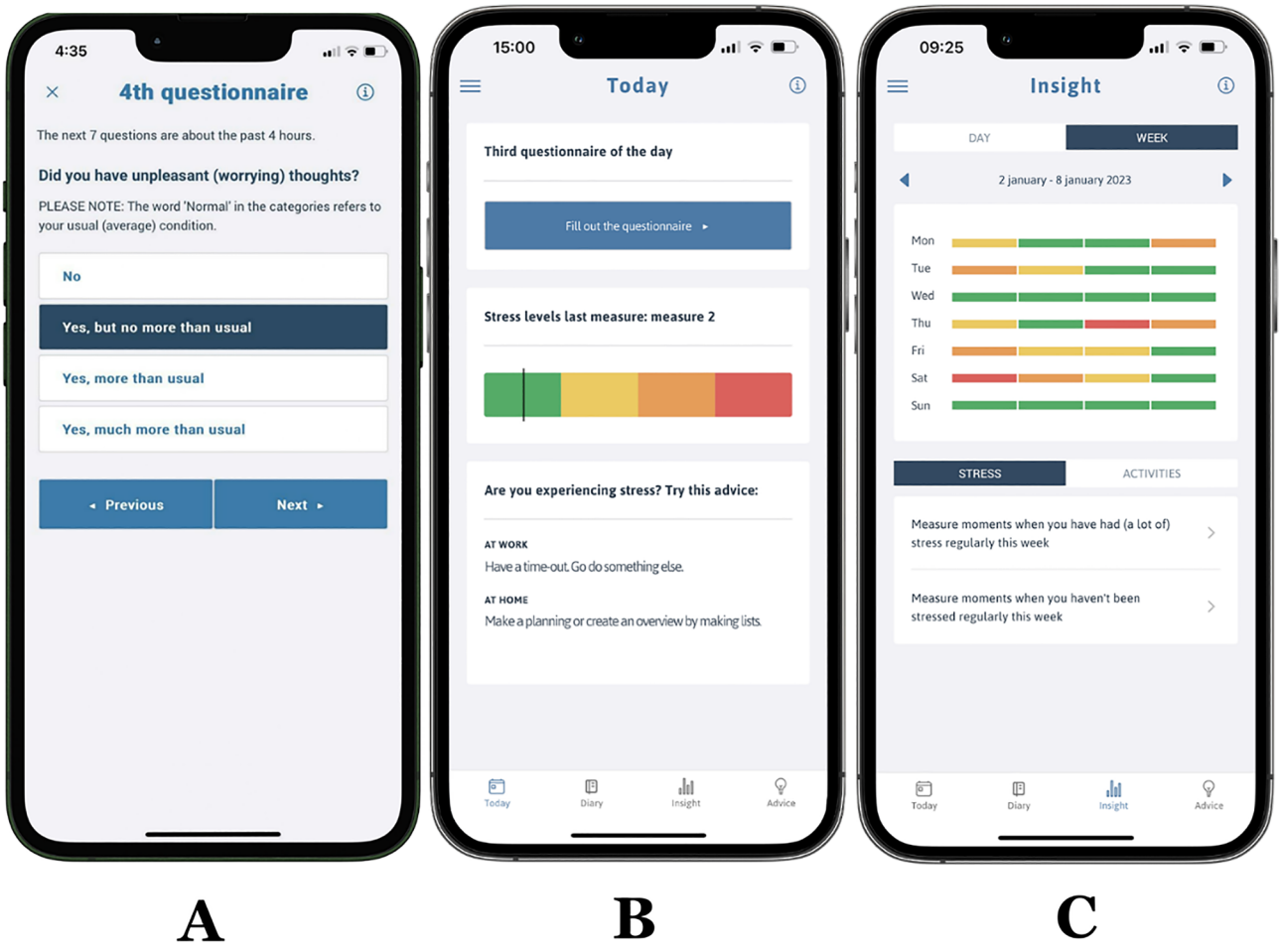

Fig. 1 Screenshots of the STAPP@Work app illustrating key functionalities. (**A**) Example of a stress questionnaire item. (**B**) Display of the calculated stress score on the home screen. (**C**) Visual overview. Image reproduced with permission from GGz Centraal, which owned and developed the app

approximately 30 to 60 min, and were audio-recorded. Each interview was transcribed and analyzed shortly after completion to inform ongoing data collection and refine the guide for subsequent interviews [42, 43]. The authors agreed that data saturation was reached when main ideas and recurring patterns stabilized, and no new major insights emerged. The data provided sufficient depth and consistency to support a coherent understanding of participants' experiences. Once this point was reached, two additional interviews were conducted to confirm that saturation had been achieved.

To ensure credibility, measures were taken to minimize bias and inconsistency, aiming for data that accurately reflected participants' experiences [35, 44]. After each interview, researchers documented their observations and thoughts in a reflexive log, to reflect on the process and be aware of their assumptions and potential influence on data collection and analysis [44, 45]. For member checking, participants received a summary of their transcript for review, ensuring interpretations aligned with their experiences [44].

Data analysis

Interviews were transcribed verbatim using a local version of OpenAI's Whisper, making the process secure and independent of the cloud. Transcripts were reviewed to gain familiarity with the data. Braun and Clarke's six-step model [46] guided thematic analysis, applying both an inductive and a deductive approach. Theme development was informed by predefined topics from the interview guide, based on the app's functionalities, while remaining open to data-driven insights [35]. This grounded approach was essential for capturing participants' experiences and identifying common themes. The Technology Acceptance Model [47] and the Theory of Preventive Stress Management [48] were used in guiding the analysis and reporting of the findings.

Data were coded iteratively in Atlas.ti (v8.4.4), involving comparison and categorization to identify patterns and themes [35]. Codes were grouped into overarching themes, reflecting recurring patterns, and underlying concepts. Themes were refined for clarity and alignment with the research question [46] and defined by their

relevance to participants' experiences and understanding of app use in the workplace.

The first author's background as a PhD researcher with a degree in Health Sciences and experience in participatory action research may have shaped the interpretation of findings, particularly the emphasis on prevention, autonomy, and behavioral change. To minimize potential bias, data analysis involved iterative coding and peer debriefing within a multidisciplinary team. Two independent coders reviewed and coded the data separately before all three coders, including the primary researcher, compared their findings, enabling an exchange of perspectives and improving reliability [35]. To support transferability, results were reported as thick descriptions, providing context and a clear understanding of the findings to individuals outside this study [44].

Results

General findings

The study included 14 MHWs, with a mean age of 41.9 years (Table 1). To preserve anonymity, age was presented in 10-year ranges. Most participants were female ($n = 10$), with diverse roles including nurses ($n = 5$), psychologists ($n = 2$), psychosocial therapists ($n = 2$), a functional administrator, an outreach therapist, a psychiatrist, and a social psychiatric nurse.

The results are organized into the following themes: (I) Usability, (II) Barriers to app use at work, (III) Facilitators of app use at work, (IV) Stress recognition, (V) Behavioral responses following awareness, and (VI) Motivations for app use. An overview of the main themes, subthemes with a short description, and illustrative quotes is presented in Table 2.

Usability

Most participants found the app convenient and easy to use. Its simplicity allowed quick session completion, while the relatable language and intuitive interface made it user-friendly.

The stress questionnaire

Participants appreciated the questionnaire's clarity and the four-hour look-back on recent activities and feelings. The response options asked whether stress signals differed from their own "normal," which felt more personal: "*So I think that 'yes, more than normal' made it very personal…it gave you a more personal feeling.*" (P2). It also felt more personal because, after the app calculated a stress score, it asked users whether they identified with it. However, the one-hour window for completion was often challenging with workloads: *"I was disappointed that if I was busy with something else and came back later, the questionnaire was already gone."* (P2).

Visual overview

Some participants overlooked the app's insight page due to time constraints or low visibility, while most valued the visual overview for identifying stressful moments and insights: *"It can just be helpful to look at, 'Did I indeed have more stressful thoughts yesterday than usual?', that you can then also look back a bit more of where was that due to this week."* (P5).

Those who viewed the overview appreciated its ability to highlight stress patterns and provide perspective: *"You also see green, and you think, 'Oh yeah, I was chill somewhere this week too.' It helps put things in perspective."* (P2). However, some felt it offered little value as they were already aware of their stress factors: *"Personally, I don't run into it very much that I think, 'What's stressing me out?' I actually know that I think. But I do believe that if you find that difficult, that can be very helpful."* (P7).

Table 1 Demographic characteristics of study participants

Participant	Age range	Function
1	20–29	Nurse
2	20–29	Nurse
3	20–29	Psychologist
4	30–39	Psychosocial therapist
5	30–39	Triage nurse
6	30–39	Triage nurse
7	30–39	Outreach therapist
8	30–39	Nurse
9	40–49	Psychiatrist
10	40–49	Functional administrator
11	50–59	Psychologist
12	50–59	Psychosocial therapist
13	60–69	Nurse
14	60–69	Social psychiatric nurse

Table 2 Overview of main themes, subthemes, and illustrative quotes

Theme	Description	Illustrative Quote
Barriers to app use at work		
High workload and time pressure	Pressing workload hindered app use; participants often forgot or deprioritized it.	*"It is often the case that your schedule is full…you often think, 'Oh yes, I still have to report, I still have to do this, I still have to do that'…there is always something…and in our work, you notice it can always be more." (P9)*
Irregular and unpredictable schedules	Unpredictable workdays interfered with organizing and completing questionnaires on time.	*"Because if you're at a post office, you can say, 'Well, at half past twelve I'll take a break, then I can use the app for a bit'…But here it's so different. The phone rings, someone comes in, and I have to take care of that." (P14)*
Difficult to shift attention during work	Redirecting attention to the app during work was difficult and often forgotten or felt disruptive.	*"I would maybe be more inclined to just leave it for a moment…So that I would first finish my things and then come back to the questionnaire…sometimes it is difficult, when I'm out of my focus, to get back into it." (P3)*
Not part of the work routine	Because it was not part of daily work routine, the app was often overlooked and questionnaires expired.	*"Yes, and it's also not in your system like, 'Okay, it's eleven o'clock, I should first do the lists before I move on'…So at the moment you take a look, you think, 'Ooh yes, I should have filled in that list.'" (P12)*
Facilitators of app use at work		
Part of daily work routine	Over time, the app became a habit, supported by timely notifications and reminders.	*"And it also provided a kind of structure. So, at one point, I caught myself thinking…at five minutes to two, 'Oh yes, wait, here it comes.'" (P2)*
Available moments during work	Available or fixed moments in schedules facilitated app use.	*"I did sometimes just have 5–10 minutes of very little time between people… I took advantage of that." (P8)*
Stress recognition		
Self-awareness	App prompts encouraged self-reflection, increasing participants' awareness of how they felt and functioned in the moment.	*"It gave me a moment to think of 'Hey, how do I feel right now?' 'How am I doing now?' and this awareness, I think, is just really nice already." (P1)*
Awareness of stress signals	Increased awareness of physical and mental stress signals through the stress questionnaire.	*"It forces you to reflect on how you feel in your body at that moment…I feel the stress especially in my body, so I often sit very tense, usually with clenched fists…I started to recognize that at one point." (P2)*
Awareness of stress level	Increased awareness of own stress level, which was perceived as validating, confronting, or an early warning sign.	*"At some point also through those questionnaires that I thought, 'Oh yeah no, I think this has given me more stress than what I might have initially noticed.'" (P13)*
Insight into stress patterns and factors	Participants identified their stress triggers (e.g., new client intakes, workload, personal factors).	*I see that an intake with a first patient apparently creates tension for me, I didn't know, but then when I started thinking about that and filling it out, I thought, 'Oh yeah that does create a little stress.'" (P8)*
Prioritizing personal well-being	Awareness increased attention to one's own well-being, including boundary setting and seeking balance.	*"It's a kind of wake-up call…it makes me think, 'Oops, I have to be careful' or 'I have to make sure it keeps going well' or 'I have to watch my own boundaries.'" (P13)*
Behavioral responses following awareness		
Task-oriented and problem-focused actions	Undertaking targeted, problem-focused action, by addressing stressors and reorganizing work tasks.	*"Yes, in the sense that you have the insight then, you can also look at what do I need now…when my head was full I would really focus on getting rid of my paperwork…'that administration is putting pressure on how I work now, and I have to do something about that.'" (P5)*
Seeking relaxation and rest	Awareness prompted to seek moments of rest, taking breaks and relaxing activities during work.	*"But also spent some time with my breathing, that I just breathed for a moment. Because then my breathing is somewhere near my ears." (P2)*
Contextualizing feelings and reframing thoughts	Understanding your feelings and reframing your thoughts, made them feel less overwhelming.	*"Then I probably start wondering how that came about…I think then sometimes I also manage to maybe when I'm sitting in red by thinking, 'What was this?' to go to orange because it's already kind of helpful to place it anyway." (P7)*
Lasting behavior change	Some maintained reflective behaviors and consistent breaks beyond app use.	*"And when something happened, I thought, 'Oh yes, if I had filled it in now, it would probably give as a tip to do this for a moment.' So, then I very briefly went to do that without using the app." (P8)*

Stress tips

The app's stress tips were well-received and seen as reminders to take stress-reducing actions: *"Because in the moment you do not really think about that. So, a reminder is quite nice."* (P3). Several participants added that even if the tips are something you know yourself, it is still helpful if the app offers it: *"It can be important or nice for us people that something or someone says things to you. Even if sometimes these are things that you could actually have thought of yourself, it's still helpful if it's just said to you"* (P7). This was further explained that it can be difficult to take the step to rest or relax in stressful situations. As it was pointed out, the brain often doesn't work optimally under stress, so you would be less likely to think or do it yourself: *"When you're in stress, our brain doesn't always function optimally, so it's hard to still think of that yourself, and so it can be nice if it's kind of pre-cooked."* (P7). For those working in more solitary roles, these

external reminders were especially important because they worked without direct colleagues who could check in on them.

Participants also appreciated the ability to view the full list of stress tips, as it provided them with more ideas. One participant noted that this feature reminded her of the variety of ways to relax beyond her usual approach: *"There are quite a lot of options actually. And normally out of myself I would probably just only think about of taking a break or something."* (P3). In addition, the option to personalize the list by adding your own stress-reducing tips was well received: *"You can say 'Go listen to a podcast,' and that is good because then it's personal."* (P4).

However, some participants felt the tips offered little added value, as the suggestions were already familiar, repetitive, or uninspiring: *"It's the same answer every time. What innovates it anymore?"* (P6). They suggested offering more diverse and creative tips to keep users engaged: *"For example, if there were two of them, one that you might have filled in yourself beforehand, because of course that is also very useful, that works well for you, but also something completely new of which you can indeed think, 'Oh no this really isn't for me' or 'Oh what fun, I'll give it a try.'"* (P9).

Barriers to app use at work

Not part of the work routine

Many participants found it difficult to integrate the app into their daily routine due to a packed schedule, administrative demands, and a fast-moving and unpredictable workday. Several participants believed that if completing the questionnaires had been easier from the start, it might have helped establish a habit: *"If I could have filled it in more easily at the beginning, that there would be a bit of a rhythm that you go and fill it in. That would have made it easier."* (P6).

High workload and time pressure

High workloads often led to forgetting or delaying app use. Notifications were frequently dismissed due to more pressing responsibilities, and by the time participants had a free moment, the questionnaire had often already expired. Some mentioned that their work required full attention on clients, making it difficult to find time to engage with the app.

Irregular and unpredictable schedules

Others noted that the unpredictability of their work environment, such as sudden phone calls, emergencies, and delayed sessions, made it difficult to plan moments for the app. Irregular shifts and schedules created additional obstacles. The app's set notifications did not always align with the availability in that moment, and those working alone had fewer opportunities to step away and complete questionnaires. Others lacked access to work phones or used shared devices, which limited their ability to interact with the app.

Difficult to shift attention during work

The fast-paced nature of their work also meant that breaking concentration to use the app felt disruptive. Some felt that once they were immersed in work, shifting focus to the app was difficult. Even when they intended to complete the questionnaires, they often became so absorbed in their daily tasks that the app was deprioritized: *"Sometimes I'm so caught up in the day, in the structure, in the groups, that I thought, 'Oh yes, I still have to do that app…' I didn't always manage to complete those lists on time."* (P12).

Facilitators of app use at work

Part of the daily work routine

Participants also identified several factors that facilitated regular app use. Over time, completing the questionnaires became part of their daily routine, eventually turning into a habit. Notifications played a key role in reminding participants to engage with the app: *"It is thanks to the notifications that I did think about it."* (P8).

Available moments during work

The fixed timing of notifications helped users anticipate them, reinforcing the habit. One participant noted how quickly the notifications became part of her routine, to the point where their absence was noticeable: *"Somewhere in the afternoon I think 'This is weird, how empty it is.' Funny how quickly that goes. How you actually just make something your own very quickly."* (P2).

Finding or setting fixed moments for app use helped participants integrate it into their workday without disruption, which was appreciated and contributed to habit forming. For example, some participants found specific moments in their workday, such as during breaks, between appointments, or at the start of the day.

Stress recognition

Self-awareness

All participants reported that the app prompted them to pause, take a moment for themselves, and reflect on their day and feelings. The notifications served as reminders to shift attention inward, helping them become more self-aware.

One participant set the first questionnaire in the morning before work. Although she initially found this inconvenient, it helped her begin the day more consciously: *"Because it does make me think again of, 'Hey, did I actually get a good night's sleep? How do I actually start my day?' I thought that was a positive thing. That did make a*

difference…I became aware that it's also good to reflect on how I start my day and how I feel." (P7).

Participants also noted that with full schedules, they were often so focused on their tasks that they operated on a so-called 'autopilot', becoming caught up in the flow of the day. The app provided a necessary pause, interrupting this continuous work cycle and compelling them to take a moment to reflect. As one participant described: *"The app makes it necessary to pause for a moment anyway. Which is really good for me, because otherwise I just drift on. Yeah especially, when I'm busy."* (P1). Without this reminder, such self-reflection often occurred only later in the day: *"It was earlier in the day, rather than just continuing and then, in the afternoon, driving home and thinking, 'Oh yes, what kind of day was it?'"* (P9).

Awareness of stress signals

Nearly all participants reported that completing the app's stress questionnaire encouraged reflection on their mental and physical states, making them more aware of stress signals such as bodily tension, a full head, or hunched shoulders. Many acknowledged that without the app, they would have noticed these signs far less or not at all.

The response options also prompted participants to assess whether their experience of stress signals differed from their usual "normal" state: *"Particularly with those answers, I was consciously engaged in that for a while like, 'Is it actually like usual or is it more than usual?'"* (P13). This comparison further helped them to distinguish between stressful and less stressful moments.

Awareness of stress level

All participants stated that seeing their calculated stress score increased their awareness of their stress levels, with some describing it as a "wake-up call". They explained that the app revealed stressful moments they might have otherwise overlooked, helping them recognize moments that had more impact than they initially thought.

Seeing the stress score also enabled participants to notice rising stress levels earlier, allowing quicker intervention. One participant described how awareness of moderate stress can prevent escalation to high stress: *"Instead of just going on and on, when you might be in orange at 12 o'clock, but not quite signaling that… you go on, on, on, on and eventually you end up in red, for example."* (P7).

For many, the score represented an accurate validation of how they felt, with low stress scores providing reassurance: *"Green I always found reassuring. Then I thought, 'Okay, it is not too bad. That is fine, that is nice.'"* (P2). Some also explained that they felt like they were doing a good job and had a sense of accomplishment. Low scores also positively influenced participants' outlook on their workday and their sense of their workload being manageable: *"And everyone also always just talks about busy, busy, busy. And then it always just feels like work is stressful then. But then when you see such a low stress score, you think, 'Well, it's really not that bad at all.'"* (P3). This helped them to approach the rest of the day more relaxed, preventing further stress build-up: *"Maybe going into it more relaxed…it also ensures that you do not get as much stress afterwards."* (P3). Conversely, high stress scores sometimes provoked confrontation and disappointment: *"Sometimes I did think, 'Oh well, I do feel I'm in orange or something' but then I was in red. Then I thought, 'Yeah this is unfortunate. I wasn't quite expecting this.' So, I found that confronting at times."* (P2).

Insight into stress patterns and factors

Participants reported that using the STAPP@Work app increased their awareness of stress factors and moments of stress: *"I do notice that I know when I get a little stressed, and sure, I knew that maybe before using that app too, but not as consciously as now, so I take that from it."* (P8). Although most participants had not actively used the visual overview, completing the questionnaire and seeing their stress scores provided valuable insights into stress factors: "*And it also gives me insight into how, even in a period of half a day, your energy or stress levels can fluctuate quite a bit. And you can also recognize a kind of pattern of, 'Hey, where are those energy dips?'" (P9).*

Participants differed in how much new insight the app provided. Some found the app helped structure and clarify stress factors they already suspected, while others felt they learned little new, as they were already aware of their stress sources. However, among those who found no new insights, all did state that the app could have been more helpful during earlier, more stressful periods in their lives: *"Back then, it could have helped me gain insight into my daily patterns. So, for that reason, I think it could be helpful again in the future, but it definitely would have helped me back then to guide me through that."* (P6).

Prioritizing personal well-being

Using the app helped participants recognize the importance of safeguarding and maintaining good health. This encouraged them to monitor their well-being more closely and pay preventive attention to stress, for instance by setting and protecting their own boundaries. High stress scores, in particular, functioned as a clear signal for participants to take action: *"Well, that would just be a strong signal for me to make sure the stress is going to decrease."* (P12). Such moments prompted participants to reconsider how certain activities had affected them and to reflect more consciously on underlying stressors. As one participant explained: *"And then, of course, it's also important to explore where that stress is coming from. Is it just coming from my work or is it coming from other*

factors?" (P12). Participants also specifically focused on preventing future stress: *"I think I also ask myself, 'Should I do something about this?' 'Can I do something about this preventively?'"* (P3).

Behavioral responses following awareness

Becoming aware of their stress prompted many participants to undertake actions during the workday, whether through the app's suggestions or their own initiative.

Task-oriented and problem-focused actions

As STAPP@Work helped to identify stress sources, participants reported taking targeted action to address and manage these stressors. This also included reorganizing and reprioritizing their work tasks accordingly for example by postponing or finishing certain tasks. One participant had pointed out that she was extra aware that the weekly meeting caused more tension which made her think: *"And maybe you can also prepare something for it, that you're going to do a meeting like that standing up or in a different way, yes…that I can look more actively into 'How am I going to keep this fun and sustain it?'"* (P9).

Another participant followed the app's tip to create an overview of work tasks, which helped her organize her thoughts and avoid feeling overwhelmed: *"Well, I do notice that I feel calmer…and I also always had the idea that my head was a little bit, what do I call it, less cloudy or something. That I could think much more sharply like, 'Okay, but what do I actually need to do?'"* (P2).

Seeking relaxation and rest

Most participants indicated that they had taken a moment to rest and take a break from their work after using the app. Some did breathing exercises or adjusted their posture, while others briefly distracted themselves with another activity. Many participants also reported taking a short walk to clear their heads and feel more relaxed: "*And now, with a questionnaire like this, I can clearly make the connection: 'Oh yes, but I've also been sitting still for an hour, so I'm just going to go for a five or ten-minute walk.' And then you feel that stiffness leaving your body, so to speak. So, you immediately feel that it helps." (P9).* Another participant decided to have lunch outside during a walk break, which contributed to feeling refreshed and better prepared to continue the workday.

Participants that were highly immersed in their daily tasks made sure to take breaks to eat and drink. Those working in isolated environments actively sought social interaction with colleagues. Participants who took a break or engaged in a relaxing activity because of the app reported feeling calmer during the workday: *"That I think I end up going through my week a little calmer, I do think. Yes, I think so."* (P7). However, some participants noted that the calming effect was temporary, as work pressure and stress returned throughout the day: *"But then the further away you are from the moment you used that app, the stress just increases again."* (P2).

Contextualizing feelings and reframing thoughts

Participants also explained that they restructured their thoughts and made them less negatively charged. Becoming aware of stress helped them place their feelings into context and understand them better throughout the day. One participant described how this prevented her from ending the day completely drained without knowing why: *"I think I have experienced this less now…that you go through the day like this, actually a bit on a kind of busy autopilot, and then at the end of the day…that sometimes you can think, 'I'm completely exhausted, but what is this now?'"* (P7).

Participants noted that simply identifying their stress level and placing it in context already helped: "*Or noticing earlier, 'Oh, I really feel like I'm getting a bit grumpy.' And then you can think, 'Oh yes, that was because of that hour or that conversation.' And if you notice that earlier, instead of at the end of your day or at the end of your week, you can also think more quickly, 'Oh yes, fine. It's also logical that you get a bit of a headache or worry a little.'"* (P9). One participant also noted that only knowing she could take a break when needed made the workday more manageable: *"I can always just take a little moment which is already helpful…and then the whole day immediately feels a little less overwhelming."* (P3).

Lasting behavior change

Some participants reported continuing certain behaviors even after they stopped using the app. One participant became more mindful of how she started her workday, now regularly reflecting on herself without the app. Another participant still thought about the app's stress tips and applied them in moments when they would normally receive advice. A participant who described the app as a tool for recognizing stress signals, reported that after a week and a half, she began independently checking for signs of stress and taking a moment to reflect. Another participant described a shift in how he approached breaks: rather than skipping them and adjusting his hours afterwards, he began taking breaks more consistently.

Motivations for app use

Participants shared their thoughts on why MHWs might or might not use the app. Some suggested that colleagues could perceive the app as an additional task in an already demanding work environment making it feel time-consuming, which might discourage them from trying it.

Some participants believed that certain professionals might feel they already know how to manage stress and therefore may not see the added value of the app: *"And I*

think some also say, 'Yeah, but what's it going to help me' or 'I'm a professional after all'…Whereas I think, we know just fine how to guide our clients, but that doesn't mean you have yourself completely in control." (P5). For others, the app's focus on self-reflection could be confronting, as it requires acknowledging stress patterns they might prefer to avoid: *"It is very confronting to also have to look at yourself, at certain patterns…to recognize that what you are doing is not so functional."* (P2).

Conversely, participants also discussed reasons why colleagues might find the app beneficial. Many believed it could help increase awareness of stress levels and provide early insight into stress patterns. This was perceived important because MHWs might not always recognize their own stress as they focus on their work: *"I think a lot of people don't realize it and just go on, go on, go on. And if you were to ask a lot of people, 'Do you have stress?' most people would say no but probably have it."* (P8).

Discussion

The findings illustrate how STAPP@Work supported MHWs become more self-aware, recognize stress patterns, and integrate more self-management into their workday.

STAPP@Work was perceived as user-friendly, quick to complete, and over time, became part of the workday. Prior research similarly reported that short, consistent interactions were habit-forming, increasing engagement with mHealth interventions at work [49]. However, the two-week usage period may have been insufficient for all employees to fully embed the app into their routines. Perceived barriers also made it difficult to engage with the app and incorporate it into their workday. Although its value was recognized, the app was deprioritized due to time constraint and hectic schedules, leaving few opportunities for self-assessment, barriers commonly seen in workplace digital interventions [49–51]. Greater flexibility in app functionality, such as extended response windows, could reinforce engagement by allowing use at more convenient times.

Previous studies in non-clinical settings highlight the importance of leadership endorsement and supportive work culture for successful implementation [51–53]. Participants in this study emphasized more on individual motivations. This may reflect the mental healthcare context, where autonomy and self-management are highly valued, and the focus on client care can overshadow employees' expectation of organizational involvement. The app's self-guided design may also have reinforced the perception that stress management is an individual rather than organizational responsibility.

In high-pressure work environments, employees often prioritize job responsibilities over personal well-being, creating an imbalance between work demands and recovery that can lead to chronic stress [53]. Prolonged cognitive demands contribute to mental fatigue, reducing performance and increasing burnout risk [53–55]. Participants reported that without external reminders, they rarely paused for self-reflection during work. STAPP@Work disrupted this cycle by prompting brief "self-check-ins," encouraging employees to step back and evaluate their well-being. Prior research also highlights that mood-tracking apps create self-awareness, helping users reflect on themselves [56, 57]. These intentional pauses interrupted the pattern of continuous task immersion, creating space for recovery and attention to personal needs. Microbreaks such as these are known to restore attention, sustain energy, and prevent cognitive overload [58, 59].

These reflection moments heightened self-awareness, important in effective stress regulation and protection against mental fatigue [55, 60]. According to Self-Regulation Theory, recognizing internal signals is the essential first step to regulate yourself and maintain balance [61, 62]. Without this awareness, employees often failed to notice rising stress until it escalated, making timely action unlikely during fast-paced work. By becoming more aware of their stress levels and patterns, employees were able to intervene early and manage stress, which helps to prevent stress accumulation, consistent with the Preventive Stress Management Theory [60, 62]. Participants were more inclined to identify sources of stress and take steps to prioritize their well-being, which is needed to prevent future stress and maintain long term well-being [60].

The findings showed that greater awareness translated into behavioral responses. Participants created moments of rest and relaxation as well as reorganized and adjusted their tasks to feel better. Participants also noticed that reframing their thoughts and contextualizing their feelings was already helpful, aligning with previous findings stating that self-monitoring apps can help externalize distress and process emotions [63]. These behaviors reflect both problem-focused and emotion-focused strategies [64]. While the previous quantitative study only showed improvements in problem-focused coping [33], these findings reveal deeper insights into emotion-focused approaches that may not have been captured in quantitative measures.

Participants emphasized that these strategies made them feel more relaxed, regain perspective, and made the day feel less overwhelming. This aligns with the Job Demands–Resources model, which posits that personal resources buffer the impact of high job demands [62]. By providing timely insights, increased awareness, and encouraging self-regulatory strategies, STAPP@Work can help build personal resources and therefore support employees in becoming more resilient against workload

and stress. Participants continued to self-reflect and prioritize stress management after discontinuing the app, underscoring its promising role in long-term resilience. This aligns with previous findings, which showed sustained improvements in coping self-efficacy [33].

Strengths and limitations

This study provides novel qualitative insights into MHWs' experiences with a self-monitoring stress management app, an area that remains underexplored. Combined with a preceding quantitative study, it offers a more holistic understanding of such interventions. While the sample size may be a limitation, it was considered sufficient for the study's aims. The sample reflected the gender distribution of the Dutch mental healthcare workforce [65] and, although homogeneous, was diverse across roles and demographics, providing rich perspectives. Together with data saturation and detailed reporting, these factors strengthen the credibility of the findings.

Social desirability bias may have influenced responses, particularly given recruitment within GGz Centraal, where the organization acted as both employer and research setting. Measures such as anonymity assurances and secure data handling helped mitigate this risk. The sample may have favored employees receptive to stress management, limiting generalizability but aligning with the app's target audience.

Although the findings may not generalize to different sectors, especially where mental health is less emphasized, they offer transferable insights rooted in the mental healthcare context. Focusing on MHWs provided a unique opportunity to examine the app's use in a high-stress environment, creating a foundation for adapting similar interventions elsewhere. By describing how employees experienced a stress management app in a fast-paced and demanding workplace, and how it supported them in managing job demands, this study enables readers to assess its relevance for their own settings. Although roles and organizations differ, stress experiences are shaped by individual appraisals of demands and resources, making self-awareness and recognition of stress patterns a cross-sectoral priority [62].

Implications

This study highlights the potential of STAPP@Work in supporting preventive stress management among MHWs while also addressing needs common across sectors. Evidence from non-clinical work sectors underscores similar demands for tools that enable self-assessment, mood tracking, stress awareness, and short recovery breaks [50, 66–68]. Features such as quick self-monitoring, pattern recognition, and reminders for stress regulation are widely valued at work [50, 67, 68]. As STAPP@Work addresses such universal needs regarding workplace stress interventions, it may be applicable across sectors and organizational contexts. As a preventive tool, it can help reduce chronic stress, emotional exhaustion, and burnout, while lowering absenteeism and turnover and supporting long-term job performance and satisfaction. Findings indicate that MHWs adopted lasting self-regulatory behaviors, demonstrating how self-monitoring technologies can promote a more mindful, resilient, and sustainable workforce. Given rising service demands and workforce pressures, retaining MHWs is critical [2]. Scalable interventions such as STAPP@Work offer a meaningful contribution to staff well-being.

For organizational leaders and occupational health teams seeking to integrate stress-monitoring apps into routine practice, it is important to recognize that introducing a new tool into established and fast-paced workflows requires careful alignment. This involves transforming its perception of an additional, time-consuming task into a helpful resource for self-care and workplace well-being. Implementation strategies should prioritize flexibility and customization, allowing the app to fit into daily work patterns. Research on digital health interventions [49, 50] emphasizes addressing barriers such as perceived effort, limited usefulness, and time constraints. Clear communication of benefits and targeted strategies to reduce resistance are essential for adoption.

Future research

Further research should explore experiences across specific departments and job roles, as this exploratory study included diverse functions. Expanding to other sectors would assess applicability beyond mental healthcare, particularly in contexts less familiar with stress management practices. Future studies should also explore barriers and facilitators in depth to inform tailored strategies for sustained engagement. As STAPP@Work targets individual employees, future developments should incorporate organizational determinants of stress, including leadership, culture, and working conditions. Addressing these systemic factors alongside individual interventions is essential for comprehensive workplace stress prevention.

Conclusion

This study reveals that self-management workplace stress apps such as STAPP@Work are an accessible means of helping MHWs manage stress and build resilience. The app created valuable moments for self-reflection, increasing awareness of stress signals and encouraging employees to prioritize well-being. This heightened awareness motivated MHWs to apply self-regulatory behaviors to manage job demands. Early identification of stress indicators and moments of introspection enabled timely intervention. This makes employees better equipped to

prevent work-related stress, which is particularly relevant in high-pressure sectors. However, barriers inherent to the mental health sector, such as high workload, need for flexibility and unpredictable schedules should be considered to optimize adoption and user-engagement. These findings help fill a gap in the literature on mobile stress interventions for MHWs, providing insights into real-world use and informing future research and innovation in digital tools for workplace well-being.

Abbreviations

EMA Ecological Momentary Assessment
MHWs Mental Health Workers

Supplementary Information

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Supplementary Material 1: COREQ Checklist.

Supplementary Material 2: Interview guide.

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Author contributions

SD designed the study, conducted data collection and analysis, interpreted the data, and drafted the manuscript. YR, PNvH, and NHC provided supervision and contributed to the reviewing and editing of the manuscript. All authors read and approved the final manuscript.

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Data availability

Due to the sensitive nature of the interview data and to protect participant privacy, the datasets generated and analyzed during the current study are not publicly available. Data are available from the corresponding author upon reasonable request. The STAPP@Work app used in this study is no longer publicly available, as it was transferred to an independent third-party following completion of the study and released under a different name.

Declarations

Ethics approval and consent to participate

This study was reviewed and approved by the Medical Ethics Review Committee Leiden The Hague Delft (METC LDD) (Ref: N25.024) and was conducted in accordance with the principles of the Declaration of Helsinki. Participants were informed about the aims and procedures of the study and provided informed consent prior to participation. They were informed of their right to withdraw from the study at any time without consequences. Interviews were audio-recorded with permission and anonymized to ensure confidentiality. All user data in the app was handled in accordance with the General Data Protection Regulation of the European Union, ensuring user privacy and data security.

Consent for publication

Not applicable.

Competing interests

YR became co-founder of a new version of the STAPP@Work app after completion of this study. The STAPP@Work app was transferred to an independent third party, who further developed, modified, and released it under a different name. All other authors declare no competing interests.

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References

1. Kober M, Chang Y. Healthcare workers' perceptions of work-related stress and burnout: strategies and barriers for self-care. Am J Lifestyle Med. 2024. https://doi.org/10.1177/15598276241230043.
2. Bootsma J, van de Glind I, van de Ven G. Op het tweede gezicht: een blik op ontwikkelingen in de ggz. Utrecht: Stichting FWG; 2023. Available from: https://fwg.nl/app/uploads/2023/05/FWG-Trendrapport-GGZ-mei-2023-webversie.pdf Accessed 20 Jan 2025.
3. Human Capital Care. Verzuim door stressklachten in vijf jaar met 30% gestegen. https://www.humancapitalcare.nl/artikelen/verzuim-door-stressklachten-in-vijf-jaar-met-30-gestegen. Accessed 20 Jan 2025.
4. GZ Psychologie. Meer psychologen en psychiaters emotioneel uitgeput door ZPM. https://www.gzpsychologie.nl/meer-psychologen-en-psychiaters-emotioneel-uitgeput-door-zpm/. Accessed 20 Jan 2025.
5. De Vroege L, Van Den Broek A. Substantial impact of COVID-19 on self-reported mental health of healthcare professionals in the Netherlands. Front Public Health. 2021;9. https://doi.org/10.3389/fpubh.2021.796591.
6. De Vroege L, Van Den Broek A. Post-pandemic self-reported mental health of mental healthcare professionals in the Netherlands compared to during the pandemic: an online longitudinal follow-up study. Front Public Health. 2023;11. https://doi.org/10.3389/fpubh.2023.1221427.
7. Daviu N, Bruchas MR, Moghaddam B, Sandi C, Beyeler A. Neurobiological links between stress and anxiety. Neurobiol Stress. 2019;11:100191. https://doi.org/10.1016/j.ynstr.2019.100191.
8. Westfall S, Caracci F, Estill M, Frolinger T, Shen L, Pasinetti GM. Chronic stress-induced depression and anxiety priming modulated by gut-brain-axis immunity. Front Immunol. 2021;12. https://doi.org/10.3389/fimmu.2021.670500.
9. Edú-Valsania S, Laguía A, Moriano JA. Burnout: a review of theory and measurement. Int J Environ Res Public Health. 2022;19(3):1780. https://doi.org/10.3390/ijerph19031780.
10. Schwabe L. Memory under stress: from adaptation to disorder. Biol Psychiatry. 2024. https://doi.org/10.1016/j.biopsych.2024.06.005.
11. Dias-Ferreira E, Sousa JC, Melo I, Morgado P, Mesquita AR, Cerqueira JJ, et al. Chronic stress causes frontostriatal reorganization and affects decision-making. Science. 2009;325(5940):621–5. https://doi.org/10.1126/science.1171203.
12. Giovanniello J, Bravo-Rivera C, Rosenkranz A, Lattal KM. Stress, associative learning, and decision-making. Neurobiol Learn Mem. 2023;204:107812. https://doi.org/10.1016/j.nlm.2023.107812.
13. Segerstrom SC, Miller GE. Psychological stress and the human immune system: a meta-analytic study of 30 years of inquiry. Psychol Bull. 2004;130(4):601–30. https://doi.org/10.1037/0033-2909.130.4.601.
14. Mönnikes H, Tebbe J, Hildebrandt M, Arck P, Osmanoglou E, Rose M, et al. Role of stress in functional gastrointestinal disorders. Dig Dis. 2001;19(3):201–11. https://doi.org/10.1159/000050681.
15. Ranabir S, Reetu K. Stress and hormones. Indian J Endocrinol Metab. 2011;15(1):18. https://doi.org/10.4103/2230-8210.77573.
16. Van De Leur JC, Jovicic F, Åhslund A, McCracken LM, Buhrman M. Psychological treatment of exhaustion due to persistent non-traumatic stress: a scoping review. Int J Behav Med. 2023;31(2):175–91. https://doi.org/10.1007/s12529-023-10185-y.

17. Lutz N, Taeymans J, Ballmer C, Verhaeghe N, Clarys P, Deliens T. Cost-effectiveness and cost-benefit of worksite health promotion programs in Europe: a systematic review. Eur J Public Health. 2019;29(3):540–6. https://doi.org/10.1093/eurpub/cky269.
18. Johnson J, Hall LH, Berzins K, Baker J, Melling K, Thompson C. Mental healthcare staff well-being and burnout: a narrative review of trends, causes, implications, and recommendations for future interventions. Int J Ment Health Nurs. 2018;27(1):20–32. https://doi.org/10.1111/inm.12416.
19. Koh J, Tng GYQ, Hartanto A. Potential and pitfalls of mobile mental health apps in traditional treatment: an umbrella review. J Pers Med. 2022;12(9):1376. https://doi.org/10.3390/jpm12091376.
20. Junker M, Böhm M, Krcmar H. Advantages and disadvantages of mobile applications for workplace health promotion: a scoping review. PLoS ONE. 2024;19(1):e0296212. https://doi.org/10.1371/journal.pone.0296212.
21. Paganini S, Meier E, Terhorst Y, Wurst R, Hohberg V, Schultchen D, et al. Stress management apps: systematic search and multidimensional assessment of quality and characteristics. JMIR Mhealth Uhealth. 2023;11:e42415. https://doi.org/10.2196/42415.
22. Coelhoso CC, Tobo PR, Lacerda SS, Lima AH, Barrichello CRC, Amaro E Jr, et al. A new mental health mobile app for well-being and stress reduction in working women: randomized controlled trial. J Med Internet Res. 2019;21(11):e14269. https://doi.org/10.2196/14269.
23. Egger SM, Frey S, Sauerzopf L, Meidert U. A literature review to identify effective web- and app-based mHealth interventions for stress management at work. Workplace Health Saf. 2023;71(10):452–63. https://doi.org/10.1177/21650799231170872.
24. Weber S, Lorenz C, Hemmings N. Improving stress and positive mental health at work via an app-based intervention: a large-scale multi-center randomized control trial. Front Psychol. 2019;10:2745. https://doi.org/10.3389/fpsyg.2019.02745.
25. Hwang WJ, Jo HH. Evaluation of the effectiveness of mobile app-based stress-management program: a randomized controlled trial. Int J Environ Res Public Health. 2019;16(21):4270. https://doi.org/10.3390/ijerph16214270.
26. Pospos S, Young I, Downs N, Iglewicz A, Depp CA, Chen JM, et al. Web-based tools and mobile applications to mitigate burnout, depression, and suicidality among healthcare students and professionals: a systematic review. Acad Psychiatry. 2018;42(1):109–20. https://doi.org/10.1007/s40596-017-0868-0.
27. Prado K, Robinson A, Chao Y. The impact of mindful meditation on health care workers during the COVID-19 pandemic. J Nurse Pract. 2023;19(3):104513. https://doi.org/10.1016/j.nurpra.2022.11.023.
28. Salvado M, Marques DL, Pires IM, Silva N. Mindfulness-based interventions to reduce burnout in primary healthcare professionals: a systematic review and meta-analysis. Healthcare. 2021;9(10):1342. https://doi.org/10.3390/healthcare9101342.
29. Taylor HO, Cavanagh K, Field AP, Strauss C. Health care workers' need for headspace: findings from a multisite definitive randomized controlled trial of an unguided digital mindfulness-based self-help app to reduce healthcare worker stress. JMIR Mhealth Uhealth. 2022;10(8):e31744. https://doi.org/10.2196/31744.
30. Yoon S, Goh H, Nadarajan GD, Sung S, Teo I, Lee J, et al. Perceptions of mobile health apps and features to support psychosocial well-being among frontline healthcare workers involved in the COVID-19 pandemic response: qualitative study. J Med Internet Res. 2021;23(5):e26282. https://doi.org/10.2196/26282.
31. Xu HG, Tuckett A, Kynoch K, Eley R. A mobile mindfulness intervention for emergency department staff to improve stress and wellbeing: a qualitative study. Int Emerg Nurs. 2021;58:101039. https://doi.org/10.1016/j.ienj.2021.101039.
32. Shiffman S, Stone AA, Hufford MR. Ecological momentary assessment. Annu Rev Clin Psychol. 2008;4:1–32. https://doi.org/10.1146/annurev.clinpsy.3.022806.091415.
33. Demirel S, Roke Y, Hoogendoorn AW, Hoefakker J, Hoeberichts K, van Harten PN. Assessing the effectiveness of STAPP@Work, a Self-Management mobile app, in reducing work stress and preventing burnout: Single-Case Experimental Design study. J Med Internet Res. 2024;26:e48883. https://doi.org/10.2196/48883.
34. Wilson A. A guide to phenomenological research. Nurs Stand. 2015;29(34):38–43. https://doi.org/10.7748/ns.29.34.38.e8821.
35. Gray DE. Doing research in the real world. 4th ed. London: SAGE Publishing Ltd; 2018.
36. Tong A, Sainsbury P, Craig JC. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. Int J Qual Health Care. 2007;19(6):349–57. https://doi.org/10.1093/intqhc/mzm042.
37. Fusch PI, Ness LR. Are we there yet? Data saturation in qualitative research. Qual Rep. 2015;20(9):1408–16. https://doi.org/10.46743/2160-3715/2015.2281.
38. Hennink M, Kaiser BN. Sample sizes for saturation in qualitative research: a systematic review of empirical tests. Soc Sci Med. 2022;292:114523. https://doi.org/10.1016/j.socscimed.2021.114523.
39. Olivier-Pijpers V, Vugts B, Signaleringsplan. zegen of vloek? reflectie op het gebruiken van signaleringsplannen in de langdurige zorg. Centrum voor Consultatie en Expertise; 2016. Available from: https://cce.nl/sites/cce.nl/files/2022-09/cce_signaleringsplan_zegen_of_vloek_webversie.pdf Accessed 16 Dec 2024.
40. Kallio H, Pietilä AM, Johnson M, Kangasniemi M. Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. J Adv Nurs. 2016;72(12):2954–65. https://doi.org/10.1111/jan.13031.
41. DeJonckheere M, Vaughn LM. Semistructured interviewing in primary care research: a balance of relationship and rigour. Fam Med Community Health. 2019;7(2):e000057. https://doi.org/10.1136/fmch-2018-000057.
42. Adams WT. Conducting semi-structured interviews. In: Newcomer KE, Hatry HP, Wholey JS, editors. Handbook of Practical Program Evaluation. 4th ed. San Francisco: Jossey-Bass; 2015. pp. 492–505. https://doi.org/10.1002/9781119171386.ch19.
43. Moser A, Korstjens I, Series. Practical guidance to qualitative research. Part 3: Sampling, data collection and analysis. Eur J Gen Pract. 2018;24(1):9–18. https://doi.org/10.1080/13814788.2017.1375091.
44. Korstjens I, Moser A, Series. Practical guidance to qualitative research. Part 4: Trustworthiness and publishing. Eur J Gen Pract. 2018;24(1):120–4. https://doi.org/10.1080/13814788.2017.1375092.
45. Jootun D, McGhee G, Marland GR. Reflexivity: promoting rigour in qualitative research. Nurs Stand. 2009;23(23):42–6. https://doi.org/10.7748/ns2009.02.23.23.42.c6800.
46. Braun V, Clarke V. Using thematic analysis in psychology. Qual Res Psychol. 2006;3(2):77–101. https://doi.org/10.1191/1478088706qp063oa.
47. Schorr A. The Technology Acceptance Model (TAM) and its importance for digitalization research: a review. In: Proceedings of the International Symposium on Technikpsychologie. Sciendo; 2023. pp. 55–65. https://doi.org/10.2478/9788366675896-005
48. Hargrove MB, Quick JC, Nelson DL, Quick JD. The theory of preventive stress management: a 33-year review and evaluation. Stress Health. 2011;27(3):182–93. https://doi.org/10.1002/smi.1417.
49. Kowalski L, Finnes A, Koch S, Bujacz A. User engagement with organizational mHealth stress management intervention: a mixed methods study. Internet Interv. 2024;35:100704. https://doi.org/10.1016/j.invent.2023.100704.
50. Carolan S, De Visser RO. Employees' perspectives on the facilitators and barriers to engaging with digital mental health interventions in the workplace: qualitative study. JMIR Ment Health. 2018;5(1):e8. https://doi.org/10.2196/mental.9146.
51. Sundstrup E, Dyreborg J, Frost AD, et al. Barriers and facilitators of implementing workplace interventions supporting young workers' safety, work environment and health: a scoping review of qualitative and mixed-method studies. J Occup Rehabil. 2025. https://doi.org/10.1007/s10926-025-10313-3.
52. de Korte EM, Wiezer N, Janssen JH, Vink P, Kraaij W. Evaluating an mHealth App for Health and Well-Being at Work: Mixed-Method Qualitative Study. JMIR Mhealth Uhealth. 2018;6(3):e72. https://doi.org/10.2196/mhealth.9146.
53. Bakker AB, Demerouti E. Job demands–resources theory: taking stock and looking forward. J Occup Health Psychol. 2017;22(3):273–85. https://doi.org/10.1037/ocp0000056.
54. Tanaka M, Ishii A, Watanabe Y. Neural effects of mental fatigue caused by continuous attention load: a magnetoencephalography study. Brain Res. 2014;1561:60–6. https://doi.org/10.1016/j.brainres.2014.03.009.
55. Millette D. Emotional self-awareness, self-care, and occupational stress in mental health professionals. advances in human resources management and organizational development. IGI Global; 2023. pp. 237–53. https://doi.org/10.4018/978-1-6684-6543-1.ch017.
56. Caldeira C, Chen Y, Chan L, Pham V, Chen Y, Zheng K. Mobile apps for mood tracking: an analysis of features and user reviews. AMIA Annu Symp Proc. 2018;2017:495–504.
57. Schueller SM, Neary M, Lai J, Epstein DA. Understanding people's use of and perspectives on mood-tracking apps: interview study. JMIR Ment Health. 2021;8(8):e29368. https://doi.org/10.2196/29368.

58. Albulescu P, Macsinga I, Rusu A, Sulea C, Bodnaru A, Tulbure BT. Give me a break! A systematic review and meta-analysis on the efficacy of micro-breaks for increasing well-being and performance. PLoS ONE. 2022;17(8):e0272460. https://doi.org/10.1371/journal.pone.0272460.
59. Kühnel J, Zacher H, De Bloom J, Bledow R. Take a break! Benefits of sleep and short breaks for daily work engagement. Eur J Work Organ Psychol. 2017;26(4):481–91. https://doi.org/10.1080/1359432x.2016.1269750.
60. Quick JC, Wright TA, Adkins JA, Nelson DL, Quick JC. Preventive stress management in organizations. 2nd ed. Washington, DC: American Psychological Association; 2013.
61. Sotiriadis NM, Galanakis NM. Self-regulation and Emotional resilience in the workplace. A systematic review. J Psychol Res. 2022;12(12). https://doi.org/10.17265/2159-5542/2022.12.007.
62. Bakker AB, de Vries JD. Job Demands–Resources theory and self-regulation: new explanations and remedies for job burnout. Anxiety Stress Coping. 2021;34(1):1–21. https://doi.org/10.1080/10615806.2020.1797695.
63. Simmons N, Goodings L, Tucker I. Experiences of using mental health apps to support psychological health and wellbeing. J Appl Soc Sci. 2023;18(1):32–44. https://doi.org/10.1177/19367244231196768.
64. Chesney MA, Neilands TB, Chambers DB, Taylor JM, Folkman S. A validity and reliability study of the coping self-efficacy scale. Br J Health Psychol. 2006;11(3):421–37. https://doi.org/10.1348/135910705X53155.
65. van Wijk M. Arbeidsmarktprofiel van zorg en welzijn. Centraal Bureau voor de Statistiek (CBS); 2020. Available from: https://www.cbs.nl/nl-nl/longread/statistische-trends/2020/arbeidsmarktprofiel-van-zorg-en-welzijn. Accessed 16 Dec 2024.
66. Chow K, Fritz T, Holsti L, Barbic S, McGrenere J. Feeling stressed and unproductive? A field evaluation of a therapy-inspired digital intervention for knowledge workers. ACM Trans Comput Hum Interact. 2023;31(1):1–33. https://doi.org/10.1145/3609330.
67. Weerasekara M, Smedberg ÅB. Exploration of user needs and design requirements of a digital stress management intervention for software employees in Sri Lanka: a qualitative study. BMC Public Health. 2023;23:566. https://doi.org/10.1186/s12889-023-15480-7.
68. Manning JB, Blandford A, Edbrooke-Childs J. Facilitators of and Barriers to Teachers' Engagement With Consumer Technologies for Stress Management: Qualitative Study. J Med Internet Res. 2024;26:e50457. https://doi.org/10.2196/50457.

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