Beyond Meditation: Everyday Mindfulness and Technology Use

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ABSTRACT

Mindfulness, a practice of maintaining awareness by bringing attention to the present without judgment, has many mental and physical well-being benefits when practiced consistently. Many technologies have been invented to support mindfulness practice: mobile apps, web resources, virtual reality environments, and wearables. We present findings from a semi-structured interview study with 6 experienced mindfulness practitioners to understand their daily practice experiences and technologies they incorporate in their practice. Participants identify the benefits and challenges of developing long-term commitment to mindfulness practice, and combine informal mindfulness practice in their daily activities in addition to formal meditation. While conflicted about including and even relying on technology, they adopt and appropriate a range of technologies in their daily practice, some of which are not designed for mindfulness, such as productivity tools and media streaming. Based on our findings, we suggest that designers of mindfulness technologies be cautious about applying behavioral change design principles and go beyond meditation to better situate the tools in practitioners' existing daily routines.

CCS CONCEPTS

• **Human-centered computing → Empirical studies in HCI**.

KEYWORDS

Mindfulness, meditation, technology use, daily life, well-being, mindfulness technology, embedded mindfulness

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1 INTRODUCTION AND RELATED WORK

Mindfulness, a practice of maintaining awareness by bringing attention to the present without judgement [11], is growing in popularity in the past decade. Scientific research has shown that mindfulness practice brings various mental and physical well-being benefits such as reduced stress and anxiety, improved emotion regulation, improved focus, and reduced chronic pain [3]. Similar to other cognitive or physical exercises, obtaining these benefits relies on people's consistent mindfulness practice.

In the past few years, mindfulness has been an emerging topic in HCI research [5–7, 14, 26], with a range of perspectives on what mindfulness is and motivations for the research [24]. Mindfulness HCI research also strives to invent digital technologies to support mindfulness practice. These include, for example, web-based mindfulness practice guidance [13], wearables that detect stressful moments and deliver in-time mindfulness intervention [12], and immersive virtual reality environments for mindfulness practice [1, 19, 21]. With a myriad of commercial technologies to support mindfulness (e.g., Calm, Headspace), other research explored the features of mobile mindfulness meditation apps and conducted expert reviews of these apps [5, 14]. Findings of these studies provide a comprehensive understanding of digital technologies, their affordances, benefits and drawbacks, but it remains unclear how mindfulness practitioners use (or why they refrain from using) these technologies in their daily practice.

Research on people's daily mindfulness practice experiences and technologies to support this practice has focused on novices in a mindfulness training program [17], or experienced practitioner's meditative practice [16]. Our focus here is on *experienced* practitioners who are beyond the stages of learning mindfulness, how they practice mindfulness in their daily activities, their experienced benefits and challenges, and technologies they use in their practice. As a result, in this study, we address the following research questions:

- RQ1: What are the working definitions and characteristics of mindfulness practice from the practitioners' perspective?
- RQ2: What motivates mindfulness practitioners to keep consistent mindfulness practice? What are their experienced benefits and encountered barriers?
- RQ3: What role does technology play in practitioners' everyday mindfulness practice?

We approach our research questions by conducting semi-structured interviews with 6 mindfulness practitioners who have been regularly practicing mindfulness for five years or more. This study extends the previous literature by providing in-depth qualitative findings of mindfulness practitioners' everyday practice and the technologies they embed in their practice.

We found that participants have a range of definitions for mindfulness and what it consists of, based on their everyday formal and informal mindfulness activities. Furthermore, short- and long-term physical and mental benefits motivated practitioners to practice it more consistently, although establishing a long-term practice routine has been an ongoing challenge for them. While being wary about relying on or including technology for mindfulness, experienced practitioners adopt and appropriate a range of technologies

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for their daily mindfulness practice. These included technologies that are not necessarily designed to support mindfulness practice, such as a calendar for reminders, digital spreadsheets for recording emotions, and music and video streaming platforms.

Based on our findings, we propose that mindfulness technology should be designed beyond supporting meditation to incorporate practitioner's informal daily activities and technology habits. We also caution about applying behavioral change design principles in mindfulness technologies, to support awareness and reflection of the original purpose of mindfulness practice. This late-breaking work contributes to better understanding everyday mindfulness practices, technologies used in the practice, and guiding the design of mindfulness technologies that are better situated in practitioners' daily lives.

2 METHOD

Our focus is to understand the practices of experienced participants, people who are beyond the learning stage and practice mindfulness in their everyday lives for a long term. Using the first author's personal networks, we recruited 6 participants who self-identify as regularly practicing mindfulness (4 female, 2 male; ages 25-54; ethnicities 2 White, 3 Asian, 1 African American; see Table 1) through the first author's personal networks and institutional email list. All participants report having more than 5 years of mindfulness practice experience, and four of them have mindfulness teaching experience.

Table 1: Demographic of the participants

ID	Gender	Age range	Years of practicing mindfulness
1	F	25-34	5
2	F	25-34	6
3	M	45-54	20+
4	F	45-54	8
5	M	25-34	7
6	F	Prefer not to answer	40+

We developed a semi-structured interview protocol based on the research questions and iterated it following pilot interviews. The interview protocol consisted of four sections: we started by asking participants background questions such as how do they got into mindfulness and how long have they been practicing it. We then moved to questions about their everyday mindfulness practices such as when and how they practice. We then asked questions about their perceived benefits and barriers to practicing mindfulness. Finally, we asked about digital technologies they use to support their mindfulness practices and the effects. We also encouraged them to show us these technologies.

We conducted all interviews in April and May of 2021 via Zoom and audio-recorded the interviews with participants' permission. Interviews lasted 45-75 minutes and were fully transcribed. Transcripts were then imported into Atlas.ti[1], a qualitative data analysis software. Using an inductive open-coding analysis approach [22], the first author read through the transcripts multiples times and conducted the initial coding. Then, both authors went over and discussed the transcripts together, iteratively highlighted excerpts, and identified key insights and recurring patterns in the data. We use the notation P[ID][Gender] to label quotes from participants' transcripts.

[1]https://atlasti.com/

3 FINDINGS

Based on our analysis, we report findings on how participants define mindfulness practice, characteristics of their daily practice, experienced benefits and challenges, and their use or non-use of technology for everyday mindfulness practice.

3.1 Defining and practicing everyday mindfulness

In our study, we found a range of definitions of what mindfulness is and what counts as mindfulness practice, and these definitions were based on participants' everyday mindfulness activities. One of these definitions, *paying attention to the present moment with awareness*, was often based on formal mindfulness practices, e.g., sitting meditation, walking with awareness, or doing yoga with attention to one's breath. Other definitions our participants offered were based on more casual activities in their daily lives. For example, they defined mindfulness as *doing one thing at a time*, such as focusing on washing dishes or on eating without doing anything else; and as *destressing and relaxation*, such as doing artwork or walking in nature. Participants reported a mix of formal practices and casual activities in their daily life that together comprise their mindfulness practice:

> *"I sometimes do mindful walking, which is like going into a meditative state while walking, and just paying attention to the feeling of walking and focusing my awareness on what's happening in the moment."* [P1F]

Four participants reported practicing formal mindfulness daily, while the other two practiced one to three times a week. Participants mentioned that when life is going well, or when they are getting busy, formal practice may not be prioritized. As experienced practitioners, casual mindfulness practice such as mindful eating, walking and exercising, was easier to integrate into their daily lives. Unlike formal mindfulness practices such as sitting meditation, informal mindfulness activities didn't require participants to find a specific time and place to practice.

In addition, many participants mentioned they bring the core of mindfulness into their everyday lives, such as washing dishes with full concentration and sensation, using mindfulness for work-life boundary management, or dealing with interpersonal conflicts by taking a pause to observe physical sensations without judgment and immediate reactions. For our participants, mindfulness is not only used as a means of relaxation, but as a way of being:

> *"I meditate every day, but I also just do things mindfully. So if I'm doing the dishes, I'm paying attention to doing the dishes. I'm not watching a television show and talking and having a conversation at the same time. Because that's not mindfulness."* [P6F]

Participants reported that when they just started practicing, their mindfulness activities were more narrow, and focused on sitting meditation or yoga. Over time, they incorporated more mindful activities in their daily lives while keeping the key principle: paying attention to the present moment without judgement. As experienced mindfulness practitioners, our participants reflect on choosing suitable activities that one can resonate with to help practice mindfulness in their daily life. Especially for beginners, one proposed starting with a dynamic form to help understand the nature of mindfulness and get immediate benefits:

> *"I think something that is easier for someone who hasn't meditated. It might be trying out yoga. Something else that's immediate, and you don't have to learn anything, is the walking meditation, that I'm saying, like, go for a walk, and for ten minutes. And try the exercise of turning off thinking, keep senses on what you feel, hear, see, smell, keep your thoughts to what you're experiencing in the present moment."* [P3M]

3.2 Benefits and barriers

Our participants reported short- and long-term physical and mental benefits of mindfulness, which motivated them to continue practicing it consistently:

> *"It's given me more control over my emotions or about my mental and physical state, kind of the idea that if you have a good mindfulness session or practice, then you feel relaxed and centered. And the idea that that's always there, and that you can return to that has been comforting to me."* [P5M]

In the short-term, participants reported immediate benefits right even after a short mindfulness session, such as 10-minute sitting meditation, or a half-hour mindful walk, of feeling calm, relaxed and clear-headed. But seeing the short-term benefits of mindfulness practice as remedy also meant, for those who practiced more intermittently, that they only practice when they needed to obtain the immediate benefits. When their life got busy or was generally going well, they forgot to practice mindfulness or felt there was less need to practice, and this prevented them from developing a consistent long-term daily routine:

> *"when I don't think I need that, I will just stop, right? I feel happy this week, I'm doing enough. And why do I need to spend 10 minutes meditating?"* [P3F]

The long-term benefits participants reported included enhanced emotional regulation, reduced chronic pain, increased resilience and a sense of control over one's life, and improved interpersonal relationships. These experienced benefits positively affected interviewees' practice frequency, forming a positive loop in consistent practice. Interestingly, participants attributed their wellbeing benefits to the practice of mindfulness, and attributed messiness in their daily lives to the lack of mindfulness practice, and felt that their life would have been worse if they had not kept the practice:

> *"I know whatever happens with my health down the road I know that it won't be as severe as it would be if I wasn't doing yoga, if I wasn't doing meditation, if I wasn't doing those things. Maybe I would be taking antidepressant pills."* [P5M]

However, even participants who have established a long-term daily practice routine felt that sticking to the practice was not easy, especially when they feel tired or after a long day. If they forced themselves to keep the formal practice regardless of how they felt in the moment, it conflicted with the core of mindfulness: being non-judgmentally aware of the present moment:

> *"I sometimes feel very tired. Or I'm not feeling well, my pain is some days worse. I don't feel like being mindful. And on those days, in a weird way, it is mindful in the sense that I know exactly what I'm doing."* [P4F]

3.3 Technology use and non-use for mindfulness practice

3.3.1 Using technology to remind, assist, and record. Our participants reported a number of digital technologies that they use or have tried using for their mindfulness practice (Table 2), some of which have been directly designed for this purpose. For example, participants mentioned using mobile mediation apps such as Headspace and Calm that provide guided resources and helped create an atmosphere of mindfulness practice with ambient music, and online journaling apps such as the Japanese Awarefy for recording emotions.

Our participants appreciated the easiness of accessing lots of great mindfulness resources with these apps. For instance, Insight Timer has the feature of recording the length of the daily practice and how many consecutive days one has practiced. This design motivated one participant to keep consistent practice, but also presented a conflict about losing the internal motivation of mindfulness as a personal journey:

> *"I'm kind of conflicted about the start, you know, I mean I think I do feel better after I meditate. I think I generally do like having a daily practice, right? But you know, creating these kinds of incentives from the technology to get your stars or keep your streak is bad because it's somehow like an external motivation, and it should be more internally driven."* [P5M]

Interestingly, our participants also discussed a range of digital technologies that aren't specifically designed for mindfulness practice. These included productivity tools such as an online calendar and spreadsheets. For example, some interviewees said they scheduled mindfulness practice sessions in their calendar to remind them to practice. One participant used Google Sheets to record events, emotions, and mindfulness practice in her daily life, then used calculations to find relationships between her practice and emotions:

> *"I try to log down at night. I try to be very ruthless with myself about that. [...] I made a bar graph, a graph with the number of times I got angry, it was direct, it was inversely correlated with the number of times that I did meditation. So it showed that the less meditation I did, the more angry I got."* [P4F]

Other participants used music and video platforms that weren't designed for mindfulness practice to find guided resources and

Table 2: Tools and primary uses for mindfulness practice

Technology	Ways used for mindfulness practice
Calender	Set up a reminder for meditation
Headspace	Guided meditation resources;
Calm	Guided meditation resources; ambiant music
Insight Timer	Guided meditation resources; Timer; Community features; Record length of each practice
Awarefy	Check in and record emotions; recommend self-care activities
Liberate	Guided meditation resources, voices from the people of color
Spotify	Meditation playlist; Ambiant music
Youtube	Mindfulness resources
Zoom	Platform for online mindfulness group session
Google sheets	Record daily life events, emotions and mindfulness practice. Find correlation of practice and emotion regulation

ambient music for their practice, or sounds of bells to signal the beginning and the end of meditation. Unlike meditation apps that required spending money or time to learn the app, Youtube and Spotify were already integrated into participants' daily use for other purposes, and the transition to using them for mindfulness practice seemed natural. The following participant describes using Spotify for guided meditation for its convenience:

> *"I just discovered that some teachers, they upload their audio recordings to Spotify, and they make it as a playlist. So I think that's very convenient for me, because I use Spotify everyday to listen to music. And I can also use that for my sleeping meditation or guided meditation, even though the resources are not as much as Insight Timer and Calm, it's convenient enough for me to open the app and start doing it."* [P2F]

In addition to these resources, the pandemic opened the door for communication tools such as Zoom for online group mindfulness sessions. Online mindfulness sessions weren't considered as ideal as in person in terms of human connection and environmental cues. At the same time, they allowed flexibility of time and place for instructors and students, and had the benefit of controlling the camera and microphone during the session:

> *"I have allergies and often sneeze. So I can just mute it. I can sneeze and it doesn't disturb. And sometimes it felt awkward. But if I sneeze during a guided session in person, that was awkward for me."* [P4F]

3.3.2 Technology non-use to defend mindfulness. Although technology provides many resources for mindfulness practice, our participants also described the downsides of technology, like relying on incentives built into technologies to practice mindfulness, as described above. Two experienced participants expressed concerns about over-reliance on technology that brings another level of addiction, such that *"without the technology, one cannot practice mindfulness":*

> *"I just feel that it should not become another barrier. Like if someone says, Oh, I don't have a smartphone. So I can't meditate. That should not become an excuse."* [P4F]

Many interviewees mentioned that sometimes *removing technology* helps defend mindfulness, by providing a mindful break from screen time and eliminating distractions during mindfulness practice. For example, silencing incoming messages on one's digital devices helped people stay more focused during the practice by creating an unobtrusive offline environment and reducing participants' anxiety about receiving notifications:

> *"Phones may be distractive. When I started meditation, and I forgot to turn off my notification, I got a message I just checked that. I think it was not good for my practice. Other bad things, maybe technology easily makes people feel anxious. When I cannot find a good meditation, I may feel very anxious. And it's not good for practicing. "* [P2F]

To sum, our participants were aware of the advantages and disadvantages of using technologies in their mindfulness practice. As experienced practitioners, they were thinking carefully about which technologies would be useful and how to incorporate and adapt these technologies in their practice. At the same time, similar to Markum and Toyama's findings [16] our participants were also mindful about when these technologies become a hindrance and should be put away or turned off.

4 DISCUSSION

This study examines experienced mindfulness practitioners' everyday practices, experienced benefits and barriers, and technology use and non-use in supporting mindfulness practice. In this section, we discuss how our study findings extend the current HCI research, recommendations for designing mindfulness tools, and limitations and future work.

4.1 Expanding the definition of mindfulness

We found that mindfulness practitioners have a range of definitions of what consists of mindfulness practice, which is consistent with previous literature that defining mindfulness and its operationalization have always been a debate [24]. Based on our findings, rather than using a top-down approach to define mindfulness, we suggest expanding HCI mindfulness research and design to include what individuals see as practicing mindfulness. This may include *formal*

and informal mindfulness activities that people practice in their daily lives. Activities such as eating, walking, doing house chores, and interacting with others, become part of one's mindfulness practice by bringing attention to the activity in the moment.

We suggest designing mindfulness tools that support a variety of informal mindfulness practices, beyond meditation [7, 16], based on practitioners' daily practice. This is similar to previous literature that suggests that mindfulness tools should teach people to translate what they have learned in mindfulness to everyday life [4, 14, 26]. Our findings extend this research by providing examples of daily activities that become part of practitioners' informal mindfulness practice. One avenue for design may be *slow technology* [9], promoting moments of reflection and mental rest in everyday activities. Another direction can include expanding HCI research on multitasking, attention, and interruptions from the workplace [10, 15] to everyday personal experiences related to mindfulness to support attention and focus.

4.2 Using behavioral change principles with caution

Creating incentive for behavioral change is a commonly used principle in persuasive technology [8], and our participants reported engaging with the rewards and streaks designed into mindfulness technology as a practical way to develop the habit of daily practice. However, our participants were also aware of the conflict between the external technological incentives and seeing mindfulness as a purposeful journey and wanting to be internally motivated to do it.

Bringing to the fore reflection and awareness of this conflict, designers are cautioned about applying behavioral change principles in mindfulness technology. Instead of deciding for users when, where, and how they should practice mindfulness and "tricking" them to do it [20], technology should highlight the original purpose of mindfulness practice. This echoes what Kai et al. [14] have found that mindfulness apps should be designed as "process-oriented, not achievement-oriented". In other words, mindfulness tools should be coherent with the concept of mindfulness, which is to encourage people to focus on the present moment, not to judge the results of mindfulness practice.

4.3 Considering personalized technology ecosystems

We found that practitioners adopt and appropriate various technologies for mindfulness practice. Some of these tools, especially dedicated mindfulness apps such as Calm and Headspace, have been previously evaluated on their efficacy to support mindfulness [5, 14]. However, we also found that practitioners incorporate technologies not designed for mindfulness, such as productivity tools and recreational media streaming platforms in their everyday mindfulness practice.

We call designers to welcome such creative appropriations, when the user acts as an "everyday designer" [25], integrating an ecosystem of technologies for their idiosyncratic practice. Supporting a technology ecosystem may require bridging and interfacing mindfulness tools with other tools that people already use in their daily practice. For example, mobile apps for guided mindfulness can sync with journaling tools to help record and reflect on their mindfulness practices, what benefits they have gained over time, emotional fluctuations, and changes in their ability of being non-judgemental; Mindfulness tools can also work with Calendar app to recommend mindfulness activities based on people's daily schedules.

At the same time, our participants were conscious about the downsides of technology and were wary about relying on them for their mindfulness practice. A mindfulness tool that counts time one practiced may be focusing on what Baumer & Silberman [2] call *computational transformation* rather than addressing the intent of mindfulness practice: attention, reflection, and awareness. Deciding to *not use* technology [23] or to intentionally *remove or eliminate* technology [18] are also acts of design that individuals engage in when they deem the technology to be inappropriate. A personalized technology ecosystem for mindfulness could therefore consist of *zero* technologies that work for a specific practitioner in specific circumstances.

4.4 Limitations and Future Work

This late-breaking work presents in-depth accounts of everyday mindfulness practice from 6 practitioners, all having long-term experience in mindfulness (5 to 20+ years). Our findings are therefore limited to experiences and practices of advanced mindfulness practitioners, and cannot generalize to novices or those with little to medium experience. Our next step to extend the scope of this research is to include beginner and intermediate practitioners who are in the process of developing practice habits. We would like to explore how practitioners with various levels of experience may benefit from technology assistance through the design implications outlined above. Another future direction is bringing practitioners together for a co-design workshop [4, 6], to generate design insights for mindfulness tools that support beginners in scaffolding their mindfulness journey and adapting and personalizing their practice as they get skilled over time.

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