What's In Your Kit? Mental Health Technology Kits for Depression Self-Management

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Abstract

This paper characterizes the mental health technology "kits" of individuals managing depression: the specific technologies on their digital devices and physical items in their environments that people turn to as part of their mental health management. We interviewed 28 individuals living across the United States who use bundles of connected tools for both individual and collaborative mental health activities. We contribute to the HCI community by conceptualizing these tool assemblages that people managing depression have constructed over time. We detail categories of tools, describe kit characteristics (intentional, adaptable, available), and present participant ideas for future mental health support technologies. We then discuss what a mental health technology kit perspective means for researchers and designers and describe design principles (building within current toolkits; creating new tools from current self-management strategies; and identifying gaps in people's current kits) to support depression self-management across an evolving set of tools.

CCS Concepts

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

Keywords

Mental health, depression, technology kit, technology bundle, self-management, tool, toolkit, design principles

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1 Introduction

An estimated 5% of adults worldwide have depression [65], characterized principally by persistent feelings of sadness or low mood and/or loss of motivation and interest in activities that were previously pleasurable. Human-Computer Interaction (HCI) research has detailed how people use technology tools to mediate and facilitate activities to promote wellness and mental health (e.g., [42, 66, 91]). Although digital mental health technologies have proliferated over the past two decades, the use of any particular tool has often been lower than expected or hoped for in regard to adoption (how much of the target population uses it) and engagement (how much an individual is using it) [9, 80]. Consequently, instead of focusing on a "silver bullet" technology, more recent research in HCI and psychology has highlighted how individuals use *multiple* tools as part of their day-to-day self-management of mental health [20, 51].

Individuals often have different perspectives regarding management of their health and preferences for the tools they use in these endeavors [12]. To develop effective technologies to support management of mental health such as depression, we need to understand the diversity of tools that people use, their usage behaviors, and their goals and needs. However, while many studies have focused on specific tools (e.g., [5, 10, 23]) to date there have been fewer studies characterizing the broad range of tools that individuals managing depression use for individual self-management and collaborative self-management (use in cooperation with other people [19]).

To understand what comprises these groupings of mental health technologies, we interviewed 28 individuals managing depression who live across the United States using semi-structured interviews, a cognitive mapping exercise (see Figure 1, below, for an example of a participant's map), and blue-sky ideation. We encouraged emic description through concept mapping, discussing the relationships between technologies, people, groups, and a person's symptoms and health goals.

We detail participants' personal selection of tools gathered over time to support their mental health. We focus our analysis on the

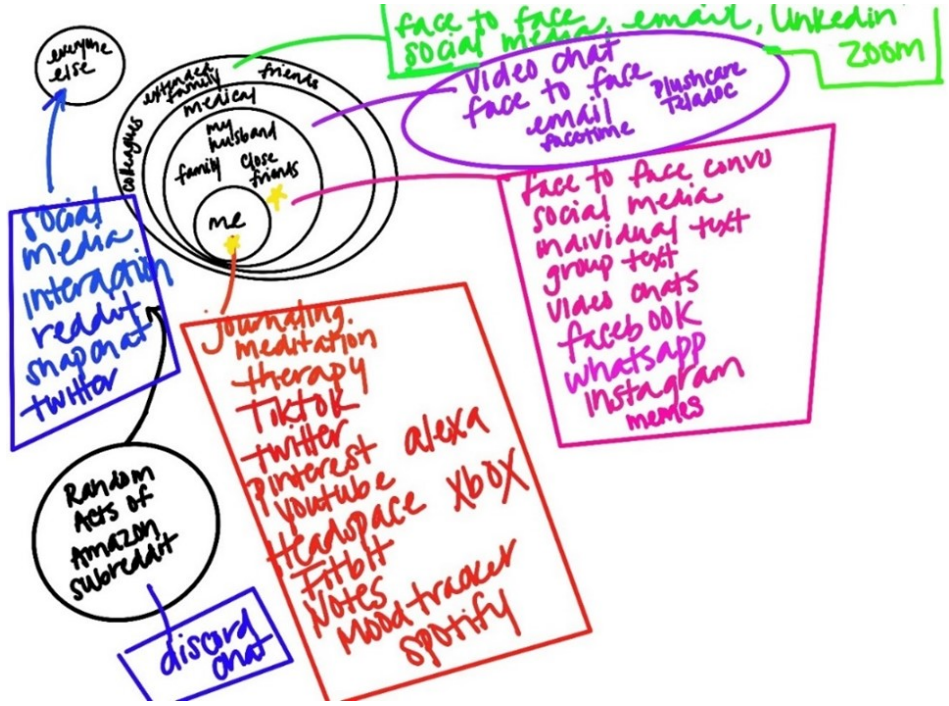

Figure 1: P15's Cognitive Map showing her mental health technology kit. She lists the digital technologies and physical tools that she uses as part of her mental health management. Her tools for individual self-management include journaling, specific mental health apps like Headspace, music tools like Spotify, gaming tools such as Xbox and many more. She also uses technologies for collaborative self-management including video chats, social media platforms, SMS, and online communities, among others.

available tools housed within individuals' smartphones, computers, wearable devices, and other physical person-level tools. We conceptualize these tools as part of a mental health technology kit.

Drawing on the analogy of a first aid kit—a pre-prepared collection of items to address different potential injuries—we define a **mental health technology kit** as the specific technologies that people have on their digital devices and physical items in their environments that they turn to as part of their mental health management. We list participant tools ranging from meditation apps to musical instruments and present kit visualizations. We detail technology kit characteristics (intentional, adaptable, and available) and report participant ideas for future technologies. We then discuss how the perspective of a connected, holistic kit enables deeper understanding of participant values and goals across the technology kits they constructed. Finally, we reflect on design principles for future mental health technologies.

We contribute to the HCI community by:

- Introducing the concept of mental health technology kits as a way of understanding the tools that people use to manage their mental health.
- Providing kit examples that participants have constructed and discussing how people use the assemblages of tools in their day-to-day life.
- Discussing how the technology kit perspective can help designers innovate to integrate tools into people's current technology structures and routines.

This paper helps to reorient our perspective as technology researchers from singular tools toward a constellation of tools used in specific ways to manage mental health. A technology kit lens can enable both a better understanding of the breadth of technology use behaviors and a renewed perspective to guide future technology creation.

2 Related Work

Our research builds on literature regarding (2.1) user goals for health self-management and (2.2) peer support and collaborative self-management of mental health, as well as recent work (2.3) shifting the analytical frame from a tool to a constellation of tools. Then we introduce (2.4) a mental health technology kit approach. This paper extends these lines of analysis with an understanding of how people use ensembles of tools to support their mental health self-management including the types of tools and characteristics of their tool assemblages.

2.1 User Goals for Health Self-Management

Deeply understanding user health goals is an increasingly important focus in HCI research. Berry et al. [12–14] and Lim et al. [55] underscore not only the need to understand what people want to achieve as part of their self-management practices, but also the work it takes to reflect on these goals. Self-management work can be very hard, requiring effort and energy, precision in tasks like counting and sorting pills and medicines, and planning time and

contexts for tasks like getting exercise, going to the doctor, or scheduling social time with others. Nunes and Fitzpatrick [61] note the pedestrian nature of this patient work, often described by researchers as invisible work [3, 85], highlighting the dichotomy of how these tasks require deep integration work into people's daily lives, yet are so commonplace that they can fade into the background. This labor could be considered just a part of "living life." Yet, as we describe in this paper, for people managing mental health needs, these commonplace self-management activities take on an increased importance as the buffer against a depressive episode or as a tool to short-circuit a negative mood so that a person can accomplish their daily goals.

Technology creators design technologies to support different self-management objectives. Many digital mental health tools are designed to support skills practice (e.g., reframing negative thoughts) with the perspective that the individual might graduate from needing the tool at some point, thereby having "ownership" over the practice. The tool then could be deleted or used again in the future. PocketSkills [78], a mental health mobile app developed to practice Dialectical Behavior Therapy (DBT) skills over a set period of engagement, follows this approach.

However, people also regularly use technology tools to manage some of their depression symptoms over time, for instance as prompts for self-reflection and critiquing negative thoughts or as reminder notes to combat brain fog [20, 33]. In our prior work [33], we describe how individuals managing depression have memory challenges, and so the Notes app on people's mobile phones is a handy way to augment one's memory recall and to have those notes close at hand in an accessible location. For a note-taking tool, a framing to work toward future "ownership" of a practice may not make as much sense as, say, thinking of the notes tool as a constant cognitive support extending the capabilities of the individual and reducing issues for them day-to-day.

Research in personal informatics also highlights the importance of alignment between people's goals and their tools. When people's goals change, this may prompt changes in which tools they use [32]. Shifts in goals—such as achieving a goal or suspending pursuit of it—are also one of the top reasons why people abandon personal informatics tools [30]. Additionally, when designers of a tool assume that all users have certain goals – such as to become pregnant or avoid pregnancy in period tracking apps – this can lead to aversive and exclusionary designs [31]. In contrast, when designs elicit users' goals and adapt accordingly, they can deliver engaging and effective experiences [77]. Proponents of goal-directed approaches note that even flexible designs will not be able to support all goals and that health application designers have a responsibility to communicate when a tool cannot support someone's goal and direct them to consider other options [77].

In this paper, we contribute to these research streams by discussing not just how people managing depression move between tools as their goals change, but also how they use sets of tools alongside each other to pursue various sub-goals (movement, engagement, sleep, and more) as they pursue higher-level mental health goals and other priorities in their lives.

2.2 Peer Support and Collaborative Self-Management of Mental Health

Individuals managing depression can experience difficulty establishing and maintaining social relationships [79, 86]. Feelings of isolation and loneliness may lead to reoccurring challenges in symptom management [41]. Addressing these challenges requires individuals to self-manage their condition to prevent or reduce the intensity of future depressive episodes.

The "self" in mental health self-management practices implies that these are solitary activities, which is reflected in many individual-focused mental health support tools (e.g., [10, 60]). Further, HCI research studying self-management of mental illness often focus on individual activities. However, self-management often happens within a social context and involves other people [33, 51, 67]. For instance, in our prior study [20] of individuals managing depression living in the U.S. Midwest, participants connected with trusted people to express their feelings to an empathetic ear, collaboratively develop solutions to ongoing issues, and reduce the intensity of their mood. Other recent HCI work in the ADHD [81, 82] and assistive device contexts [75] have noted the importance of care ecosystems comprising actors who play a role in "dynamic networks" who work toward "improving the care provided to a particular population" [75].

Investigating tool use from a collaborative lens acknowledges the role that others play in self-management activities and the need to further understand the interactional experience of these collaborations. However, collaborative work in this context can be challenging. Supporting mental health and ongoing management through collaboration raises concerns about issues such as reciprocity [38] and burden [45]. In this paper, we strive to complement prior work on individual-focused tool use (e.g., [60, 78]) with a new understanding of people's use of tools within their support ecosystems to highlight future opportunities for researchers and designers.

2.3 Shifting the Analytical Frame from a Tool to a Constellation of Tools

HCI researchers have investigated health technologies including self-tracking technologies (e.g., [6, 7, 44, 70, 77]), online communities (e.g., [23, 39, 54, 92]), mobile apps (e.g., [2, 4, 60, 78]), smartphone and wearable sensor data [49], and VR tools (e.g., [22, 46, 56, 74]), among many others. These studies with a deep focus on a single tool or intervention support our understanding of topics including tool usability, folk theories, and opportunities to implement new features. However, a single-tool lens creates a limited view of an individual's technology use. For example, in a single-tool lens, abandonment of a tool may appear to be a failure when someone has, in fact, successfully identified another tool that better supports their goals [30]. Both novice and expert trackers often use multiple data collection and analysis tools in parallel to best support their process [25, 70]. If our goal, as a field, is to support people – rather than to ensure the success of any one tool – we may better perceive needs and opportunities when we look at why and how people use tools together or in sequence.

The CHI'22 Complex Health Needs workshop called for intervention designs which "advocate for approaches to design that

interlink services to address multi-faceted needs rather than developing standalone tools" [64], and in their 2024 paper about care ecologies in HCI, Wilson et al. [87] describe the need for focus on wider "collaborative networks of care that exist across people, places and objects." Especially for mental health conditions which are often comorbid, researchers and designers need framings to help both conduct relevant research and to build tools that support needs that may need to be served and supported across multiple interlinked technology tools. Within the mental health context, recent work has begun to start to develop categories of technologies to understand broader usage patterns, called for in the CHI'20 Technology Ecosystems workshop [21]. For instance, in Eschler et al. [33], we highlight particular "bundles" of tools including funny videos, social media, and video games for self-regulation of mood.

Our paper addresses these calls for a wider multi-tool analysis. We describe tools used for depression self-management to help provide a foundation for future complex health needs work.

2.4 A Mental Health Technology "Kit" Approach

In 1888, Robert Wood Johnson commissioned a novel "first aid kit" to meet the needs of railway workers who were quickly laying track for the United States transcontinental railroads [43, 72]. Working in the rugged Western U.S., railway workers were often miles from the nearest hospital. Given the grueling demands of their work, they often suffered major injuries. To address this issue, Johnson and Johnson sent letters to many railway surgeons to learn what they thought would best support their on-the-go medical needs. The company started to develop sterilized kits of medical materials – bandages, syringes, and other implements – to be available when injuries occurred. Now, in the mental health context, we should consider *how might we create a kit to support mental health?*

Recent research highlights the importance of advance preparation for future mental health needs. Participants managing depression in Kornfield et al.'s study [48] prepared for future depressive episodes with specific notes and setups for future energy/mood challenges. Similarly, recent psychology articles discuss preparing for future mental health needs by gathering activities in one place. Gearsbeck [34] described staying at a psychiatric hospital and learning from a practitioner how to create a "mental health self-care kit" to use whenever she has an "'off day,' an anxious moment, or a panic attack." Her kit is stored in an old shoebox and it includes items to promote coping grounded in the 5 senses – sight, smell, taste, sound, and touch. Beyond a physical box, Hawaii Pacific University [84] encourages people managing depression as well as psychiatric nurses to develop a "wellness toolbox" encompassing activities focused on self-care, social interactions, and professional help, and connected to four pillars of interpersonal, communal, self-care and spiritual experiences. Finally, psychologist Dr. Copeland also uses the "wellness toolbox" framing as an integral part of her WRAP (Wellness Recovery Action Plan) method [26, 58]. For Copeland [27] the wellness toolbox is "a list of things you have done in the past, or could do, to help yourself stay well, and things you could do to help yourself feel better when you are not doing well." She even encourages individuals to include new things that they would like to try in the future.

Drawing on these wellness toolbox ideas from psychology, we focus our investigation in the HCI context largely on the technology and technology-enabled services that people use. While previous HCI research has shown the benefits of mental health support provided through online communities (e.g., [23, 54]), mobile apps (e.g., [2, 10, 78]), and social media (e.g., [4, 91]), here, we focus on the wide variety of support technologies utilized by individuals managing depression. Torres et al. [83] investigated a similar question in the narrow context of board-certified music therapists, describing "artifact ecologies" of "interactive technology ensembles," tied to specific therapeutic stages such as referral, assessment, and treatment planning. They described electronic/digital and acoustic musical instruments and streaming platforms, among other tools. We also take a multi-tool lens, but instead investigate this question from the patient perspective – what tools do people use to support their mental health? – to probe opportunities for future technology innovations.

3 Methods

We conducted a qualitative study with 28 participants managing depression. The study consisted of remote semi-structured video interviews aided by a cognitive mapping elicitation and blue-sky design thinking. All research was conducted in the United States and received ethical clearance from the Institutional Review Board at the lead author's organization. Participants received 25 U.S. dollars through PayPal.

3.1 Participants

Participants in this study fit the following criteria: 18 or older, living in the U.S., previous diagnosis of depression, and had experienced symptoms of depression within the previous 12 months. Participants lived in many different U.S. states. See Table 1 and 2 for additional demographic information.

Participants managed their depression in several ways and often combined strategies (e.g., medication and therapy). When asked: "What treatment (if any) are you currently receiving for depression" in the questionnaire, 19 noted that they used medication such as antidepressants and 12 participants participated in therapy (including cognitive behavioral therapy, talk therapy, EMDR Therapy, and group therapy). One participant reported using psychiatric care. Four participants said "none."

3.2 Data Collection

Recruitment and data collection occurred from May-July 2020. Due to the COVID-19 pandemic, all recruiting occurred online, primarily through a research registry database operated by a behavioral health group within the lead author's institution. We sought participant diversity in our study through connecting with a community organization focused on peer-based mental health for people of color, immigrant, LGBTQ, women, and transition age youth communities to share our study recruiting materials. We also shared recruitment materials with student organizations at the lead author's institution focused on supporting individuals in historically marginalized populations. We were able to interview a few participants through those connections. However, recruitment occurred just as the U.S. was experiencing racial justice protests. We did

Table 1: Participant Demographic Information

Demographic	Details
Race/Ethnicity*	21 White/Caucasian, 2 Hispanic (Guatemala; Mexico), 2 White and Hispanic (Puerto Rico; Mexico), 1 White and Asian, 1 African American and Asian, 1 Mixed Race
Gender	18 Female, 9 Male, one participant left the gender question blank
Education	20 completed college or more, 6 completed some college, 1 completed high school or GED, 1 completed 1st grade–11th grade
Employment	13 working full time, 6 working part-time, 4 not working but looking for work, 1 not currently working and not looking for work, 1 retired, 3 "other": (1 undergraduate student, 1 laid off due to COVID-19, and 1 on very part-time work due to COVID-19 and disability)

* We recognize that these are U.S.-centric constructions of race and ethnicity.

Table 2: Participant Details

Participant	Age	Gender	Years Managing Depression*
P01	21	Female	2
P02	66	Female	21
P03	28	Female	9
P04	38	Male	10
P05	34	Female	20
P06	38	Female	23
P07	38	Male	11
P08	35	Male	19
P09	36	Female	9
P10	32	Female	9
P11	28	Female	6
P12	25	Left blank	5
P13	62	Male	21
P14	39	Female	25
P15	30	Female	12**
P16	33	Male	4
P17	60	Female	33
P18	24	Female	5
P19	26	Female	20
P20	23	Female	8
P21	24	Female	3
P22	25	Female	10
P23	33	Female	11
P24	54	Male	35
P25	36	Male	10
P26	25	Male	10
P27	62	Male	27
P28	23	Female	A few months

* 'Years managing depression' was in response to the question "When were you diagnosed with depression?" Participants may have managed depression before their official diagnosis, so this number gives us some idea but not necessarily the full period of management.

** P15 noted that she had been managing "since high school" so this is our estimate given current age.

not request further circulation of recruitment materials so that our partner organization could attend to emergent priorities supporting the mental health of their members during that distressing time.

3.3 Procedure

Potential participants filled out a short study screener on REDCap (browser-based software for designing clinical and translational research databases) and an online consent form with e-signature and a background questionnaire asking about demographics, current depression treatment routines, and technology device and online platform use. Participants received a Zoom video call login link along with instructions: a request for the participant to have a piece of paper and a pen or markers for the upcoming activity (cognitive mapping exercise) and to gather mental health management tools near their computer.

The lead researcher began the interview with the webcam on for both the researcher and the participant. Depending on internet connection quality and participant preference, either the participant or the researcher could turn the video off. The lead researcher followed a semi-structured approach coupled with an interview guide covering 4 areas: mental health management, support network experiences, the mapping activity, and design questions. Some participants shared artifacts including showing their phone screen for a visual of a game or app or showed a smartwatch technology or a journal. When this occurred, the lead researcher asked the participant to hold the artifact steady and took a screenshot.

The Nielsen Norman Group [35] defines cognitive maps as "any visual representation of a person's (or a group's) mental model for a given process or concept." Laying out and connecting concepts can enable identification of themes across different concepts and surface new patterns and connections. The mapping instructions: "*Please map out the people or groups who you feel help support your mental health as well as the people who you help to support, leaving some space between them for connections.*" Participants followed a talk-aloud protocol. Then, the lead researcher prompted the participant to note their communication channels, "*Now, what are the ways that you connect with these people? Feel free to create links or note however you'd like to show these connections.*" As Figure 2 and 3 show, individuals detailed their support networks by using circles, stick figures, arrows, links, different colors, and text in creative ways.

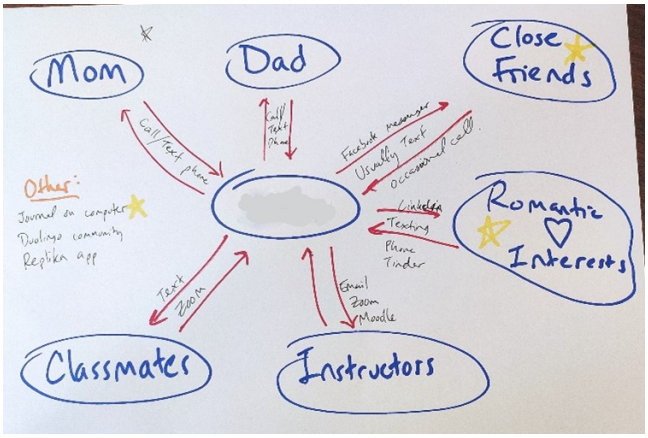

Figure 2: P26 Cognitive Map

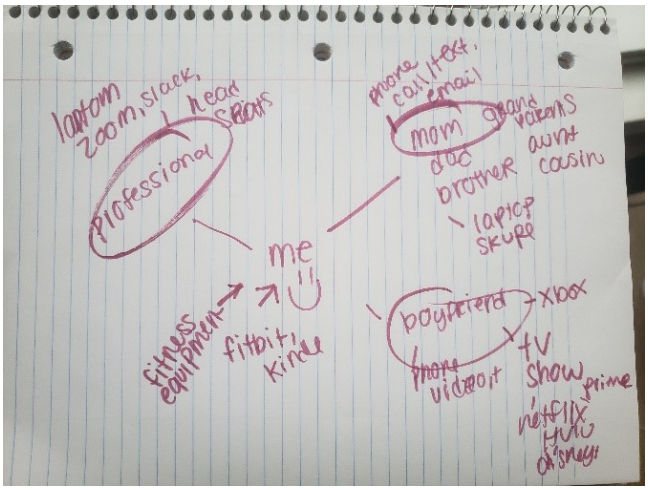

Figure 3: P12 Cognitive Map

Other questions probed in-person groups, online communities, and group texts. When finished, the researcher took a screenshot of the participant's map as they held it up to their webcam. Then, using the picture as a shared visual artifact, the researcher asked follow-up questions, including the frequency of communication with each person or group, whom the participant would turn to if they had a bad day, which communication technology they used the most frequently, and the perceived strengths and challenges of the technologies noted on their map. The explicit focus of our research was to investigate the collaborative activities of individuals managing depression and mediating technologies. We also asked participants about the technologies they used for individual support, "*Are there other technologies that you think are important for your mental health management that aren't social that you'd like to add to your map? For instance, do you use a medication app? A journal, a Fitbit, etc.?*"

The lead researcher also probed challenges to connection routines as well as "blue sky" questions, asking: "*if you had a magic wand and could make anything happen, even outside the realm of current science, how would you change this map?*" Macadamian [1] defines a blue-sky approach as "a chance to validate design ideas that are not limited to current notions of what is practical or feasible." Through these open-ended, exploratory questions, we gathered ideas from participants ranging from creative solutions tackling current challenges to futuristic technologies. We wanted to hear ideas for future mental health support technologies from individuals managing depression themselves. We believe it is important to learn what seems exciting to them and what fits with their sensibilities – for instance, a strong theme of the importance of feeling safe and comfortable emerged from participant ideas. Video and audio files of the interviews and screenshots were recorded locally and then stored in our secure password-protected and HIPAA-compliant [62] institution server.

3.4 Data Analysis

The lead author led the analysis process and regularly discussed ongoing analytical approaches and emerging themes with the research team. Our data included participant stories both prior to and during the COVID-19 pandemic. Overall, participants did not report trying many completely new technologies for connection and collaboration during the pandemic. Instead, the technical infrastructure was largely already in place between participants and their social support networks.

We used the cognitive maps primarily to elicit greater detail from participants regarding their social support network and support technologies. The first author numbered the individuals and groups on each map as well as the number and type of communication channels. For the interview transcripts, we followed Braun and Clarke's thematic analysis method [17], beginning by open coding several participant transcripts to gain familiarity with the data. The first author primarily coded at the sentence level, but some coding took place at the paragraph level because we were interested in understanding sequences of interaction(s). Through a process of iterative analysis and comparison we arrived at a set of axial codes reflected in the themes of this paper.

Concurrent with open-coding, we also utilized the MEECS (Move, Eat, Engage, Cogitate, Sleep) framework [76] to categorize people/patients' daily health goals and their activities. The MEECS categories provided us a way to connect individual's daily goals with the tools they described using. MEECS encompass fundamental processes that are vital to day-to-day health and functioning: volitional processes shared by all, physically based, that have been shown to be correlated with mortality/quality of life and interact with the other categories throughout a person's life [76]. We present this categorization in Table 3 in Findings section 4.1.

3.5 Study Ethics and Reflexivity Statement

Working in the mental health research space, we believe it is essential to build trust with participants. We thought deeply about how to create a research environment that prioritized participant comfort in discussing the sensitive nature of their depression management and social relations. The research team included an experienced clinical psychologist who provided guidance throughout the study design and data collection and offered clinical guidance when needed. Participants selected a time for the interview that

best fit their schedule, with opportunities to carry out the interview on weekends and after work hours. While the remote nature of the interviews meant that participant privacy was not something we could control, through study emails, we recommended finding a quiet, private place for the interview, noting that there would be a discussion of potentially sensitive mental health topics. A few participants rescheduled the interview due to unexpected events. When this occurred, we rescheduled together for a better interview time.

There are aspects of the lives of the participants that we know we cannot empathize with personally. To understand their experiences, we took a human-centered approach to support participants in expressing their lived experience, their goals, and their daily activities. We did our best to frame questions to enable individuals to reflect as they saw fit on potentially sensitive past experiences.

As digital mental health researchers who have all previously designed mental health applications, we had pre-conceived ideas of what constitutes "mental health technologies." However, through this study, we noticed that participants had a broader definition of these technologies than our starting point. They mentioned items such as books and musical instruments. Therefore, when developing these themes, we thought it was important to reflect on these tools that stretched our thinking about what constitutes a "technology."

4 Findings

Participants used a variety of tools to manage their mental health. In 4.1, we present an overview of the diversity of tools participants described using to support their mental health management. In 4.2, we describe kit characteristics, and, in 4.3, we share participant's envisioned novel future technologies for mental health support.

4.1 Participant Mental Health Support Technologies

Participants described using a wide variety of technologies to support their mental health. When drawing out their kits, participants noted a variety of elements including apps and connected platforms, physical tools, people, and animals. In this paper, our interest is in the technological components of the kit, thus our focus on the "technology kit." We use the term "technology" broadly to include both physical (e.g., pen and paper, musical instrument, barbells) and digital tools (e.g., mobile apps). Participants often described their use in tandem, such as listening to music on a smartphone while working out on a treadmill. Figure 4 provides a view of the top-mentioned tools. Communication technologies were the most mentioned category and participants used them to facilitate one-to-one communication, group communication, and communication via social media. In this section we first present quantitative data on the most used tools across participants (Figure 4) and then we present a thematic analysis of the categories of tools (Table 3) sorted into the 5 MEECS (Move, Eat, Engage, Cogitate, Sleep) framework.

4.1.1 Move. In our study, the Move category (Table 3) includes tools such as Fitbits and step trackers along with exercise equipment including workout bikes, treadmills, weights, punching bags and hula hoops. In addition, while not listed within the table, many participants discussed how their dogs were an important force in their life prompting going outside for walks and runs. Thus, while half of our participants mentioned having some movement tracking/motivating technology in their kit, others discussed additional ways of motivating movement such as their dogs.

4.1.2 Eat (and drink water and consume medicine). Next, in the Eat category, we include participant tools to meal-prep, track their water consumption, and intake medications. Some participants had realized their tendencies to forget to eat the right amount of food, drink sufficient water, or take medications. P02 had a medication reminder tool that connected to her daughter as well for a social force supporting staying on track with her medication consumption.

4.1.3 Engage and Cogitate. Many of the technologies discussed by participants were in the Engage category. Because of the reflective nature of mental health support processes, we could not separate the use of these tools from the ways that they supported people's Cogitate processes, so we combined them into one larger category. For instance, talking to a friend or loved one could help short-circuit a cycle of rumination. These tools and services included text-based, voice, video, and picture-sharing applications. Tools could also be used for multiple purposes. For instance, participants used the Zoom video call tool for work, to connect with friends, and to participate in depression peer support groups.

P05 described using tools in tandem and managed anxiety in addition to her depression. Although Zoom video calls were an important social connection, she found it difficult to "sit still" during them. To keep herself focused and grounded, she manipulated kinetic sand and Legos—tools she had on hand as the mother of small children—to keep her hands busy during virtual calls. She also took her devices outside and weeded in the garden or pet her dog during these calls to maintain attention and feel better during these virtual interactions. See Figure 5 for a visual of her whole technology kit.

People used tools individually as well as for shared activities including watching TV and movies, playing video games, and participating in online communities. Practices such as expressing emotion, sharing advice, setting boundaries, and affirming, encouraging, and calming helped participants to engage and to self-reflect, reframe, and other supportive cogitation. Being able to select between communication channel options also supported individuals' cognitive state in-the-moment. When in distress, participants appreciated the ability to send a single text message instead of carrying out a phone conversation. Many individual-focused tools also supported cognitive aspects of mental health management, including apps to support meditation, keep track of notes (helpful for individuals managing depression who often have memory difficulties [69]), track mood, and other similar activities. For example, while sometimes used for step count tracking, P24 uses his Apple Watch as an aspect of Cogitation to check his pulse rate during a panic attack:

> *If I feel anxious or if I'm upset or if I'm feeling a panic attack coming on, something like that, I'll check my heartrate and my pulse. And then I guess I kind of mentally talk myself into calming down and then I check the heartrate and the pulse rate again a few minutes later and it makes me feel better if they've dropped.* (P24)

Similarly, P25 described how music from his smart speaker is helpful to improve his mood: "*Sometimes I'll use it in the afternoon*

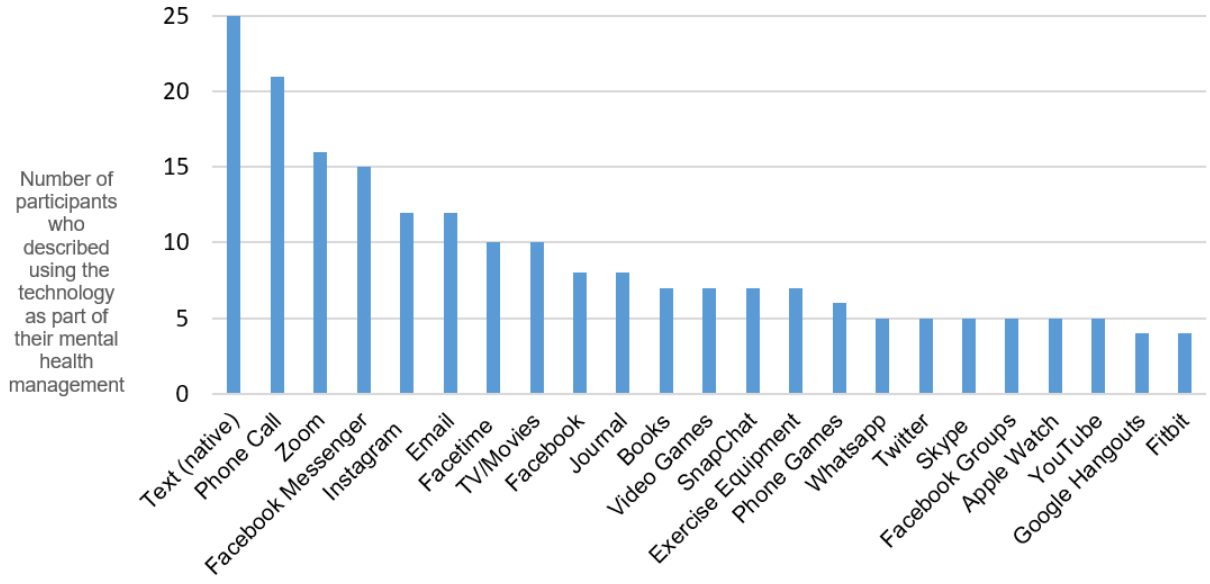

Figure 4: Tools and services participants most frequently mentioned as being part of their mental health support. The top six were all social, and use cases for all but one (Instagram) required active participation.

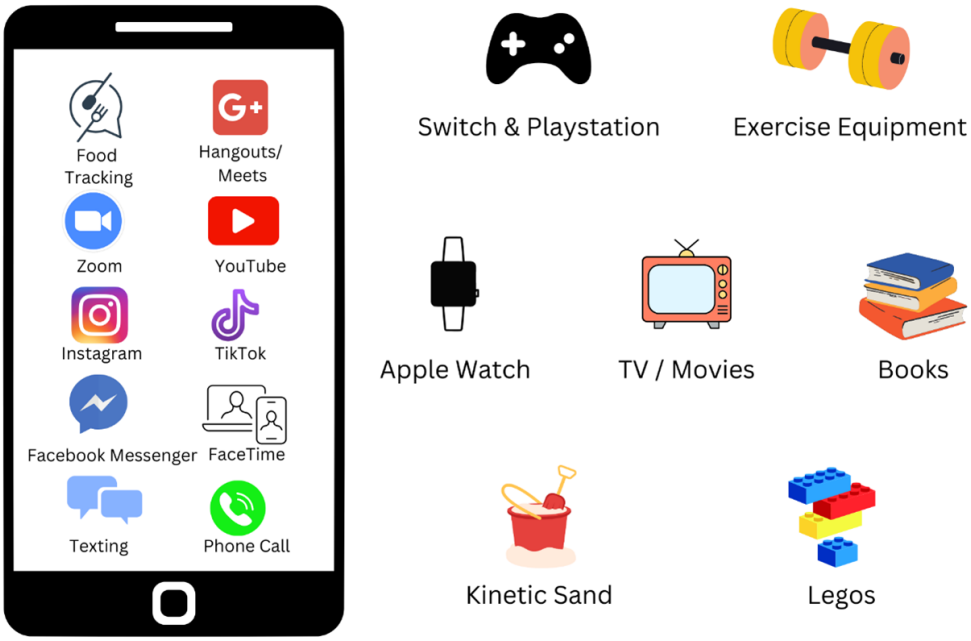

Figure 5: P05's Mental Health Technology Kit. P05 emphasized the Movement, Engagement, and Cogitation MEECS categories in her kit. P05 also manages anxiety and has developed strategies to keep herself focused and grounded while listening to her talkative social circle. Using tools she has on-hand as the mother of small children, she keeps her hands busy during virtual calls by manipulating kinetic sand and building Legos. She also may weed in the garden or pet her dog during these calls.

Table 3: Technology Categories for Participant Mental Health Technology Kits Categorized by MEECS

MEECS Category	# who Used	Specific Tools and Services (# of participants who reported using the tool/service)	
		Digital Tools	**Non-Digital Tools**
Move	14 (50%)	Exercise Equipment – bike, treadmill (7 across digital/non-digital**), Apple Watch (5), Fitbit (4), Step Tracking app (2), Nike Run Club app (1), Nike Training Club app (1), Alexia Clark app – home and gym workouts (1), WayBetter app – fitness challenges (1)	Exercise equipment - weights, punching bag, hula hoop (7 across digital/non-digital)
Eat (and drink water and consume medicine)	7 (25%)	Water Consumption Tracking app - (e.g., Plant Nanny) (2), Food-tracking/Meal planning app (e.g., Omada Health, Renaissance Periodization) (2), Medication Reminders app (e.g., Medisafe) (2), PillPack medication delivery service (1)	
Engage + Cogitate*	28 (100%)	*General Communication Technologies:* SMS (25), Phone Call (21), Zoom (16), Facebook Messenger (15), Email (12), FaceTime (10), WhatsApp (5), Skype (5), Google Hangouts (4), Telegram (2), Tinder (1), Google Duo (1), Google Chat (1), GoTo Meeting (1), Marco Polo (1), TextMe (1)	Paper Mail (1)
		Small Group/Community Communication Technologies: Instagram (12), Facebook (8), Twitter (5), Facebook Groups (5), Snapchat (7), TikTok (3), Discord (3), LinkedIn (2), Reddit (1), Twitch (1), Slack (1), GroupMe (1), Moodle (1), Duolingo Community (1)	
		Individual and Collaborative-Use General Tools and Platforms: TV/Movies (10), Journal (8 across digital/non-digital), Video Games (7), Mobile Games (6), YouTube (5), Podcasts (3), Online Courses (3), Digital Drawing (3), Spotify/Digital Music (3), Kindle (3), Planner/Calendar (3 across digital/non-digital), Audiobooks (2), Alexa (2), Notes App (2), Vehicles – calming driving (2), Period/Fertility Tracking Apps (2), Car Radio (1), Library App (1), Online News (1), Online Blogs (1), Pinterest (1), Business Website (1), Camera (1), Google Home (1), Goodreads – reading tracking app (1)	Journal (8 across digital/non-digital), Books (7), Planner/Calendar (3 across digital/non-digital), Bible (1), Artwork (1), Kinetic Sand (1), Legos (1), Musical Instrument (1)
		Specific Mental Health and Mindfulness Tools: Tele-therapy tools – (e.g., Talkspace, Teladoc, PlushCare) (2), Headspace app (2), Mood tracking tools (2), Mental Health Hotlines (1), Breathe app (1), Meditation app (1), Replika app – AI avatar journaling app (1), Smiling Mind app – mindfulness (1)	
Sleep	6 (21%)	Fitbit (4), Sleep Tracking app (1), Bible Verses app (1), Headspace app (1)	

* Many of the tools and services in this table could support multiple MEECS categories. Where participants explicitly described using tools for multiple tasks (e.g., Fitbit for both step and sleep tracking) we include the tool in all relevant categories. Participants described using both digital and non-digital tools for mental health, particularly for exercise and cogitation. For instance, listening to music from an app on a mobile device while lifting weights. We have highlighted non-digital tools for the purposes of this table. In practice, participants utilized both the digital and non-digital tools in concert.

** Some participants used exercise equipment at gyms where they used both digital and non-digital tools, thus the combined number.

just when I'm doing maybe things in the house. Housework. Sometimes music can make you feel better." (P25). See Figure 6 for P25's full kit.

4.1.4 Sleep. Finally, for Sleep, P17 uses a Bible auto-reader: "*And, when I'm having a hard time sleeping at night because I'm really frightened or anxious or scared, I can have it read to me on my phone and there's one specific version where the person's voice that's reading is fairly soothing.*" Similarly, P11 used her Fitbit to keep track of sleep as well as her menstrual cycle:

> *I have a Fitbit that I wear all the time. It's not getting a lot of use now since I'm not exercising as much as I did before COVID hit, but I do use it to track my sleep and I use it to track when my period is coming, which definitely affects my mental health.* (P11)

Overall, participants used technologies to support their mental health self-management in all 5 MEECS categories, however, many tools could be used for more than one purpose.

4.2 Technology Kit Characteristics

Here we describe characteristics of participant technology kits. Participants were intentional about using tools to support specific mental health goals, adapted their kits as they interwove tools into their day-to-day life, and took advantage of available resources in their environments.

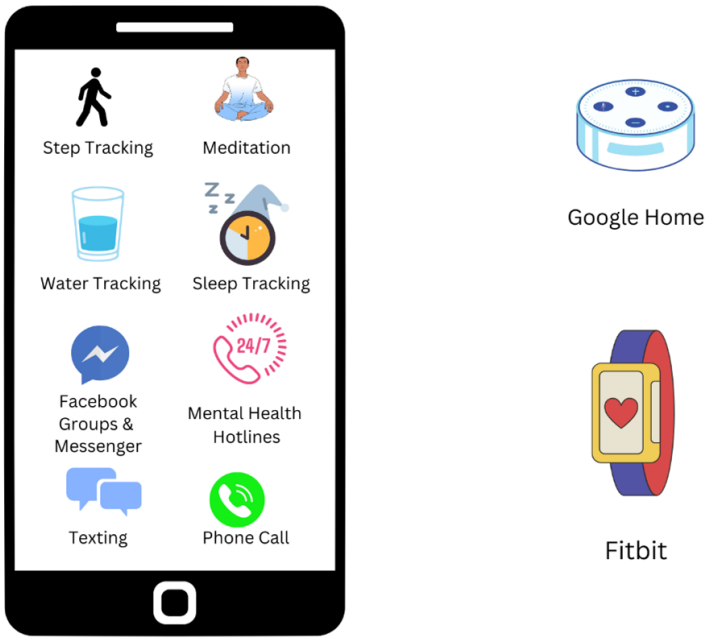

Figure 6: P25's Technology Kit. P25 emphasized the importance of tracking movement, water consumption, and sleep, and used his smart speaker to uplift his mood at home with his choice of music.

4.2.1 Intentional. A mental health technology kit tells a story of what elements in an individual's mental health management are important to them. Several participants described using tools regularly as part of daily mental health maintenance. For instance, P14 describes daily mobile game playing and technology use to track menstruation: "*there's an app I use to track my period. So, I use that every month. There's some game ones that I play pretty much every day*" (P14). Similarly, P03 enjoys a daily session of "*relaxing on the swing set*" (P03) outside and playing Wordscapes, a crossword puzzle phone game with soothing music. People using communication technologies to connect often used them consistently, but for different mental health support activities day-to-day, depending on their needs or circumstances. For example, P19 described that during the times when she had a particularly rough day, she would talk to her husband in-person as well as to other people via technology channels: "*sometimes multiple people. It depends on what the – why the day is rough.*" Participants who consistently used tools integrated them into their routines, using them as an extension of themselves to provide daily moments of relaxation and mood-boost activities and to better understand habits over time (e.g., P19 looking at her app to see biometric tracking; P25 looking at his Fitbit and water consumption; P26 looking at his journals). P02 described how she liked to "*open up and see trends*" in her journal and calendar on her smartphone.

Several participants used tools to manage specific issues or short-term projects. This included specific, reactive use (e.g., to an acute situation) as well as more proactive use. Reactive use included tackling challenges when an issue began to feel overwhelming. People encounter mental health challenges in their day-to-day activities. Thus, we heard examples related to tool use which highlighted issues about wellbeing (e.g., feeling in control or mitigating an emerging mood) and accomplishing some daily activity. For example, P26 described how he had noticed in the past week that when he was texting friends he was: "*snarky... very irritable and agitated with them...and I was like, this is not cool*" and this spurred him to take action, doing more exercise, sleeping at better times, listening to music, making YouTube ASMR videos, and journaling in his paper journal or via a Word document on his computer. The use of texting to communicate with his friends led him to also appreciate that his mood was negative. Similarly, P21 journaled by making lists when she felt unmotivated: "*If I'm feeling really unmotivated and I don't want to do anything at all, sometimes making a list helps,*" and she also described how she used her journal to prepare for a difficult conversation with her boyfriend:

> *And I have used it to help me work through big things that I'm struggling with like if I want to talk to somebody about something – to have a difficult conversation – so I had sort of a conversation that I wanted to have with my boyfriend and so I took notes about it and I had it with me. So, I guess it helps me to handle certain situations, but not necessarily my mental health as a whole.* (P21)

Many of the tools mentioned by our participants, such as P21's use of a journal to prepare for a difficult conversation, have no explicit scaffolding in mental health, yet individuals used them for mental health purposes.

In contrast, P14 used technologies not only for emotional needs but also for certain "challenge" periods of concentrated use to stay motivated. She put together a Facebook group for her friends who like to read with year-long reading assignments. Similarly, she used productivity journals and health apps with challenge periods including the WayBetter app for financial incentives and the Alexia Clark app to keep on track with physical and mental health, feel better about herself, and improve her confidence proactively, saying "*It helps to keep me on track with working out because that definitely helps with my mental health.*" Focused technology use does not need to be consistent to be helpful, because these tools offer benefits in concentrated timelines. Our findings align with Epstein et al.'s [32] Lived Informatics Model which shows the common cycle of deciding, selecting, tracking and acting, and then lapsing that many individuals go through when using health technologies.

Some participants used a tool to build skills around a topic and then were able to move beyond that scaffold for future mental health maintenance. P16 described using a tool to learn skills: "*My therapist recommended that I use a meditation app called Headspace. Which I used to great effect for quite a while and I can pretty much implement that kind of way of thinking now on my own without the app, but I more so use it to try and fall asleep now.*" While P16 has not completely removed the app from his routines (he still uses it to help him sleep), he was able to practice and build his competency in meditation and can now use the thought processes he learned without the app's prompting. Given the variety of tools described in our study, one potential implication is that tools that have an educational or practice-based component might be able to fulfill their function and could be used less often in a technology kit, whereas tools that are focused on entertaining or connecting to others might not follow the same engagement patterns.

4.2.2 Adaptable. Participants adapted their kits over time by adding individual tools or using tools in different ways to best fit their goals. Major life events often prompted people to adapt technology kits. For example, when preparing for retirement, P02 spent a "*considerable amount of time*" preparing things to do like signing up for classes in town to learn new photography skills with her camera, knowing that without these steps she tended to self-isolate ("*I would be a hermit*" (P02)). Similarly, moving was a "shock" to participant's technology kits and wider routines. When P01 moved back home to take online classes, this changed her in-person routines: "*the first couple of weeks were rough; hard existentially*" and prompted her to interact more with her family, her boyfriend, and to look for people to digitally follow using social network platforms. P20 described how pregnancy plus some difficulty getting an appointment to get an ID led her to pick back up journaling and planning but that she needs to continue to experiment with what will work best for this phase:

> *So, I've been having to practice journaling, more writing stuff down, giving myself more day-to-day goals, but that hasn't been as easy either because I don't always have the energy to get it done – even though I have the energy to write it down. So, I don't know. I'm just adjusting trying to figure out what to do with my days and my lack of energy being pregnant.* (P20)

Unexpected life events also shaped people's technology kits. In particular, the COVID-19 pandemic and social distancing put stress on people's routines, especially prior social active practices like dancing, running groups, choir, and volunteering at museums, among others. P07 notes changes across work and leisure activities: "*working at home instead of at the office or in the field. Not going to restaurants and not travelling are the biggest things. Well, also not enjoying live sports.*" For these participants COVID-19 was an external force causing the pause in use or removal of some of the group communication tools they had relied on previously because these in-person social groups and related conversation petered off during the height of social distancing.

Changes in social interaction could encourage participants to use new technology tools or features within prior technologies (e.g., group SMS) when joining a new social group. For instance, P03's Choir group text and P08's "Soup Family" group text where every Sunday he would enjoy soup at a friend's parent's house. The life changes of other people could also influence a participant's technology kit. For example, some of P06's friends found partners, and another had a baby, so she said that at present her friends were less interested in prior routines of social interaction:

> *Occasionally, my friends and I would see a movie. That's changed a lot too though because one of my friends had a baby in February, so we weren't really going out that much anyway because she's been feeling kind of stuck at home…And, I have not had any adults to interact with, so even though I feel like I need our video chats, [my friends] don't so much and they're usually the ones who cancel them.* (P06)

Similarly, when P01's mentor moved away, this "*took away my best coping strategies*" and led her to reach out to other people in her network via the communication channels she uses with them.

Many participants described experiences of trying certain technologies, particularly popular ones like journals or Fitbits, and then ending their use because the tool was not helpful in supporting their mental health management. For example, when asked whether she used any individual-focused (non-collaborative) mental health support technologies, P23 said, "*No, I've tried some, but they don't really help me.*" Similarly, P21 previously used a Fitbit but began to feel negatively about herself based on the tracking over time, so she stopped using the technology: "*Sometimes I feel like things like [the Fitbit] can actually have a negative impact on me because it makes me feel bad about how much I'm not exercising and stuff or I'm aware of how much sleep I'm not getting when I look at what the app says.*" (P21)

Over time, participants became aware of opportunities to try various mental health support technologies and they purchased or downloaded these options. However, when these tools failed to meet their goal(s), they stopped using them long-term.

4.2.3 Available. Tool availability can include purchasing a tool, receiving it as a gift, or using a tool that is already in one's environment. As described earlier, P05 used nearby tools, including Legos, to keep focused during long video calls. Additionally, further using current devices and apps can support technology kit evolution trajectories. For example, P04 likes to text on his iPad using the TextMe software because he "*doesn't have the greatest eyesight.*"

Now that he has a device that better supports his eyesight needs, his activities and technology use plans are based on his preference to use his iPad for text-based communication including to "*communicate quickly with family.*" Within-app recommendations can also trigger continued development of technology kits, e.g. following new people on Tiktok (P01) or family vloggers on YouTube (P03).

Tool availability enabled technology experimentation. For example, P05 used technology both to engage with and to get some time away from her children. She set up family movie nights where her family watched a show together to enjoy a shared fun and relaxing activity. Yet sometimes she needed a mental health break where "*movies are the babysitter*" and she could take a nap, disconnect, and get things done while her children watched a show. P05 would not have necessarily used TV in this way on her own, but to manage her personal needs and the needs of her children, tools like the TV are important component of her technology kit. P08 also experimented with different tools to try different types of interaction with therapists through in-person therapy and asynchronous text therapy.

However, technologies that seem available may not actually be available when someone needs them. For example, P08 described his habit of downloading apps that he intends to but ultimately does not use. When he hears about an app that seems like a good idea, he easily downloads it, but then becomes anxious about his ability to follow-through with use, leading him to not use the app at all. He shares his experience with a recent splits challenge app:

> *And then I think, "oh I need to get into the app," and then like the "Splits in 30 days" one, "Oh jeez, that's 30 days, and I have to do this thing." And a lot of times thinking about doing something as the entire future thing of doing it. Um, I just get frozen and I'm like, "ah, I don't want to start that now." 'Cause when I start it I'm going to want to stay with it…So it's like, I don't know, it's a big commitment maybe.* (P08)

Other participant challenges using what might seem like an available technology tool included difficulties remembering time zones or forgetting to charge separate items (e.g., P03's Apple Watch). Similarly, remembering passwords for social media accounts also presented challenges. Several participants described wanting one social media channel to keep in touch with everyone. P03 called it a "*universal or big social media without remembering 47 passwords.*" For communication tools, spotty cell and internet service and feeling like there was nothing new to talk about prevented some participants from reaching out. Goals around reducing screen time additionally influenced participants' use of digital tools. Finally, upgrading devices could complicate long-term app use. For instance, P12 used to have a journal on an old phone yet lost this record when upgrading to a new phone.

4.3 Supported, Included, and Safe: Envisioning Future Horizon Technologies with People Managing Depression

Blue-sky ideation encourages thinking about design on different temporal horizons [71]. When thinking toward sociotechnical futures that could support their mental health (overlaying/adding to their current toolsets) participants described three themes: sensorial experiences, shared space, and movement freedom. Many participant ideas had roots in technologies portrayed in science fiction media like Star Trek and Star Wars. Separately, one participant imagined a future where his depression was fully cured. Many of these ideas are not currently feasible but help us to understand gaps in people's technology kits today and principles that we can incorporate into future tool design.

4.3.1 Sensorial Experiences. Participants desired future tools to support rich connection experiences deepening our lived senses beyond what is possible with today's technologies. These included sending technology-mediated smells, using telepathy, and connecting to pets while away from home. For example, the ability to send smells through technology-mediated interactions could enable sharing the scent of tasty cooking or a humorous bad whiff. P09 constantly shares funny memes and jokes with others as an important part of her mental health management. She describes the humorous possibilities of interacting with her mother who lives abroad if they could send smells to each other: "*I know that if we could really smell that thing it would be really funny.*" (P09). Other participants described being able to share emotions (e.g., through the idea of "telepathic" communication) to possibly enable better support from therapists or friends. P24 describes how telepathy with an emotion-sharing component could be useful when receiving support from someone else:

> *Well, of course, I'm a huge Star Trek fan and I think it would be kind of cool to reach out to someone mentally and talk things out, I guess, through telepathy and I think it would be faster and they could get a sense of how you're feeling more through that way…I'm sort of an empath and I take on the emotions of people around me sometimes. And there are a lot of people who don't. They have empathy, but they can't really feel what you're feeling. They don't understand why you're feeling that way. And I think if there was a way, they could actually feel what you're feeling, maybe it would help them a little bit more to help you, I guess. To me if I go to therapy if my doctor kind of knew, I mean, exactly how I was feeling, maybe he would be able to help better.* (P24)

Beyond human-human connections, several participants desired to better interact with pets via technology when they were at a distance. While this paper focuses largely on human-led support because the study protocol specifically probed this, many participants discussed the mental health support benefits of dogs and cats.

Together, these sensorial ideas build upon current practices of sharing and connecting yet seek to heighten the experience. These ideas show how participants valued shared experience and closeness as a goal for future digitally-mediated support experiences.

4.3.2 Shared Space. Participants believed that sharing space with others through technologies like holograms or virtual reality experiences could engender a more supportive experience. For example, hologram-type communication might enable participants to look a person in the eye and see their whole body, giving the experience

"*like we were sitting together*" (P18). P11 describes the mental health support possibilities of joining family gatherings via hologram:

> *My mom lives in Florida, so being able to virtually stand on the beach with my mom or like holidays when all my family gets together, yeah, I can see them on a video, but wouldn't it be cool if there was like hologram [me] here sitting at the table with everyone…I'm not one who gets homesick. I don't mind living 900 miles away from everyone, but there are some situations like holidays or if you have a bad day. Just being surrounded by family not only on a screen, but if I was hologram [me] standing there being surrounded by in a very familiar place with very familiar sights and smells, you kind of feel more supported and included and safe than you do staring at everyone on a video call.* (P11)

As P11 described, technologies that support a shared presence at a group level could enable sharing in holiday traditions. By sitting in a familiar place with familiar sights (and perhaps smells), participants thought that they would feel more supported, included, and safe than in current video call experiences. These ideas highlight how sharing space with others is often an important part of in-person collaborative self-management, replete with eye contact and co-presence. Many current mediating technologies, for instance text messages and phone calls, enable only limited information about the other person. Thus, these shared space ideas move toward the richness of in-person experience through technological means.

Our data were collected during the context of the COVID-19 pandemic when many people were more isolated as a result of local mandates and precautions they chose to take. This likely made the desire for shared social spaces more salient to participants. However, many participants also described wanting this kind of interaction long before the pandemic, so we do not think this need is unique to the pandemic period.

4.3.3 Movement Freedom. Participants desired to easily go places in their own towns as well as to and from friends and loved ones. One participant described the benefits of an eco-friendly car that could be folded up and put into a pocket to eliminate parking hassle. Other ideas included teleporting supportive others on an as-needed basis for physical touch like hugs, shared presence, and group laughter. Teleportation might also eliminate participants' time spent traveling to visit people who live in far-away places. P07 loved to see friends all over the world, so wished for teleportation:

> *The time that it takes to travel somewhere is time taken away from other things that need to get done, whether it's work or home or whatever. And so, it's about finding a balance there. A balance that could be much easier to find if you could be somewhere fairly instantaneously rather than driving for several hours or flying for several hours or whatever…I think group laughter is a lot harder to have everyone take advantage of when you're not face-to-face in a group…Just it would be a freedom that would open up. It would be a barrier that was removed with regard to time.* (P07)

P20 thought that it would be scary to teleport people but would love to scan and share food or items to better interact with others in the moment, for instance, through sending bites of a tasty sandwich while at a café. "*I think it's more about like getting food that I like or items that I want or being able to interact with each other in the moment. For example, you're like, 'Dude, I'm at Brazilian café (or whatever) and I got this awesome sandwich. I need you to try this.' You'd be like, 'Oh, yeah, scan me that'.*" (P20) Some participants also described a desire for human touch as a part of collaborative self-management (e.g., hugging, cuddling), and ideas around fast travel underscore that this need is not met by current technology tools. Yarosh et al. [90] have begun to work on technologies that could transmit touch from afar, but these type of tools are still largely in their infancy.

5 Discussion

Our findings offer a deeper understanding of the tools used for depression self-management. We now discuss mental health technology kits and describe design principles for supporting depression self-management across an evolving set of tools. As a section summary, here are some benefits of the analytical lens of a mental health technology kit, which we discuss in the section below:

- Help people reflect on their current tools, activities, and connections.
- Serve as a potential discussion point in therapeutic settings.
- Inspire people to discover new tools for their kits.
- Understand broader technology kit gaps.

5.1 Mental Health Technology Kits

A mental health technology kit comprises the specific technologies that people have on their digital devices and physical items in their environments that they turn to as part of their mental health management. Technology kits help us to understand people's work to address their mental wellness. These are not just a grab-bag of tools; a person constructs their kit to reach their goals. Consequently, taking a kit perspective allows us to see both the tools and the people and groups in a person's life as well as how those elements connect. Resonating with our technology category findings (4.1), Xu et al. [88] analyzed conversations among participants in bipolar disorder communities, noting that these individuals also use a wide variety of technologies including communication technologies, online communities, and tracking tools.

Using the technology kit perspective, we can begin to understand both how individuals engage with different tool types to manage their mental health and how multiple tools can be used together. For instance, participants used Legos and kinetic sand to manage anxiety and maintain attention while on Zoom calls. One important characteristic of these toolkits is that most tools were not designed specifically to support mental health. While people used some tools developed specifically for mental health support such as the Headspace app and a variety of teletherapy applications, these were just a few tools within a much larger kit. This finding also highlights one of the enduring traits of digital tools – that tools are often appropriated in ways that they were not initially designed to support [57].

5.1.1 Mental Health Technology Kits Go Beyond 'Health' Tools. Mental health technology kits encompass both physical and mental health. However, the term "health technologies" applied to only about a third of the tools described by our participants. We also found that communication and entertainment tools were essential components for mental health management that people used to combat symptoms of depression. In prior work with individuals managing depression [19] we describe how communicating perspectives and making sense of situations with other people creates space for new understandings and perspective shifts through interpersonal dialogue. Entertainment technologies offer opportunities for distraction to: short-circuit rumination, boost one's mood, gain a "mental reset" [33], and share fun experiences with others, such as streaming a movie on Zoom to watch together when not physically in the same place. Technologies such as Facebook Messenger and FaceTime are also sometimes used for mental health support [19, 20, 33]. Therefore, a participant's goals determine whether a particular technology is being used as a "mental health support" tool.

Wilson et al.'s [87] Care Spectrum themes provide some useful ways of thinking about kits. Key themes in their work included: individual to collective, human to more-than-human, tangible to intangible, present to future, unidirectional to reciprocal, and formal to informal. Our findings join the efforts of these authors in "sensitizing designers to the ecological and more expansive notions of care in the contexts they are designing in." A key part of this approach, in the context of our work, is the broader perspective of the interrelated tools highlighted within one's kit.

What are the implications for clinically-oriented digital mental health tools? Researchers and digital technology developers have struggled with low continued use of mental health technologies [9, 80]. Our findings provide some perspective toward this. People may be meeting their needs through interactions and tools that are not mental health specific. Therefore, when we study digital technology use behaviors, it is useful to have a broader view of technology use such as in the MONARCA study [10] where the authors evaluated usage across multiple apps, including communication apps, to develop predictions and early warning signs for an upcoming manic or depressive episode. Overall, there is not necessarily a strict separation between "health" and "life" tools. Rather, participants managing depression in our prior work [20] highlighted that what is more important is the strategic process of selecting who to talk to or which activity to do through which medium about what topic. The toolkit perspective brings this broader assemblage of tools into a more explicit focus.

5.1.2 Mental Health Technology Kits Tell Stories of Individuals' Values. Mental health technology kits are intentional, adaptable, and take advantage of available tools (4.2). A kit tells a story of what a person values and what mental health management elements are important to them. As highlighted by the tool variety listed in Table 3, people look for support in different ways, e.g., creating support in their toolkit for needs as they change over time. People had resources available for consistent use (e.g., relaxing games; regular calls with family, friends, and support groups) as well as for episodic or acute needs (e.g., preparing what to say for an important conversation).

Mental health technology kits evolve over time as people try different tools and keep those that are most useful. Kits also reflect broader changes in technology availability over time. Some tools are core and (relatively) unchanging like default texting applications on people's smartphones (e.g., Messages for Apple devices) whereas other tools could come in and out of use.

Building on the physical first aid kit metaphor, the American Red Cross recommends checking your first aid kit contents every three months and doing a review after major events to assess if there are items that may have been useful to add to your kit [28]. While not a focus of our study, future work should examine techniques to support people in taking stock of their current kit, determining gaps, and finding tools that may help fill those needs, as well as dropping tools and practices that are no longer helpful.

In the assistive device context, Savage et al. [75] find that "follow up" activities enabled better tailored devices. These activities included "fixing broken assistive devices, adjusting the device to better fit the recipient, or even providing recipients with physical therapy." Drawing inspiration from these follow up activities, we envision processes of reviewing one's kit, either on one's own or in concert with a therapist, to better tailor one's kit over time. In this way we can further examine the usefulness of framing the set of mental health tools as a holistic "kit" rather than a standalone series of tools.

5.1.3 A Mental Health Technology Kit Lens for Therapeutic Sessions. Delineating the tools in one's mental health technology kit can be a useful reflection exercise. Most participants had never visually drawn the people and technologies that are part of their mental health management in this way, and several liked the novel perspective to see everything in one place. Our participants seem to have built their kits in more ad-hoc ways; therefore, a future design challenge is how we might support future assemblage using this kit-level view.

We see an opportunity for visualizations of technology kits to be used as part of therapeutic conversations. In the mental health care management context, during design workshops, Kornfield et al.'s [47] patient participants envisioned that once they had built trust and rapport they might collaborate with care managers using digital tools. Their data could provide insights and information for care managers to tailor support, and some participants were interested in communicating "meaningfully with care managers via a large range of channels without threat to rapport or disclosure" [47]. In a different therapeutic context, Yoo et al. [91] investigated why and how people shared data and insights from their social media activities in the context of their psychotherapy sessions, noting how "social media helps augment narratives around interpersonal conflicts, digital detox, and self-expression." Building on these emerging practices of discussing technology use in therapeutic conversations, a technology kit can give a broad picture of tools which then can be used to investigate specific questions.

If a client has current goals of, for example, wanting to improve sleep or have a more satisfying social life, and from looking at the kit it becomes clear that their current tools are not supporting these goals, a therapist might consider suggesting other tools or seeing if the participant might want to look for tools in those areas to add into their kit. However, this may add additional challenges for therapists

who have different digital literacy or preferences than their clients (e.g., more experience in the Android ecosystem when their client is an Apple ecosystem), therefore clinicians themselves may need additional support. Some clinicians have technologies they already "prescribe," balancing ameliorating distress and building autonomy and skills, and we could see the technology kit perspective adding to those discussions.

Therapeutic conversations may also provide space for a clinician to prompt individuals to assess their technology use. While most technology interactions in this paper are framed in a positive light, in our prior work [33] with individuals managing depression, some participants viewed technology as a temptation or a trap. Discussion topics to support developing healthy and useful routines with technologies may be useful as well as technology-free activities to help individuals "reflect on their attitudes about technology to promote metacognition around its use" [33].

5.2 Design Principles for Depression Self-Management Support Within Mental Health Technology Kits

Digital mental health support technologies for individuals managing depression often focus on treatment targets to improve or reduce symptoms of the condition (e.g., [59, 60, 78]). While alleviating or reducing the impact of these symptoms is certainly important, technologies developed following this view often focus on correcting perceived "deficits" of an individual in terms of mood regulation, self-management activities, and negative thoughts. However, we can reframe prior approaches by considering design directions starting from people's strengths and current context, known as assets [68]. Asset utilization refers to "the extent to which an intervention recognizes and leverages resources already existing in the community, including physical and social infrastructure, skills, knowledge, networks, and environmental resources" [89]. We encourage designers of digital mental health technologies to consider solutions that enhance individuals' current mental health technology kits.

We share 3 design principles: building within current toolkits, creating new tools from current self-management strategies, and identifying gaps in people's current kits.

5.2.1 Building Within Current Toolkits. We see mental health technology kits as a way to engage people in the co-design and ideation of potential future tools by focusing attention not only on individual tools but also on how tools may interact with each other. Gouveia and Epstein [36] showed how people can be inspired to try new tracking tools by looking at fun tracking visualizations on online smartwatch store pages. Similarly, in the context of interactive technological ensembles for music therapy, Torres et al. [83] describe how HCI researchers and designers should support the use of "wide and adaptable" artifact ecologies in ways that can be learned and shared. Specifically, they recommend surfacing tool "functions, therapeutic goals and use" through documentation for knowledge-sharing and clinical decision-making. Likewise, our paper contributes to the HCI community by showing the real tools that people currently use as a reference both for people managing depression as well as for technology designers.

With this lens there might be opportunities to support mixing and matching several tools to push toward more personalization than a single app can ever offer. However, trying to learn and use many tools is difficult, especially when many people managing depression already struggle with energy and motivation, exemplified by our participant who struggled to commit to new apps. One way to approach technology kit development while managing burden is to consider possibilities for changing the use of tools already in a persons' toolkit before seeking to add additional tools.

With a greater understanding of people's kits, there is potential to identify gaps where a new technology or feature might fulfill an unmet need. However, changes need to be carefully made, considering how people managing mental health needs can have functional issues with multiple tools, including scarce memory or call minutes (e.g., [50, 52, 60]), and may need additional support for interoperability including secure but easy logins (if logins are necessary). We could consider what kind of control we might provide to people over their entire mental health technology kit versus today's focus largely on individual apps.

5.2.2 Creating New Tools from Current Self-Management Strategies. Clearly, toolkits consist of tools, so we need to think about the design of these individual apps as much as we do about the broader toolkit. Understanding specific apps that people use, and their associated routines, can provide a foundation for future design. For example, we can learn from P03's daily routine of sitting outside on her porch swing and playing a relaxing word game on her phone. Location can add to the technology experience, heightening the relaxation of the moment. Additionally, we can look at the app itself: The Wordscapes app includes soothing music and nature-based scenes (e.g., sunsets, mountains) as background behind the word-based gameplay elements. Game levels do not have a time limit and the game shares positive phrases when a level is completed. These elements could help suggest related apps she might like to try, or to incorporate these characteristics (e.g., nature scenes; relaxing music) in other future personalized tools or features within tools. On the other hand, we might probe whether this game fully meets her relaxing needs today, and if she would instead prefer to add future tools to her kit which address other unmet or not fully met needs and goals.

Of course, not all practices are as productive as others, and some might even be harmful, so this is an important aspect to keep in mind when designing tools integrating prior behaviors. However, given the heterogeneity of depression symptom effects [11] (e.g., one person may struggle to sleep, another might sleep too much), and the ways that access to resources make certain self-management activities easier or more difficult [15, 24], it is worth understanding an individual's previously developed useful routines.

Gathering self-management strategies from users may yield a creative corpus including emergent uses of technology tools. Moving in this direction, the MUBS [73] behavioral activation tool is a smartphone-based recommender system for the treatment of depression symptoms utilizing machine learning techniques for recommending healthy activities to patients and is designed to be used stand-alone outside therapy. MUBS provides a base set of activity recommendations but also allows users to input their own

activities and to search for activities added by other users. Other depression support apps have begun to create self-management "personality" classifications (e.g., [40]), and are able to suggest activities in this type of language: 'other people who like similar self-management activities rate that they particularly enjoy running.' Suggesting reasonable activities for a user's current climate and weather (e.g., winter activities in Chicago, U.S.A.), activity preferences, and local geography are promising avenues. This could help to avoid unreasonable activity recommendations using some contextual awareness while still supporting skill development and a person's agency in figuring out which activities and when is the right time for them. Personalized recommendations, combined with interaction ideas gathered through a crowdsourced method, could yield exciting opportunities.

5.2.3 Identifying Gaps in People's Current Kits. While looking at their cognitive maps, we probed our participants to understand what else they would add into their current mental health technology kits. We invited magical thinking and participants described visions for future digital mental health technologies (section 4.3). Thus, the described tools could be additive to their routines and processes that are currently functioning rather than necessarily replacing today's activities. We did not probe what tools they would remove or other smaller kit adjustments, both important topics for future research.

While people managing depression are often positioned passively as people in need of help, we sought to show in this paper their creativity and thoughtful sensitivities. Overall, participants described ideas where they felt supported, included, and safe. These ideas show important characteristics of future tools and might help us to see why some tools are not meeting people's needs today.

Participants were excited about future shared experiences enabling increased and ongoing closeness. This included sharing the details of daily life encounters across distances through humor, laughter, taste, touch, smell, and connection with animals. Together, these sensorial ideas build upon current practices of sharing and connecting through tools including social media and video chats yet aim to heighten the feeling of closeness through simulating in-person experiences.

Another facet of sharing experiences involved improving the ability to share one's feelings to get better support and explain "why you're feeling that way." This desire for exactness of internal feeling is intriguing because it highlights that describing feelings can be frustrating for individuals managing depression. While participants' interest in sharing emotions brain-to-brain is not currently possible, these imaginings tell us that even with the ability to describe how one is feeling, another person might not understand how the mood feels to the individual who is experiencing it. Therefore, directly sharing emotions has the potential to transcend words and enable improved support.

Participant ideas for social augmented and virtual reality showed the importance of safety and interaction with trusted people. Participants' anticipated feelings of freedom and safety in virtual environments paralleled findings from Deighan et al.'s study of people's use of the VRChat app during the COVID-19 pandemic [29]. Their work provides some context about what their participants meant by feeling "safe": not feeling emotionally or physically threatened, feeling a sense of social security to go to a different world or block a user, and having an escape from the offline world. In contrast to their work, which focused on anonymous avatar-based interactions, our participants envisioned VR/AR interaction in environments with known and trusted others embodied as themselves, without avatars. While there are many current virtual reality experiences that incorporate "adventuresome" locations like climbing a mountain [37] or exploring a jungle with dinosaurs [63], participants' visions showcased familiar locations experienced in multi-sensory ways (familiar smells of a home kitchen during the holidays; "sitting with" other people). Future design work in this space could build on recent findings [16, 53] highlighting co-design as an appealing approach for creating VR environments to support teen mental health. Augmented and virtual reality tools available in the market continue to develop as business models and technology evolve and we believe that focusing on feelings of user safety and comfort may create immersive technology experiences that appeal to individuals looking to support their mental health.

6 Limitations

This paper describes perspectives from people living in the United States experiencing the U.S. healthcare system. While some participants had previously lived in or had family in other countries, our findings do not necessarily relate to the experiences of individuals facing different cultural and healthcare system stressors. We did gather data from both urban and rural perspectives in the U.S.. We also spent more time exploring collaborative technologies than individual-use tools. Therefore, we likely gathered more participant stories and greater detail in this study about collaborative mental health technology interactions. We sought racial diversity in our sample but were only able to recruit 25 percent of our participants from minority populations so in the future we will continue to partner with organizations to reach more racially diverse individuals. Next, our participants largely fit within the "moderate" and "moderately severe" depression categories based on their PHQ-8 scores. One participant scored in the severe depression range, but beyond that participant, our work is unlikely to speak to the experiences of individuals suffering from severe depression, who may have different needs which should be investigated in future work. Digital recruiting may have excluded people who we could have reached through in-person flyers (which was our plan prior to COVID-19) who did not have access to our digital channels.

7 Future Work and Conclusion

We can continue to deepen our conceptualizations of mental health technology kits and how individuals integrate their tools into larger assemblages. Future research should explore the work of constructing kits through intentional assembly and how people maintain and update them over time (e.g., temporal changes in preferences and collaboration [18]). As innovators, we can further build out descriptions of people's needs (and tools within each need), to help them determine which tools might be a best personalized match for specific contexts. Given the constraints of the pandemic, this research was done remotely, but a home or workplace-based 'technology tour' [8] could be a next-step approach to deepen both the categories of tools described in this work and to better understand

how physical environments interact with technology use. While the focus of this study was on technologies, we encourage future researchers to broaden the analytical lens to a "mental health toolkit" which might include elements of physical environments, pets, food and drink, medicines, and other potential topics. We view mental health technology kits as a scoped selection within a potential wider set of artifact ecologies.

In conclusion, this study details assemblages of tools and digital services used by people managing depression to assist their mental health management. We draw on the framing of a mental health technology kit to conceptualize the tools that people use for individual and collaborative depression self-management. We describe how mainstream technologies are critical avenues to enable the work of depression self-management. Most tools were not specifically developed for mental health support yet were used frequently for that purpose. While previous HCI literature has shown the benefits of mental health support provided through online communities, apps, and social media, our study further advanced our knowledge of the wide variety of support technologies utilized by individuals managing depression. We characterized these mental health technology kits as intentional and adaptable using available tools. We contribute opportunities for designing technology improvements and future collaborative interactions using a technology kits lens.

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