

Opportunities and Challenges for Technology Use in Substance Use Disorder Recovery

by

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Dedication

This dissertation is dedicated to the ones we have lost, and the ones still living.

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Abstract

This dissertation investigates the role technology plays in substance use disorder (SUD) recovery, with the goal of characterizing technology's potential role in effective recovery care.

The findings in this dissertation are derived from four studies: one design space analysis of commercially available SUD recovery mobile applications, including user reviews (n=55 apps), and three interview studies with SUD recoverees and support professionals such as therapists, social workers and peer recovery coaches. Interview study one had 18 participants (8 recoverees and 10 support professionals), with topics focused on the process of re-entering digital spaces after beginning recovery. Interview study two had 11 participants (all support professionals), and focused on the role of social media in recovery and the impacts of distance care on providing recovery support. Interview study three had 10 participants (5 support professionals, 5 recoverees) and was part of a user experience study testing a prototype app that would help support professionals and recoverees communicate and share resources.

Drawing on the findings of these studies throughout the dissertation, I discuss four dimensions of SUD recovery that can be facilitated by technology: social networks, professional support, resource access, and self-guided activities. For each, I investigate the opportunities and challenges of different affordances, and identify strategies for maximizing benefits and mitigating dangers.

For social networks, recoverees must reshape their digital social environment to get access to supportive communities without exposing themselves too much to destabilizers. For professional support, professionals must capitalize on the flexible, convenient communication

afforded by technology without making a recoveree feel isolated and care feel impersonal. For resource access, recoverees must be able to access up-to-date, accurate information while avoiding misinformation and prohibitively high search costs. Lastly, for self-guided activities, recoverees need to be able to get the therapeutic “active ingredients” without being exposed to design that creates discouragement and distrust.

I use my analysis in these recovery dimensions to argue that there are two important functions of technology in SUD recovery that are often overlooked: a connection amplifier and gentle on-ramp. As an on-ramp, technology offers a low-stakes way for people to explore recovery if they are feeling ambivalent about engaging. As a connection amplifier, technology serves to deepen connections between recoverees and their support network by giving them more ways to connect and communicate. This has implications for intervention design. For example, rather than attempting to replace a human therapist with a chatbot, designers might instead focus on building decision support systems that help therapists track client needs and suggest therapy exercises. Everyone involved in the work of SUD recovery is likely operating under an enormous cognitive load, and so it is important to have technology absorb as much of this cognitive load as possible, especially the monotonous work that lends itself to automation. This way, recoverees and professionals can focus on the parts of the recovery journey that are irreducibly human.

Chapter 1 Introduction

How does technology affect recovery from substance use disorder, both positively and negatively? And how can recoverees, support professionals, technology providers, and researchers exploit the advantages and mitigate the dangers? This dissertation attempts to answer those questions in a comprehensive way.

Substance use disorder (SUD) is a dangerous chronic disease. Drug overdoses have killed almost a million people in the United States since 1999 [174], and SAMHSA estimates that 40.3 million people aged 12 or older (14.5%) had a SUD in 2020, of which 24.9 million involved illicit drugs [217].

The support infrastructure to help people recover from SUD is buckling under the pressure. Demand for recovery support services far outstrips the supply [109], and only a fraction of the people who need treatment get it each year [216]. As with so many types of healthcare access, this shortage affects people unequally, disproportionately failing those who are most vulnerable: those with low incomes, who are uninsured, who live in rural areas, and BIPOC and/or queer people. These vulnerable populations are disproportionately likely to be unable to afford quality care, cannot physically access care, or cannot access culturally resonant care.

Technology holds the potential to bring greater efficiency, cost savings, and accessible care to more people. However, technology often fails to live up to these promises in SUD care and other healthcare contexts. Adoption is often slow, and the technologies that promised to improve care turned out to create their own barriers and frustrations. Electronic health records (EHRs), for example, are designed to improve efficiency, minimize errors, reduce costs, and

raise quality of care; however, implementation of EHRs has faced significant barriers, with many care providers resisting a tool they find cumbersome and inefficient [215,238].

Given these deficiencies, it is understandable why providers can be resistant to adopting new technologies. Healthcare professionals are suspicious of promises of efficiency, and it is difficult to integrate new technologies into the complex work processes of healthcare. Hesitation also comes from the worry that telehealth solutions will feel impersonal, adding both physical and emotional distance between the patient and their care provider.

For SUD treatment, there is an additional complication: there is a lot of money flooding into treatment right now, especially for telehealth. There are several reasons for this, one being that the Affordable Care Act (ACA) required insurance providers to provide SUD treatment coverage in insurance plans [3]. Though undoubtedly a good thing overall, this also incentivized bad actors to move into the SUD treatment space to exploit vulnerable people for their insurance money. This problem became so significant that, as an example, Facebook put a blanket ban on advertising for SUD treatment centers for some time until they partnered with a third-party certification service called LegitScript to screen potential advertisers to make sure that the services being offered were of an acceptable quality [246]. This makes it all the more critical for SUD telehealth interventions to be carefully designed using evidence-based practices, and that existing interventions are carefully screened before being recommended to recoverees.

When discussing the benefits of technology in healthcare, we often focus on efficiency and automation. As a consequence, the benefits of technology are most often conceptualized as either a stop-gap measure or a supplement to in-person care. As a **stop-gap measure**, it is an option that is “better than nothing” for people who cannot access the care they need because of constraints related to availability, distance, finances, etc. Other research has called this “first step

treatment.” As a **supplement**, technology serves as a place to get information and support in addition to in-person care or other structured treatment program.

While both of these are important functions of technology in SUD recovery – as a stop-gap measure and as a supplement – this dissertation will argue that two other functions are often overlooked but even more important: As a connection amplifier, and a gentle on-ramp. As a **connection amplifier**, technology offers a way to deepen connections between recoverees and their support networks by giving them more ways to connect and communicate. As a **gentle on-ramp**, technology offers a low-stakes way for people to explore recovery and start engaging with recovery ideas when they are resistant to engaging with in-person mutual help groups or formal recovery institutions in health systems; with the eventual goal being to encourage these people to engage more fully with recovery. Recognizing these functions has important implications for design; for example, while the usual focus on efficiency and automation often attempts to replace the need for human input, the function as a connection amplifier emphasizes the importance of retaining a human touch in the process. Identifying these two themes as things to be focused on in telehealth, over efficiency and automation, is one of the contributions of this dissertation.

This dissertation addresses the overarching research question: What are the opportunities and challenges in integrating technology into SUD recovery care, in particular the ways that they can be a connection amplifier or on-ramp? This dissertation has four chapters, based on four factors in recovery that technology can facilitate or impede. For each, I ask the same question, investigating opportunities and challenges with a focus on their potential as an amplifier or on-ramp. This framing is another conceptual contribution.

Each chapter also has its own contributions; below I present a highlighted contribution from each.

1. **Social networks:** Online social networks are an important place for recoverees to build healthy support networks to help them through recovery and connect to a recovery community. However, it can also amplify bad connections as well as good ones, opening them up to unwanted access and triggering content that can be destabilizing. Digital social reshaping of their networks is critical to making social media a positive space, but recoverees are often left to do this work without professional support.
2. **Professional support:** Communication at a distance (videoconferencing, texting, phone calls) is an important tool in the relationship between professionals and recoverees. It affords flexible, short check-ins using convenient communication channels that amplify connections with support professionals. This makes it easier to maintain engagement and creates a lower bar for entry for people who may be nervous about in-person recovery support, serving as a convenient on-ramp. However, distance communication is more or less useful depending on the individual and recovery stage; for example, it does not work well during inflection points such as building rapport and crisis intervention.
3. **Resource access:** Online information resources such as meeting finders are a convenient way to share a diversity of information that can be instantly updated, but outdated information or misinformation can be very harmful, and it is often difficult to sort through all the available information and determine what is trustworthy. Just because information can be updated does not mean it will be updated, and information that is supposed to be an onramp for recoverees can actually be a bridge to nowhere.

4. **Self-guided activities:** There are a number of apps that offer personal informatics for SUD recovery, ranging from self-monitoring tools to automated therapeutic chatbots. When implemented well, these can be a valuable way for recoverees to take control of their recovery and provide accessible care; but the stakes of failure are high. A tool that seems like an onramp, but is implemented poorly, can be discouraging and turn recoverees away from pursuing more high-quality options.

In the remainder of this introduction, I will first cover some general background about SUD and SUD recovery. I will then describe the methods of the four studies from which I draw evidence, and conclude with a discussion of how the dissertation is structured. Because of the nature of the studies and the structure of the dissertation, evidence from the four studies is combined and presented throughout the dissertation, rather than having one study per chapter.

1.1 Background

1.1.1 Terms and definitions

SUD is defined in the Diagnostic and Statistical Manual of Mental Disorders 5 (DSM-5) as characterized by behaviors including impaired control of substance use, impaired social interactions with others because of substance use, risky drug use, and experiencing withdrawal [11].

As SUD is a stigmatized disease, it falls victim to the euphemism treadmill, in which neutral terms take on negative connotations as people use them in derogatory ways. At the time of this writing, the preferred terms are as follows; in the future, these may also be perceived as derogatory and replaced by new preferred terms. Substance use disorder has replaced substance abuse, drug habit, and addiction as the preferred term to emphasize its nature as a chronic disease. People with SUD should not be referred to as addicts, users, and certainly not junkies,

though people sometimes use those terms to describe themselves. Recovery and sobriety are two different things, though they are sometimes used interchangeably; recovery is a more inclusive term that acknowledges forms of recovery that do not mandate total abstinence from substances. Finally, people or drug tests should never be referred to as dirty or clean, because of the implied moral judgment; it is better to use terms such as in active use or positive/negative test [5].

Although the goal of SUD treatment is “recovery,” there is no agreed-upon definition of what constitutes recovery [19]. Recent working definitions have moved away from making abstinence a keystone piece of the definition [31], and have instead turned toward definitions such as the one from Substance Abuse and Mental Health Services Administration (SAMHSA), which prioritizes health, home, purpose, and community [218]. The transition into active recovery has many facets and includes many life domains like work, family, health, relationships, and for some, the criminal justice system; this is why it is critical to create a network of support around a recoveree during their transition [30].

1.1.2 Significance of SUD

Substance use disorder is a major public health problem. One study found that 9.1% of U.S. adults (22.35 million) reported having resolved a significant problem with drugs or alcohol in their lifetime [131]. Of those, about half used professional help or informal assistance (e.g., mutual help groups) to resolve their problem use, while half resolved it on their own (sometimes called “natural recovery”). People with more severe issues with substance use were more likely to need outside assistance. However, many people who need SUD treatment do not get it [216]. There are a number of barriers to SUD treatment, including a severe shortage of SUD treatment specialists [47], cost [60], and the stigma against people with SUD [6].

1.1.3 Treatment approaches

Previously, SUD treatment has been limited to short-term, intensive care that focuses on treating acute symptoms [140]. More recently, this model has shifted to a recovery-oriented model based on chronic care, which recognizes recovery as a long-term process that needs to address the many complex factors that may drive an individual to use substances [69]. The recovery landscape is complicated: there are many models of recovery care, the most popular of which is the 12-step model established by Alcoholics Anonymous (AA)/Narcotics Anonymous (NA), but includes a number of psychosocial approaches that may be used in combination with, or instead of, the 12-step approach [78].

Treatment for problem substance use is varied and needs to be highly individualized in order to successfully address the reasons why an individual uses illicit substances [173]. Contributing to the complexity of treatment is the fact that about half of people with SUD have co-occurring mental health disorders [193]. Treatment often includes a combination of behavioral therapy (e.g., cognitive behavioral therapy), pharmacological intervention (e.g., methadone, buprenorphine), and mutual help groups (e.g., AA, NA) [173]. Depending on their needs and comorbidities, an individual's web of support may also include other medical professionals, social workers, parole officers, etc.

Once an individual seeks treatment, depending on the severity of their needs they may enter treatment at several points in SUD's continuum of care [12,173]. SUD recovery is nonlinear, and an individual may move along the continuum to more or less intensive stages of care as their needs change (see Figure 1) [140]. The most intensive of these is detoxification, in which the individual undergoes medically managed withdrawal. From there, the individual may go to residential/inpatient services, intensive outpatient/partial hospitalization services, or

outpatient services [12]. Long term recovery may include sober living homes, a type of group home that helps people maintain long-term abstinence from alcohol and drugs [111].

1.1.4 People of SUD recovery

SUD recovery usually involves a web of people who provide social support for the recoveree. In addition to the recoveree themselves, this web of support is usually composed of:

- **Support professionals:** This category encompasses a range of roles including peer recovery coaches, licensed social workers, psychologists, and clinicians. The specifics of their support role may differ significantly but the common thread is all of them are part of an institution of some kind and are bound by professional ethics rules.
- **Sponsors:** Mentors who are also in recovery themselves, further along in their recovery and now reaching back to help people on their own journey. Sponsors are part of the Alcoholics Anonymous (AA)/Narcotics Anonymous (NA) tradition. They are similar to peer recovery coaches but the relationship is informal and more like a friendship than a professional relationship.
- **Recovery peers:** People who are also in recovery. These may be people that the recoveree has met during treatment, in mutual help groups, etc.
- **Supportive friends & family:** Anyone in a recoveree's social network who are not directly involved in recovery but provide support in some way.

These categories may overlap; for example, sponsors are also peers in recovery, and support professionals may also have a history of recovery. The evidence presented in this dissertation comes from recoverees and support professionals.

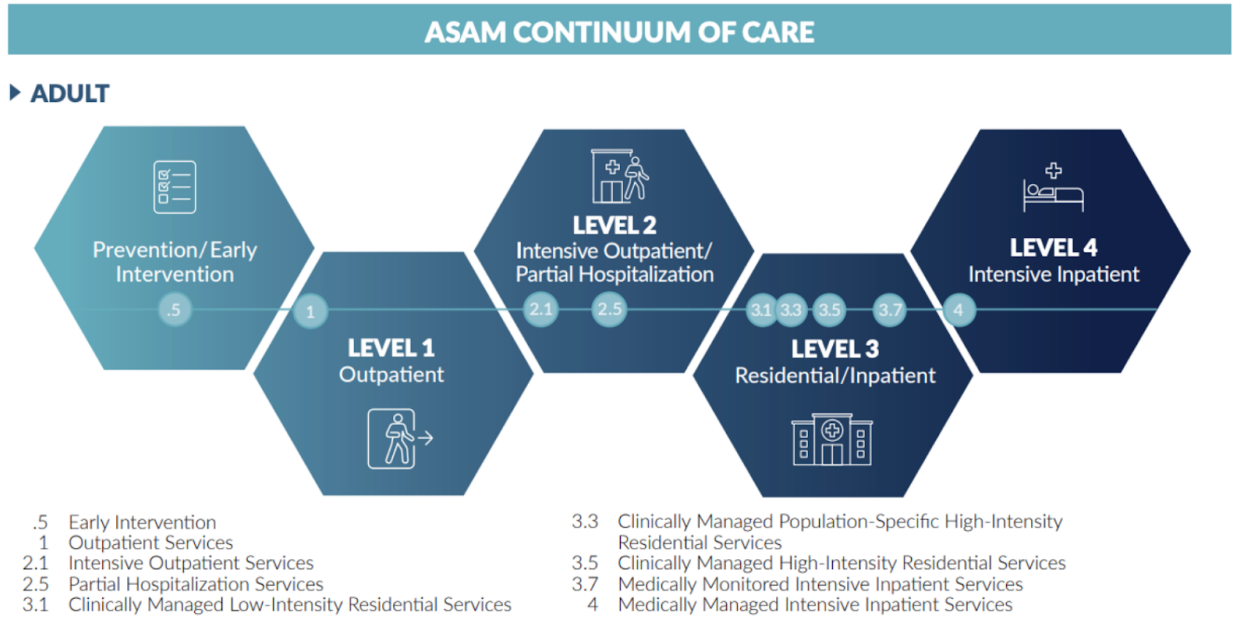


Figure 1. The SUD continuum of care, as defined by the American Society of Addiction Medicine (ASAM) [13]. The ASAM criteria are widely used for determining what level of care is appropriate for an individual.

1.1.5 Technology in SUD treatment

Technology has begun to be incorporated into SUD treatment, albeit slowly. Some of this resistance is cultural: research has found that people in AA think of themselves as being generally suspicious of changing traditions and incorporating technological tools [243]. Some of this is regulatory: government regulations place restrictions on what kind of treatment could be conducted via telehealth, though restrictions have recently eased significantly as COVID-19 forced regulators at the US Centers for Medicare and Medicaid Services to make adjustments that would make remote SUD care possible [54]. Details of how technology has been integrated into SUD treatment and research surrounding SUD telehealth will be discussed further in each chapter.

The next section describes the data sources from the original research that I will be reporting in this dissertation.

1.2 Methods

The results presented in this dissertation come from analysis of four data sources: three interview studies conducted with support professionals and recoverees, and a design space analysis of commercially available SUD recovery mobile applications. The analyses of these four data sources are woven throughout the paper, presented as they become relevant to the chapter topic. The analyses of these studies informed the structure of this dissertation.

Quotes from participants in the three interview studies will be differentiated in the body of the dissertation through identifier codes as follows: (D1-SP1). The first part of the code indicates which data source it is coming from (Data source 1 = D1), and the second part indicates whether the speaker is a support professional (SPx) or recoveree (Rx). The numeric identifier x following SP or R was arbitrarily assigned to make it clear when two quotes come from the same person without revealing any other information about the person.

1.2.1 Digital re-entry: Interviews with professionals & recoverees (D1)

Data source 1 (D1) is an interview study with both support professionals and recoverees discussing the process of re-entering digital spaces after beginning recovery. This data came to me as raw transcripts of interviews conducted by an IUPUI PhD student (Jeremy Heyer), who has since left the program. I was not involved with the development of the interview protocol or conducting the interviews. I led the coding and analysis of the interview data from scratch, working with two other coders. After initial coding, I did most of the remaining analysis alone. From Heyer's lines of questioning, I infer that he was focused on generating possible design solutions to help recoverees deal with social media (e.g., social media usage monitored by a counselor); my analysis focused on characterizing how people use their mobile devices in recovery and understanding what strategies they currently use to navigate the process.

Procedure: This study recruited two types of participants: individuals in recovery, and SUD support providers.

Recoverees: We used phone and/or email (based on the individual's preference) to set up a time and place for the interview. Three interviews were conducted in-person at a location of the participants' preference (i.e., a local coffee shop, community center). The remaining interviews were conducted over the phone. Consent forms were emailed to all participants prior to interviews. Prior to the beginning of each interview, verbal consent was obtained. Each interview lasted between 30 and 45 minutes. Participants were paid \$20.00 USD upon completion of their interview.

Support providers: All provider interviews took place via phone/video conference. Prior to the beginning of each interview, verbal consent was obtained. Each interview lasted between 30 to 60 mins. Participants were not compensated for their participation. Like the recoveree interviews, these were semi-structured in nature. Providers were asked basic biographical information, like what type of treatment provider they are and the types of services provided, the role social media and other digital platforms play in the active addiction state as well as the recovery journey.

Participants: The interviews included 8 recoverees who identified as having a substance use disorder and were currently in a recovery program. Five were living in sober living facilities when interviewed, with the rest living in their private residence. There was a range in the duration of the most recent recovery journey as well as the preferred drug/substance of choice. Recoveree participants all had experience using social media both during active addiction and recovery.

Table 1. D1 Recoveree demographics

<i>Participant ID</i>	<i>Gender</i>	<i>Drug of choice</i>	<i>Sobriety duration</i>	<i>Current residence</i>
D1-R1	F	Opioids	3 months	Sober house
D1-R2	M	Opioids	8 months	Sober house
D1-R3	M	Opioids	4 months	Sober house
D1-R4	M	Alcohol	13 years	Private residence
D1-R5	M	Opioids/Alcohol	7 years	Private residence
D1-R6	F	Meth/Heroin	7 months	Sober house
D1-R7	M	Heroin	2 years	Private residence
D1-R8	M	Heroin	3 months	Sober house

Recruitment for patients began with two participants through an affiliation with a recovery center with which there was an existing research partnership. Through word of mouth and snowball sampling, an additional six patient participants were recruited from two gender-specific sober living facilities in the region. Most participants had resided in a sober living facility for at least the previous two months. Demographics are summarized in Table 1.

In addition, 10 SUD recovery support providers were interviewed. A community safety net approach is taken with respect to SUD recovery. We recruited from a variety of different support/treatment providers. The researchers worked with supervisors and leaders within the organizations to identify the email addresses of the potential participant pools. Recruitment emails were sent out to an initial cohort of individuals. We then used snowball sampling to recruit other participants. Support professional demographics are reported in Table 2.

Table 2. D1 Support professional demographics

<i>Participant ID</i>	<i>Provider type</i>
D1-SP1	Peer recovery coach
D1-SP2	Peer recovery coach
D1-SP3	LCSW*
D1-SP4	Clergy
D1-SP5	Addiction counselor
D1-SP6	Clergy
D1-SP7	Therapist
D1-SP8	LCSW*
D1-SP9	Psychologist
D1-SP10	LCSW*
*LCSW = licensed clinical social worker	

Topics: Interviews were semi-structured, granting the participants the ability to drive the conversation and to broach relevant topics. Each interview began by discussing the participant's background, history of substance abuse, recovery, and relationships with healthcare providers. Additionally, participants were questioned about their experiences transitioning from active addiction into recovery (both online and offline), identifying the role technology plays in establishing new social norms, and emergent social media practices used to circumvent any negative experiences online.

Analysis: Each interview was audio recorded, transcribed, and analyzed. We analyzed each interview using an inductive thematic approach, which is characterized by the generation and constant comparison of open codes in order to reveal underlying themes. We began the analysis by three coders performing line-by-line open coding and memoing on each interview, identifying individual units of meaning within the textual data. The team met twice a week until

all interviews were coded to find consensus and resolve any discrepancies. We then further refined and iterated themes for the final codebook. This analysis informed the interview protocol for dataset D2, and the same codebook was used as a starting point for the D2 codebook.

Some of these codes were used to inspire the structure of this dissertation: the opportunities, challenges, and strategies. Not all of the codes were used in this dissertation, but it was through the analysis process that I was steeped in the interview results and was able to draw on them to illustrate points throughout. The codebook was used for both D1 and D2 studies.

1.2.2 Recovery & social media: Interviews with support professionals (D2)

Data source 2 (D2) is an interview study with support professionals who were involved with various stages of recovery. This study was inspired by responses from data source 1. In these interviews, I focused on exploring more deeply the role of social media in recovery generally, and the recoveree-support professional relationship specifically. I designed the study and conducted the interviews. I coded about half the interviews and led two other Parkview Health researchers who coded others. I also did most of the analysis on my own after the initial coding.

Procedure: Participants were recruited through direct email. The project coordinator reached out to individuals who met inclusion criteria: over the age of 18, worked for one of three partner organizations, and provided direct support to clients who are struggling with or in recovery from substance use disorder. The partner organizations work together to provide recovery support in Fort Wayne, Indiana: a health system, social services, and an outreach team that is a collaborative project between the health system, social services, and the local police department.

Table 3. D2 Support professional demographics

<i>Participant ID</i>	<i>Provider type</i>
D2-SP1	Peer recovery coach
D2-SP2	LCSW*
D2-SP3	Law enforcement
D2-SP4	LCSW*
D2-SP5	Law enforcement
D2-SP6	Peer recovery coach
D2-SP7	Peer recovery coach
D2-SP8	Peer recovery coach
D2-SP9	Peer recovery coach
D2-SP10	Peer recovery coach
D2-SP11	Peer recovery coach
*LCSW = licensed clinical social worker	

Participants took part in a video or phone interview lasting between 45 and 70 minutes. Participants were not compensated for their participation, as it was deemed by Parkview Health to be part of their workplace activity. Interview questions were semi-structured in nature. The research was determined to be exempt by the Parkview Health Institutional Review Board on January 12, 2021 and the University of Michigan Institutional Review Board on February 25, 2021.

Participants: All participants are employees of one of three interconnected organizations that work together to provide support for individuals seeking help recovering from SUD. We conducted 11 in-depth interviews with participants in February and March 2021. Two male participants were representatives from the Hope And Recovery Team (HART), two female representatives were from Lutheran Social Services of Indiana, and seven female representatives

were Coaches. Any further descriptive aspects of their identity would unmask them and thus are not reported. Table 3 summarizes the participants. Below, we describe the three teams in more detail.

HART: The Hope and Recovery Team (HART) is a peer support team made up of representatives of the local police department and peer recovery coaches. The goal of HART is to connect with individuals who have recently survived a drug overdose. The team has access to some records of reported overdoses, contingent on HIPAA restrictions. Within 72 hours of a reported overdose, the team will attempt to make contact with the person by visiting their home, where they briefly offer information about recovery services available in the area, in some cases give out naran, and offer instrumental support to the individual such as help signing up for insurance or providing rides to treatment centers or job interviews. If they are asked to stay, these visits can last for some time; otherwise, the interaction is very brief, less than five minutes. In the first month of operation, the team reached 39 people, five of whom entered treatment (13%). Within the first three months, the rate of contacted people entering treatment had risen to 47%.

In addition to individual targeted visits, HINT does general outreach, posting flyers and business cards in police stations and hotels where at-risk people often stay. These flyers include a telephone number to a voicemail that interested individuals can call to ask for information or support. The HINT team monitors this voicemail and returns calls.

Parkview Peer Recovery Coaches: Parkview Health has an established peer recovery coach program. Peer recovery coaches (PRCs) are embedded in the Behavioral Health branch of this healthcare system. PRCs, while similar to other nonclinical supports (e.g., AA sponsors, financial navigators), walk alongside the client in recovery while taking a recovery oriented, chronic care approach to the support they provide. These coaches often have lived experience

with SUD themselves; however, this is not a requirement. PRCs are certified professionals - certification includes defined hours of training and a bi-annual recertification with the state.

The coaches' specific duties vary slightly, as they work in different parts of the Parkview health system: most are embedded in the hospitals' emergency rooms, but peers also work at the hospital's medication-assisted treatment (MAT) center, work with HART outreach, or work specifically with expectant mothers in the health system who are struggling with substance use. Across all postings, however, the general goal of the peers is the same: to serve as a mentor, connector, and liaison for individuals during their recovery journey. A peer coach's first step in establishing a relationship with a client often involves visiting them in an ER before they have entered treatment. This initial approach is similar to HART's outreach: the peer provides informational and emotional support, and invites the individual to join the peer recovery program. If the individual agrees, the peer coach sets up a time to meet with their new client and helps the client establish a wellness plan.

The peer coach's role is to advocate for safe recovery without being prescriptive, following their clients' lead during their unique recovery journey. This often involves checking in and meeting with their clients to offer support; connecting clients to resources and social services that can provide instrumental support such as recovery services, housing assistance, or food banks; and helping clients access formal and informal recovery support communities. Outside of pandemic times, this is usually done through a mix of phone calls and in-person meetings, and in some cases text messaging. Some peer coaches are provided with work cell phones; most only have an office landline.

Lutheran Social Services of Indiana: LSSI provides a range of faith-based social services for residents of the Fort Wayne area, including recovery care. Their Recovery Care program is intended for individuals who have already completed initial treatment, and helps them integrate recovery into their everyday lives. Though the program does offer some therapeutic services through Recovery Care's umbrella program, a mental health initiative called Balance Works, the program is intended to be used as support for an individual's existing SUD treatment, not as primary treatment. They also provide support for families affected by SUD.

LSSI staff are licensed social workers. They provide a range of types of social support, with an emphasis on instrumental support: employment services, financial stability services, etc. They can also act as advocates to help clients navigate the courts, child welfare, and other government institutions. This is one of the major differences between Recovery Care and PRCs: as social workers, Recovery Care staff provide more direct instrumental support, while PRCs act as connectors and mentors. Like PRCs, staff meet with clients and provide resource referrals and other informational support. They also provide behavioral services, including a type of therapy called Eye Movement Desensitization and Reprocessing (EMDR), developed to treat post-traumatic stress disorder. Before COVID-19, these services were delivered with a mix of phone calls and in-person visits, both in the office and in clients' homes. An in-person support group for families affected by SUD was started shortly before COVID-19, to be replaced by a phone hotline once in-person visits were not possible.

Topics: The interviews focused on the threats and opportunities posed by technology in the SUD recovery process, including questions about how COVID had affected care. We report those results related to how these organizations adapted to COVID disruptions.

Analysis: Three coders conducted an inductive thematic analysis on the written interview transcripts. The coders each reviewed all of the transcripts to identify concepts related to COVID and the use of telemedicine technologies, using the codebook generated for D1. The coders met twice a week to review the codes applied and discuss any discrepancies. This iterative process refined and finalized the codebook in addition to ensuring that consensus was met for all codes applied. Data was coded using individual Microsoft Excel notebooks that were then combined into the finalized document each meeting. A few themes were added based on this new data, and so we iterated through the D1 interview data again to code for these additional themes. This resulted in the final codebook with combined interview data.

1.2.3 Parkview peer mobile application (PMA): UX study with providers & recoverees (D3)

The Parkview peer mobile application study (D3) was a user experience (UX) study reporting on the user-centered design of a custom mobile app for Parkview Health peer recovery coaches. The intent of the app is to streamline communication between peer coaches and recoverees. Of all the data sources I plan to use in this dissertation, this is the one of which I have the least ownership. I was present for the interviews, but did not conduct them and was not involved in the development of the protocol or prototype. A paper has been published from this research project, of which I was the second author [184]. It included results from both the focus groups and the UX study. The analyzed results in this study are not used directly, but these results informed my understanding of the design landscape and inspired some parts of this dissertation, particularly in the professional support and resource access chapters. This dataset is not a foundational part of either chapter; I instead returned to the raw interview data to select a few quotes that can extend and deepen the discussion. This dataset is useful for providing context

for how the Parkview peer coaches do their work, and it provides a point of comparison to assess how well the existing commercial apps serve the needs of peer coaches.

Procedure: Each 1:1 usability session was conducted by one facilitator trained in user experience research and one to two note takers in a standard office room (I was a note-taker). The usability session tested an app prototype developed with Adobe XD and deployed on a mid-range Android smartphone (Samsung J3). Sessions were audio- and video-recorded (hand interactions with screen only).

Participants: We recruited five peer recoveree coaches and five recoverees to test PMA prototypes (one for coach participants, one for recoveree participants). Fifteen coaches were informed of this project through their manager and five voluntarily accepted to complete the usability session. Among participants in recovery, we recruited three referred by coaches and enrolled in the programs managed by the Parkview healthcare system, and two from a convenience sample who were not part of any recovery program. We did not exclude any participant based on their stage of recovery because of challenges in recruiting people in early stages of SUD recovery. Participants were given a \$20 gift card for their participation in the study.

Topics: While thinking aloud, participants were first instructed to explore the prototype, then performed a series of specific tasks testing PMA's features on the smartphone. After each task, participants were asked follow-up questions on what they had just done. The session ended with the administration of the System Usability Scale (SUS), an oral assessment of their familiarity with technology, a semi-structured interview about how PMA could benefit their workflow (coaches) or their recovery (recoverees), and a basic demographics questionnaire.

Analysis: The analysis was not directly used in this dissertation so I do not report analysis methods here. The analysis served as general inspiration for the other research presented here, which is what I used to develop themes. I returned to the dataset to pull some quotes from the interviews that fit the themes already identified.

1.2.4 Design space analysis of commercially available recovery apps (D4)

Procedure: An initial list of commercially available apps for SUD recovery was compiled through two primary methods: web search and searches of the Google and Apple app stores. Web searches of “apps for addiction recovery” produced 27 lists of apps and identified a total of 82 apps. Additional searches on the app stores for “addiction” and “drug recovery” produced 91 additional apps, bringing the initial total to 173 apps to review.

The app store listings were reviewed for each one of these 173 apps. Apps were excluded if they met any of the following criteria: 1) no longer available to be downloaded, 2) less than 1,000 downloads, 3) had not been updated for more than 18 months, or 4) were predatory or extremely low-quality. Some inclusion exceptions were made for small apps that were very new or had novel design. These exclusion rules removed apps that were close duplicates of apps with features that were already well represented in the included list; e.g., there were dozens of simple timers branded as sobriety trackers. After screening for exclusion criteria, the final list totaled 55 apps to analyze.

For each of these, the app was downloaded onto an Android or Apple mobile device and their features were recorded. For apps behind a paywall of some kind (usually clinical telehealth apps), the app features were recorded using the product descriptions and/or website. Additionally, information was recorded about the publisher, cost, downloads, reviews, and date last updated.

Table 4. D4 Recovery app categories

App categories
Integrated (full-featured)
Support network: peer
Support network: coach
Clinical platform
Relapse prevention
Therapy/mindfulness
Sobriety timer
Personal informatics
Meeting finder
Static resources

Once a full feature list was created, the 27 identified features were consolidated into a taxonomy and each app was assigned at least one of 10 categories. Table 4 shows these 10 categories.

A qualitative analysis of the content of user reviews for these apps was also conducted. The star rating and content of a sample of users reviews for apps belonging to each category was collected in a Microsoft Excel spreadsheet. User names were not collected for privacy reasons. User reviews were collected until saturation was reached, approximately three apps per category with 27 to 75 reviews per app, totaling 480 reviews. These reviews were then coded according to opportunities and challenges of the relevant technical capabilities and features. This coding was performed after the opportunities and challenges reported in the Self-guided activities chapter had already been identified; no new opportunities or challenges were identified.

1.3 Dissertation structure

Each chapter in the body of the dissertation corresponds to an important component of SUD recovery: social networks, professional support, resource access, and self-guided activities. Each chapter discusses how technology interacts with the corresponding component, both positively and negatively, and concludes with strategies for how to maximize the advantages and

minimize the dangers of technology in that category. Each of the chapters draws on all four of my data sources to varying degrees.

Each chapter uses the following structure. The **Introduction** provides some context and background to help situate the reader. The remainder of the chapter is split into sections, **Technical capabilities & features (TCF)**. Under each TCF, there are subsections labeled O.x, which denotes an **Opportunity** of that feature, and C.x, which denotes a **Challenge** of that feature. Following these sections, there is a section discussing the different **Strategies** that can be deployed by recoverees, supporters, and technology providers, and researchers to navigate the balance between opportunities and challenges.

Put together, the intent of this dissertation is to provide a comprehensive overview of technology in SUD recovery that answers the following research questions:

- **R1.** How does technology affect SUD recovery? What are the opportunities and challenges presented by the use of technology in recovery?
- **R2.** How can recoverees, support professionals, and researchers exploit the advantages and mitigate the dangers involved with bringing technology into recovery?

Chapter 2 Social Networks

2.1 Introduction

Social support is a critical part of recovery [122,186]. People with substance use disorders (SUD) often have smaller support networks than those without [186], and a major part of many recovery journeys is establishing a healthy social network of support professionals, peers in recovery, and other healthy supports. This process takes place in twelve-step group meetings, recovery homes, and increasingly, in online social spaces as well. Research has shown that continued engagement with online recovery networks is a core element of sustainable recovery [35].

Recoverees have access to a range of online social spaces. Some are recovery-specific, such as in the social features on commercially available recovery apps such as I Am Sober, or SoberGrid, which bills itself as the largest sober social network in the world. Recoverees are also on mainstream platforms such as Facebook, where they will often have a mix of connections with people in recovery and not. As our social lives are increasingly mediated through digital spaces, it has become important to address the question of how social technologies such as social media networks and mobile phones play a role in advancing and inhibiting recovery goals. Most people in recovery use social media [67], and previous research investigating other types of major life transitions point to social technologies playing an important role in navigating various life transitions [106,153,166]. Previous work has argued that social media platforms can provide a “forum for patients and caregivers to learn effective coping strategies and seek both emotional and practical support” [72]. Even when the risk of returning to substance use is high,

encouraging online recovery methods for individuals in early recovery may still be one of the best support recovery efforts [101].

In this chapter, I discuss the opportunities and challenges associated with different features of online social networks, and how recoverees navigate these spaces. I call this process digital social re-shaping, utilizing digital social spaces such as social media and reconstructing networks after starting recovery. In the case of SUD recovery, this involves exploring opportunities that help in their recovery journey (e.g. accessing a broader range of social support) while protecting themselves against threats to their recovery (e.g. easy access to communication channels that facilitate access to drugs). Many of these tasks echo the work that recoverees are doing in their offline environments, though unlike in offline recovery tasks, recoverees navigate digital social reshaping largely unguided. The results in this chapter are based primarily on interviews with support professionals and recoverees (Data sources D1 & D2) and are supported by an analysis of commercially available SUD recovery apps (Data source D4). I also discuss the strategies that recoverees and support professionals might use to navigate the process of maximizing the opportunities and minimizing the challenges.

2.2 Digital social re-shaping

This chapter introduces the term digital social reshaping for SUD recovery. For our purposes, we define digital social reshaping as an individual's process of re-establishing a connection to digital spaces and transforming their digital environment to something sustainable for their recovery from SUD.

Digital social reshaping reflects and extends a similar process occurring offline as the recoveree completes treatment and transitions back into their everyday environment while facing the challenge of maintaining their recovery. In recovery, this is often referred to as changing

your “people, places, and things,” a phrase from Alcoholics Anonymous that refers to the triggers in one's life that threaten recovery [197]. As life is increasingly lived online, it has become more important in recovery to change not only in one's physical environment, but one's digital environment as well. For the same reason, simply remaining offline indefinitely is not a feasible option for the majority of people in recovery. As will be discussed later in the chapter, online spaces and especially social media are important channels – sometimes the only channel – to communicate with loved ones, access family photos, and keep up with recovery news.

While this is a process that is well-studied for recoverees in the physical world (i.e. how to change one's physical environment to be supportive of recovery), little attention has been given to the digital aspects of reshaping with no attempt to conceive a conceptual framework to understand the process. A recent developmental psychology paper by Weinstein et al. is a rare example of studying what happens in digital social spaces after a period of institutionalization, in this context adolescents hospitalized for suicidal behaviors [235]. They used the term “digital re-entry” to refer to a subset of questions for patients about their attitudes toward reconnecting with their social media once they were released from the hospital, but this is not the main focus of their study and they only use the term a few times. However, their results are relevant in that they indicate that clinicians should weigh the positive and negative aspects of social technologies for individuals before recommending digital re-entry to not make this an additional stressor. They point to the need to develop innovative approaches to digital re-entry and reshaping.

There are two primary channels of digital social reshaping: phone service and internet access. Most people, including recoverees, get both of these through a smartphone [154]. In addition, internet access usually comes first: a smartphone that is not “turned on” (has phone service) and only has wifi access. Once a recoveree establishes internet access, they must wrestle

with which digital spaces to enter, and when. This could involve any number of digital spaces: mainstream social media (Facebook, Snapchat, TikTok, etc.), web forums (In the Rooms, Reddit, etc.), telehealth platforms, apps for recovery (many of which include dedicated social networks), and other communication platforms (Zoom, Whatsapp, Clubhouse, etc.). In practice, mainstream social media are likely to present the most significant and complex challenges in digital social reshaping, because social media is the most common space for social interaction online, and therefore the space with the greatest potential need to change people, places and things. The degree to which that change can/should occur depends entirely on the individual, and this tailored approach to recovery is at the core of the support professionals' philosophy of care: there is no one “best” way to do recovery, and professionals emphasized this repeatedly in interviews. After recoverees re-enter digital spaces, they must decide who to distance themselves from, how to build a supportive community, and how to navigate triggering content. As one support professional pointed out, the issues that arise in digital social reshaping are not novel, but are an *“extension of a lot of the social life questions people have been bringing about recovery long before social media”* (D1-SP10).

This point that digital social reshaping involves the same issues that have existed for offline social reshaping before social media is important, and leads to a surprising observation: given the similarities between physical and digital re-entry, one would expect that support professionals would discuss digital social reshaping with their clients just as they do with offline social reshaping. However, most professionals in our interviews said they did not discuss digital social reshaping with their clients, despite saying at other times that they believed it was important. Most of the recoverees said they navigated the process on their own even when they were well supported through the process of physical re-entry.

This chapter discusses how social networks online can influence recovery, both in positive and negative ways. This chapter is arranged into sections. The top levels refer to the technical capability or feature under discussion. Under each of these are sections labeled O.x, referring to opportunities, and C.x, or challenges. The chapter concludes with a section on strategies (S.x) that help maximize opportunities and minimize challenges.

2.3 Direct messaging

Direct messages afford a private means of communication between sender and receiver or within a small group on social networks. Examples include Facebook Messenger, direct messages on Instagram, video or text chats on Snapchat, etc. Some recovery-specific apps also have social networks with direct messaging features.

2.3.1 O.1: Communication with supportive contacts

Summary: Direct messaging on social media is often the most convenient means for recoverees to communicate with peers and sponsors in recovery.

One common reason recoverees re-entered digital spaces was to connect with people they had met in person in recovery groups, including their sponsors. Many of their peers did not have phone service and instead turned to social media messaging services as their main channel of communication, which was a powerful incentive for recoverees to get back on their social media accounts.

Three recoverees said they used social media messaging to talk to their sponsors, using it as much as multiple times a day to connect, like D1-R3: *“I talk to my sponsor a lot through Facebook Messenger... and a lot of times I'll Snapchat with my sponsor and that way we have the face to face thing. It's a little bit better than doing it over the phone or just messaging through*

Messenger.” This informal method of communication reflects the unique role that sponsors can play in recovery. In contrast, the support professionals we interviewed were strongly against using social media to connect with their clients and considered it to be a violation of professional boundaries. In most cases, they were required to abide by HIPAA, which rules out social media messaging services. As will be discussed in a later section, this may play a part in why recoverees seemed to talk about digital social reshaping more often with their peers and sponsors, compared to support professionals: they are already in those digital spaces together.

2.3.2 C.1: Exposure to deleterious contacts

Summary: Social media leaves recoverees exposed to communication from people who can hurt their recovery.

For recoverees, engaging with digital social spaces after starting recovery means opening themselves to unwelcome contact from others, which usually occurs through direct messages. Participants spoke of two primary groups that might be bad influences for recoverees: first, old contacts who did not respect the recoveree's new boundaries, and second, new contacts from recovery communities who may not be a positive influence. Recovery is not a linear path, and someone who is currently in recovery may not stay in recovery; participants emphasized that though recovery communities were overall positive spaces, they still posed some risks.

There are a number of ways recoverees can protect themselves from these messages, but at least among our participants, most had to deal with some level of unwanted contact. Therefore, recoverees had work to do in establishing and maintaining boundaries.

Five recoverees spoke of having to enforce boundaries with people who used digital spaces as a route to violate their boundaries or even evade a block, like D1-R3, who said having accounts on a lot of social media platforms made it too easy for people to continue attempting

contact: *“I just had to start blocking people. They would make one account and then they would switch to another because there's so many avenues of social media they can come from and that's why I focused my attention just on Facebook and Snapchat because it limits the way people can contact me.”*

D1-R4 spoke of a specific instance where an ex-romantic partner triggered them with unwanted contact after being blocked: *“My ex called me like 3 or 4 weeks ago, because I had blocked everyone's number - well apparently she got a new number and she called me. She didn't know I was sober and it was triggering, it was disturbing to hear in her voice that she was still getting high”* (D1-R4).

According to interviewees, these explicit boundary violations mostly came from former romantic partners. However, one support professional had a client who was contacted by an old dealer on her new Facebook account even though they were not friends, and the client did not know how she was found (D1-SP10). This could be an inherent risk to deciding to re-enter social media: *“There's 6 degrees of separation, so even if I unfriend or disconnect from an individual who could either be triggering or someone who I have a past with within my substance use world that doesn't mean I'm necessarily totally sheltered from their life”* (D1-SP10). Even after attempting to disconnect, a platform might inadvertently resurface the connection through friend suggestions, other users' content, etc.

The second group that may need work to maintain boundaries, is new connections found in recovery communities. Some members might threaten one's own recovery; for example, “thirteenth steppers” in AA groups, slang for people (usually men) who target new, vulnerable members for sex [37]. Even when behavior is not explicitly predatory, relapse during recovery is common, and one relapse can increase the risk of relapse in others [46,208]. Participants in our

interviews said this was true for both in-person and digital recovery communities: “*Now we have so many vulnerable, lonely people. It's encouraged to give up people, places and things. And usually that's their whole life. So when they come into recovery, [...] they're very lonely and just could be easy prey*” (D2-SP6). However, they tended to agree that the risk was amplified online:

“When fresh in recovery I don't think you should be using social media to find new friendships or whatever. I think it should be done inside the recovery walls, or at meetings. When you've got a couple of months into it and you're capable of saying no. Not everyone you meet online is genuine.” (D1-R6)

While these participants spoke of the risks as coming from disingenuous people, others spoke of the risks inherent in building these relationships. A friend in recovery might relapse, which could be destabilizing, and friends in recovery might be more likely to have access to substances and be able to facilitate a relapse. Direct messages tend to be particularly dangerous as a destabilizing force because the private nature of direct messages invites the sender to express intimate, secret, or illegal information to the recoveree that could be triggering.

2.3.3 C.2: Facilitate relapse

Summary: Social media shortens the distance between triggers and relapse because recoverees can be triggered and then easily access substances on the same platform.

Digital social spaces can easily be used to facilitate access to illicit substances; both recoverees and support professionals said this was common practice, especially with Facebook Messenger, an assertion backed up by research [74,167,242]. In a recent study within the US and Spain, 77% of people surveyed affirmed using social media to find drugs and illicit substances [179].

The platforms were perceived as being convenient for this purpose because it was a reliable way to connect with people using a service that was harder for law enforcement to access (D2-SP3, D2-SP5). Consequently, many recoverees described their social media use as being closely linked with their substance use:

“I probably looked for drugs every single day on social media. That was a way to get ahold of people to buy or sell drugs. Or to sell items that we had. And that's probably the only way that I did use it because I was high then so I didn't care.” (D1-R7)

“A lot of times it would just be sending a message through Messenger, like 'Hey I'm coming over' or 'Do you have anything?' [...] A lot of people, we used the call option on Messenger [...] because they don't want to exchange phone numbers. Keep it a little more private.” (D1-R3)

Recoverees remained aware of how close they were to substance access online even after entering recovery. Especially in early recovery, this could be dangerous. D1-R2 said they blocked a lot of people when they were in early recovery to protect themselves, because *“I thought a lot about just cutting my ankle bracelet off and [...] just going and getting high and saying screw this. I had to do things to prevent myself from doing that”* (D1-R2). For at least one recoveree interviewed, social media did cause a relapse, in the form of an unwanted message coming at the wrong moment.

“I was trying to get clean and I'm like a few days into recovery withdrawing and then somebody messages me... this just recently happened last year. And somebody messaged me and that was really all it took. I was - I didn't want to feel that pain anymore so I just

went ahead and met up with them. So I would say yeah in that instance with myself like I definitely took to social media and relapsed even though I wanted to be clean.” (D1-R8)

Support professionals said this was a risk that worried them with their clients, and one of the reasons why they recommended clients disconnect from people in active use:

“It was a conversation we constantly were having. Like, how is this jeopardizing your recovery? You don't want to use today, but what's to say tomorrow something bad happens and you see them snorting a line, what are you gonna do? You know you have easy access when they're your friends still. What benefit does it have to you to keep their phone number in your phone?” (D2-SP2)

Though recoverees said the temptation faded over time as they entered long-term recovery, they were also aware of how easy it could be if they chose to, like D1-R5: *“If I wanted to with social media and technology, I haven't bought sh*t in so long and I've lost contact with everybody. I know I could find stuff if I really tried.”* This awareness – knowing that a drug of choice is likely within reach if they were to go looking – is an inherent risk of digital social spaces that can never be entirely eliminated.

2.4 New profile & posts

Personal profiles and posts encompass the content that recoverees curate to form their online identity. This might include their profile picture, bio, photo feed, stories, shared news articles, etc. In this section, I refer only to new content that the recoveree generates; past content is discussed in the next section, Personal archives.

2.4.1 O.2: Find recovery friends in existing network

Summary: By posting about recovery, recoverees can extend their recovery support network by discovering members of their existing network who are involved in recovery themselves.

When asked about the positive side of social media for them, several recoverees talked about how they connected with people in their network – friends, or friends-of-friends – because of recovery. They tend to discover these connections after posting about recovery: *“When I hit my sixth month I put on Facebook basically thanking God, saying how thankful I am that I came this far in my recovery and some lady who's in counseling reached out to me and we talk on a weekly basis now”* (D1-R6). D1-R3 met an entire group of friends this way:

“It's like a domino effect, once you get a support group around you and people start to see you're in recovery, the group just grows... I have a pretty big group of friends that are in recovery and we all kind of inspire each other [...] A lot of them are just friends of friends [...] we'll see that we're both in recovery. There will be posts or inspirational memes on their page about recovery and we'll request each other and start chatting about it or whatever.” (D1-R3)

These online interactions can build on each other to create the domino effect D1-R3 described. Offline recovery supports help recoverees find online recovery groups (discussed in the next section), and then in turn the groups can be a space in which recoverees can deepen their offline connections. By sharing memes and other content from their recovery groups onto their personal pages, recoverees invited conversation with others in their network interested in recovery.

2.4.2 O.3: Present & reify new identity

Summary: Recoverees can use social media to explore their new identity as a person in recovery and reify that new identity by reworking their personal profiles and getting feedback from their social network.

A few recoverees said that they chose to go back into digital social spaces because they wanted to show their networks that they had made a change in their identity as a person in recovery. D1-R8 was one such person, who said that they went back online because *“I wanted people to know that I am still alive. I’m still here, I’m still fighting. And I wanted people that I’m closest to that I’m healthy and... yeah. I’m not dead. I’m not on drugs anymore”* (D1-R8).

Recoverees said they found it gratifying to post about their “new selves” and get affirming feedback from their network:

“I have had several people [...] message me through Facebook or Snapchat telling me that the change they see in me is great. One of my really good friends that I used to go be out there going crazy with is actually in recovery now and they said that a large part of it was that they saw me doing so good and they wanted to change their life too and I inspired them through my Facebook posts and my Snapchat posts.” (D1-R2)

For some, advocacy grew into part of their identity. Several support professionals said they knew peer coaches or other professionals who were very public about presenting their sober identity online for this exact reason, to inspire others and act as a resource.

The way recoverees spoke of their experiences presenting their new identity echoes a model of recovery called the social identity model of recovery (SIMOR), which posits that recovery from SUD is best understood as an identity transition, one that is socially negotiated and occurs largely through changes in one’s social network [30]. (Earlier models of recovery

have also argued that identity change is a core aspect of recovery, as early as 1986 [30,33], but frame the transition in derogatory moral terms as a change from a spoiled “addict” identity to unspoiled identity.) SIMOR can be used to understand how peer support groups such as AA can be effective, as they provide recoverees with a pathway to create a new social network with people who do not use substances. This model of recovery implies that social networking sites might be of core importance to one’s identity transition in recovery, a space in which recoverees can explicitly reconstruct their social networks, which supports creating their new identity.

Further, previous research in other contexts has shown that social media is used as a space to navigate identity shifts during major life transitions, including gender transitions [104], going to college/university [70,166], career changes [36,48], transitioning out of the military [76,203], and health changes [14,152]. This research has found that online social networks are not only an important source of social support for people undergoing life transitions, but a space where they can explore their changing identities. Disclosing stigmatized life events can be particularly difficult [14], but socially sharing despite the stigma can be very important to processing emotions, getting needed support [191], and social reintegration [84].

There is some indication that people on a SUD recovery journey might get similar benefits. An individual in recovery undergoes major changes in their individual and social identities [45,157,190]. Therefore, it may be useful to examine how people negotiate their changing identities on social media during other kinds of life transitions.

Previously, Haimson has used the liminality framework by ethnographer Arnold van Gennep to analyze how people document their gender transitions on social media, and argues that reconstructing one’s online identity during life transitions is a rite of passage [104]. van Gennep’s liminality framework describes three stages in which an individual separates from an

old identity, enters a transitional period, and incorporates back into the social world after transition [95]. In the context of gender transitions, Haimson found that people use different social media spaces to work through their transition, going to Tumblr to do transition work and then going to Facebook to announce their coming out when they are ready [104]. As described by our interview participants, SUD recoverees appear to follow a similar arc: entering transitional spaces to find community with others undergoing the same transition into a recovery identity (in-person groups, recovery homes, private online groups), and then re-emerging into previous social media spaces when ready to be more public about their identity.

2.4.3 C.3: Dissonance with presented identity

Summary: A recoveree's identity is in flux, and overly curating an online identity may cause dissonance for recoverees, especially when they are struggling.

Support professionals said they saw an opportunity in using social media as a platform to mindfully construct this new identity, but were cautious in endorsing this idea because of the potential risks and pitfalls they saw.

"I would want to make sure that the individual, when you're curating who you are.... Is it a true [you]? Does it feel true to you? [...] I think I hesitate, because I wouldn't want to set up failure. And I worry that if I appeared a certain way on my profile and I grab my phone and I wasn't that person, it could cause some disassociation and some more identity problems. But I think it could be awesome, but I think it would have to just make sure that it didn't perpetuate a negative thought process for that person." (D2-SP4)

This point of how to approach presenting one's new identity garnered the most variation in responses from participants, both from recoverees and support professionals. Some recoverees liked holding onto their old profiles and changing the content to reflect their new selves, while

others wanted to throw it away. Some professionals liked the idea of using social media profiles as a platform for exploring one's new identity, while others were concerned about the risk of dissonance for individuals whose identities are in a state of flux.

2.5 Personal archives

Recoverees' personal archives – that is, photos, posts, and other content from their feeds – can be emotionally fraught for recoverees. These archives may contain good memories and family photos that are stored nowhere else, making them very valuable; but they can also serve as records of the recoverees' time in active use, which can be a source of shame/regret or make the recoveree nostalgic for good times during active use.

2.5.1 O.4: Progress indicator

Summary: Personal archives of photos and posts can serve as motivating reminders of recoverees' progress.

Some recoverees said they used their Facebook profile as a progress tracker, looking back at past posts and history to see how far they have come. D2-SP10 said that they liked this method over other options that would involve erasing these memories. Rather than erasing, they suggested that being able to observe one's own progression from active use to recovery could be a motivation:

“It's not like you hit a certain point and you no longer have to think about it [SUD]. So I'm not saying keep your profile picture as a picture where you can tell that you were so high that your eyes are barely opening. [...] I do think it's good to show the progression, but I don't think that you have to act as though you've never had that. I think you'd almost benefit from the fact that you overcame that because you may need that daily reminder,

like this may be a really hard day, maybe you want to go back [...] But also, let's still remember that this is who we were so that we don't end up back there and that we know that we can continue to grow.” (D2-SP10)

One user review of a recovery app mentioned doing this exact thing: they uploaded a photo of themselves during active use in the “motivation” section of the app. *“I always forget why staying sober is worth it... Seeing that terrifying photo is enough to remember the urgency of maintaining healthy habits and routines to stay sober”* (I Am Sober user review).

2.5.2 C.4: Triggering content

Summary: Personal archives of photos and posts can be a dangerous source of shame and triggering memories.

Confronting one's past can be extremely painful for recoverees, as D1-SP10 said, *“There is usually a good bit of grief and loss that comes out for people because they are starting to go through life without being under the influence of anything. Oftentimes this period is where it really hits them, the damage that has been done.”* This can lead to what D1-SP10 called an “emotional cost-benefit analysis” where the recoveree questions if it is worth maintaining their sobriety. Again, this is not unique to digital social reshaping, but rather is a process that occurs both offline and online.

Digital traces that might look innocuous to outsiders can hold negative or triggering memories for recoverees. Recoverees provided several examples of content in their personal archives that reminded them of their time during active use. *“I was always taking pictures. It was my main form of communicating with people in addiction... Even looking at the pictures that I posted from then I can just look at me and see that I was obviously doing something. Pictures are*

totally different” (D1-R8). Another recoveree said they would use social media posts to hide their use:

“I was pretending to be someone that I wasn't [...] 'Oh, I'm sitting here cooking,' but actually I'm cooking dope. This and that, just lying just to make someone else think that my life is different than what it is. [...] I felt like people were talking about that I was using and I needed to convince them otherwise.” (D1-R1)

In these cases, both recoverees had been in recovery for some time and did not consider their personal archives to be seriously threatening to their recovery, but they illustrate the risk that recoverees take on when they return to old accounts that may have negative memories in them, especially if the recoveree is confronted with them unexpectedly or in a time when they are feeling unstable.

Complicating the process of life transitions are the social media platforms themselves, which research has also found can hinder life transitions by preserving digital footprints that an individual may wish to discard: photos, old friend networks, etc. This research found that erasing these digital footprints can be a difficult process that is not well facilitated by social media platforms [105].

2.6 Others' profiles & posts

Others' profiles and posts refer to the ability to friend/follow other people online and see the content they post.

2.6.1 O.5: Deepen offline recovery relationships

Summary: Recoverees can make new friendships with other recoverees “Facebook official” to deepen and extend their recovery network.

For many of the recoverees interviewed, the desire to strengthen in-person relationships was often the reason why recoverees took their first steps back into digital spaces. At least one support professional said they preferred this method of reinforcing connections: *“It seems that the best outcomes with social media are people that go to meetings, establish relationships in the meeting and then make that their circle through social media. Not social media first, but the physical connection first”* (D2-SP6). As with all recommendations, professionals emphasized this was only a general maxim that may not fit for all; some recoverees might be more open to support from online communities over in-person options. One caveat of making connections in early recovery is that caution is necessary. D1-R1 said that they are given the same advice for people they meet for in-person recovery events, too; online spaces just amplify the need for caution.

2.6.2 O.6: Connect with supportive family and friends

Summary: Social technologies are also important for engaging supporters who are not part of recovery communities.

In addition to building an online recovery community, recoverees used social technologies to connect with supportive family and friends outside of recovery. Several recoverees said that keeping in contact with family was one of their main reasons for getting back online, especially for recoverees who had family out of state and wanted to keep up with major life events. They said that social media was their only point of contact with some of their extended family members, and without their Facebook account they would have lost touch with them (D1-R1, D1-R2). Being able to return to these social networks was a meaningful marker of a return to normalcy for some recoverees: they could engage with old friends about hobbies that

had nothing to do with substances. One example of this is D1-R3, who gave this explanation when asked why they rejoined social media:

“I do have some good friends out there that live a positive life. A lot of buddies, we do the hunting and fishing and going to races [...] As far as family goes, just pictures of nieces, nephews [...] reconnecting with my family that I don’t get to talk to that much. It’s a lot easier to talk to them through social media. And my pictures of my kids when they were younger, a lot of it is all on social media.” (D1-R3)

Here, being able to return to social media to keep up with friends and family who lead a “positive life” was an important indicator of recovery for them.

2.6.3 C.5: Triggering posts

Summary: Social media is full of triggering content, or “wisps of triggers,” that cannot be entirely avoided.

Recoverees must also learn to manage triggering content that they come across in digital social spaces. Content that recoverees considered to be triggering included people posting saying they were high or wanted to get high; pictures of drug paraphernalia or alcohol; and discussions of legal marijuana trade. Though most recoverees said that triggering content was a fairly minor concern for them on social media, they also said these triggers may be a more significant concern for people who are early in their recovery. Previous research agrees with this, finding that social media provides a platform for triggers related to old influences and can create emotional distress for a person unstable in their recovery [56].

As with triggers encountered in offline spaces, the goal is to manage exposure to triggering content, because eliminating it entirely is not feasible. Though one might think that digital spaces can be more easily curated than the offline world, in reality participants still had

trouble with things leaking through. Thus, the approach to dealing with online triggers is the same as offline: *“Most people have to return to some level to the same environment. So I feel like that can shoot clients in the foot later on if they haven't learned to reintegrate like coping with triggers rather than avoiding them totally”* (D1-SP10).

Triggers in the content in recoverees' newsfeed appeared to be something that recoverees found difficult to eliminate entirely. Even after reworking their social media environment, D1-R3 said that in their social media, *“there's the [recovery] groups here and there and inspirational memes and things like that but you see a lot more drug-related things on social media than you do recovery”* (D1-R3). This is in line with other research. One survey of recoverees in an intensive outpatient program (N=259) found that about half of their respondents (47.4%) said that social media content had triggered drug cravings [20]. In another survey of people in active recovery, twice as many respondents had observed drug cues (Millennials: 67.5%, Generation Zs: 71.7%) than recovery information (Millennials: 30.6%, Generation Zs: 34.0%) on social media [67].

The challenge in controlling exposure to this triggering content was that it could come from sources one would consider to be “recovery safe,” such as news stories about drug busts and posts from anti-drug organizations. Images of people in bars or with alcohol can also be triggering, as D1-R6 described: *“I like to stay connected with what's going on and whatnot but I guess it was challenging because I'm young and people are supposed to be able to go out and drink and have a good time when I'm over here and I'm an addict”* (D1-R6).

Most recoverees said they were no longer triggered by content on their feeds, but had examples of negative content that still bothered them (D1-R3) or *“got into my thoughts”* (D1-R6). This is what one professional called “wisps of triggers”: *“I don't think we always realize*

what social media does to our brains by seeing stuff, publications, we look at pictures... We call them triggers or things like that, but I think to me those are wisps of triggers that you don't even think [about]" (D2-SP4). Like in the offline world, it is likely impossible to completely remove triggering experiences from the newsfeed, which is why SUD treatment providers focus on coping with triggers instead of just removing them. However, these small triggers can be very damaging early in recovery and/or when a recoveree is feeling unstable in their recovery. As discussed previously, social media shortens the distance between temptation and relapse, so the effects of these wisps of triggers can more easily accumulate and snowball.

2.6.4 C.6: Triggering targeted advertisements

Summary: Social platforms can push targeted advertisements to recoverees that remind recoverees of their old identity and are triggering.

In addition to content posted by others in their network, four recoverees brought up seeing targeted advertisements that showed drug paraphernalia or made reference to their former drug use.

"I get advertisements for Wish on my Facebook and they'll be putting meth pipes on there, syringes or something like that. That's a little triggering sometimes. Not much anymore, I don't really get triggered by stuff on social media much anymore. There's this one ad that keeps popping up for [ADHD medication]... It's an amphetamine. I have ADHD, I've been diagnosed. [...] When I see that, it's not like I want to go get high, but I start thinking I could just go to the doctor, get prescribed this and it'd be fine." (D1-R2)

One recoveree said they made a new Facebook account after targeted advertisements continued to serve content to their former identity that they wanted to leave behind: *"When I had my old Facebook account I did see a lot of [triggering ads]... now on this new one I really don't*

have a lot of triggering things. There were a lot of ads that are like, 'If you were a victim of opiate use, click here now.' Shows needles and pills and that” (D1-R8). This is one way in which the social media platform itself can be stigmatizing and frustrating for a recoveree who is trying to move forward and form a new identity. Their digital footprint causes platforms to push content to them that still reflects an old identity that they are trying to distance themselves from.

2.7 Online groups

Online groups hosted on social media can include Facebook groups, Instagram pages, and communities on SUD recovery apps. These groups may be public or private and vary in size; the common element is that they are a recovery-focused space where recoverees can go to connect with other people involved with recovery.

2.7.1 O.7: *Connect with online recovery communities*

Summary: Recoverees can access recovery-specific communities in online groups to get support and motivation from peers.

Another way recoverees built their recovery communities in digital spaces was through online recovery groups. In our participant sample, nearly all recoverees said they belonged to at least one recovery page/group on social media, primarily on Facebook. One survey of intensive outpatient recoverees found that about two-thirds said they would join a Facebook or other online group for recovery support, leaving a significant minority who would not [20]. However, for those who do choose to participate, multiple studies have found that engagement in online recovery groups predicts reduced instances of relapse [34,172,222].

In many cases, online recovery pages were the next step out into public recovery spaces after in-person groups. Most recoverees said they found their online recovery groups through

personal recommendations, and those who found them through searching instead expressed lower trust in the groups and were less engaged with them. A few support professionals said they had online recovery groups that they recommended to their clients, but most did not, and said that they would not be comfortable making recommendations unless they were personally familiar with the group. Again, this demonstrates the caution with which recoverees and professionals approached the task of rebuilding social networks after recovery begins.

Recoverees reported a mix of activities on recovery pages. Some were mostly readers: they used the pages to look at inspirational memes, read advice, and hear others' experiences. Others reported being more active and building a group of friends from the people they met in these recovery groups. For example, D1-R7 said she met a group of women in an online meeting and they formed a separate group where they talked and texted daily. D1-R7 was one of the most involved in online support groups, even though she also described herself as “not tech-savvy” at other points of the interview. Most of the participants in our sample had lighter social media use, like this typical example from D1-R2:

“Online in the support groups, I haven't really posted that much. The last thing I posted I think was [about six months ago]. I got my sixth month and I posted about that... I posted other times, but I can't remember exactly what I said. Probably asking advice from people, I've done that a few times. [...] It can be [helpful]. Sometimes people are rude, but that's kind of the way of the world I guess. It helps. Sometimes it helps just to get it out [...] just the fact that I said it out loud makes me feel better about certain things.”

(D1-R2)

Some recoverees reported online groups as a significant source of support, while for others the groups played only a minor role. Support professionals also reported significant

variance in how much support their clients received online: though most had at least one client who preferred online support groups, they said that most of their clients preferred online groups as a supplement to in-person support, not a substitute.

Support professionals said they saw several other potential advantages of online groups in addition to getting support, even beyond recovery-focused groups. D1-SP9 liked that the groups gave recoverees the chance to practice having conversations and connecting with new people without the pressure of face-to-face contact, as this can be difficult for some people in recovery.

2.7.2 O.8: Find hobby groups

Summary: Recoverees can explore new hobbies and group identities in online communities.

Social networks online can help recoverees access communities around hobbies or identities that have nothing to do with recovery. For example, D2-SP8 works with expecting mothers: *“I do try to get my moms connected more to mothering [groups] that aren't necessarily addiction focused because I also want the moms to feel like they're just a dang mom, and that's it, without everything else going on.”* Several support professionals also mentioned clients who had joined gaming communities after entering recovery, which for their clients became a positive source of social support from their gaming friends, and the game itself served as a distraction from cravings (D2-SP6, D1-SP8).

The importance of hobbies and the communities around them is supported in other research. The SIMOR model of recovery posits that SUD recovery is a process in which one's belonging to “non-using” groups becomes increasingly salient [30]. McKay has argued that SUD leads to a “decline in activities that give life meaning and provide a sense of purpose,” and that in the absence of hobbies and other meaningful activities, there is little incentive for recoverees

to maintain long-term recovery [158]. Fear of negative consequences may be enough for someone to enter recovery, but being able to enjoy the advantages of recovery is critical to maintaining recovery for the long term. Other research has affirmed that recoverees find meaningful activities important to maintaining their recovery [229]. Online social spaces can help with this process of recoverees discovering ways to fill their time and find meaning.

2.7.3 C.7: Wider exposure to negativity

Summary: Entering digital social spaces means a recoveree will be exposed to more negativity from other people, including trolls.

Negative interactions on social media may threaten recovery in the wrong circumstances. One example of this is D1-R3: *“If you are putting your personal business out there, if you're having a relationship that is centered on social media it can blow up in your face. I mean a lot of things can go wrong [...] and it causes a lot of turmoil and fights and breakups and it can really be bad for somebody in recovery”* (D1-R3). Both D1-R3 and D1-R6, who were heavy users of social media before entering recovery, emphasized how damaging social media can be to personal relationships. Any user can have these negative experiences on social media, not just people in recovery, but the consequences can be more severe (i.e. contribute to a relapse). One support professional (D2-SP3) also said they believed that people in recovery were also more susceptible to the negative effects of social media, suggesting that recoverees may be more sensitive to negativity while also experiencing more severe consequences. This may also be true in recovery-specific spaces, as indicated in a review of a recovery app with a social network feature: *“Some people on there are not sober and don't always post things that recovering addicts, especially addicts who haven't been sober long, need to hear. Seeing addicts talk*

negatively really can bring people down. Just like in NA meetings how they ask addicts who haven't been sober long to limit their comments” (Sobergrid user review).

There are also trolls, even in recovery spaces. For example, D1-R1 mentioned seeing trolls in recovery groups who would post things like “just get off the dope” on posts by people struggling with substance use. One support professional, D2-SP8, said that they have had clients leave online recovery spaces because of trolls. One review of the recovery app I Am Sober made reference to the presence of trolls in that community, even in a dedicated app for recovery: *“I went into a panic attack and started crying because I relapsed, found this app wanting help, and yet was made a mockery of by kids who shouldn't be using this app because they posted triggering content that didn't even belong in the community section” (I Am Sober review).* This is amplified for recoverees who choose to be very vocal about their recovery; being an advocate for recovery is important for many recoverees, especially those who have achieved stability in recovery. In offline spaces, they might express this by being sponsors or peer mentors; in online spaces, their advocacy is more likely to put them in the sights of trolls and other critical voices.

2.8 Strategies

The work of digital social reshaping is highly individual: there was considerable variation in what recoverees found challenging and how challenging it was for them. Recoverees and support professionals both were quick to emphasize the individual nature of recovery, but they also agreed that it was important for recoverees to set themselves up for success and had recommendations for how to approach initial re-entry. All of these recommendations revolve around the general principles of 1) waiting until achieving stability, and 2) putting up safeguards against things that could be destabilizing. In this section, we cover how participants recommended approaching initial re-entry in more detail.

2.8.1 S.1: Digital detox

Taking a break from digital spaces or a “digital detox” – e.g. giving up their phone and getting off of social media – was common for people in recovery, according to our participants. Nearly all of the recoverees took a break from digital spaces in early recovery. Recoverees and professionals alike strongly recommended taking a break from digital spaces for most people when they enter recovery. This recommendation was usually based on the fact that our interview participants considered digital social spaces to be too dangerous and destabilizing for people early in recovery. Some of the risks are practical: it gives recoverees easier access to substances. However, research in other life transitions has also observed a digital exit or separation from old profiles and digital spaces, suggesting that the separation is also important for a recoveree’s identity transition [104]. In the case of other life transitions, this may mean moving to other online spaces instead of getting offline entirely, whereas with SUD recoverees it may be more important to break the link to online spaces in general until they have stabilized in their recovery.

Participants in our interviews said the one exception to the recommendation of getting offline was recoverees who had already been through recovery before, who did not always see the need to get offline: *“They are people who've had a couple of stints of being in recovery for awhile, and had a relapse and are trying to get readjusted... [they feel] 'I know how to navigate it a little bit better'“* (D2-SP7).

In most other cases, support professionals said they would consider it a warning sign if a client resisted taking a digital break. A few support professionals had clients who they believed relapsed as a direct result of social media access, but most said that it was simply one of a constellation of indicators that a recoveree was not completely committed to their recovery.

Despite the widespread recognition of the benefits of a digital detox, participants agreed that leaving digital spaces permanently – or even leaving social media permanently – was not a practical solution. As D2-SP1 said, *“That's just not ideal. That's like, OK, I'm gonna start this diet. I'm only going to eat vegetables the rest of my life. That's too extreme.”* Surveys of people in recovery for SUD have previously found that most do use social media in some form (73.6% to 94.3%, depending on the sample), and those who have social media accounts use it daily [20,67]. Case studies in other contexts, such as domestic violence, found that abstaining from social media entirely was not desirable even when social media was a source of harassment because it provided such an important connection to support and resources [153]. This suggests that abstaining from social media entirely is not a practical or desired strategy for recoverees.

Further, deleting social media can leave recoverees cut off from important information and social supports, and can make the recoveree feel isolated: *“The first thing when you say that [suggesting leaving social media entirely] makes me think of isolation. I mean, it's a level of isolation. Knowing all the million reasons we feel, we have a lapse, a slip, we use... feeling alone is one of the ones. I mean, the pain of being alone is why a lot of individuals use”* (D2-SP4).

Once an individual has taken a digital break, what is the best process for re-entering those spaces? Participants recommended taking it slow after deciding to re-enter digital spaces: *“A quick cut-off and then a gradual reintegration is probably my clinical opinion about what would be best [...] Because the temptations are so high and the connections the brain has to certain images, people and places are so strong, that breaking those connections is usually what's best, at least at first”* (D1-SP10).

Recoverees varied in how much time passed before they felt ready to approach digital social reshaping. Most interview participants agreed that it was common to take at least a 30-day

break, ranging up to six months. One recoveree gave their phone to their mother to reduce temptation (D1-R6); another chose not to pay their phone bill (D1-R1). Another recoveree echoed this desire to get space from former contacts:

“If you were important you knew where I was at and what I was doing. There were some people that thought that I had passed away. But I did take a very long time to where I wouldn't even log in [...] I took that time for myself and I was ready and I got my phone back and that's when - I don't even think it's right when I got my phone back after those 30 days. I think it was a week or two later that I decided to make a new account. I took the time that I wanted and I didn't feel rushed or persuaded to be on social media.” (D1-R8)

Here, D1-R8 emphasizes a point that was made by many interview participants: more important than hitting a particular milestone in time away, was achieving stability in recovery.

“The more comfortable you get in your recovery, the more comfortable you get in your personal life. You tend to open up a little bit more as you go,” said D1-R3 while explaining why they chose to start using social media again.

2.8.2 S.2: Remake social network

As in offline recovery, one of the challenges in digital social reshaping is to remake one's social network. As described by participants, in an online context this requires a decision early on: whether to 1) return to old accounts/phone numbers and remove unsupportive contacts, or 2) create new accounts to start fresh and build up from there. Support professionals said they did have clients who re-entered without making any changes to their networks, but considered it a risky choice.

S.2a: Prune old networks

Some recoverees chose to return to their previous social media accounts and kept their phone numbers. Some chose this option intentionally, and proactively deleted and blocked people who posed a risk to their recovery. For example, D1-R5 said they gave their phone to their spouse, had them block any old contacts involved with drugs, and deleted the numbers from their phone. In all, several recoverees said that they did this as a first step when they re-entered digital space. They also said they were faster to enforce boundaries: *“I’ve just had to honestly block a lot more people than what I normally do. I don’t put up with any of the games,”* said D1-R3, who deleted people as soon as they returned to their accounts.

However, many recoverees just returned to their old accounts by default and did not proactively prune their networks. Support professionals said that this was the more typical approach to digital social reshaping that they saw with their clients, which was reflected in how recoverees described the process: they would make no changes to their networks at first, and then eventually do a “purge” once they had a few instances of boundary violations or triggering experiences. As D2-SP7 described,

“Usually when I’ve seen a purge, it happens after they have gotten back on social media and they had someone reach out to them. Sometimes it’s a dealer, but sometimes it’s just a friend, it’s like, “Oh, we’re doing this and that”... and [the recoveree] is like, ‘Hey, you knew I was back into my recovery. Why would you do something [like this]?’ And sometimes it’s not just from once. They seem to be like, ‘Well, maybe they don’t quite get it,’ and then they’ll give them another chance and then after that if there is more, it’s like OK, no. And now they get upset about it. They feel like they’re not being respected in their recovery.”

There could be a number of reasons for why this happened so frequently. It could be intentional, because recoverees were not ready to break ties or did not find it necessary; but it could also be because they did not consider the costs of re-entering without making changes and would have preferred to have a better plan beforehand. At least with our participants, the recoverees who did not make changes proactively considered it a mistake. D1-R6 was one such person: *“At first I would only do [...] the drug dealers but then about a month into it I realized it needed to be everyone. It needed to be people I've used with, friends that get high, anybody that doesn't support sobriety needs to go”* (D1-R6).

While drug dealers were often the first contacts to be removed from recoverees' phones and friend lists, for some, breaking that social connection was not so simple. Recoverees can have a complicated relationship with their former dealers: *“When I got out, I still thought I could call the dope man like he was my friend. He wasn't my friend [...] You think you're going to call him again sometime in the future so I think that's why I kept that in the forefront of my brain [...] in case I wanted to get high again”* (D1-R7). This ambivalence towards sobriety is a normal and common part of the recovery process, and contributes to the challenge of digital social reshaping.

Though in retrospect recoverees recognized that they needed to prune their friends list more than they expected, it may be that this stepwise process of removing friends is more acceptable to recoverees as they first go through the process. Recoverees may not know who they want to remove from their social networks when they first begin the process of digital social reshaping, so stepwise friend removal would be necessary, as with D1-R6 above.

Furthermore, the process can be emotionally difficult, and doing it all at once may be unnecessarily costly. D1-SP10, who was one of the professionals who did have direct experience working with recoverees during digital re-entry, said: *“They might have been having a specific*

problem with someone they cared a lot about being a trigger on social media, and we might sit there in session and go through and say, 'Okay, are we blocking this person?...Are we deleting all of your pictures with them?' It's a grief and loss thing. People are emotional as they do it" (D1-SP10).

Several support professionals mentioned that their clients struggled with this because it felt like leaving people behind when they needed help. D1-R7 said they feel this way about friends who left their recovery program: *"There's people who have left and they're getting high and I still talk to them. I feel like if I don't talk to them, I'm abandoning them. If I didn't have Facebook then I wouldn't even be able to contact them"* (D1-R7). D2-SP10 pointed out that a digital connection is often the final one that remains: *"Cutting off the social media one feels really difficult because it feels like it's the last tie you have with that person or space or community. I feel like the social media ones are more symbolic [compared to cutting off in-person relationships]"* (D1-SP10).

Two professionals, D2-SP2 and D2-SP4, thought that removing friends all at once could actually be detrimental and would emphasize the loneliness that can characterize early recovery: *"OK, I have 500 friends. If I start deleting, I'm going to have 20 left.' And I think that can be a hard pill to swallow"* (D2-SP2). D2-SP4 expanded on this:

"That is sometimes the hardest thing is changing your peer group because first we say change your peer group, and then we say you need support. Well, my peer group was my support so like, what exactly are you asking me to do? [...] it can feel so alone. I can stop seeing my friends, I can tell them I'm in recovery, they stay away, but a lot of us use our phone for solace. [...] What does my newsfeed look like [after removing friends]? Who's left?" (D2-SP4)

As D2-SP4 describes it, digital spaces can amplify a recoveree's sense of loneliness, especially after they have done what they are “supposed” to do and remove friends who may not be good for their recovery. Here again, it is clear how the recovery process can look different for everyone; there is no single ideal strategy for reshaping one's social network during digital re-entry. Some recoverees were ready to do a single “purge,” while others needed time to weigh the role of different social circles in their lives and remake their networks in stages. Still others preferred to just start fresh and rebuild their network from zero, as in the next section.

S.2b: Build a new network from scratch

When re-entering digital spaces, some recoverees decided to discard their old accounts and start with all-new accounts, building up their social networks instead of pruning them down. In our sample, there was a mix of pruning down and building up, but across the board, recoverees seemed to have a strong instinct for which approach they preferred. A peer coach who was also in recovery described how important it was for them to get a clean break from their former life:

“When I ended up getting clean I created new social media platforms for myself because I needed to change everything about my life in order to create a new life for myself. [...] I had completely demolished my life and so I was literally starting over from scratch. And it just kind of made sense to start everything fresh. It was so bad. [...] I don't feel like I was thinking anything besides that life was completely filled with terror” (D2-SP9).

While recoverees who returned to old accounts sometimes did so because they liked looking back to see their progress, recoverees who chose to start new accounts were more focused on looking ahead and not carrying the baggage of their old digital lives.

Some recoverees who kept their old accounts said in retrospect that they wished they had started new accounts instead, as they underestimated the difficulty of having to inhabit their old digital spaces after starting recovery. Support professionals also tended to recommend starting new accounts, though most also added that following recoveree preference was more important than taking any prescriptive strategy. D1-SP4 described how they would walk through the process with a recoveree: *“I would encourage them to first consider, is social media something that is going to positively or negatively impact their recovery? It's going to vary. If they believe it's positive, then I would encourage them to create new social media profiles. So they can be selective in how they reconnect”* (D1-SP4).

One thing to consider, especially for these recoverees who start new accounts, is what happens to the old accounts. Since it tends to be inconvenient to permanently delete social media accounts, they are likely still there, dormant. Talking about their personal recovery, D2-SP9 said they were always very aware of their original accounts even as they used new accounts, and thought of them as a secret “back door” or escape hatch to return to their old life if they decided to leave recovery. This is one advantage of taking the strategy of pruning instead of building fresh, as with pruning the back door becomes less accessible. Though in their case they never took this route, it illustrates one of the many ways that digital spaces can invite recoverees back into unhealthy habits.

2.8.3 S.3: Mindful usage

Comparing their use of social media before and after treatment, recoverees said they tried to be more mindful of their social media use and generally used it less overall. Recoverees were still active social media users: all but one of the recoverees said they checked social media at least once per day. However, they were careful about their time and engaged less on the

platform, for reasons such as feeling less social when they are sober (D1-R5) or because they want to avoid “*a bunch of drama*” (D1-R6).

Reducing their overall time was more of a byproduct of using their social media more mindfully. D1-R2 described the change in a way that was echoed by a number of participants:

“I mostly used to use Facebook to get in contact with my drug dealers and stuff because I never had a phone turned on. That's mostly what I used Facebook for before this. [...] Now I use it to spread the message and keep a tracker of my life and stuff like that. My whole purpose of using social media has really changed in the past eight months.” (D1-R2)

Support professionals said their clients who were using social media in a healthy way changed their approach to social media: *“It wasn't just listless, aimless time spent online. It was actually time that was spent for a very specific purpose. They then usually regulated the amount of time they spent”* (D1-SP3). This helped recoverees limit their exposure to negative content.

2.8.4 S.4: Collaborate with support professionals

Given how similar the challenges are in digital social reshaping and offline re-entry, it is surprising that social media was not a frequently discussed topic among most of the support professionals and recoverees in our interviews. Most recoverees said that they navigated digital re-entry on their own, and most support professionals said it was not in their inventory of issues to bring up unless the recoveree did first. Interviews showed there were several reasons for this.

Results from the interviews suggest that help with social media may be a task that is not appropriate for all support professional relationships. When recoverees did get help with their digital social reshaping, most of the time they got it from their 12-step sponsors. These recoverees described going through their friends list one-by-one, alongside their sponsor, and

choosing who to remove. D1-R6 said his sponsor held his phone and read out names, *“and I would say yes or no whether they did drugs or not and if I said yes they would be deleted. And as far as groups that I followed, anything that was vulgar or not positive to my life, it was deleted.”*

(D1-R6)

This is a process that takes a lot of trust, as they are handing over a considerable amount of control to their sponsors. Responses from interviewees suggest that this may be a role that is most appropriate for a sponsor, an informal peer relationship. D1-R6 above, for example, said he refused to clear out his friends with his therapist and opted to do it with his sponsor instead. Few support professionals had experience doing this with their clients, and were wary of invading their clients' privacy by going through clients' social media accounts together.

Support professionals are also dealing with serious time constraints that may limit how much time they have to spend on their clients' digital re-entry. There was a mix of responses from support professionals on how important they thought it was to address digital social reshaping in their positions. D2-SP4, a social worker, joked, *“I mean you're looking at social services. Last time I looked at Maslow's hierarchy, he didn't have a little square of social media in there.”*

D2-SP4 said this is because social workers are often focused on stabilizing foundational supports like housing and food. D2-SP4 said they thought it was important to address digital social reshaping at some point, especially if a client brought it up, but that there often simply is not enough time to address it on top of the other stabilization actions being taken. D2-SP9 also said they did not address digital re-entry often with their clients, but that it was important:

“If it's not being addressed and it's not being talked about, I think that that is a problem, because that's such a big part of the entire drug culture, like Messenger or Instagram. [...]

hopefully you're dealing with the environment [...] hopefully you're dealing with discharge planning. [...] But if you don't deal with the other parts, then you're just setting somebody up to walk out of there and just get high.” (D2-SP9)

Support professionals said another barrier to discussing digital social reshaping with their clients is that they did not have a way to open the conversation to invite recoverees to discuss it if they wanted to. D2-SP4 said they would like a handout about social media as a conversation starter, and that they have used this tactic in the past: *“That's how sometimes I used to talk about big subjects I knew they didn't want to talk about. I'm like, ‘I found this paper, we should talk about this.’”*

A potential opportunity for opening this conversation would be sharing information about resources that can be found online, or on social media. Professionals who shared resources about Facebook recovery groups, etc. with their clients said that they check first to see if the client is on social media before they recommend anything. This opened the door for clients to talk more about social media if they wanted to.

Some of these barriers may exist because reshaping digital social spaces is thought of as qualitatively different than other types of environment reshaping: a topic to be discussed separately instead of interwoven. Our participants painted a picture of digital social reshaping that can be emotionally fraught, challenging, and in at least one case led to a relapse. Many support professionals said they thought that digital social reshaping was under-addressed in recovery treatment, like D2-SP9:

“I mean honestly, [...] if somebody goes to treatment before they get out of detox or like 28-day treatment or something, they need to have something done with their phone. With their social media or with their contacts, with their phone number or something because

as soon as they step out and they turn on their phone, they're going to have all these messages, all these phone calls and everything, asking them what's up.” (D2-SP9)

The challenge is identifying when and how strategies for approaching digital social reshaping can be integrated into existing care so that support professionals and recoverees can better collaborate on creating strategies that work for the individual recoveree.

For some recoverees, it could be that they get sufficient support for digital social reshaping through peers or other members of their support network. The interview protocol for recoverees did not ask specifically if they wanted more support than they had; however, support professionals said that advising clients on digital social reshaping was an emotionally difficult process, an indication that the support should be available, even if it is not always needed. Not everyone will need the help, or they will want help from a different person in their web of support; but starting the conversation opens the door to collaboration, a door that currently usually remains closed.

I argue that support professionals need to have a way to open the door to the discussion of digital social reshaping, and be prepared to provide support for it, so that the recoveree knows that there is the option to collaborate with their support network on strategizing digital social reshaping. According to my findings, the current barriers to doing so include: a) professionals do not have time to address digital social reshaping and b) they do not have a good way to open the conversation. Given the extreme time constraints under which support professionals work, any conversation opener would need to be a lightweight intervention or it is unlikely to be accepted into practice.

There are multiple ways a lightweight intervention might be implemented with minimal disruption. For example, ASAM Criteria (American Society of Addiction Medicine) is a

commonly used SUD assessment tool that measures six dimensions of SUD and recovery in an individual [125]. One dimension focuses on an individual's living environment, supportive people, and drug use in their environment, questions that could be adapted to assess these issues in both the offline and digital environments.

Another lightweight intervention option is a flier or information pamphlet. Support professionals in our interviews said that they already use information pamphlets to broach topics of discussion that they or their clients find difficult. Having such a pamphlet for digital social reshaping would fit into support professionals' existing workflow and remind both recoverees and support professionals that recoverees can get support for this aspect of their recovery journey if they need it.

2.8.5 S.5: Guided re-entry

To guard against the relapse facilitation that occurs in digital spaces, recoverees might consider doing initial re-entry in a controlled environment where one cannot take the path to relapse even if the recoveree is triggered by the re-entry; for example, under the close guidance of a sponsor or in an inpatient setting as part of preparation for release. For recoverees who underwent inpatient treatment and were away from their phones for an extended period, they could have a phone full of messages and temptations waiting for them when they get out. One of the support professionals in our interviews said that in her facility, at least, they do not prepare clients for this challenge. Instead of having to confront this challenge in an uncontrolled environment during the dangerous time right after leaving inpatient treatment, digital social reshaping could be addressed by support professionals as part of the preparations for release. For example, recoverees could get access to their phones shortly before they leave inpatient treatment and do some initial digital social reshaping work in the inpatient environment, where

they would be unable to access any illicit substances and would have the resources and professional support to work through any challenging emotions that arise. This could even be a way to practice dealing with triggering scenarios in offline re-entry. Unlike in offline situations, recoverees can confront digital triggers while still in a protected environment that makes it more difficult to relapse.

2.8.6 S.6: Join recovery-specific social networks

One potential strategy for avoiding some of the dangers of mainstream social media sites is to have a recovery-only social network, a commercially available app that is designed explicitly for recoverees to get support from one another. Such networks do exist, e.g. SoberGrid, Sober Peer, etc. However, an analysis of commercially available apps with social network features showed that many of them are fairly small, with a handful of active users. It is fairly typical to see a community feed with a few dozen posts in a day, with each post having one or two interactions (likes, comments, etc.). This may be because it is generally easier to meet users where they are – i.e. on mainstream social media platforms – than to get them to adopt a new technology. One survey found that a majority of Millennials preferred social media as a delivery method for recovery support (55.0%), while only about a third preferred a separate recovery-focused app (36.9%) [67]. Interestingly, no such gap existed for the Generation Z participants in that same survey (49.1% preferring social media, and 45.3% preferring a separate app), suggesting that there may be some generational differences in preference.

Most of the participants in our interviews said that they found online recovery groups through word of mouth from their offline recovery friends. Recovery-focused social networks may therefore be in a catch-22 where they need a critical mass of people to join and recommend the service to their offline friends, but can't get that critical mass because they have no one

recommending them. It does appear that recovery groups inside mainstream social media sites are more popular than recovery-specific social networks. This may simply be because not enough people know about the recovery-specific networks. It could also be because the challenges of mainstream social media sites described above, are offset by the convenience of being on a platform with which people are already familiar.

Though recovery-specific social networks may be less popular, their design can give us insights on what recoveree needs are served by online support. The most significant feature present in many recovery-specific social networks that is not present in mainstream networks is an SOS/crisis intervention feature that allows users to alert their support networks that they need help. SoberGrid has a feature they call “Burning Desire,” a button that users can tap to indicate that they are feeling triggered and need help from the community there (see Figure 2). The feature allows the app user to post to the global newsfeed and flags the post as coming from a person in crisis. Other apps have a crisis intervention feature as well, but they are more limited: they either link one to a crisis hotline, or allow the app user to set up preset contacts (e.g. sponsor, family member) to whom they can send out an urgent request for help if they need it. About a quarter of apps (24%, 13/55 apps analyzed) had some kind of “call for help” feature, though SoberGrid was the only one that had a feature for users to call for help to the general community. Several reviews of the SoberGrid app make references to this feature as being valuable: *“It’s wonderful for those 3:00 in the morning emergency situations when you don’t want to wake anyone but feel like you need to reach out for support to get through something”* (SoberGrid review).

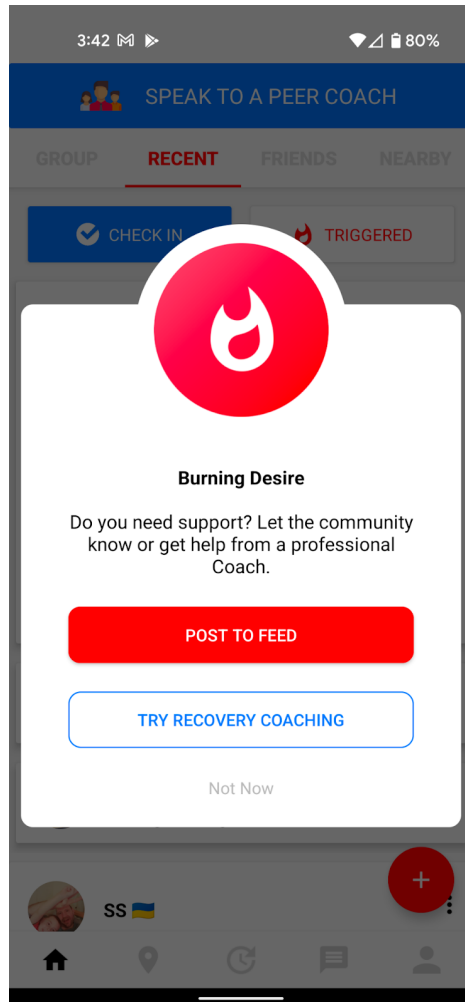


Figure 2. SoberGrid's "Burning Desire" feature that can be used to ask for help in a crisis.

Though many of these app communities appear to be fairly small, the app reviews suggest that the community size is sufficient to get support; a number of reviews praised community features for providing “24/7 support” that makes it possible “to pull your phone out any time you need motivation and you can find it in seconds” (SoberGrid review). Having access to a community of peers with similar experiences was also mentioned as important to the people leaving reviews: “I have also posted a few times when I have relapsed...I always get at least a little support that reminds me I am not alone” (I am Sober review). The other common themes in positive user reviews about these app communities were anonymity of discourse and atmosphere

of acceptance, as in this review: *“I love this app because you got to say and express how you’re feeling without anyone knowing you and no one is judging you because everyone else is going through what you’re going through”* (I Am Sober review).

Some of these advantages may also be accessible through online recovery groups on mainstream social media sites, but the recovery-specific network may be preferable for people who do not want to expose themselves to the risks of re-entering Facebook or other social media sites.

2.8.7 Recommendation for social platforms

Social platforms have a way of pulling recoverees back to their old identities, reminding recoverees that the platforms still see the old digital footprint of the person in active use. People perceive the algorithmic knowledge in a number of ways: targeted advertisements for syringes, triggering content surfaced through a “memories” feature, or suggesting their profile to old contacts through the “people you may know” feature. In this way, social platforms could be directly causing harm to their users. This can create the perception that platforms are failing to recognize the recoveree’s identity shift, creating dissonance for the recoveree when they are in these digital environments. Platforms could better support users in transition in remaking their identities and discarding their old digital footprint.

Our results suggest that some harmful content may be difficult for an outsider to detect; for example, a participant's old photos of her “cooking” that she presented as innocuous but actually depicted her cooking meth. Seeing family photos may be motivating for some and triggering for others. It is therefore important to give more power to the user in protecting themselves and giving them guidance on how to use the tools. Platforms may already have the features available, but people are not able to use them effectively because they do not know

about them or because they are time-consuming. It may also be that the filtering capabilities are not effective enough to be useful.

One way this could be done is through more advanced content filters that would give users fine-grained control over things they do not want to see, both on their newsfeeds and in advertisements. Currently, platforms do provide some content filtering – for example, blocking alcohol or gambling advertisements – but participants spoke of seeing triggering content fairly regularly, suggesting that these tools are inadequate and/or users do not know how to use them effectively. Social media platforms could better support recoverees by adding fine-grained filtering options for content beyond just being able to block a few types of advertising, such as content referencing drinking at bars. It may be difficult for social media platforms to predict what kind of content is harmful to recoverees without expert domain knowledge. One potential solution to this problem, lack of domain knowledge, has already been proposed by researchers working in content moderation. The Stanford University Working Group on Platform Scale has proposed a solution using middleware companies: independent third-party companies that provide filtering and re-ranking criteria [93]. Their solution is meant to target problems like misinformation, but could easily be adapted for other types of content filtering too, such as a content filter created by Alcoholics Anonymous or other domain experts.

Another way platforms could help recoverees and other users in identity transitions is to better support stepwise re-emergence into digital environments. This would follow the way that many participants in our interviews re-entered digital spaces: starting small and opening up as they became more comfortable in their recovery. There are several ways this could be done; for example, an option to temporarily hide their profile and content from most of their friends without requiring them to unfriend, which many seemed to consider a “nuclear” option that they

were reluctant to exercise, at least at first. This would give recoverees space without requiring them to confront the decision of unfriending before they are ready. Similarly, recoverees might wish to hide their past content from themselves for a period of time. Our interviews found a mix of responses to personal archives: some liked them to mark their progress, while others were ashamed. Further, this stance could change over time; later in recovery people might like to return to content that they would have once found unpleasant and triggering. By adding flexibility in users' control to what they see and who can see them, and allowing the changes to be temporary, the platforms could support the recoveree's work of exploring their changing identity.

2.9 Conclusion

Digital social spaces are for many an integral part of everyday life. For people in SUD recovery, these digital spaces are an important way to access critical recovery tools such as a supportive community and information about material resources; for some, it is their only access. The process of digital social reshaping is often a necessary, even desirable part of the SUD recovery journey. During re-entry, the recoveree has the opportunity to remake their digital environments into something sustainable for their recovery. But in pursuing those opportunities, recoverees may be put in a position where they must simultaneously guard against unwelcome influences and triggers.

Our interviews painted a picture of digital social environments that are full of what one support professional called "wisps of triggers"; that is, many microtriggers that may not always be noticeable in daily experience to a person who is stable in their recovery, but can quietly accumulate and destabilize recovery if they catch someone at the wrong moment. These wisps occur alongside recoverees' awareness of how easily they could use digital social spaces to get

access to illicit substances. Even people who had been in recovery for a long time said they could get access to substances easily if they wanted. Thus, these digital spaces create an environment where recoverees are exposed to content that could be detrimental to recovery while also shortening the path between destabilization and the means of relapse.

Part of the work of recovery is to decrease one's sensitivity to triggers and negativity so that they do not put one's recovery at risk, because exposure to triggers is inevitable. The work of digital social reshaping that participants describe, in many ways echoes the work that has been long established as important to recovery. However, it appears that digital social reshaping is thought of as something separate from other parts of recovery, leaving recoverees to navigate it on their own even when recoverees collaborate with support professionals on how to strategize similar challenges in other contexts. It is unclear what the barriers are that prevent them from doing so. Given how often support professionals spoke of the need to build a web of support, it seems likely that collaboration would be valuable here, as in other dimensions of recovery. Further, recoverees in our interviews spoke of mistakes and regrets from their own experiences of digital social reshaping, especially in early recovery, that indicate some strategic help would have eased the process for them. The challenge that remains is how to integrate digital social reshaping into existing recovery support, such that it does not take away from the important work that is already being done by support professionals under extreme time constraints.

Chapter 3 Professional Support

3.1 Introduction

Technology has the potential to connect recoverees with support professionals such as peer recovery coaches, social workers, and clinical psychologists, with flexible, accessible communication. At its best, technology can remove both physical and psychological barriers for recoverees to entering recovery and maintaining engagement. For support professionals, it can help manage their often enormous caseloads and allow them to deliver support more efficiently. However, if implemented poorly it can also feel impersonal, create frustration, and waste time.

In this chapter, I will cover the opportunities and challenges of computer-mediated communication between recoverees and support professionals: videoconferencing for support meetings or therapy, text messaging for support and information sharing, etc. Technology can also facilitate data sharing and resource access, both important information tasks in the recoveree-support professional relationship; those will be discussed in more detail in the chapters “Self-Guided Activities” and “Resource Access.”

I use the umbrella term “support professionals” to refer to a variety of positions. Most of the support professionals in my interview sample are peer recovery coaches employed at Parkview Health in Fort Wayne, Indiana. As described in the introduction to this dissertation, peer recovery coaches are people who have gone through SUD recovery themselves and now help recoverees navigate the process through emotional, informational, and instrumental support. Their purpose is to walk alongside the recoveree, a position that is similar to a sponsor but more formal: they are employees of the health system, must abide by HIPAA regulations, and do not

give out their personal numbers to their clients. Support professionals also include social workers, clinical psychologists, and nurses (e.g., in medically-assisted treatment clinics). They are characterized by providing support to a recoveree as an employee of an organization, in contrast to informal support such as a sponsor. Some of the interview results presented in this chapter are from data source D3, where participants were involved in a user experience test of a prototype mobile app for communication between support professionals and recoverees.

3.2 Background

Distance care for mental health (e.g. telephone, text, or videoconference) has been around for decades [23,210]. Services delivered include assessments, treatment, education, and extended monitoring [100]. For SUD treatment specifically, a metareview found that the most common uses for telehealth are computerized assessments (45%), telephone-based recovery support or therapy (28%), and video-based therapy (20%) [178]. Texting and smartphone apps were less common at the time of the metareview, but the use of these technologies has likely increased in the last few years, especially since the COVID-19 pandemic.

Overall, research has found that mental health interventions delivered over telehealth are reliable and about as effective as in-person interventions [92,112]; further, the services delivered via this medium are well received by patients and providers [117]. However, barriers like education [22,44], access to technology [44], payer/insurance reimbursements [63], and trust [205] have hindered widespread adoption.

The last few years have been a particularly interesting time to study distance care for mental health and substance use disorder treatment specifically because of the changes brought on by the COVID-19 pandemic. COVID-19 complicated substance use disorder (SUD) recovery in many ways. To remain compliant with social-distancing requirements, residential treatment

centers reduced their capacity and suspended some services, such as group therapy, resulting in reduced access to care [120,181]. Outpatient treatment services and medication-assisted treatment (MAT) clinics also had to reduce their hours and services once COVID-19 hit, as did social services and other support services [175]. Support groups could no longer meet in person, including mutual aid 12-step meetings such as Alcoholics Anonymous (AA) and Narcotics Anonymous (NA) [28]. This forced support professionals to quickly adapt and integrate digital solutions to maintain vital services to their patients [225].

To address the lack of in-person options, many organizations turned to telephones or videoconferencing to deliver care and/or support to individuals in recovery [51,132,165]. This caused a rapid acceleration in the adoption of telehealth options for care [143]. Many inpatient and outpatient treatment services (e.g. counseling and group meetings) shifted to telephone or videoconference options instead of in-person meetings [130,181]. Responses to this shift were mixed, with some reporting significant barriers and frustrations to adoption, with others saying they liked the convenience and flexibility of the remote options [130,181]. Informal support groups, such as AA and NA meetings, were also pushed online, with a similarly mixed response [28]. In MAT, critical policy changes loosened restrictions on providers' ability to use telehealth, including allowance for initial MAT induction appointments to be done remotely [178], with an audio-only option for people who could not use video [199]. Insurance providers also began covering more telehealth options, including meetings with counselors and social workers [135]. Before COVID-19, these old policies had been identified as major barriers to access and retention [89,135].

In addition to removing practical barriers to care access, distance communication adds psychological distance to an interaction between a recoveree and support professional, where the

participants feel more removed from the interaction than if they were in person [142]. Especially in the early stages of telehealth technologies such as therapy over videoconferencing or asynchronous text messaging, there was concern that technology as a mediator would create a psychological distance that would be harmful to the therapeutic relationship [206]. On the other hand, research has shown that psychological distance can have its advantages. For example, research in trauma-informed telehealth has shown that greater psychological distance afforded by telehealth options can create feelings of safety [96] and prompt greater honesty [21], important advantages in SUD recovery support.

This chapter is arranged into sections. The top levels refer to the technical capability or feature under discussion. Under each of these are sections labeled O.x, referring to opportunities, and C.x, or challenges. The chapter concludes with a section on strategies (S.x) that help maximize the opportunities and minimize the challenges.

3.3 Mediated communication

Telehealth increases accessibility to SUD support services by removing a lot of the time and distance barriers that constrain in-person care, making it easier for recoverees to access the care they need. This became especially salient during the COVID-19 pandemic, but even outside of pandemic times, telehealth serves as an important way to remove barriers in delivering care. Support professionals interviewed characterized their contact with many clients as precarious – because the clients were struggling in recovery or because they did not have a stable point of contact – and so it was particularly important to them to remove as many barriers as possible for their clients.

3.3.1 O.1: Lower participation barrier: no same-place requirement

Summary: Telehealth eliminates barriers to care caused by physical distance and transportation costs.

Getting to a physical location for care can pose a significant barrier for recoverees [85,90,236]. For some, it is just an inconvenience, but for others – who perhaps have no car, no driver’s license, or live in a place where public transportation is inconvenient or nonexistent – it can make accessing care nearly impossible. Telehealth removes these constraints. Furthermore, telehealth increases the diversity of options available for recoverees, so they are not limited to only the options that they can physically reach.

Many of the providers in our interviews mentioned transportation issues as a significant barrier for many of their clients, especially those who did not have reliable private transportation. Getting to recovery care can be a complicated and time-consuming process. One support professional described the experience for their clients:

“Transportation is, at the end of the day, probably one of the biggest stressors I ever observed. You could have someone that has a low-paying job and if they have to take off work to try and wait six hours for a bus to get [to treatment] or they have to walk two miles because their rural community doesn’t have a bus or they had a DUI, so they no longer have a license and have to take the bus - transportation is a massive issue.” (D1-SP3)

Studies on SUD treatment [188], mental health [226], and healthcare access generally [221] have found that transportation consistently ranks as a major barrier to access. One study found that transportation was a more significant barrier than the distance itself: when provided

with transportation access, people were just as likely to access SUD treatment regardless of the distance they had to travel to get it [236].

One population for whom transportation issues are particularly salient is recoverees in rural areas. Telehealth has long been identified as a possible solution to increasing access in rural areas to healthcare generally [164,207] and recovery care specifically [27,50]. The advantages of telehealth for rural areas are intuitive: in places that struggle to provide enough healthcare for their residents, it opens up access to a range of options that would otherwise be prohibitively expensive to provide. Previous studies of telehealth for SUD treatment in rural areas have found that clients and providers alike find telehealth options to be acceptable substitutes for in-person services, and further that they reduce direct and indirect costs (e.g., transportation time) for both [27,164]. This points to the potential for telehealth to increase cost-effective access to SUD treatment in areas that have few or no in-person options for treatment.

In addition to improving access for people constrained by transportation or distance, it also increases the diversity of options for SUD treatment. There are more choices of providers offering different approaches to recovery. Providers emphasized repeatedly in interviews that recovery looks different for everyone, and it is impossible to build a one-size-fits-all approach to recovery. This again is an issue that is amplified in rural areas. While in cities like Fort Wayne, there are ample choices for treatment and support, in rural areas there are often only one or two options for SUD recovery, which implicitly forces everyone into the same recovery approach.

Having diversity in different models of recovery care is important; e.g., having alternatives to the popular 12-step Alcoholics Anonymous (AA) approach to recovery, which does not fit all recoverees' needs [99]. Telehealth also affords access to a greater diversity of

communities and individuals. Several recoverees in our interview sample said they liked how online recovery spaces opened up a global community, like this recoveree:

“When we download [recovery apps], we are part of a community, you see what I’m saying? ... you may have something you can share with me ... [about] going through your struggle, your battle of addiction that I don’t know nothing about and I don’t even know you, you could be staying halfway across the world, and I’m communicating with you... [It’s an] option to broaden your horizons.” (D3-R9)

Diversity of care models and people is an issue for all recoverees, but is especially true for minority populations such as rural populations of indigenous or immigrant people [94], LGBTQ+ people [175], and others who are less likely to be able to access local culturally and socially resonant recovery care. This lack of local diversity of care contributes to the observed health disparities that exist in mental health care and SUD recovery care for minority groups [113].

3.3.2 O.2: Match media preferences

Summary: Telehealth makes communication easier because it gives more options, making it possible to match to recoverees’ preferences of texting, phone calls, or video.

Another practical advantage of telehealth is that it gives providers and recoverees more ways to communicate: instead of just in-person meetings, perhaps with some additional short phone calls, recoverees can get support through text-based messaging and video chat. There are several ways this can facilitate support, as it allows recoverees and support professionals to better match their communication preferences.

One support professional said that adding a telehealth communication platform to their recovery care program gave them an indirect way to get early warning signs for potential

relapses. The platform allowed clients to put in requests for telehealth appointments, and the support professionals learned very quickly that an urgent request for telehealth actually meant that they needed to do an in-person at-home intervention because the person was likely very close to a relapse (D2-SP4). The recoveree may be in a state where they are unable to tell their support that they are close to a relapse, and may even be avoiding seeing their support in person, but telehealth remained an approachable option for the recoveree, allowing them to ask for support when they may have otherwise stayed silent.

Text-based messaging: Support professionals and recoverees in our sample commonly said that many people preferred text messaging over phone calls. This is in line with larger trends, as studies have shown that people – particularly younger generations – prefer texting over calling [108]. Several support professionals said they thought their clients sometimes ignored their calls just because they did not want to pick up the phone. Most support professionals said they were fine with texting:

“A lot of younger people don’t necessarily like to talk on the phone... and I get it, maybe it’s more comfortable, and to be quite honest I would rather you text me 100%, never talk to me, if that means at least you can communicate with me because I do want to help. If that means we are seriously just going to text, I’m OK with that.” (D2-SP2)

D2-SP4 said members of their team sometimes use text or social media messaging as well. *“We look at it as OK, I might not necessarily have you going to meetings or into a rehabilitation center, but just talking to somebody helps him through that day. Maybe that hour, that month, etc.” (D2-SP4).*

Drawing from the design space analysis study (D4) for further context, the majority of commercially available SUD recovery apps that offered professional support did so via text

messaging. Most apps that offered a professional support option offered unlimited text messaging support as a base feature, while video calls cost considerably more. This suggests that text messaging is a more scalable and cost-effective solution than other forms of professional communication.

Video calls: Video calls were thought to be less often used than texting and voice, but still an important option to have for communication. Its usefulness appeared to be primarily in giving additional signals when text- or audio-only communication was not enough. For example, recoveree D3-R9 said that they would use the video call option when they needed urgent support; they said that text messaging would not be enough. Similarly, support professionals said that they liked having a video call option because it was harder for their clients to “hide” and say that things were going fine even when they were not. Video calls allowed for a closer connection where it is easier for a client to admit they are struggling, and easier for a support professional to pick up on nonverbal cues that indicate there is trouble, e.g. their clients’ appearance.

3.3.3 O.3: *Reduced anxiety & perceived judgment*

Summary: Getting support over distance care helps some recoverees feel less anxious and less judged by the support professional.

The support professionals in our interviews said most of their clients preferred in-person support, especially for group meetings; however, most of them had at least one or two clients who preferred remote meetings: *“Some people, they have social anxiety. They don’t feel like... They are weirded out by going to meetings. Basically, they don't feel comfortable, so they’d rather attend the virtual”* (D2-SP1).

Anxiety and perceived stigma are barriers for people with SUD seeking care. People who expect to be judged for their substance use are significantly less likely to seek help, as are people

who feel higher levels of shame related to their substance use [1–4]. People with anxiety disorders (including social anxiety disorder) report more barriers to care [60,98,156]. These effects are amplified among minority populations [98].

Research has also found that telehealth options can reduce perceived stigma and feelings of anxiety [61,87,119]. One of the mechanisms by which this reduction occurs may be psychological distance: because recoverees feel farther away from the person/people providing support on the other side of the screen, they may feel safer, less judged, and more distant from their feelings of shame.

One open question is if this positive effect of psychological distance is something that varies depending on the stage of recovery, or if it is dependent on personality type and varies more by individual than recovery stage. Responses from interview participants were mixed on this. Some participants said that virtual options made it easier for recoverees to show up early in recovery, as discussed in the next section, which suggests that it may vary by recovery stage. However, others also said it depended more on the person than the recovery stage, like D2-SP6, who said that among her clients, *“with the Zoom meetings, it’s either they like them, or they don’t”* (D2-SP6). There is some indication these feelings changed over time. P6 continued, *“[The clients] went at first, ‘No, no, I don’t want it on Zoom, not for me, I don’t get as much as into it. I’m distracted,’ and then about July [2020], they’re like ‘OK, yeah, I’m going to like three Zoom meetings a week.’”* This suggests that at least some resistance to virtual meetings faded as the pandemic progressed and clients were given time to adapt to the new medium, though participants were relieved when in-person options began reappearing.

3.3.4 O.4: Lower psychological barrier for entry

Summary: Especially for recoverees just testing out the idea of recovery, it is easier to join a Zoom meeting or text someone than walk into a rehab or room full of strangers to ask for help.

The psychological distance of telehealth can also make the process less intimidating: it can be easier to click into a Zoom meeting than to walk into a building for the first time. This can make support more accessible for people who are more ambivalent about recovery, as a support professional described:

“Newcomers, people newly in recovery prefer the virtual, so they can get a better feeling of what it's like before they actually go to a meeting... what I pulled from people who are newer in the process who have never been to a meeting, I've heard that they feel more comfortable testing it out through virtual.” (D2-SP1)

In this way, Zoom meetings can serve as something like a trial period in which recoverees test out what recovery might look like before they are fully committed. This lowers the barrier to getting started, when recoverees may struggle to build momentum[8,240], creating an on-ramp. To paraphrase a support professional from my interviews, it is easier to just push a few buttons and join a meeting online than to get in a car, walk, or take the bus to get to a meeting; but that ease comes from more than just removing the inconvenience and time spent in travel. It can also alleviate some of the stress and uncertainty of walking into an unfamiliar space with unfamiliar people to try something new and difficult. The relative anonymity of digital interventions can also create a sense of safety for the recoveree, something previous research has found for digital behavioral health interventions [150].

3.3.5 O.5: Increase support time efficiency

Summary: Telehealth affords brief check-ins that recoverees can more easily fit into their day, making access more flexible.

With mediated communication, short sessions are possible; all that might be necessary is sending a text message of a single emoji or a quick video check-in. Without the time lost to transportation to a physical location, this makes it possible to provide more flexible care and support. Recoverees can snatch time to get support here and there throughout the day, and can get support outside of normal business hours. A further implication of this convenience is that it requires a lower level of commitment: it is easier to send a message on a phone than to travel to an office. This makes it easier to keep a connection with recoverees on the borderline, who would otherwise be at risk of dropping away from professional support because they are hesitant about accepting support or are feeling ambivalent about their recovery. One provider described how she saw this work with her clients; though she is referring to peer support meetings here, the same principle works for professional support as well:

“I had a client the other day, he said he worked 80 hours a week and [...] so he said he loves the virtual because he can just jump on [meetings] on his lunch break and he can listen as long as he wants. He can talk, and [he] can be at work while he's doing that.”

(D2-SP1)

D2-SP7 said that one of her clients started attending online support meetings because his work schedule made it difficult to attend in-person meetings, and ended up becoming deeply engaged with the community he found there: *“He was saying he was spending hours on Facebook chats and chatting with people at night [...] he said, yeah I’ll spend nights chatting with people, or in this group chat, or in this forum”* (D2-SP7).

Increased time efficiency can benefit both the support professional and the recoveree, by allowing the support professional to be more efficient with their time while also potentially improving the success of the recoveree.

3.3.6 O.6: Surface knowledge about clients through tracked interaction

Summary: Support professionals can more easily track their interactions with clients, which can help surface important information about client engagement.

A general promise of adopting new technologies is efficiency and/or automation. This might be especially valuable to support professionals, whose time is often stretched thin. Telehealth communication apps can easily track important information for support professionals that helps them better manage their large caseloads, for example, recent contacts list:

“I can see all my people that I'm working with, and who I talk to and when I talk to them last. Which is kind of helpful 'cause I may or may or may not have seen these people like in the office so if something says “Hey, you talked to this person 3 weeks ago” ... that would be a good like notification of maybe I should text them and see what's going on.” (D3-SP2)

With long client lists and not enough attention to spare to manually track all of them closely, standard features like a recent contacts list in a telehealth app can help relieve some of the cognitive load of support work with simple automatic processes. The peer coach can easily sort their clients by last communication date, for example, or filter clients according to risk level, and use that to help surface important information like how long since they've talked or if a client has stopped engaging. These same promises of automation and efficiency are what drive the adoption of electronic health record (EHR) systems. EHRs have the potential to support clinical decision-making and make it easier to exchange health information [160]. When

implemented properly, EHRs can improve outcomes, reduce costs, and lower organizational overhead [79].

3.3.7 C.1: Technical limitations

Summary: A lack of a steady internet connection or updated technology can lead to poor access to support services for recoverees.

Though technology-mediated communication presents a utopian promise of more accessible and affordable care, there are challenges to successful implementation, as well. Peer recovery coaches in our interviews repeatedly described the difficulty of keeping in contact with their clients; addressing this was one of the driving reasons for making the mobile app being tested during the interviews from data source 3 (D3). Though the coaches were generally optimistic about telehealth's potential, an optimism that is reflected more generally in the literature as well, they pointed out several important caveats in technical challenges their recoverees would face. In a user experience test with a prototype app for communication between peer recovery coaches and clients, one coach expressed some ambivalence about the app because of the barriers to getting their clients to adopt it:

“It would just be having to have that connection with someone to get them to download an app on their phone [that would be a challenge]. [...] One, they might not want to download an app on their phone, Two, they might not have that storage space, Three, sometimes it takes a while in order to build that connection with someone, like I might go out to a person's house and try to reach them and they might not live there anymore [...] And in the meantime, I'm trying to reach out to them on their cell phone or I strictly am only able to go to their house because they don't have access to an actual phone number right now.” (D3-SP1)

This quote articulates several challenges in getting a recoveree to adopt a telehealth system. Recoverees may have limited technical resources that make it difficult to adopt telehealth tools that help them communicate with professional support, such as old smartphones or inconsistent internet connections. This unequal access to tools can lead to an increase in health outcome disparities [192].

One of the most common limitations that our coaches mentioned was that recoverees often did not have a mobile service plan. Their internet and communication access was through wifi only. Further, even when recoverees did have a phone number, it may still not be a reliable way to reach them, as one coach described:

A lot of our patients sometimes won't have minutes or [...] they go without a phone because they couldn't afford to pay for it and then they get the "Text Now" number [an app that creates temporary numbers] and if you don't use it for so long, it deactivates. So now we have fake numbers for them. (D3-SP4)

This is an important limitation that appears to be often overlooked in the literature: many studies use text messaging or phone calls as the primary means of communication in the intervention. Texts and phone calls have been used in several successful interventions. However, a blind spot in these studies are recoverees who have smartphones, but not a phone plan. Successful communication must be flexible to accommodate intermittent connectivity. In some instances, recoverees may not have a phone at all. One support professional, D1-SP10, mentioned that they have a client with whom they communicate mostly through email because his only access is through computers at public libraries. *"A lot of times when he comes to see me I can't call him, he just shows up. He'll email me throughout the week, just to check in and I can email him back"* (D1-SP10). This is another instance in which having communication tethered to

a certain device or phone number can be limiting, a barrier that would be alleviated with cloud-based solutions that would allow a recoveree to access an account across different devices.

Another limitation for videoconferencing specifically is a lack of reliable broadband, especially in rural areas. For the social workers in our interviews, the broadband issues were so significant for their rural clients that they were unable to do videoconference check-ins reliably when COVID-19 lockdowns made distance care necessary. The social services offices where D2-SP2 and D2-SP4 worked returned to in-person care in rural areas before urban ones during the COVID-19 pandemic:

“Rural areas have very spotty internet connection. So when we were doing our services via telehealth, we had a lot of individuals that their broadband, it couldn't sustain that. And so we actually went back into in-person in our rural areas probably a little bit quicker than we did other places because we had clients that were like, ‘I haven't seen anyone in weeks.’” (D2-SP4)

The issue of broadband access in rural areas has been previously identified in the literature as a significant barrier to providing telehealth, as rural areas generally lag behind more populated areas in terms of internet and technology access [27], and the broadband gap has been identified as a barrier to telehealth adoption [147]. There are second-order effects that also hinder adoption, i.e. digital literacy, which tends to be lower in rural areas [121]. This combines to create an environment where telehealth becomes more difficult.

The final technical limitation that the support professionals mentioned was clients owning smartphones that are older and may have limited computing power or storage capacity. This poses a barrier to downloading, as recoverees may have to delete other apps in order to download the recovery app, and may make it more likely that a recoveree will delete the app to make room for other things if they are not getting enough value from it. Previous research has

found that behavioral health intervention designers tend not to plan for these technical limitations adequately [151].

3.3.8 C.2: *Slower rapport-building*

Summary: Distance communication makes it harder for support professionals to build rapport with recoverees early in their relationship.

One of the fundamental issues with delivering support during COVID-19 quarantine for the support professionals in our interviews was difficulty establishing and building rapport. Though it was a reasonably effective way of maintaining rapport, it fell short for support professionals in our sample during a) initial outreach and b) crisis intervention.

For initial outreach, our support professionals could be involved in two different programs. The Hope And Recovery Team (HART) does outreach in the community, while the peer recovery coaches reach out to at-risk individuals who have come to the health system for treatment, often in-person in the emergency room or MAT clinic until the pandemic made in-person approaches impossible. Both teams found that establishing rapport with potential recoverees was difficult or impossible at a distance.

Most of the HART team's activities are centered around outreach, and these interview participants had the most to say about the effect of the pandemic on their work. Specifically, the HART team contacts individuals within 72 hours of a non-fatal overdose with a brief informational intervention, giving them information about SUD treatment options and offering support (e.g. help with insurance, and transportation). Interviewees emphasized the brevity of the intervention: *"We don't sit there. We don't bug them. We tell them, we're not going to take much of your time. We hand them paperwork, we kind of explain real quick who we are, we offer*

Narcan and then we leave.” (D3-SP3) They will stay longer if the individual is interested in talking more, but the intent is to make the visit minimally intrusive.

This description of their outreach – providing primarily informational support – suggests that this work would translate well to a remote format. However, HART team participants said that in-person contact was critical in their work, particularly for establishing trust and building rapport.

The most significant COVID change to their approach was that they would no longer come into houses when invited, a practice that was common pre-COVID. All HART team members interviewed said this limitation, while necessary, damaged their efficacy. A PRC shared, *“Before COVID, we were allowed to go into people’s houses, we would go into their house and sit there for an hour and have a whole conversation. But now it’s a little bit more like, we’ll stay on their porch, have a conversation, get a phone number and then leave so it’s a little bit more guarded of what we can do.”* (D3-SP9)

HART team members D3-SP3 and D3-SP5 also both brought up front porch visits, saying they found them to limit opportunities to build rapport with prospective clients. P3 said: *“Before we [went] in the house, which I like doing. It broke the ice a lot more instead of just standing there at the door like a salesman, that’s what I kind of feel like. And I think it’s unfair to them that we’re out talking to, and it’s kind of unfair to us just at the door.”* (D3-SP3)

Establishing rapport is very important to the team because they are doing more than just providing information in their outreach. They are also offering to help break down the process of recovery and walk alongside the individual as they make their decisions about entering recovery. D3-SP5 described a frequent response he experienced during outreach:

“[They say] ‘I don't even know where to go. What do I need? Insurance, don't even have insurance.’ And so we roll up there we're like, ‘Yeah you need insurance? Sure, we'll get you hooked up with insurance today. You don't know where to go? Talk to [peer coach], they'll walk you right through with you, walking through the door.’ It takes a lot of those, ‘OK, well, I got all those things out of the way.’ [...] I think they're just scared to death physically and emotionally of the toll it takes on them [to enter recovery].” (D3-SP5)

The HART team can help alleviate the cost of that toll, but doing so requires building rapport and establishing trust, something they believed was much more difficult to do when they felt like “salesmen.” For them, adding further distance to this interaction with telephone or video mediums would only compound the problem further.

There are instances of initial outreach happening successfully via telephone for both the HART and peer coaches, so some success is possible at a distance, but it may take longer or only be effective for people more equipped to take action. For example, the HART team also does general outreach, posting flyers and leaving business cards at police stations, and at hotels where overdoses are more common. Interviewees said that repeated, passive exposure to these flyers resulted in people reaching out. *“[A man] called this one day. He's like, ‘I looked at that flier for three months and today's the day.’ And he handed us his needles and what little product he had left... He was wanting to go to treatment right then and there.” (D3-SP5)* Though the team needed to go out in person to post the flier, this asynchronous in-person contact was effective.

Even before COVID, peer coaches would use phone calls to contact potential clients, though they preferred to do it in person when possible. *“Connecting only by phone is never ideal [...] we primarily are stationed in a hospital, so just being able to go down to where the patient*

is so convenient [...] building that rapport that way is so much more ideal than a phone call. So it [COVID] was a big adjustment.” (D3-SP11)

Interview evidence suggests that trust – or lack thereof – may be a critical mechanism in why building rapport should be done face-to-face. For example, as a part of their normal workflow, peer recovery coaches call clients and potential clients to check in. This remote outreach worked satisfactorily (though not particularly efficiently) until the COVID-19 pandemic. Pandemic restrictions caused two important changes: 1) they were usually no longer able to make initial contact in-person at the hospital and 2) they did not call from health system landlines, so they did not have a caller ID identifying them as coming from the health system. These two changes made rapport-building very slow for peer coaches, and they had much fewer successful contacts with recoverees.

“At the beginning [of COVID], any rapport that we were building up with people kind of slacked during that time because we weren't able to meet face to face with them... It was over the phone. [We] didn't have telephone numbers that they knew immediately who we were... Maybe when it wasn't the best way to interact with them.” (D2-P7)

Because these peer coaches are embedded in a health system, they may be able to take advantage of the institutional trust afforded them by the health system; when they were no longer identified as coming from the health system, interviewees said that they had very little success establishing contact via telephone. This effect of trust suggests there may be ways to moderate the negative effect that distance has on establishing contact and getting people in the door to recovery. However, interviewees were clear that success is much more difficult when in-person outreach is restricted.

For crisis intervention, like when a recoveree is at risk for a relapse, our interviewees also said challenges with rapport-building make it hard to deliver support adequately. A few support professionals said they would do home visits instead of telehealth appointments when they believed a recoveree was struggling. Other studies of telehealth SUD interventions have found that telehealth can be successful in reducing relapse rates overall [8,102].

The support professionals in our interviews were of mixed minds, dissatisfied with telehealth's ability to deliver adequate support during a potential crisis, but as reported above, interviewees said that telehealth did help recoverees ask for support when they were in a crisis. Both recoverees and support professionals in our UX testing interviews liked a feature that allowed recoverees to send urgent messages. It may be that having a telehealth option makes it more likely that clients will reach out when they are in urgent need, which could help with relapse prevention.

3.3.9 C.3: Fewer nonverbal & context cues

Summary: Support professionals say that distance communication causes them to miss important cues that help them assess their clients and deliver care.

One of the weaknesses of using distance options for clinical care that has concerned therapists is the loss of nonverbal cues that help them understand their clients better. While this lack of nonverbal cues contributes to the feeling of distance that can make clients feel safer in reaching out for support and disclosing information honestly, it also makes things harder for support professionals. Multiple clinical professionals in our interview sample said that therapy via videoconference required more attention and effort, and still often produced sessions that felt less “meaningful” than in-person sessions (D2-SP2).

The nonverbal cues were particularly important for the clinical professionals interviewed. Nonverbal cues are an important part of therapeutic practice [137], both for providing support and (for some clinical professionals) accountability: *“But it was so easy to hide [during COVID-19 quarantine]. We can't smell your breath. If your video isn't working, I can't see you, I can't see your home, I can't see stuff like that. Where then we mandated, at least every other session has to be in the home. It was just too much.”* (D2-SP2)

Some recoverees also sought out accountability to keep themselves abstinent and told their support providers that they found videoconferencing to be lacking. *“I can sit at home and use and get on the meeting, but I'm not gonna go to a meeting high,”* said D1-SP10, paraphrasing their clients.

This was less of a concern for the peer recovery coaches in our sample because their role is as a peer walking alongside someone in recovery. Their top priority was just to keep lines of communication open to their recoverees. Even for peer coaches, though, some brought up the risk of going to communication channels that are more flexible, but less rich: *“[With] texting and not really having a one-to-one, face-to-face conversation, there's a lot of misunderstanding. And if people already struggle with communication...”* (D1-SP9).

This is an issue particularly in early contact, when a support relationship with a recoveree may be tenuous. The HART team, which is responsible for making initial contact and follow-up with potential recoverees at their homes, said that their work could only be done in person. P5 said that in-person contact was important for reading body language when there is so much uncertainty in how they are going to be received. *“I think face to face is better because people seem to really get a judgment of all the nonverbal cues that people put off with each other. And they could see that, oh, this guy really does seem interested in me getting some help. Or, you*

know, I can see this person is looking every direction besides us, they're kind of annoyed that we're here.” (D3-SP5) Without these nonverbal cues, the team was less capable of tailoring their approach to the individual.

3.3.10 C.4: Lower barrier for exit

Summary: Just as it is easier to enter a digital recovery space because of psychological distance, it may be easier to leave again.

An advantage of telehealth is that it lowers the barrier for entry to getting treatment and support; on the other hand, it also could make it easier to disengage. Interview participants said they lost contact with many of their clients once COVID-19 forced them to go entirely to distance care. However, previous research has shown conflicting results, that telehealth after SUD treatment improves continued engagement [89]. These different results suggest that the lower barrier for exit is only a meaningful risk in some contexts. Interview participants gave some insight into how this lower barrier for exit might look: *“We have seen so many clients who don't get... They say they're not getting anything out of virtual meetings, like it's easy to not pay attention to just doze off, or you know, it's not meaningful.” (D2-SP2)*

This suggests that there are times when the distance caused by telehealth makes it easier for recoverees to disengage from recovery, while in other cases it improves engagement. It is not yet clear how different factors affect the outcomes of engagement and retention when using telehealth.

3.4 Asynchronous communication

A particular feature of text-based messaging is that it adds flexibility by enabling asynchronous, intermittent communication: the support professional and recoveree do not need

to be present at the same time to hold a conversation, and the conversation can continue even if one of the two parties disconnects for a period of time (e.g., other appointments for the support professional, unreliable wifi access for the recoveree).

3.4.1 O.6: Conversations can unfold over time

Summary: Text messaging makes it possible for recoverees and support professionals to communicate even if they are not present at the same time, which helps with scheduling constraints and intermittent connectivity.

A critical opportunity in asynchronous communication is that it allows conversations between support professionals and recoverees to unfold over time. This alleviates the constraints of needing to be in the same place at the same time. In user experience testing of a communication app, both recoverees and support professionals said that playing “phone tag” was a pain point in their communication.

“The follow through [from recoverees] is not always the greatest. So even [if they ask], ‘Hey can you help me find counseling?’, just use that as an example. I may not be able to get back with him that same day because they're not the only person that I'm working with. But then I'll look through, get some resources and go to call them back and they don't answer. And then I call him the next day, and they don't answer, and then I call the next day..” (D2-SP10)

Support professionals in SUD recovery are often operating under extreme time constraints and a heavy caseload. This means they are not always able to answer immediately. Being able to send off text messages at their convenience instead of spending time tracking down recoverees on the phone would allow them to use their time more effectively and efficiently.

On the recoverees' side, the difficulty connecting with their support professional can be caused by several factors. They may be at work so they cannot answer the phone during business hours when the support professionals are available, they may be taking care of their children so need to be able to multitask and take frequent breaks, they may not have phone service so cannot answer phone calls at all or only when they are in an area with wifi, or their motivation to engage with recovery support has waned. Asynchronous and intermittent communication channels address barriers related to all of these. Whenever the recoveree is willing and able to re-engage with the support professional, they can open the conversation and review the chat history, whether the break in the conversation is a matter of a few minutes or weeks. This could be especially helpful in times when a recoveree has disengaged for a long time, perhaps because they have relapsed. Instead of having to get up the motivation to re-engage with recovery and get in contact with their support professional, they can simply pick up where they left off because the barrier to reaching out is lower. One recoveree gave an example of what this might look like:

“I like to tell them on a daily basis how I’m feeling today, or if I need help with anything. So I’ll probably use that for the text messaging, just to text them daily to check in and ask them, if I’m not feeling well, how can I get through the day or how do I fill up my time... when I go meet them in person, I’ll tell them I’m having trouble with this or that ... but it kind of makes it difficult because I only see them like once a week.” (D3-R10)

Though this may result in a higher volume of messages to support professionals, none of the support professionals in our interviews were concerned about being overwhelmed by messages. They believed that a higher volume of messages could be easily managed by maintaining their boundaries, and preferred that recoverees would be able to reach out to them when they needed help.

3.4.2 O.7: Shorter, more frequent interactions

Summary: Asynchronous communication further amplifies telehealth's ability to do brief check-ins that make access more flexible.

As discussed in Mediated Communication O.4, telehealth permits shorter and more frequent interactions: quick check-ins, sharing information, etc. enabled by eliminating travel time and other inconveniences. This is even more so the case for text messaging specifically, which allows for interactions that are even briefer than phone calls or videoconferencing.

Recoveree D3-R10 liked texting because it allowed for a quick way to check in with someone and offer support without much effort: sending links to resources, for example, without any accompanying message. As the recoveree described it, it is a lightweight way to make someone feel supported and connected. Recoverees generally seemed to think they would contact their support professionals more if they had a text-based communication channel, and would feel more comfortable reaching out about more minor things (one recoveree said they wanted to be able to reach out just to thank the support professional for being there (D3-R9)).

3.4.3 C.5: Lower barrier for exit

Summary: It is easier to slowly fade out or ignore text messages than in-person appointments.

Asynchronous communication, like mediated communication generally, makes it easier for recoverees to disengage. This is discussed in Mediated Communication, C.3, but merits brief mention here as well. An unanswered text message is more ambiguous than a missed appointment because norms around response times are fluid. Gradually disengaging from a text conversation is a common enough practice in social situations that it has its own term, “the slow fade,” where people slowly stop responding as quickly and then stop responding at all [230].

3.5 Challenges to adoption

There are also general challenges to the adoption of new technologies into workflows in the healthcare space. These sections discuss how these challenges affect the integration of technology into SUD recovery care.

3.5.1 C.6: Privacy constraints

Summary: Various privacy issues can complicate technology use for communication. HIPAA can be restrictive, but unregulated technologies have a history of privacy violations.

There are some necessary privacy considerations for telehealth, especially for support professionals who need their communication to be HIPAA-compliant. Keeping private information secure means trading off some convenience; for example, while many recoverees use Facebook Messenger for daily communication, the support professionals in my interview studies (D1-D3) could not use Messenger to communicate with their clients because of HIPAA.

Telehealth also introduces several privacy issues that do not exist for in-person care. Some recoverees may find it challenging to find a private space to conduct a video therapy session, for example. Some recoverees may share their mobile phone with others, meaning chat histories and other private data may not be secure. Support professionals in the user experience study (D3) mentioned these as issues that they had encountered with their clients in the past.

Privacy concerns may complicate the integration of commercially available telehealth apps for SUD recovery into professional care, especially when the professional is bound by HIPAA. Most of the apps that facilitate communication with a support provider say they are HIPAA compliant (13 of 18, or 70%). This leaves a significant proportion that is not compliant, and if other apps are considered as well – for example, apps that collect self-monitoring data – this proportion of non-compliant apps rises. Privacy considerations vary widely across different

apps, and it is hard to know whether user data is safe. Some apps offer privacy options such as a secure log-in or the ability to lock the app behind a passcode, but in several instances, this is a feature that is kept behind a paywall. Data security is also a question: most mental health apps (including for SUD) are not regulated unless they offer diagnosis or treatment [124], and an analysis of apps for depression and smoking cessation found that 29 of 36 of the top apps shared data with Facebook or Google, but only 12 accurately disclosed this in their privacy policies [118]. This uncertainty would make it difficult for a support professional to recommend an app to their recoverees, and even more so when HIPAA must be taken into account.

3.5.2 C.7: Adoption inertia for recoverees

Summary: Recoverees may be hesitant to adopt new technologies for support.

A further consideration follows from the technical limitations listed above. First, part of the difficulty in getting clients to download a dedicated, HIPAA-compliant communication app is that peer coaches have to build rapport with the client before they are interested in committing to downloading an app to communicate. D3-SP1 explained this point further: *“I might go out to that address and I might talk to them, but that doesn't mean that I'm actually going to really get a response from them until I talk to them five more times”* (D3-SP1). This creates a catch-22 where support professionals need to build rapport to get their clients to participate in telehealth communication, while also needing the app to remove the barriers like changed addresses and phone numbers to build that rapport in the first place.

3.5.3 C.8: *Switching costs for professionals*

Summary: Support professionals were concerned about the switching costs of having to learn a new system and adapt it into their workflow, even when they believed the new system would be better in the long run.

Finally, a challenge in adopting telehealth by a health system or other group of support professionals is the switching costs. This causes inertia against change, for both the institution and individuals. Switching costs are inherent in any change, not just for telehealth, but they comprised such significant barriers for the support professionals in our interviews that they merit discussion. The support professionals in our interviews were so overloaded with work that they had very little capacity for incurring the short-term costs involved in switching to a new system, even if they believed that system would be more efficient in the long run.

One particularly salient example of this was how peer recovery coaches managed resources such as AA/NA meeting lists and food bank information. One coach in user experience testing displayed hesitancy with the prototype app, then compared it to their current system, illustrating the concern with switching costs:

“Using that [resource sharing in a prototype app] often would take time and effort, just adding a thing and then sending it out to the people that you want to send it out to. Especially the things that are [...] one event. But then again, in my office, I might have it pinned on my wall 'cause I made a copy of it or something like that, so I mean, that takes effort too, so... I guess it's probably no more effort than sharing [on the app].” (D3-SP2)

This quote reflects many coaches' responses. Nearly all of them said that they kept track of these resources by having physical printed copies around the office that they would then photocopy when they needed to give them to a new client. One coach mentioned taking photos

of the paper with her phone and then sending the image to their clients (D3-SP4). When asked, most of them said they did not have a centralized database of resources that was shared among coaches; rather, everyone kept their own or shared them through word of mouth, where one particular coach was known for having the best AA/NA meeting list, etc. When the research team later followed up with the peer recovery coach supervisor, it was discovered that there was in fact a centralized database of resources and a staff member who was tasked with keeping it up to date. Even so, hardly anyone used it. The current system of printed pieces of paper pinned in different areas of the office remained more popular than the supposedly efficient and convenient centralized database. It is not clear why it was left unused, but there are several possible failure points. It might be that the switching costs of going to the online database and breaking the habit of finding physical copies were too high. The location of the database in the institution's intranet might have been too inconvenient to bother, or the coaches were not confident that the resources were up to date. Whatever the cause, it appeared as though the inconvenience of breaking an inefficient habit was not worth the value offered by this centralized database.

This example is not a criticism of the coaches' system, but rather an example of how little bandwidth coaches have available in their days to incur the switching costs of using the internal shared database instead of their existing system of sharing photocopies. Even though they don't particularly like their current system, it is easier for them to continue with that system than to switch to another one. In user testing, coaches were enthusiastic about the idea of centralized resource sharing and rated the design highly but were nonetheless slightly hesitant, citing worries that the shared online resources would not be up to date or that they would require training to be able to use it.

The other barrier to be discussed briefly is institutional inertia. Even when individuals have the will to switch, the organization may be slow to accept change. One interviewee who was part of a social work organization described how difficult it was to get their organization to agree to incorporate telehealth options, finally agreeing on a five-year rollout plan that was still considered ambitious by the organization (D2-SP4). In the end, the five year plan was implemented in less than two weeks when COVID-19 lockdowns made telehealth a necessity.

While these are not problems inherent to telehealth, switching costs do pose a significant barrier to successful implementation, and can cause an otherwise good design to fail. Successful designs will need to take them into account.

3.5.4 C.9: Technology adds to workload

Summary: Support professionals have had bad experiences with technology adoption and are concerned about the risk of introducing more inefficiencies with a new system.

In user experience testing of a communication app, peer coaches were hesitant about adopting a new system because of concerns that it would become just another system to feed. Nearly all peer coaches expressed some concern about the communication app increasing their workload, instead of making it more efficient.

“The negative is just the process of using [the app] along with everything else I still have to do as part of my job. And then my question too is, with text messages and phone calls right now, I document every phone call I make, and I document it twice, so if I'm texting how is that documented? How is that time captured for my job? ...if you don't document it, it didn't happen. So, there's a lot of communication through text and if it's not being documented anywhere to me that's not a great thing.” (D3-SP2)

Many peer coaches were concerned about documentation, both in making sure everything was recorded and in minimizing duplicated paperwork. Peers were also concerned about the amount of work it would take to input user information and resources upfront, and then maintaining the information after. These peers had already been exposed to technology that amplified inefficiencies, like a mobile app for EPIC that was so buggy that participants considered it unusable. As a consequence of this, it may be that support professionals may be more resistant to adopting a new telehealth system, and be faster to abandon it if startup requires significant time investment.

3.6 Strategies

3.6.1 S.1: Always offer an in-person option

The consensus among support professionals and recoverees was that telehealth was good as a supplement, but not a substitute, for in-person care:

I think telehealth in small bits is nice. It is good, you know. Like instead of missing something, you can just like, hey, let's just talk this way. But when it is only that, and then especially the people too on lockdown, like no human interaction, it just... And that's the biggest thing. It was like, just like the physical touch, or like a hug, or just even a hand touching a shoulder, like they... they don't get anything. (D2-SP2)

As this chapter has demonstrated, there are many features of telehealth that may make it more or less accessible and desirable for a given individual, and those preferences may change over the recovery journey. It is critical to build a web of support that maximizes the opportunities of telehealth without forcing anyone to accept the challenges. Current research in the recovery domain highlights the need for discovering what aspects of this journey show the most readiness

for technology intervention [233] or show the most promise for positive outcomes from technology [213].

As our interview participants emphasized, there is no one-size-fits-all approach to SUD recovery, so offering both in-person and online options allows the recoverees and support professionals to collaborate on identifying which channels work best for their needs. However, there did appear to be some trends where telehealth options were less likely to be effective. These are discussed in the next two strategies.

3.6.2 S.2: First build rapport face-to-face

This strategy follows from findings reported in the challenges particularly for C.2: Slower rapport building. Many of our interview participants were frustrated by how distance-only communication slowed down their rapport-building and outreach efforts during the early months of the COVID-19 pandemic, where in-person options were not available. The HART outreach team spoke critically of how awkward the in-person outreach was when they could only visit people on their porches instead of coming inside because the nonverbal cues and context made them feel like salesmen. The peer recovery coaches were able to adapt to distance communication a little better – phone outreach is already a standard part of their job – but they too said that phone-only communication slowed down their rapport-building, as outside of COVID times they would have had more opportunities to make initial contact in person (e.g., in an emergency room).

There are a few interesting counter-examples that may provide some further insight into how technology may be useful as a supplement to in-person outreach. The law enforcement members of the HART team mentioned that they got a lot of pushback from other law enforcement officers when they began their work on the HART team, but that when they

distributed their business cards to police stations, the cards were always gone when they came by to check on them, and several officers later followed up with them to help loved ones get treatment (D2-SP3, D2-SP5). In another example from the HART team, one participant reported a recoveree who called them after walking past an outreach flier repeatedly until he decided “today is the day” and called the HART team to take the last of his stash and help him find a treatment center (D2-SP3). In these examples, the people were not ready for help in the moment when the HART team was there in person, but reached out to them later. Though business cards and fliers are not telehealth, these examples suggest a potential role for telehealth in outreach: telehealth and other remote outreach may be able to open the door for recoverees to step through, when they are ready. Remote outreach allows for more of a gradient of commitment from recoverees; it is easier to just check out some online resources or enter a Zoom group support meeting instead of showing up in person. However, evidence from interviews suggests that support professionals should be there in person to greet them once they do decide to step through the door.

3.6.3 S.3: Have an in-person crisis response plan

Summary: Crisis response should be done in person, though the call for help/crisis detection may be aided by technology options.

The second point in recovery where telehealth seems insufficient is during a crisis, e.g., when a recoveree is close to relapse. As with the previous strategy, this is taken from the findings of the psychological distance affordance section, especially C.2: Slower rapport building. The support professionals in our interviews generally found that telehealth visits were not enough to meet their clients’ needs when they were in crisis.

Where telehealth did seem to help, however, was in making it easier for recoverees to reach out. One support professional in our interviews mentioned that her organization had learned that urgent requests for telehealth were a sign that their client needed in-person support. Additionally, many commercially available recovery support apps have features that allow recoverees to send out a message or other signal that they are in crisis. So though telehealth may not be the primary route of support for someone in crisis, it may be an opportunity to help recoverees reach out when they need help.

3.6.4 S.4: Support intermittent connection

Supporting intermittent connection addresses users' technical connectivity issues (C.1 Technical limitations) while taking advantage of telehealth's flexibility and its support of asynchronous communication. Intermittent connection may be caused by technical limitations (e.g. no phone plan) or by user behavior (e.g. fluctuating motivation to engage with support).

Supporting intermittent connection leads to several design implications. First, connecting over the internet instead of through a phone line means that users can access communication without a phone plan via public wifi, leading to a more stable connection to their support. Our interviews suggest that a user account would be a more stable connection to a recoveree than a phone number, as peer recovery coaches said that recoveree phone numbers often changed, went out of service, belonged to family members, etc.

The second design implication that follows from this strategy is to focus on asynchronous communication, e.g., text messaging. Participants in our interviews spoke repeatedly about the difficulty of connecting with clients: playing phone tag, trying to catch recoverees when their phone has service and when they want to answer. Asynchronous communication would allow the peer coach to sidestep the time-consuming process of trying to get their client on the phone, and

instead just send them a message. The recoveree can then choose to interact with the information whenever they choose. If there are gaps in the conversation, asynchronous conversation allows people to more easily pick up where they left off by having a record of the text conversation.

3.6.5 S.5: Integrate with existing systems

Integrating SUD telehealth communication with existing systems that support professionals already use is a strategy that follows particularly from C.8 (Switching costs) and C.9 (Technology adds to workload). Support professionals were wary of the risk of telehealth tools making more work for them, possibly because of a history of telehealth interventions that promised more efficiency while delivering cumbersome tools that were hard to use. For example, participants often were frustrated by electronic health record tools that were intended to make record-keeping easier.

Consequently, responses from participants suggest that there will be little tolerance for anything that causes support professionals' work to be duplicated (e.g., having to document activities in multiple places). Integrating telehealth tools into existing systems is one way to prevent duplication of work; for example, an option to sync calendars with other systems or exporting message metadata to record how they spent their time. There are tradeoffs to integrating with existing systems, however. Multiple support professionals said they would rather have an un-integrated system than wait for the system to work with the EHR system EPIC, which was widely considered to be unwieldy and impossible to integrate with.

3.6.6 S.6: Simplify start-up

Following from the previous strategy, and particularly the challenges of C.1 and C.8, simplifying start-up is another important strategy for making a telehealth communication tool

that is acceptable to support professionals and recoverees. Barriers like poor usability or program complexity that require a steep learning curve will likely cause users to abandon the system.

For support professionals, simple start-up is necessary on their end because they have little bandwidth to devote to learning a complicated new system. This is further exacerbated by past negative experiences with new technology adoptions. One strategy for simplifying start-up would be to work with existing systems as much as possible, so that support professionals do not need to learn another interface or system; for example, using an Excel spreadsheet to track resources instead of a dedicated mobile app that is not already part of the coaches' workflow. Any new systems might be more successful if they are limited in their scope, focusing on implementing just a few features with a simple interface instead of attempting to be comprehensive, which appears to often bog down implementation. Past technological solutions had been implemented in this workplace before, but challenges in using the systems caused support professionals to adopt manual workarounds instead. Simplifying start-up would make it faster for support professionals to get value out of the system.

On the recoveree side, simple startup may also be necessary because of technical limitations of their technology: an app that requires a lot of storage space, for example, might be a bigger barrier for recoverees. Even outside of the SUD context, eliminating downloads and making it easy to create an account are important features to increase signups [7]. The effect may be exacerbated in this population. One study of telehealth platforms found that the biggest barriers to adoption were usability issues during installation and account creation, implying that minimizing or eliminating these steps would have the biggest impact on successful adoption [7].

Commercial applications for SUD telehealth have implemented this strategy widely, especially on the recoveree side. It is common for apps to not require an account, or only require

an account for some features so the user can explore the app before committing to a sign-up process. One example of a telehealth platform that has prioritized simple startup design is Doxy.me, which is a HIPAA-compliant video conferencing and messaging platform that is browser-based (requiring no downloads) and requires no account on the client side. Clients need only go to the URL of their provider's waiting room, which is intended for use on either desktop or mobile. The provider side does require an account for privacy purposes but again is designed to minimize effort during start-up. This strategy does have some costs, e.g., clients cannot access any message history or other private records, but the increased accessibility may be worth the tradeoff.

3.7 Conclusion

Communication between professional support and recoverees is of critical importance; it can even be a matter of life or death. However, this communication occurs under constraints: support professionals are often operating under extreme time constraints, and recoverees have a host of barriers, such as transportation issues, that can hinder their access to care.

Telehealth options have been proposed across many domains of healthcare as a way to make communication easier. Distance communication such as phone calls, videoconference, and text-based messaging can increase accessibility to SUD support by removing distance barriers and offering flexible communication that can better fit into the busy schedules of recoverees and support professionals alike. In some situations, distance communication can even be an advantage: it affords a psychological distance that can reduce anxiety and make it easier for hesitant or nervous recoverees to access care.

The participants in our interviews were eager to have better distance communication options, even before COVID-19 made distance communication a necessity. However, they also

emphasize repeatedly that distance communication was useful as a supplement, not a substitute. This is because for some situations, and some people, the affordances of distance communication become more of a liability than an asset: the psychological distance can make recoverees feel isolated from their supports, and cumbersome technology solutions can be more trouble than they are worth.

One thing that is particularly interesting about these interviews is that they occurred across the COVID-19 pandemic: before, during early quarantine, and in 2021 after people had adjusted to socially distanced life and were just beginning to return to more in-person activities. Though devastating in many other ways, one advantage of COVID-19 was that it created a unique context for evaluating technology adoption. The pandemic forced the rapid adoption of distance options at every stage of treatment and recovery care. Both providers and clients were motivated to make these technological adaptations work for them because technology was the only pathway for delivering support, making it easier to differentiate between issues due to technology adoption hesitancy, design problems, and more fundamental issues with delivering care at a distance. These results suggest that many perceived barriers to telehealth are solvable with proper design, especially the challenges in accessibility. The more fundamental issues, related to psychological distance, appear to be less possible to design away; however, a communication ecosystem that allows recoverees and support professionals to move between in-person and distance communication affords them the flexibility to choose what communication method works for them.

Chapter 4 Resource Access

4.1 Introduction

Online spaces are an important source of recovery information. Participants in my interviews used technology to access resources such as support meeting calendars and information; social services and charities; AA information and readings; and general recovery advice. Focus groups in the early stages of the design of a mobile app for Parkview Health peer recovery coaches and recoverees consistently ranked resource access as one of the most desired features in a mobile app [184].

These resources are not centralized. They are spread across social media, organization websites, discussion forums, and mobile apps. Resources such as food bank events, discounted bus fare, beds in halfway houses, and mutual support meetings were less accessible online to recoverees, often requiring professional assistance. Support professionals said they gathered this information with a mix of phone calls to local services, government websites, and organization pages on social media sites.

In comparison, the apps for SUD recovery in the commercial app analysis had two main categories for resources: meeting finders and digitized versions of recovery-related readings. Five apps were designed specifically as meeting finders, with six more having a meeting finder feature, making a total of 20% of apps with that capability. Forty percent of apps had some kind of static resources, usually AA/NA readings or other content related to AA/NA.

Information access is an important puzzle to address in the context of SUD recovery, specifically because small failures in information (e.g., outdated meeting times or confusing

navigation) can have severe effects on the information seekers. Relying on bad information can cause a recoveree to feel lost and unsupported – and could ultimately lead them to disengage from the recovery community. Meanwhile, support professionals often do not have time to seek and verify these information sources for their clients. In this chapter, I review the opportunities and challenges related to using digital tools to improve access to information resources during SUD recovery.

This chapter is arranged into sections. The top levels refer to the technical capability or feature under discussion. Under each of these are sections labeled O.x, referring to opportunities, and C.x, or challenges. The chapter concludes with a section on strategies (S.x) that help maximize the opportunities and minimize the challenges.

4.2 Instant, remote updating

Keeping resources online makes it possible to have remote access for updating, with updates instantly visible to everyone doing remote read access. This contrasts with having a list of support meetings on paper, for example, which would need to be retrieved, updated, and disseminated manually.

4.2.1 O.1: Timely information

Summary: Online information resources can be updated quickly, especially important for resources that need to be updated frequently such as meeting finders or other event listings.

Keeping an up-to-date listing of mutual support meetings for recoverees is one task that online tools are particularly suited for because they can be updated quickly and the changes distributed instantly. AA and other peer support groups are often organized locally and actually

resist centralized organization, which can make it difficult for people who are new to recovery or people who are looking for meetings in a new town [243].

Another important source of timely information online is social media sites. Support professionals in our interviews mentioned Facebook particularly as a place to find up-to-date information about relevant events and resources for their recoverees. Said one support professional: *“On Facebook I have been able to be up to date on food resources, shelter resources. Like the resources I’m constantly giving out, I’m literally getting in real time from Facebook [...] to just have that right then and there and I can screenshot it. I can send it out to like 10 people [...] if I know that they live close to that”* (D1-SP8). The resources participants mentioned finding on social media included sober events, food bank times, and meetups for new moms. Research on the use of social media by nonprofit organizations and social services has found that social media provides essential tools to these organizations, most notably community engagement and information dissemination [97].

4.2.2 C.1: Unnoticed updates

Summary: Uncertainty about when information was last updated can be very demotivating for recoverees because they are not sure what information to trust.

Like any database, online resources for SUD recovery can expire: meetings change location or times, contact numbers for social services changes, etc. Having outdated information – or even the uncertainty of possibly outdated information – can make online resources much less useful.

Reviews of meeting finder apps showed that this was a major issue for their users. Nearly every negative review of meeting finders brought up issues with outdated information, e.g.:

“I have now gone to a fourth location in 3 days that this app sent me to, and the times are wrong, and or the addresses are wrong. I don't understand what is wrong with the developers of this app. We are using the app to literally save our lives, and these developers for some reason aren't willing to provide accurate information to help us save our lives.” (user review, Pink Cloud)

Because AA/NA and other support group organizations are decentralized, there is no centralized database from which to easily draw updated information. Instead, these meeting finder apps rely on a piecemeal system of local websites and volunteers to provide updates. The problems come when this piecemeal system fails to notice an update, and their information expires without warning to the end user of the meeting finder.

One reviewer who said that they were involved in AA administration attributed this to issues with volunteers updating the information: *“Not as good as the central office guide online or in print guide... It's hard to prove to app fans that the old way is more thorough. I handle 2 central offices. Volunteers aren't always reliable.”* (user review, Meeting Guide) This problem with outdated meeting times has been identified in previous research [10,12].

4.3 Anyone can publish

Online platforms give anyone the capability to publish content that people can access, whether it be text, images, or video. Platforms such as Reddit and Youtube give everyone a voice; many independent websites disseminate recovery information, for example, those created by residential treatment centers. This makes for a rich, but sometimes confusing, information environment.

4.3.1 O.2: Diverse recovery information

Summary: Recoverees can find a diversity of information that makes it easier to find a mode of recovery that works for them.

Digital resources make it possible for recoverees to access diverse recovery information that is not constrained to locally available recovery programs. Everyone has a different recovery journey, with many different possible pathways. Finding the right recovery space can take time, and limited options can make it difficult to explore, as D1-SP4 described:

“There are times that I feel like being in recovery in very rural areas, where you only have one provider, sometimes they feel like they have to do [recovery] on their own [...] [in my area] I can walk out the front door and spit on six recovery places right now. [...] I can say, ‘hey I went to Avenues and felt accepted,’ or ‘I went to Parkview and I didn’t jive with them.’ There’s a lot more providers.” (D1-SP4)

Sometimes this exploration means finding a different recovery approach altogether. Twelve-step groups are perennially popular, but do not work for everyone [75]; an individual may prefer the explicitly secular Self-Management and Recovery Training (SMART) recovery, the Buddhist Refuge recovery, or some other recovery tradition. Further, minority groups may have to search further than their local 12-step group to find acceptance and culturally relevant recovery advice (e.g., LGBTQ+, veterans, Natives). Most of the meeting finders in the app store have a filter function that allows app users to find specialized groups, and many of the reviews mention this filtering capability as being important to them to find groups where they feel safe.

4.3.2 C.2: Information overload

Summary: There is so much recovery information available online that it is hard to sort through it all.

The many different approaches to SUD recovery, and the many different resources available, means that recoverees and potential recoverees are left with a lot of information to sort through.

On a macro level, recoverees may struggle to find what recovery approach would work best for them. For example, AA/NA 12-step groups are the most popular recovery approach, but some of them take an abstinence-only approach to recovery that can be unforgiving and alienating to people who do medically-assisted treatment (MAT) or who prefer a harm reduction approach. Previous research has found that recoverees often report feeling information overload early in recovery [194].

On a micro level, the effects of information overload are also visible in some user reviews of meeting finders, where some interfaces are difficult to understand and leave their users frustrated and confused, for example: “*When u search [for] zoom [meetings], they’re not organized, nor can they be filtered by timezone, so I need to scroll thru 100s of posts til I can find the occasional [meeting] in my timezone and they’re not even all in 1 section.*” (user review, NA Meeting Search) Information overload can be particularly dangerous for recoverees because it amplifies feelings of frustration and helplessness, which may drive them away from important resources.

4.3.3 C.3: Misinformation and non-authoritative sources

Summary: Some information online is wrong, either because it is not evidence-based or because it is outdated.

A lot of recovery advice is a mix of personal experience and evidence-based practices. Especially in peer forums on social media such as Reddit, there is little to no vetting of the information that is shared. This could lead to incorrect information, rumors, and clinically

dubious treatments gaining traction in a recovery community, even if it is not evidence-based practice.

One example of this that has been studied in previous research by Chancellor et al. is the spread of information about alternative treatments online, i.e., treatments for SUD that are “clinically unverified and medically unsupervised” [55]. This research identified several alternative treatments that people used to help with cravings and withdrawals from opioids, most prominently kratom. These alternative treatments are not by definition misinformation, and the authors of that research argued that this could be a valuable way to identify undiscovered treatments for SUD. However, this is leading recoverees to make medical decisions without medical supervision and with information that is certainly not clinically verified. Depending on the source, it may underestimate the risks or overestimate the benefits of the alternative treatment, making it impossible for a recoveree to make a fully informed decision.

The diverse and open sources of information about recovery may help recoverees find a recovery path that works for them, but it also leaves them vulnerable to unverified and potentially harmful information. It could also drive them away from clinically proven interventions, a phenomenon that has been observed in misinformation surrounding MAT treatment. The myth “You are not really in recovery if you are on Suboxone” is believed to be one of the major reasons that individuals hesitate to enter MAT, even though it has been demonstrated to be an effective method for recovery [110]. El Sherief et al. demonstrated that this myth continues to spread across online health communities [81]. Though there is no research demonstrating that this misinformation has led to lower MAT uptake, a sentiment analysis by Chenworth et al. found that less than 20% of tweets mentioning MAT medication were positive,

suggesting that this myth may have a measurable impact on the choice to enter a MAT program [57].

4.4 Aggregators

Aggregation sites and apps collect information resources from various sources and put them in one place, removing some of the work of searching. This makes aggregators a convenient one-stop shop, often with features that help people sort through the information there. However, the aggregators can fail to update their information, and the uncertainty of expired information can quickly make these aggregators useless.

4.4.1 O.3: One-stop shopping

Summary: Aggregators make it easier for individuals to find the information they need by gathering it all in one place.

Aggregators have the potential to communicate up-to-date, timely information about support meetings (e.g., AA groups) and other social services. Having everything in one place is an important convenience for recoverees and support professionals alike. Focus groups in the early stages of the design of a mobile app for Parkview Health peer recovery coaches and recoverees consistently ranked resource access as one of the most desired features in a mobile app [184]. For the peer coaches especially, they wanted a shared repository of resources for peer coaches and recoverees because it was much easier to keep resources up to date in a common online database instead of the current method of passing around photocopies of local 12-step meetings and other information.

Some commercial apps have been deployed to address this need, particularly around finding meetings. User reviews consistently praise the convenience of having the information all in one place: “*Sometimes when traveling I find it's when I need a group the most! ... As convenient as the Starbucks locator, now I can always find my nearest CR meeting!*” (user review, Celebrate Recovery) Meeting finders eliminate the need for recoverees to go searching for information about local chapters and where they might be meeting; everything is already gathered and presented to them in the meeting finder app.

4.4.2 O.4: Personalized, filtered views

Summary: Many aggregators have filters and other features that help people sort through the information and find what is most relevant to them.

Aggregators usually have some kind of filtering or other personalization features to help individuals navigate their information. Four of the five dedicated meeting finder apps are for AA or NA meetings and one is for a Christian 12-step group called Celebrate Recovery. The search features of these meeting finders are basically identical: they allow users to search by location; list the meeting name, time, location, and description; and in most cases have some kind of filtering (e.g., LGBTQ, meditation). Some also have further instructions on how to get into the building and find the room where the group is held (see Figure 3 for example, from the Meeting Guide app created by AA).

User reviews of meeting guide apps give an indication of what features users find important, for example:

“What a wonderful surprise. After moving to a new area, one of the first things I did was research new meeting locations. I was pleasantly surprised to find this AA meeting finder app. What a great way for Alcoholics Anonymous to step into the 21st Century and

provide our younger (in heart and in age) members with a[n] easy, fast way to look for up-to-date meeting locations that include Zoom links. With our ‘new normal’ reality of social distancing and spur-of-the-moment changes, it’s of ultimate importance that our community help 12-step members find the information they need.” (user review, Meeting Guide)

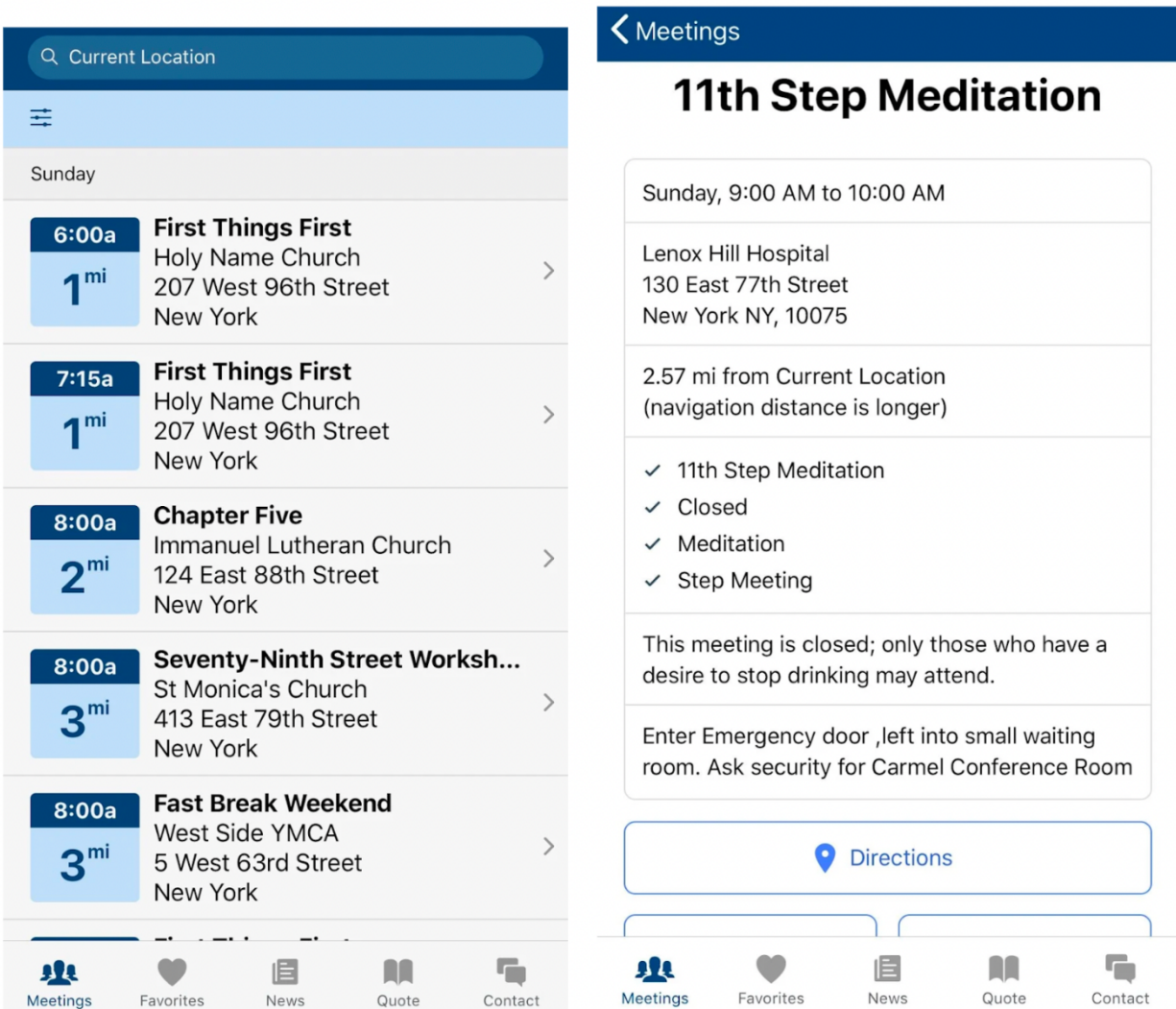


Figure 3. Screenshots from the app Meeting Guide by AA that shows what kind of information is included in the meeting listing (screenshots taken from the app store listing; information is not live).

These user reviews are illustrative of what features were most often mentioned as valuable to recoverees: finding meetings when in a new area, up-to-date information, and convenient access. Users also liked having detailed information that made getting to a meeting more convenient, such as integration with Google Maps and detailed instructions on how to get to the specific meeting room and what to expect. Recoverees in previous research have said that these are all important elements in connecting people to support meetings, especially newcomers because there is a chance of them becoming frustrated and losing faith in the program [194]. Reducing frustrations and barriers to getting a recoveree in the door to a meeting may be critical in helping them maintain their recovery. As one user review said of the Meeting Guide app, “Loved it since it came out. Newcomers can't say they didn't have a where & when.”

4.4.3 C.4: Out-of-date aggregated information

Summary: Out-of-date information can quickly render an aggregator useless, especially when the aggregator is not transparent about the source of the information or when it was last updated.

As discussed in C.1 Unnoticed updates, out-of-date information – or even the possibility of it – can be very damaging to the usefulness of an aggregator. One example of this is found in a user review of a meeting finder:

“It is useful sometimes, but since the pandemic started, a year and a half ago, it has been a roll of the dice as to whether the meetings actually exist or not. So many times I have driven to a location only to find there is no meeting. I had this problem in metro Atlanta and now in metro Nashville. They aren't being updated. Also, many times there is no information as to where inside the building, church, etc. to go. No contact info to verify either.” (user review, Meeting Guide)

As the user says, the information is out of date and there is no way to independently verify the accuracy of the information (i.e. no contact information). When users cannot trust that the information being aggregated is accurate, the aggregator loses much of its power, because the user ends up needing to trace the information back to the source to verify it. Many aggregators are not transparent about the provenance of their information which makes it difficult for users to trace the source. Further, just because the aggregator is scraping for updates does not mean it is successful: in response to one critical review about outdated information, the developers of Meeting Guide said their app updates information every thirty minutes. However, it was failing to capture accurate information, perhaps because the scraper was inaccurate or one of their sources had gone out of date.

Outdated information is a challenge for other types of information, as well. Peer recovery coaches in our interviews said they spend a lot of time making phone calls on behalf of their clients looking for a free bed in a sober living facility or residential treatment center. The information changes very quickly, and participants explained free spots in these facilities go quickly because of high demand; consequently, the most effective method for coaches to get this information is to make phone calls around to area facilities. Even though it is not an efficient use of their time, it is the only way that they can get reliable, up-to-date information to pass along to their clients.

4.5 Strategies

4.5.1 S.1: Human information guide

A recoveree, especially one first entering online recovery spaces, might easily be overwhelmed by the challenges of accessing resources (i.e. outdated information, information

overload, misinformation). They may also not know the right keywords to find the information they need. This is a challenge that recoverees also face offline, but is amplified in online spaces.

Recovery programs often address this challenge with human information guides, namely positions such as sponsors, peer recovery coaches, and social workers who among other things are tasked with helping recoverees navigate these new information spaces. This emphasizes the importance of human information guides in the SUD recovery journey: recoverees often have not just one, but a network of human informational supports who help the recoveree navigate different information spaces. Having a human expert can help a recoveree by a) knowing what information resources are available and b) guiding the recoveree to reliable, high-quality information. They can also help a recoveree do the tedious work of information gathering that might otherwise prevent a recoveree from accessing the resources they need; e.g., calling around to different rehab facilities to find which ones take the recoveree's health insurance. Providing informational support in this way is one of the pillars of SAMSHA's definition of peer recovery coaches, along with emotional, instrumental, and affiliational support [198]. It is also a critical part of outreach. The support professionals from the HART outreach team said that one of the most important parts of their jobs was simply removing informational barriers between an individual and recovery: helping them look for health insurance, giving them phone numbers to call for resources, etc.

4.5.2 S.2: Cross-checking information

Cross-checking information is an important strategy for fighting outdated information and misinformation; i.e., verifying information from other sources. For recoverees, it is important to cross-check; for support professionals and designers, it is important to support recoverees' ability to cross-check by teaching recoverees cross-checking strategies and providing

tools to help them do so. For example, app designers of meeting finders could include contact information for meeting organizers, or display the date of when the meeting information was last updated.

To combat bad information or misinformation related to SUD recovery, we can draw from strategies used to combat misinformation in other domains. Misinformation researchers have identified lateral reading as an effective fact-checking tool [239]. Lateral reading is a strategy used by professional fact-checkers where instead of reading into a website deeply to determine its credibility (called vertical reading), they instead go to other sources to check the credibility of the information and its source [43,239]. Studies have shown that teaching lateral search strategies to students can combat misinformation related to COVID-19 [42] and immigration [43].

4.5.3 S.3: Pushing updates

To address the issue of outdated information, it is of course necessary to keep the information in knowledge repositories updated. Equally important is to signal to users that information is being kept up to date so there is no uncertainty about whether the information has expired. Previous research has addressed possible solutions to keeping knowledge repositories updated for SUD recovery, specifically with keeping support meeting lists up to date; though the same basic principles can be applied to any repository with information that needs to be updated frequently, e.g., charity events or availability at sober living homes.

With SUD resources, the particular challenge to keeping information up to date is that it is often not centralized. There is no single place where all AA/NA meetings are listed, for example; and depending on location, social services may be provided by a patchwork of government, non-profit, and religious institutions (see Figure 4 for an example). To address the

challenge of keeping meeting lists up to date, researchers have proposed a semi-automated process of scraping meeting data from local and regional websites with meeting information and then using crowdsourced workers to validate the information [194–196]. This research found that crowd workers recruited from an online recovery community were significantly more accurate in their data validation, compared to workers on Amazon’s crowdsourcing site Mechanical Turk (MTurk), both general MTurk workers and MTurk workers with 12-step experience [195]. The researchers theorized that these community-based volunteer workers were most accurate because they have the contextual knowledge necessary to interpret meeting information and because they were motivated by a drive to provide service to the recovery community; however, the drawback was that this group took longer to recruit than paid workers.

Another possible strategy for updating meeting times, after doing the initial work of populating the meeting list, would be to go directly to meeting organizers, obtain contact information for a meeting organizer, and then periodically texting/emailing them to verify that the meeting information in the repository was still up to date. This strategy comes with its own challenges, as many meetings may not have any contact information accessible or the contact information itself will go out of date. To an extent, this lack of contact information is built into the ethos of AA: anonymous, mutual help.

MEETING TYPE FACE TO FACE (FOR ONLINE/VIRTUAL MEETINGS-SCROLL DOWN TO LIST BELOW)

Search:

Name	Location	Address	City	Time	Day	Type	Special
11th Step	Washtenaw Alano Club	995 N. Maple Rd.	Ann Arbor	11:00 AM	Sunday	C,D,X	In Person. Mask Optional. (Rm. 1 & 3)
12/12 and Big Book Study	Washtenaw Alano Club	995 N. Maple Rd.	Ann Arbor	7:30 PM	Wednesday	C,D,X	In Person. (Rm. 3) Mask Optional. Info: 734.668.8149
5:35 Fellowship Zoom	Online Only.		Ann Arbor	5:35 PM	Friday	C,D,X,TX	Canceled.
A New Way of Living	Online Only.		Ann Arbor	7:30 PM	Friday	O,D,LGBTQ,TC	Canceled.

Figure 4. A snippet of meeting finder results from one of the Ann Arbor 12-step organizations.

Another important aspect of keeping repositories up to date is signaling to their users that the information is up to date and trustworthy. One easy way to do this would be to simply include a field in the search results that displays the last time the information was updated and verified. Another strategy might be to accept user feedback in the repository so people can report if the information is correct, incorrect, or outdated, similar to how users can report businesses as permanently closed in Google Maps, for example. User reviews of meeting finders show that in the absence of clearly verified information, app users use secondary signals to judge the quality of the meeting data: duplicated meeting listings, the app asking for money, and bugs in the user interface were all mentioned in user reviews as indicators of low information quality.

Though this strategy has most frequently been studied in the context of meeting finders, the same basic semi-automated system could be applied to other contexts, as well. The level of automation achievable may vary considerably, or the speed of information turnover may affect how accurate the information is because of how quickly it expires, but the same basic structure could apply for anything from tracking food bank events to available beds.

4.5.4 S.4: Provenance indicators in aggregators

A weakness in aggregators such as meeting finders, lists of available social services, etc. is that it is not always clear where they are getting their information and when it was last updated. This makes it difficult for viewers of the information to be able to trust it. One simple strategy app designers and resource publishers could implement would be adding provenance indicators to their information. For example, a meeting finder could add a time stamp to each of their meeting listings that indicates when the information was last updated from the original source.

A second important indicator would be stating where this information is retrieved from in the first place. Meeting finders tend to aggregate their meeting information from a patchwork of different local websites and other meeting aggregators. If one of these sources is poor quality or is out of date, listing the information source would help app users determine which meetings are more or less likely to be accurate. Without this website source, they may be more likely to distrust all of the information in the aggregator even if the inaccurate information is coming from just one or two sources.

4.6 Conclusion

Online resources open up a world of information. Recoverees and support professionals can access more information, from more diverse sources, that can be updated instantly and filtered/aggregated. As always, however, this open world of information adds the risk of misinformation and non-authoritative sources, and the sheer volume of information can be overwhelming. This can be particularly harmful to a recoveree, who is likely already operating under extreme stress while navigating new, unfamiliar territory. These frustrations can easily become demotivating and cause a recoveree to disengage.

To navigate the many online resources available, recoverees and support professionals need a toolbox of strategies that help them sift out high-quality, up-to-date information. This toolkit includes other people – human information guides who know how to find good information – as well as personal strategies of cross-checking information. Publishers of recovery resources can help recoverees and support professionals by signaling that their information is up to date and trustworthy; for example, by including information showing viewers when support meeting times were last updated. In the current information ecosystem,

good information can get overlooked and bad information can propagate. A more robust system of verifying trustworthiness can do a lot to help sort through the wealth of information available.

Chapter 5 Self-guided Activities

5.1.1 Introduction

Most of the topics covered in this dissertation so far have been about how technology can connect recoverees to people and networks: friends and peers, support professionals, and service organizations. In this chapter, I will discuss how technology supports self-guided activities: recovery work that can be done independently such as therapeutic exercises and self-monitoring. Many commercially available SUD recovery apps have an extensive feature list of self-guided activities, though in a lot of cases they also offer ways to share the data with a support professional, in some cases even having an entire separate clinician-facing interface available.

This chapter draws heavily on Data source 4, the design space analysis of commercially available SUD recovery applications. The sections in this chapter are based on the most commonly-found features in these apps. Many of these are features common in other types of health behavior change interventions: self-monitoring, daily commitments, etc. I discuss the role of each in the context of SUD recovery, and how the recovery context affects how particular design choices might be more or less effective.

This chapter is arranged into sections. The top levels refer to the technical capability or feature under discussion. Under each of these are sections labeled O.x, referring to opportunities, and C.x, or challenges. The chapter concludes with a section on strategies (S.x) that help maximize the opportunities and minimize the challenges.

5.2 Self-monitoring

Most of the commercially available apps for SUD recovery include some kind of self-monitoring feature. Some of this is part of the Alcoholics Anonymous (AA) tradition, where keeping track of sober time and celebrating sober milestones is an important part of the program. Some apps include more comprehensive self-monitoring such as mood, activities, and triggers. Even before the rise of digitally-aided tracking, self-monitoring emotions and behaviors as a method of raising self-awareness has been a goal in “analog” treatment for a range of mental health issues since 1970 [59,136]. Self-monitoring is also a common component in cognitive behavioral therapy (CBT).

In the context of SUD, self-monitoring is often used as a tool to 1) raise motivation and/or 2) guard against relapse by helping recoverees recognize emotional states, people, activities, and environments that put them at a higher risk. Technology seems like a natural medium for self-monitoring interventions, as it can be a convenient way to record and summarize data. Further, technology has the potential to deliver ecological momentary assessments (EMAs), which are intended to repeatedly sample a user’s experience in real time, in their natural environment. EMAs have been touted as a way to gather more accurate data for clinicians, an improvement over self-reports during clinic visits[204]. SUD recovery apps have a few instances of EMAs being used, but brief daily check-ins or reviews are much more common.

I will briefly describe the different types of self-monitoring features present in SUD recovery apps before going into the opportunities and challenges of self-monitoring for recovery.

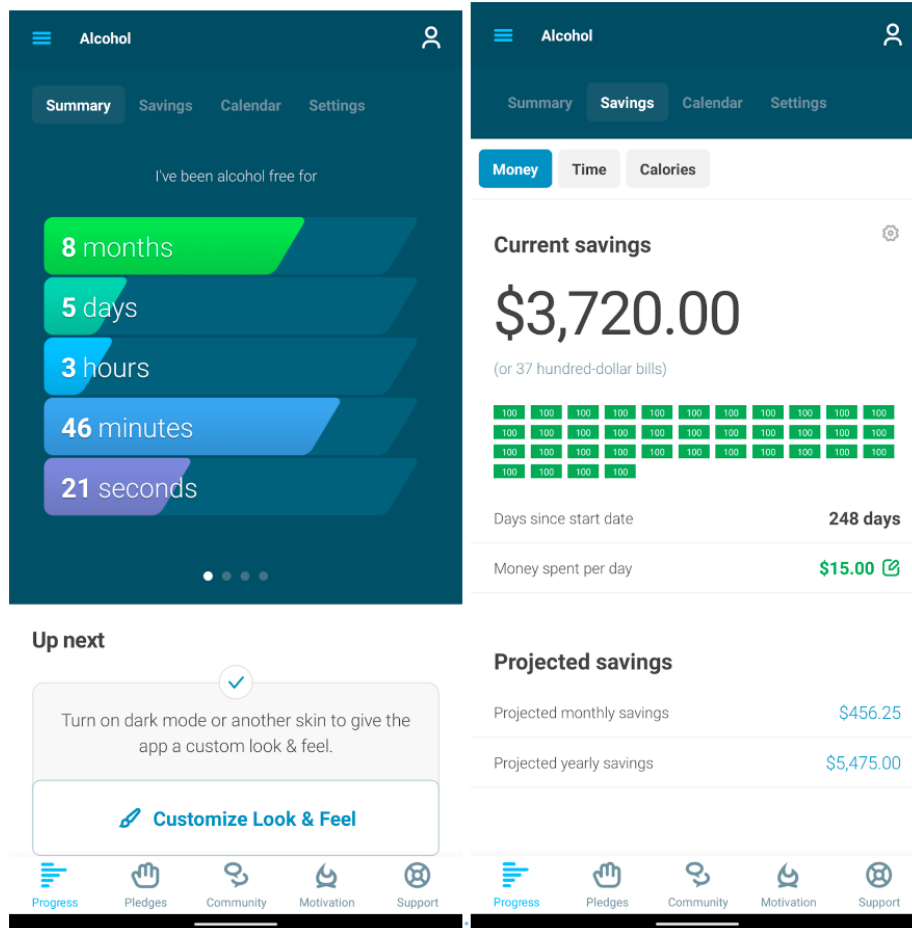


Figure 5. Screenshots of I Am Sober's sobriety timer in two different units: time and money.

Sobriety timers: Sobriety timers are a common feature in recovery apps, with 60% (33 of 55) including a sobriety timer. The sobriety timers in commercial apps are straightforward: a user enters a start time, and the app tracks from there (see Figure 5 for an example from the popular app I Am Sober). In addition to tracking sober time, some apps also present sobriety in terms of money saved, time saved, heartbeats, drinks skipped (for alcohol) or calories saved (for alcohol). One limitation of sobriety timers is that they assume abstinence, which some models of recovery try to de-emphasize. Some apps use alternate framing to side-step this issue, for example Four Streams Coaching tracks days of “progress” (nonuse) and “setbacks” (use), which allows users to track their use without framing a relapse as a failure that resets the sobriety clock.

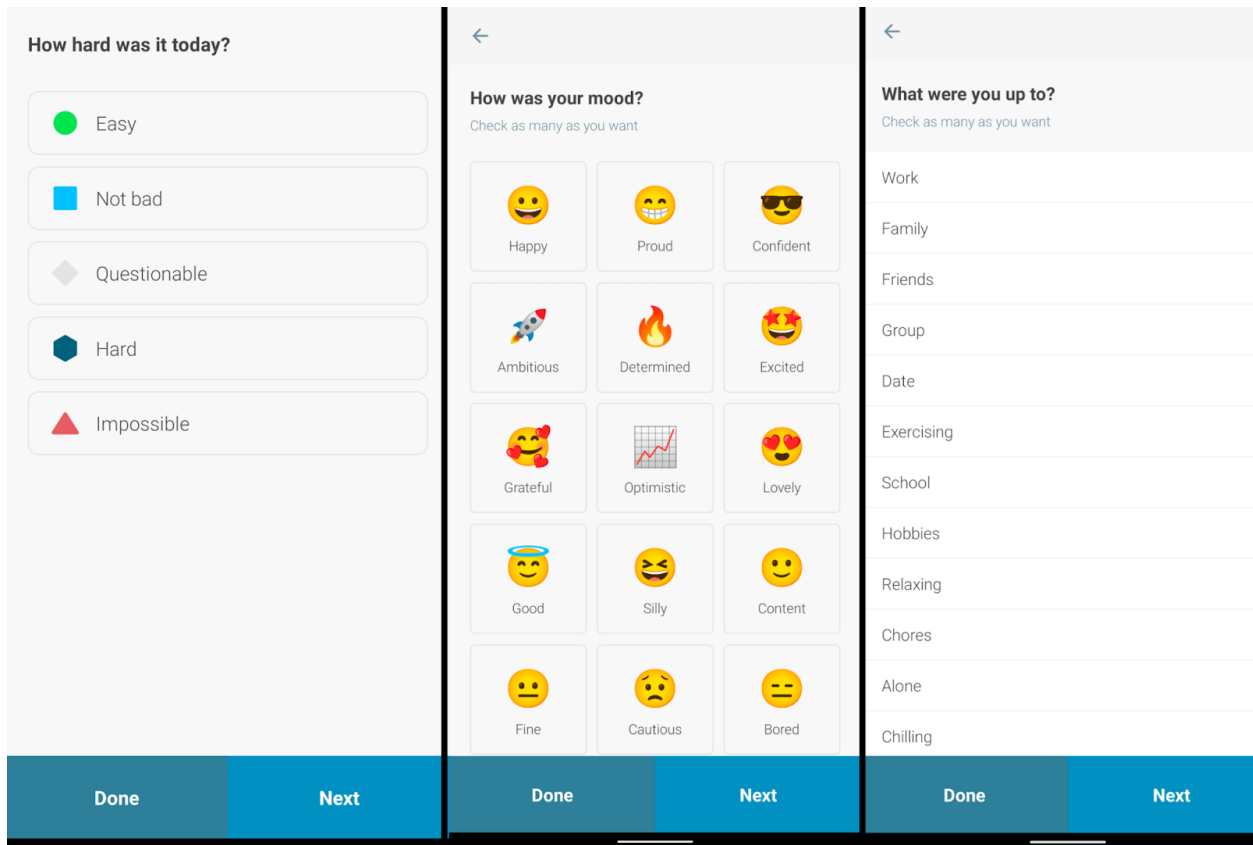


Figure 6. An example of a quick check-in from *I Am Sober* which focuses on gathering just a few important variables.

Other self-monitoring: Other types of self-monitoring mostly fall into one of four categories: emotions, activities/actions, external environment, or physiological data (See Table 5 for a complete list). In all, 36% (20 of 55) of recovery apps offered self-monitoring beyond sobriety timers. The detail captured in the self-monitoring varied widely from app to app, with some emphasizing quick check-ins and others emphasizing comprehensive records (see Figure 7 for an example that focuses on being comprehensive). Oftentimes, these are accompanied by some kind of summary data that is meant to help users identify patterns and gain insights that will help them maintain their recovery.

Dysfunctional Thought Record ⚙️

Describe the situation or event

Automatic thoughts ⓘ

Belief in automatic thought at the time

0	1	2	3	4	5	6	7	8	9	10
---	---	---	---	---	---	---	---	---	---	----

0. No belief 10. Extremely strong

Emotions

SELECT

Identify distortions

- All or nothing thinking ⓘ
- Overgeneralization ⓘ
- Mental filter ⓘ
- Discounting the positives ⓘ
- Mind reading ⓘ
- Fortune telling ⓘ
- Personalization ⓘ
- Magnification or minimization ⓘ
- Emotional reasoning ⓘ
- "Should" statements ⓘ
- Labeling and mislabeling ⓘ

Alternate rational or realistic thoughts

Belief in alternate thoughts

--	--	--	--	--	--	--	--	--	--	--

Submit

Figure 7. An example of one of the more in-depth check-ins available, from Recovery Path. This is one of several detailed inventories available in the app; this is one of the shorter inventories.

Table 5: Types of self-monitoring variables

<i>Emotions/interior states</i>	<i>Activities/actions</i>	<i>External environment</i>	<i>Physiological data</i>
<ul style="list-style-type: none"> • Mood • Intrusive thoughts • Cravings • Urges • Difficulty of the day • Motivation 	<ul style="list-style-type: none"> • Work, school, relaxing, etc. • Self-care • App engagement • Therapy activities • Drug refusal • Drug use • Money spent 	<ul style="list-style-type: none"> • Triggers (activities, times, locations, people) • Social support • Material resources (e.g. housing, employment) 	<ul style="list-style-type: none"> • Breathalyzer • Drug tests

5.2.1 O.1: Compile insights to identify patterns

Summary: Self-monitoring data can be summarized to identify patterns that are only apparent in the aggregate.

The data gathered through self-monitoring presents an opportunity to summarize information that can help the recoveree surface insights that are only available in the aggregate, allowing them to identify patterns and raise self-awareness in how their mood and activities affect cravings and drug use. At least in theory, these data could also be used to tailor things such as in-app therapeutic activities or suggestions for resources.

In commercially available apps, these summary insights are often fairly simple; for example, a chart with time as the x-axis and mood as the y-axis. The app I Am Sober presents summaries of daily check-ins as seen in the left image in Figure 8, where summaries of mood and activity are divided according to users’ rating of the day’s difficulty (5-point “Easy” to “Impossible”). SURE Recovery, an app developed by researchers at King’s College in London, has the most comprehensive summary in the form of a “SURE score” based on a 63-item inventory across five categories (right image of Figure 8). These two examples are among the

few apps that compile insights for recoverees beyond a basic graph. Several more claim to have similar features in development but do not appear to have been released.

The idea behind these summary insights is to surface knowledge that is only visible in the aggregate. To use the examples of the previous paragraph, I Am Sober’s summaries might help a recoveree notice that they are most triggered to use when they are alone and feeling bored; the “SURE score” (Figure 8) takes many different aspects of recovery and condenses them into five dimensions to help a recoveree reflect. For recoverees who are working with a support professional, these summaries can give the professional an at-a-glance summary of what is going on with their patient that is more detailed and more accurate than asking a recoveree to remember and summarize events and emotional states since the last time they met.

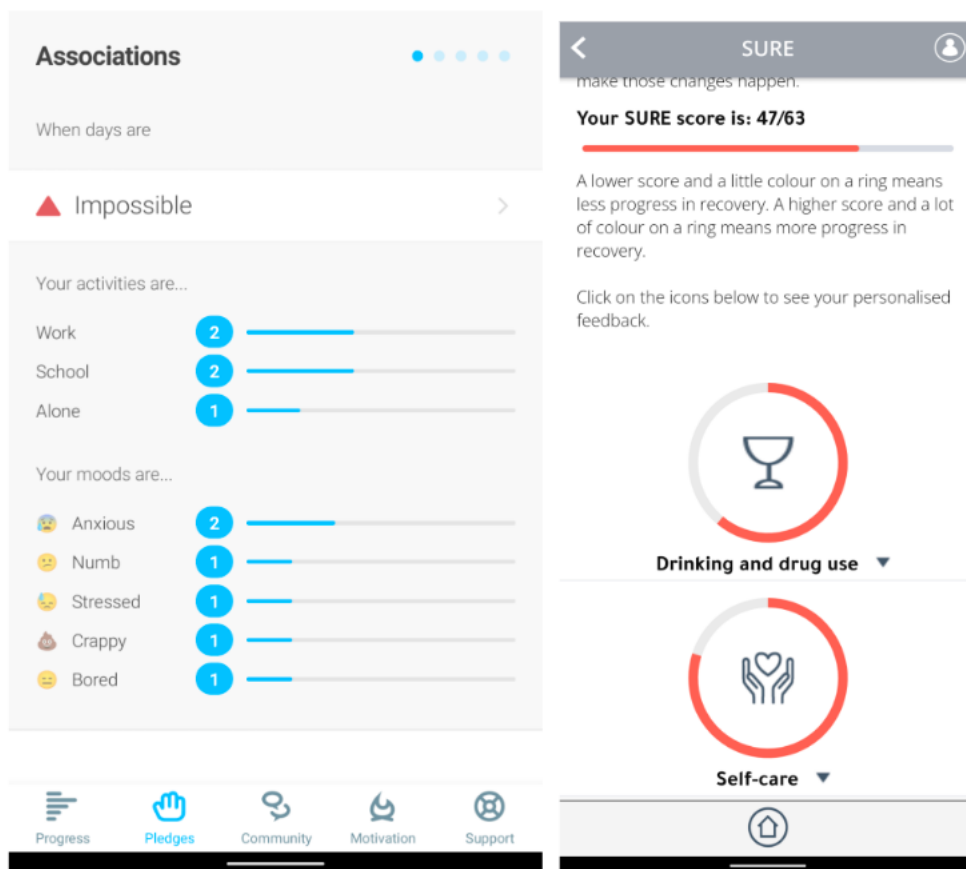


Figure 8. Snippets of I Am Sober’s summary insights (left) and SURE Recovery’s SURE score (right).

5.2.2 O.2: Act of entering data raises awareness

Summary: Simply paying attention enough to enter self-monitoring data may be enough to get the payoff of raised awareness.

It may be that these summary visualizations are not particularly important; that is, the “active ingredient” in self-monitoring for SUD recovery is the act of entering data itself, and reflecting on it during input. Research into self-monitoring for mental health has indicated that it can increase emotional self-awareness (ESA), the ability to identify one’s own emotions and self-regulate. Low ESA is present in a number of mental health issues, including anxiety, depression, and substance use disorder. Raising ESA is thought to be one of the main mechanisms by which self-monitoring improves wellbeing.

Self-monitoring has been a technique for mental health treatment for decades, long before smartphone apps made personal informatics so popular [126,136]. This analog self-monitoring included techniques such as diaries, forms of self-monitoring that do not easily afford the creation of summary statistics. These forms of self-monitoring make the data collection the point, rather than simply a chore in service of the summary. Further, reviews of SUD recovery apps make no mention of the summary charts being unsatisfactory, even though most of them are fairly basic; the reviews that include mention of self-monitoring features instead focus on how they appreciate daily check-ins that nudge them to reflect on their emotions and activities.

“I like all of the options for goals, check-ins, and trigger logging/preparing for... Been very helpful during moments of cravings, urges, or distress to refocus on positive thinking and sticking to my plans” (user review, Recovery Path).

“I love the gentle questions that prompt me to plan action steps each day to protect my recovery. The act of writing them down in the morning, and checking back in with this app in the evening, inspires me to keep my word to myself. It feels as if I have a caring coach in my corner cheering me on as I take my power back from the addiction that had me down. (user review, Recovery Path)

It is important to determine where exactly app users are deriving their value from self-monitoring data because it affects design implications. If the primary value of self-monitoring comes from reflecting on summary data that surfaces patterns for the app user, then the focus should be on reducing the burden of manually inputting data and creating meaningful summaries. If, however, the primary value comes from raising awareness of emotions and behaviors in the present moment, then automatic passive data gathering could undercut its effectiveness. In this case, it is not as important to create detailed summaries of the self-monitoring data, and the summaries might instead be thought of as simply an incentive to get people to regularly engage in self-monitoring.

5.2.3 C.1: Manual entry is cumbersome & time intensive

Summary: Manual entry of self-monitoring data is inconvenient and can cause people to abandon the activity.

The challenge for SUD recovery self-monitoring, and personal informatics for mental health generally, is that many of the relevant variables are experienced internally. Consequently, the burden for measuring and recording these data points will fall largely on the recoveree. In other domains of personal informatics, such as physical activity, there are straightforward methods for automatically measuring relevant variables (pedometers, heart rate monitors). For the variables commonly gathered in SUD recovery apps (Table 5), there are only a few that

could feasibly be automated, such as geotracking to tag activities like work and school. This means that recoverees must invest time and effort into gathering this data themselves; and depending on what variables they are recording, this data entry can be tedious and burdensome. The detailed check-ins from Recovery Path for example can take 15-20 minutes to fill out.

Personal informatics research has found that the inconvenience of having to input data causes people to abandon self-monitoring technology [62,65,82,141]. For self-monitoring ranging from financial to physical activity, former users of self-monitoring technologies said they abandoned tracking because it became too much work to keep up the monitoring, and the knowledge produced from it was not worth the effort put into the data collection. These research studies included automated self-monitoring (pedometers, credit card spending), and even with these automated methods people often found the data collection too cumbersome to bother with for the long term [141].

5.2.4 C.2: *Summary insights may be redundant*

Summary: The compiled insights from self-monitoring data may not produce any new information for recoverees.

In addition to the inconvenience factor, one of the common reasons for abandoning self-monitoring technologies was that they did not get enough useful knowledge out of the data they gathered [62,82,141]. One could easily see the same being the case for the insights produced from self-monitoring data in SUD recovery apps. For example, the app I Am Sober has one of the more detailed summary insight features available out of the apps analyzed (see Figure 6). It groups days by difficulty (easy to impossible) according to daily check-in data, and lists what activities and emotions are most frequently associated with that level of difficulty. This summary visualization would most likely produce insights such as, “days are more difficult when I am

working rather than relaxing,” and “my days are harder when I have more negative emotions listed.” User reviews of these apps rarely mention these summary insights so it is difficult to determine if they are valuable for recoverees, but at first glance the insights do not seem particularly compelling.

5.2.5 C.3: Abandonment can be demotivating

Summary: Abandoning a goal of self-monitoring can be interpreted as a failure and be demotivating, leaving the recoveree worse off than before.

The danger with self-monitoring is not simply that it becomes an inconvenience; rather, device users may interpret the abandonment of self-monitoring as a failure, leaving them demotivated and potentially in an even worse position than before. Studies that interviewed people who abandoned self-monitoring technologies found that they often said things like they felt “guilty” that they had stopped, or that they were “too lazy” to keep up with their self-monitoring goals [62,82]. Emotions like this can be dangerous for people recovering from SUD, as they are already fighting against their own or others’ perceptions that they are lazy, unmotivated, or uncommitted [6]. Though self-monitoring is a process that many people abandon, recoverees may interpret the abandonment as a personal failing, rather than a failure of the technology, which can have repercussions for their recovery.

5.3 Daily commitments

A feature in some commercially available SUD recovery apps is daily commitments or pledges to a recovery goal. One example of this is from I Am Sober, Figure 9, which has a simple pledge interface where the user pledges to stay sober.

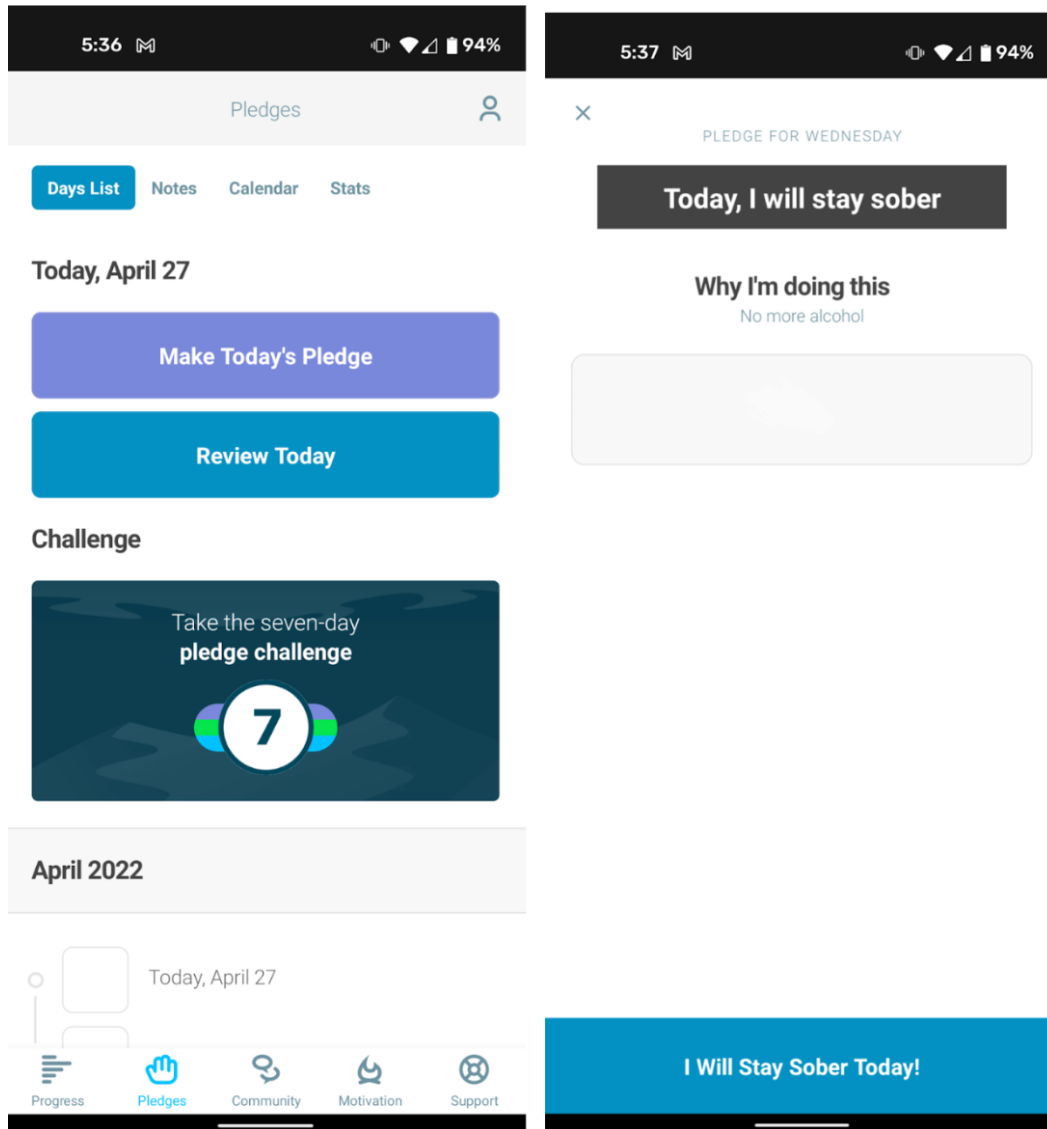


Figure 9. Daily pledge screen from *I Am Sober*. The left screen shows pledge history, the right is where the actual pledge occurs, along with an optional text field where the app user can input their reason for staying sober.

Some apps built on the Alcoholic Anonymous (AA) tradition often have a morning check-in, “On Awakening,” based on AA advice to consider the 24 hours ahead. One example of this is in the app “AA 12 Step Toolkit RecoveryBox,” which prompts the user every morning to do a six-item journaling activity every morning: 1) Select mood from several emoji options, 2) “Did you remind yourself about your powerlessness?”, 3) “Did you pray to God and ask him to

keep you sober?”, 4) “Did you think about the 24 hours ahead?”, 5) “Did you meditate?”, and 6) an optional free-entry journaling space. While not asking for an explicit pledge to stay sober, the activity is asking the user to reaffirm their commitment to AA principles (powerlessness, praying to a higher power, etc.). Most pledging features assume a goal of sobriety, though some apps allow for self-determined goals that could encompass any number of recovery-related goals.

Across all apps analyzed, this was not a common feature: 15% of apps (7 of 46, 9 unknown) included a pledge at the beginning of the day. Much more common was a daily review/check-in, which was present in 47% of apps (23 of 29, 6 unknown); the data from these daily reviews are part of the self-monitoring features. The fact that these are relatively uncommon in the apps is surprising, as commitments and goal-setting (e.g. “I commit to walking 10,000 steps today”) are a common strategy in other types of health behavior change interventions [80].

5.3.1 O.3: Can raise motivation

Summary: Daily commitments as part of a goal-setting process have been demonstrated to raise motivation in many contexts of health behavior.

Goal-setting increases performance by raising motivation [139]. Commitments to goals also raises one’s capacity for self-reflection, which is often an important skill targeted during SUD treatment [223]. This is reflected in user reviews of apps with daily commitments, such as this one: “*I like the daily reminder to pledge. It reinforces my commitment & brings it into sharp focus. This will sound NUTS, but it’s...caring. Comforting*” (user review, I Am Sober).

Though making commitments to goals can raise motivation, research has shown there are a number of conditions that these commitments need to meet in order to be successful. For one, self-regulation theory models behavior change as needing repeated commitments to be

successful, as opposed to a one-time commitment [145]. This is why a mobile app for SUD recovery might include these daily pledges to recovery: the pledges act as re-affirmations of a user's commitment in order to boost their motivation.

Another necessary component is having specific goals, as opposed to vague statements such as “do your best” [145]. Contracts between patients and doctors that affirm a patient's commitment to a specific plan of action have been used successfully in smoking cessation [177]. They also need to be goals that are important to the individual, and that an individual believes they can achieve the goal (self-efficacy) [145]. Literature on goal-setting in SUD treatment mostly discusses goal-setting in a therapeutic setting, and emphasizes the need for treatment professionals to work with patients to set individualized goals [16]. The self-guided daily commitment features in commercial apps do not satisfy three criteria, especially for recoverees who have goals other than (or in addition to) abstinence. Most apps with daily commitments offer an option to commit only to sobriety; for those few apps that do allow user-determined goal commitments, there is no guidance offered in how to set goals that are specific, important, and believably achievable.

One strategy for achieving difficult goals is to make public commitments to them [114,145]. Public commitments create accountability and raise motivation for people to achieve goals because they want to appear consistent to others. This is a strategy that has shown some conditional promise in other domains of health behavior [159,168,176]. None of the commercial apps offered a feature where the daily commitments were announced publicly, i.e. to the social networks within the apps. There were some other features that afforded recoverees accountability by sharing results with a selected support person; this could be used by a recoveree as a way to make public commitments, but there were no features for it specifically. The closest

approximation to this is in the app MyLifeLink, which allows users to select from a number of achievements that they can share with the app's public newsfeed (see Figure 10). The important difference here is that they are retrospective, and not a prospective commitment: the focus is on sharing an accomplishment instead of getting accountability.

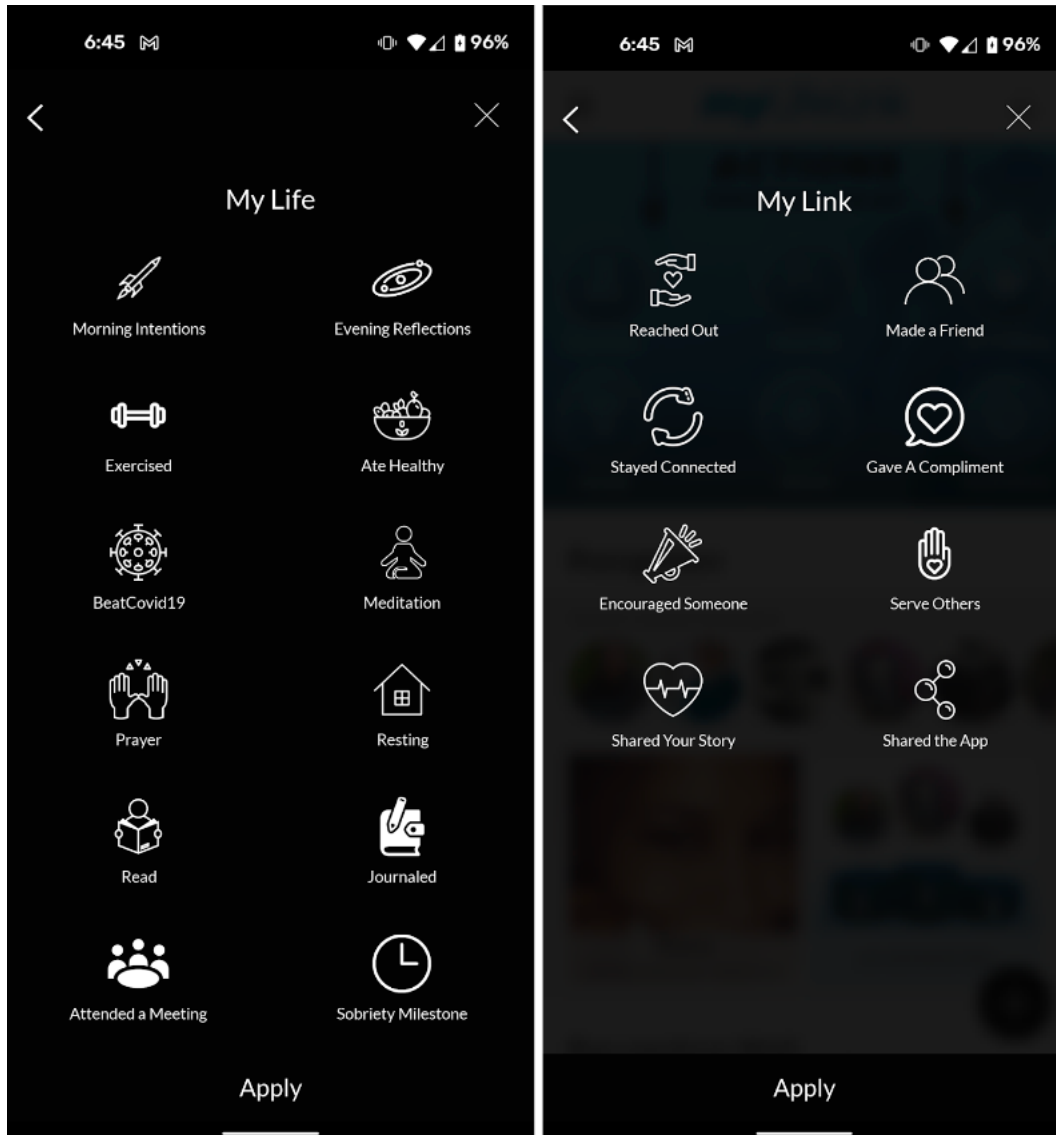


Figure 10. Menu in MyLifeLink to select achievements to share in the app. This is the closest recovery apps come to having a public commitments feature: sharing retrospectively instead of prospectively.

Much of the research on goal-setting in the context of SUD treatment focuses on use-related goals: abstaining from or reducing substance use [16,91]. In a treatment setting, these goals involve periodic check-ins with a clinician to evaluate progress; in a mobile app, this might be enacted as daily commitments to sobriety. Goal-setting in other domains – e.g. physical activity or career goals – are not as well studied in the SUD treatment context [4], but the research that does exist encourages the use of goal commitments by recoverees broadly in order to encourage “goal-directed forward movement as the scaffolding structure in the SUD recovery process” [180].

Research in goal-setting in SUD does seem to indicate that goal commitments can increase motivation, but that the increase in motivation is highly dependent on who sets the goals (clinician or recoveree) [91], at what stage in treatment the goals are set [26], and other factors. This may explain why daily goal commitments are relatively uncommon in recovery mobile apps: commitments rely on a goal-setting process that needs individual tailoring through support professional-recoveree collaboration.

5.3.2 C.4: Feel bad when you don't meet them

Summary: People sometimes fail to reach goals. In the context of SUD recovery, this feeling of failure can be particularly dangerous.

A challenge that makes commitments risky is the negative effects of failing to meet one's goal. Goal setting theory posits a positive relationship between difficulty and achievement; that is, the harder the goal, the more participants accomplish [214]. This has been backed by many empirical studies spanning decades [145]. However, research has also shown that failing a high, specific goal damages an individual's motivation and self-esteem [116]. In a context such as SUD recovery, where motivation and self-esteem can fluctuate over time and be very low, it may

be that the consequences of goal failure overshadow any advantage to be gained by setting difficult goals.

Relapse is an expected part of the SUD recovery process; the majority relapse at least once after first starting recovery [163]. Relapse is associated with feelings of shame and decreased self-efficacy to change behavior, so can be very dangerous to recovery [40,73]. Recovery professionals place emphasis on reframing relapse so it does not feel like a failure; with a relapse prevention approach, relapse is instead framed as an “opportunity for intervention and the interruption of the relapse process” [148]. In the American Indian and Alaska Native community, as well as other groups, relapse is seen as an opportunity to demonstrate forgiveness without shame or judgment [209]. This approach is also visible in the framing of relapses in the commercial recovery apps analyzed: in features that record relapses, they are often called “setbacks,” “challenges,” or “resets” instead of using the term relapse.

Though relapse is only one kind of goal failure, this reasoning may be why the daily prospective pledge is an uncommon feature in commercial recovery apps. Goal commitments unguided by a support professional, as in the analyzed apps, may be too risky to be a popular option.

5.4 Therapeutic exercises

Some recovery apps offer therapeutic exercises and/or self-guided therapy modules. Forty percent (22 of 55) of apps in the design space analysis offered some kind of therapy or mindfulness module. These exercises come from a range of therapy approaches, most frequently cognitive behavioral therapy (CBT). Other approaches named in the apps were contingency management (CM), motivational interviewing (MI), acceptance and commitment therapy (ACT), dialectical behavior therapy (DBT), mindfulness, and stepwork from 12-step programs. In many

cases, the exercises are not labeled with specific therapy approaches and may be mixed in with exercises designed by the app creators.

Most of the therapeutic exercises present in SUD recovery apps can be sorted into four categories: 1) reflection, 2) planning, 3) meditation, or 4) education. These roughly correspond to common treatment elements in CBT for SUD, with some elements borrowed from other treatment approaches: functional analysis of situations for substance use, cognitive skills training to challenge maladaptive thoughts, and coping skills to reduce craving [232].

Reflection includes activities of self-monitoring (covered in a previous section) and journaling prompts. Journaling includes general reflection prompts, such as “What or who am I grateful for today?” and “How could I have made today better?”; there are also journaling prompts that appear after certain user inputs, for example, a prompt that asks the recoveree to reflect on why they felt triggered or were craving substances. In the case of AA programs, these journals may also prompt the user to reflect on their powerlessness and trust in a higher power.

Planning mostly revolves around relapse prevention plans or relapse response plans. These activities ask recoverees to think about possible relapse scenarios and what they will do to prevent relapse. For example, an app might ask recoverees to input any upcoming events that could be high-risk, and then guide the recoveree to create a plan on what they will do to mitigate risks. Similarly, the apps might ask recoverees to think about how to get back on track if they do relapse, including prompting them to do things like identify a contact that they will call to get help. Relapse prevention and response plans are a common component of recovery treatment, and many rehabs have worksheets for relapse planning available online.

Meditation is part of a mindfulness practice that has become increasingly popular in SUD treatment. There are only a few apps in the design analysis that include a SUD-specific

meditation practice, but generic meditation apps such as Headspace are frequently recommended on online recovery forums. Research suggests that meditation for SUD can help with regulating neural processes underlying reward learning and executive functioning, both of which become deregulated in SUD [187].

Education encompasses modules that help recoverees learn more about SUD and what to expect in recovery. These are often short readings that recoverees can do quickly, covering topics such as “pink cloud syndrome” that can appear in early recovery that makes people feel euphoric for a short period of time. Coming down from the pink cloud can be a time of high relapse risk. Other topics include the physiology of substance use and vignettes from other recoverees sharing their experiences.

5.4.1 O.4: Scalable way to increase access to treatment

Summary: Self-guided, technology-delivered therapy is cheaper than human therapists and could help with the shortage of mental health professionals.

Self-guided technology-delivered therapy has often been proposed as a way to increase access to affordable mental health treatment [129]. Meta-analyses studying self-guided, internet-based cognitive behavioral therapy (iCBT) for anxiety and depression have found that it can improve symptoms, and that iCBT holds promise as a viable alternative to first-step treatment approaches, especially for those who are resistant to meeting with a human therapist [128,129].

There are advantages and disadvantages to removing this human link in recovery care. Research generally suggests that therapist-guided treatment is better than self-guided, both in efficacy and in satisfaction, but that self-guided treatment is better than nothing [71]. This suggests that it can be a useful stop-gap measure for people who would otherwise be shut out of

professional mental health/recovery care, and could serve as an on-ramp for people who are hesitant to begin a therapy program.

Self-help apps make it possible for potential recoverees to explore recovery options even if they are not ready to reach out to ask for in-person help. They may not trust recovery institutions, or are still early in their commitment to recovery and find it easier to explore options on their own. Of course, the major disadvantage of removing the human link is that it breaks the link to the recovery community and the personal support that is largely considered critical to recovery. However, there are people who do achieve “natural recovery,” meaning recovery without formal treatment or support groups [49,211]. It is a phenomenon that is not well studied, and is even rejected as impossible by some in the recovery community (i.e., if you can recover on your own you’re not really an “addict”) [49]. Self-guided therapeutic exercises are one way this population can engage with recovery on their terms.

5.4.2 C.5: Low-quality exercises

Summary: Many self-guided therapy programs currently available are full of low-quality exercises because in most cases they are not regulated.

The research on self-guided therapy programs that demonstrates efficacy presumes high quality, evidence-based content. This is not a given in commercially deployed apps. Unless the app is a digital therapeutic, it is unregulated by the FDA and the app developers are not accountable for making evidence-based choices about exercises. The therapeutic exercises available in recovery apps are often a mish-mash of personal experience and evidence-based practice. Looking at the landscape of available commercial apps, there does not appear to be much incentive to put much investment into validating an app’s approach. For example, Pear reSET, an FDA-approved digital therapeutic for SUD recovery with several research papers

demonstrating its effectiveness [234], has low download numbers and low user ratings (1K+ downloads with a 4.5 star rating on Google Play, and 27 reviews with a 3.1 star rating on the Apple App Store. Compare this to I Am Sober, an app that makes no particular claims of being backed by research as effective: 1M+ downloads with a 4.9 star rating on Google Play, with 53K reviews and a 4.9 rating on the App Store).

Few of the apps have any reference to following evidence-based approaches, and those that do often have exercises that are written in-house (ex: SoberBuddy, WorkitHealth, SoberPeer). These are usually written by social workers or therapists with some experience treating SUD, but are not necessarily validated by research. SoberBuddy describes their content like so: “We use research-backed cognitive behavioral therapy (CBT), thought stopping techniques (DBT), motivational interviewing, some 12 Step principles, and the personal experiences of our in-house clinical experts to create a well rounded and effective approach to recovery” [212]. Thus, recoverees who use these apps must trust the expertise of these support professionals who have authored them. Depending on the in-house experts, many of whom are unnamed and undefined qualifications, these exercises may or may not be effective. If they are low-quality or ineffective, this may give recoverees the mistaken impression that therapy does not “work” on them and turn them away from exploring therapy further. Because these self-guided therapies tend to attract people who are new to treatment and may be suspicious of therapy [129], the low-quality content could be harmful.

5.5 Motivational messaging

Many commercially available apps have a feature that delivers some kind of motivational message: AA Daily Reflections, inspirational quotes that are not SUD-specific, bible verses, memes, and other types of encouragement. Some also include options to add personal images or

reasons to quit. In all 40% of apps (22 of 55) included some kind of motivational messaging feature. They are also common in research prototype interventions for SUD (e.g. [15,39,66,170,171,237]).

The prevalence of these motivational messages in apps may be partly because they are static resources that are easy to integrate into an app with minimal effort. However, they appear to be popular with users. A number of user reviews specifically mention the motivational messages positively – “*a wonderful little message appears on the app reminding you of your worth and your power to overcome obstacles*” (I Am Sober review) – and complain when the motivational messages do not update often enough. In addition to feedback in reviews, users often post motivational messages or images in social feeds in these recovery apps, further indication that users engage with the messages.

Alongside these earnest motivational messages is a separate category of memes that tend to be more sarcastic and snarky. Though these were not present in SUD recovery apps, sober meme pages are popular on Instagram and other social media: for example, Instagram pages @brutalrecovery (88k followers), @dankrecovery (104k), @fucking_sober (214k), @dumbsoberbitch (130k). Though very different in tone, comment responses suggest that they are performing a similar function of providing motivation.

5.5.1 O.5: *Be inspired (motivational quotes)*

Summary: Motivational quotes are inspiring and popular with app users.

Inspirational quotes are not just popular with users; research has also suggested they serve important functions. One study used inspirational quotes to encourage engagement by engaging norms of reciprocity (though the study does not explain how inspirational quotes activate reciprocity norms) [66]. Another intervention, a group therapy design, used inspirational

quotes to start each meeting in order to provide a familiar structure and encourage engagement [39,170].

These quotes are not exclusively SUD-related, but there is some indication that quotes from people in recovery may be particularly inspiring, with research showing that hearing from people farther along in recovery in online forums increases abstinence motivation [29]. Example quotes from one study that participants liked included, “There’s no situation so bad that you can’t make it worse by the way you handle it.” (G. DuWors), and “Our life is what our thoughts make it.” (Aurelius) [171]. See Figure 11 for examples from recovery apps.

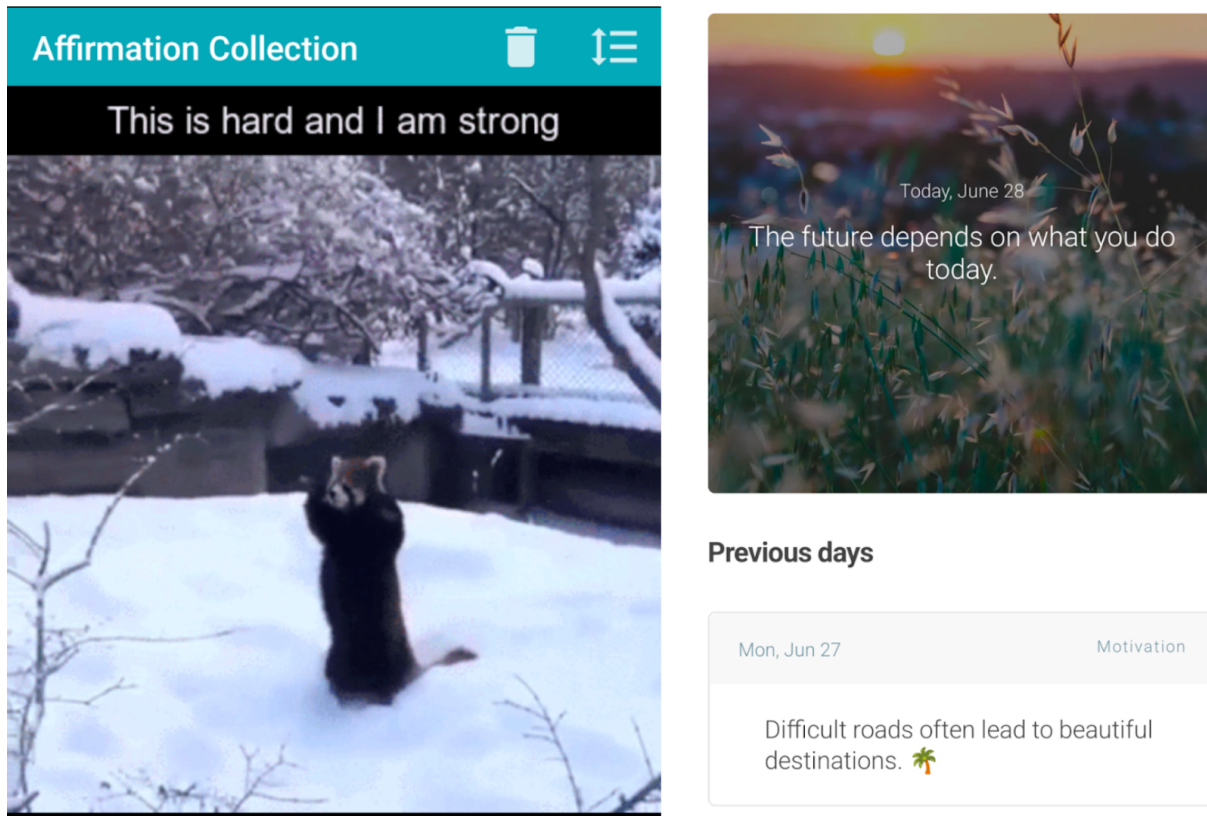


Figure 11. Examples of motivational messages from Recovery Path (left) and I Am Sober (right). I Am Sober has motivational “packs” that one can purchase to get additional quotes.

Across these interventions, participants liked having inspirational quotes. One mobile app intervention that tracked the relative popularity of the different features found that motivational messages were the most commonly used feature (68% of their participants), more popular than symptom tracking, dairies, or psychotherapy modules [237]. Additionally, in Parkview’s user experience research, several recoverees asked the research team to add inspirational quotes or Bible quotes into a prototype SUD communication app when asked if there was anything they would add to the design.

5.5.2 O.6: *Feel connected to community (memes)*

Summary: Memes are more sarcastic and acerbic but provide a similar function in motivating people and communicating relatable experiences.

The motivational quotes and images supplied by commercially available recovery apps tend to be very earnest: quotes from great thinkers, or from recovery materials such as AA’s Big Book. The recovery-related meme communities that exist on social media are in stark contrast to that earnestness, leaning more on sarcasm and irony (see Figures 12 & 13 for examples).

Meme communities for mental health issues have been studied in previous research. Some of the findings are relevant to SUD. Previous research has argued that posting on social media about mental health issues such as anxiety and depression allow individuals to “unfurl the signs, feelings and attributes that express a person’s ordinarily stigmatized experiences of mental ill-health” [155]. Given the amount of stigma that can surround SUD, these communities can serve an important purpose in letting recoverees see and become visible to others in the community [41]. Research has found that these types of communities, i.e. grassroots mental health activism, can be a rejection of “psychiatric authority” [227], which can be a good or bad thing (as illustrated by pro-eating disorder communities [182]).

Research in other mental health contexts has shown that memes may serve as coping mechanisms, for example to cope with anxiety related to COVID-19 [10]. This research found that people experiencing COVID-related anxiety found COVID-related memes funnier, more relatable, and more shareable compared to a non-anxious control group. A study using a similar methodology found the same was true for people with depression looking at depression-related memes [8], and an eye-tracking study found that people with depression preferred looking at depression-related memes over neutral ones [9]. A survey study found that 47% of survey participants believed that looking at memes alleviated their depressive symptoms [127].

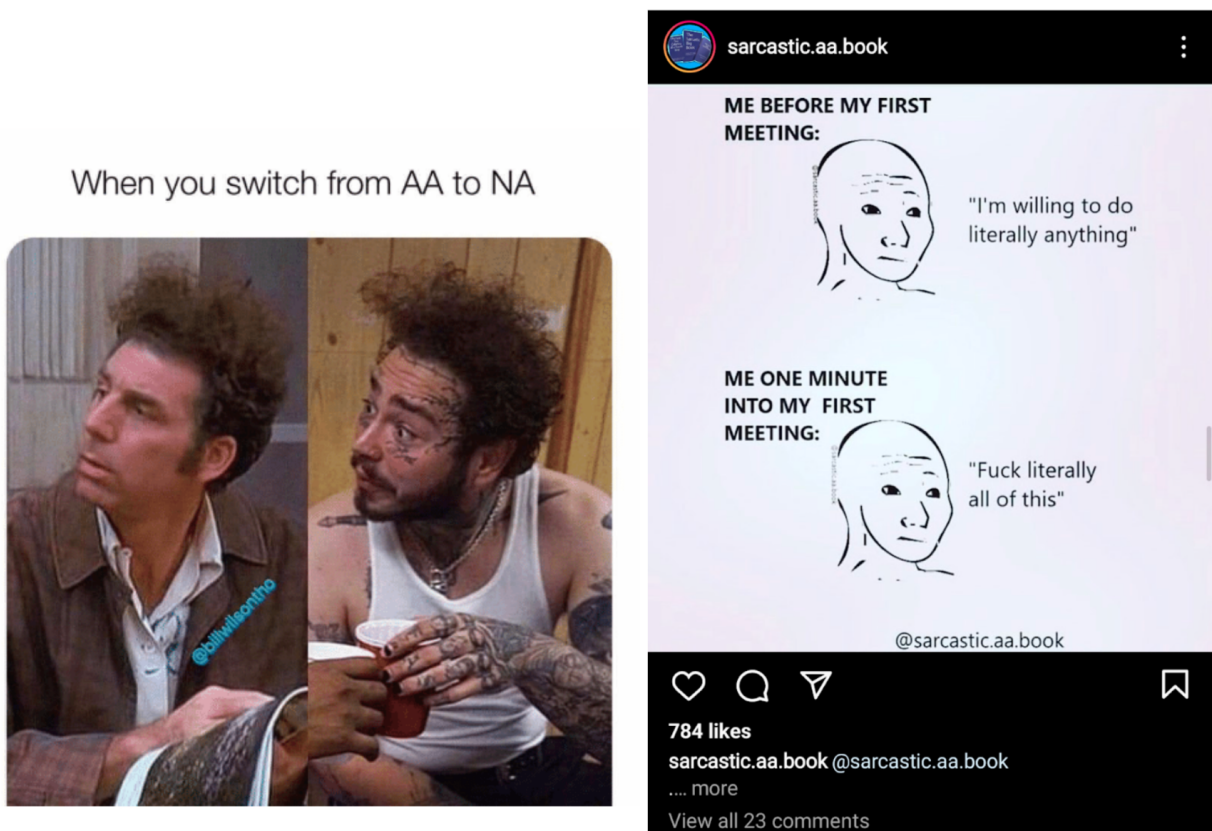


Figure 12. Examples of recovery memes. 8a (left) reflects a common offensive stereotype in 12-step circles that AA members are more clean-cut and successful than NA members. 8b (right) acknowledges the ambivalence and frustration of early recovery.

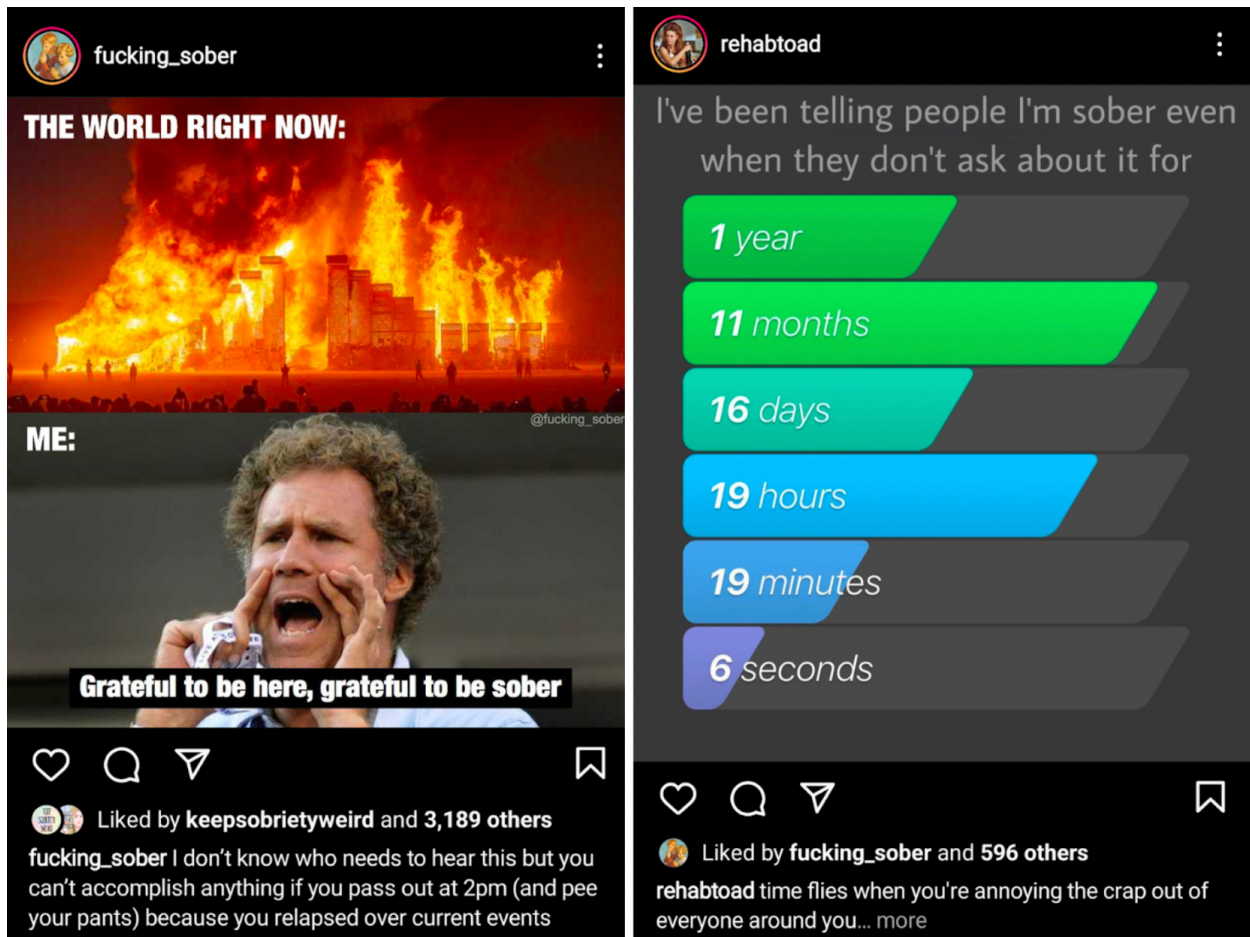


Figure 13. Examples of recovery memes. 9a (left) is an example of a more motivational, if still sarcastic, meme. 9b (right) references a joke that people in recovery announce their sober time to everyone, using a screenshot from the app *I Am Sober*.

This research provides evidence there are two elements to why memes may be helpful to a SUD recoveree. First, posting memes is one way to participate in an online community. Second, viewing the memes themselves may alleviate some negative feelings like anxiety and the feeling of stigma, possibly by making people feel like they have a community.

5.5.3 C.6: Finding the right messages

Summary: Preferences for motivational messaging are highly personal and messages that do not fit preferences can be perceived as annoying.

As might be apparent from the different tones of the quotes and memes, motivational messages are not one size fits all. The most effective motivational messages vary across individuals, and may depend on their recovery stage, drug of choice, religion, or any number of demographic factors. Earnest inspirational quotes may feel cheesy to some, and edgy memes may be offensive to others. One mobile SUD intervention that included inspirational quotes as a feature, found that though participants liked the inspirational quotes generally, many also had issues with some specific quotes, calling them “vague,” “strange,” or “patronizing” [66]. An intervention designed for Deaf people with SUD included inspirational quotes from Deaf people, and feedback from participants was that including the quotes was a “very hearing thing to do” [15]. Different recovery approaches are not always compatible; for example, some AA communities can be disparaging to recoverees who use suboxone or other medically assisted treatment, and that tension is visible in some meme pages on social media. Helping recoverees find the types of motivational content that work for them is a challenge for designers.

5.6 Automated chatbot

Chatbots, or virtual conversation agents, are computer programs that simulate human communication with text or voice communication [219]. A long-held goal in mental health research has been to create a chatbot that can be used to deliver therapy. One of the first chatbots ever created, ELIZA, was written in the 1960s to simulate a psychotherapist [24]. Though that might have been simply because the bot could mimic a Rogerian psychotherapist with some fairly simple rules, namely pattern matching and pronoun substitution [107], there have been numerous attempts to make chatbots for mental health treatment. One of the most prominent recent chatbots for mental health is Woebot, which was developed as a “self-care expert” that uses cognitive behavioral therapy (CBT) frameworks to help its users. There is only one mobile

application on the current market that bills itself as a “virtual recovery coach,” called SoberBuddy. On its website, it describes itself as a chatbot.

5.6.1 O.7: Scalable way to increase access to treatment

Summary: Automated chatbots have the potential to provide low-cost, on-demand therapy for everyone.

A major promise of chatbots is that they can increase access to treatment in an affordable, scalable way. Replacing human therapists with chatbots relieves some of the pressure on mental health services caused by the severe shortage of mental health professionals [109]. It also has the potential to improve barriers to care that have been discussed in other chapters such as geographical isolation, conflicts with employment/childcare, and reducing perceived stigma [138,161,228].

Research with mental health professionals has found that professionals perceive chatbots as a potentially powerful method to get people the care they need [219]. A survey found that 77% of mental health professionals considered chatbots to be “somewhat important” or “very important” in the context of mental health, and 80% of them said that they would be “very likely” or “somewhat likely” to prescribe a chatbot to their clients in the next 5 years [219]. The reasons mental health professionals gave for this optimism were largely based around scaling access: reducing travel time, preventing unnecessary visits, improving timely access, and improving quality. Other research has found that chatbots have the potential to provide low-cost mental health care [77,88,224].

5.6.2 O.8: Psychological distance

Summary: Some recoverees might prefer the psychological distance of talking to a chatbot over a human therapist.

As discussed in the chapter Professional Support, there are some instances where computer-mediated communication and chatbots can be preferable to in-person communication or communication with a human therapist for mental health issues. Virtual conversation agents can feel more psychologically distant and anonymous to users, which makes them feel more comfortable disclosing sensitive information that they would not have disclosed to a human therapist (e.g. service members disclosing PTSD symptoms) [146,162]. For SUD recoverees who are particularly worried about the stigma of SUD and do not trust human therapists to be non-judgmental, having a chatbot could be preferable and more effective than a human. This could potentially make chatbots particularly useful at the very beginning of a recovery journey, when some recoverees have low trust in institutions and human help. There is also some indication that demographic factors may affect how one responds to chatbot vs. human conversation, such as age [228]. This may affect what kinds of people would be able to make chatbots work for them in their recovery.

5.6.3 C.7: Not good enough yet

Summary: Chatbots as they currently exist are not very good and seem to be mostly a gimmick.

Though chatbots do present some promise of increasing access to affordable care, the options that currently exist suggest that chatbots have not yet achieved the minimum standard to be helpful to most users. SoberBuddy, the only “virtual recovery coach” available on the market, was poorly reviewed in the Apple and Google app stores through 2021. In 2022, it was relisted in

the Apple store with sparse, but positive, reviews: *“My favorite feature is every day Buddy asks me how I’m doing and then gives me a warm response. I love that!”* (user review, Sober Buddy). However, most of the reviews comment positively on other features such as daily challenges and sober time trackers, and make no mention of the chatbot itself. This may indicate that the chatbot is not a major selling point to those users who do like it. Further, though the average rating in the Google Play Store is 4.8, the majority of the written reviews are negative and criticize the idea of charging for a chatbot: *“This app is a joke. \$10 a month for quotes and stuff?”* and *“You better be an addiction counselor or something otherwise it's disgusting to make anyone pay for this app”* (user reviews, Sober Buddy).

Systematic reviews of studies using chatbots for mental health have concluded that chatbots hold promise as a method for delivering mental health care, but individual studies produce inconsistent and sometimes contradictory evidence on their effectiveness [1,2,38,138,228]. For example, one study found that chatbots could alleviate symptoms of anxiety and depression, while another found that chatbots did not help feelings of subjective well being [2]. There is also evidence that chatbots used in research have not translated to widespread use or awareness in clinical practice; a survey of mental health professionals found that even though a majority of the professionals were optimistic about chatbots in theory, most of them had never used – or even heard of – any of the chatbots that researchers asked about [219].

One possible explanation for the inconsistent response to chatbots for mental health is that “chatbot” is an umbrella term that covers a wide range of quality and complexity. A 2019 scoping review found that 92.5% of the chatbots in studies had responses based on predefined rules, i.e. a decision tree [1]. Only four studies used machine learning to create responses. Responses from decision tree chatbots may not be good enough to create rapport between the

recoveree and the chatbot, which several studies have noted is crucial for a chatbot to be successful in delivering mental health interventions [146,162]. Some advanced chatbots have shown evidence of being able to create human-like bonds with their users [68]. However, if the chatbot is just a glorified form, asking recoverees a predetermined set of questions with only simple if/then decision trees customizing the responses, the chatbot is unlikely to register as human enough to create a connection between the recoveree and the bot.

Though it is not possible to tell for certain, it does appear that the single SUD chatbot on the market (SoberBuddy) is powered by a decision tree. In the conversations with SoberBuddy, in most cases the users can only choose from a set of predefined responses, with only a few opportunities for a free response. For mental health chatbots, there have been several high-profile failures that suggest the technology simply is not yet ready to be used. One of the most popular and advanced chatbots for mental health currently on the market is Woebot [68,103,189]. A usability study for Woebot in the context of SUD found that use of Woebot was associated with reduced substance use and improvements in confidence, depression, and anxiety; however, attrition in the study was unusually high, suggesting that the chatbot was not an acceptable intervention for many of the participants [189].

More seriously, though Woebot is programmed to recognize crises and refer people to emergency services for serious issues, it was found that Woebot failed to respond appropriately to reports of child sexual abuse. This resulted in the Children's Commissioner for England classifying Woebot as "not fit for purpose" [25]. An investigation of the app by the British Broadcasting Company (BBC) found in 2018 that the app also failed to respond appropriately to eating disorders and drug use [25]. Voice assistants such as Siri and Alexa, though not intended as mental health interventions, are advanced virtual agents who are supposed to react to

emergency mental health disclosures by referring people to appropriate services, but a study in 2016 [163] and more recently in 2020 [241] found that these agents usually did not react appropriately. Specifically, the 2020 study found that the most successful virtual agents gave clinically appropriate responses to questions about postpartum depression only 29% percent of the time (the least successful did so only 14% of the time) [241]. In all, the evidence suggests that chatbots for delivering SUD interventions such as a virtual therapist have potential, but currently mostly fail to reach the threshold for being an effective tool.

5.7 Strategies

5.7.1 S.1 Automate data gathering

Automatic detection and recording of complex behaviors is a “holy grail” of ubiquitous computing; it is no different in SUD recovery [123,133]. Automated (or even semi-automated) data gathering for self-monitoring can reduce the burden on the user of manual inputs, making it more likely that the app user can maintain a data gathering practice more easily and for a longer period of time [58]. It also allows them to focus on their day rather than recording it. In the words of a recoveree from a research study by Jones et al., “*I am used to just my human self, and not checking with a computer device before I do human things*” [123]. In turn, this will lead to more detailed and complete data to power summary insights.

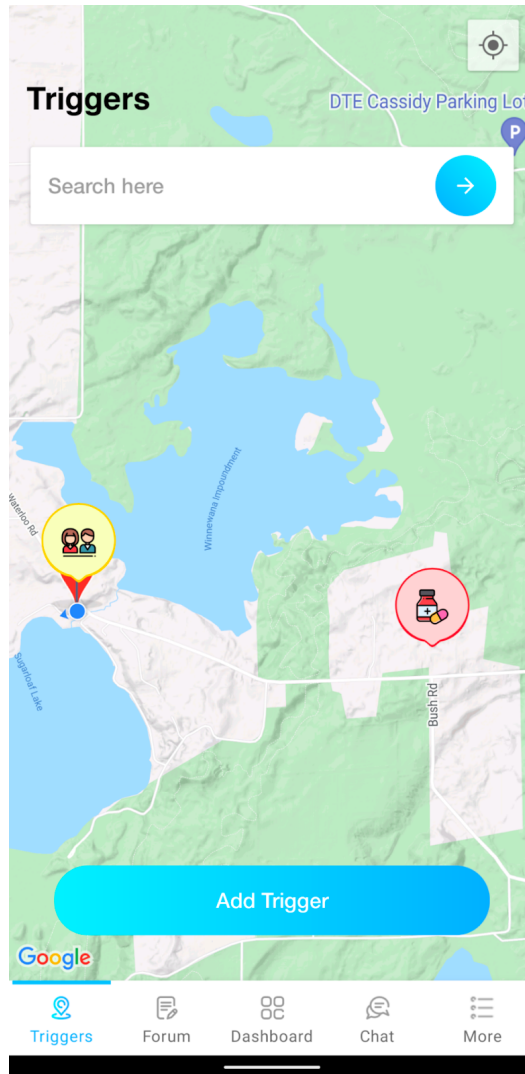


Figure 14. A geo-tagging feature for pinning trigger locations in SoberPeer.

Automating data gathering is easier said than done. There have been some limited attempts to add automated elements to self-monitoring for SUD. One that is commercially available now is geolocation data for tracking triggers, for example in the app SoberPeer (see Figure 14). In its current form, it would be more accurately described as semi-automatic monitoring: the app user must manually input locations that are good or bad triggers (the yellow “family” pin, and the red “drug acquisition” pin). The app can then warn the app user (or a trusted support network) that they are in an area that puts them at risk. The app WeConnect

tracks recoveree meeting attendance by recording when they are in a location where the app knows a meeting is scheduled. Geolocation data is one form of data that seems most possible to automate in order to generate summary insights; for example, helping the recoveree notice that a particular location is associated with higher stress levels in mood assessments.

Researchers have also explored the opportunities for wearable technologies to gather physiological data. These technologies are still in their infancy, and most focus on the detection of drug or alcohol use. There are a few applications that use breathalyzers linked by Bluetooth to a mobile phone (e.g. Soberlink), and sensors to detect cocaine use (iMStrong [53]). However, these appear to be more often used as part of a court-ordered program than something a recoveree decides to take on themselves. Some of the only instances of physiological data being used for SUD treatment (rather than accountability) are some research studies that used wearables to detect biomarkers of stress in people with SUD to detect cravings and deliver cognitive behavioral therapy exercises to help them work through the cravings [52,115]. Though still in their early stages, these interventions point to concrete ways forward in automating, or at least semi-automating, data collection.

5.7.2 S.2 Identify minimum effective dose

As discussed in challenges for self-monitoring, extensive tracking can be cumbersome and time-consuming without producing much payoff, especially if the tracking data is not transformed into actionable information. However, some tracking can be helpful, both in providing support professionals with fine-grained data that helps with recovery treatment; and in raising recoverees' awareness of important patterns in mood, triggers, etc. The challenge in self-monitoring is to balance these factors and identify what the minimum effective “dose” of self-

monitoring is, for recoverees to get the benefits without getting too encumbered by the data gathering process and giving up.

The first necessary component is identifying what is most meaningful to recoverees, and what insight data collection would provide. Though the details are highly individualized, a previous study has found that recoverees most frequently want to track 1) important recovery activities (e.g. meeting attendance) and 2) quality of life indicators (e.g. hiking, reading, eating healthy) that allow them to reflect on the positive changes they have made. Intervention designers could pinpoint what would be the minimum number of variables necessary to meaningfully track progress. Currently, it is not clear that apps are designed to support these goals. The brief check-ins from the popular app I Am Sober focus on activities and mood, which while useful take a long time to produce meaningful insights, and there is a distant connection between the data and being able to reflect on progress. Comprehensive self-monitoring, such as with Recovery Path, allows for customization but leaves the burden on the app user to determine what variables will be most meaningful for them. The app could suggest a handful of defaults to nudge recoverees to pick a reasonable number of variables, and in doing so demonstrate an understanding of recovery that would help recoverees trust that the app understands their experience. This is something recoverees said was important to them [123].

The second task is to identify how long self-monitoring needs to be done to get value out of the data. One option might be to do intensive monitoring – track many variables – for a short period of time. This strategy might work for people who are enthusiastic about tracking comprehensively or are not sure what variables are most important to them. This allows them to explore self-monitoring but adds an end date to the self-monitoring task so that they are less likely to feel like they have failed if they are unable or uninterested in keeping up with recording

a large number of variables. Other work on personal informatics calls this “happy abandonment”: stopping self-monitoring because it has served its purpose and the user is satisfied with the knowledge gained from it [62]. Like a nicotine patch, personal informatics technology may not be intended to be used indefinitely [202]. It may be better to design technology that is meant to be used intermittently, when it matches what the recoveree needs at that time.

Another option would be to do long-term monitoring with a minimal number of variables. This seems to be the tactic that most commercial apps take with self-monitoring; many of them do daily check-ins with a short inventory of questions about mood and activities. However, as mentioned above, these variables need to be meaningfully connected to their goals in order to motivate continued collection, and so that the app can surface insights enough to maintain motivation. Research on long-term tracking has suggested that while short term tracking is connected to specific and actionable goals, the goals of long-term tracking are more broad and diverse, like improving well-being [83].

The answers to both of these questions – what is meaningful, and how long does it need to be tracked to get insights – are likely to vary from person to person. Further, the individual may not have clear insight on what they need out of self-monitoring. Therefore, the challenge for intervention designers is how to guide app users to explore what they need in order to identify the minimum necessary dose to get what they want out of their self-monitoring.

5.7.3 S.3 Find optimal success rate for goals

An important question in goal-setting in health behavior is how often individuals need to succeed in their goals in order to find goals motivating. As discussed in the section about daily commitments, goals can be motivating, and goal-setting theory suggests that difficult goals are more motivating than easy ones; but in practice, too many failures can be demotivating. This risk

may be particularly salient for people who are in recovery, who might be especially sensitive to setbacks and could exacerbate feelings of inadequacy [200]. This might mean goal-setting is just not an appropriate strategy for some recoverees.

Research has found that some recoverees do like the idea of goal-setting, however [200]. For these recoverees, it might be possible to design goals that are challenging but protect from demotivating failure. In other domains of health behavior change, i.e. physical activity, research has found some promise in balancing motivation and challenge by setting primary and secondary goals [169]. With this design, individuals can set both realistic goals and stretch goals, where they can be reasonably confident that they can reach the realistic goal but can push themselves to the stretch goal if they are having a good week. This may be helpful for SUD recoverees as well who are setting goals related to their well-being such as sleep, social support, completing therapeutic activities, etc.

It may be that the goal failure is too harmful for people in SUD recovery, that the failure is too demotivating and harmful to self-esteem. If this is the case, it might be that self-guided goal-setting is not an appropriate activity for SUD recoverees, and that it should only be done in an environment where they are well-supported in case of failures, e.g. in a mutual support group or with a support professional.

Two possible strategies for protecting against goal failure are 1) focus on rewarding someone returning after a setback, e.g. going to a meeting after a relapse; and 2) sharing achievements after a goal is completed instead of sharing an intended goal prospectively as a commitment device for goals, as in other domains of health behavior change. Recoverees have said in previous participatory design research that in a gamified goal-setting intervention, they preferred the idea of giving people enhanced rewards for returning after a relapse over having

them lose points for the relapse [200]. For the second strategy, several commercial recovery apps have options to share achievements with the community; they want their users to share achieved goals instead of prospective commitments to goals. It may be that they found that this focus on achievements instead of accountability is more appropriate for the recoverees who use their apps. This would be consistent with findings in other studies, which generally find that recoverees and support professionals prioritize minimizing shame.

5.7.4 S.4 Gamification: badges and leaderboards

Gamification elements are common in computer-supported health behavior change interventions [32,134,144]. They are also present in commercially available apps for SUD recovery: about a third of analyzed apps have badges or leaderboards (37%, 19 out of 52). Here I discuss specifically badges/trophies and leaderboards for accomplishments.

Sobriety badges are the most common type of award feature in the recovery apps; if the app has a badging gamification feature, it likely has sobriety badges. Only three of the 19 gamified features do not have sobriety badges, and instead reward app engagement and other healthy activities such as meditation and serving others. For these apps, the choice to exclude sobriety badges is likely driven by the harm reduction model of SUD recovery which avoids centering abstinence as a prerequisite for recovery. Most apps have both, rewarding both sobriety and other types of recovery activities.

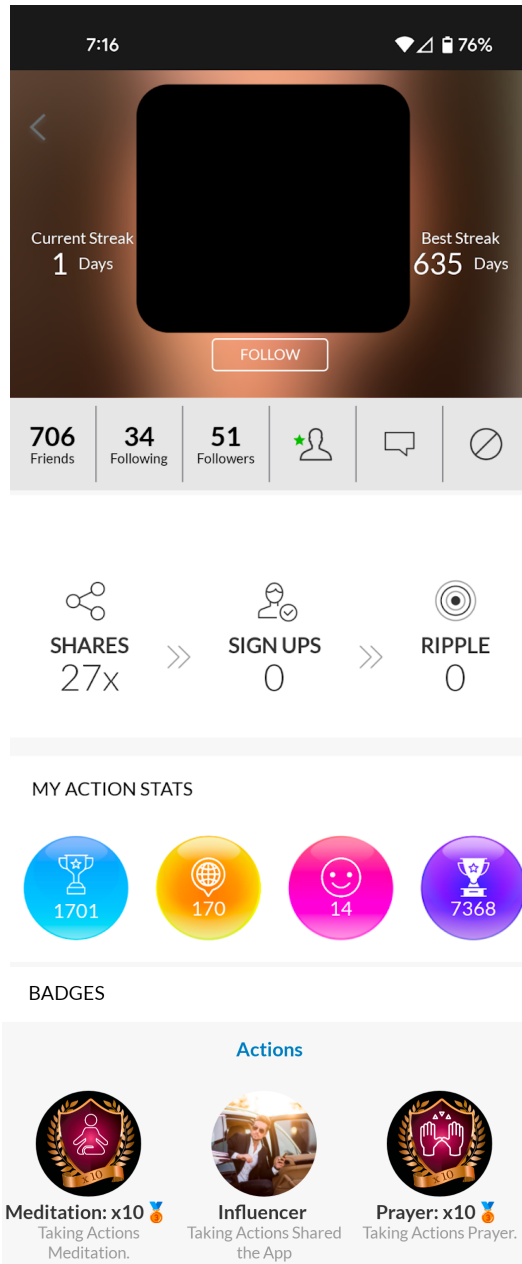


Figure 15. Gamification elements (streaks, badges) in MyLifeLink.

One illustrative example of badging in SUD recovery apps is MyLifeLink, an app that has extensive badging features (see Figure 15). The app allows users to track many kinds of activities under four categories: Life (e.g. eating healthy, attending a meeting), Link (e.g. serving

others, complimenting someone), Emotion, and Engagement. The app tracks these “action stats” and awards badges for accomplishments.

The app Sobriety Counter - Easy Quit focuses specifically on quitting or cutting down on alcohol consumption, which allows them to create badges related to physical health that make physiological improvements more visible to recoverees: neurological repair, cell regeneration, etc. (see screenshot). The app estimates these improvements using research based on sobriety time, presents progress, and awards badges when that metric is completed. The advantage of this kind of badge reward is that it surfaces improvements that the recoveree may not notice otherwise, though it makes the app slightly less flexible (Sobriety Counter can only be used for quitting alcohol).

Badges as rewards have two origins in this context. First, Alcoholics Anonymous and 12-step programs present chips/coins to their members to celebrate sobriety milestones. In addition, badges and trophies are a common element in gamification for serious games [245]. Research on gamification for health behavior change has found mixed reactions to badges and trophies. For example, one user study on the use of badges in an intervention to encourage physical activity found that participants thought the badges were silly, but even so, found them motivating [231]. A user study with people in recovery from SUD found similarly mixed reactions from participants [200]. Some participants liked the idea of gamification, and many included gamification elements in sketches during a participatory design activity, but others had a strong negative reaction to badges and trophies: they said the prizes “trivialized” recovery [200]. There were concerns that these prizes would undermine intrinsic motivation, and that gamification could be too similar to gambling.

Leaderboards as a method for motivation via social comparison are also a popular gamification technique in health behavior change interventions [17,64,244]. Social comparison, that is, evaluating one's standing relative to others [86], has been demonstrated to be an effective strategy in encouraging health behavior change in some domains [17]. However, leaderboards are rare in SUD recovery apps: only three have a leaderboard feature, and of those, two rank app engagement/helping community members, and only one has a leaderboard for streaks of “dry days” (no alcohol consumption).

This absence of leaderboards in recovery apps is meaningful. Framing SUD recovery as a competition is fundamentally incompatible with the ethos of recovery, like 12-step programs that emphasize all members are equal [200]. Furthermore, research on social comparison in other health behavior domains has found that social comparison can have negative effects such as lower motivation, mood, and self-efficacy, and it was not clear who would have a negative reaction to the comparison [18,201]. This can make the social comparison a dangerous lever to push for SUD recovery, where negative reactions could be more likely and the consequences much more severe.

5.7.5 S.5 Social comparison as inspiration

One example of a possible strategy for harnessing the positive effects of social comparison comes from a commercially available option, the popular app I Am Sober. They do not have leaderboards; rather, they include motivational messages that leverage social comparison, “X people reached their 7-day milestone today, can you get there?” They also include summary statistics about other people at a similar point in their recovery journey and the improvements they are reporting in their quality of life. The critical difference between this

messaging and leaderboards is that the messaging emphasizes connection to similar others to be inspired by them instead of competition.

5.7.6 S.6 Tailor to individual and recovery stage

Personalization – that is, tailoring behavior change interventions to an individual’s needs – is a major component of health behavior change technologies. This is no different for SUD recovery. Support professionals in my interviews tended to resist making general statements about SUD recovery and instead emphasized the need to have a web of support that is flexible to recoverees’ individual needs. This presents a significant challenge to technologies to support SUD recovery, as they are often designed as toolboxes for recoverees without much capacity to guide the recoverees on how to use them. The task of sifting through all the recovery content and figuring out how to use the tools successfully, still usually falls on human helpers. The primary task of peer recovery coaches in my interview sample is to act as a connector and guide for recoverees trying to navigate the available resources.

The self-guided exercises offered by commercially available recovery apps can be helpful, but only if a recoveree knows how to adapt them to their needs. Some apps claim to offer automated tailoring, but it is unclear how effective this tailoring is and currently seems more like the promise of artificial intelligence rather than a successful execution. Successful personalization is challenging and depends on many factors. To support recoverees during self-guided activities, practitioners and designers need to have a clear understanding of what works for whom, and when. For example, research has shown that self-monitoring may be most effective for people who are in the early stages of recovery, when they are still contemplating making a change [220]. In addition, my interviews with support professionals suggest that

having self-guided options may be better for some recoverees early in the process, when they may be too anxious or otherwise hesitant to reach out for human support. Further research is needed to determine how to facilitate recoverees exploring recovery options without being too prescriptive, while also not being too overwhelming.

5.8 Conclusion

The self-guided activities covered in this chapter encompass the most common features of SUD recovery apps available in the Android and Apple app stores. Many of these features are inspired by therapeutic activities one would do in a SUD treatment program, but are designed so that it is possible to do them alone. These affordances have a lot of similarities with personal informatics tools in other domains, and so the associated opportunities and challenges are similar to what we see in other types of personal informatics, too. Self-monitoring can help recoverees gain important insights, but is a difficult habit to establish especially when the self-monitoring does not produce meaningful payoffs; daily commitments to goals can be motivating but can be discouraging if they are too difficult. In the context of SUD, this makes for a difficult balancing act, as the stakes are high. Poorly designed features could nudge a recoveree to give up on recovery more broadly, and unlike a human support professional is not able to so easily identify and adapt to warning signs that a recoveree is pulling away.

The most extreme, techno-utopian end goal of self-guided activities is to replace human supports: chatbots instead of human therapists, data-crunching apps that can show you your own mind through charts and graphs. This version could make SUD treatment accessible and affordable for everyone who wanted it, but is not realistic and probably not even desirable. Connection with other people appears to be at the heart of SUD recovery, a process of rebuilding a healthy community to replace the one lost when deciding to enter recovery.

A better way to think of the potential in self-guided activities is a way to facilitate human connection. This can be done in several ways. First, research into anxiety and depression has suggested that self-guided, internet-delivered therapy is an effective first-step treatment. This points to the promise of self-guided activities as being a stop-gap measure, something that is at least better than nothing for a recoveree who cannot access professional support right away, or at all. Second, in a similar vein, this method of self-guided recovery could be an on-ramp to reaching out for more substantial help for people who are uncertain about seeking help. In this case, it is even more critical that the activities are well-designed and effective, so that the app user does not get discouraged and decide recovery is just not for them. And lastly, these self-guided activities can be a way to deepen a recoveree's collaboration with support professionals. Most of the affordances discussed in this chapter can be done alone but would be improved with the involvement of a support professional or professionals. Self-monitoring could help a support professional better understand the recoveree, and could help guide the recoveree in an approach to self-monitoring that is feasible for them to achieve and maintain. Support professionals could also help guide recoverees in setting goals and making daily commitments, and filter therapeutic exercises to identify those that are high-quality and relevant to the recoveree.

The current state of chatbots suggests that fully automated therapy is still a long way off. It may be that chatbots can never fully replace a human, and that goal may not even be desirable. For now, the bar is much lower: self-guided activities must simply not be harmful. SUD recovery can be delicate, especially at its early stages, and so it is easy to do harm accidentally; however, careful design can create tools that can help recoverees explore and shape their recovery journey.

Chapter 6 Conclusion

Recoverees and support professionals alike in my interviews emphasized just how overwhelming the recovery journey can be. For recoverees, navigating the process of starting recovery is often overwhelming: finding a rehab that takes their insurance, finding a support group that works for them, etc. while also having to wrestle with the idea of making a major life change. After that, they often have to deal with finding employment, navigating social services, and possibly dealing with the unyielding bureaucracy of the legal system; and that is on top of the hard work they have to do of recovery itself. This overwhelming list of tasks is why professionals in my interviews talked about the importance of a recoveree having a web of support to help them navigate all the pieces.

The professionals in this web of support spoke of being overwhelmed in their own ways: massive client lists, a shortage of resources, and not enough time to give out all the help that recoverees need. In sum, everyone involved in the work of SUD recovery is likely operating under an enormous cognitive load. The natural role of technology in this landscape is to absorb as much of this cognitive load as possible, especially the monotonous work that lends itself to automation. This way, humans can focus on the parts of the SUD journey that are irreducibly human.

This dissertation covered the possibilities for technology intervention in four facets of recovery.

- *Chapter 2 on Social networks* discussed how recoverees can reshape their digital social environment to get access to supportive communities without exposing themselves too much to destabilizing people or content.
- *Chapter 3 on Professional support* discussed how to capitalize on the flexible, convenient communication afforded by technology without making a recoveree feel isolated and care feel impersonal.
- *Chapter 4 on Resource access* discussed how to navigate the wealth of recovery knowledge available online so that recoverees can find up-to-date, accurate information that they know they can trust.
- *Chapter 5 on Self-guided activities* discussed how details of the design of various tools can make the difference between getting the therapeutic “active ingredient” and making a recoveree discouraged and frustrated.

A common thread throughout all of these chapters is that technology is a supplement to, but not a replacement for, the web of human connections that are central to SUD recovery. Current tools that purport to replace humans (chatbots, AI-powered tailored therapy) appear to be largely inert, with these features either being unremarked on or negatively reviewed, or absent from available apps outside of publicity materials.

I argue that the goal of technology in SUD recovery should not be to function as a full replacement. Technology in SUD recovery has four roles: as a stop-gap measure, a supplement to in-person care, a gentle on-ramp, and a connection amplifier. Though the roles of stop-gap measure and supplement are important, I argue that the last two are more critical.

Conceptualizing technology's role as a route to efficiency and automation leads to these two being undervalued or ignored entirely.

The **connection amplifier** is a critical function for intervention designers to keep in mind. It has the most promise as a guiding principle: technology should be used to deepen recoverees' connection with their supports, and we should be very mindful of situations where well-intentioned interventions interfere with that connection instead of helping it. The language around telehealth (especially outside of HCI spaces) tends to focus on the advantages of efficiency, cost savings, and scalability. Though these are valuable, they can get designs off track, prioritizing the wrong things. The first and last question to be asked in intervention design should always be, "Is this bringing people closer together with the right other people?" This is what makes it so important to do user-centered design in SUD recovery: designers should focus on the pain points in human processes and focus on automating the things that are taking away from support professionals, recoverees, and other members of the support network connecting with each other.

Technology's role as a **gentle on-ramp** is also critical. There are significant barriers between the decision to ask for help in recovery, and getting that help. Deciding to enter recovery is a weighty decision, and technology presents a space for recoverees to explore recovery and start testing the waters. This presents an opportunity for intervention design to invite potential recoverees in to further engage with recovery, in the form of mutual help groups or a recovery program.

I will use three examples of possible future work to illustrate what this could mean in practice to broaden technology's role as a source of more than just efficiency and automation. The first addresses the lack of collaboration between support professionals and recoverees in

digital social reshaping. Today, recoverees rarely make plans for their digital re-entry that will help them maximize opportunities and overcome challenges, and few professionals are prepared to help them make such plans and avoid the pitfalls. One way to address this might be to develop a toolkit that helps recoverees make a plan for re-entering digital spaces such as social media, and get useful advice from professionals in making those plans. The toolkit would include three components: a one-page easy reference guide for recoverees, a handbook for professionals, and an easily accessible introductory webinar for both. My current theory based on previous interviews is that support providers will prefer a simple artifact that can easily fit into their existing workflow and open the conversation about digital re-entry without being prescriptive: an easy reference guide. The second artifact, aimed at professionals, will be a digital handbook that goes into more detail about the opportunities, threats, and strategies involved in digital re-entry, and offers exercises and activities to conduct with recoverees. The third artifact, the webinar, will have similar content as the professionals' handbook but will be accessible to both audiences. A participatory design approach would help ensure that these tools are usable and feel relevant to recoverees and support professionals.

A second avenue for future work that illustrates how technology can be used to offload some cognitive burden is decision support for support professionals to tailor therapy activities. Currently, there are several apps on the market that advertise self-guided, AI-tailored therapy curricula; however, in practice, the automated tailoring seems rudimentary at best. Further, it may not even be desirable to fully remove a human therapist from therapy activities, as that therapeutic relationship is often a critical part of therapy's success. A decision support tool that collects information about a recoveree (for example through occasional self-reports) and uses those inputs to recommend therapy exercises to the *therapist*, rather than the recoveree, both

allows quality control from a human expert and keeps the personal connection central. For therapists who have very large caseloads, this can help with some of the routine personalization of their therapy. Further, it can act as a memory aid that surfaces their internal knowledge about their client, which they can use to fine-tune recommendations. Support professionals have a lot of information about their clients in memory that is not easily externalized and fed into a recommender system, at least not without adding on further burden of documentation. This decision aid would make it possible for therapists to manage large caseloads while still maintaining the personal care that is so important, thus amplifying the support-recoveree connection.

A third example of future work would be a guide for support professionals on useful technology for their recoverees. Recoverees need guidance on using technology in a way that is positive for their recovery, and a support professional would be a natural source of guidance: they will deal with this multiple times with many clients, while the recoveree only experiences it once. Support professionals do not appear to be accumulating knowledge about useful technology in the way that they do for other recovery resources. A solution to this might be a practical guide, aimed at support professionals, that presents accumulated knowledge about what has and has not worked for lots of recoverees. The guide should aim for practical, on-the-ground knowledge: what Facebook groups and what mobile apps are good for what kinds of things, which meeting finder apps are kept up to date, etc. Future work could design this guide, with a focus on identifying what information support professionals would find most useful in their practice.

The findings in this dissertation have implications for other health domains, as well. The concept of digital social reshaping may be applied to any situation where an individual needs to

remake their digital environment for their health. One example of this in the literature is teens hospitalized for suicidal behavior; the researchers briefly mention that re-entering digital social spaces can be a daunting task for these teens after they are discharged [235]. Another domain where this may be particularly relevant is eating disorder recovery. Research has found that eating disorders can be greatly accelerated by online content, and online communities that propagate pro-eating disorder content can be very destructive [183]. People in recovery for an eating disorder talk about social media in similar terms as those in SUD recovery, mentioning triggering content and friends on social media that threatened to destabilize their recovery [185].

Some of the more specific contributions of this dissertation also apply outside of the SUD recovery context. For example, in *Self-Guided Activities*, I argue that the stakes of failure are particularly high for people in SUD recovery, partly because “failing” a poorly-designed intervention can be especially demotivating in a context where the individual is primed to feel ashamed and believe the failure is their fault. Research with people living with HIV finds similar feelings of shame, and Marcu et al. argue for identifying empathy-driven design strategies that target stigma and marginalization that would otherwise drive people away from using an intervention [149].

There are two important limitations to this research that could change the conclusions in this research. First, this research is limited in its sample: everyone in my participant sample is involved in formal recovery institutions of some kind (health system, social services, etc.). Their responses are likely biased toward the assumption that recovery works best with a network of support professionals and mutual help groups. People who undergo self-help recovery or “natural recovery” without the involvement of rehab programs or mutual help groups are generally understudied in the literature and it is unclear how much their recovery needs differ from those

who undergo more formal modes of treatment. Including this group might change the relative importance of amplifying connections, for example. People who achieve long-term self-help recovery do so without engaging much with the recovery community. This might be because they did not need social support, they were getting social support from other sources, or they were cut off from it. All of these factors affect design, especially in understanding how to design an on-ramp for people to engage with recovery and how to shape an online community that can engage people who would otherwise remain disconnected.

Second, the effects of COVID-19 on attitudes toward telehealth interventions are still unknown. After a year or more of forced distance communication, Zoom support groups, and other rapid pivots to technology solutions to manage recovery care (and life in general) during the pandemic, there may have been a seismic shift in people's attitudes toward incorporating technology into care. It is possible, for example, that the distance people reported feeling from Zoom calls in my interviews has faded as people adapted to having much of their communication mediated by a screen. Or perhaps people find it easier to connect with chatbots because they have gotten better at connecting with words on a screen and feeling presence that way. Many of the participants in my interviews who were interviewed after COVID-19 quarantines started said they were looking forward to being able to return to in-person care, but also that they had found some telehealth adaptations that they planned to keep. As of yet, it is still unclear if COVID-19 isolation will usher in a sea change in perceptions of telehealth in SUD, or if it was just a temporary destabilization that will mostly return to pre-pandemic habits of technology use.

Technology is very promising as a SUD recovery tool, but it is also perilous. With such an environment, everyone needs strategies for achieving the promise while avoiding the peril as much as possible. The specific strategies vary across different stakeholder groups, but the

common theme in these strategies is cutting cognitive load while creating more – and better – connections with supportive people.

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