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The adoption and sustainability of digital therapeutics in justice systems: A pilot feasibility study

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Abstract

Background: This study explored whether participants with substance use disorder (SUD) would adopt and use a smart-phone app with a cognitive behavioral therapy program, weekly Brief Addiction Monitor (BAM) assessments, daily check-ins, tools to track sobriety and treatment, and other patient-centered resources. In addition, participants with SUD could access a social worker and peer support specialists.

Methods: The study sought participants from two groups: those referred by a justice-related agency and participants who responded to outreach from the Addiction Policy Forum (APF). The Connections smart-phone app was offered to both groups. The study examined use of the app and social worker/peer recovery support services by participants who downloaded and used the app; those referred by a justice-related agency and those who self-referred through APF. The app provided primary data, including socio-demographics, referral status, dates of use, activities completed, and BAM scores.

Results: The app was offered to 1973 participants, 40% of whom downloaded it. Three groups emerged from among the 350 who used the app: those who used only the cognitive behavioral aspects of the app, those who used only the recovery support services offered, and those who used both the app and recovery support services. Looking at the two referral groups, the justice-referred group preferred telehealth recovery support services with the social worker; the self-referred group

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Declarations of Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests: Author Molfenter has < 1% stock ownership in CHESS Mobile Health that markets the Connections App. Author Molfenter played no role in the data collection, analysis or interpretation of the study data. Dr. Molfenter has worked extensively with his institution to manage any conflicts of interest.

No other authors had any financial interests or personal relationships that could appear to influence the work reported in this paper.

Ethics approval

The Office of Research Integrity and Assurance, Institutional Review Board of George Mason University approved this project on November 20, 2020 (OSP #119666). All participants were adults who volunteered; a consent form was included as part of the Connections App.

used the app and the app plus the recovery support services equally. Scores on the BAM improved across time. Justice-referred participants' protective behaviors improved more than those of the self-referred participants while self-referred participants' risk behaviors improved more than those of justice-referred participants. Older participants were more likely to use the app, and to report fewer risky behaviors, as measured by the BAM.

Conclusions: Use of a digital therapeutic appears to support recovery of participants with SUD although many clients need and want the integration of social worker-driven recovery support services. Basically, the app can be an extension to personal services, but many people with SUD (particularly during COVID-19) crave human interaction. It also appears that those who seek assistance on their own, rather than being referred by a justice-related agency, may be more likely to benefit from digital therapeutics such as the Connections app.

Keywords

Substance use disorder; Digital therapeutics; Telehealth and SUD

Background

The recent pandemic exacerbated the need for flexibility in health care delivery. The COVID-19 shutdowns layered more challenges, including additional stress and isolation, on an already vulnerable population such as people with substance use disorder (SUD) and/or those involved in the criminal justice system. Social isolation can lead to higher-risk behaviors for such populations, including relapse (Hosseinbor et al., 2014; C.S. Kruse et al., 2020). Telehealth, or telemedicine, can augment health care delivery for a variety of health conditions and tends to have a myriad of positive results. Telehealth includes health care supported by telephones, mobile phones, computers, the internet, and audio and video processing for alcohol use disorder (Kruse et al., 2020), mental health (Lawes-Wickwar et al., 2018), long-term health conditions (Henderson et al., 2013; Paré et al., 2007), and substance use disorder (Molfenter et al., 2015). Telehealth contributes to some positive outcomes in terms of management of a medical condition, but results vary.

According to C.S. Kruse et al., a major advantage to telehealth is that it "has the ability to reduce obstacles such as geographical locations and time while still continuing to deliver the same (or better) quality health care" (2020, p. 2). Studies have demonstrated that patients view telehealth as convenient, efficient, comfortable, private, and as promoting communication (Powell et al., 2017). Telehealth can improve health outcomes for diabetes (Wu et al., 2018), heart disease and psychiatric conditions (DelliFraine & Dansky, 2008), and chronic diseases (Rush et al., 2018); increase adherence to treatment protocol (Hommel et al., 2013); enhance obstetric outcomes (DeNicola et al., 2020); and increase autonomy and cognitive ability among older adults (Kruse et al., 2020) as well as resulting in greater cost-effectiveness (Finkelstein et al., 2006).

However, those who are justice-involved and have SUD still face barriers to treatment both within and outside carceral contexts and remain underrepresented in digital health literature (Leach et al., 2022) and even those who receive SUD treatment while incarcerated continue to face challenges maintaining their recovery upon release. Some of these challenges include

lack of familial and social support, financial issues, and inadequate housing (Langdon et al., 2022). In addition, justice-involved participants who are referred to out-patient treatment often report more severe SUD symptoms and greater resistance to treatment compared to those who self-refer (Batastini et al., 2016).

The COVID-19 pandemic led to closures or suspensions of most community-based support services upon which people with SUDs depend. In-person support group meetings and group therapy sessions were shuttered quickly as appointments with social workers and counselors were canceled or moved online. Early in the pandemic, people with an SUD history were at an increased risk for COVID-19 and, once infected, were more likely to exhibit severe complications (Wang et al., 2021). While there is some evidence that synchronous telehealth modalities can be effective, for those with SUDs in both group and individual sessions, there have been few studies that involve both modalities (Oesterle et al., 2020).

The pandemic did not quell overdose-related fatalities; instead, they increased by 28% in April 2021 to 100,306, eclipsing the number of gun- and vehicle-related deaths combined (Ahmad et al., 2022). Service gaps for high-risk homeless and justice-involved populations presented significant challenges during shutdowns (Baggett & Gaeta, 2021) as well as for marginalized populations such as Black, Latinx, and American Indian communities (Hendel, 2022). Many jails and prisons downsized their populations to protect against the spread of COVID-19 and, given that linkage to SUD care could not be established during early release, the population is likely to have experienced increased risks (Gutierrez & Patterson, 2021).

While it appears that telehealth may be a viable treatment for some participants in some circumstances, Lin, et al., note that there has been little research examining its use with clients with SUDs. They further recommend that “additional resources and tools are needed to help patients with SUDs and with comorbid mental health disorders” (2020, p. 1209). A review of studies looking at the efficacy of telehealth for those with SUDs found that telehealth may be as effective as in-person treatments, especially as it improves both access and convenience (Mark et al., 2021).

There remain some unresolved issues with telehealth including whether it can increase participant engagement over enough time to demonstrate effectiveness (Nahum-Shani et al., 2022), whether staff training is sufficient to use the technology and integrate it with clinical care (Hendel, 2022), and barriers such as technical literacy, lack of desire, and cost (C. Kruse et al., 2020), whether appropriate medications can be prescribed through telehealth, and whether insurance, including Medicare, will cover the costs of telehealth (Lin et al., 2020).

This study used the Connections App (“the app”) which has been found previously to support patients in recovery by reducing heavy use days and promoting prosocial engagement (Gustafson et al., 2014; Johnston et al., 2019; Molfenter et al., 2015; Quanbeck et al., 2014). The study examines the use of the Connections App in justice-related programs for SUD clients and a second group of participants who voluntarily sought assistance for their substance issues. The current study also explores the use of the Connections app in

terms of access to traditional services, the app, and engagement with SUD clients referred by justice-related agencies and clients who self-referred.

Methods and procedures

This demonstration project provided services and support to participants with SUDs who were either involved in the criminal justice system (justice-referred) or responded to outreach from APF (self-referred). All were volunteers, all could cease participation at any time.

Digital Therapeutics. Digital therapeutics, which fall under the umbrella of telehealth, are digitally delivered evidence-based therapeutic interventions designed to prevent, manage, or treat a medical disorder or disease. These products require clinical evidence and real-world outcomes to support claims of efficacy, risk, and intended use (Hong et al., 2021). The Connections app itself is a digital therapeutic (A-CHESS, developed by (CHESS Health, 2018)). In addition, the app offers a digital cognitive behavioral therapy program (Computer-Based Treatment for Cognitive Behavioral Therapy - CBT4CBT). CBT4CBT uses cognitive behavioral skills to help participants reduce substance use by guiding them through seven modules, each lasting 30–45 min (Kiluk et al. 2016, 2018). These modules use a variety of engaging techniques such as films, quizzes, and games to teach skills including how to recognize triggers for substance use, how to cope with cravings, and other management techniques. Data from clinical trials demonstrate that CBT4CBT is associated with reduced risk of relapse, decreased substance use, and increased social support (Muroff et al., 2019). The app has provided immediate support across multiple populations (e.g., Latinx, Spanish-speakers (Muroff et al., 2019)) and SUD types, including alcohol (Gustafson et al., 2014) and OUD (Gustafson et al., 2016).

Recovery Support Services. In addition to the app, participants were offered access to peer support services facilitated by APF including a weekly recovery newsletter with recovery content and tools, virtual recovery meetings, and access to a social worker or peer support specialist. The peer support services were conducted in a virtual therapeutic framework, modified after a Therapeutic Community (TC) where participants have different roles and responsibilities in the group. As participants progress through the program, they assume greater responsibilities and leadership roles in the community and facilitate support group meetings, help each other navigate challenges and problem solve, and encourage and support each other (De Leon, 2000). APF's recovery support services allowed participants to have leadership roles in support group meetings, respond to others on the app, and share personal experiences with others who report difficulties.

Social Worker. An APF social worker posted new content on the app each day and facilitated conversations on the app's message boards. Each day the social worker facilitated discussions on recovery-related topics that ranged from triggers, gratitude, and goals to use of medication for opioid use disorders (MOUD) treatment, and provided overall support. In addition, the social worker sent reminders about these services with electronic dissemination of recovery content and resources.

Staff training. APF staff members were trained in the use of the app and assisted each participant in downloading, setting-up, and using the app; these staff were available for further assistance on an as-needed basis. In some cases, this onboarding process took several hours across multiple days.

Study design

The Connections app was offered to a total of 1973 participants referred by correctional agencies (justice-referred) and participants who responded to outreach by APF (self-referred). Those who indicated an interest in the app were provided the app at no cost.

The main portion of the study involved two groups, 234 justice-referred and 116 self-referred. Participants in both groups were offered digital services (the Connections app) and recovery support services (APF services). Participants in both groups could use (or not use) the app and/or APF recovery support services as they desired.

Self-Referred Group. Beginning in March 2020, APF launched the Connections App and offered access free of charge to anyone with an SUD who needed support. The self-referred group for this study were participants from 27 states who voluntarily requested the app between December 1, 2020, and September 30, 2021 (see Fig. 1). No incentives for participation were offered. Some research has shown that those who are stigmatized, face discrimination, and/or are marginalized (including those who use drugs) may have concerns about privacy risks when asked to share personal information (e.g., Smith et al., 2023). Therefore, these participants were not asked about involvement with the criminal justice system and reporting of age, gender, and race/ethnicity was optional.

Justice-Referred Group. In the same timeframe, APF recruited pilot sites from criminal justice agencies and community-based reentry providers. More than 100 criminal justice agencies expressed interest in the project; 62 submitted applications to APF to be a demonstration site and 31 were invited to participate. Ten sites ultimately chose not to participate due to COVID-19-related staffing shortages. The 21 participating sites represented 16 states (see Fig. 1). Participants in the justice-referred group who downloaded the app were referred by correctional agencies (73%), courts (17%), community-based reentry providers (9%), or law enforcement agencies (1%). These agencies referred participants to the study, and provided demographic data, between December 1, 2020, and September 30, 2021. None of these individuals were required to participate and none received any incentive to participate.

Data

Data for this study come from varied sources. The app was the primary source of data. Data from the app include participants' start and end dates, the activities in which each participated and the date(s) on which they participated, demographic information, and the weekly Brief Addiction Monitor (BAM). Data also were drawn from the personal logs and notes of APF staff who assisted participants in both groups to download and onboard the app and provided recovery support services outside the app (e.g., virtual recovery meetings,

individualized support). A total of 350 participants actually used the app; this group included 234 justice-referred participants and 116 self-referred participants.

The 14 BAM items have two primary subscores. Protective factor items support sobriety (e.g., participation in work, school, or volunteering and time spent with family/friends who support recovery - higher scores are better). The second subscore is related to risk factors for substance use (e.g., difficulty sleeping and depression or anxiety - lower scores are better). Each factor's scores can vary from 0 to 35. Participants' responses to individual BAM items also can be considered a "score" measuring change in a specific activity (Cacciola et al., 2013). The comparison-wise alpha for analyses was set at 0.05.

Findings

Participant demographics and characteristics. Table 1 provides the background information for participants who accessed the app or who accessed APF recovery support services. Looking at gender, one-third of the justice-referred participants were female while nearly three-quarters of the self-referred participants were female. Further, more than three-quarters of the justice-referred participants were white. The largest group of self-referred participants, more than 70%, did not report their race/ethnicity; most who did report were white. Given the disparities in the reporting of gender and race/ethnicity, analyses based on these variables were not feasible.

Use of the app. Of the 1973 participants who were offered the app, fewer than half downloaded it and of the 796 who did download the app, less than half (44.0%) actually engaged with the app. Fig. 2 provides the number of participants who were offered the app, adoption rates (number who downloaded the app), engagement rates (number who downloaded and engaged with the app), and patterns of engagement.

For the purposes of this study, engagement was defined as using only the app ($n = 116$) or using both the app and APF recovery support services ($n = 234$); these numbers can be further divided into those who were justice-referred and those who self-referred. Those who did not engage with the app in any way ($n = 446$) are not included in analyses (see Fig. 2).

Looking at the two referral groups, more self-referred participants engaged with the app in some way (77.9%) than did the justice-referred group (36.2%). There were no between-group differences in the number of people who used the app only. However, significantly more participants from the justice-referred group used both the app and APF services than participants from the self-referred group ($\chi^2 = 22.3$, $df = 1$, $p < .001$).

Services accessed. Study participants could use the app and/or the recovery support services from the APF social worker. While 176 justice-referred and 58 self-referred participants received APF support services and/or the app, there were 58 participants in each group who only used the app, with no APF recovery support services. In the justice-referred group, nearly two-thirds participated only in APF services while less than one-quarter of the self-referred group used only APF services (see Fig. 2). The self-referred group used the app and the app plus APF services equally and nearly twice as much as they used only APF

services. An analysis of the data indicated that these differences in the use of the services were statistically significant ($\chi^2 = 116.1$, $df = 2$, $p < .001$).

Connections app activities. Overall, there are 34 activities within the app, some with multiple options (e.g., view sobriety is an activity with additional options of update sobriety, add sobriety, and remove sobriety). There also is an icon to request support and help from a social worker or peer support specialist. In total, there are 68 activity options. Participants completed a total of 87,752 activities, with self-referred participants accounting for 36,727 activities (41.2%) and justice-referred participants accounting for 51,025 activities (58.8%). When breaking this down to averages, the self-referred participants completed more activities ($M = 319.4$) than the justice-referred participants ($M = 218.1$), but this difference was not significant ($t = 1.07$, $df = 349$, $p > .05$). (See Table 2 for data.)

Days active on the app. The app was available for a total of 304 days of possible activity. However, clients downloaded the app at different times during the study and could stop using the app at any time. The greatest number of days that anyone was active on the app was 270 while the fewest number of days was 1, with an average of 60.1 days for the justice-referred group and 58.1 for the self-referred group. This difference was not significant. Data for the two groups are in Table 2.

Because there is some indication that substance use declines with age (e.g., Mattson et al., 2017), a correlation explored the relationship between age and the number of activities completed, anticipating that older clients might be inclined to participate in more activities each day. The correlation was positive and linear, though quite weak ($r = 0.14$, $df = 347$, $p < .05$), with age and activities sharing 1.9% of the variance; older participants are slightly more likely to use the app than younger participants.

Brief Addiction Monitor. The BAM monitors weekly progress in recovery (Cacciola et al., 2013). Participants who began participating in the study on December 1 and continued through September 30 had the opportunity to respond to the BAM 43 times. Of the 232 who completed at least one BAM, 158 were justice-referred and 74 were self-referred. Across the two groups, 121 completed multiple BAMs; of these, nearly three-quarters were justice-referred. However, the vast majority of both groups completed no more than five BAMs. The maximum number of weeks anyone in the justice-referred group responded was 34 ($n = 1$) while the maximum number for the self-referred group was 35 ($n = 1$). BAM data are provided in Table 3.

Analyses of changes in BAM scores (from baseline to last assessment) subtracted the mean change from each participant's change score, making the analyses similar to an analysis of covariance.

Protective factor scores. A two-way mixed model repeated measures ANOVA tested the effects of referral group (self- or justice-referred), time (baseline BAM and last BAM), and the referral group x time interaction on the change in BAM protective factor scores. Time was significant ($F = 8.56$, $df = 1, 119$, $p < .01$), accounting for about 1.0% of the variance in BAM protective factor scores. Group also was significant ($F = 4.90$, $df = 1, 119$, $p <$

.05), accounting for approximately 3.0% of the variance in BAM protective factor scores.[1] These results indicate that (1) the final protective factor scores were better than the baseline protective factor scores and (2) the justice-referred group improved their protective factors scores somewhat more than the self-referred group (an average difference of less than 1 point).

Risk factor scores. A second two-way mixed model repeated measures ANOVA tested the effects of referral group (self- or justice-referred), time (baseline BAM and last BAM), and the group x time interaction on the change in BAM risk factor scores. Time was significant ($F = 6.10$, $df = 1, 119$, $p < .05$), accounting for approximately 1.0% of the variance in BAM risk factor scores.[2] The final BAM risk factor scores showed some improvement over the initial BAM risk factor scores. Group was not found to be significant. The self-referred participants showed minimally greater improvements (less than 0.5 points) in their risk factor scores than the justice-referred participants. The interaction of group x time was not significant.

Relationships with BAM factor scores. It was anticipated that age might be related to BAM scores with greater age associated with better scores (Mattson et al., 2017). For participants who self-referred, the correlations between age and BAM scores were statistically significant and relatively strong, indicating that greater age was related to more protective activities ($r = 0.27$, $df = 72$, $p < .05$, sharing 7.3% of the variance) and fewer risk activities ($r = -0.23$, $df = 156$, $p < .01$, sharing 5.4% of the variance). For justice-referred participants, neither relationship was significant although both were in the anticipated directions.

The relationship between risk and protective factors was significant and quite strong ($r = -0.42$, $df = 230$, $p < .005$, sharing 18.0% of the variance). The negative relationship indicates that those with more protective activities are more likely to have fewer risk activities.

When comparing the change in scores (baseline BAM to last BAM) for the individual items, both groups showed some level of improvement for 13 of the 14 items. The self-referred group reported a lower score for “confidence in recovery” on their last BAM than on their first (baseline). Table 3 provides the details.

Relationship between BAM scores and Connections app information. Correlations were calculated to determine whether there was a relationship between the number of weeks a person was active on the app and their protective or risk factors. For the justice-referred group, the relationship between number of weeks active on the app and protective factor was in the anticipated direction and significant, but fairly weak ($r = 0.16$, $df = 159$, $p < .05$, sharing 2.6% of the variance). The relationship between risk factor and weeks of activity was not significant.

[1]While there were no extreme outliers, the assumptions of normality and homogeneity of variances were violated. ANOVA is robust with regard to violations of the normality assumptions, but readers should be aware that violations regarding homogeneity of variance can be more problematic when sample sizes are unequal.

[2]While there were no extreme outliers, data violated the normality assumption; the homogeneity of variances assumption was not violated.

For the self-referred group, both correlations were in the anticipated direction, and both were significant. The correlation between protective factors and weeks active on the app was positive but only somewhat meaningful ($r = 0.23$, $df = 57$, $p < .05$, sharing 5.3% of the variance). The relationship between risk factors and weeks active was stronger ($r = -0.32$, $df = 57$, $p < .01$, sharing 10.2% of the variance). More time spent on the Connections app was related to more protective behaviors and fewer risk behaviors.

Limitations

These findings focus on analyses of data from the participants in the justice-referred and self-referred groups who chose to download and use the app (see Fig. 2). Basic demographics (age, gender, ethnicity/race) were provided for nearly all participants; few participants provided information about past overdoses (about 10%) or previous treatment(s) (25%).

The criminal justice referral agencies provided demographic information for the justice-referred participants while the self-referred participants responded to an optional survey. Socio-demographic data were more complete for justice-referred than for self-referred. For instance, race/ethnicity was provided by only 29% of the self-referred group, compared to 98% of the justice-referred group. Given the variability in complete data, the different proportions of males and females across the two groups (the justice-referred were two-thirds male while the self-referred were three-quarters female), and the overwhelming percentage in both groups reporting their race/ethnicity as white, neither gender nor race/ethnicity could be analyzed. Future research should focus on identifying study participants who represent other ethnicities/races, more marginalized and underrepresented groups, and more equal representation of the genders.

Analyses also are limited by the variation in group membership numbers and the concomitant disparity in variance, which often was larger within groups than between groups. For any statistically significant results, variance accounted for was calculated to determine how meaningful or important the statistical result. In some cases, statistically significant results did not indicate that a great deal of variance was explained by the variables being analyzed.

There were individuals in each group who experienced difficulty in downloading and using the Connections app. In addition, some experienced a delay between the time when they indicated a willingness to participate in the study and the time when they received a text message to download the app. When they did connect with an APF staff person, there still could be difficulties in downloading and using the app. These implementation issues no doubt decreased the number of participants in each group. In addition, the technological expertise of the participants, and the abilities of their smart phones, are unknown. Future studies may consider providing appropriate phones, and training on the phones, to potential participants.

The BAM provides information regarding success in maintaining sobriety. However, roughly one-third of each group did not respond to the BAM at all, and another one-third responded only once. Thus comments regarding the BAM must be considered carefully. The BAM

was developed for use in a clinical setting during a meeting between clinician and patient. In such cases, the patient had little choice but to respond to the items; given the choice of whether to respond or not, participants in this study often chose not to respond.

Discussion

While some research has questioned whether telehealth modalities can maintain participant interest and engagement, this 9-month feasibility study found that the use of digital therapeutics for individuals with SUD who were referred by the legal system was favorable. They also demonstrated a keen interest in personal contact with APF recovery support services personnel. Overall, the results for the justice-referred group were positive – slightly better than those of the self-referred group. Individuals in the self-referred group were more likely to engage with activities through the app while those referred by a justice agency used the app more often. The method of recruitment may account for this difference with justice-referred participants wanting to assure that they met the expectation that they would use the app and self-referred choosing to participate in activities to support their sobriety.

These overall results support the hypothesis that self-referred individuals are motivated internally to seek assistance with regard to their SUD. Another interpretation could be that the justice-referred individuals were more concerned with potential privacy issues related to use of the app. While there is no evidence that the app is problematic with regard to privacy, research has indicated that this still can be a fear among justice-involved individuals. Study participants were told that the information within the app would not be shared with justice-related agencies, nor would it be used to create any sanctions against them; this does not appear to have lessened their concerns.

From this study it is evident that the app did support recovery for many participants. However, it also is evident that many individuals were eager to be in personal contact as well. The Connections app plus APF recovery support services with human interaction were the most prevalent services used. Among the justice-referred group, nearly two-thirds of participants participated in APF recovery support services only, which included virtual mutual aid support group meetings, texts and calls with peer counselors and a social worker, and digital recovery content. For these participants, the least used service was the app only. Still, one client commented about the app, “I was feeling so alone in my recovery, there was no place to go because of COVID restrictions and lockdown and after being on the app awhile I learned there was a recovery meeting on Thursday nights which was great. I met a lot of really cool, genuine people, and they helped me to open up about my alcoholism.” Among the self-referred group, equal numbers used the app only and used the app and APF recovery support services together.

There were implementation issues within the studied app. Downloading the app was a multi-step process that may have affected the number of individuals who participated; some agency staff referred to it as “a hassle.” Some participants were able to navigate the use of the app more easily. While participants provided their own smart phones, their levels of technical proficiency may have varied greatly. A fairly large proportion of individuals used

the app on one occasion only – often their onboarding date (i.e., the date on which APF personnel assisted them to download the Connections app).

The platform that was used for this project did present unique challenges that also may have hampered participation, particularly with the justice-referred group. The Connections app was designed to be used by treatment facilities with few clients; it was not designed to serve a project that is national in scope with many participants. The platform did not allow bulk uploads, and several agencies sent enrollment lists that included hundreds of people. APF staff were trained in using the app, still uploading each participant one-by-one was tedious and time consuming. Individuals were added within a few days of when APF received the enrollment lists, but the delay also may have contributed to lower download rates.

A benefit, however, was that the app could be offered to participants at no charge so there were no issues regarding support from insurance companies. It may be helpful in future studies to provide specific training to potential participants and agency staff, as well as to those who are implementing the app, and to assure that all have some level of technological literacy.

As noted earlier, few studies have involved digital therapeutics, or other telehealth modalities, in both group and individual sessions and few have included justice-involved individuals. This study offered both individual sessions with the APF social worker or peer support specialist and more group-oriented sessions on the app. Nearly two-thirds of the justice-referred participants preferred to work one-on-one with the APF social worker or peer support specialist. This may be because they were concerned about privacy issues when working with the app, or that they felt they needed a human connection. This also may be reflected in their BAM scores that indicated less change related to “participation in work, school, volunteering” and “time with supportive people.” The self-referred participants used the app alone and the app plus the APF social worker equally. Their BAM scores in several areas showed more improvement than those of the justice-referred participants.

Both groups underused the app features, suggesting that simpler apps might be more beneficial than those with many features. Although the Connections app has been successfully used in randomized clinical trials (Gustafson et al., 2014, 2016), other apps have been developed with fewer options and greater ease of use. It may be beneficial to explore some of these options, particularly for individuals who may have less technological skills. It also may be possible to provide some benefits to incentivize participants. For instance, providing an up-to-date smartphone, a small stipend, or access to meals. This may be especially important for those who are justice-referred.

Regardless of the issues identified in this study, the Connections app is an emerging digital therapeutic that has been shown to support recovery from alcohol and substance use disorders in clinical trials involving multiple populations. However, the Connections app is not the only app available. There are two FDA-approved digital therapeutics, reSET for SUD and reSET-O for OUD (Xiong et al., 2023), the FDA Breakthrough Device, DynamiCare, for smoking cessation (Kurti et al., 2020), and other apps that are currently undergoing clinical trials (e.g., CBT4CBT for Alcohol Use Disorder, Cocaine Use Disorder, and OUD

(Carroll et al., 2008)). Across this set of approved and emerging digital therapeutics, various populations have been involved, including justice-involved individuals, Spanish-speakers, pregnant women, and individuals with SUD, OUD, and AUD. As more apps become available, justice agencies may be more willing to use them within justice settings (e.g., for the purposes of community supervision or recovery court programs) and insurance companies may be more willing to cover the costs of their use.

This demonstration project provides a proof-of-concept that the use of digital therapeutics does appear to support the recovery of participants with SUD and that integration of other recovery support services is an asset that many clients need and want - the app can be an extension to the personal services, but many people with SUD (particularly during COVID-19) crave interaction with a person rather than with technology. It does appear that those who seek assistance on their own, rather than being referred by a justice-related agency, are more likely to benefit from digital therapeutics. But the proof of concept is that those who seek assistance on their own are more likely to use the app to support their recovery than those to whom a new means of recovery is suggested by those in positions of authority.

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Data availability

Research data for this article Data from this study will be available on the Justice Community Opioid Intervention Network (JCOIN) Data Commons https://jcoin.datacommons.io

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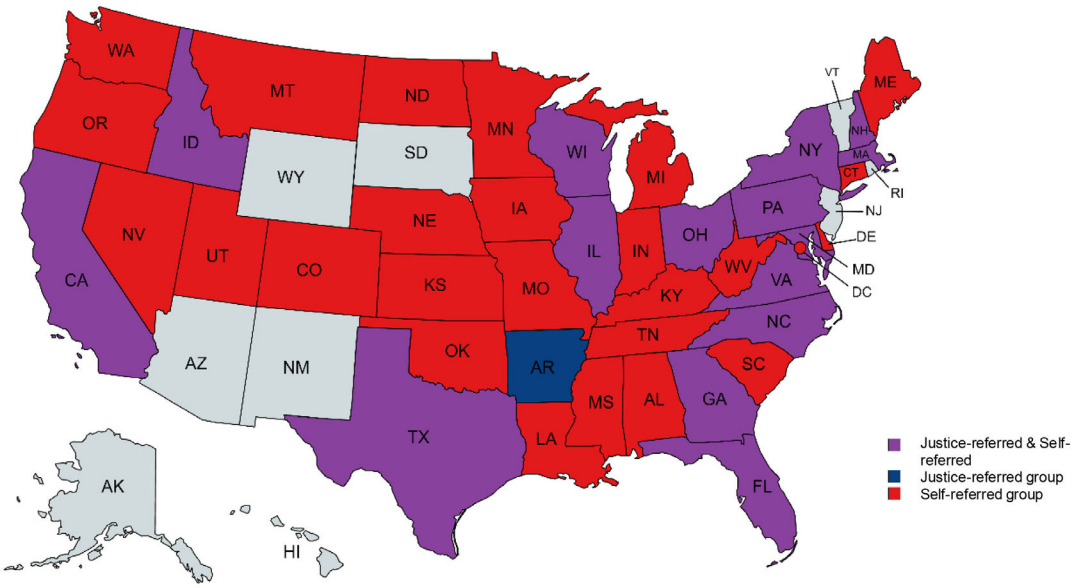

Fig. 1.
States in which study participants live.

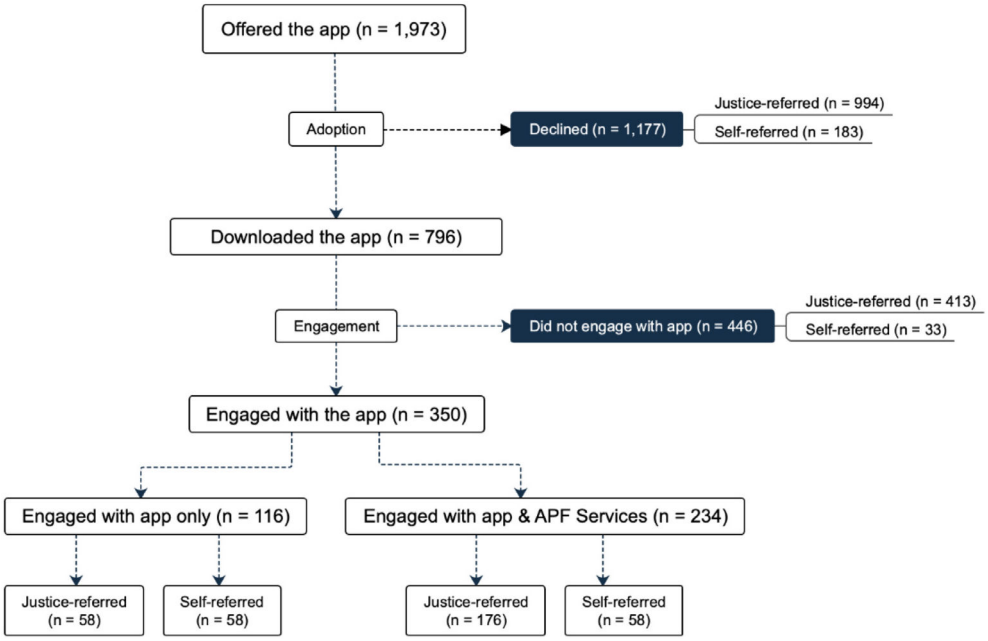

Fig. 2.
Engagement with the connections app.

Table 1

Demographics of participants who downloaded the Connections app (N = 796).

Demographic		**# justice-referred (*n* = 647)**	**# self-referred (*n* = 149)**
Age	18–83 years	18–73 years	20–83 years
	Unknown	M = 37 years	M = 41 years
		1 (<1%)	5 (3.4%)
Gender	Female	215 (33.4%)	109 (73.2%)
	Male	421 (65.5%)	36 (24.2%)
	Other (not defined)	−0-	2 (1.3%)
	Unknown	11 (1.7%)	2 (1.3%)
Race/Ethnicity	White, non-Hispanic	502 (78.1%)	34 (22.8%)
	Hispanic	20 (3.1%)	1 (<1.0%)
	Black/African American	54 (8.4%)	2 (1.3%)
	Indigenous peoples	22 (3.4%)	3 (2.0%)
	Multi-racial	18 (2.8%)	3 (2.0%)
	Other	17 (2.6%)	−0-
	Unknown	14 (2.2%)	106 (71.1%)
Have experienced an overdose	72 (11.4%)	14 (9.4%)	
Have participated in treatment	177 (27.5%)	34 (22.8%)	

Table 2

Connections app use by justice-referred and self-referred group participants.

	M **(std dev)**	**Justice-Referred (*n* = 234) 60.1 (72.0)**	**Self-Referred (*n* = 116) 58.1 (69.4)**
Frequency of App use (Varied from 1 to 270 days, with a maximum possible of 304 days)	1–30 days	126 (53.8%)	60 (52.2%)
	31–100 days	50 (21.4%)	29 (25.2%)
	100+ days	58 (24.8%)	26 (22.6%)
App activities completed	Total completed	51,025	36,727
	Maximum completed	3474	7062
	Minimum completed	4	5
	M (std dev)	218.1 (441.3)	319.4 (970.1)
Days active on the App	Maximum days active	270	261
	Minimum days active	1	1
	M (std dev)	60.1 (72.0)	58.1 (69.4)

Table 3

BAM Completion and Scores by Group.

Number Completing BAM (maximum possible: 43 times)			
Among those who engaged with the app	**Justice-Referred**	**Self-Referred**	**Total**
Never completed the BAM	76 (32.5%)	42 (36.2%)	118 (33.7%)
Completed the BAM 1 time	71 (30.3%)	40 (34.5%)	111 (31.7%)
Completed the BAM 2-10 times	66 (28.2%)	27 (23.2%)	93 (26.6%)
Completed the BAM 11-20 times	11 (4.7%)	5 (4.3%)	16 (4.6%)
Completed the BAM more than 20 times	10 (4.3%)	2 (1.7%)	12 (3.4%)
Total	234 (66.9%)	116 (33.1%)	350 (100%)

BAM change factor scores (baseline BAM to last BAM) by group‡							
Justice-Referred	87	16	−14	2.2 (6.0)	28	−25	−1.7 (7.6)
Self-Referred	34	16	−15	1.5 (6.8)	15	−14	−2.1 (7.5)

Correlations between age and BAM factor scores								
	Age with Risk Factors				**Age with Protective Factors**			
	r	***df***	***p***	**Variance shared**	***r***	***df***	***p***	**Variance shared**
Justice-Referred	−.09	156	>.05	0.8%	<−.01	156	>.05	0.0%
Self-Referred	−.23	54	<.05	5.4%	.27	54	<.05	5.4%

Improvements in BAM item scores		
Protective items	**Justice-Referred**	**Self-Referred**
Improved participation in work, school, or volunteering	7.3%	23.5%
Increased participation in spiritual activities	6.1%	1.9%
Increased participation in support group meetings	1.5%	2.0%
Increase confidence in recovery	2.7%	−3.3%
Increased time with supportive people	0.2%	3.0%
Risk items	**Justice-Referred**	**Self-Referred**
Reduction in relationship troubles	24.1%	38.8%
Reduction in difficulty sleeping	20.2%	23.7%
Reduced depression / anxiety	18.0%	1.2%
Reduced urges / cravings	12.1%	8.7%
Reduction in risky situations	4.7%	9.3%

‡For *protective factors,* positive numbers indicate improvement; for *risk factors,* negative numbers indicate improvement.