Keeping Track of My Drinking - Patient Perceptions of Using Smartphone Applications as a Treatment Complement for Alcohol Dependence

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ABSTRACT
Background: Alcohol dependence is common, yet highly undertreated. Smartphone applications (apps) have potential to enhance treatment accessibility and effectiveness, however evidence is limited, especially studies focusing on user experiences. The aim was to describe patient perceptions on the usability and acceptability of self-monitoring apps provided as treatment complement for alcohol dependence.

Methods: Individual semi-structured interviews were conducted through video or phone calls with 21 participants, recruited from a randomized controlled trial at a dependency clinic in Stockholm. The participants had used two specific apps for self-monitoring consumption (“Glasklart” and “iBAC”) during 12 wk prior to the interviews. Data was analyzed using Qualitative Content Analysis.

Results: Two domains were identified: 1) Smartphone applications as facilitators to treatment, and 2) Barriers to smartphone application use. Using apps within the treatment context was believed to increase the accuracy of the reported consumption. Participants became more aware of their alcohol problem and described the apps as reinforcers that could increase both the motivation to change and the focus on the problem and commitment to treatment. The apps were further described as helpful to control alcohol consumption. However, app usage was constrained by technical problems, unfit app-specific features and procedures, and alcohol-related shame and stigma.

Discussion and Conclusions: Self-monitoring alcohol apps have several beneficial features that can help assess, track, and control alcohol consumption, and improve communication with clinicians. The results indicate they can be useful complements to treatment for patients with alcohol dependence, but their use can be limited by different, foremost technical, issues.

KEY POINT SUMMARY
• Smartphone applications for self-monitoring of alcohol consumption may help provide accurate data, increase consumption awareness, focus, motivation, and perceived control;
• Smartphone applications for self-monitoring of alcohol consumption are considered helpful complements to alcohol treatment;
• The use of smartphone applications for self-monitoring of alcohol consumption can be constrained by technical problems, and unfit app-specific features and procedures.

Introduction
Alcohol use is a leading risk factor for disability and premature death among adults (Griswold et al., 2018; Rehm et al., 2017). An estimated 10-30% of the Swedish population have a risky alcohol consumption (The Swedish Council for Information on Alcohol and Other Drugs, 2020), and 4% fulfill the diagnostic criteria for alcohol dependence (Andréasson et al., 2013). Still, alcohol dependence remains highly undertreated (Rehm et al., 2015). Low treatment seeking may be explained by lack of knowledge of available treatment options and by conventional treatments being perceived as stigmatizing (Wallhed Finn et al., 2014). Consequently, those who enter treatment tend to have slightly larger problems (Blomqvist et al., 2007).

Although underused, there are different evidence-based treatments available with proven effectiveness to curb alcohol consumption, including brief interventions, cognitive behavioral therapy (CBT), 12-step facilitation, and harm-reduction treatments (Witkiewitz et al., 2019). Additionally, there has been an increase in digital solutions the past years, aiming to enhance treatment access and availability (Muench, 2014). Specifically, mobile health (mHealth), i.e., advice or treatment received by mobile wireless devices, has a promising impact on disease prevention and management through its ease of use, reachability, and high acceptance (World Health Organization, 2018). Other advantages include real-time,
repeated assessments within the natural environment (Shiffman et al., 2008), and increased affordability, dependability, individualization, and de-stigmatisation (Fowler et al., 2016). The development and use of smartphone applications (apps) is growing rapidly and offer novel opportunities for self-management and care engagement, which may support behavior change (Siegler et al., 2021; Tofighi et al., 2018).

The evidence base for mHealth, and especially app interventions for excessive alcohol use is growing. Studies investigating their effectiveness have shown inconclusive results and considerable heterogeneity regarding intervention-specific characteristics, small study samples and inadequate study designs (Colbert et al., 2020; Kazemi et al., 2017; Song et al., 2019). Qualitative research focusing on user experiences could increase the understanding of how app interventions are perceived, and what features drive behavior change (Dick et al., 2020). So far, only a few apps aimed at monitoring and reducing alcohol consumption have been qualitatively evaluated. Results show that apps could be useful and accessible for non-treatment seekers (Bolt et al., 2022), provide additional support to remain abstinent and enhance motivation following a treatment program (Klingemann & Wieczorek, 2022), are perceived as acceptable and meaningful for monitoring and providing feedback on alcohol consumption (Puddephatt et al., 2019), and have the possibility to increase awareness and reduce consumption among hazardous or harmful drinkers (Attwood et al., 2017; Bolt et al., 2022; Giroux et al., 2014). Still, to our knowledge, studies that have evaluated apps as part of dependency treatment are to a large extent lacking. Hence, the aim of this study was to describe patient perceptions on the usability and acceptability of two self-monitoring smartphone apps ("Glasklart" and "iBAC") provided as a treatment complement for alcohol dependence. The research questions were 1) how are the apps used by the participants, 2) what are the experiences of using the apps, and 3) what are the perceived effects of the apps on the outcome of treatment?

Methods

Theoretical framework and study design

This is a descriptive qualitative study. Data was collected through individual semi-structured interviews and analyzed using inductive Qualitative Content Analysis (QCA) (Graneheim et al., 2017; Graneheim & Lundman, 2004). The Consolidated Criteria for Reporting Qualitative Studies (COREQ) guideline was used when reporting the findings (Tong et al., 2007).

Setting and participants

Participants were recruited from the early stage of the MORE study (MOBILE phone technology for ReducEd drinking) - a three-armed randomized controlled trial (RCT) (n=164) aiming to investigate differences in alcohol consumption among alcohol-dependent adults receiving treatment as usual (TAU), and those who receive an app as a complement to TAU (Danielsson et al., 2018). (Trial registration: ISRCTN14515753, registered on 31 May 2018). The RCT took place at Riddargatan 1, a specialized outpatient dependency clinic in Stockholm city treating patients with alcohol dependence, where the treatment-period typically is limited to 12 wk, with follow-up 26 wk post treatment start. Inclusion criteria were: alcohol dependence according to the ICD-10 criteria (World Health Organization, 1992), a minimum of five days of heavy drinking (Allebeck et al., 2018) the past eight weeks, having a smartphone, being at least 18 years, and being fluent in Swedish. Exclusion criteria were somatic diseases or mental disorders, pregnancy, recent (past two years) treatment for alcohol problems, other drug use, and participation in another study. Following the last treatment session (at 12 wk), a sample of participants were invited to participate in this interview study, selected by purposeful sampling with maximum variation to ensure a varied sample of age, sex, dependency level, treatment goals, and app used (Hudelson, 1994). Participant characteristics are presented in Table 1. Four participants declined to participate due to other commitments or no desire to participate.

Intervention

In the MORE study, two apps were investigated: “Glasklart” ("Crystal clear" in English) and “iBAC.” Hence, participants in the RCT were randomized into receiving either 1) TAU, 2) TAU+Glasklart, or 3) TAU+iBAC. TAU included a manualized psychological treatment based on theories of guided self-change, and CBT (Hammarberg & Wallhed Finn, 2015; Sobell & Sobell, 2005), containing four 60-minute treatment sessions with a clinician during the 12 wk of treatment, and possibly pharmacotherapy (disulfiram, acamprosate, or naltrexone). MORE participants thus followed the same clinic flow as patients within routine care, apart from three extra sessions with the study nurse at screening/baseline, 12-week assessment, and 26-week assessment. All sessions were free of charge for the participants.

Glasklart included an app and a health care online portal. Participants were instructed to instantly register every unit of alcohol they consumed into Glasklart, as well as information on mood, cravings, location, and social context. An automatic prompt (push-notification) followed half an hour after each registered unit, asking about any additional units consumed. Participants were further instructed to register days with null intake and could revise the number of consumed units in retrospect. Participants could then review their alcohol consumption, in relation to their own set daily- and weekly consumption goals, as well as their estimated mood and cravings, location and company.

iBAC included an app, a portable mini breathalyzer connected to the app via Bluetooth, and a health care online portal. Participants randomized to iBAC received a prompt (push-notification) from the app thrice daily (morning, evening and irregularly) instructing them to use the breathalyzer. They were also instructed to use the breathalyzer hourly during drinking occasions, if any. During each test, participants registered their subjective mood. A picture (using the smartphone camera) was taken to verify the
Table 1. Participant characteristics.

<table>
<thead>
<tr>
<th>#</th>
<th>Age</th>
<th>Sex</th>
<th>Marital status</th>
<th>Education</th>
<th>Source of income</th>
<th>App used</th>
<th>ICD-10 criteria at baseline</th>
<th>HDD (≥4 standard units) past month at baseline</th>
<th>Consumption goal</th>
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<tr>
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<td>Female</td>
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<td>28</td>
<td>Abstinence at first, then cut down</td>
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<td>Employment</td>
<td>Glasklart</td>
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<td>Divorced/separated</td>
<td>Upper secondary school</td>
<td>Pension</td>
<td>iBAC</td>
<td>3</td>
<td>14</td>
<td>Cut down</td>
</tr>
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<td>4</td>
<td>27</td>
<td>Cut down, abstinence if possible</td>
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<td>Employment</td>
<td>iBAC</td>
<td>4</td>
<td>23</td>
<td>Cut down</td>
</tr>
</tbody>
</table>

HDD= heavy drinking days.

correct user. The breathalyzer gave a biologic measure of the current blood alcohol concentration (BAC) directly visible for the patient in the app. Participants could further track their results in the app.

In both intervention arms, app data was automatically sent in real-time to the two separate online portals to be shared with clinicians and used for feedback during treatment sessions.

**Data collection**

An interview guide was developed to reflect the study aim and research questions, including topics to be covered and suggested open-ended questions. The interview guide (Supplementary file 1) was pilot tested on two volunteers (not included in this study), resulting in minor adjustments. Individual interviews were held by JÖ through video calls, and one phone call, due to the Covid-19 pandemic, between December 2020 and July 2021. During data collection, a logbook for self-reflection on the quality of each interview and dialogue was kept. All interviews were audio-recorded, held in Swedish, and transcribed verbatim. The data collected was considered to have reached information power with 21 interviews (11 Glasklart users, 10 iBAC users). The rather large sample reflected the broad aim, the study of two different apps, and the explorative analysis strategy (Malterud et al., 2016). The interviews varied between 18 and 47 min in length (median 26 min).

**Data analysis**

Data was analyzed using QCA (Graneheim & Lundman, 2004). JÖ performed the analysis supported by MJ, and any ambiguities were continuously discussed to enhance credibility of the findings. Categories were shared with AKD, SA, AL and PW who provided feedback and confirmed the results. According to QCA, transcripts were read repeatedly (JÖ, MJ), after which meaning units were identified and labeled with codes (JÖ).
codes were then abstracted into sub-categories and categories (JÖ). During the process, it was evident that data covered two different areas. Thus, the categories were sorted into two domains (JÖ, MJ). An example of the analysis process is presented in Table 2. The analysis process was performed in Swedish and thereafter translated to English.

The research team included a registered nurse (RN) and MSc (JÖ), an associate professor of public health science (AKD), a PhD in epidemiology (AL), a professor in social alcohol and drug research (PW), a senior professor of social medicine and medical doctor (SA), and a RN and professor in nursing science with vast experience in qualitative methods (MJ). JÖ was the study nurse performing the assessments within the MORE-study and was thus acquainted with the participants but not involved in their clinical treatment. This was thought to aid building trust during interviews, especially as they were performed at distance. Also, she had good knowledge of the specific features and functions of both apps. SA has long clinical experience working with treatment for alcohol dependence and performed the initial medical assessments on some of the participants in the study but did not actively take part in data collection. It is possible that preunderstandings of the apps as beneficial within the clinical treatment for these patients may have influenced the results. However, during data collection open-ended, clarifying, and prompting questions were used, letting the participants freely describe their experiences. Additionally, MJ has vast experience in qualitative methods and is moreover affiliated to a different university, bringing a neutral perspective to the data. Likewise, AKD, AL, and PW, were not actively involved in neither data collection, nor the clinical treatment on site. Through team discussions throughout the analysis process, trustworthiness was thus ensured.

Ethical considerations

Ethical approval was granted from the Regional Ethics Committee in Stockholm (DNR: 2018/174-31). Written informed consent was obtained from each participant.

Results

Two domains were identified: 1) Smartphone applications as facilitators to treatment, including four categories, and 2) Barriers to smartphone application use, including three categories.

Smartphone applications as facilitators to treatment

Accurate measurements

The participants thought that their registered consumption got more accurate by using the apps. Remembering consumption retrospectively was seen as difficult, or even impossible, and in this respect both apps were considered useful.

Reporting accurate data was considered to be facilitated by the simplicity of registering units or BAC-level directly into the smartphone, and by the reception of timely prompts.

That’s the big win with apps, I think. In a very simple way, I just need, I just need to contribute with the data and there will be a result that I can feel happy about (Female, 62, Glasklart)

Glasklart users further discussed the availability of the app and compared it to keeping a paper diary to track consumption, which was considered a less reliable method.

[...] but then also the fact that you always have your phone with you, as I imagine, if I was to write it down on paper, it wouldn’t uh, I would forget that. And then I’d lose the paper (Female, 58, Glasklart)

On the other hand, one Glasklart user preferred registering consumption on paper, and thought that registering into the app resulted in double work.

The fixed alternatives of standard units in Glasklart did not always correspond to the amount actually consumed. Also, registering units into Glasklart while intoxicated was believed a potential risk of inaccurate reports. However, participants mentioned that they strived to be honest in their reporting. For example, Glasklart users described checking and correcting their data continuously and retrospectively. Likewise, iBAC users described compensating for missed prompts by taking additional spontaneous tests.

iBAC users further described that using the breathalyzer made it more difficult to lie to yourself.

[...] Instead of registering this manually, where you sometimes lie to yourself and so, you don’t lie to yourself if you have this. Then it’s a much, much more accurate report, because you’re always a bit too kind to yourself, that’s how it is (Female, 55, iBAC)

Nevertheless, iBAC was considered unreliable as BAC-levels sometimes varied greatly during a drinking occasion or displayed results that according to the participants obviously were incorrect (both high and low), which led them to question its accuracy.

And so, I could go on for a whole hour and blow, and it got higher and lower. And I hadn’t eaten or drunk anything in between, the only thing I’d drunk was water. So, there was nothing I had done that could affect the blood alcohol level (Female, 77, iBAC)

Focus and motivation

Both Glasklart and iBAC users described that the apps increased focus on their alcohol problem and commitment to treatment. They were considered as “someone” who kept track of their progress.

That you need to remember that you took a decision, that is, to do something about it. Because, after four beers it’s super easy to not care, like forgetting it, but then to have it in your pocket and getting a prompt or such … then, it becomes … how to say it … a reminder (Male, 27, iBAC)

Furthermore, adding a zero day, or blowing zero, and tracking the progress in the apps was considered both motivating and satisfying.

And I’ve thought that it’s been, it’s been fun to add zeros, the days you’ve had zero to drink and also fun to see all these zeros in a row, like all the days in a row that you’ve been without alcohol (Female, 29, Glasklart)
Awareness and control

Using an app increased problem- and consumption awareness. Participants described that the units registered, or the BAC-levels measured, generally were higher than expected, which was a wake-up call. iBAC users also described getting increased awareness of tolerance levels by using the breathalyzer.

To see how it affects the body, how high value it is and realize, fact-based, see how harmful it is for my body, the impact on my body. It was like, oh wow, now I really must do something about it because… it's noticeable (Female, 37, iBAC)

With Glasklart, participants could track their consumption over time, which was considered valuable. It clarified if they were above or below their treatment goals and allowed for evaluation by comparing days and weeks, as well as differences in mood between sober and drinking days.

Tracking the consumption in Glasklart was further described as a means of gaining control as it made participants reflect on drinking occasions, added units, and treatment goals.

Keeping track of my drinking and, like, that you don't just go on, but that you actually think about how much you drink (Female, 29, Glasklart)

Similarly, iBAC users described getting more careful when drinking, as they wanted to have results as low as possible and tried to find strategies such as switching to drinks with lower alcohol content or drinking water between each unit.

Yes, you get some references, and you see what's happened and understand what you've been doing and yes, you get more careful with what you do. You think twice if you have it (Female, 55, iBAC)

On the other hand, one participant who experienced surprisingly low values found iBAC less useful.

Complementing alcohol treatment

Using the apps was not considered enough to change the drinking habits, but rather seen as complements and reinforcers to the treatment.

It's more like it's been a tool, sort of an additional ingredient that I think has been valuable (Male, 51, iBAC)

Sharing information from the apps with the clinician was considered helpful as it resulted in a shared view of the consumption and problem and offered a relevant base for evaluation during treatment sessions.

No, I felt it was only positive, that you got… that you got a better picture of me as a patient (Male, 27, iBAC)

Shared data further led to increased accountability. Getting encouragement and confirmation during treatment sessions was also thought as motivating.

Yes, you also get some sense of responsibility if you've agreed to register and knowing that you're not the only one seeing it, sort of increases… well, the importance of what you do, or that you perhaps gain a greater personal responsibility because you know that others can see what you do (Male, 48, Glasklart)

[…] So, you do this for your own sake, completely, it's like, it's not for someone else's sake more than for myself and my loved ones, not for the clinician and not for your sake, but it's still a motivation if you've someone on the other side who sort of encourages when things have gone well. In that way, maybe just to, like, yes but get a confirmation that "I can see here, yes, when you've blown" (Female, 45, iBAC)

On the other hand, sharing data with clinicians also resulted in feelings of embarrassment and shame when
participants had to disclose the number of units consumed or had failed to reach their treatment goals.

It was a bit embarrassing when you had to talk to your therapist and say that yes, as you can see, I have drunk 200 units in a month now and it's kind of horrible. But I think it was necessary to do so (Female, 29, Glasklart).

Because I feel that I've disappointed you, and let you down, because I entered this study with such high ambition that yes, I will do so well. And it should be 0, 0, 0, 0 (Female, 37, iBAC).

Being ashamed in front of the clinician led to a higher motivation to do better and became a reminder of the reason for going through treatment for iBAC users, but also resulted in adjusting the drinking after prompts for results to look better, or stopping using the app.

If it hadn't been for that [sharing data] it'd probably been… then I could've blown each time I'd been drinking too and when I was hungover because it'd only be me seeing it, then it doesn't matter… It's easy to find shortcuts… you lie to yourself, you're a professional at that when you drink (Male, 25, iBAC).

**Barriers to smartphone application use**

**Unfit features and procedures**

The use of the apps differed greatly among participants, but Glasklart was usually used once daily to register units in retrospect, and by some continuously during a drinking session. Participants described that they forgot to register as prompts did not always appear, were considered too modest, and only appeared following the first registered unit. In Glasklart, mood, location, and social context was registered less frequently as these parameters were perceived as less interesting and not possible to register in retrospect. Craving was further described as difficult to assess.

But as I said, I'm generally always happy and it's very rare that I drink alone, so it's always in company that I take a drink and I'm not a depressive person or so… (Male, 63, Glasklart).

Similarly, the perceived relevance of taking a test affected the use of iBAC.

Well, it was zero… So it wasn't needed. It was zero for three weeks (Male, 67, iBAC).

The test-picture in iBAC was seen as irrelevant and affected app use when participants tried to re-direct the camera and thus got difficulties following the instructions on the screen. Moreover, the use of iBAC was constrained by too discrete prompts, and by forgetting to bring the breathalyzer everywhere. Episodes of heavy drinking, or illness, also hampered the use of iBAC. It was thought tricky to take tests if the timing of the prompts did not work well with the daily schedule, or if it did not fit the drinking pattern. The procedures with many daily prompts were described as extensive, and it was difficult to find a routine for continued use over time.

It resulted in, I felt a bit tied up, I thought, in terms of time, just because you had these set times (Female, 37, iBAC).

Additionally, the use of both apps was constrained by social activities where participants did not have their phone or breathalyzer close by, or if it was considered inconvenient to use the smartphone.

Well then, then it's a party, and you don't want to sit with your phone and... you want to be social or whatever, you don't want to sit with your phone (Female, 40, Glasklart).

**Technical issues**

iBAC users described difficulties finding the correct blowing technique, and experienced Bluetooth and Internet connection problems, measurement errors and error values, as well as problems charging the breathalyzer, which hindered prompt app use.

And then it was difficult to blow sometimes, I got measurement errors quite often (Female, 65, iBAC).

Similarly, Glasklart users experienced issues with the app crashing which affected the possibility of prompt and retrospective registration, the possibility to see the progress, and thus, the motivation to continue registering into the app.

When you click on the icon it opens and then disappears. And that resulted in, well, you lose the motivation to try… It got too troublesome trying to sign in. And like, writing each time you drink. So, there's been evenings when I've completely ignored it (Male, 29, Glasklart).

**Alcohol-related shame and stigma**

The use of iBAC was constrained in the presence of others, as it was considered uncomfortable receiving prompts and using the breathalyzer at work, on the subway, or in other social settings, despite the possibility to relocate. There was a fear of it leading to questions and discussions on the consumption, or being judged as a person who cannot handle drinking.

And it's also from the app and the iBAC device that, well, am I going to sit down in the office and blow when it pings? I didn't feel completely comfortable with that, and why then, because really it shouldn't matter, but it's based on what other people think of me. Why are you doing that! And so (Male, 51, iBAC).

And then, it was sort of a double effect I think…, even if others can't see when these kinds of stuff [prompts] appear, you are affected in a way; it's sort of noticeable. That you're not comfortable, in a way (Male, 56, iBAC).

Results could further display that personal treatment goals were not reached, which contributed to feelings of failure and resignation.

Well, it was black and white that I had failed to reach my goal (Male, 25, iBAC).

**Discussion**

**Main findings**

This qualitative study aimed to describe patient perceptions on the usability and acceptability of apps given as complements to treatment for alcohol dependence. Our results show that apps could be helpful within an alcohol dependency treatment context in terms of reporting accurate data,
and increasing awareness, focus, motivation, and control. However, app usability and acceptability can be limited by barriers such as unfit app-specific features and procedures, technical problems, and stigma.

In accordance with previous literature among community samples (Attwood et al., 2017; Bolt et al., 2022; Giroux et al., 2014), our study shows that self-monitoring of units consumed, or BAC-levels attained, using apps increased the awareness of the drinking behavior, which further resulted in participants becoming more careful and thoughtful in regard to alcohol. Tracking the units consumed, or BAC-levels reached, provided them with new insights into their drinking patterns and related mood, intoxication, or tolerance levels. Although clearly displayed measures could lead to feelings of shame and resignation when set goals were not achieved, tracking the progress in the apps enhanced motivation when goals were met. Also, using apps enhanced focus of both the alcohol problem and the commitment to treatment. This is in line with the Social Cognitive Theory of Self-Regulation (SRT) describing the self-regulatory mechanisms of behavior change (Bandura, 1991). This theory implies that by self-monitoring a behavior, people can influence their motivation and actions by setting realistic goals and evaluating the process toward them (Bandura, 1991). It further describes that people can gain increased self-respect and self-satisfaction by reacting on their performances, which may result in behavior change (Bandura, 1991). Accordingly, reflecting on the amounts consumed in relation to set limits and the satisfaction of registering or blowing a zero was seen as something that helped limiting participants’ consumption. Likewise, consumption was thought to be limited by the satisfaction of keeping sober, getting low outputs, or getting constant feedback on sober days.

Within the treatment context, the apps were seen as valuable complements where shared data resulted in enriched discussions on drinking behaviors during the treatment sessions. Similarly, participants described getting a higher accountability for their drinking and subsequent reporting knowing that someone else could see the results. Furthermore, in our study, participants acquired motivation and encouragement when clinicians confirmed the results. Contrary, some participants felt embarrassed and ashamed in front of the clinicians when consumption increased. In some cases, this led to an additional motivation to do better, or in some cases to feelings of resignation. The different reactions on failure may be explained by differences in self-efficacy, i.e., people's beliefs in their capacity to control their motivation, behavior, and environment, which affects goal setting and the evaluation of performances (Bandura, 1991). People with high beliefs in their capacity to make a change thus set higher goals and intensify their efforts when judging their performances, while people with self-doubt usually are put off by failures (Bandura, 1991). Such differences ought to be taken into consideration and discussed when using apps and sharing data within treatment.

The simplicity and availability of the apps facilitated registration of consumed units and BAC-levels. Even though participants mentioned that they commonly deviated from the instruction to register continuously, using apps was still considered a more accurate and truthful method compared to conventional methods such as paper calendars. Nevertheless, both apps suffered from initial technical issues. The varying BAC-levels in iBAC made participants question its accuracy. Also, it affected the monitoring negatively. This warrants attention as inaccurate results risk resulting in negative consequences, such as unintentionally drunk driving. Credibility of measures has been identified as a key factor for app acceptability and engagement (Bertholet et al., 2023; Puddephatt et al., 2019). Hence, ensuring technical stability is essential for app safety, acceptability, and usability.

The beneficial effects described by our participants following app use, including facilitated registration, increased awareness, focus, motivation, and control, demonstrate the apps as usable within this clinical context, albeit limited by technical constraints. Moreover, usability was affected by the perceived relevance of app registrations. Unfit features and procedures due to the participants’ different preferences, drinking habits, consumption goals, and problem severities illustrates the need for individualization. This is in line with previous literature, identifying individualization as essential for app engagement and acceptability among servicemen (Puddephatt et al., 2019), students (Bertholet et al., 2023), community samples (Perski et al., 2018) and people in recovery from alcohol and other drug problems (Neale & Bowen, 2022). Apps need to be perceived as relevant, beneficial, and targeted (Bertholet et al., 2023; Neale & Bowen, 2022; Perski et al., 2018), and allow for flexibility of specific features (Perski et al., 2018; Puddephatt et al., 2019). In our study, both apps included a specific set of procedures that did not suit all. Being responsive to the patients’ individual needs and preferences when offering apps within the treatment context could thus further enhance usability and acceptability, while at the same time respecting autonomy and potential differences in self-efficacy. This highlights the internationally recognized concept of person-centred care, where the patients actively partake in their treatment planning and realization (Olsson et al., 2013).

In our study, an important distinction between the apps was that one included a breathalyzer. So far, studies on using breathalyzers within clinical treatment are sparse. In line with our findings, a Swedish study investigating an app-based system including a breathalyzer given as a complement to treatment for alcohol dependence found that it was perceived a simple, convenient, and useful tool for self-monitoring and self-control (Nehlin et al., 2018). Apart from some technical issues, the need for privacy was regarded an important factor for sustained use, as patients avoided using it in public (Nehlin et al., 2018). Similarly, it was in our study evident that the iBAC device itself provoked both shame and stigma for participants and thus constituted a barrier to use which was different from the Glasklart app. As alcohol dependence is the most stigmatized of psychiatric disorders (Schomeres et al., 2011), this warrants further attention.

**Strengths and limitations**

This study adds to the scarce literature on user experiences of self-monitoring apps developed specifically to curb
alcohol consumption and dependence, which may help inform future app-based interventions in similar settings. By purposively selecting a varied sample of participants, different perspectives were captured and illustrated. The sample was homogenous in terms of education, severity of dependence, and income, but still reflected the target population at the clinic. Peer-debriefing with coauthors during the analysis process was further applied to strengthen the credibility of the findings (Graneheim & Lundman, 2004). Both apps investigated in this study were developed by two external companies, with no conflict of interest.

Conclusions

Self-monitoring alcohol apps have several beneficial features that can help assess, track, and control alcohol consumption, and improve communication with clinicians. The results indicate that apps can be useful complements to treatment for patients with alcohol dependence, but also that their use can be limited by different, foremost technical, issues. Thus, to enhance acceptability and usability within a treatment context, patients’ personal needs must be considered, and technical stability must be ensured.

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Author contribution statement

- Conceptualization: AKD, SA
- Funding acquisition: AKD, SA
- Data collection: JÖ
- Data curation: JÖ
- Formal analysis: JÖ (lead), MJ (supportive)
- Writing original draft: JÖ
- Supervision, review, and editing: MJ, AKD, SA, PW, AL, JÖ

Each author certifies that their contribution to this work meets the standards of the International Committee of Medical Journal Editors. All authors approved the final draft of this manuscript.

Declaration of interest

The authors declare that they have no conflict of interest. The authors alone are responsible for the content and writing of the article.

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