



# Adapting and Implementing Apps for Mental Healthcare

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## Abstract

**Purpose of Review** To describe examples of adapting apps for use in mental healthcare and to formulate recommendations for successful adaptation in mental healthcare settings.

**Recent Findings** International examples are given to explore implementation procedures to address this multitude of challenges.

**Summary** There are only few published examples of adapting apps for use in mental healthcare. From these examples and from results of studies in implementation science in general clinical settings, it can be concluded that the process of adapting apps for mental healthcare needs to address clinician training and information needs, user needs which include cultural adaptation and go beyond mere translation, and organizational needs for blending app use into everyday clinical mental healthcare workflows.

**Keywords** Cultural adaptation · Blended care · Mental disorders · Implementation research

## Introduction

With the advent of smartphones and apps, a great potential to improve mental healthcare was created. In a survey of use of depression and anxiety apps, Wasil and coworkers [1] showed that these apps had about 10,000 monthly downloads, several thousand daily active users, and several hundred thousand monthly active users. Potential promises of mental health app use include but are not limited to increased utilization of mental healthcare, shortening of waiting times, better access to mental healthcare for people from rural or remote areas, empowerment of persons with mental illness, and increased therapeutic flexibility about when and where therapy may take place. Increasing evidence suggests clinical efficacy for many mental healthcare apps, but there is at best limited clinical efficacy of standalone apps for mental

disorders of “heightened severity” [2•]. Internet-based cognitive behavioural therapy has been shown to be effective in clinical routine practice, albeit with variable effect sizes, for example in depression and anxiety. Acceptability of the interventions was moderate to high and healthcare providers are faced with the challenge to select and integrate appropriate types of intervention for their clinical settings [3]. Early studies had shown that clinical efficacy in routine practice was high, for example in a large Dutch study of online cognitive behavioural treatment in routine clinical practice following a general practitioner referral for depression, panic disorder, posttraumatic stress disorder, or “burnout”. Study attrition, however, was high with 33% at 6 weeks and 65% at 1 year [4••]. There are a number of important barriers to routine clinical use of apps in professional mental healthcare settings including their integration with clinical practice and clinical workflows [5]. Gaebel and coworkers had provided a survey of the various states of implementation of e-mental health in six European countries pre-COVID [6•], and the COVID-19 pandemic decreased professionals’ negative sentiments about telehealth, but it also highlighted critical issues of technical difficulties and of challenges of adapting telehealth and digital healthcare to routine clinical workflows [7]. This review focuses on the potential that adapting apps to specific mental healthcare settings may have for increasing the uptake of efficient mental healthcare apps in clinical practice.

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Smartphones and apps are part of a wider “digital psychiatry” system, which also includes other technologies like artificial intelligence and virtual reality [8••]. The implementation of digital healthcare interventions like apps in clinical practice is subject to many barriers and facilitators, and scaling up to certain populations and/or settings are important challenges [9]. Surveys of people with mental illnesses and mental healthcare professionals show that although much research has been invested in studies showing the efficacy of mental healthcare apps, knowledge and clinical uptake are still limited. Few studies in real-world clinical settings are available regarding patient willingness to use an app for mental healthcare. As an example, Lipschitz and coworkers [10•] surveyed 149 US veterans who had consultations for anxiety, depression, or posttraumatic stress disorder. Eighty percent owned a smart device and 71% used apps in general. Seventy-three percent took interest in using an app for mental illness, but only 11% had done so. Recommendations by mental health providers were an important factor of raising interest in using a mental health app, and the most frequent concerns were lack of efficacy, data privacy, and how to find suitable apps. These factors seem to be of importance when adapting apps to mental healthcare.

Compared to other sectors, the digitalization of healthcare provision in general seems to be slow [11], and mental healthcare is no exception. In a recent German physician survey, 40% of respondents indicated that digital health apps were completely unknown to them, while 57% used mobile apps in their everyday work life [11]. For virtual reality applications (not necessarily as smartphone apps), the uptake was shown to be even lower in a recent Australian survey among mental healthcare professionals [12]. The task for professionals of identifying high-quality, evidence-based mental healthcare apps is complicated in that few repositories evaluate mental health apps and provide detailed information about clinical trials about the recommended apps, like the German DIGA list (Digitale Gesundheitsanwendungen, Digital Health Applications; <http://diga.bfarm.de>), or the American Psychiatric Association App Advisor project (<https://psychiatry.org/psychiatrists/practice/mental-health-apps>). Many apps have overlapping functionalities or are not updated regularly [13]. Uptake is also constrained from the patients’ side. One recent study in Germany examined the uptake of an app-based symptom checker in an outpatient psychotherapy clinic, showing that 71% of the 49 users would have preferred a face-to-face over an app-based diagnostic assessment, although the usability of the app was rated very favourably by the users [14]. In a much smaller study with 17 veterans in the USA, acceptability and willingness to recommend a smartphone-based self-management intervention for people with severe mental illness were very good in that all but one veteran would have recommended the app to a friend. However, the question whether the veterans would

have preferred a face-to-face service was not included [15]. Thus, acceptability may depend on the usability of the app, the care setting, and the target patient group, indicating that user group-specific and care setting-specific app adaptations may lead to increased rates of usability and acceptance. The last review on the topic of the integration of mobile apps into psychiatric treatment in 2017 [16] had reported that the integration process involved several aspects with a focus on the clinical workflow, the patient’s culture and day-to-day life, and the patient’s socioeconomic status. The app itself should be evaluated from user, clinical, business, and information systems perspectives. Specific methods to address user experiences and integrate such experiences in the mental health app development process are being refined [17]. An “onboarding” process may be necessary, whereby both app standalone solutions (with an app being prescribed by a physician) and physician-guided solutions are possible. A central aspect of an app as a “good product” may be usability also for persons with disabilities, cognitive issues, or low health literacy. Issues of “digital exclusion” of those without the necessary financial resources to own a smartphone or of those living in areas without internet access arise. Apps need to be developed in a culturally sensitive way, and this may lead to different culturally adapted solutions for different ethnic groups within a mental healthcare service. Social concerns and liability issues must be addressed.

A systematic literature review retrieved 48 studies about the implementation of electronic mental health interventions in routine mental healthcare and identified 37 areas of barriers and facilitators, which were categorized by the review authors into three broad categories: (1) acceptance by patients and professionals on the background of their preferences and expectations; (2) appropriateness of the intervention; and (3) availability, reliability, and interoperability of the intervention [18••]. Obviously, the multitude and complexities of these factors will make the clinical adaptation of mental health apps in mental healthcare a major undertaking, which seems to be beyond the faculties of single psychiatrists or single psychiatric hospitals. Another aspect is the multitude of healthcare apps and more specifically apps for mental healthcare, which is difficult to oversee for individual mental healthcare providers. A recent systematic review of mental healthcare apps reported finding 158 articles (2013–2018) and most research targeted depression and anxiety disorders. However, only 16% of the studies were randomized controlled clinical trials (RCTs) and the authors concluded that there was a need for designing interventions for more mental disorders and to focus on RCTs to improve the robustness and trustworthiness of assessments [19•].

Specific requirements by users, professionals, or the health system context may lead to needs for adaptation of existing apps, and adaptation will thus become an essential component of the larger process of implementation of apps

in clinical routine workflows. App adaptation may become necessary because of patient characteristics, like limited cognitive capacities or language difficulties. Service context factors may also play a role, for example, when an app developed for standalone use is used in a blended care setting. Professionals may require special adaptations of the app to integrate an app into a clinical data management system. Data security and data protection regulations may lead to technical adaptations with the advent of new digital platforms for exchanging mental health data (e.g. electronic patient records). An underresearched aspect for app adaptation is which modules of an app users really activate and use in clinical settings, and how to adapt an app once such data become available [20]. A similar area of few studies is the question of the cost-effectiveness of implementing apps in mental healthcare services [21•]. Cultural adaptation is a term used to describe adaptations of mental health interventions to users' cultural backgrounds and may lead to increased acceptance and usability, but a recent meta-analysis could not identify which components of cultural adaptation of mental health interventions were effective [22] and another review also did not find studies directly comparing the efficacy of culturally adapted vs. culturally non-adapted internet- and mobile-based interventions for mental disorders [23••]. Of interest, the latter review identified 55 studies and 17 components of cultural adaptation, ranging from minor language tailoring to addressing differences in concepts of mental health and its treatment. This provides a taxonomy for further studies.

## Implementation

Three quarters of French general practitioners participating in an online survey were interested in using mobile health apps, and among the factors related to increasing the probability of implementing mobile health apps in clinical practice were sound scientific evidence, app certification, and the availability of training support [24]. In a similar survey of inpatient psychiatrists in the European eMEN project in Germany, Sander and coworkers [25•] showed that mental healthcare professionals perceived the severity of mental disorders, a neglect of face-to-face contacts and insufficient technical equipment as potential barriers to implementation. Specific challenges may arise for special patient groups like patients with psychotic disorders [26•] or in specific settings (e.g. forensic settings, see discussion below). Implementation in routine mental healthcare will usually occur as a “blended” treatment approach, i.e. internet-based interventions are provided in parallel to face-to-face interventions. The implementation of apps in such a clinical setting may pose time demands on clinicians, which need to be addressed when apps are adapted to blended care

[27]. For example, feedback opportunities for patients within an app need not only to be recorded; they also need to be assessed by clinicians. An important aspect of implementing new technologies in mental healthcare is to assess their usability [28•]. Recent research shows that validated short scales are becoming available, which may considerably aid in the process of adapting apps to user needs (e.g. the system usability scale for mental healthcare professionals using internet-based interventions for depression; [29]). To assess the implementation process as a whole, instruments like the Normalization Measure Development Questionnaire, which has been tested in mental healthcare settings, may be helpful [30].

### *Examples I-REACH: An Example of Cultural Adaptation and Adapting an App for an Inpatient Mental Healthcare Setting.*

International studies show that refugees suffer from increased rates of mental healthcare problems (e.g. [31]). Due to several barriers (e.g. language and cultural barriers), current mental healthcare for refugees is insufficient. Implementation of blended care approaches in psychiatric-psychotherapeutic healthcare has the potential to improve the situation for “hard-to-reach target groups” (e.g. refugees).

The aim of the I-REACH consortium (Internet-based REFugee mentAl health Care) is to develop a culturally and contextually adapted internet-based intervention (app ALMAMAR) for Arabic and Farsi speaking refugees, and to implement and evaluate ALMAMAR in in- and outpatient settings in Germany. The evaluation of the app in an inpatient setting was planned as a controlled, multicentre intervention study, and is conducted in eight psychiatric hospitals in Germany. Refugees currently undergoing inpatient psychiatric healthcare due to a posttraumatic stress disorder, depression, or anxiety disorder are offered to use ALMAMAR as an add-on to routine mental healthcare.

ALMAMAR is based on CETA (Common Elements Treatment Approach, CETA; [32]), a transdiagnostic therapeutic intervention that has already shown medium to large effect sizes in different populations and different healthcare settings [33, 34]. CETA was designed to implement common cognitive behavioural treatment elements like psychoeducation and relaxation techniques and focusses on trauma, anxiety, depression, and behavioural problems. It allows to adapt the selection and dosing of each therapeutic element to individual treatment needs. As a preparatory step for the implementation in the I-REACH project, CETA was culturally and contextually adapted to the relevant target group (Arabic and Farsi speaking refugees) [35••]. In a second step, the adapted CETA version was converted into a digital format (app) and adapted to the specific clinical context (inpatient setting). Therefore, appropriate modules for

a psychiatric inpatient setting were selected. We decided to implement ALMAMAR as an *unguided* version in the framework of a blended care approach, hopefully reducing the workload for healthcare professionals and at the same time advancing patient self-empowerment. In the I-REACH context, ALMAMAR was considered a tool which supports communication with refugees during their inpatient stay in a psychiatric hospital.

In order to familiarize therapists with ALMAMAR, a training course for therapists (two hours) was developed. Therapists may decide which modules and exercises they assign to each patient according to the diagnosis and the current mental health status. Therapists may select a standard workflow, which consists of modules and exercises for a specific mental disorder (e.g. a standard workflow for depression), or an individualized workflow only consisting of an introductory module, where all other modules and exercises may later be assigned from a list. Therapists are able to monitor the progress in the app usage of their patients and see the content and ratings of completed modules in German. Patients have the opportunity to complete modules and exercises and to repeat these independently from therapeutic feedback. Usage frequency of modules and exercises is not predefined. The feasibility of this approach is currently under study in a controlled clinical implementation study in eight psychiatric hospitals in Germany.

Storm and coworkers [36] describe a pilot study using semistructured interviews and usability testing in Norway during the implementation of a US smartphone health app supporting self-management of somatic and mental disorders. Three persons with severe mental illness, two peer support workers, and six mental health professionals participated. Besides language translation, the study resulted in a recommendation to add context-specific content to tailor the app for its intended use in a Norwegian community in a peer-supported setting.

A project developing and adapting an app for displaced persons was the Hikma Health Electronic Health Record, initiated by a non-profit organization [37]. The authors stress the importance of three aspects as success factors for implementation: provider-tailored modular workflows, multilinguality of the app (English, Spanish, Arabic), and an offline-first capability. The last aspect is especially important for use in remote areas, where data are first recorded locally on the user's smartphone and are then sent to a central server once a connection is possible. Implementation was tested in a Syrian refugee camp in Lebanon and was underway at a rural healthcare clinic in Nicaragua.

Klein et al. [38•] described a co-design qualitative interview study to identify domains for tailoring a smoking cessation app to the needs of people with severe mental illness. The complexities of the intricate links between smoking and mental illnesses became evident, for example by addressing

the symptoms of mental illness and nicotine dependency or by providing real-time assistance when the urge to smoke arose.

For older adults, there are many customized (adapted) internet-based solutions to reduce social isolation (reviewed by Thangavel and coworkers [39]). A special group among older adults is the group of people with dementia. Rai and coworkers [40] employed a systematic approach to develop an app for cognitive stimulation therapy via touchscreen tablets using agile project management principles integrating people with dementia and their relatives. Feasibility of using this app in this setting was shown in a subsequent controlled clinical trial, indicating that the methods of adapting the app were efficient [41]. The latter study also showed that users completed the app quicker than expected and that an extension of the app was needed to maintain user engagement for longer periods of time. While this was no adaptation of a previously existing app, the project may be taken as a guidance for a successful participatory approach when adapting an app to the special needs of people with dementia and their caregivers.

In a similar co-design approach with patients and professionals, a mobile health app was developed for patients with opioid use disorders beginning with a formative phase with several iterative steps to tailor the app design and contents for this user group followed by a pilot study assessing acceptability and usability [42]. Also in the area of substance use apps, Lord and coworkers [43•] identified facilitators and barriers for implementation of substance use recovery apps for community settings, indicating a large range of aspects to be considered. Among the facilitators, careful planning, engaging a dedicated team, working closely together with the app development team to address technical issues, and consistently reviewing app usage data to inform progress were central. The team used the Consolidated Framework for Implementation Research as a guiding principle.

From a patient perspective, Chiauzzi and Newell described the multitude of available app use options for an individual with bipolar disorder [44]. While this was a single-person account, it clearly showed that the needs of adapting an app for use in mental healthcare from a patient perspective go beyond aspects of usability or cultural adaptation. Adapting the app in a broader sense may mean intense discussions between patients and treatment providers about finding the features the patient wants, determining what works, deciding how to integrate apps into clinical sessions, and taking safety and privacy precautions (Table 1 in [44]). The authors conclude that the key to effective deployment of apps in psychiatric treatment rests on the flexible use of apps rather than the sole reliance on condition-specific apps, thus addressing the broad range of lifestyle challenges for people with mental disorders. Along a similar line of thinking, Miralles and Granell based on a literature review and focus

**Table 1** List of examples of frameworks and approaches for app adaptation and implementation in mental healthcare cited in the text

Target area	Example with reference
App adaptation	Comprehensive language, cultural and contextual adaptation of cognitive behavioural therapy for Arabic and Farsi speaking refugees [35••]
	Language and content adaptation for an app supporting self-management of somatic and mental disorders in Norway [36]
	Development of an offline digital health system for refugee care [37]
	Co-design process to adapt a smoking cessation app for people with severe mental illness [38•]
	Agile project management principles to adapt an app for cognitive stimulation for people with dementia and their relatives [40, 41]
App implementation	Co-design process to develop an app for patients with opioid use disorders [42]
App implementation	Establishing an ecosystem of digital mental healthcare in existing routine clinical workflows [46, 47••, 48, 49••]
	Establishing “blended” mental healthcare by combining face-to-face and online therapies [51•]

group interviews with professionals described a multitude of dimensions which may need to be considered, connected, and related when designing context-sensitive mental health apps [45]. Three basic dimensions emerged in their study, which were related to the mental disorder, technical aspects of the app, and the spatio-social context of its use.

In the USA, two examples of successful implementation of electronic mental healthcare were provided by Connolly and coworkers [46]. The authors use the term “digital clinic” to describe the synchronous provision of mental health visits (in person, by video, or by phone) and visits via digital health tools such as smartphone apps. One example describes the deliberate development of a general digital mental health clinic for patients with mood and anxiety disorders at the Boston Beth Israel Deaconess Center. Besides the development of a customizable app, the service includes the new role of a “digital navigator”, who serves to assist in app selection, technical troubleshooting, and providing clinical summaries from app data. This new service allows clinicians to focus on clinical aspects of using the new technologies (see also [47••] for a more detailed description of the “digital clinic” implementation and technology-enabled clinical care in a mental health outpatient clinic, and [48] for clinical case examples). Another approach was taken to integrate a specific app (PTSD Coach) into Veterans Administration Primary Care. App use and in-person visits are blended together in a low-intensity stepped-care intervention, with clinicians providing patients with information about tailoring their app use. The implementation process was guided by the Consolidated Framework for Implementation Research. In a broad-based implementation process, the Australian Project Synergy developed, implemented, and evaluated an e-mental health clinic platform for diverse clinical settings across different age groups and populations. The system was integrated into existing mental healthcare services and the whole process followed co-design principles. The study authors list health professional and service readiness for change, leadership at the local service level,

the appropriateness and responsiveness of the technology for the service end users, and availability of funds as important for success [49••]. The results and experiences of this process support the notion that successful app integration into routine clinical workflows is a complex task involving more steps than just adapting an app to user needs.

## Special Mental Healthcare Settings

Within mental healthcare services, some areas deserve special attention because clinical studies are scarce and complicated and we focus on two special services: forensic services and services for people with intellectual disorders and comorbid mental disorders.

A recent survey in the Netherlands among forensic mental healthcare professionals showed a broad range of recommendations for fostering the implementation of digital mental healthcare in this setting [50]. Similar to non-forensic settings, the recommendations centred around the domains of the professionals, the patient, the technologies, and the organizational context. The same group of Dutch researchers has adapted a generic toolbox for adapting mental healthcare settings to the requirements of blended care for use in a forensic setting, in which an online intervention with more than 200 intervention modules was already in use, but with low frequencies (only 18% of patients used it) and with little endurance by patients (82% of patients who started a module did not finish it) [51•]. The adaptation process was user-centred and highly participative; it followed agile project management concepts and was divided into four phases (requirements for adaptation, identifying factors, content generation, and testing). The study group succeeded in developing new ways of integrating the internet-based intervention modules into clinical care, for example by better supporting professionals in their communication with patients about blended care and how to use the internet-based interventions. Although probable effects



of implementing this adapted version of the toolbox were not reported, the methods of adapting the toolbox may be used as a guideline for the process of optimizing the potential of digital technologies in blended mental healthcare.

In the field of people with mental disorders and intellectual disabilities, we could not find studies describing the adaptation of apps to this setting. However, given the challenge to develop appropriately tailored apps and especially a desire to offer non-textual interventions, it is encouraging to see studies employing virtual reality for this group of patients [52••].

A new concept is the user-centred just-in time adaptation of responses by an app itself after an automated analysis of a user's sensor data, for example for patients with depression [53•]. However, this approach has yet to be more fully studied regarding apps for mental illnesses.

Table 1 provides a summary of examples of frameworks and approaches for app adaptation and implementation in mental healthcare cited in the text.

### The COVID-19 Pandemic: a Game Changer for Apps in Mental Healthcare?

The COVID-19 pandemic impacted on mental health [54] and mental healthcare. It leads to decreases of in-person consultations and increases of remote mental healthcare consultations [55•]. There was an increase of mental health app downloads [56], special app developments in mental healthcare [57], and aspects of problematic internet use especially among youths and adolescents arose [58]. A Canadian review identified 31 mobile apps and more than 100 internet sites of potential benefit for mental health [59] and reports began to appear about which mental health apps and other digital solutions were used by people with mental disorders in times of the pandemic (see, for example, Dahmen and coworkers for a study in Germany [60]). Satre and coworkers [61] described the opportunities that arose during the COVID-19 pandemic to integrate mobile app-based interventions into mental healthcare. These opportunities were influenced by increasing rates of mental disorders during the pandemic in parallel with treatment access limitations. This required the development of clinical decision processes and reliable information resources for both patients and professionals about which app to use in which clinical situation, and how to integrate them into clinical workflows. Satre and coworkers describe several “digital ecosystems”, which emerged in the USA and other countries during the COVID-19 pandemic. In a comprehensive European online survey, DeWitte and coworkers assessed the experiences and opinions of 2082 mental health professionals from 13 European countries about online consultations during the first wave of the COVID-19 pandemic in 2020 [62]. The survey

showed that there was a high uptake of online consultations and generally positive experiences, but a lack of training experiences and some concerns about relational aspects and practical considerations like privacy protection. Although this survey did not address apps, it shows that the pandemic was a driver towards digitalization of mental healthcare, and that professionals quickly adapted to the new challenges. As some of the regulatory and payment adaptation due to the pandemic was of a temporary nature, it remains to be seen which developments will be overduring.

### Recommendations for Mental Healthcare Professionals

Panel reviews including a broad spectrum of stakeholders identified several dozens of facilitators and barriers for upscaling and implementing digital health solutions in healthcare [63]. More specifically, Connolly and coworkers [46] have provided suggestions for factors of success of implementing digital tools in routine mental healthcare, including but not limited to providing clinician and support staff training, integrating digital solutions into clinical workflows, and safety planning and defining borders of clinician responsibilities given the possible 24/7 use of digital technologies by patients. In order to avoid creating a new digital divide, increasing health literacy, providing hardware and software for free, and providing language and cultural adaptation of apps may be deemed necessary. For professionals working in regulatory services or policymakers, recommendations have been developed and published [6•, 64]. It may be advisable to integrate and adapt existing apps into complex local or regional digital health ecosystems, which may also allow and simplify the tailoring of apps for several clinical use cases. Torous and coworkers describe the development and implementation of such a complex platform solution employing a participative, interdisciplinary approach [65••], and the results of a similar approach in Australia have been published [49••]. These and other studies profited from strategies of user and professional co-design throughout the life cycle of a mental health app [66]. For app developers, a central tenet may be to include options for users to adapt the app to their needs, which was a frequent desire in user surveys in mental healthcare [67]. Table 2 summarizes the concluding recommendations for clinicians when considering to adapt or implement apps in their clinical routine mental healthcare practice.

A new potential which may be tapped to increase the uptake of mental health apps in specific mental healthcare settings may be peer-to-peer support, which was shown to be effective in an undergraduate student program to support digital mental health [68].

**Table 2** Summary of key concluding recommendations for clinicians who consider to adapt or implement apps in their clinical routine mental healthcare practice

Target process	Recommendation
Adapting apps to mental healthcare	<p>Define the target patient population and their needs</p> <p>Consult available evidence-based app repositories as sources to identify high-quality apps for clinical use; also check medical device status and regulatory aspects of app use like data safety and data protection, costs and liability issues when adapting, prescribing or recommending apps</p> <p>Address language barriers and cultural barriers</p> <p>Provide low-threshold access (e.g. ease of use, free access)</p> <p>Consider interoperability with existing clinical information systems</p> <p>Where possible, use co-design methods involving patients and staff</p> <p>Consider the use of standardized scales to assess the degree of adaptation reached (e.g. the System Usability Scale)</p>
Implementing apps in mental healthcare	<p>Create implementation teams ideally consisting of all relevant user and staff groups</p> <p>Consider to study already available clinical digital ecosystems and consider to use standardized guides to implementation (e.g. the Consolidated Framework for Implementation Research)</p> <p>Define target processes and structures that may change following app implementation, integrate app into existing clinical workflows and existing or emerging local digital health ecosystems</p> <p>Address concerns of potential users and professionals whose workflows may be influenced by app implementation; identify and engage with motivated staff members who may become multipliers of app use</p> <p>Ascertain sustained financial and managerial leadership support</p> <p>Define borders of clinician responsibilities</p> <p>Train patients and staff</p> <p>Constantly monitor implementation success (e.g. by measuring access rates and asking users to evaluate the app; consider the repeated use of standardized instruments like the Normalization Measure Development Questionnaire to assess implementation progress)</p> <p>Provide sustained support to patients and staff to ascertain long-term success of implementation</p>

## Conclusions

Digital mental healthcare, apps, and other electronic devices are emerging technologies which are now at a transition point between research and clinical implementation. Adaptation of apps to user needs and integration into existing clinical workflows is a complex process, which may, however, advance communication and patient empowerment, and support and sustain the clinical use of evidence-based clinically safe apps. The potential benefits and the unique opportunities to overcome cultural and language divides between healthcare professionals and patients by adapting apps are great. Also, processes of data sharing and user empowerment may significantly enrich clinical routine work. Such potential benefits are only beginning to emerge and implementation science will help to realize these potentials. Healthcare professionals, policy stakeholders, patients and their relatives, and technology experts need to cooperate closely to advance this novel field of mental healthcare.

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## Declarations

**Conflict of Interest** The authors declare no competing interests.

## References

Papers of particular interest, published recently, have been highlighted as:

- Of importance
  - Of major importance
1. Wasil AR, Gillespie S, Shingleton R, Wilks CR, Weisz JR. examining the reach of smartphone apps for depression and anxiety. *Am J Psychiatry*. 2020;177(5):464–5. <https://doi.org/10.1176/appi.ajp.2019.19090905.2020a>.
  2. ● Weisel KK, Fuhrmann LM, Berking M, Baumeister H, Cuijpers P, Ebert DD. Standalone smartphone apps for mental health—a systematic review and meta-analysis. *NPJ Digit Med*. 2019;2(2):118. <https://doi.org/10.1038/s41746-019-0188-8.#>. **Standalone apps were efficient for depression and smoking-related behaviour,**

- but not for other mental disorders like anxiety or alcohol-related disorders. The authors conclude that using smartphone apps as standalone psychological interventions cannot be recommended.**
3. Etzelmueller A, Vis C, Karyotaki E, Baumeister H, Titov N, Berking M, Cuijpers P, Riper H, Ebert DD. Effects of internet-based cognitive behavioral therapy in routine care for adults in treatment for depression and anxiety: systematic review and meta-analysis. *J Med Internet Res.* 2020;22(8): e18100. <https://doi.org/10.2196/18100>.
  4. ●● Ruwaard J, Lange A, Schrieken B, Dolan CV, Emmelkamp P. The effectiveness of online cognitive behavioral treatment in routine clinical practice. *PLoS ONE.* 2012;7(7): e40089. <https://doi.org/10.1371/journal.pone.0040089>. **One of the early and few studies with longer follow-up (up to one year) on online therapist-assisted cognitive behavioral therapy in routine clinical practice performed in the Netherlands yielding important information on long-term effectiveness and usability.**
  5. Huckvale K, Nicholas J, Torous J, Larsen ME. Smartphone apps for the treatment of mental health conditions: status and considerations. *Curr Opin Psychol.* 2020;36:65–70. <https://doi.org/10.1016/j.copsyc.2020.04.008>.
  6. ● Gaebel W, Lukies R, Kerst A, Stricker J, Zielasek J, Diekmann S, Trost N, Gouzoulis-Mayfrank E, Bonroy B, Cullen K, Desie K, Ewalds Mulliez AP, Gerlinger G, Günther K, Hiemstra HJ, McDaid S, Murphy C, Sander J, Sebbane D, Roelandt JL, Thorpe L, Topolska D, Van Assche E, Van Daele T, Van den Broeck L, Versluis C, Vlijter O. Upscaling e-mental health in Europe: a six-country qualitative analysis and policy recommendations from the eMEN project. *Eur Arch Psychiatry Clin Neurosci.* 2021;271(6):1005–16. <https://doi.org/10.1007/s00406-020-01133-y>. **Results of a European project, which addressed the needs of policymakers for the successful uptake of e-mental health interventions based on a literature review and narrative country reports.**
  7. Nitiema P. Telehealth before and during the COVID-19 pandemic: analysis of health care workers' opinions. *J Med Internet Res.* 2022;24(2): e29519. <https://doi.org/10.2196/29519>.
  8. ●● Torous J, Bucci S, Bell IH, Kessing LV, Faurholt-Jepsen M, Whelan P, Carvalho AF, Keshavan M, Linardon J, Firth J. The growing field of digital psychiatry: current evidence and the future of apps, social media, chatbots, and virtual reality. *World Psychiatry.* 2021;20(3):318–35. <https://doi.org/10.1002/wps.20883>. **A comprehensive overview of the promises, challenges and solutions for implementing digital technologies in mental healthcare.**
  9. Klaic M, Kapp S, Hudson P, Chapman W, Denehy L, Story D, Francis JJ. Implementability of healthcare interventions: an overview of reviews and development of a conceptual framework. *Implement Sci.* 2022;17(1):10. <https://doi.org/10.1186/s13012-021-01171-7>.
  10. ● Lipschitz J, Miller CJ, Hogan TP, Burdick KE, Lippin-Foster R, Simon SR, Burgess J. Adoption of mobile apps for depression and anxiety: cross-sectional survey study on patient interest and barriers to engagement. *JMIR Ment Health.* 2019;6(1): e11334. <https://doi.org/10.2196/11334>. **A U.S. veteran survey study showing facilitators and barriers of mental health app implementation.**
  11. Burmann A, Tischler M, Faßbach M, Schneitler S, Meister S. The role of physicians in digitalizing health care provision: web-based survey study. *JMIR Med Inform.* 2021;9(11): e31527. <https://doi.org/10.2196/31527>.
  12. Chung OS, Johnson AM, Dowling NL, Robinson T, Ng CH, Yücel M, Segrave R. Are Australian mental health services ready for therapeutic virtual reality? An investigation of knowledge, attitudes, implementation barriers and enablers. *Front Psychiatr.* 2022;13: 792663. <https://doi.org/10.3389/fpsy.2022.792663>.
  13. Lagan S, D'Mello R, Vaidyam A, Bilden R, Torous J. Assessing mental health apps marketplaces with objective metrics from 29,190 data points from 278 apps. *Acta Psychiatr Scand.* 2021;144(2):201–10. <https://doi.org/10.1111/acps.13306>.
  14. Hennemann S, Kuhn S, Withhöft M, Jungmann SM. Diagnostic performance of an app-based symptom checker in mental disorders: comparative study in psychotherapy outpatients. *JMIR Ment Health.* 2022;9(1): e32832. <https://doi.org/10.2196/32832>.
  15. Buck B, Nguyen J, Porter S, Ben-Zeev D, Reger GM. FOCUS mHealth intervention for veterans with serious mental illness in an outpatient department of veterans affairs setting: feasibility, acceptability, and usability study. *JMIR Ment Health.* 2022;9(1): e26049. <https://doi.org/10.2196/26049>.
  16. Chan S, Godwin H, Gonzalez A, Yellowlees PM, Hilty DM. Review of use and integration of mobile apps into psychiatric treatments. *Curr Psychiatry Rep.* 2017;19(12):96. <https://doi.org/10.1007/s11920-017-0848-9>.
  17. Lemon C, Huckvale K, Carswell K, Torous J. A narrative review of methods for applying user experience in the design and assessment of mental health smartphone interventions. *Int J Technol Assess Health Care.* 2020;36(1):64–70. <https://doi.org/10.1017/S0266462319003507>.
  18. ●● Vis C, Mol M, Kleiboer A, Bührmann L, Finch T, Smit J, Riper H. Improving implementation of eMental health for mood disorders in routine practice: systematic review of barriers and facilitating factors. *JMIR Ment Health.* 2018;5(1): e20. <https://doi.org/10.2196/mental.9769>. **This systematic review identified 37 areas of barriers and facilitators. These encompassed three main areas of acceptance by patients and professionals, appropriateness of the intervention, and availability, reliability and interoperability.**
  19. ● Miralles I, Granell C, Díaz-Sanahuja L, Van Woensel W, Bretón-López J, Mira A, Castilla D, Casteleyn S. Smartphone apps for the treatment of mental disorders: systematic review. *JMIR Mhealth Uhealth.* 2020;8(4): e14897. <https://doi.org/10.2196/14897>. **The authors found an increasing interest in smartphone-based interventions in mental healthcare over time mainly focused on high-prevalence mental disorders like depression and anxiety. Randomized controlled trials were still in the minority of study designs (15.8% of 158 articles retrieved in this systematic review).**
  20. Wasil AR, Gillespie S, Patel R, Petre A, Venturo-Conerly KE, Shingleton RM, Weisz JR, DeRubeis RJ. Reassessing evidence-based content in popular smartphone apps for depression and anxiety: developing and applying user-adjusted analyses. *J Consult Clin Psychol.* 2020;88(11):983–93. <https://doi.org/10.1037/ccp0000604>.
  21. ● Piera-Jiménez J, Etzelmueller A, Kolovos S, Folkvord F, Lupiáñez-Villanueva F. Guided internet-based cognitive behavioral therapy for depression: implementation cost-effectiveness study. *J Med Internet Res.* 2021;23(5): e27410. <https://doi.org/10.2196/27410>. **One of the few examples of a health economy study of implementing digital psychiatry in clinical practice.**
  22. Rathod S, Gega L, Degnan A, Pikard J, Khan T, Husain N, Munshi T, Naeem F. The current status of culturally adapted mental health interventions: a practice-focused review of meta-analyses. *Neuropsychiatr Dis Treat.* 2018;4(14):165–78. <https://doi.org/10.2147/NDT.S138430>.
  23. ●● Spanhel K, Balci S, Feldhahn F, Bengel J, Baumeister H, Sander LB. Cultural adaptation of internet- and mobile-based interventions for mental disorders: a systematic review. *NPJ Digit Med.* 2021;4(1):128. <https://doi.org/10.1038/s41746-021-00498-1>. **This systematic review provides a list of 17 domains of cultural adaptation, which may provide a taxonomy for this area of research.**



24. Della Vecchia C, Leroy T, Bauquier C, Pannard M, Sarradon-Eck A, Darmon D, Dufour JC, Preau M. Willingness of French general practitioners to prescribe mHealth apps and devices: quantitative study. *JMIR Mhealth Uhealth*. 2022;10(2): e28372. <https://doi.org/10.2196/28372>.
25. Sander J, Bolinski F, Diekmann S, Gaebel W, Günther K, Hauth I, Heinz A, Kleiboer A, Riper H, Trost N, Vlijter O, Zielasek J, Gerlinger G. Online therapy: an added value for inpatient routine care? Perspectives from mental health care professionals. *Eur Arch Psychiatry Clin Neurosci*. 2022;272(1):107–18. <https://doi.org/10.1007/s00406-021-01251-1>. **A qualitative content analysis of an online questionnaire survey of 176 German mental healthcare professionals from ten psychiatric hospitals based on the Unified Theory of Acceptance and Use of Technology showing among others a need for staff training to integrate digital technologies into clinical routine practice.**
26. Bucci S, Berry N, Morris R, Berry K, Haddock G, Lewis S, Edge D. "they are not hard-to-reach clients. We have just got hard-to-reach services." Staff views of digital health tools in specialist mental health services. *Front Psychiatry*. 2019 May 10;10:344. <https://doi.org/10.3389/fpsy.2019.00344>. **A qualitative study addressing perceived barriers, acceptance and data security, safety and risk issues, from the viewpoints of mental healthcare professionals.**
27. Mol M, van Genugten C, Dozeman E, van Schaik DJF, Draisma S, Riper H, Smit JH. Why uptake of blended internet-based interventions for depression is challenging: a qualitative study on therapists' perspectives. *J Clin Med*. 2019;9(1):91. <https://doi.org/10.3390/jcm9010091>.
28. Inal Y, Wake JD, Guribye F, Nordgreen T. usability evaluations of mobile mental health technologies: systematic review. *J Med Internet Res*. 2020;22(1): e15337. <https://doi.org/10.2196/15337>. **This review shows that usability, feasibility and acceptability are studied in mental healthcare mobile intervention studies using different approaches and that the development of a standardized questionnaire may be warranted.**
29. Mol M, van Schaik A, Dozeman E, Ruwaard J, Vis C, Ebert DD, Etzelmüller A, Mathiasen K, Moles B, Mora T, Pedersen CD, Skjøth MM, Pensado LP, Píera-Jiménez J, Gokcay D, Ince BÜ, Russi A, Sacco Y, Zanalda E, Zabala AF, Riper H, Smit JH. Dimensionality of the system usability scale among professionals using internet-based interventions for depression: a confirmatory factor analysis. *BMC Psychiatry*. 2020;20(1):218. <https://doi.org/10.1186/s12888-020-02627-8>.
30. Vis C, Ruwaard J, Finch T, Rapley T, de Beurs D, van Stel H, van Lettow B, Mol M, Kleiboer A, Riper H, Smit J. Toward an objective assessment of implementation processes for innovations in health care: psychometric evaluation of the Normalization Measure Development (NoMAD) Questionnaire among mental health care professionals. *J Med Internet Res*. 2019;21(2): e12376. <https://doi.org/10.2196/12376>.
31. Charlson F, van Ommeren M, Flaxman A, Cornett J, Whiteford H, Saxena S. New WHO prevalence estimates of mental disorders in conflict settings: a systematic review and meta-analysis. *The Lancet*. 2019;394(10194):240–8.
32. Murray LK, Dorsey S, Haroz E, Lee C, Alyasiry MM, et al. A common elements treatment approach for adult mental health problems in low- and middle income countries. *Cogn Behav Pract*. 2014;21(2):111–23.
33. Kane JC, Van Wyk SS, Murray SM, Bolton P, Melendez F, et al. Testing the effectiveness of a transdiagnostic treatment approach in reducing violence and alcohol abuse among families in Zambia: study protocol of the Violence and Alcohol Treatment (VATU) trial. *Global Mental Health*. 2014;4: e18. <https://doi.org/10.1017/gmh.2017.10>.
34. Murray LK, Haroz EE, Doty SB, Singh NS, Bogdanov S. Testing the effectiveness and implementation of a brief version of the Common Elements Treatment Approach (CETA) in Ukraine: a study protocol for a randomized controlled trial. *Trials*. 2018;19(1):1–16.
35. Böttche M, Kampisiou C, Stammel N, El-Haj-Mohamad R, Heeke C, Burchert S, Heim E, Wagner B, Renneberg B, Böttcher J, Glaesmer H, Gouzoulis-Mayfrank E, Zielasek J, Konnopka A, Murray L, Knaevelsrud C. From formative research to cultural adaptation of a face-to-face and internet-based cognitive-behavioural intervention for Arabic-speaking refugees in Germany. *Clin Psychol Europe* 2021;3(Special Issue): e4623. <https://doi.org/10.32872/cpe.4623>. **Detailed description of the cultural and language adaptation of a psychotherapeutic mental healthcare app for Arabic-speaking refugees in Germany.**
36. Storm M, Fjellså HMH, Skjærpe JN, Myers AL, Bartels SJ, Fortuna KL. Usability testing of a mobile health application for self-management of serious mental illness in a Norwegian community mental health setting. *Int J Environ Res Public Health*. 2021;18(16):8667. <https://doi.org/10.3390/ijerph18168667>.
37. Ashworth H, Ebrahim S, Ebrahim H, Bhaiwala Z, Chilazi M. A free, open-source, offline digital health system for refugee care. *JMIR Med Inform*. 2022;10(2): e33848. <https://doi.org/10.2196/33848>.
38. Klein P, Lawn S, Tsourtos G, van Agteren J. Tailoring of a smartphone smoking cessation app (Kick.it) for serious mental illness populations: qualitative study. *JMIR Hum Factors*. 2019 Sep 3;6(3):e14023. <https://doi.org/10.2196/14023>. **An interview study which focusses on identifying user needs to adapt an app to the needs of people with severe mental illness.**
39. Thangavel G, Memedi M, Hedström K. Customized information and communication technology for reducing social isolation and loneliness among older adults: scoping review. *JMIR Ment Health*. 2022;9(3): e34221. <https://doi.org/10.2196/34221>.
40. Rai HK, Schneider J, Orrell M. An individual cognitive stimulation therapy app for people with dementia: development and usability study of thinkability. *JMIR Aging*. 2020;3(2): e17105. <https://doi.org/10.2196/17105>.
41. Rai HK, Schneider J, Orrell M. An individual cognitive stimulation therapy app for people with dementia and carers: results from a feasibility randomized controlled trial (RCT). *Clin Interv Aging*. 2021;22(16):2079–94. <https://doi.org/10.2147/CIA.S323994>.
42. Waselewski ME, Flickinger TE, Canan C, Harrington W, Franklin T, Otero KN, Huynh J, Waldman ALD, Hilgart M, Ingersoll K, Ait-Daoud Tiouririne N, Dillingham RA. A mobile health app to support patients receiving medication-assisted treatment for opioid use disorder: development and feasibility study. *JMIR Form Res*. 2021;5(2): e24561. <https://doi.org/10.2196/24561>.
43. Lord S, Moore SK, Ramsey A, Dinauer S, Johnson K. Implementation of a substance use recovery support mobile phone app in community settings: qualitative study of clinician and staff perspectives of facilitators and barriers. *JMIR Ment Health*. 2016;3(2): e24. <https://doi.org/10.2196/mental.4927>. **An example of using the Consolidated Framework of Implementation Research as a guiding principle for developing and implementing a mental health app.**
44. Chiauzzi E, Newell A. Mental health apps in psychiatric treatment: a patient perspective on real world technology usage *JMIR Ment Health*. 2019;6(4): e12292. <https://doi.org/10.2196/12292>.
45. Miralles I, Granell C. considerations for designing context-aware mobile apps for mental health interventions. *Int J Environ Res Public Health*. 2019;16(7):1197. <https://doi.org/10.3390/ijerph16071197>.
46. Connolly SL, Kuhn E, Possemato K, Torous J. Digital clinics and mobile technology implementation for mental health care. *Curr Psychiatry Rep*. 2021;23(7):38. <https://doi.org/10.1007/s11920-021-01254-8>.

47. ●● Rodriguez-Villa E, Rauseo-Ricupero N, Camacho E, Wisniewski H, Keshavan M, Torous J. The digital clinic: implementing technology and augmenting care for mental health. *Gen Hosp Psychiatry*. 2020 Sep–Oct;66:59–66. <https://doi.org/10.1016/j.genhosppsych.2020.06.009>. **A comprehensive report about the implementation of a digital ecosystem implemented in clinical mental healthcare. The cornerstones are integrating digital technologies into clinical workflows, evidence-based healthcare, and shared decision making. Apps and sensors are used to collect data and inform healthcare service provision, which can supplement and/or integrate other telehealth applications.**
48. Rauseo-Ricupero N, Henson P, Agate-Mays M, Torous J. Case studies from the digital clinic: integrating digital phenotyping and clinical practice into today's world. *Int Rev Psychiatry*. 2021;33(4):394–403. <https://doi.org/10.1080/09540261.2020.1859465>.
49. ●● LaMonica HM, Iorfino F, Lee GY, Piper S, Occhipinti JA, Davenport TA, Cross S, Milton A, Ospina-Pinillos L, Whittle L, Rowe SC, Dowling M, Stewart E, Ottavio A, Hockey S, Cheng VWS, Burns J, Scott EM, Hickie IB. Informing the future of integrated digital and clinical mental health care: synthesis of the outcomes from project synergy. *JMIR Ment Health*. 2022;9(3): e33060. <https://doi.org/10.2196/33060>. **A concise report about the development, implementation and evaluation of a digital mental healthcare platform in routine mental healthcare in Australia. The project is an example of co-design development and practical experiences of adapting and integrating e-mental health features into clinical mental healthcare.**
50. Kip H, Oberschmidt K, Bierbooms JPA. eHealth technology in forensic mental healthcare: recommendations for achieving benefits and overcoming barriers. *Int J Forensic Ment Health* 2021;20:1, 31–47. <https://doi.org/10.1080/14999013.2020.1808914>.
51. ● Kip H, Wentzel J, Kelders SM. Shaping blended care: adapting an instrument to support therapists in using eMental health. *JMIR Ment Health*. 2020;7(11): e24245. <https://doi.org/10.2196/24245>. **A participative approach towards fostering the implementation of a web-based multimodular mental healthcare intervention in a blended care forensic setting by improving a toolbox for professionals used when informing and guiding patients.**
52. ●● Nabors L, Monnin J, Jimenez S. A scoping review of studies on virtual reality for individuals with intellectual disabilities. *Advn Neurodevelopmental Dis*. 2020;4:344–56. **An important review of the use of virtual reality for individuals with intellectual disabilities, a group which is often neglected as a user group for e-mental health applications although features like non-textual training may be of specific benefit for this group.**
53. ● Teepe GW, Da Fonseca A, Kleim B, Jacobson NC, Salamanca Sanabria A, Tudor Car L, Fleisch E, Kowatsch T. Just-in-time adaptive mechanisms of popular mobile apps for individuals with depression: systematic app search and literature review. *J Med Internet Res*. 2021;23(9): e29412. <https://doi.org/10.2196/29412>. **A review on automatic interventions provided by apps detecting momentary mental health states.**
54. Leucht S, Cipriani A, Furukawa TA, Peter N, Tonia T, Papakonstantinou T, Holloway A, Salanti G. A living meta-ecological study of the consequences of the COVID-19 pandemic on mental health. *Eur Arch Psychiatry Clin Neurosci*. 2021;271(2):219–21. <https://doi.org/10.1007/s00406-021-01242-2>.
55. ● Patel R, Irving J, Brinn A, Broadbent M, Shetty H, Pritchard M, Downs J, Stewart R, Harland R, McGuire P. Impact of the COVID-19 pandemic on remote mental healthcare and prescribing in psychiatry: an electronic health record study. *BMJ Open*. 2021;11(3): e046365. <https://doi.org/10.1136/bmjopen-2020-046365>. **A study from the U.K. showing that analysing electronic healthcare utilization data can provide rapid information on the clinical implementation of remote mental healthcare services during times of a virus pandemic.**
56. Wang X, Markert C, Sasangohar F. Investigating popular mental health mobile application downloads and activity during the COVID-19 pandemic. *Hum Factors*. 2021;7:18720821998110. <https://doi.org/10.1177/0018720821998110>.
57. Jaworski BK, Taylor K, Ramsey KM, Heinz A, Steinmetz S, Pagano I, Moraja G, Owen JE. Exploring usage of COVID coach, a public mental health app designed for the COVID-19 pandemic: evaluation of analytics data. *J Med Internet Res*. 2021;23(3): e26559. <https://doi.org/10.2196/26559>.
58. Gansner M, Nisenon M, Lin V, Pong S, Torous J, Carson N. Problematic internet use before and during the COVID-19 pandemic in youth in outpatient mental health treatment: app-based ecological momentary assessment study. *JMIR Ment Health*. 2022;9(1): e33114.
59. Strudwick G, Sockalingam S, Kassam I, Sequeira L, Bonato S, Youssef A, Mehta R, Green N, Agic B, Soklaridis S, Impey D, Wiljer D, Crawford A. Digital interventions to support population mental health in Canada during the COVID-19 pandemic: rapid review. *JMIR Ment Health*. 2021;8(3): e26550.
60. Dahmen A, Keller FM, Derksen C, Kötting L, Lippke S. Which digital services do psychosomatic rehabilitation patients use during the corona pandemic and do interrelations with anxiety and depressive symptoms exist? *Psychother Psychosom Med Psychol*. 2021;71(12):508–14. <https://doi.org/10.1055/a-1503-5548>. **Article in German.**
61. Satre DD, Meacham MC, Asarnow LD, Fisher WS, Fortuna LR, Iturralde E. Opportunities to integrate mobile app-based interventions into mental health and substance use disorder treatment services in the wake of COVID-19. *Am J Health Promot*. 2021;35(8):1178–83. <https://doi.org/10.1177/08901171211055314>.
62. De Witte NAJ, Carlbring P, Etzelmueller A, Nordgreen T, Karekla M, Haddouk L, Belmont A, Øverland S, Abi-Habib R, Bernaerts S, Brugnera A, Compare A, Duque A, Ebert DD, Eimontas J, Kassianos AP, Salgado J, Schwerdtfeger A, Tohme P, Van Assche E, Van Daele T. Online consultations in mental healthcare during the COVID-19 outbreak: an international survey study on professionals' motivations and perceived barriers. *Internet Interv*. 2021;26(25): 100405. <https://doi.org/10.1016/j.invent.2021.100405>.
63. Schlieter H, Marsch LA, Whitehouse D, Otto L, Londral AR, Teepe GW, Benedict M, Ollier J, Ulmer T, Gasser N, Ultsch S, Wollschlaeger B, Kowatsch T. Scale-up of digital innovations in health care: expert commentary on enablers and barriers. *J Med Internet Res*. 2022;24(3): e24582. <https://doi.org/10.2196/24582>.
64. Van Daele T, Karekla M, Kassianos AP, Compare A, Haddouk L, Salgado J, Ebert DD, Trebbi G, Bernaerts S, Van Assche E, De Witte NAJ. Recommendations for policy and practice of telepsychotherapy and e-mental health in Europe and beyond. *J Psychother Integrat* 2020;30(2):160.173. <https://doi.org/10.1037/int0000218>.
65. ●● Torous J, Wisniewski H, Bird B, Carpenter E, David G, Elejaldo E, Fulford D, Guimond S, Hays R, Henson P, Hoffman L, Lim C, Menon M, Noel V, Pearson J, Peterson R, Susheela A, Troy H, Vaidyam A, Weizenbaum E, Naslund JA, Keshavan M. Creating a digital health smartphone app and digital phenotyping platform for mental health and diverse healthcare needs: an interdisciplinary and collaborative approach. *J Technol Behav Sci*. 2019;4:73–85. **An example of a comprehensive digital system solution to implement and integrate digital psychiatric services employing an iterative co-design approach and providing versatile functions to tailor the system to specific service needs.**

66. Storm M, Venegas M, Gocinski A, Myers A, Brooks J, Fortuna KL. Stakeholders' perspectives on partnering to inform the software development lifecycle of smartphone applications for people with serious mental illness: enhancing the software development lifecycle through stakeholder engagement. *Proc IEEE Glob Humanit Technol Conf.* 2021;2021:195–9. <https://doi.org/10.1109/ghtc53159.2021.9612444>.
67. Alqahtani F, Orji R. Insights from user reviews to improve mental health apps. *Health Informatics J.* 2020;26(3):2042–66. <https://doi.org/10.1177/1460458219896492>.
68. Rosenberg BM, Kodish T, Cohen ZD, Gong-Guy E, Craske MG. A novel peer-to-peer coaching program to support digital mental health: design and implementation. *JMIR Ment Health.* 2022;9(1): e32430. <https://doi.org/10.2196/32430>.

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