

# Do mental health mobile apps work: evidence and recommendations for designing high-efficacy mental health mobile apps

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## Smartphone-based apps may expand access to mental health treatment

Smartphone-based mental health apps represent a unique opportunity to expand the availability and quality of mental health treatment. The number of mobile health (mHealth) apps focused on mental health has rapidly increased; a 2015 World Health Organization (WHO) survey of 15,000 mHealth apps revealed that 29% focus on mental health diagnosis, treatment, or support (1). Additionally, public health organizations like the UK's National Health Service (NHS) and the U.S. National Institute of Mental Health (NIMH) have pointed to mental health apps as cost-effective and scalable solutions to addressing the mental health treatment gap. But though the ubiquity of smartphones is well-poised to address the mental health provider shortage, the efficacy of mental health apps remains contested (2). As mental health apps are increasingly prescribed to supplement psychiatric treatment and help patients self-manage their mental health conditions, it is key to understand (I) whether, and which, mental health apps have proved effective, and (II) what makes a mental health app effective. Here, we argue that mental health apps do have value in providing psychological treatment, and present four recommendations for high-efficacy mental health apps.

## Why apps: the utility of mental health apps for psychological treatment

Mental health apps target a broad range of psychological disorders and vary in design and functionality. NIMH

classifies mental health apps into six categories based on functionality: self-management, cognition improvement, skills-training, social support, symptom tracking, and passive data collection (3). Mental health apps span all stages of clinical care provision, including immediate crisis intervention, prevention, diagnosis, primary treatment, supplement to in-person therapy, and post-treatment condition management (4). Mobile apps are a good choice for psychological treatment delivery compared to other platforms due to (I) ease of habit, (II) low effort expectancy, and (III) high hedonic motivation (2,5).

## Do they work: evidence for using mental health apps for treatment

Though evidence supports the use of smartphone-based apps as a vehicle for mental health treatment delivery, there remains debate around whether these apps have demonstrated high efficacy (3). This is due to both the lack of evidence-based mobile apps available on the market, and the lack of studies that bring together the disorder-specific silos of evidence that do exist. To show that the efficacy of evidence-based mobile apps is comparable to traditional psychiatric treatment, we analyze the efficacy of smartphone-based treatments for three psychological disorders with high 12-month global prevalence rates: depression, anxiety, and schizophrenia.

### *Depression*

Depression treatment options may not result in complete

alleviation of symptoms, and often fail to address post-treatment subclinical or residual depression symptoms. Mobile apps that use cognitive behavioral therapy (CBT), mindfulness training, mood monitoring, and cognitive skills training to treat depressive symptoms are gaining momentum. A meta-analysis of 18 randomized controlled trials (RCTs) covering 22 mobile apps revealed that using apps to alleviate symptoms and self-manage depression significantly reduced patients' depressive symptoms compared to control conditions ( $g=0.38$ ,  $P<0.001$ ). They also found that smartphone-based therapies yield the greatest benefits for individuals with mild to moderate, rather than major, depression (6).

### *Anxiety*

Though clinical evidence suggests that relaxation training, CBT, and mindfulness can reduce anxiety symptoms, access to these interventions is limited by cost and availability. Using mobile apps to deliver these interventions has thus garnered attention as a supplement to in-person therapy and a mechanism to treat sub-clinical anxiety conditions that may lie below the threshold for anxiety disorder treatment (7). A meta-analysis of nine RCTs that evaluated the effects of smartphone-delivered interventions on symptoms of subclinical and diagnosed anxiety disorders revealed that users experienced reductions in total anxiety after using anxiety treatment apps ( $g=0.33$ ,  $P<0.001$ ). Additionally, anxiety-focused mobile apps delivered the greatest reductions in anxiety symptoms when paired with face-to-face or internet-based therapies. In fact, replacing outpatient patient-therapist sessions with a mobile app resulted in no significant loss of treatment efficacy (8).

### *Schizophrenia*

Antipsychotic medications can relieve schizophrenic hallucinations, delusions, and disorganization, but fail to address its behavioral symptoms. Though psychosocial interventions (e.g., social skills training, cognitive training, and education on illness management) can alleviate behavioral symptoms, these interventions are rarely integrated into clinical treatment due to limited funding and adequately trained staff. Mobile apps may present an opportunity to deliver these services directly to patients, especially given evidence of little difference between how schizophrenic patients and healthy controls use technology (9,10). A systematic review of five studies

focused on using smartphone apps for treating symptoms of schizophrenia demonstrated app retention was 92%, and approximately 3.95 patient-app interactions took place each day. Self-reported patient experience survey results revealed high adherence, positive user experience, and broad-ranging clinical benefits (11).

### **What makes them work: characteristics of high-efficacy apps**

It is important to acknowledge the challenges of using apps for mental health treatment. These challenges can broadly be divided into the following categories: (I) poor regulation of quality and privacy; (II) inconsistencies in engagement; (III) narrow focus on one disorder per app (12,13). To be effective and address these challenges, mental health apps must be evidence-based and carefully designed. Developers should integrate the following four characteristics of high-efficacy mental health apps.

#### *High patient engagement*

Because patients typically use apps on their own time without clinical oversight, they must be intrinsically motivated to engage with the app. Evidence from the literature suggest that patient engagement can be improved through: (I) real-time engagement; (II) usage reminders; (III) gamified interactions (14-16).

#### *Simple user interface (UI) and experience*

Models of technology-based behavior change emphasize the importance of simple, intuitive UIs for driving faster behavior change through reduced cognitive demands. For patients suffering from depression or anxiety, working memory is often impaired. Apps serving these population must be designed to generate a low cognitive load, the total mental activity imposed on working memory. A simple UI reduces cognitive load and increases capacity for learning. Features that reduce cognitive load include: (I) the use of pictures rather than text; (II) reduced sentence lengths; (III) inclusive, nonclinical language (14).

#### *Transdiagnostic capabilities*

Psychological disorders are highly comorbid; however, few mental health apps explicitly harness transdiagnostic methods to treat symptoms shared among disorders. Since

interventions for comorbid disorders are typically similar in delivery and content, transdiagnostic apps can increase patient engagement and treatment efficacy by reducing the commitment needed to interact with multiple apps for comorbid disorders (14,17,18).

### *Self-monitoring features*

App-based features that enable users to self-monitor their mood by periodically reporting their thoughts, behaviors, and actions can increase emotional self-awareness (ESA), which has been found to be implicated in anxiety, depression, and substance abuse (14). Increasing ESA, defined as the ability to identify and understand one's own emotions, has been shown to reduce symptoms of mental illness and improve coping skills (19-22).

### **Conclusions**

Mobile apps have significant potential to deliver high-efficacy mental health interventions. Given the global shortage of psychiatrists and the lack of mental health care access in rural regions, apps have emerged as a viable tool to bridge the mental health treatment gap. Technology is well-poised to transform how mental health treatment is delivered and accessed, but this transformation requires the combined mobilization of science, regulation, and design.

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### **Footnote**

*Conflicts of Interest:* The author has no conflicts of interest to declare.

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