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Can mobile apps enhance the impact of evidence-based psychological treatments for youth with mental illness?

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Summary

Recent advances in digital technology and mobile platforms have widely shown the potential to enrich evidence-based psychological treatments by supporting the remote delivery of therapeutic tools to individuals with mental illness. Compared to in-person approaches, mobile apps offer several benefits that are particularly attractive to youths struggling with mental illness. First, mental health apps enable scheduling flexibility and decrease scheduling burden, thus facilitating accessibility and compliance with intervention requirements and ultimately increasing cost-effectiveness. Second, mental health apps can enhance the quality of treatment by incorporating computerized treatments and innovative methods of communication, and by making treatment adaptive and responsive to dynamic, ecologically valid data. Third, mental health apps can be accessed with greater frequency than in-person treatment approaches for brief therapeutic interactions that help consolidate support and maintain inter-session continuity. Fourth, delivering treatment in real-world settings may support the retention, reinforcement and successful generalization of cognitive and behavioral skills. Finally, mental health apps can include opportunities for remote social engagement, like social networking or direct peer-to-peer messaging. The successful development of a mobile intervention for youth experiencing mental illness requires the coordinated activity of clinical researchers with patients, clinicians and the technology sector. The intervention should emerge in response to a symptom dimension or unmet clinical need, which resonates with the patient group it is intended to serve. Finally, building strategic and appropriately formalized academic-industry partnerships can result in long-lasting digital tools that are more easily adopted and disseminated.

Key words: mobile health, digital psychiatry, intervention development, digital mental health, adolescence

Introduction

The opportunities presented by the rapid expansion of mobile technology for delivering new models of care in people experiencing mental illness have stimulated a surge of interest and pervasively revolutionized the field of treatment development and delivery in mental health [1,2]. In particular, recent advances in software development, communication technology, and health care delivery now offer the unique opportunity to supplement and radically enhance the impact of Evidence-Based Treatments (EBT) for youth with mental illness, including Cognitive Behavioral Therapy, or CBT, Dialectical Behavior Therapy

(DBT), Mindfulness-Based Cognitive Therapy (MBCT), and Acceptance and Commitment Therapy (ACT) [3]. Youths are particularly amenable to using mobile apps to seek information, support, and treatment. With 81.4% of youth with mental illness owning a mobile phone [4], Mental Health Apps (MHA) today allow users to engage with treatment entirely remotely, anytime, anywhere, on their own schedule. Several lines of evidence now indicate that youth with mental illness already use mobile apps to manage their clinical conditions, and that these are acceptable across a range of educational level and clinical characteristics [5]. Most research targeted youth disorders with high prevalence, i.e. depression and anxiety [6,7]. However, several MHA have been developed to target a wide variety of symptoms and/or dimensions, including insomnia, eating disorders and body image disorders, trauma self-harm and suicide prevention, as well as psychotic illnesses and substance-related disorders [8].

It is widely acknowledged that delivering EBT through MHA offers advantages, including ready accessibility, standardized delivery of therapeutic concepts, time flexibility, cost-effectiveness, and convenience [9-12]. Importantly, MHA can help overcome many limitations of in-person psychological EBT, thus promoting the systematic application of skills in the natural environment of patients, and ultimately facilitating the generalization of treatment to real-world settings [13]. As the field proliferates, however, unique challenges emerge [14]. Although several MHA have been shown acceptable and feasible for youth with mental illness, and have demonstrated the potential to improve clinical and functional outcomes [15,16] the majority of these interventions has been evaluated through small and brief pilot studies [17], raising doubts around their impact over longer durations, in more heterogeneous patient groups.

A rush to implementation has been arguably counterproductive for the longer-term adoption of apps by patients and clinicians. However, clinical researchers are fully equipped to lead the development of MHA by identifying specific clinical dimensions or areas of unmet clinical need, for which parameters and key variables can be systematically measured and characterized. The aim of this commentary is to highlight the unique benefits brought by mobile technology into the field of treatment development for youth with mental illness, and to summarize guidelines for researchers and clinicians interested in studying or implementing MHA with their young patients.

State of the art

Access

The increasing ubiquity, affordability and ownership of smartphones among youth with mental illness can help overcome some of the barriers inherent to the delivery of in-person psychological EBT. For example, youth with mental illness is known to be reluctant to use traditional health care services and to experience distress during face-to-face encounters [18,19]. Mobile technology presents the opportunity to enable remote engagement and delivery of care. Similarly, treatment can be delivered through MHA to patients who seek treatment but are unable to come into the clinic, those who live in rural or under-resourced areas where EBT requiring trained therapists- are not available [20], and those who hesitate to approach traditional mental health settings because of stigma, which often interferes with help-seeking behaviors [21]. In sum, MHA may improve access, expand reach, and ultimately address the disparities in healthcare provision in underserved populations, including members of ethnic minorities and individuals living in low-resource settings [22].

Engagement

Psychological EBT often have a high scheduling burden, usually requiring multiple weeks of participation and regular in-person clinic visits. This time commitment can be untenable for young individuals who have to take time off from school for appointments [23], those who study, are employed, have other responsibilities to manage, or are without transportation. The remote delivery of EBT through MHA enables scheduling flexibility and decreases time burden, thus improving accessibility and compliance with intervention requirements, resulting in an increase in cost-effectiveness [24].

Measurement

The portable nature of mobile devices allows for the remote, real-time, and high-resolution capture of clinical and functional variables in ecologically valid settings. Data collection can happen both actively – through self-rated Ecological Momentary Assessments (EMAs) – and passively – using sensors to sample objective markers of social, emotional and cognitive states, with negligible user burden. Of course for active tools such as EMAs need to be acceptable, they need to me meet certain criteria, including: 1) able to be self-administered; 2) short, possibly taking less than a minute; 3) with standardized instructions that are simple and understandable; and 4) easily interpretable for the end-user. Although EMAs and sensors have been shown to increase accuracy, minimize retrospective bias and highlight context-specific relationships of symptoms or behaviors [25], only a few studies to date have used these methods to capture specific manifestations of neuropsychiatric illnesses [26-28].

Treatment generalization

As a matter of fact, psychological EBT for youth with mental illness do not take place within an ecologically valid context, despite exposure (i.e., repeated confrontation of stress-provoking situations without escape/avoidance) [29]

being often one of their founding principles. This is problematic, as the inability to behave as desired in real-world situations is the primary reason why most young individuals seek treatment, and is of critical importance in the clinical presentation of various illnesses, and in diagnostically determining their presence/absence [30]. By feeding back data collected through MHA to the patient and their clinical teams in real time via digital dashboards, it is possible to make EBT responsive to the dynamic, real-time, ecological data in many ways [25]. First, making data available to patients is in and of itself a great opportunity to promote self-management. Second, without requiring local infrastructures, clinicians obtain a thorough characterization of a patient's clinical status and real-world functioning, which can be used to guide the timely delivery of personalized, potentially preventative, care, and to assess its efficacy [31]. Third, although research overall demonstrates positive effects of many psychological EBTs on clinical and real world-functioning functional outcome measures [32-34], not many studies to date routinely collect ecological data to measure the generalization of clinic-based EBT–that is, the application of acquired skills in real-world settings. In sum, MHA have the potential to bridge the translational gap and provide clinicians and patients with a cost-effective assessment tools that could inform strategies to radically transform the delivery of psychological EBT.

Self-guided computerized treatments

Personalized knowledge related to illness management, behavioral techniques, and cognitive remediation are all good examples of EBT that have been digitized and provided dynamically using self-guided modules in the context of MHA [16,35,36]. For example, psychoeducational material that explains the underlying processes central to various forms of mental illness, systematically reinforce skills for real-world role performance, and provides personalized feedback has been successfully deployed across samples of youth with mental illness, and shown to augment the efficacy of existing EBT [37]. Similarly, computerized cognitive remediation – a treatment that leverages implicit learning mechanisms to promote more adaptive processing styles for cognitive and affective stimuli – has been successfully integrated into MHAs and shown to improve cognitive abilities and functional outcomes in various neuropsychiatric conditions [38].

Peer-to-clinician interactions

Providers of psychological EBTs are often restricted in their ability to connect with patients in between sessions. This in turn can limit the capacity for patients to directly apply under supervision the skills learned during the sessions within their real-life scenarios. Methods such as 1:1 Instant Messaging (IM) can be embedded in the intervention to extend the reach of the clinician and facilitate remote communication. Besides consolidating

therapeutic alliance and maintaining inter-session continuity, IM is known to be a very effective means to provide patients with opportunities, encouragement, and reinforcement for using the behaviors and skills learned in the clinic and for receiving the appropriate rewards [25,39]. Taken together, these elements are likely to bolster content delivery and support the retention of skills in real-world settings [39]. Although the provision of around-the-clock communication support has potential to improve the impact of psychological EBTs and even prevent relapse or suicide, it also introduces practical and ethical dilemmas, such as extended availability and liability issues for involved mental health professionals. To mitigate these concerns, specific regulations and protocols for safety are being currently developed [14].

Peer-to-peer support

Youth with mental illness are interested and willing to engage in online peer-to-peer interactions, a form of social interaction that has been described as one of the most transformational features of the Internet [40]. Online support groups, forums, and chat rooms help youth with mental illness establish new relationships, maintain relationships, and reconnect with people, and are important venues for disclosing personal experiences, challenging stigma, reducing the feeling of isolation and building hope, cultivating support through reciprocity and exchange, sharing coping strategies, or seeking and sharing information related to symptoms and medications [41,42]. However, online peer-to-peer interactions can pose numerous risks, including cyberbullying [43], addictive behaviors [44], greater social withdrawal and avoidance [45], increased anxiety, low self-esteem, psychological distress, and depression [46-48]. By means of direct peer-to-peer 1:1 or group IM [13], the reach of peer-support can now be feasibly integrated into MHA and extended beyond the clinical setting, becoming an important source of nonprofessional support [49]. The shortage of peer-based MHA is presumably attributable to a lack of knowledge about how to develop a social network for clinical use and, in particular, about which structural elements (identifiability, privacy, and moderation) and user characteristics (symptoms, cognitive abilities, motivation, and insight) are associated with more positive outcomes. However, a recent review on MHAs that have enabled peer-to-peer support among youth with mental illness found that, as long as the digital environment is secure and online interactions are regularly monitored and moderated by trained professional, the benefits of online peer-to-peer support seem to outweigh the concerns [50].

Developing and testing an app for youth with mental illness

How do we optimize the process of designing effective digital solutions in a timely, cost-effective manner? Which clinical dimensions do we target? How do we create

clinical interventions that adapt to a shifting technological landscape, while retaining their core functionality? The goal of this section is to offer some of the lessons learned throughout the process of developing and testing digital health tools in patients with psychiatric illnesses [16,51,52].

Development

MHA are likely to be adopted for long-term use only if they provide intrinsic value for the user in managing their condition, or improve critical aspects of their functioning and well-being. Engaging key stakeholders (patients, clinicians, research experts, and designers) to participate in user testing, interviews, simulations, and mock-ups during iterative, is critical to building MHA that are acceptable and likely to be disseminated successfully on a large scale [13]. Additionally, establishing interdisciplinary collaborations that harness the expertise of clinicians, patients, data scientists, software engineers and user experience designers is critical in ensuring that an intervention meets scientific and technical standards. Fostering trusted, multidisciplinary networks greatly enhances the development process. However, traditions of scientific independence, difficulties in sharing implicit knowledge and organizational barriers can form obstacles to collaboration. Employing "team science" principles [53] – scheduling meetings and initiatives to promote interdisciplinary dialogue, and ultimately the formation of a collective knowledge base – can help to align objectives and nurture effective collaborations. Before any work begins, it is essential that agreement is reached between collaborators on issues of payment, academic credit, authorship, intellectual property, and data ownership, storage and security. Finally, a key objective for the field is developing MHAs which are affordable and acceptable for extended use, and allow interoperability between mobile operating systems in order to maximize the reach and generalizability of the intervention. It is preferable to rely on existing mobile platforms that are in general use, provided they meet the needs and goals of the study, are secure, and compliant with ethical and clinical governance structures [16]: advantages include a significant reduction in costs and the possibility to promptly test the feasibility and acceptability of the technology in the clinical population. However, researchers have very little control over the development process, and may need to adapt the intervention to the rapidly changing features of the digital tool, in turn creating problems with consistency of study procedures and replicability of findings.

Testing

To date, several MHA for youth with mental illness have shown promise in improving several outcomes, including symptoms, quality of life, social connectedness and support, socialization, perceived stress and empowerment [7,8,54]. However, study methodology and trial reporting are generally poor. Further, validated assessments and appropriate clinical trial procedures that encompass follow-up periods need to be consistently implemented across studies. Given that the rapid developments in the available technology may make the original product obsolete and uncompetitive by the time the trial is over, traditional RCTs may not be the most effective way to test the efficacy of MHAs. Instead, well-conducted, properly powered clinical trials that incorporate novel analytical methods and designs – including sequential, multiple assignment, randomized trial (SMART) methods or stepped-wedge research designs – may be more useful in determining the efficacy of MHA [55,56].

Conclusions

Each point discussed above relates to the production, delivery and evaluation of mental health apps for youth with mental illness. The field of mobile mental health research will certainly continue to face many challenges including: 1) understanding new types of data; 2) transitioning from studies of feasibility to those of effectiveness; 3) integrating MHA existing clinical infrastructure; 4) ensuring privacy and security; and 5) promoting equity in access to mental health services and hopefully reducing disparities in mental health outcomes. To address these issues, we cannot encourage enough a closer collaboration between academic and industry to fuse the advantages of supported technologies with the collection and interpretation of clinical-quality data. As technology progresses, new opportunities will arise to develop, deliver, and evaluate apps for youth with mental illness. We believe that, in this rapidly evolving landscape, apps that will continue to thrive are those meeting clinical and scientific standards, capable of integrating seamlessly into the user's everyday life in the long term, and ultimately valued by patients and clinician.

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