mHealth VR Can Transform Mental Health

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MOBILE HEALTHCARE—mHealth—is beginning to revolutionize how and where behavioral health services can be delivered and enhanced. Using immersive technologies such as virtual reality (VR), health professionals can augment their treatment protocols, and individual smartphone users can improve their mental health, at home or on the go.

mHealth is a broad topic. Therefore, this editorial focuses solely on smartphone apps, offering examples to illustrate how such technology can facilitate a transformation in mental health and well-being.

Apps for Depression

Standard tests

Several versions of the Beck Depression Inventory are available for popular smartphone platforms (Android, iOS, Windows Mobile). However, no one has yet found a way to transform this proven 21-question inventory into an interactive simulation that would just as effectively help guide health professionals to diagnose major depression. So far, the closest we can find that developers have come to making such an experience interactive is with an empirically supported app called Mood Tools (Android; see moodtools.org), which includes the PHQ-9 (Patient Health Questionnaire, 9 questions) depression inventory, as well as other apps such as a thought diary, activity tracker, safety plan, and guided video meditations. It would be relatively simple to add VR to the guided meditations to help immerse the user and promote deeper relaxation.

Education

A Brazilian app called Puerperal Disorders (Android) is designed for health professionals “to describe mood swings during [the] postpartum period and identify differential diagnostic criteria, as well as to characterize these changes in their conceptual, epidemiological, clinical, therapeutic, and prognostic aspects.” While it is a simple text-based app, adding VR video to illustrate this disorder would be a powerful educational enhancement. Other researchers in Spain are looking to use smartphone apps as a diagnostic aide for postpartum depression.¹

Apps for Addictions

Substance abuse

Drinking Snitch (Android, soon for iOS), an on-demand video app, uses craving-specific videos to distract, as well as prerecorded motivation from family and friends, available at

the touch of a help button. British developer David Crane is using his app Smoke Free (Android, iOS) as an ongoing experiment to help find out what helps people quit, by providing additional features on a random basis to users. Again, it would be relatively easy to add a virtual bar or other triggering environment to these types of apps, offering the user rewards for abstaining.

Food addictions

Recovery Record Eating Disorder Management (Android, iOS) is available for both patients and clinicians (HIPAA [Health Insurance Portability and Accountability Act] compliant), and includes a built-in support network of other users as well as meditation images. Again, this type of app would lend itself to a VR adaptation, perhaps using body imagery. According to a recent review and meta-analysis,² effectiveness of mHealth apps for eating disorders is a subject ripe for research.

Apps for Anxiety

Social anxiety

Self-help for Anxiety Management (Android, iOS) developed by university psychologists in the United Kingdom, includes a closed social network among its apps. This is helpful, as would be VR video that guides the user through social interactions, helping to self-regulate breathing and heart rate.³

Anxiety reduction training

A project funded by the National Institutes of Health used a smartphone app to teach patients how to reduce stress and anxiety by employing a technique called attention-bias modification training (ABMT). ABMT involves having patients ignore threatening stimuli (e.g., an angry face) and focus instead on nonthreatening stimuli (e.g., a happy face). This could be enhanced easily by VR, with stimuli embedded in everyday scenarios.

Apps for Special Populations

Youth mental health

The *mobiletype* program was used in a randomized clinical trial to assess and monitor mood, stress, coping strategies, exercise, sleeping, eating, and marijuana and alcohol use daily in a group of patients aged 14–24. The mobile phone program resulted in improved emotional self-awareness and substantially improved mental health outcomes.⁴ If there

were VR stress reduction scenarios embedded into the program for those scoring high on stress or needing relaxation exercises prior to sleep, this may improve an already useful program.

Military mental health

The way people think about a particular experience impacts current mood and how they think about future experiences. Created for use by deployed soldiers, Mental Armor Training (iMAT) serves to enhance soldiers' abilities to form accurate interpretations of the events they experience during deployment and in every day life. Developed to assess for traumatic brain injury and post-traumatic stress disorder, more than 600 of these apps were distributed on iPhones to members of the Virginia National Guard during their deployment to Afghanistan.⁵ Although successful in its current format, it could be made more interactive and compelling by the addition of VR.

Apps for Chronic Conditions

Chronic pain

Chronic pain affects approximately 108 million individuals in North America and Europe. Mobile phones may provide a good platform to extend treatment from the clinic to the home to provide relief anytime, anywhere it is needed. In a recent study, VR worlds that had been clinically validated were ported to a mobile phone platform. Patients reported both subjective decreases in pain and stress (and increases in relaxation), as well as a decrease in objective physiological measures (heart rate), confirming a less aroused state.⁶

Parkinson's disease

Parkinson's disease (PD) is the most prevalent movement disorder, affecting an estimated 6.3 million individuals worldwide. Using an Android platform, the PD Dr app was used to extend assessment and monitoring from the clinic to the home setting. Tested on 40 individuals, the system captured motion features that showed a strong correlation with PD severity, hand resting tremor, and gait difficulties in patients.⁷ Adding a VR rehabilitation environment to the app would allow individuals to continue appropriate home rehab once the assessment had been completed.

Future Directions

Some current theoretical models may be inadequate to inform the development of apps "that can increasingly interact dynamically and adaptively with users."⁸ How do users interact with these apps, and how do these apps lead to behavior change and improved outcomes? Perhaps we can incorporate control engineering, which according to Wikipedia uses "sensors to measure the output performance of the device being controlled, and those measurements can be used to give feedback to the input actuators that can make corrections toward desired performance."

In addition, developers need to be mindful to use inclusive language when developing apps. In a recent review of depression and anxiety apps, for instance, 58% assumed the user was heterosexual. Since lesbians and gay men have disproportionately high rates of depression and anxiety, it is important to develop apps to accommodate better mental health stressors specific to lesbians and gay men.³ Mobile apps may also be used to help reduce health disparities. In one study, for those older than 65 years of age, a strong association was shown between perceived stigma and reluctance to seek out treatment. There is also some evidence that non-Caucasians are less likely to seek mental health services. For multicultural populations and for those older than 65 years of age, apps designed to address stigma associated with receiving treatment for mental health conditions may help lead to improved likelihood of treatment engagement.⁹

From the examples above, it is clear that while studies are beginning to show the evidence-based effectiveness of smartphone mental health apps, much work remains to be done before the benefits of the mHealth revolution can be fully realized.

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