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Original article

Smartphone-based ecological momentary assessment for Chinese patients with depression: An exploratory study in Taiwan

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ABSTRACT

Mobile mental health has a potential to improve the recognition and management of Chinese patients with depression. Currently, evidence regarding ecological momentary assessment (EMA) for depressive disorder mostly originates from Western studies. Herein, we examined the validity of smartphone-based EMA for depression in Chinese patients and explored the determinants of use. A smartphone application, iHOPE, was used to perform daily EMA of depression, anxiety, sleep and cognitive performance. Outpatients with depressive disorder were recruited to use iHOPE for 8 weeks. Clinical characteristics and smartphone use patterns were assessed at baseline. We enrolled 59 Chinese patients with depression. In 8 weeks, participants interacted with iHOPE for an average of 10.8 (SD = 12.3) days; a trend of decreased frequency of use ($p = 0.03$) was observed. Scores of HAM-D at baseline was associated with, of the first 2 weeks, scores of PHQ-9 ($p = 0.005$), EMA of depression ($p = 0.003$) and anxiety ($p < 0.001$), and poorer sleep quality ($p = 0.023$). Among the demographic, clinical and smartphone-use variables examined, only limited internet package for smartphone (<500 M per month) predicted higher use of iHOPE ($p = 0.04$). The present study provides initial evidence for the feasibility of smartphone-based EMA in Chinese patients with depression. Level of engagement needs to be improved before determining its clinical usefulness.

1. Introduction

The recognition and treatment of depressive disorder is challenging in Chinese communities worldwide. Stigma of psychiatric illnesses with scarcely and unevenly distributed mental health resources constitutes prominent barriers for patients to engage and retain in treatment (Chang et al., 2016; Chen et al., 2015; Lee et al., 2016; Miller et al., 2016). For example, in Taiwan, the term 'psychiatric' needs to be replaced with 'psychosomatic' in naming community mental health clinics to reduce stigma (Dai et al., 2016), and the rural-urban gap regarding the availability and utilization of psychiatric services is substantial (Chiang et al., 2016).

Mobile mental health, as defined by mental health assessment and intervention delivered by mobile devices, represents an accessible and scalable means to explore novel strategies of monitoring, treatment, and research (Torous and Powell, 2015). Smartphone users worldwide have reached 2.08 billion in 2016 (Statistica, 2016); the majority of them reside in developing countries where mental health resources are scarce (World Health Organization, 2012). Similarly, in Taiwan, smartphone penetrance rate has reached 70% (The China Post, 2014). Moreover, in US, it has been estimated that 72% of psychiatric patients use a mobile phone, while ownership in patients with affective disorders (e.g. depression) is as high as 86% (Ben-Zeev et al., 2013). Leveraging mobile technology to intervene depression in Chinese communities is, indeed, a viable solution (Li et al., 2014).

Preliminary evidence regarding the application of mobile health in Chinese population primarily targets on the management of physical disorders such as age-related neurological diseases (Raknim and Lan, 2016; Sun et al., 2016), delirium (Yang et al., 2016) and home care for chronically-ill patients (Chiang and Wang,

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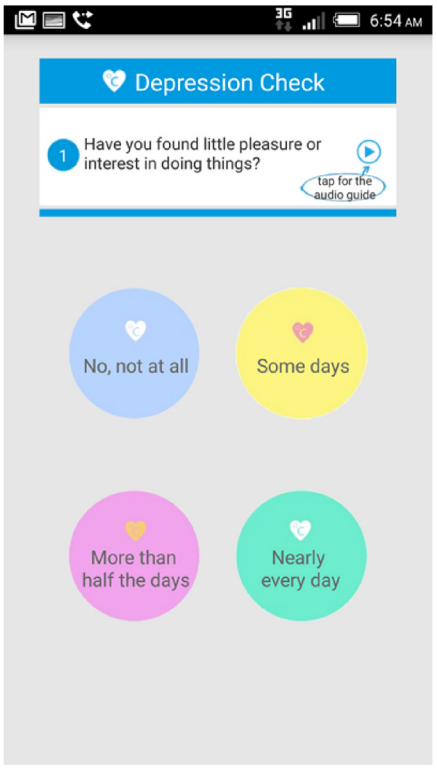
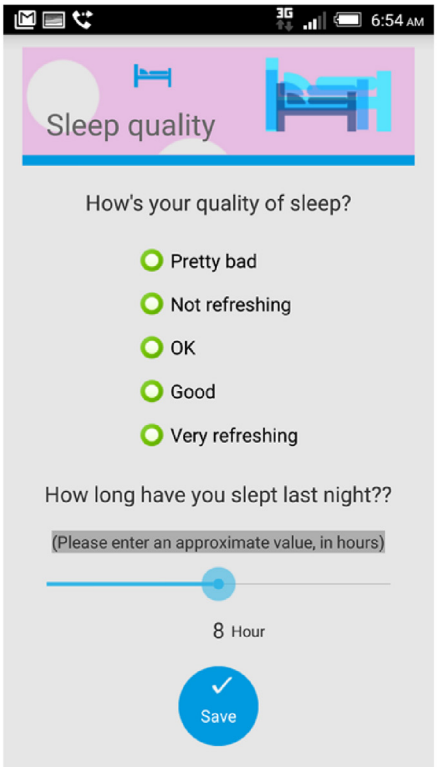
(a) Visual Analogue Scale for anxiety

(b) PHQ-9 sample question



(c) Inquiry for sleep quality and duration



(d) Sample of cognitive task: Trail B test

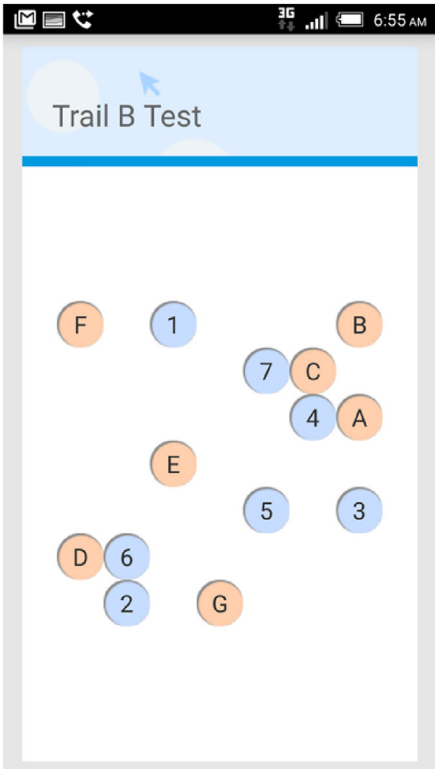


Fig. 1. Screenshots regarding major features of iHOPE.
(1a) Visual Analogue Scale for anxiety.
(1b) PHQ-9 sample question.
(1c) Inquiry for sleep quality and duration.
(1d) Sample of cognitive task: Trail B test.