

# FEELING MEH: *PSYCHOLOGIST IN A POCKET* APP FOR DEPRESSION SCREENING

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## Abstract

Among the most prevalent clinical disorders worldwide, depression is also a major cause of illness and disability. This makes early detection of depression critical in its prevention. However, barriers, such as social stigma and insufficient awareness regarding the condition prevent help-seeking behaviors.

Conventional mental health assessment procedures primarily involve direct interactions between clinicians and patients. One emerging tool in the delivery of healthcare and information is the use of mobile technology. Known as mobile health (mHealth), this approach offers unique advantages, particularly in mental health screening, in terms of capturing behaviors real-time, thus preventing recall bias and enhancing objectivity in data gathering. More importantly, assessments are private and entail no undue attention.

The Psychologist in a Pocket (PiaP) is an application we developed that screens for depressive symptoms via text analysis. All text inputted electronically—such as short message services, emails, social network posts—is analyzed based on keywords related to depression based on DSM and ICD criteria. Data evaluation and collection happen in the background, on-device, without requiring any user involvement. Currently, the application is in an early prototype phase entering initial clinical validation.

**Keywords:** *depression, Psychologist in a Pocket, mHealth, text analysis.*

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## 1. Introduction

In the 2015 estimate of the World Health Organization (WHO), there are approximately 350 million people of all ages worldwide suffering from depression, making it a common global mental health disorder. As a complex disorder, there are a myriad of factors to the development of depression, such as genetics, neurochemical imbalance, personality and temperament, and environmental. Among its symptoms include depressed mood, loss of interest, significant weight changes, alterations in sleeping behaviors and, in more serious cases, suicidality (American Psychiatric Association, 2013). The condition takes a toll in all aspects of life – personal, academic, social and financial, among others. Around 80% report functional impairment while 27% face serious difficulties at home and in the workplace (Centers for Disease Control and Prevention, 2013). As a result, depression has become a primary cause of disability and, being such, has been identified as a key determinant in the global burden of disease (WHO, 2015).

Due to unfortunate circumstances, such as social stigma, cultural barriers, misdiagnosis and lack of competent mental health practitioners, a significant number of depression-sufferers do not avail themselves of scientifically proven therapeutic strategies and interventions.

Technological innovations and advancements have paved the way for pioneering methodologies and approaches in the area of health care. The proliferation of the use of mobile technologies, such as mobile phones, has opened non-conventional access to health services and information. Mobile health (mHealth), an area of electronic health (eHealth), is a growing trend in the practice of medicine (e.g., Fiordelli, Diviani & Schulz, 2013; de Jongh et al, 2012). The ubiquity of mobile devices, both in developed and developing countries, caters to easier health access and delivery even in remote areas. It allows for greater patient-engagement and better patient-clinician communication, especially in chronic health conditions.

In the area of mental health, mobile technology can be used to screen for symptoms, monitor health conditions and provide treatment approaches (e.g., Luxton et al, 2011). This can be used to augment established and formal clinical assessment procedures, such as face-to-face interviews, psychological test batteries and observations.

Despite the relatively high prevalence and serious consequences of depression, the condition does not always exhibit obvious symptoms in the realms of cognitive, behavioral and emotional functioning. For this reason, it is beneficial to develop an acute screening mechanism that will allow for a timely and more “sensitive” detection.

## **2. *Psychologist in a Pocket* Application**

*Psychologist in a Pocket* (PiaP) (Bitsch et al, 2015) is a mobile application available for Android smartphones to screen for symptoms of depression as revealed in electronic data, such as in Emails, SMS and social media posts. We emphasize, however, that PiaP does not aim to serve as a replacement and/or substitute for mental health professionals, such as clinical psychologists and psychiatrists. The application does not provide a clinical diagnosis, and, in its current form, does not yet offer any form of psychotherapy. At best, PiaP can reinforce the more time-honored and conventional clinical screening and assessment practices.

### **2.1 Background**

Using text analysis, PiaP is primarily based on the hypothesis that language provides valuable insights into the state of one’s mental health (e.g., Goh & O’Kearney, 2014; Demb, 1980). In depression, for example, cognitive theory puts emphasis on the role of underlying negative belief systems and how such thoughts influence the way we view the self, the world and the future (Beck, 2011). An example of a statement is “I am worthless.” Higher incidences of first person pronoun usage (Weintraub, 1981) and tendencies towards self-rumination (Greenberg & Pyszczynski, 1986) are likewise found to be more common among individuals suffering from depression. Social media, which has been fast-becoming a regular mode for communication and self-expression, can likewise furnish relevant and considerable evidence of depression and its symptoms. Certain behavioral patterns in online communication (e.g., heightened self focus, negative affect) may signify the onset of depression (De Choudhury et al, 2013). Studies also support that social network postings, status updates and blogs may reflect depression (e.g., Coppersmith, Dredze & Harman, 2014; Moreno et al, 2011; Ramirez-Esparza, Chung, Kacewicz and Pennebaker, 2008).

### **2.2. How Does PiaP Work? An Overview**

PiaP employs ecological momentary analysis in the detection of text inputs. Among the key advantages of this approach are: a) data access in various settings is real-time or at the moment of occurrence; b) analysis is done passively, thus there is no need for user involvement; c) evaluation is objective; and, d) ensures privacy.

Data analysis necessitates three major steps. The preprocessing stage is characterized by language extraction (in English or in Filipino) and word or sentence normalization (e.g., spelling). This is followed by the classification of the keyword to the relevant symptom category. Symptom categories are based on the Diagnostic and Statistical Manual for Mental Disorders (5<sup>th</sup> ed.) and the International Statistical Classification of Diseases and Related Health Problems (10<sup>th</sup> ed.). In addition to this stage is the tallying of first-person pronouns used. Lastly, depression warning is triggered when several symptoms are present over a 2-week period.

### **2.1 Important Technical Details**

To meet concerns about data security and privacy, PiaP does not need Internet connectivity to analyze electronic data. Specifically, text analysis is performed locally, i.e., on the device itself. The only time wherein an Internet connection is needed is during the installation of the application. As a consequence, data is never uploaded to a cloud service. Text capture is realized as an accessibility service, whereas the operating system automatically excludes passwords. Plug-ins, such as for sleep, movement or activity detection and third-party contacts, are optional.

## **3. Conclusion and Research Directions**

There is sufficient scientific evidence regarding the role of mental health (and illness) and its impact on one's quality of life and day-to-day functioning. Depression is a specific example of how a mental disorder can debilitate millions of people worldwide. Although there has been, over the years, an increased public campaign, varied assessment procedures and available treatment options, there still exists the challenge of prompt and proper identification of individuals suffering from depression.

Technological advancements, along with the growing influence of the Internet and the proliferation of mobile devices, should be tapped in the practice of mental healthcare. Mobile applications, such as PiaP, can help steer the discourse and development towards this direction by providing more contemporary and convenient approaches towards depression screening.

Currently, PiaP is undergoing a series of validation studies and clinical trials among university students. It is also in the process of including a third language (German) in its depression lexicon. Among its future research directions are determining vocal identifiers and clues among individuals with depression, widening the scope of depression screening in terms of physical activity indicators and incorporating cognitive-behavioral therapy (CBT), which has been well established to be very effective in treating depression (e.g., Wiles et al, 2016).

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