

# Mental Health: Towards Effective Self-Care Through Digital Technology

## Abstract

Mental health disorders affect one in four people globally<sup>1</sup>. Though awareness and acceptance of mental health conditions is increasing, discrimination against people with such conditions is still very high. Mental health self-help tools that people can use discretely – for instance, through apps on mobile phones - addresses a critical need.

This paper analyzes currently available tools, their key features as well as their drawbacks. It also provides a high-level view of a self-help solution that detects mental health conditions unobtrusively and provides behavioral science-based interventions to effectively address those conditions.

## Enabling timely and discrete support for sustained emotional health

About 13% of the global population suffers from some form of mental illness. But only 1% of the global health workforce is working in the mental health field. Global attention to mental health is on the rise. Numerous firms in Europe and around the world have also launched initiatives to help their employees deal with mental health issues<sup>2,3</sup>.

The good news is that technology that senses human emotions through speech, text and facial expressions is available today. By using such technologies along with research backed findings from behavioral sciences, it is possible not only to accurately detect early signs of mental health issues, but also to provide behavioral interventions to help people improve their mental health conditions. Making such tools available through mobile phones can help users discretely detect their mental health conditions early on and avoid the stigma of discussing such conditions with humans. At a time when global primary mental health care infrastructure is stressed, such self-care tools can reduce the load on critical infrastructure while supporting people afflicted with mental health conditions.

### Why early detection matters

One important question that arises when considering self-help tools is: can such tools help with mental health conditions regardless of how acute the conditions are? Figure 1 showcases the indicative stages of emotional wellbeing over a continuum. People who fall to the far right (purple side) on the continuum can cope quite easily with daily stress. Those that fall to the left (the blue side) on the continuum face significant difficulty in performing their daily tasks hence require clinical treatment.

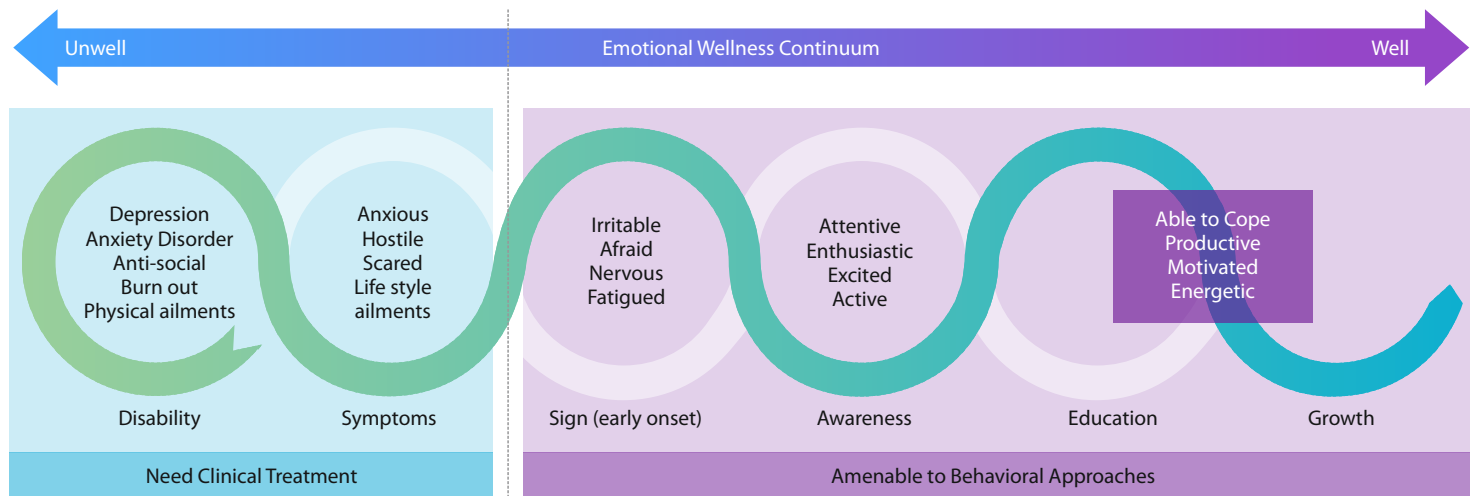


Figure1: Emotional Wellness Continuum

However, people falling to the immediate right of the vertical line do not necessarily require clinical help. A well-conceived self-help tool can help such individuals detect early signs of emotional health issues and guide them to move further to the right on the continuum. The tool can highlight the need to consult a clinician at the very earliest for those that end up moving to the extreme left despite intervention by way of the self-help tool. Moreover, such tools have the potential to provide clinicians with just the right information to help them take better decisions during therapy sessions. For instance, they can indicate the level of improvement in a patient's emotions since the said patient started using drugs prescribed.

## Analyzing existing self-care tools: An overview

Several mobile apps are available in the market today that claim to address different conditions – for instance, smoking, sleep disorders, anxiety, stress, depression, schizophrenia, bipolar disorder and so on<sup>4</sup>. Interestingly though, many of these apps have less than 5,000 downloads and less than five apps have over a million downloads<sup>5</sup>. This raises a big question – are these apps truly effective? It is worth analyzing what these apps offer and where they fall short.

Based on the way these apps address mental health conditions, they can be broadly classified into five categories:

(a) supported care (chatbot / clinical connect) (b) activities / games to improve memory, attention etc. (c) guided meditation (d) tracking moods and helping rationalize negative thoughts (e) mental health screening questionnaires. While many tools across these categories claim to provide interventions based on cognitive behavior therapy, a deeper analysis reveals the following:

- Most of the apps do not detect existing mental health state or conditions. They simply expect people to use them as needed. As a result, these apps cannot check and confirm if the remedial measures they offer (e.g. guided meditation) are truly reducing users' mental health problems or not.
- Even those apps that do detect a user's emotions (e.g. through a chatbot), do so mostly through only one mode of sensing (e.g. by analyzing what a person communicates in the chat sessions). Unless emotional data is captured through multiple modes (voice, facial expressions, typed text, etc.) and common emotional patterns are found across such modes, the accuracy of emotion detection is likely to be very low.
- Given that emotion sensing is missing or inaccurate in most apps, the remedial activities provided by existing apps are generic and not customized for specific individuals and their unique needs.
- Without emotion sensing, these tools fail to provide a visual representation of users' changing emotions over time. We believe that such a visual representation is critical to making users proactively use the apps' remedial measures/activities.
- Those apps that provide a view of a user's changing emotions over time, do not give collective or aggregate view of a group of users' emotions changing over time. Such a population level view is essential in many cases to drive greater impact.
- Alerting individual users and their near ones in case of critical situations is essential but only a few apps provide this feature.
- Mental health apps need to give users complete control over the privacy of their emotional data. They must provide a transparent view of how their emotion data is being used and by whom. In the absence of such transparency, concerns regarding discrimination can deter users from leveraging the apps. A vast majority of existing apps do not meet this requirement effectively.

- Mental health conditions usually do not change overnight. Unless the user experience of mental health apps is highly engaging, users are not likely to use them continually. Users discontinuing interaction after a few days or resorting to intermittent usage will significantly hamper the tools' ability to accurately detect mental health conditions. Unfortunately, a large number of existing apps do not provide an engaging enough user experience.

## The Solution: Gamified self-care mental health solution

Using a gamified app can help deliver a truly engaging experience to support mental health — using a pet, for instance, as a central character. The pet can guide users through their journey of detecting and maintaining good emotional health. Enabling easy configurability such as allowing users to choose their preferred animal as their pet character and combining it with a compelling user experience design, can keep users engaged with a mental health app over a longer duration.

A gamified app can deploy multi-modal, non-intrusive sensing by analyzing a user's voice, image and text (as illustrated in Figure 2). The app can also provide a graphic view of a user's emotions and a population level graph of emotions over time.

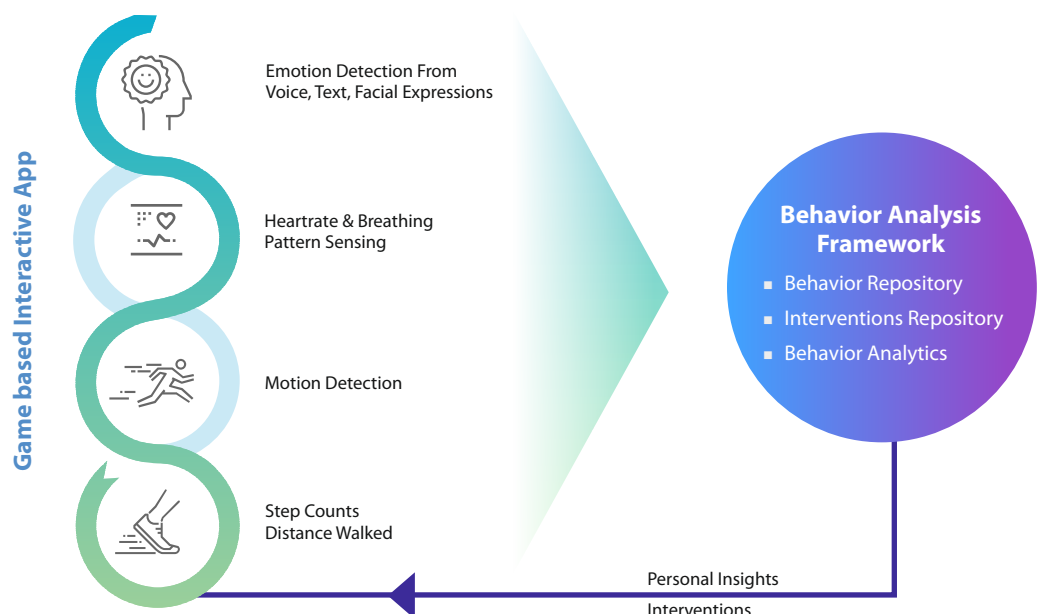


Figure 2: Proposed Gamified - Emotional Wellbeing Solution

Such views are possible only if the app is backed by a rich behavior analysis framework.

The framework must store the captured user behavior and emotions in the behavior repository (as illustrated in Figure 3). A pattern discovery module in the behavior analytics engine can then run multiple algorithms to determine if a person's captured behavior is indicative of any specific pattern – for instance, persistent negative emotions, persistent inactive (sedentary) behavior, hyperactive and negative emotions etc. For an individual or a group of people indicating any such pattern, the framework can recommend a target behavior and corresponding interventions (activities, games, etc.) to improve mental health conditions. The framework can then send identified interventions to each user through the app's front-end interface. The results of emotion pattern analysis can also be used to provide timely alerts to users or their near and dear ones when the user's mental health condition needs urgent attention.

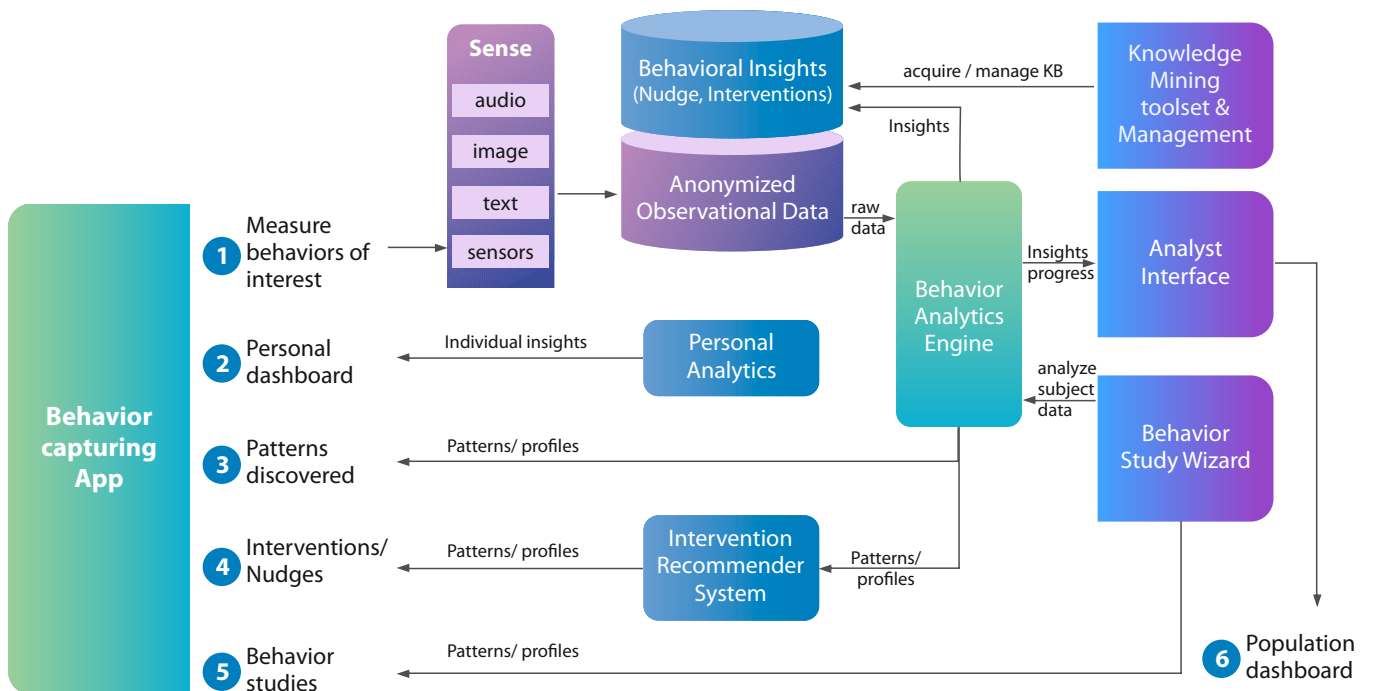


Figure 3 : Behavior Analysis Framework

It is important to equip the framework with robust data privacy capabilities as well as the ability to detect many mental health conditions by continuously updating the sensing algorithms, behavior pattern detection algorithms, and library of interventions (nudges).

Applications of such a generic self-help solution are wide-ranging:

- Organizations can monitor for early signs of adverse changes in their employees' mental health and provide timely help.
- Clinical psychotherapists / psychiatrists can monitor their patients' mental health between therapy sessions, helping them with timely course corrections.
- Health insurers (payors) can use group level mental health views to determine premium benefits.
- The solution can also be used in clinical trials – to check if specific medicines have any side effects on mental health.

## Coming together for mental well-being

The time is ripe for effective technology-based mental health solutions to flourish. Governments across the world are increasing their infrastructure to prevent and cure mental health conditions. This is mirrored by a keen interest in the corporate world to improve mental well-being at the workplace. At the same time, sensing technologies have also matured enough to enable accurate detection of mental health conditions and a multitude of essential sensors are now available on mobile devices. Moreover, the effectiveness of mobile phones as a platform to deliver mental health solutions, is well documented<sup>6</sup>. There is, however, an urgent need to a) address regulatory and data privacy concerns of such apps and b) build solutions that users truly like to use over a long period of time.

To achieve this, it is important that technology based solutions provide research backed interventions that can distinctly improve mental health conditions. Solutions that can accurately sense and effectively address multiple mental health conditions using a single underlying behavior analysis platform will be well positioned to address opportunities in the market that emerge across multiple healthcare sectors.

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