

On the Design of Technology and Applications for Personal Health Technology in Mental Health – A Social Paper

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This social paper works as an introduction of me to the 2019 Symposium on Computing and Mental Health. I am a computer scientist of background and have been researching technologies for healthcare settings in a number of year, including mental health. This paper will provide an overview of prior, present, and future research within technology and applications for mental health.

I. PRIOR WORK – SENSING

In 2010, research on using mobile phones in monitoring and treating mental health were initiated in the European MONARCA project¹. The overall goal of the MONARCA system [2] was to improve the treatment of patients suffering from bipolar disorder. This is done by collecting self-reported health data and sensor-based behavioral data from patients using a smartphone app, which can be continuously reviewed by clinicians in a web portal. We call this socio-technical treatment setup for a *double loop* [1] (see Fig. 1).



Fig. 1. Double-loop treatment in mental health.

The MONARCA system have been subject to a number of studies, which can be divided into three types: (i) usability and usefulness studies showing that patients found these kinds of technologies very useful [2], (ii) mood forecasting studies where mood was predicted from behavioral sensor data [3] and voice [4], and (iii) clinical studies, showing a high correlation between data collected via smartphones and clinical assessments [6], but no treatment effect in a randomized clinical trial [5].

II. PRESENT WORK – BEHAVIORAL ACTIVATION

Moving on from research in sensing, our group has lately focused on technologies for intervention, in particular focusing on behavioral activation (BA), which is a therapy

approach focusing entirely on changing behavior. Still relying on smartphone technology, we have build and tested two BA prototypes that support the BA techniques of activity-monitoring, scheduling, and regulation of daily routines, which have shown to reduce depressive symptoms. Automatic collection of activity and mobility patterns are used as part of the BA support on the smartphone, which helps the patient reflect on and plan for healthy activity patterns. In contrast to general-purpose guidelines in BA textbooks, our research shows that the smartphone can help patients sustain a much more *personalized* behavior activation.

III. FUTURE WORK – OPEN ACCESS DATA PLATFORM

Our current and future work pivots around building a basic technology stack for open access data sharing in digital phenotyping. This platform have three overall goals:

- collect – enabling the collection of (i) behavioral, (ii) cognitive, (iii) biomedical, and (iv) self-reported data,
- design – a programming framework for creating mobile and wearable health applications, and
- share – allowing data sharing across studies and patients.

The last goal sets up some fundamental challenges in terms of user/patient security and privacy. And in line with the topic of this year’s symposium, we are researching novel mechanisms for *usable security and privacy*.

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¹<http://www.bardram.net/2015/12/30/monarca/>