Acceptance of smartwatches for automated self-report in mental health interventions

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Abstract. Tracking of mood is an activity commonly employed within a range of mental health interventions. Physical activity and sleep are also important for contextualising mood data but can be difficult to track manually and rely on retrospective recall. Smartwatches show potential to help reduce the burden on users in terms of remembering to track, and the effort of tracking, as well as difficulties in accurate recall of sleep and activity. This ongoing study explores the acceptance of the use of a smartwatch app for automated self-report in a mental health intervention context. The watch app studied allows the manual self-report of mood and automated self-report of sleep and physical activity. Acceptance is measured through usage metrics and a questionnaire based on the Health Information Technology Acceptance Model. Acceptance issues more specific to the context of mental health interventions (e.g. perceived stigma) are also explored. The questionnaire is delivered before first use of the app, after initial use, and following sustained use, in order to assess the evolution of patients' acceptance over time.

Keywords. Technology acceptance, self-report, smartwatch, mental health.

1. Introduction

The literature suggests that changes in one's physiology could be associated with mental health difficulties [1]. The detection of physiological changes has been made possible with the advent of sensing technologies. These technologies include smartwatches, devices increasingly used by the general population to monitor health-related behaviour such as sleep and physical activity. The sensing capabilities of smartwatches could make them an efficient tool for augmenting self-report of mental wellbeing through automated monitoring. A review [2] stressed the importance of exploring the acceptability of user monitoring when designing for engagement. This study investigates whether smartwatches can be employed within mental health interventions. Specifically, the study addresses whether use of smartwatches in the context of mental health is *acceptable* to patients, and how patients' acceptance evolves over time.

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2. Method

The study is planned as a nested study in the context of a CBT-based intervention for depression. The smartwatch app developed allows patients to log their current mood and automatically collects their sleep and physical activity data. In order to assess the degree of acceptance of the technology, the study will gather:

- the amount of mood, sleep and activity data recorded
- the valence of each mood (positive/negative)
- whether data has been shared, through the app, with a therapist
- the watch app usage
- answers to an acceptance questionnaire delivered at three time points.

The questionnaire is based on the acceptance constructs identified in the Health Information Technology Acceptance Model [3]: perceived health threat, perceived usefulness, perceived ease of use, attitude, intention to use, and usage behaviour. Existing acceptance models do not cover specific factors which may impact on acceptance of technology in the context of mental health interventions. Thus, we explore additional constructs, including patients' perceived stigma [4], privacy [5], resistance to change [6], and attitude towards sharing sensitive data [7]. Where participants decline to use the app, they will be asked to explain their reasons. In line previous work [8], the questionnaire will be delivered before the study starts, at two weeks in, and at 6 weeks in, in order to measure the evolution of acceptance over time.

3. Results

The watch app offers two main features. Patients can log their moods via a discreet and quick interaction with the watch screen (see Figure 1).

Figure 1: Mood selection screen.

In addition, twice per day, scheduled notifications remind patients to log their current mood. To support individual preferences, patients can dismiss or postpone reminders, increase or decrease their frequency, and set "do not disturb" hours. The app also provides patients with a visualization of their daily moods, sleep, and physical activity. The aim is to encourage patients reflect on the influence their sleep hygiene (bedtime, sleep hours) and physical activity have on their mood over time.

4. Conclusion

This study explores the acceptance of an innovative way to keep track of patients' mood, sleep and physical activity. This study is novel as it investigates acceptance issues specific to the context of mental health interventions, explores the temporal dimension of technology acceptance, and examines the evolution of patient acceptance over time.

References

[1] K. Woodward, E, Kanjo, D. Brown, T. M. McGinnity, B. Inkster, D. J. Macintyre & A. Tsanas, Beyond mobile apps: A survey of technologies for mental well-being, *arXiv preprint arXiv:1905.00288* (2019).

[2] K. Doherty, G. Doherty. Engagement in HCI: conception, theory and measurement. ACM Computing Surveys (CSUR). Nov 19;**51**(5):1-39 (2018).

[3] J. Kim & H. Park, Development of a health information technology acceptance model using consumers' health behavior intention, *Journal of Medical Internet Research* **14(5)**:e133 (2012).

[4] M. L. Cheung, K. Y. Chau, M. H. Lam, *et al*. Examining Consumers' Adoption of Wearable Healthcare Technology: The Role of Health Attributes. *Int J Environ Res Public Health*, **16**:2257 (2019).

[5] P. Sanches, A. Janson, P. Karpashevich, C. Nadal, C. Qu, C. Daudén Roquet, ... & C. Sas. HCI and Affective Health: Taking stock of a decade of studies and charting future research directions. In *Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems*, pp. 1-17 (2019).

[6] K. Dou, P. Yu, N. Deng, *et al.* Patients' Acceptance of Smartphone Health Technology for Chronic Disease Management: A Theoretical Model and Empirical Test. *JMIR MHealth UHealth*, **5**:e177 (2017).

[7] R. Cheung & D. Vogel, Predicting user acceptance of collaborative technologies: An extension of the technology acceptance model for e-learning. *Computers & education*, **63** (2013), 160-175.

[8] C. Nadal, C. Sas & G. Doherty, Technology acceptability, acceptance and adoption-definitions and measurement, *Proceedings of WISH 2019 Workgroup on Interactive Systems in Healthcare Symposium, CHI* (2019).