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Title: Feasibility and Acceptability of the Empatica E4 Sensor to Passively Assess Physiological Symptoms of Depression

Background

Significant advances in the fields of engineering and computer science have facilitated the examination of digital biomarkers that may characterize major depressive disorder (MDD). The Empatica E4 is a wristband sensor that measures physiological features including blood volume pulse (BVP) and electrodermal activity (EDA). The E4 has been used in several research studies to assess physiological features. While preliminary data from a previous study suggest that the E4 may be helpful to assess physiological depressive symptom severity passively, the feasibility of its dissemination is unclear. The present study examined the feasibility and acceptability of using the E4 among individuals with MDD.

Method

The original study consisted of a longitudinal evaluation of mobile and wristband sensors to assess depressive symptoms passively. The protocol included an initial screening visit and 4 biweekly in-person visits for 8 weeks during which symptoms were assessed. Participants were instructed to wear two E4 sensors (one on each wrist) for 23 hours a day, 7 days per week (with one hour per day of charging), for the duration of the study. During the final visit, subjects returned the device and completed a brief exit survey about their experience wearing the E4. The present analysis examined exit survey responses and a binary logistic regression was conducted to examine whether depression scores on the 28-item Hamilton Depression Rating Scale (HAM-D-28) predicted if the participant would wear the E4 each day.

Results

Forty-one individuals with MDD were enrolled in the study and 32 completed the exit survey. Overall, 57.1% of participants found the E4 wristband comfortable or neither comfortable nor uncomfortable, 82.1% of participants found the E4 easy to operate, and 64.3% of participants found the E4 wristband easy to put on. In addition, 42.8% of participants found it easy to upload data and charge the E4 device and 50% of participants said they did not feel stressed or uncomfortable when wearing it in a public place. Finally, 64.3% of participants said they would consider wearing the E4 wristband on a regular basis to help assess physiological measures related to depression. Results showed that the HAM-D-28 did not predict whether participants would consider wearing the E4 wristband on a regular basis ($\chi^2(19) = 27.99, p = .083$).

Conclusion
Results suggest that several aspects of the E4 sensor may be well received, but others should be improved upon to be able to disseminate this device. Areas of improvement include comfort level and ease with which data is uploaded.