Collaborative Management of PTSD Treatment through Smartphone Apps Validated through Patient-Centered Design

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1. Background

Post-traumatic stress disorder (PTSD) is a mental health disorder that is estimated to impact up to 23 percent of all Veterans returning from the recent wars in Iraq and Afghanistan. An estimated 8% of Americans (~24.4 million people) have PTSD at any given time. That is equal to the total population of Texas.

Smartphone apps have been developed to treat PTSD symptoms, complimenting treatment.

2. Research Aims

Aim 1: Derive functional and information requirements to inform the design of a usable, efficient, and interactive PTSD information system that meets the needs of clinicians and patients.

Aim 2: Develop and verify the efficacy of a sensor-enabled smartwatch app in predicting stress state changes.

3. Research Methods

3.1 Systematic Review of Peer-Reviewed Literature

- Review or validate an existing PTSD app
- Detailed the development of a new app (treatment or detection) of PTSD
- Case study using PTSD apps

28 papers met inclusion criteria → 6 original studies to evaluate design or usage; No documentation of design methodologies → Only 2 PTSD apps were studied: PTSD Coach and PE Coach

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<th>Findings</th>
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<td>1 Kuhn, Greene, et al., 2014</td>
<td>PTSD Coach</td>
<td>Evaluation</td>
<td>Validate PTSD Coach</td>
<td>The mobile application could potentially be used as an effective self-management tool for PTSD</td>
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<td>2 Reger et al., 2013</td>
<td>PE Coach</td>
<td>Evaluation</td>
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<td>Application may improve patient compliance with treatment, as well as convenience.</td>
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<td>3 Owen et al., 2015</td>
<td>PTSD Coach</td>
<td>Usage</td>
<td>Analyze PTSD Coach analytics</td>
<td>PTSD Coach has reached a large population, and based on reviews is well-received</td>
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<td>4 Possemato et al., 2016</td>
<td>PTSD Coach</td>
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<td>Analyze PTSD Coach with and without clinician support</td>
<td>Clinician support for PTSD Coach increases effectiveness of the mobile application.</td>
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<td>5 Kuhn et al., 2015</td>
<td>PE Coach</td>
<td>Usage</td>
<td>Clinicians’ perceptions of PE Coach</td>
<td>Clinicians are keen to use a PE mobile application for therapy.</td>
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<td>6 Reger et al., 2015</td>
<td>PE Coach</td>
<td>Usage</td>
<td>Compare treatment with and without PE Coach</td>
<td>PE Coach can enhance the treatment engagement of the clinician and patient.</td>
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3.2 Patient-Centered Design of a PTSD Smartwatch App

- 7 interviews with VA psychiatrists and psychologists
- To validate descriptive model of current PTSD treatment process
- To derive functional requirements for app

Periods of “hyper arousal” are detected by the heart rate sensor while other activities are de-noised using the accelerometer and the device alerts the patient. The tool provides variety of interactive activities, facilitates connection to peers, and clinicians, and patient’s social networks. Patients can use the tool to complete periodical self-assessments, review their progress, and share the results with clinicians.

4. Work in Progress

4.1 Subject Matter Expert (SME) Interviews

- Recruiting veterans with PTSD (Texas A&M University community and regional VA clinics)
- Expanding the descriptive model of care
- Deriving additional requirements for next iteration of the tool

4.2 Laboratory Study

- Recruiting 40 veterans to participate

4.3 Formative Usability Testing

- Iterative design informed by user feedback
- Incremental improvement
- Improved user experience
- Collecting signals from EEG and voice metrics to evaluate mental state
- Tests with wearable devices for usability and reliability of data

4.4 Summative Usability Testing

- Recruit a minimum of 15 PTSD patients
- Test the device in a usability laboratory
- Post-use interviews to collect subjective data on usability and overall experience
- In-home trials will be used to gather additional data
- Longitudinal study:
  - 5 Veterans with PTSD
  - Document thoughts, evaluate experiences
  - Provide contextual information in case of hyperarousal