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. 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

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

<table>
<thead>
<tr>
<th>Reference</th>
<th>Application</th>
<th>Method</th>
<th>Study Objective</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<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 treatment, as well as conveniences.</td>
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<tr>
<td>2 Reger et al., 2013</td>
<td>PE Coach</td>
<td>Evaluation</td>
<td>Validate PE Coach</td>
<td>Application may improve patient compliance with treatment, as well as conveniences.</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 reach 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>
<td>Usage</td>
<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>Utility</td>
<td>Clinicians' perceptions of PE Coach</td>
<td>Clinicians are keen to use a PE mobile application for therapy.</td>
</tr>
<tr>
<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>
</tr>
</tbody>
</table>

3.2 Patient-Centered Design of a PTSD Smartwatch App

- **Subject Matter Expert (SME) Interviews**
  - 7 interviews with VA psychiatrists and psychologists
  - To validate descriptive model of current PTSD treatment process
  - To derive functional requirements for app

- **Usability Testing**
  - 10 Texas A&M University students
  - Task: explore PTSD Coach and provide first impressions
  - Technical and usability issues identified
  - Results: app is easy to use, does not meet expectations

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

Critical need: to determine how to best integrate information from these apps into on-going treatment.