Collaborative Management of PTSD Treatment through Smartphone Apps Validated through Patient-Centered Design Carolina Rodriguez-Paras¹, Justin Benzer^{2,3}, Suzannah Creech⁴, Hye-Chung Kum², Farzan Sasangohar¹

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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.

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

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





experienced some type of traumatic event at least once in their lives. This equates to approximately 223.4

Up to 20% of these people go on to develop PTSD. As of today, that equates to approximately 44.7 million people who were or are struggling with PTSD.

> 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.

3. Re	searc	h Meti	nods			 Deriving a iteration of 	dditional requirements for next f the tool
3.1 Systematic Review of Peer-Reviewed Literature						4.2 Laboratory Study	
	Review or validate an existing PTSD app					 Recruiting 40 veterans to participate . 	
Inclusion	Detailed the development of a new app (treatment or detection) of PTSD						
Criteria	Case stue	Case study using PTSD apps					
28 pape inclusion	ers met n criteria	6 orig	inal studi usage; No design r	es to evaluate desigr o documentation of methodologies	Only 2 PTSD apps were studied: PTSD Coach and PE Coach	Heart Rate Sensor	 Identify optimal sensor configuration for heart rate values
R	eference	Application	Method	Study Objective	Findings		 Develop model to predict patient's mental state
1 Kuhn, Gre	ene, et al., 2014	PTSD Coach	Evaluation	Validate PTSD Coach	The mobile application could potentially be used as an effective self-management tool for PTSD	Analytical Model	 Adjust for environmental
2 Reger et	al., 2013	PE Coach	Evaluation	Validate PE Coach	Application may improve patient compliance with treatment, as well as convenience.		factors, perspiration, and watch movements
3 Owen et a	al., 2015	PTSD Coach	Usage	Analyze PTSD Coach analytics	PTSD Coach has reach a large population, and based on reviews is well-received		 Determine human factors and usability issues for enhanced design and improved user engagement
4 Possema	to et al., 2016	PTSD Coach	Usage	Analyze PTSD Coach with and without clinician support	Clinician support for PTSD Coach increases effectiveness of the mobile application.	Usability	
5 Kuhn et a	I., 2015	PE Coach	Usage	Clinicians' perceptions of PE Coach	Clinicians are keen to use a PE mobile application for therapy.	Cocionity	
6 Reger et	al., 2015	PE Coach	Usage	Compare treatment with and without PE Coach	PE Coach can enhance the treatment engagement of the clinician and patient.		



76 %

58 %

3.2 Patient-Centered Design of a PTSD Smartwatch App Subject Matter Expert (SME) Interviews **Usability Testing** • 7 interviews with VA psychiatrists and 10 Texas A&M University students Task: explore PTSD Coach and provide first psychologists • To validate descriptive model of current impressions Technical and usability issues identifies PTSD treatment process • To derive functional requirements for app Results: app is easy to use, does not meet expectations • Veterans in outpatient Patients can use the tool to Periods of "hyper arousal" are The tool provides variety of complete periodical selftreatment for PTSD own detected by the heart rate sensor while interactive activities, facilitates assessments, review their other activities are de-noised using connection to peers, and progress, and share the results the accelerometer and the device clinicians, and patient's social with clinicians. alerts the patient. networks.

Longitudinal study:

- 5 Veterans with PTSD
- Document thoughts, evaluate experiences
- Provide contextual information in case of hyperarousal

 Showed interest in using an app as part of the therapy

a smartphone

Critical need: to determine how to best integrate information from these apps

The application has noticed that you are experiencing high levels of stress symptoms. How are you feeling right now?

OK

First, take a long, deep breath through your nostrils. Breathe in for four seconds, and slowly exhale with a Whoosh sound. Continue these breaths for a few minutes.

In the past month, how much were you bothered by repeated, disturbing, and unwanted memories of the stressful experience?

To a Great Extent

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

