

Usability Assessment of a Post-Traumatic Stress Disorder (PTSD) mHealth App

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Post-traumatic stress disorder (PTSD) is a common mental health disorder that can affect those who have experienced a traumatic event. Despite the availability of different treatment options for PTSD, there are several barriers that prevent some patients from receiving treatment. To overcome these barriers, mobile health (mHealth) apps have been developed to allow access to therapeutic and self-assessment tools outside the clinic. Our review of literature shows that the three mostly used apps (PTSD Coach, PE Coach, and CPT Coach) are not empirically evaluated and very little information is available for the process used in design and development of these tools. This paper documents a usability study of the most popular PTSD mHealth app; PTSD Coach. Findings indicate that the learning component of the app provides useful information, the assessment is effective in keeping track of the symptoms, and that some of the tools provided can help mitigate some of the symptoms. However, the color scheme, lack of personalization options, and lack of clarity on the mitigation techniques was deemed to affect usability.

INTRODUCTION

Post-traumatic stress disorder (PTSD) is a common mental disorder that affects an estimated 8% of the American population, with over one third of the diagnosed patients continuing to suffer some of the symptoms even after several years (Kessler, Sonnega, Bromet, Hughes, & Nelson, 1995).

Symptoms of PTSD are fourfold: 1) re-experience (e.g. flashbacks, nightmares), 2) avoidance (particularly of situations reminiscent of the event), 3) negativity (e.g. thoughts and feelings), and 4) hyperarousal (American Psychiatric Association, 2013). In order to be diagnosed as having PTSD, a traumatic event must have occurred, followed by the presence of these four symptoms (American Psychiatric Association, 2013). So far, there has been no distinction between the many possibilities on how the person acquires the PTSD symptoms, as the civilian cases (e.g. car accident, violence) and armed forces (e.g. veterans) are treated the same (Castro, 2014).

People who experience a traumatic event can be at risk of developing PTSD, but not everyone who experiences a traumatic event will develop it (American Psychiatric Association, 2013). The traumatic event does not necessarily need to be experienced by the patients themselves; experiences of people close to the patient (e.g. family members or friends) may also result in PTSD (National Center for PTSD, 2015). However, some populations can be more susceptible to develop PTSD than others (e.g. war soldiers). Nevertheless, there are no barriers in demographics or target population.

Some populations are exposed to traumatic events in their everyday jobs (e.g. paramedics, firefighters, soldiers). Veterans, having acquired warzone experiences, are one such population. For veterans, the prevalence of PTSD is highly dependent on the conflict in which the veteran served, ranging from 10.1% for Gulf War veterans, to 13.8% for Operation Enduring Freedom/Operation Iraqi Freedom (Gradus, 2016). In many cases, PTSD is not the only mental disorder afflicting the patient, as it tends to be present at the same time as other

disorders. Anxiety and depression are common mental disorders that sometimes afflict patients simultaneously with PTSD. Such complications have put veterans at higher risk of suicide. From 2009 to 2011, about 22 servicemen committed suicide on daily basis (Nicks, 2014). Having access to treatment is crucial to support veterans who suffer from this serious condition.

Treatments for PTSD consist of two main categories, which can occur simultaneously: 1) pharmacotherapy, and 2) psychotherapy (Forbes et al., 2010). In pharmacotherapy, patients are prescribed medicines to aid with PTSD symptoms. On the other hand, psychotherapy focuses in most cases on providing two cognitive behavioral therapy (CBT) methods: prolonged exposure (PE), and cognitive processing therapy (CPT). Psychotherapy has been suggested as a more effective treatment than pharmacotherapy (Forbes et al., 2010).

Despite having treatment options, there are still several barriers preventing patients from receiving treatment. These include geographic (e.g. access to healthcare facilities), temporal (e.g. lack of time for appointments), financial, and cultural (e.g. societal stigma) (Fortney, Burgess Jr, Bosworth, Booth, & Kaboli, 2011) barriers. To ensure timely and effective treatment for PTSD patients, other treatment alternatives need to be taken into consideration.

One such alternative is remote healthcare options such as electronic health portals (eHealth) and mobile apps (mHealth) to provide information and treatment options for patients while away from clinical environments. mHealth apps have shown promise as treatment complements for several diseases and disorders, including diabetes (Ciernins, Coon, & Sorli, 2010), weight loss programs (Carter, Burley, Nykjaer, & Cade, 2013), and other areas of healthcare, such as ophthalmology (Bhosai et al., 2012), and dermatology (Robson, Blackford, & Roberts, 2012). Following this trend, several mHealth apps have been developed to support PTSD patients among which three apps have had particularly widespread usage namely: PTSD Coach, CPT Coach, and PE Coach. PTSD Coach has been downloaded the most, with over 261,045 downloads followed by PE Coach (49,453

downloads) and CPT Coach (11,689 downloads) (Rodriguez-Paras et al., 2017). While CPT Coach and PE Coach were designed for usage during the therapy sessions, PTSD Coach is standalone tool designed to provide PTSD patients with additional information on the disorder, its symptoms, and mitigation techniques. The tool also enables patients to complete periodic self-assessments and supports connection to support groups. However, our recent review of PTSD Coach and other mHealth apps shows that remote capabilities are very limited and information collected using these apps is not integrated into clinician's work (Rodriguez-Paras et al., 2017). In addition, our systematic literature review showed that while few papers detail the evaluation process of the apps, particularly PTSD Coach (Kuhn et al., 2014; Owen et al., 2015; Possemato et al., 2016) and PE Coach (Kuhn et al., 2015; Reger et al., 2013; Reger, Skopp, Edwards-Stewart, & Lemus, 2015), usability testing and evaluation of the currently available PTSD apps are largely absent in the literature (Rodriguez-Paras et al., 2017).

Patient engagement in interaction with remote health tools has been one of the major challenges of the past decade. Given the special characteristics of the PTSD patient population, such as emotional state variability and emotional numbness, usability becomes an essential requirement in the success of any remote health tools. Since there is no evidence suggesting the utilization of a user-centered design approach or usability evaluation of the publicly-available PTSD tools, we decided to conduct a usability test on the most prevalent PTSD tool; PTSD Coach. This paper summarizes the findings from the usability testing sessions conducted to determine learnability, efficiency, memorability, potential for user errors, and other user satisfaction issues. Particularly, the study used the Android version of PTSD Coach, which at the time of the study had different characteristics from the iOS version.

METHODS

Participants

A total of 10 volunteers (6 males, 4 females, mean age of 26.4 years old, with standard deviation of 4.47) were recruited from the Texas A&M University student population to participate in the study. The participants were recruited through mass email, and met the criteria of being over 18 years old, and having familiarity with smartphones. None of the participants were familiar with the tool.

Apparatus

The study utilized the mHealth app PTSD Coach for Android (version 3.6), installed on a Nexus 6 phone. PTSD Coach is a free mobile app for iOS and Android, but only the Android version was tested to keep study results consistent. The sessions were video and audio recorded for future analysis.

PTSD Coach consists of a standalone application which provides four main functionalities including PTSD education, PTSD Checklist for DSM 5 (PCL-5) self-assessment (Blevins,

Weathers, Davis, Witte, & Domino, 2015), manage symptoms through several therapeutic activities, and finding support.

Tasks

Participants were asked to assume the role of a PTSD patient and tasked with exploring PTSD Coach. The objective of the usability study was to record participants' first-time interaction with the application. For the study, participants were instructed to follow a think-aloud protocol to provide information on their thoughts and impressions of the app. The study was complete when participants explored all the four main areas of PTSD Coach, as well as the settings. If participants had omitted a certain section, they were prompted to explore it.

Procedure

Upon arrival, participants read and signed the consent form which explained the study procedures. Once the experimenters had the participants' consent, the video recording of the session started. The participants were then asked some demographic questions, including their age, sex, which electronic devices they frequently used, and how often they used these devices. This questionnaire was followed by a semi-structured interview during which participants were asked about their knowledge of PTSD, and the mobile apps used for PTSD, such as PTSD Coach. In the case where participants have not heard of PTSD before, the experimenter explained the disorder and its symptoms. Participants were asked to imagine if they or someone they know has PTSD. Next, participants were asked to provide their expectations from a mobile app that can be used to treat PTSD. Several interview questions were dedicated to obtaining the participants' mental model, such as which functionality they expect to be provided in the app, and how the app should look like.

Participants then started exploring the tool while thinking aloud. Their first impressions of the app were recorded. If the participant fell silent, they were prompted to think aloud. If a participant missed a section, they were prompted to explore that section. The study was complete after participants explored all the possible sections in PTSD Coach, and they thought they had a very good understanding of the app.

Next, participants completed a semi-structured interview focusing on their overall experience with the tool and to expand on specific usability issues. The questions asked included what the participants liked or disliked about the app, as well as how they would like to have the app in a smartwatch format; the current focus of the broader project.

Finally, participants were asked to complete the system usability scale (SUS) questionnaire. Participants were asked to verbalize the reason for their response to SUS questions to ensure the selection was not random. The entire usability testing session took approximately 45 minutes.

RESULTS

Half of the participants in the study knew what PTSD was but only 20% have heard about PTSD Coach. The participants who knew about PTSD Coach had not used it before.

When participants asked about the expectations from a PTSD tool, several of the already existing functionalities from PTSD Coach were mentioned. All participants mentioned at least one of the already existing functions in PTSD Coach (e.g. mitigation tools to calm the patient, an “about” section with more information on PTSD and its symptoms, an assessment, social component, and an alarm tool). However, 50% of participants expected the tool to connect them with other patients to share their experiences anonymously; a functionality that does not exist in the studied version of the app. Besides these functions, 60% of participants mentioned their expectation to have access to a community of PTSD patient from the tool. This would be similar to social media, where PTSD patients could share their experiences with others who also have PTSD. Particularly, some participants mentioned a feature to allow them asking the community what has helped others in their treatment.

When participants were asked about the aspects of the tool they liked, 70% favored the information about PTSD in the learning component of the app. Most agreed that the home screen’s simple design showing only four options is visually appealing (Figure 1).



Figure 1: Home screen of PTSD Coach, which shows the four main app components.

The self-assessment functionality was the one that met most participants’ expectations. Particularly, participants liked the option of taking the assessment on demand. Having the option of tracking their progress was also something that participants reported as being in accordance with their mental model of the app (Figure 2)

Participants expected different screens to contain useful information or instructions. Half of participants mentioned disliking the blank space that appears between sections and in some screens. For example, one such screen appeared immediately before the beginning of the self-assessment, and before the results of the self-assessment are represented (Figure 3). This screen shows no information, except for the

“next” icon. Participants were especially confused before the start of the assessment, as they expected some instructions or directions on how to take the assessment. Similarly, after the assessment, participants expected to see in-depth results based on their symptoms.

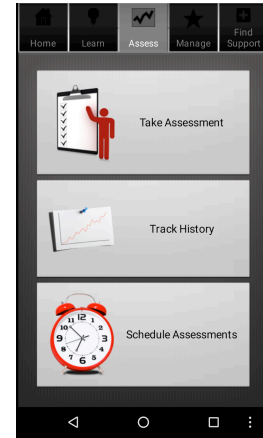


Figure 2: Self-assessment functionality of the PTSD Coach. The three options for the assessment are: taking the assessment, tracking the history, and scheduling a new assessment.

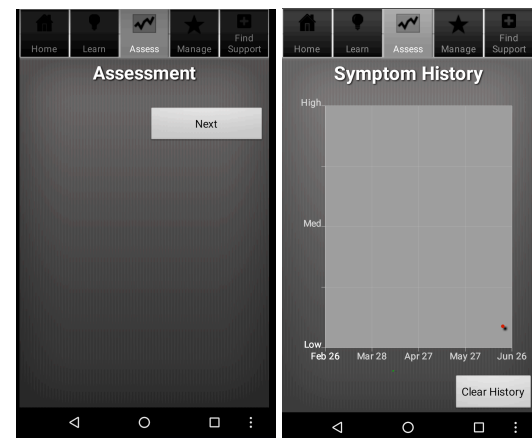


Figure 3: The main page of the assessment. It is a blank page with no instructions, only the icon “next” is visible. The assessment graph shows dots to indicate the score, but has no zoom capabilities.

Participants also commented on the importance of aesthetics and look and feel for any app designed for patients of mental disorders. The main complaint from most of participants was the graphical representations of the app. For example, the color scheme tends to be gray in color, with the exception of the colorful icons on the home screen. A clear example of the gray color scheme can be found in the learning components. The menu background color is black, with white text. Once the participant clicked on any of the options to learn more about PTSD, the screen turns to dark gray with white text, as seen in figure 4.

Participants expected the results from any self-assessment to be descriptive, detailed, and interactive. Participants mentioned that graphs that provide the self-assessment history could be improved by having the option of zooming in or out (Figure 5). Some participants did not find the result of the self-assessment to meet their expectations. Participants agreed that

having a graph is a good option to visually track the results, however, they mentioned that they would also add the option view their results as a numeric score. Some even mentioned they prefer to see the results for each question they answered instead of an overall score.

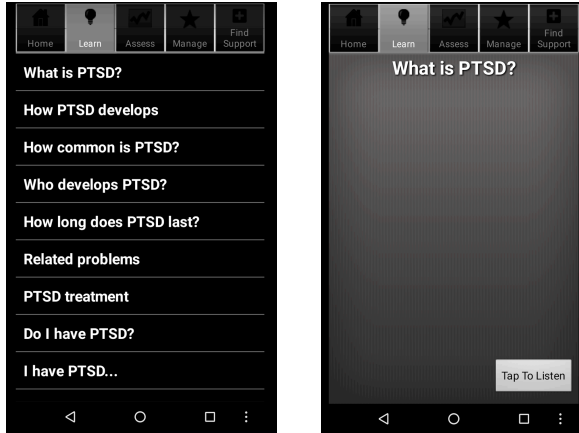


Figure 4: Learning component of PTSD Coach. The background for this section is black or dark grey with white letters.

participants were satisfied with the app, however the visual design (symbols, graphics, use of space) was not favored. The unreliability of the tools and lack of detailed instructions to complete the questionnaire might have also contributed to the low SUS score.

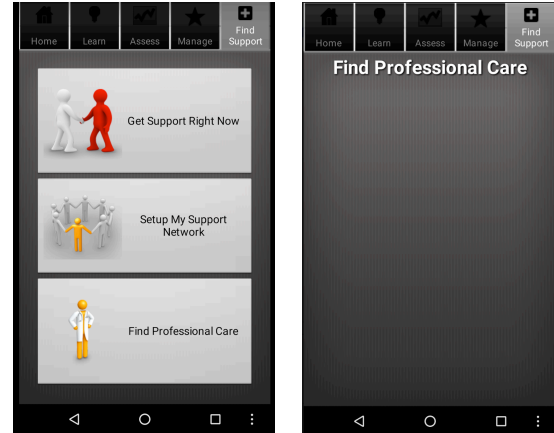


Figure 6: The find support option provides three main categories. Only the first two are functional.

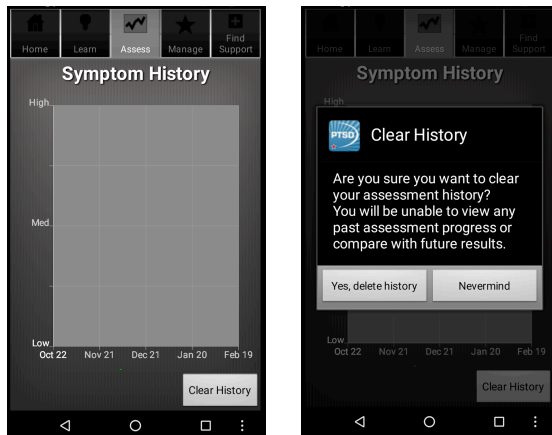


Figure 5: The symptom history shows a static graph with no possibility of navigating to the previous page or zooming in and out. Additionally, the clear history button is located where the “next” button was in the assessment interface making it prone to unintended interaction.

The “find support” screen in the app attracted participants. All participants favored having a capability to contact support group or network in the app. Participants mentioned such support group can include clinicians, friends and family or people in their area that might also suffer from PTSD. The “find support” functionality of the PTSD Coach allows the patient to choose phone numbers to call in case of an emergency. Participants were especially supportive of the “finding professional care” option. However, in the studied version of PTSD Coach, this option was not functional and led to a blank screen as shown in Figure 6.

The results of the system usability scale (SUS) questionnaire showed an average score of 66.25 which is considered low for mobile applications. The app tended to crash in the section designed to upload personal pictures, crashing at least once per participant trial (Figure 7). Overall,

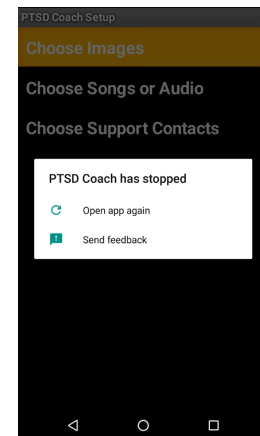


Figure 7: There are some places where the app tends to continuously crash. The option where the user can upload their own personal pictures is one such screen.

DISCUSSION AND CONCLUSION

PTSD is a mental disorder that affects a vast population in the United States, but many barriers prevent PTSD patients from receiving the necessary treatment. These barriers and lack of motivation to perform therapeutic activities such as completing self-assessments warrant the need for access to tools to complete in-session treatments. Mobile health (mHealth) applications are being used increasingly to fill the void in care while away from clinical settings. Several mHealth apps are available for PTSD on several smartphone operating systems, and have been proven to be effective in other areas of healthcare. The most downloaded PTSD mHealth app, PTSD Coach, is a standalone tool designed to provide information, self-assessments, mitigation techniques and support for PTSD patients.

To our knowledge, the tool has not been tested for usability, and literature is limited to preliminary evaluation of the app (Kuhn et al., 2014), usage statistics (Owen et al., 2015), or pilot randomized control trials (Possemato et al., 2016). Due to the prevalence of this tool, and its life-saving potentials, we decided to investigate and document the usability issues of the current app. To our knowledge, this research is the first usability study conducted to evaluate such issues. This study is also the first formal usability study performed on a PTSD mobile application, contributing to our knowledge of design for PTSD support, especially on mobile devices.

The study has several noteworthy limitations. While usability testing is insightful regardless of participant type, the findings from intended users of the tools are much more reliable. Future usability efforts should use PTSD patients with varying demographics. In addition, at the time of the study two versions of the tool existed on both Android and iOS operating systems. Due to visual differences in these versions, it is important to conduct a usability test to identify issues specific to each version.

Many mHealth applications are freely available on both the iOS and Google Play stores, with our review of apps showing about 1,800 PTSD-related apps. However, the majority of these apps have not been validated, and it is uncertain to what extent human factors and usability engineering methodologies were implemented in design and development of these apps. Despite the shortcomings, these apps have been downloaded by thousands of people, showing potential impact. A user-centered approach with frequent formative usability tests needs to be embedded in the design process to ensure the interaction issues are discovered and addressed early in the design process.

Providing the necessary assistance and support to patients with PTSD, particularly war veterans is timely. Technological interventions such as wearable devices show promise in facilitating the delivery of care specialty in-between therapeutic sessions. Work is in progress to design a wearable PTSD patient monitoring tool utilizing a user-centered design methodology. The tool detects the onsets of PTSD triggers and intervenes at the opportune time by engaging users in therapeutic activities or by connecting the patient to a support group.

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