Mental Health Apps: Lessons from the Trenches

Julia E. Hoffman, Psy.D.
National Director, Mobile Health
US Department of Veterans Affairs
Principal
BehaviorDx
A Little Backstory...
The PTSD Coach Timeline
PTSD Coach Metrics of Success

- Versioned for various countries and traumatic events
- Successful research & evaluation efforts
- 2011 FCC Chairman’s Award for Advancements in Accessibility
- 2012 ATA President’s Innovation Award
- 2011 Nextgov.com Best Government App
- 2011 Yahoo’s Top 10 Health Apps
- 2014 Finalist, Excellence.gov Innovations in Healthcare IT
- 2014 Finalist, Webby, Healthcare

Customer Reviews

About time ★★★★★
by STROKER-ACE-KID

Being a vet with PTSD I hope this will work in some way. Even if it helps in the slightest way I would rate it 10 stars

Outstanding! ★★★★★
by Fit Medic

Great app! A must for all active military + vets for help with dealing with things known only to them. Also get the Breath2Relax app for help with those tough situations. Keep the faith.

Thank you for this app! ★★★★★
by danwatson1

I have been struggling with PTSD for a while and this app has become a great tool for me especially when I don't know what to do. It easy to use and a big help. I would recommend this app everyday of the week!
Technology as a Solution

IMPROVE TREATMENT DELIVERY.
INCREASE TREATMENT EFFECTIVENESS.

Aid Self-Management
Enhance Clinical Care
Support Families

Enable Healthcare Providers
Support Evidence-Based Psychotherapy
Educate/Train/Increase Efficiencies
Refining a Process for Safe, Appropriate, and Effective Development of Technology-Enhanced Mental Healthcare
Understand the Limits of Agile Development under Certain Conditions

Initiation
- Ideation
- Approvals
- Contracting
- Planning
- Schedules

Definition
- Requirements
- Scope & Structure
- Content

Design
- User Interface
- Graphical assets

Development
- Software development
- Quality Assurance
- Beta testing

Certification
- FDA Guidance
- Internal certifications
- Apple or Google regulation

Deployment
- Creation of assets
- Marketplace review
- Launch to store
• Over past 5 years, a collaborative mobile research & evaluation network has been established with VA sites and universities across the U.S.

• Improving and expanding patient-centered care at the heart of research efforts

• Investigators focus on app usability, effectiveness and outcomes, and how apps can most successfully be integrated into care settings

• Projects typically involve the collection of quantitative and qualitative data, from both patients and providers
Lessons from the Trenches
Tracking and CHANGING Mental Health Status is Hard

“Everyone’s talking about steps these days, but I’m really into breaths.”
The Problems You Will Have Are Predictable

- Intervention Design
- Business Needs
- Funding Constraints
- Healthcare System Complexities
- Clinical Implementation
- Ethics
Mental Health-Specific Challenges

• Our gold-standard measures are self-reported
• Continuous (not actually categorical) mental status
• Our gold-standard interventions are complicated, hard to drive, and only partially successful
  – Cognitive restructuring
Learn about a few things before you start...
“As a field, we have discovered that all the paper in file cabinets plus all the manuals on the shelves do not equal real-world transformation of human service systems through innovative practice.”

Fixsen et al, 2005
Design Thinking

Design Thinking: d.mindsets

**Show Don't Tell**
Communicate your vision in an impactful and meaningful way by creating experiences, using illustrative visuals, and telling good stories.

**Craft Clarity**
Produce a coherent vision out of messy problems. Frame it in a way to inspire others and to fuel ideation.

**Be Mindful of Process**
Know where you are in the design process, what methods to use in that stage, and what your goals are.

**Radical Collaboration**
Bring together innovators with varied backgrounds and viewpoints. Enable breakthrough insights and solutions to emerge from the diversity.

**Embrace Experimentation**
Prototyping is not simply a way to validate your idea; it is an integral part of your innovation process. We build to think and learn.

**Bias Toward Action**
Design thinking is a misnomer; it is more about doing that thinking. Bias toward doing and making over thinking and meeting.

**Focus on Human Values**
Empathy for the people you are designing for and feedback from these users is fundamental to good design.

d. 
HASSO PLATTNER Institute of Design at Stanford
Diffusions of Innovation

How new ideas spread via communication channels over time and a set of principles for understanding the barriers to spread.
REALITY CHECK AHEAD
User Experience/Interface Mistakes

or: “How I Gave Up On Being An Expert and Learned to Do Usability/Acceptability Testing”
Form is Function.

- HCI literature clearly indicates that you cannot differentiate form from function.
- Stop pretending that you can (or should!) replicate the functions of therapy.
- Understand trends (e.g. no more skeumorphic buttons)
Choose **Parsimony.**

Solve exactly the problem you need to solve, for a specific audience, using only the tools you need to solve it.
Get **Qualitative Input/Feedback** from Every Group of Users
Unintended Consequences of Graphics and Iconography Choices
Understand Clinicians and Clinical Care

- Dashboard fatigue / integration with EHRs and workflow
- Bring in clinicians early and often
- Consider impacts to therapeutic alliance
- Create implementation materials like clinician guides
- The >45 split, perceived complexity, trialability, and relative advantage
Know your **User** Population

- College
- Veterans
- Create user profiles, use cases, and workflows
- Platform penetration
Structure for Users

Not for Your Theories or Protocols
Create Good Mobile Content

- Understand the limitations on real estate (and attention span): 50-100 words is the maximum that the average mobile user is willing to read at a time (research shows that 50% of individuals drop off at 50 words).
- Use clear titles, especially for buttons that will require moving to a new screen.
- Edit any non-essential information.

Goldilocks came upon the bears’ cottage and found that she was hungry and tired enough to take and use some things that did not belong to her. She was so entitled, in fact, that she felt justified in being displeased with the items that she stole when they were not to her exact liking.
Initial Engagement is the First Point of Failure

- The importance of onboarding
- Motivational messaging
- Accurate, respectful, and tolerable problem-description
- Marketing is often hard for the same reasons you chose to build an app in the first place
- Assessments: “I see you.”
Gamification For **Sustained Engagement**

But it’s Not a Panacea

- Game mechanics (e.g. denote progress, unlock features, provide rewards)
- Consider appropriateness for your population
- Alternative strategies:
  - Personalization
  - Interactivity
  - Responsiveness/ Value add
  - Reciprocity
  - Therapeutic alliance / pedagogical agent
  - Addition of “service layer”
Don’t Underestimate the Challenges of Meaning-Making for Users
Design First, Then Build.

- Design 1st
- Then Build

- CBT protocol
- Optional audio
- Auditory input
- Auditory output
- Visual interface
- Visual feedback

- Feedback mechanisms
- Feedback loops
- Feedback cycles
- Feedback processes

- Feedback structures
- Feedback patterns
- Feedback models
- Feedback systems

- Feedback principles
- Feedback rules
- Feedback regulations
- Feedback guidelines

- Feedback strategies
- Feedback tactics
- Feedback techniques
- Feedback methodologies

- Feedback approaches
- Feedback methods
- Feedback procedures
- Feedback practices

- Feedback mechanisms
- Feedback processes
- Feedback cycles
- Feedback loops

- Feedback structures
- Feedback patterns
- Feedback models
- Feedback systems

- Feedback principles
- Feedback rules
- Feedback regulations
- Feedback guidelines

- Feedback strategies
- Feedback tactics
- Feedback techniques
- Feedback methodologies

- Feedback approaches
- Feedback methods
- Feedback procedures
- Feedback practices

- Feedback mechanisms
- Feedback processes
- Feedback cycles
- Feedback loops

- Feedback structures
- Feedback patterns
- Feedback models
- Feedback systems

- Feedback principles
- Feedback rules
- Feedback regulations
- Feedback guidelines

- Feedback strategies
- Feedback tactics
- Feedback techniques
- Feedback methodologies

- Feedback approaches
- Feedback methods
- Feedback procedures
- Feedback practices

- Feedback mechanisms
- Feedback processes
- Feedback cycles
- Feedback loops

- Feedback structures
- Feedback patterns
- Feedback models
- Feedback systems

- Feedback principles
- Feedback rules
- Feedback regulations
- Feedback guidelines

- Feedback strategies
- Feedback tactics
- Feedback techniques
- Feedback methodologies

- Feedback approaches
- Feedback methods
- Feedback procedures
- Feedback practices

- Feedback mechanisms
- Feedback processes
- Feedback cycles
- Feedback loops

- Feedback structures
- Feedback patterns
- Feedback models
- Feedback systems

- Feedback principles
- Feedback rules
- Feedback regulations
- Feedback guidelines

- Feedback strategies
- Feedback tactics
- Feedback techniques
- Feedback methodologies

- Feedback approaches
- Feedback methods
- Feedback procedures
- Feedback practices

- Feedback mechanisms
- Feedback processes
- Feedback cycles
- Feedback loops

- Feedback structures
- Feedback patterns
- Feedback models
- Feedback systems

- Feedback principles
- Feedback rules
- Feedback regulations
- Feedback guidelines

- Feedback strategies
- Feedback tactics
- Feedback techniques
- Feedback methodologies

- Feedback approaches
- Feedback methods
- Feedback procedures
- Feedback practices

- Feedback mechanisms
- Feedback processes
- Feedback cycles
- Feedback loops

- Feedback structures
- Feedback patterns
- Feedback models
- Feedback systems

- Feedback principles
- Feedback rules
- Feedback regulations
- Feedback guidelines

- Feedback strategies
- Feedback tactics
- Feedback techniques
- Feedback methodologies

- Feedback approaches
- Feedback methods
- Feedback procedures
- Feedback practices

- Feedback mechanisms
- Feedback processes
- Feedback cycles
- Feedback loops

- Feedback structures
- Feedback patterns
- Feedback models
- Feedback systems

- Feedback principles
- Feedback rules
- Feedback regulations
- Feedback guidelines

- Feedback strategies
- Feedback tactics
- Feedback techniques
- Feedback methodologies

- Feedback approaches
Building Mistakes & Suggestions
or: “How I Gave Up On My Years of Training and Learned to Actually Build Things”
Leverage the Evidence Base and Prior Work (Create Evidence-Informed Interventions)
Decouple Content from Functions and Prioritize Interdisciplinary Clarity

Scope & Structure Documentation

A document in plain English that is intended to communicate the big picture and major functions of the app to all members of the team, to serve as a guide for development and documentation throughout and after development.

- Project Team
- Overview of the problem
- Goals of the app
- Use cases
- Mobile platform
- Basic software requirements
- User interface requirements
- Program evaluation and metrics
- Menu structure
- Overview of menu items
- Definition/function of app sections
- User stories
- Schedule
- Version 2.0 ideas
Respect Your Technical Colleagues

- The first rule of software development is never assume you understand software development.
- The second rule is you must understand the difference between a bug and a feature.
  - Content changes aren’t bugs.
Allow for All Abilities
Section 508 Amendment to the Rehabilitation Act of 1973

Color-blindness
Deafness
Blindness
Cognitive Impairment
Motor-impairment

https://www.section508.gov/
Anticipate Costs

- Design
- Development
  - Multi-platform (?)
- Testing devices
- Licensing existing products
- Deployment (e.g. annual licenses)
- Maintenance
Don’t be Greedy or You’ll Hear About it from the User or the IRB

Content Types

- Highly dynamic elements (e.g. pedagogical agent)
- Video
- Audio
- Graphics
- Text

![Images of electronic devices and a mobile phone with battery status and app store updates.]
Use – but Avoid Overreliance on – Cross-Platform Solutions

- Do: externalize content from function as much as possible
In order to post a public app bearing VA (or any subsidiary) logos/seals you must go through the certification process defined and overseen by Connected Health / Web and Mobile Solutions.

<table>
<thead>
<tr>
<th>Functional Testing and SQA</th>
<th>Code Review</th>
<th>VA Branding</th>
<th>Application Data Security</th>
</tr>
</thead>
<tbody>
<tr>
<td>Privacy</td>
<td>Security</td>
<td>Patient Safety Assessment</td>
<td>508 Accessibility</td>
</tr>
<tr>
<td>User Interface</td>
<td>Usability</td>
<td>Data &amp; Terminology Standards</td>
<td>Sustainment Plan</td>
</tr>
<tr>
<td>Data Security for Government Furnished Equipment</td>
<td>System Performance Impact Testing</td>
<td>Clinical Assessment</td>
<td>Governance Board Approval</td>
</tr>
</tbody>
</table>

http://mobilehealth.va.gov
Don’t Make Claims You Can’t Support

• FDA guidance was made available July 29, 2016.

• Most mental health applications are considered low risk and do not require review.

• Those that diagnose, claim that they treat, or replace existing medical equipment require oversight.
Budget Time and Money for Sustainment

“Change is the only constant in life.”

Heraclitus

• New devices
• OS updates
• New data/needs to tweak algorithms
• Funding and contracting challenges

Example time table for your 2-year retrospective cohort study:

<table>
<thead>
<tr>
<th>Task</th>
<th>Month 2</th>
<th>Month 4</th>
<th>Month 6</th>
<th>Month 8</th>
<th>Month 10</th>
<th>Month 12</th>
<th>Month 14</th>
<th>Month 16</th>
<th>Month 18</th>
<th>Month 20</th>
<th>Month 22</th>
<th>Month 24</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocol development and IRB approval</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Study enrollment</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Recieve questionnaires</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Data entry</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Data analysis</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
<tr>
<td>Documentation of results</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
</tr>
</tbody>
</table>
Implementation Challenges
or: “How I Learned to Stop Worrying and Love Iteration”
Do Dry Runs with Graduate Students or Testers
Anticipate Support Needs

HAVE YOU TRIED

TURNING IT OFF AND ON AGAIN?
The Dangers of Putting Data in the Wrong Place
Mental and Behavioral Health Care for Anyone Who Needs It Anywhere Anytime.

Contact

Julia E. Hoffman, Psy.D.
julia.hoffman@va.gov

or (better):

julia@behaviordx.com