Mobile Health (mHealth) App to Support Self-Management of Anxiety and Depression in African American Women: A Usability Study

Muhammad Osama Ali
Internship Presentation

Carolina Health Informatics Program
Agenda

- Background
- Internship Objective
- Usability Study
  - Methodology
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    - Scenarios
    - Recruitment
    - Procedure
  - Data Collection
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    - QUIS
    - Quantitative/Qualitative
- Results
  - Video Walkthrough Analysis
  - Heat Maps
  - QUIS
- Discussion
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- Lessons Learned
Compared to the general population, African American women suffer higher rates of mental illness.

Mental health service use: 10.3% vs 21.5% (African American vs White Women)

81% of U.S Adults (18 and up) owned a smartphone in 2019.

>300,000 mHealth apps; 10,000 mental health

2016 Study published in the Journal of General Internal Medicine; 43% of tasks completed in 11 mHealth apps
Internship Objective

To evaluate a mobile health (mHealth) App designed to help African American Women self-manage their anxiety/depression through a usability study

Dr. Terika McCall (PI) & Dr. Saif Khairat
Usability Study

- Methodologies for establishing utility of a system

**Purpose**

- Effectiveness:
  - Task Completion
  - Accuracy
  - Recall
  - Request for Help

- Efficiency:
  - Time Taken
  - Trial and Error

- Satisfaction: Subjective measure
  - Questionnaires
  - Cognitive Walkthrough
Usability Study

Three Methods:

1. Tobii Eye Tracking Technology
   • Heat maps
   • # of taps and time taken to complete tasks

2. Questionnaire for User Interface Satisfaction (QUIS)
   • Overall reaction
   • Screen (layout of information)
   • Terminology
   • Learning
   • System Capabilities

3. Cognitive walkthrough: Think Aloud
Methodology

- mHealth App
- Recruitment
- Procedure
- Results/Analysis
- Recommendations
mHealth App

• Developed by multi-disciplinary team at UNC
• Built through:
  - Literature reviews
  - Survey of current mental health apps
• Features:
  - Thought Journal
  - Information about Anxiety/Depression
  - Self-Assessments
  - Mood tracking graphs
  - Self-Care planner
  - Therapy for Black Girls therapist directory - Link
<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Scenario 1 (8)</th>
<th>Scenario 2 (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Open the app and find out the latest levels of anxiety through the graphs feature</td>
<td>1. Open the app and find out the latest depression levels through the graphs feature</td>
<td></td>
</tr>
<tr>
<td>2. Find tips on how to manage anxiety through the information feature on the app</td>
<td>2. Find tips on how to manage depression through the information feature on the app</td>
<td></td>
</tr>
<tr>
<td>3. Add a new entry to the journal describing anxiety thoughts and feelings</td>
<td>3. Create a self-care plan through the app feature with certain activities</td>
<td></td>
</tr>
<tr>
<td>4. Use the therapist locator feature to find a specific therapist to schedule an appointment with</td>
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<td></td>
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</tbody>
</table>
Recruitment

• **Population:** 15 women who identified as African American (18 and older)

• **Methods:**
  - Flyers around Campus, Chapel Hill-Durham area
  - Listing on Recruitment for me @UNC

• **Incentive:** $25 Amazon Gift Card
Procedure

1. Appointment times set for study in UNC School of Nursing Biobehavioral Lab
2. Inform participant about study and duration (consent)
3. Calibrating Tobii Eye Glasses
4. Tasks for participants: Two scenarios (Alternating) focusing on either anxiety or depression features of the app
5. Ensure participants view is always facing the phone (Tablet)
6. Questionnaire for User Interface Satisfaction (QUIS)
Data Collection
Scenario 1

1. Open the app and find out the latest levels of anxiety through the graphs feature
2. Find tips on how to manage anxiety through the information feature on the app
3. Add a new entry to the journal describing anxiety thoughts and feelings
4. Use the therapist locator feature to find a specific therapist to schedule an appointment with

Baseline Data – Scenario 1 (Anxiety)

<table>
<thead>
<tr>
<th>Task</th>
<th>Taps</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>0:13</td>
</tr>
<tr>
<td>2</td>
<td>6</td>
<td>0:25</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>3:10</td>
</tr>
<tr>
<td>4</td>
<td>8</td>
<td>0:56</td>
</tr>
</tbody>
</table>
Baseline Data – Scenario 2 (Depression)

<table>
<thead>
<tr>
<th>Scenario 2</th>
<th>Scenario 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Open the app and find out the latest depression levels through the graphs feature</td>
<td>Task</td>
</tr>
<tr>
<td>2. Find tips on how to manage depression through the information feature on the app</td>
<td>1</td>
</tr>
<tr>
<td>3. Create a self-care plan through the app feature with certain activities</td>
<td>2</td>
</tr>
<tr>
<td>4. Use the therapist locator feature to find a specific therapist to schedule an appointment with</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>
Questionnaire for User Interface Satisfaction (QUIS)

Five Domains: (0-9)
- Positive & Negative Aspects
- N/A for questions not relevant to app

- Overall reaction
- Screen (layout of information)
- Terminology
- Learning
- System Capabilities
Quantitative/Qualitative Analysis

Quantitative
• Statistics in QUIS (mean, median, range)
• # of Taps & Time Taken for completion of tasks
  ➢ Comparison to benchmark data

Qualitative
• Positive & Negative aspects (QUIS)
• Heat Maps (Tobii Eye tracking glasses)
Results
### Time Taken/Taps

<table>
<thead>
<tr>
<th></th>
<th>Task 1</th>
<th>Task 2</th>
<th>Task 3</th>
<th>Task 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Benchmark</strong></td>
<td>0:13</td>
<td>3</td>
<td>0:25</td>
<td>6</td>
</tr>
<tr>
<td><strong>Average</strong></td>
<td>0:58</td>
<td>3</td>
<td>1:45</td>
<td>13</td>
</tr>
<tr>
<td><strong>Range (Taps)</strong></td>
<td>0:20 - 1:41</td>
<td>3-6</td>
<td>0:48 - 4:24</td>
<td>5-37</td>
</tr>
<tr>
<td></td>
<td>2:48 -6:10</td>
<td>9-19$^1$</td>
<td>1:42-3:21</td>
<td>10-35$^2$</td>
</tr>
</tbody>
</table>
Video Walkthrough Analysis – Scenario 1

Confusion between “Info” about app and “Info” about Anxiety/Depression

2/8 Participants tried tapping on the graph.
1/8 rotated phone

2/8 participants had difficulty using the search function
1. Open the app and find out the latest depression levels through the graphs feature
2. Find tips on how to manage depression through the information feature on the app
3. Create a self-care plan through the app feature with certain activities
4. Use the therapist locator feature to find a specific therapist to schedule an appointment with

<table>
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<th>Time Taken/Taps</th>
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<td>0:36</td>
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<td>1:21</td>
<td>9</td>
</tr>
<tr>
<td><strong>Range (Taps)</strong></td>
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<td>3-6</td>
<td>0:28 - 2:14</td>
<td>6-14</td>
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</table>
2/7 Participants accidentally pressed “Add” which resulted in another text field (Did not affect final result)

Participants still had trouble with the “Info” feature and searching for therapists using the directory

Participant tried zooming in on the graph
Heat Maps
Heat Maps
Heat Maps

Food for Thought
Having a plan is the first step in improving or avoiding negative experiences. Good job on thinking through what you can do to make the situation better or avoid it from happening in the future.

Journal Entry Summary
Title: Today was a lot
Comment: Today my AP told me that I will be teaching one more section of Algebra in the Spring. I am already overwhelmed with the sections that I have now. I don't know how to tell him that it is going to be too much to manage.
Emotions: Anxious, Overwhelmed
How will you address the current situation? I can email the AP to schedule a meeting to discuss my concerns, and propose that other tasks be taken off my plate if I am going to teach one more class.

SAVE
QUIS – Scenario 1
## QUIS – Scenario 1

<table>
<thead>
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<th>Positive Aspects</th>
<th>Negative Aspects</th>
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<tr>
<td>Ease of interface usability</td>
<td>Lack of visuals and color</td>
</tr>
<tr>
<td>Variety of Features (Mood tracking, journal entries, useful information about anxiety)</td>
<td>Trouble finding certain features</td>
</tr>
<tr>
<td>Therapist finding feature</td>
<td>Lack of intuitiveness in graph feature</td>
</tr>
<tr>
<td>Positive Aspects</td>
<td>Negative Aspects</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Ease of interface usability</td>
<td>Lack of visuals and color (&quot;Harsh white background&quot;)</td>
</tr>
<tr>
<td>Variety of Features (Mood tracking, journal entries,</td>
<td>Hard to move back pages due to lack of prominent home button</td>
</tr>
<tr>
<td>useful information about anxiety)</td>
<td></td>
</tr>
<tr>
<td>Therapist finding feature</td>
<td>Lack of intuitiveness in graph feature</td>
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Discussion

- Mostly satisfied with the app with regards to resources and app capabilities
- Heat maps showed, participants looked mainly at the left-middle side of the screen
- Discrepancies in time taken may be due to typing speed or using different methods to go back a page

Recommendations:

- Re-label “Info” Feature
- Increase spacing between buttons on screens
- Make the app more visually appealing
- Put important information on the middle & left side of the screen
- Revamp graph feature
- Making the therapy for black girl's directory more mobile-friendly – reduce reluctance
Discussion
Challenges

- Being able to collaborate and analyze data virtually
- 30-Day trial of Tobii Software to complete heat maps
- Phone glare in Tobii Eye tracking video analysis
Limitations

- SMALL SAMPLE SIZE (15)
- 80% HAD A BACHELOR’S DEGREE
- STUDY FOCUSED ON USABILITY, NOT EFFICACY
Lessons Learned

• Real world applications of a usability study
• Process of giving informed consent (Human based research)
• Usefulness of the Tobii Eye Tracking Technology
• Applicability to usability project in INLS 725: Electronic Health Records
• Literature review:
  ➢ Knowledge about mental health apps and how best to design them
  ➢ INLS 620: Implementing Healthcare Informatics Initiatives (mHealth interventions)
• Manuscript work
References


THANK YOU!

Questions?