CBT MobileWork: ©
Illustrating User-Centered Design Principles

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CBT Homework

• assignments that patients are expected to complete outside of their therapy session

• integral component of CBT yet adherence is a common problem—patients report many barriers

• adherence associated with enhanced and earlier clinical recovery
Technology Development Framework
User-Centered Design

• Designing with the **User** and **Task** in mind

• Having user evaluate prototype based on usability standards

• Designing for specific user characteristics, i.e. age, how tech-savvy, cognitive deficits, etc.
Usability Testing - What is it?

• “applies to all (evaluation of) aspects of a system with which a human (the end users) might interact”

»Nielsen, 1993
Usability: User-Centered Design Attributes for System Acceptability

- learnable
- efficient-utility
- minimize errors
- satisfaction
- compatible
- consistent and practical
- simple and natural dialogue that speaks the user’s language
Development Phase

- review of CBT Literature to extract and organize homework exercises

- work with programming team to simplify and identify appropriate functionalities

- collapse exercises to manageable and related content areas
Development of Content and Features - Considerations

• clinically appropriate-addresses a real need, not just for the sake of technology

• addresses theory and knowledge of clinical area

• any issues unique to the population, i.e. cognitive deficits, lack of knowledge
Development Results:
7 categories of homework

- Monitoring
- List-making
- Thinking
- Scheduling
- Behavioral
- Problem-solving
- Interpersonal

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Development Findings: 7 Additional Features

- CBT Skill Navigator
- What is CBT?
- E-mail my therapist
- My CBT library

- My CBT toolbox
- Check my mood
- Take notes

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CBT MobileWork Main Icon
Log In Page

Username

Password

Login  Change Password

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CBT MobileWork Main Menu

- CBT Skill Navigator
- What is CBT?
- Check My Mood
- E-mail My Therapist
- CBT Library
- CBT Toolbox
- Settings
- Take Notes
- Homework
Homework Menu
Thought Record - Description of Situation

Identify a situation that has brought about a change in your mood. Examine the who, what, when, where and how to describe it briefly.

I got a flat tire on the way home from work.
## Identify Feelings & Automatic Thoughts

### Thought Record (Full Form)

<table>
<thead>
<tr>
<th>Initial Feelings</th>
<th>Automatic Thoughts</th>
<th>Alternative Thoughts</th>
<th>Feelings Now</th>
</tr>
</thead>
<tbody>
<tr>
<td>anger</td>
<td>I hate my life</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rate Feeling, Rate Thought
Rate Strength of Feeling-slidebar

Rate the strength of this feeling from 0-100%

75%
Rating of Alternative Belief Listed

![Thought Record (Full Form)](image)

- **Initial Feelings**: anger
- **Automatic Thoughts**: I hate my life
- **Alternative Thoughts**: I can fix this
- **Feelings Now**: Rate Feeling

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Laboratory Testing of App

• Completion of 3 Usability sessions with iterative review and revision

• Subjects included 8 depressed patients in CBT and 5 CBT therapists.

• Information was provided about screen images, organization, ease of use, satisfaction, etc.

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Methods

• Session 1- structured review of icons and navigation
• Session 2- review of revised icons and navigation, talk-aloud procedures of features and homework activities
• Session 3- talk aloud procedures of revised homework and features
Main Icon-Change Based on Patient Feedback
Main Homework Icon- Revision Based Upon Feedback
My CBT Toolbox
Monitoring Homework
Check My Mood
Navigation- Option 1

Problem Solving
Please select one of the following:

- Portion of the Pie Exercises
- Prioritising
- Emotional Fire Drill
- Breaking Task Down
- Steps to Solving a Problem
# Usability Study Findings : ASQ

<table>
<thead>
<tr>
<th>Items</th>
<th>Session 1 (N=8)</th>
<th></th>
<th></th>
<th>Session 2 (N=7)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><em>Mean (SD)</em></td>
<td><em>Med</em></td>
<td><em>Mode</em></td>
<td><em>Mean (SD)</em></td>
<td><em>Med</em></td>
<td><em>Mode</em></td>
</tr>
<tr>
<td>Ease of completing tasks in scenario</td>
<td>1.75 ± 1.04</td>
<td>1.5</td>
<td>1</td>
<td>1.71 ± 1.25</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Time to complete tasks</td>
<td>1.63 ± .74</td>
<td>1.5</td>
<td>1</td>
<td>1.71 ± .95</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Support when completing tasks</td>
<td>1.5 ± 1.22</td>
<td>1</td>
<td>1</td>
<td>1.86 ± 2.27</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>ASQ Overall</td>
<td>1.63 ± 1</td>
<td>1.33</td>
<td>1</td>
<td>1.76 ± 1.49</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

ASQ scores range from 1-7 (lower scores = higher satisfaction)
PSUQ (final session)

- assess the interface, organization, helpfulness, ease of use, clarity, learnability, and overall satisfaction.

- potential scoring ranges from 17 to 119.

- The range for the individual PSUQ questions were 1.0 (0) to 1.8 (.836).

- **The mean total rating for the PSUQ was 22.8(5.40).**
Clarity, Conciseness, Clinical Utility (Patients)

- clarity ranged from 8 to 10 with a mean of 9.85 (0.48).
- conciseness ranged from 7.5 to 10 with a mean rating of 9.60 (1.23).
- clinical utility ranged from 8 to 10 with a mean rating of 9.81 (0.6).

Scale of 1 to 10 (1 is worst rating; 10 is best rating)

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Clarity, Conciseness, Clinical Utility (Therapists)

- Clarity had a mean (SD) of 7.61 (1.99).
- Conciseness had a mean (SD) of 8.41 (1.38).
- Clinical utility had a mean (SD) of 7.48 (2.19)

*Scale of 1 to 10 (1 is worst rating; 10 is best rating)*

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Pilot Study

• Recruited 14 depressed patients in CBT (16 to 20 sessions)

• Patients use CBT MobileWork as their primary method to perform CBT Homework activities
Computer System Usability Findings (Pilot)

• IBM developed instrument to measure interface organization, helpfulness, ease of use, clarity, learnability and satisfaction

• Scores range from 19 to 133 (lower scores are more favorable)

• Mean individual item score (range from 1 to 7: lower scores are more favorable) was 3.46 (1.64)

• Average overall score was 64.50 (20.06)

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# Use of Phone Features (N=11)

<table>
<thead>
<tr>
<th>Category of Use</th>
<th>Mean (sd)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>n actions</td>
<td>587.00 (152.24)</td>
<td>376.00</td>
</tr>
<tr>
<td>n bibliotherapy</td>
<td>19.36 (5.39)</td>
<td>15.00</td>
</tr>
<tr>
<td>n features</td>
<td>90.91 (24.92)</td>
<td>60.00</td>
</tr>
<tr>
<td>n homework</td>
<td>26.64 (6.51)</td>
<td>24.00</td>
</tr>
<tr>
<td>% features</td>
<td>14.94 (1.22)</td>
<td>13.89</td>
</tr>
<tr>
<td>% homework</td>
<td>4.33 (.65)</td>
<td>4.44</td>
</tr>
<tr>
<td>% bibliotherapy</td>
<td>4.12 (.85)</td>
<td>3.86</td>
</tr>
</tbody>
</table>

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Pilot Findings

• 13/14 patients used the app regularly

• Total clicks ranged from 21-1445/patient

• Use of Biblio-therapy features ranged from 0 to 63/patient

• Use of Features ranged from 1 to 261/patient

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## Research Findings (N=14)

<table>
<thead>
<tr>
<th>Clinical Factor</th>
<th>Mean (sd)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDS-SR (Baseline)</td>
<td>34.07 (3.02)</td>
<td>32.00</td>
</tr>
<tr>
<td>IDS-SR (Final)</td>
<td>15.71 (3.70)</td>
<td>11.50</td>
</tr>
<tr>
<td>IDS-SR (Change)</td>
<td>-18.36 (3.38)</td>
<td>-15.50</td>
</tr>
<tr>
<td>IDS-SR (%) Change</td>
<td>-55.69 (8.67)</td>
<td>-57.20</td>
</tr>
<tr>
<td>Overall ACRS</td>
<td>5.92 (.27)</td>
<td>6.00</td>
</tr>
<tr>
<td>Within Subject ACRS Deviation</td>
<td>1.77 (.25)</td>
<td>1.66</td>
</tr>
</tbody>
</table>

(IDS-SR: 29-item scale scores range from 0 to 78) ranged from -7 to -49 (from baseline to end of study); (ACRS is an 8-point scale from 1 (did not attempt homework assignment to 8 (did more of the assigned homework than was requested)
Mood Change

- Reduction in Mood ranged from 15.56% to 96.15% (IDS-SR)
- Mean reduction of mood of 18.36 (3.38) and a 55.59 (8.67) mean % change in mood measured by the IDS-SR
  - IDS-SR is a 29-itemscale ranging from 0 to 78

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Relationship between “app” usage and mood change

- Pearson correlations of the association with the percent of skills practice actions with difference of IDS-SR from baseline to final therapy session was -0.527 (p= .078)

- The percent of change in the IDS-SR was -0.554 (p=.062).
CBT Homework Adherence

• Overall homework adherence ranged from 4(4.24) to 7.42(1.73) on an 8-point scale from 1 (did not attempt homework) to 8 (did more homework than was requested)

• Mean homework adherence was 5.92 (0.27)
Patient Ratings of “app” Features

• Patients were asked to rate the navigation, conciseness, and clinical utility, as well as their opinions (favorable or unfavorable) on each of the homework menus on a 10-point scale, with lower scores indicating less favorable ratings.

• The ratings ranged from 7.0 (2.65) to 9.21 (1.30).
Findings Summary

• In real-world use, patients found the app highly usable
• The vast majority of users used the app regularly
• All patients in the study had a drop in depressive symptoms
• There appears to be a moderate association between doing homework activities on the app and reduction in depressive symptoms

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Take Home Lessons

- Issue of speed of technology development
- Issue of server development sequence
- Software development expertise
- Analyzing phone data
- Intellectual property
The Poor Researcher’s Dilemma

Technology Outpaces RCTs

- YouTube
  - 2005
  - Grant Submit and Award

- iPhone
  - 2006
  - Development and Pilot Testing

- Android
  - 2007
  - Recruit and Randomize

- iPad
  - 2008
  - Follow-ups

- 2009
  - 2010
  - 2011
  - Analyze and Publish

Riley, NHLBI, 2012
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