Integrating human-centered design and implementation science to improve the accessibility and effectiveness of mental health services

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Overview

1. Implementation gap & innovation complexity
2. Human-centered design (HCD) overview
3. The design and usability of complex psychosocial innovations
   - Client-facing interventions
   - Implementation strategies
4. Methods for assessing usability of interventions and implementation strategies
The First Research-to-Practice Gap?

- Lemon juice was shown to be effective in preventing scurvy in 1601.
- Not introduced into sailors diets on ships until 1795!!

Slide stolen, most recently, from Byron Powell
There is a longstanding implementation gap in health services (and most other fields)...

- Benefits of decades of research to routine service have been negligible
- It takes 17 years for just 14% of original research to benefit practice (Balas & Boren, 2000)

Green et al. (2009)
Implementation science: the scientific study of methods to promote the systematic uptake of research findings …into routine practice (Eccles & Mittman, 2006)
Implementation science has tasked itself with addressing this gap, via multilevel frameworks...

(Consolidated Framework for Implementation Research [CFIR] Damschroder et al., 2009)

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Implementation science has tasked itself with addressing this gap, via implementation strategies…

An implementation strategy is a “method or technique used to enhance the adoption, implementation, and sustainability of a clinical program or practice” – Proctor, Powell, & McMillen (2013), p.2
Progress has been slow due, in part, to the complexity & usability of our service and implementation solutions.

(1) Psychosocial interventions
(2) Implementation strategies
What is Design?

The process of creating or shaping tools for direct human use
“Logic is wonderful, but it doesn’t describe real behavior. When we are designing...we need to design for real people.”

Don Norman
There is no such thing as “no design”

“The alternative to good design is bad design, not no design at all. Everyone makes design decisions all the time without realizing it.”

Douglas Martin (1990)
Problematic Design is EVERYWHERE
Problematic Design is EVERYWHERE
Problematic Design is EVERYWHERE

It is a well known fact that you must spin a USB three times before it will fit. From this, we can gather that a USB has three states.

Until the USB is observed it will stay in the superposition. Therefore it will not fit until observed - except in cases of USB tunelling.
Design Problems Reduce Usability

**Usability**: the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency, and satisfaction (International Standards Organization, 1999)
Improving Usability with Human-Centered Design

- **Human-centered design (HCD)** is an approach that grounds the product development process in information about the people and settings that will use the product.

**Generic HCD process**
(adapted from ISO, 1999)

1. Identify need and plan the user-centered design process
2. Understand and specify context of use
3. Specify users and user / contextual requirements
4. Develop design solutions to meet requirements
5. Evaluate designs against requirements
6. Design meets user / contextual requirements
Many health services research products (HSRPs) benefit from intentional (re)design.

<table>
<thead>
<tr>
<th>Health services research product (HSRP)</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
</table>
| **Digital technology** | A broad range of technologies to support users (most typically clinicians or clients) in changing behaviors and cognitions related to mental health and wellness. | • Devices and wearables  
• Clinical decision support tools  
• Digital therapeutics  
• Mobile health apps |
| **Evidence-based psychosocial intervention (EBPI)** | Interpersonal or informational activities, techniques, or strategies that target biological, behavioral, cognitive, emotional, interpersonal, social, or environmental factors with the aim of reducing symptoms of these disorders and improving functioning or well-being (Englund, Butler, & Gonzalez, 2015) | • Parent training protocols  
• Cognitive behavioral therapy  
• Applied behavior analysis |
| **Implementation strategy** | Methods or techniques used to enhance the adoption, implementation, and sustainment of a clinical program or practice (Proctor et al., 2013) | • Initial training meetings  
• Post-training consultation  
• Leadership training for implementation  
• Clinician motivation enhancement |

Typical focus of HCD efforts

Primary focus for redesign at UWAC & SMART (may or may not involve tech)

Lyon, Dopp, Brewer, Kientz, & Munson (under review)
Leveraging HCD to improve implementation via better-designed innovations: *DDBT Framework*

**DISCOVER**
- Identify the different needs & points of views of all stakeholders.
- Understand the unadapted EBPI & its context.
- Clarify usability issues & other barriers to implementation.

**DESIGN**
- Synthesize findings & insights.
- Define requirements for possible solutions.
- Ideate concepts.

**BUILD**
- Develop concepts into low fidelity iterative prototypes.
- Test concepts with users for feedback and validation.
- Refine solution.

**TEST**
- Develop high fidelity prototypes.
- Implement a pilot to evaluate the feasibility of the solution in a real world context.

Discover modification targets | Redesign solutions | Implementation & service outcomes

- Currently being applied across 15 UWAC-funded studies


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System Level: *Intervention (i.e., EBPIs)*

Damschroder et al. (2009)
EBPIs Dominate the D&I Landscape in MH

- Most MH research exists at the level of individual evidence-based psychosocial intervention (EBPI) manuals (Chorpita et al., 2007; Garland et al., 2008)
MH EBPIs are Well Engineered

- Emphasize technical “correctness”
  - (i.e., delivery with fidelity)
- Robust solutions to well-defined problems
MH EBPIs are TERRIBLY Designed

Long, Complicated, and Difficult to Learn

Too confining?

OVERdesigned

FEATURE CREEP
The misguided notion that somehow more is always better.

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Intervention Usability is a Key “Upstream” Determinant of Implementation Outcomes

Relationship of Intervention Usability to Implementation and Service Outcomes...

<table>
<thead>
<tr>
<th>Intervention Usability</th>
<th>Perceptual Implementation Outcomes</th>
<th>Behavioral Implementation Outcomes</th>
<th>Service Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Efficiency</td>
<td>• Acceptability</td>
<td>• Adoption</td>
<td>• Symptoms</td>
</tr>
<tr>
<td>• Effectiveness</td>
<td>• Appropriateness</td>
<td>• Fidelity</td>
<td>• Functioning</td>
</tr>
<tr>
<td>• Errors</td>
<td>• Feasibility</td>
<td>• Reach/Penetration</td>
<td>• Wellbeing</td>
</tr>
</tbody>
</table>

## Design Goals for EBPIs

(Lyon & Koerner, 2016)

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Learnability</td>
<td>Well-designed EBPI should provide users opportunities to <strong>rapidly build</strong> understanding of, or facility in, their use.</td>
</tr>
<tr>
<td>(2) Efficiency</td>
<td>Minimize the time, effort, and cost of using the EBPI to resolve identified problems.</td>
</tr>
<tr>
<td>(3) Memorability</td>
<td>Users can <strong>remember and successfully apply</strong> important elements of the EBPI protocol without many added supports.</td>
</tr>
<tr>
<td>(4) Error Reduction</td>
<td>Prevent or allow <strong>rapid recovery</strong> from errors or misapplications of EBPI content.</td>
</tr>
</tbody>
</table>
## Design Goals for EBPIs (continued…)
*(Lyon & Koerner, 2016)*

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>(5) Satisfaction / Reputation</td>
<td>Be viewed as acceptable and valuable, especially compared to alternative products available within the larger mental health marketplace.</td>
</tr>
<tr>
<td>(6) Low cognitive load</td>
<td>Simplify task structure or the number of steps in order to minimize the amount of thinking required to complete a task.</td>
</tr>
<tr>
<td>(7) Exploit natural constraints</td>
<td>Successful designs should incorporate or explicitly address the static properties of an intended destination context that limit the ways a product can be used.</td>
</tr>
</tbody>
</table>
Intervention-Level Determinants are Underexplored in Implementation Science

• SIRC Instrument Review Project (IRP) (Lewis et al., 2015)

  • Only **19** instruments addressed intervention characteristics
    • *Inner setting:* **90** instruments
    • *Individual:* **98** instruments

• **0** instruments addressed **Design Quality & Packaging**
Evaluating the design quality of EBPIs
“Good design is when someone shows it to you, you say, ‘Oh, I see.’”

Don Norman
Evaluating EBPI Design Quality

EBPI usability testing allows for…

1. Evaluation of innovation characteristics likely to be PREDICTIVE OF ADOPTION (Rogers, 2003)

2. Discovery of the most critical issues that should be addressed in REDesign EFFORTS (Lyon & Bruns, 2019; Lyon & Koerner, 2016)
Example Application of USE-EBPI to an Exposure Protocol for Anxiety

“Lab-based” testing \( (n = 10 \text{ users, stratified by experience}) \)

- **Think Alouds**
- **Keep Calm It’s Rehearsal Time**
- **Interview**

Intervention Usability Scale (IUS; Lyon, 2016)
Usability issues: aspects of the intervention which make it unpleasant, inefficient, onerous, or impossible for the user to achieve their goals in typical usage situations (Lavery et al., 1997).

- “1” (low priority) to “3” (high priority)
- Organized via User Action Framework
<table>
<thead>
<tr>
<th>Average Rating / User Type</th>
<th>Usability Problem</th>
<th>Step of UAF Impacted</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>Contraindicated behaviors are ambiguous</td>
<td>X X</td>
</tr>
<tr>
<td>3.0</td>
<td>Failure to block contraindicated behaviors</td>
<td>X</td>
</tr>
<tr>
<td>2.5</td>
<td>Signposting</td>
<td>X X X X</td>
</tr>
<tr>
<td>2.5</td>
<td>Unclear Processing detail</td>
<td>X X</td>
</tr>
<tr>
<td>2.5</td>
<td>Lack of feedback on accuracy of hierarchy level</td>
<td>X X</td>
</tr>
<tr>
<td>2.0</td>
<td>Insufficient support of exposure planning</td>
<td>X X</td>
</tr>
<tr>
<td>2.0</td>
<td>Unclear purpose/rationale</td>
<td>X X</td>
</tr>
<tr>
<td>2.0</td>
<td>Omission of key content</td>
<td>X</td>
</tr>
<tr>
<td>1.5</td>
<td>Failure to highlight therapist barriers</td>
<td>X</td>
</tr>
<tr>
<td>1.5</td>
<td>Insufficient feedback for success</td>
<td>X</td>
</tr>
<tr>
<td>1.5</td>
<td>Lack of troubleshooting for family/system issues</td>
<td>X X X X</td>
</tr>
<tr>
<td>1.0</td>
<td>Habitation is unclear</td>
<td>X X X X</td>
</tr>
<tr>
<td>1.0</td>
<td>Developmental level is unclear</td>
<td>X</td>
</tr>
</tbody>
</table>

**Legend**

- P – Planning
- T – Translation
- A – Actions
- F – Feedback

Filled circle = user experience issue

Mean IUS score: 80.5
Application of USE-EBPI to an Exposure Protocol

- **Example redesign recs:**
  1. Clearer labeling of information within exposure guide
  2. More explicit supports to identify and avoid contraindicated behaviors when delivering exposure (e.g., reassurance)
  3. Directions and example scripts for processing exposures
  4. Build in feedback loop / guidance re appropriate exposure difficulty
  5. Design abbreviated version of procedures to account for limited time and/or explicit guidance on exposure opportunities outside of the office
Evaluating the design quality of implementation strategies
Implementation strategies *also* are complex psychosocial interventions in need of (re)design.

Implementation strategy complexity varies, but multifaceted and multi-level strategies are common (e.g., Aarons et al., 2017; Glisson & Schoenwald, 2005; Kilbourne et al., 2007).

- Many strategies are **bulky / expensive / not always usable** by implementation practitioners and other stakeholders.
Cognitive Walkthrough for Implementation Strategies (CWIS) (Lyon, Coifman et al., in prep)

“Swiss”
...an efficient methodology for evaluating implementation strategy usability.
CWIS: Example application to post-training consultation procedures

• Post-training consultation is a cornerstone implementation strategy (Herschell et al., 2010)

• CWIS Study Procedures
  • Part of a larger project to develop an online training + consultation program for measurement-based care
  • Applied CWIS to **REFINE REMOTE POST-TRAINING CONSULTATION PROTOCOL** (**live calls & msg. board**)
  • \(n = 10\) school-based clinicians (90% female, 70% Caucasian, 2-18 yrs in role)
    • Group CWIS walk-through procedure
    • Administered Implementation Strategy Usability Scale (ISUS)
1. Determine necessary strategy pre-conditions
2. Hierarchical task analysis
3. Task prioritization ratings
4. Top tasks → testing scenarios
5. Group testing w/ representative users
6. Problem classification / prioritization
### Step 5: Example

Results from group testing of a coaching protocol

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Task</th>
<th>Participant Ratings of Anticipated Task Success</th>
<th>Very confident in success</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1-1</td>
<td><img src="chart.png" alt="" /></td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30%</td>
</tr>
<tr>
<td>2</td>
<td>2-1</td>
<td><img src="chart.png" alt="" /></td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>20%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10%</td>
</tr>
<tr>
<td>3</td>
<td>3-1</td>
<td><img src="chart.png" alt="" /></td>
<td>90%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>50%</td>
</tr>
<tr>
<td>4</td>
<td>4-1</td>
<td><img src="chart.png" alt="" /></td>
<td>40%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>70%</td>
</tr>
<tr>
<td>5</td>
<td>5-1</td>
<td><img src="chart.png" alt="" /></td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>30%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>60%</td>
</tr>
<tr>
<td>6</td>
<td>6-1</td>
<td><img src="chart.png" alt="" /></td>
<td>80%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>60%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>60%</td>
</tr>
</tbody>
</table>

Mean ISUS score: 71.3
### Step 6 Example Results: Identification / Classification

<table>
<thead>
<tr>
<th>P</th>
<th>Usability Issue</th>
<th>U</th>
<th>H</th>
<th>S</th>
<th>C</th>
<th>F</th>
<th>T</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.0</td>
<td>Danger of discussion <em>overflow</em></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>3.0</td>
<td>Problems multitasking with technology</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2.7</td>
<td>Difficulties / worries about performing well under pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2.7</td>
<td>Consultation time might not fit contextual constraints</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>2.3</td>
<td>Difficulty translating know. to beh. for case presentation</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>Inadequate supports to evaluate solution effectiveness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>Susceptibility to technology accessibility issues</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2.3</td>
<td>Inadequate consultation engagement structures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>1.3</td>
<td>Consultation &amp; assessment timing incompatible</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3</td>
<td>Some terminology confusing / inaccessible</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>1.3</td>
<td>Feedback misaligned for some providers/contexts</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>Difficulties saving / accessing prob. solving plan</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CWIS-driven redesign decisions

- **Discussion overflow** → Clearer directions; targeted praise for consultee brevity; troubleshooting tips for consultants
- **Multitasking with tech** → Brief orientation to training platform; Consultant pushed materials out via online consultation platform
- **Performing under pressure** → written/verbal case presentation examples; set clear expectations; Created collaborative, safe atmosphere via video calls, etc.
- **Time + context constraints** → rank-ordered time slot selection; group calls < 1hr; brief make-up sessions
Summary

1. Innovation design is an under-explored and **UNDER-ADDRESSED DETERMINANT** of implementation success

2. Human-centered design (HCD) and implementation science share **SIMILAR GOALS** (i.e., facilitating the use of innovations)

3. Emerging methods can efficiently (e.g., w/ small samples) evaluate the usability of complex interventions that may **EXPLAIN ADOPTION ISSUES** and **DRIVE REDESIGN**

4. Application of HCD in implementation science is **JUST BEGINNING**
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Sometimes

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