

# Evaluating mRehab/mHealth mobile apps

*evidence base, use of behavior change techniques,  
usability, & engagement*

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# Disclosures

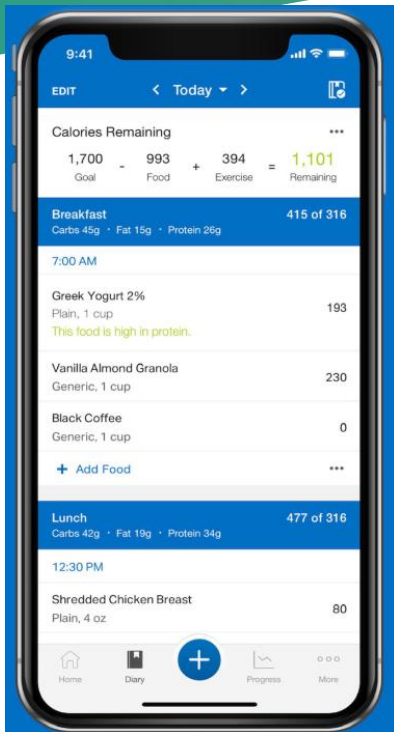
**I have no conflicts of interest to report.**

# Overview

## Evaluating mRehab/mHealth mobile apps

- Evidence base
  - Use of established behavior change techniques
- Usability
- Efficacy testing
- Measuring engagement
- 3 ■ Ethics, privacy, security

# Utilizing technology in health promotion



Three broad approaches:

- Develop a completely new tool
- Develop a “wrap-around” solution to add to/make use of existing tools
- Use a commercial tool as-is

# Building evidence around commercial mobile apps

Commercial mobile apps flourishing in marketplace, but little evidence exists to support their use

Evidence could:

- Increase adoption of commercial apps in clinical practice
- Inform the development of the next generation of apps
- Increase the impact of commercial apps

# Importance of User-Centered Design

Potential to improve reach, accessibility, and engagement with end product

- Multistage process using mixed methods, in-depth qualitative research
- Continual improvements to design final intervention that best meets user requirements

# Evidence Base

Often analyzed through content analysis

- Coding and interpreting qualitative, text-based material
- Analyzed from downloading an app and/or analyzing info in app store
- Common comparators: clinical guidelines, evidence-based protocols, behavior change techniques

# Evidence Base

Common finding, across comparison methods:

**Lack of clinical guidelines, evidence-based treatment strategies, and behavior change techniques used**



# Evidence Base: Clinical Guidelines

## Weight Loss Apps

N=30 apps evaluated for inclusion of 20 evidence-based strategies used in Diabetes Prevention Program

■ Apps included 19% (3.8/20) of the strategies:

■ 93.3% included a weight loss goal

■ 90% included a dietary goal

■ 3.3% included problem solving

■ 0% included stress reduction, relapse prevention, nutrition label reading

# Behavior Change Techniques

Taxonomy of BCTs provides list of discrete evidence-based techniques for use in interventions

- provide a list of BCTs in their smallest reducible size
- improve the specification, replication, and implementation of behavioral interventions
- Commonly used:
  - Prompt review of behavioral goals
  - Prompt self-monitoring of behavior

# Behavior Change Techniques: Evaluation of Commercial Apps

- On average, physical activity apps incorporated 5 of the 23 BCTs (22% of total)
- App descriptions mentioned, on average, 4.2 of the 26 BCTs (16% of total)

# Behavior Change Techniques: App Development

App for promoting healthy dietary behaviors and local food consumption; used BCTs in development & deployment of messages:

- providing information about the behavior-health link, consequences, and contingent rewards
- prompting intention formation
- instruction, and specific goal setting
- using follow-up prompts, motivational interviewing, and time management

# Usability Testing

How well an app functions and whether or not it serves its intended purpose

## ■ User ratings of:

App Flexibility

Operability

Understandability

Learnability

Efficiency

Satisfaction

Attractiveness

Consistency

Error Rates

# Usability Testing

Four main methods of usability evaluation:

- Expert-based evaluation
- Observation of users
- User surveys
- Experimentation evaluation

# Usability Testing: Pain Management Apps

Two apps evaluated by N=41 patients with chronic pain

- Recalled two main memories

- Rated apps on ease of use and time to enter pain data

- Results:

  - One app was much faster for data entry

  - Other app incorporated more attractive fonts and colors

# Efficacy Testing

Does the use of the app lead to meaningful change in behavior and clinical outcomes?

- Randomized controlled trials
- Alternative study designs (N-of-1; use of MOST)



# RCTs

Few exist for commercially-available apps; more for research-developed apps, but often of limited use

Gold standard of evidence generation, but challenges abound

- Selecting comparator (e.g., usual care? another app?)
- Time and resource intensive
- Frequent app updates
- If testing commercial app– cannot discern what features have impact

# RCTs: Example of Weight Loss App

Two studies testing use of MyFitnessPal (MFP)

■ (N=212) Testing MFP vs. usual clinical care

■ No difference in weight; app users set more calorie goals

■ (N=100) Testing MFP alone vs. MFP + behavioral coaching vs. MFP + delayed diet tracking + behavioral coaching

■ No difference in weight or tracking (all lost weight)

# Alternative designs

Use of N-of-1 expanding in other areas of health behavior research

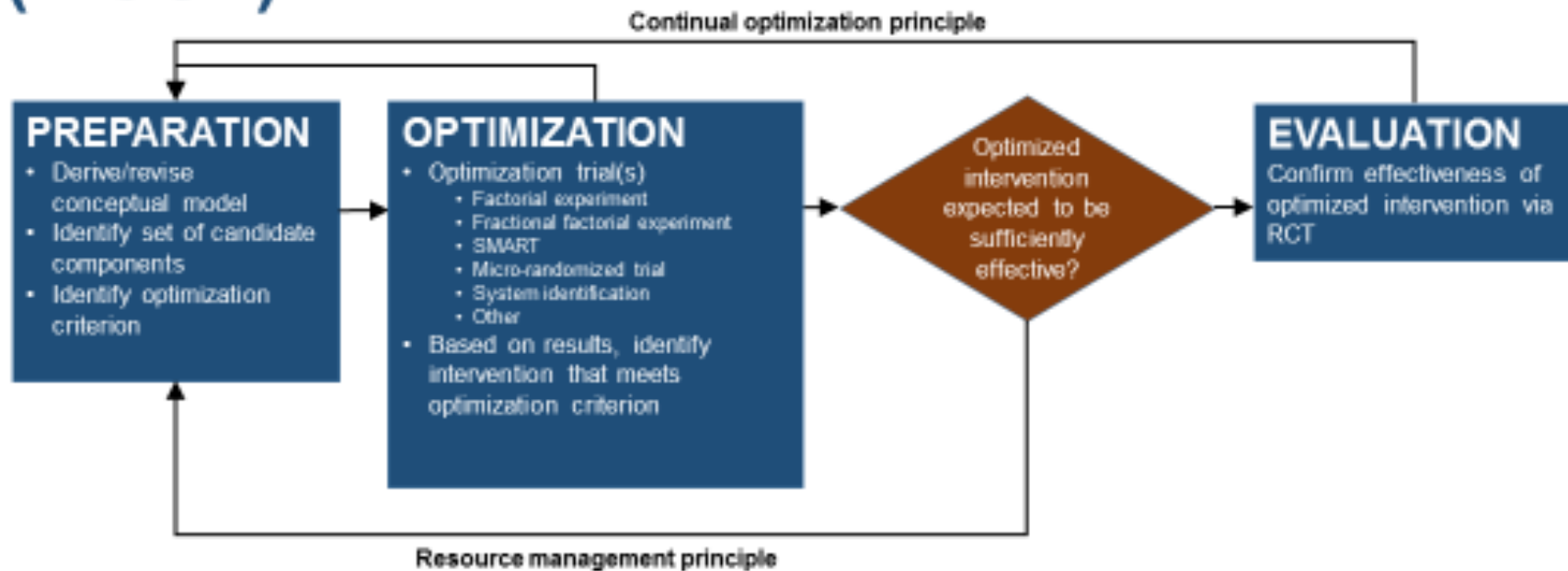
- Aided by recent advances in analytical techniques

Multiphase Optimization Strategy (MOST)

- Engineering-inspired framework that allows for systematic testing of components

  - Identify optimized intervention package for testing in an RCT

# The Multiphase Optimization Strategy (MOST)



# Measuring Engagement

Difficult to define! Contextual! Dynamic!

- “a) The extent of use of a digital behavior change tool (e.g., amount and depth of use) and b) a subjective experience with emotional and cognitive facets (i.e., attention, interest, affect)”
- Not just more = better
  - “Effective Engagement”, i.e., sufficient engagement with the intervention to achieve intended outcomes

# Measuring Engagement

Critical to measure to understand exposure to information as well as user experience

Understand patterns of use and relationship with behavioral/clinical outcomes of interest

■ What does disengagement with the tech represent?

■ Mastery? Boredom? Mismatch of information with needs?

Recent review of published measures, but still much room to grow  
22 in this budding field

# Ethics, Privacy, Security

Critical to evaluate risks and protect patients/participants

■ E.g., are permission levels request necessary?

Digital Health Toolkit:

■ ReCODE Health: <https://recode.health/about/>

■ Research center for optimal digital ethics

■ Resources for working with IRB

	<b>Ethical Principles</b> Place a check to indicate the ethical principle(s) to consider for each item within a domain evaluated			Researcher Responsibility	
	<u>Autonomy</u> Actions demonstrate respect for the person	<u>Beneficence</u> Actions involve comprehensive risk and benefit assessment	<u>Justice</u> Actions demonstrate respect for the person	Addressed in the Research Protocol	Addressed during the Informed Consent Process
<b>Domains</b> <ul style="list-style-type: none"> <li>Ethical Principles</li> <li>Privacy</li> <li>Risks &amp; Benefits</li> <li>Access &amp; Usability</li> <li>Data Management</li> </ul>					
<b>Privacy (respect for participants)</b>					
Personal information collected is clearly stated				Yes No Unsure	Yes No Unsure
What data are shared is specified				Yes No Unsure	Yes No Unsure
With whom data are shared is stated				Yes No Unsure	Yes No Unsure

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# Questions?



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