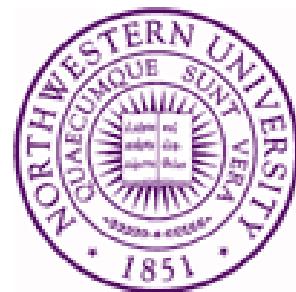


Behavioral Intervention Technologies for Depression in Youth

David C. Mohr
Northwestern University



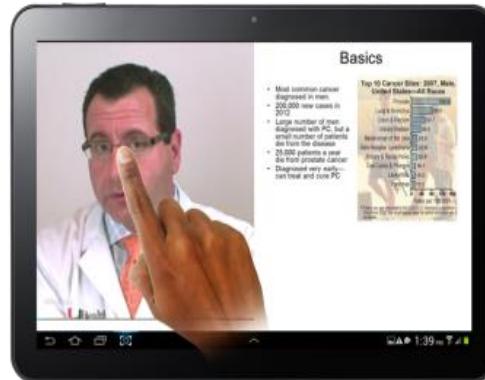
What's a Behavioral Intervention Technology?



mobile phones



computers



tablets
www.cbits.northwestern.edu



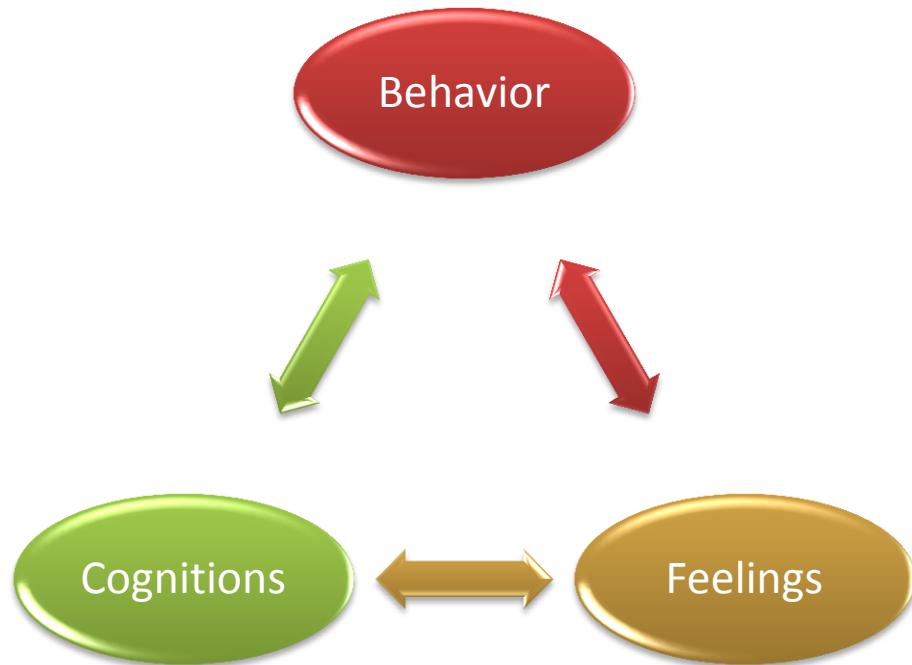
sensors

Why do we need BITs?

- 12- month prevalence of diagnosable mental illness
 - 26% of Americans (approximately 60 million)
 - 21% of youth
- Far more have subthreshold symptoms that deserve treatment.
- There will never be enough mental health professionals to treat these problems.

What do we know?

We know some things...



but not others.



MoodGym: Prevention of Depression

O'Kearney, *Depress Anx* 2009;26:65-72

- 157 girls randomized to
 - MoodGym
 - Attention Control
- No difference ($p=.75$)
- Only 30% used more than 2 of 6 modules



Text Messaging (SMS) in Youth

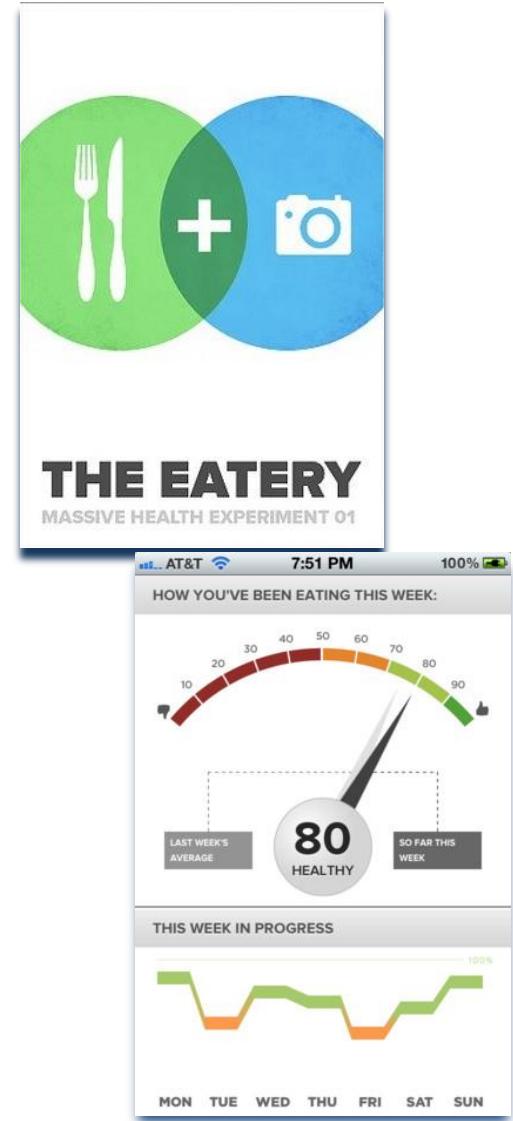
Preston, K.E. Amer J of Lifestyle Med. 2011:5;247



- SMS alone has been investigated mainly for health behaviors.
- Generally well accepted
- Not consistently effective at improving health behaviors (physical activity, smoking cessation).
- May be useful for providing reminders (medication, appointments)

Smartphone Applications

- There are ~40,000 health apps available
 - 1,980 health apps for specific conditions
 - Most are free
- But
 - Most are of poor quality, no clear evidence base
 - Virtually none have been evaluated
 - Use is low. Of 189,770 downloads:
 - Non-Use – 86.4%
 - Tried a few times – 11.0%
 - Used > 10 times - 2.6%



Humans are Important!

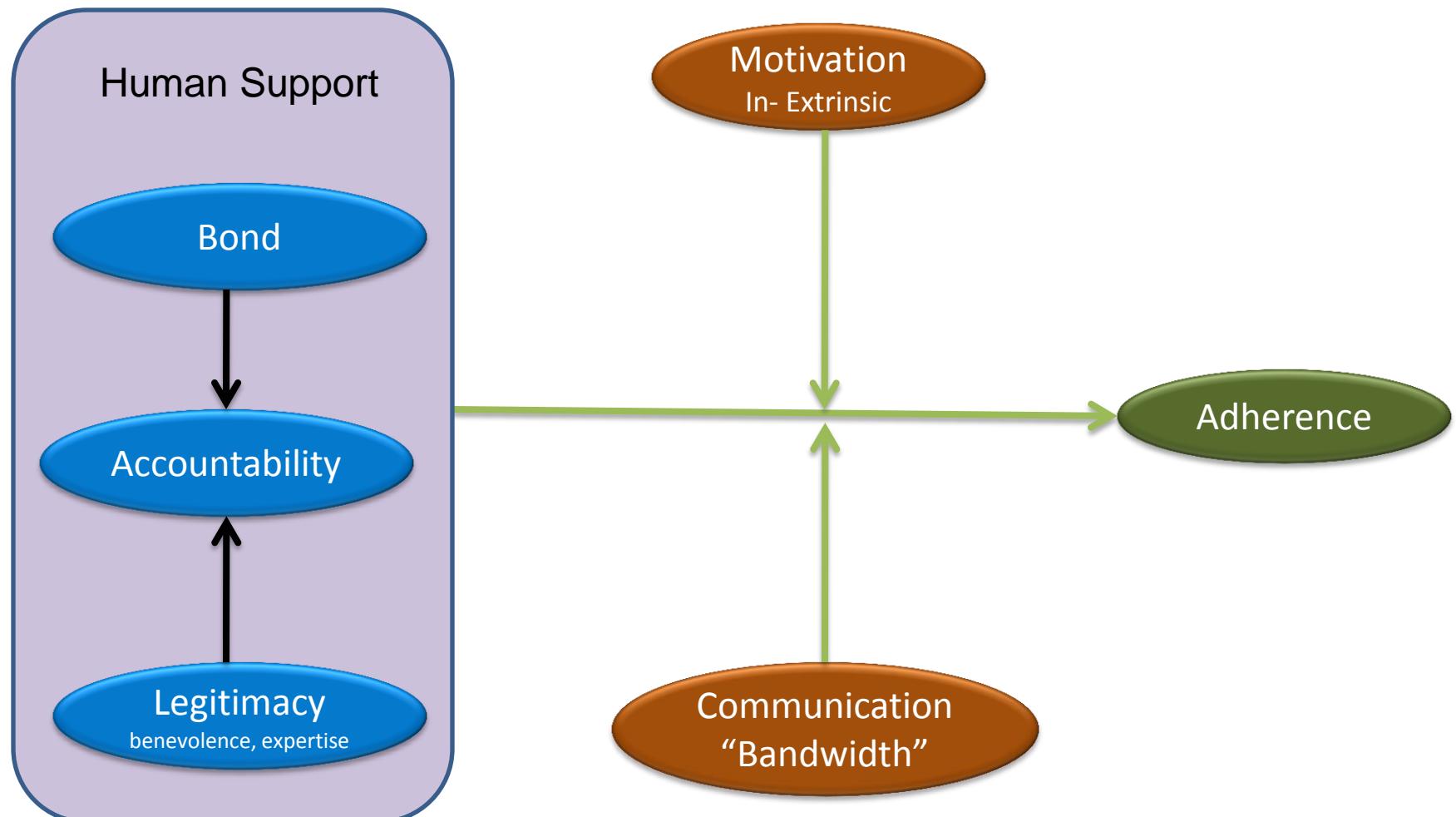
Cuijpers *Cogn Behav Ther*, 2009;38:66-82; Richards, *Clin Psych Rev*, 2012;32:329-42)

- Standalone web-based treatments
 - $ds=.18 - .36$
 - <2 logins
- Coach-supported web-based interventions
 - $ds=.56 - 1.08$
 - ~9 logins



TeleCoaching Model: Supportive Accountability

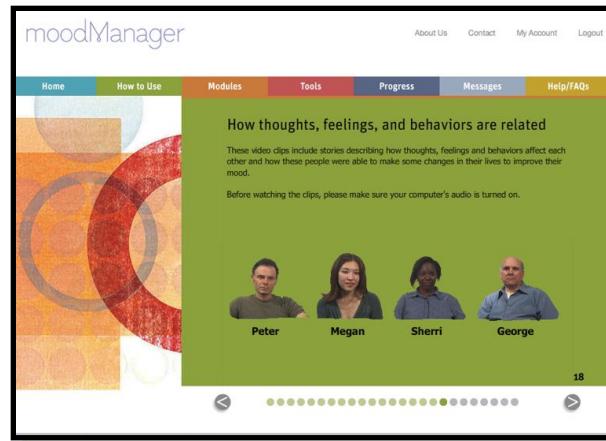
Mohr DC, et al. *Journal of Medical Internet Research*. 2011;13:e30



moodManager Adherence

101 Primary Care Pts with MDD

Mohr DC, et al. PLoS One. 2013;8(8):e70086

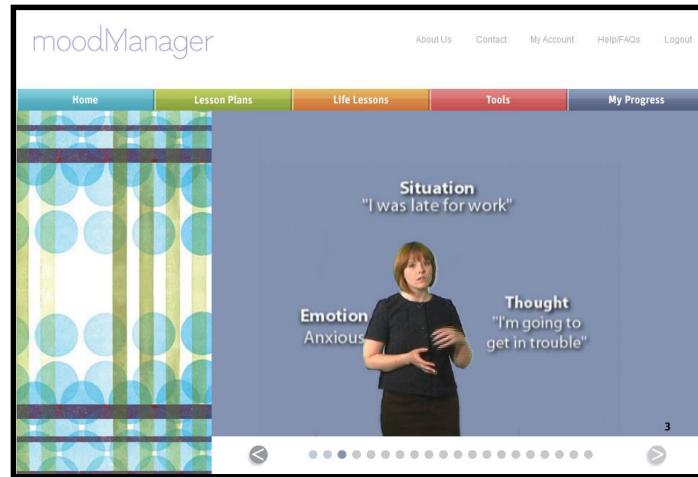


Coach time

- Mean = 43 min per participant

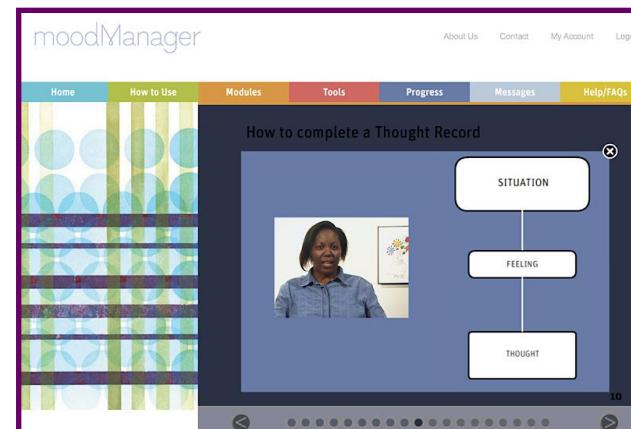
Improvement in Depression

- Significant reduction in depression



Adherence to Web-Site

- Coached adherence significantly greater than uncoached



Peer Networking

Peer Networking

Collaborative Learning:
Lessons and tools

The screenshot displays the ThinkFeelDo platform interface. At the top, there is a navigation bar with links for 'Home', 'Guidelines', 'Contact a Moderator', 'Page Tour', 'Edit your profile', and 'Log out'. Below the navigation bar, there are several sections: 'Road Map' (blue tile with a large letter 'A'), 'Today's Lesson' (blue tile with a lightbulb icon), and a 'Mod' tile (pink tile with a circular icon). The 'Peer network' section shows a grid of user profiles. Each profile card includes the user's name, a recent activity message, and their last seen timestamp. The profiles are: J-Dog, Fearless Leader, GS2, Joyce, Ben, BuzzHappy, Maya, and Urba. The 'Activity Tracker' section shows a calendar icon. The 'Think & Feel' section shows a puzzle piece icon. The 'Summary' section shows a grid icon and a quote icon, with a tooltip for 'The Activity Tracker' that reads: 'Record activities you've done and plan future activities.' Below these are 'Discussion' and 'Share' sections. Arrows from the surrounding text blocks point to specific features: one arrow from 'Collaborative Learning' points to the 'Road Map' tile; another from 'Intervention support' points to the 'Today's Lesson' tile; a third from 'Peer support & prosocial behavior' points to the 'Summary' section; and a fourth from 'Accountability' points to the 'GS2' profile card.

User	Activity	Last Seen
J-Dog	Shared a thought	Oct 3, 2:47 PM
Fearless Leader	Commented on Joyce's shared activity: 'Get Max to practice piano'	Oct 4, 1:56 PM
GS2	No Activity Yet	Sep 20, 2:22 PM
Joyce	Read lesson 'Final Lesson #21: Moving forward...'	Oct 1, 2:16 PM
Ben	No Activity Yet	never
BuzzHappy	No Activity Yet	Oct 3, 4:42 PM
Maya	Commented on Final Lesson #21: Moving forward...	Oct 1, 12:29 PM
Urba	No Activity Yet	never

Intervention support:
A page tour explains components

Peer support & prosocial behavior:
Daily group activities

Didactic Content

Lesson

Learn Today's Lesson

What is depression?

You may know what depression is. You may have heard about it, read about it, or known someone dealing with it. But what you might not know is how depression is different from just "having a bad day". You may even have experienced depression in the past, or not. All we know that is, approximately 20% of adolescents will experience depression during their teenage years.

[← Previous](#) [Next →](#)

 1 like this

Comments

Post Comment

Media

Lesson



AFSP's More Than Sad: Teen Depression (Clip 5 of 6) ◀ ⓘ

Answer the questions below:

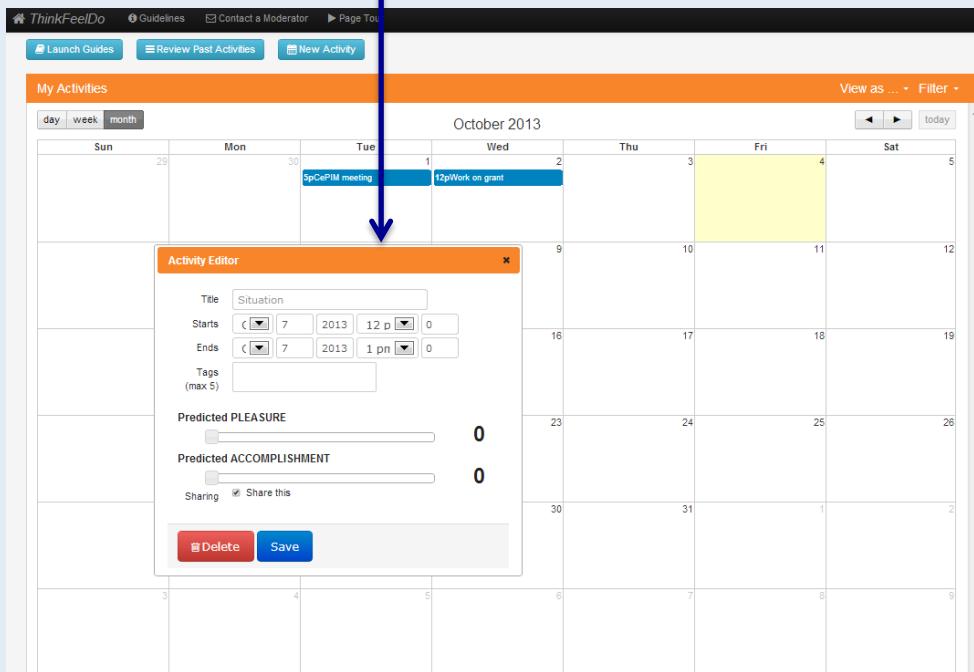
1. Which videos did you watch?
2. What did you like about the videos, if anything?
3. Did anyone say something that made an impact or that you could relate to?
 - If so, who was it and what did they say?

Comments

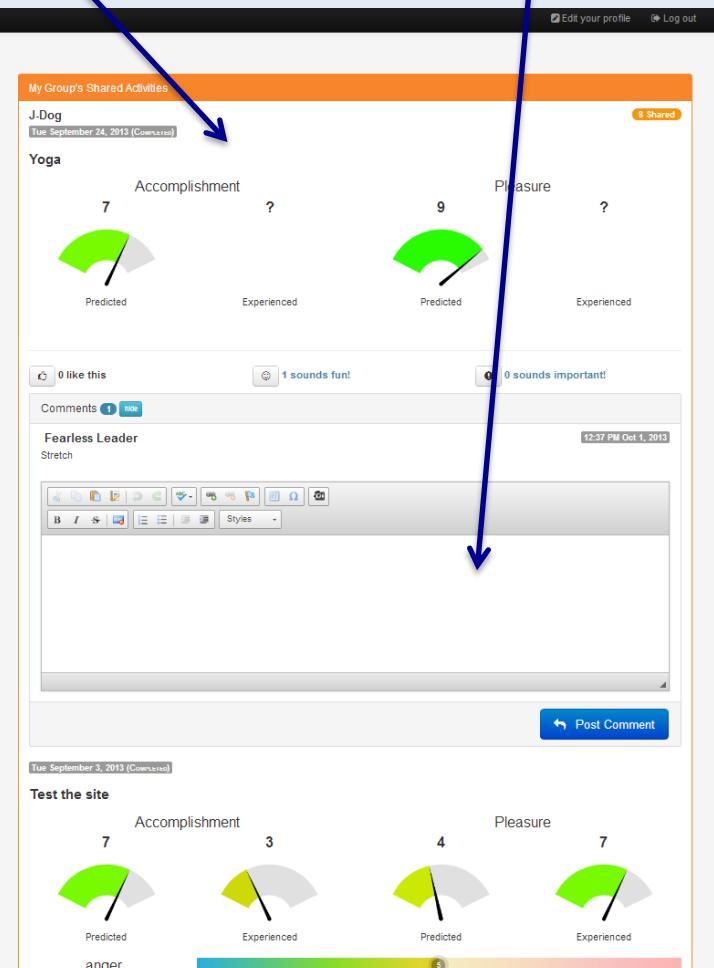
Post Comment

Networking Features

Scheduling/rating tool



Peers' activity



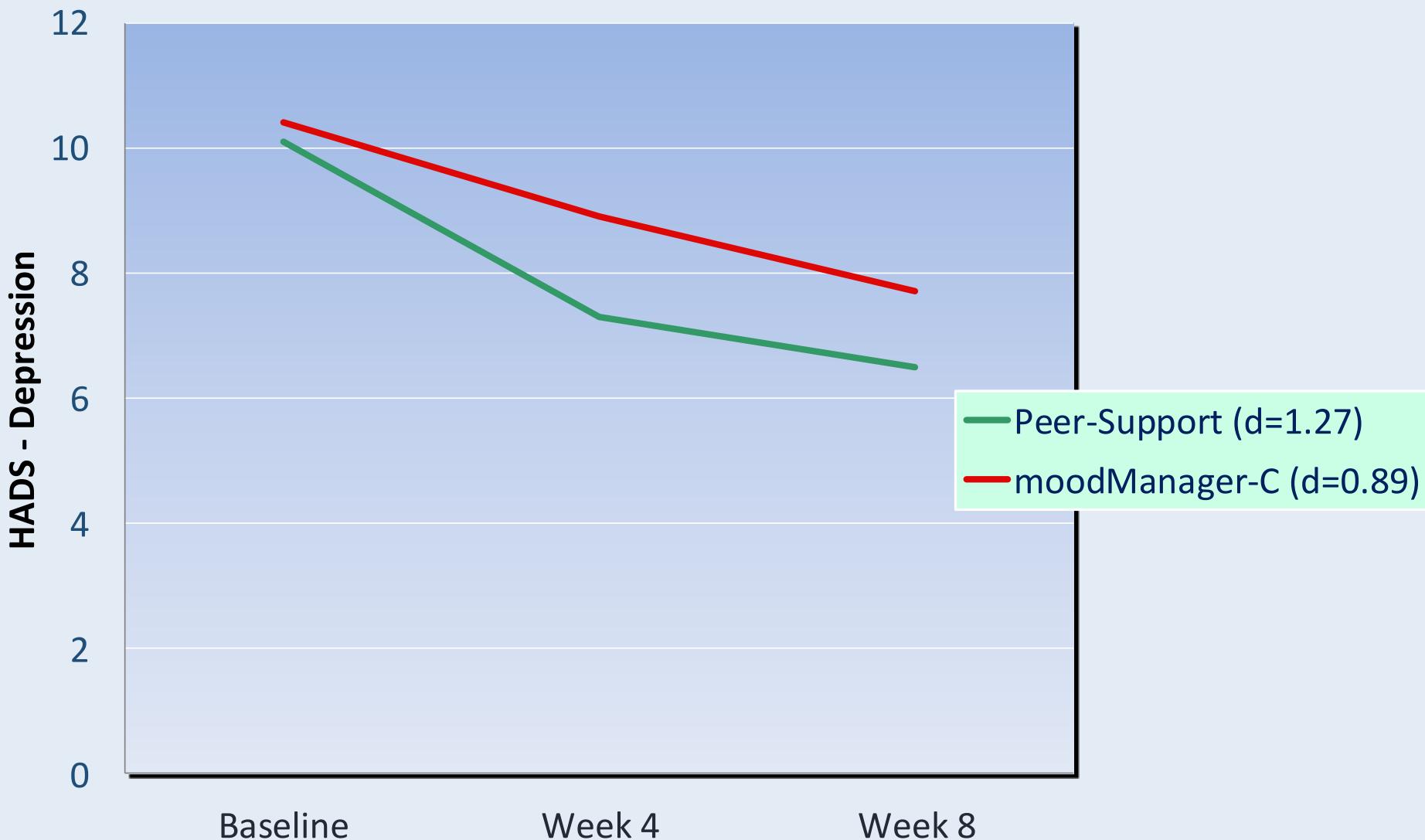
Peer comments

Use Data

- Youth (prevention) – 2 cohorts in 10-week intervention
 - 14 users age 14-18 (6 non-caucasian)
 - Mean # logins: 24
- USE questionnaire (1-7 likert scales)
 - Mean 2.1 (range 1.3 – 3.1)
- Qualitative feedback
 - More interaction with peers
 - Go where they are – mobile & text

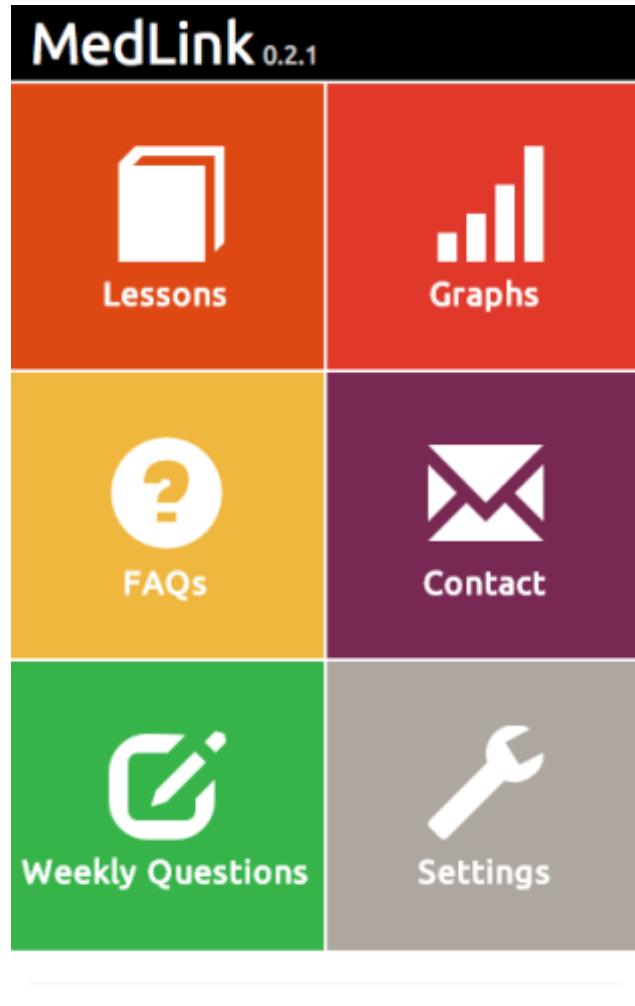
Cancer Survivorship Pilot Trial

17 cancer survivors with depressive symptoms
randomized



Connecting Patients and Providers

(R34 MH095907)



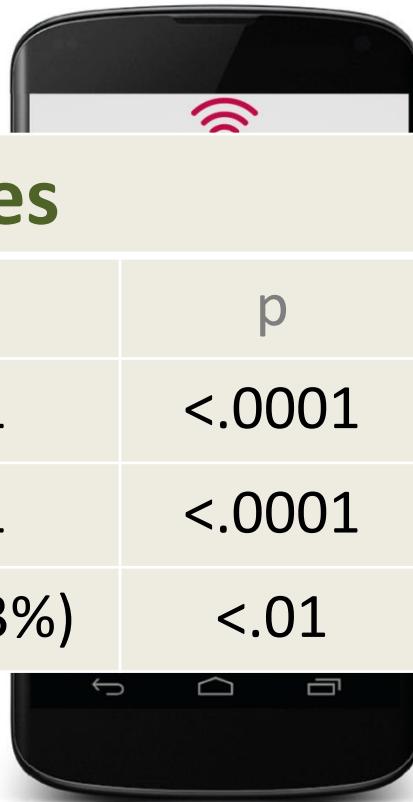
Mobilyze

(P20 MH090318)

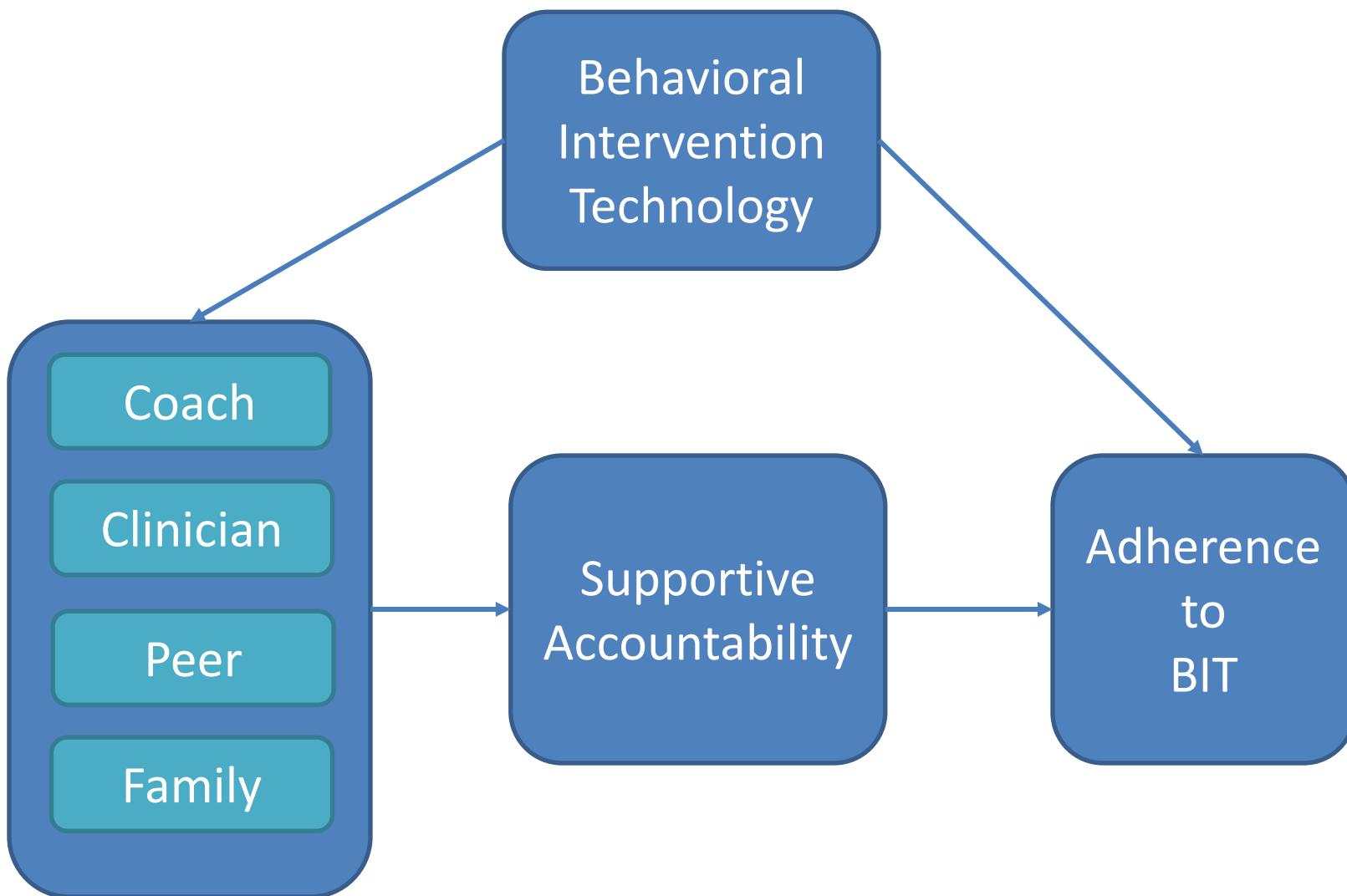
Conducted in an 8-week pilot of a mobile phone app for depression that

Depression Outcomes

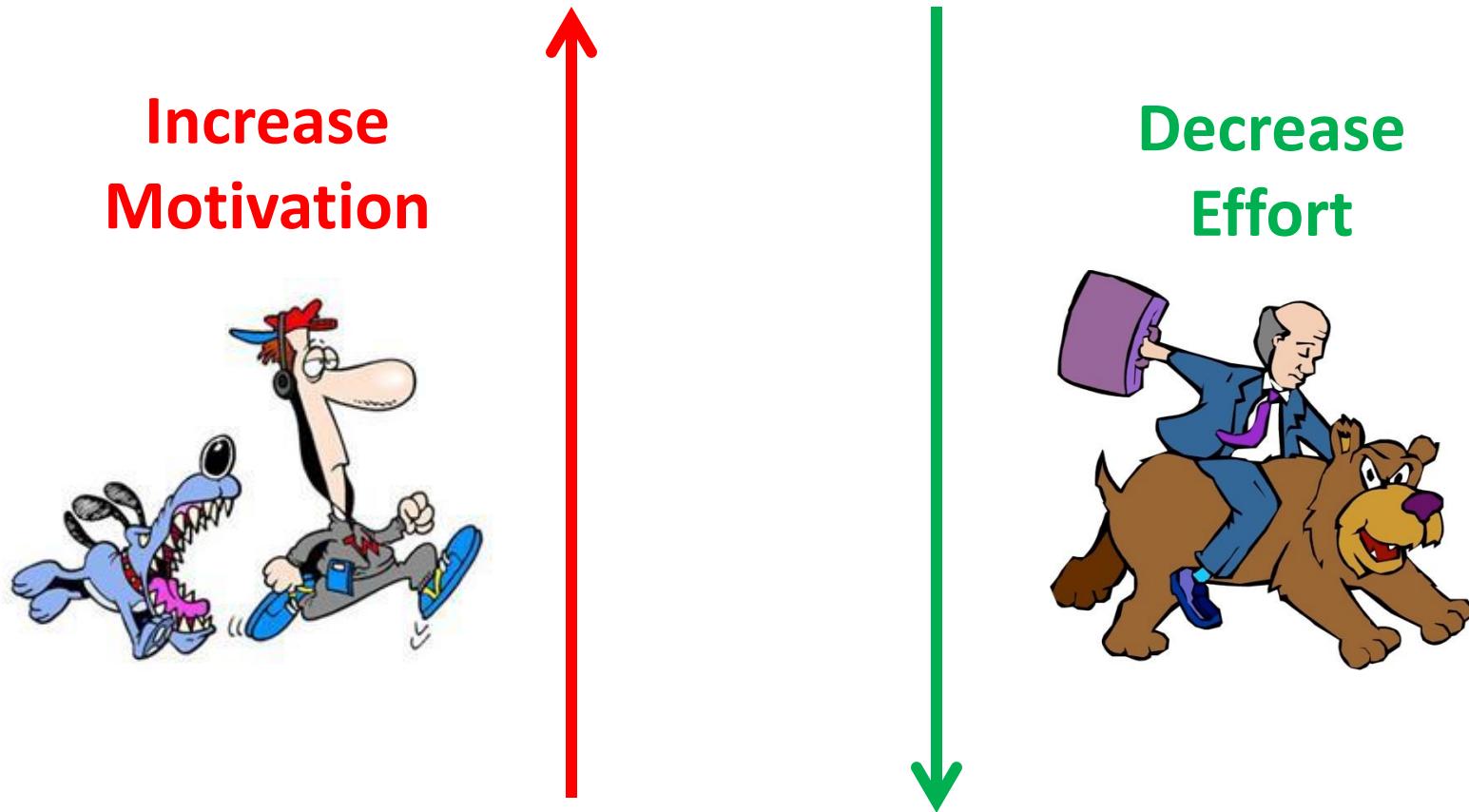
	Week 1	Week 8	p
PHQ-9	17.1 ± 3.8	3.6 ± 4.1	<.0001
QIDS	13.8 ± 2.1	3.4 ± 3.1	<.0001
MDE	8 (100%)	1 of 7 (14.3%)	<.01



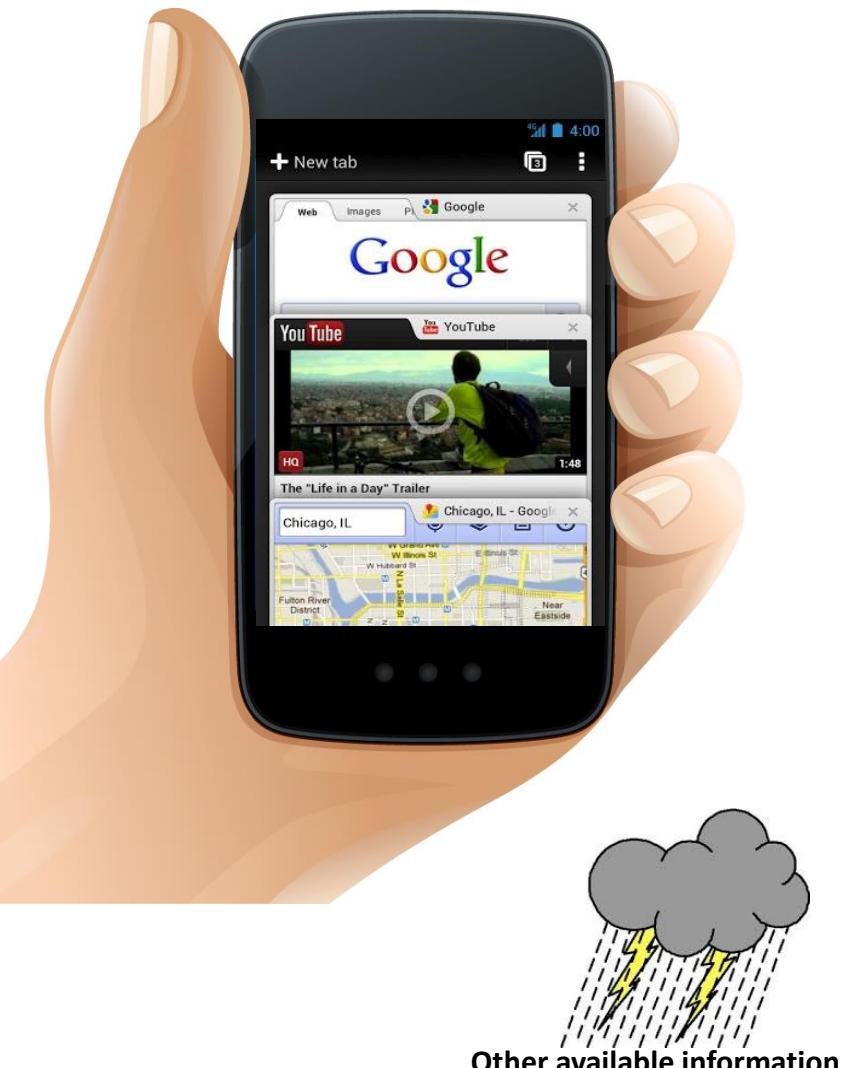
Take Home: The System is Important



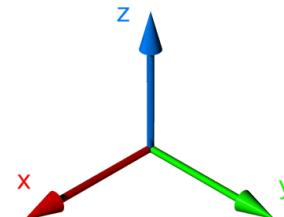
How to Get People to Do Things



Mobile Sensing



41.8322 N, 87.6513° W
250 m, 70% accurate,
Wifi, Currently Near 4
Wifi Networks [Linksys,
VultureWeb, Bob's
HouseNet], more...



Rotation
Acceleration
Velocity
Gravity
Gyroscope



Hardware



Called for 3 minutes @ 2:30PM
Text @ 1 PM
Email @ Noon
More...



Device ID: 33:AD:4F:C3:3F:B2:D1:11



External Devices

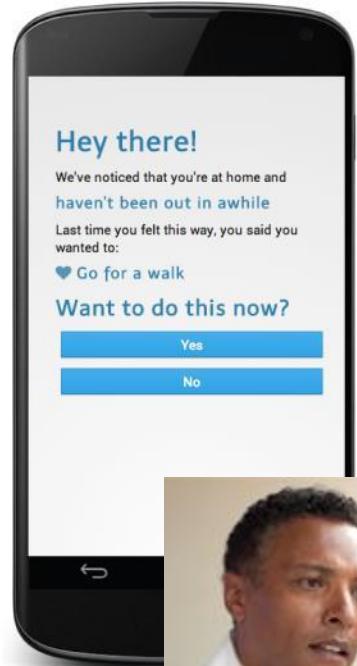
What would we want to know?



Emotional States and Contexts

- Location:
HOME
- Activities:
WORK
- Places:
WORKPLACE, STRESSED, FRIEND'S HOUSE
- Mood:
Happy
- Scheduling & etc:
- Attendance
- Other...

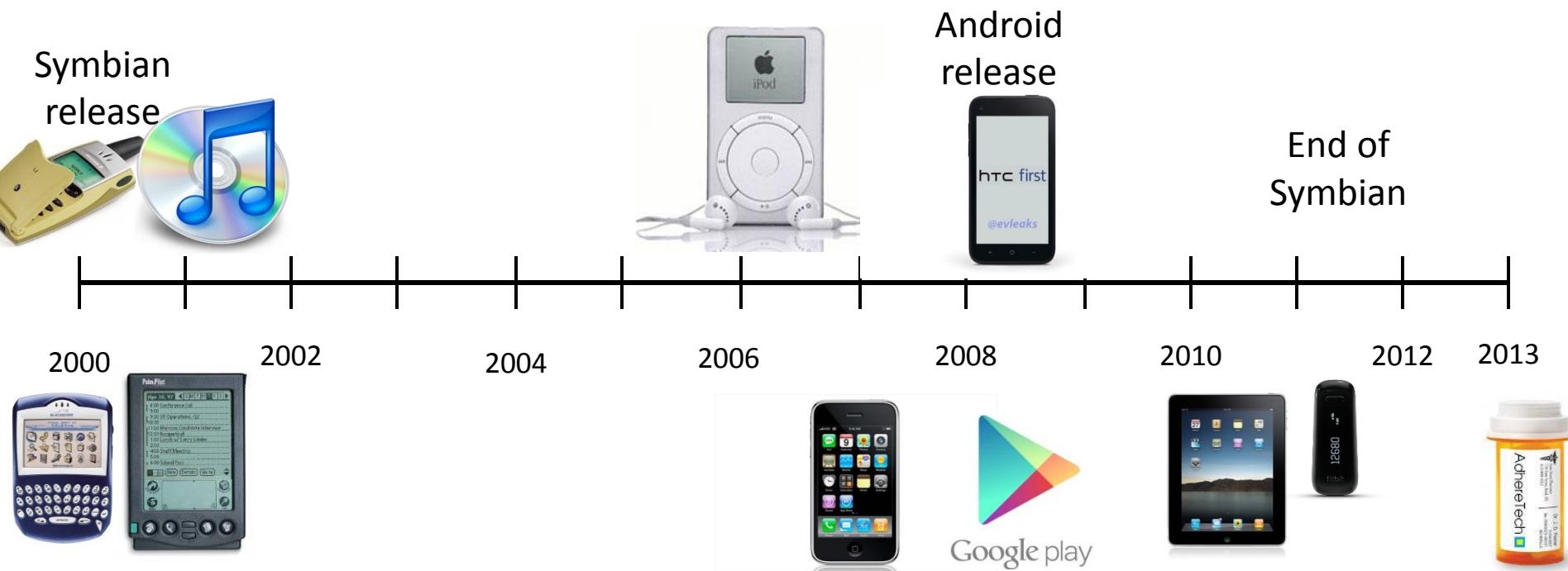
Coming to an app store near you in What could we do? 2022!



- Feedback, positive reinforcement, suggestions to patients
- Information to clinicians

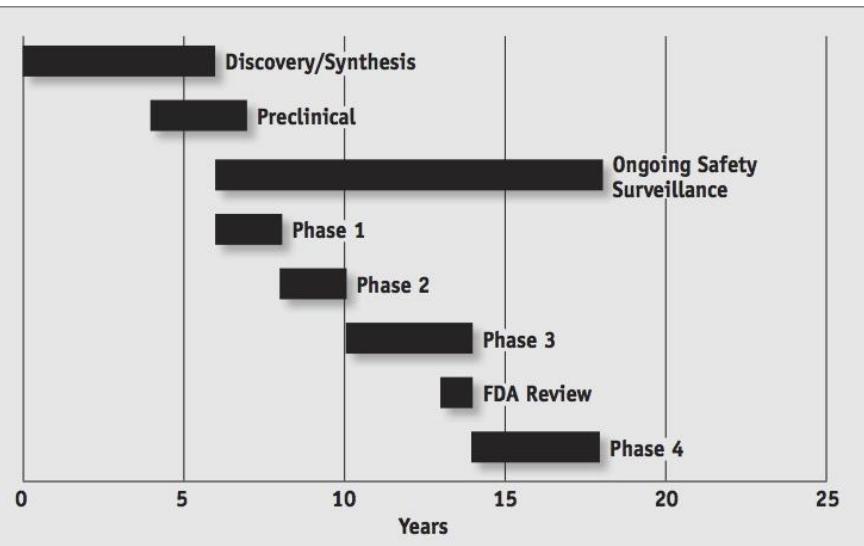
Obsolescence

Timeline for Technology Development



What are our Models?

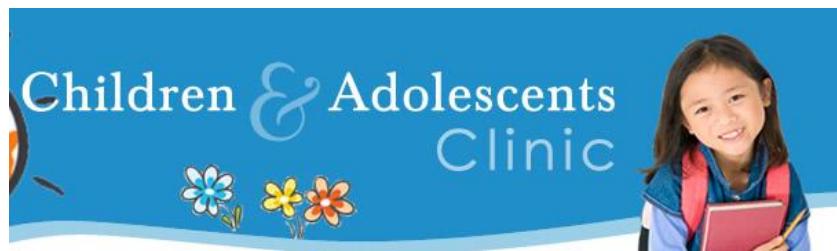
Academic Model



Industry Model



Implementation



Where do we stand?

- BITs can be effective.
- But they need to be integrated into care systems.
- Everything is changing (technology, culture, environment...) – we need principles, not apps

What do we need for BITs research?

- Methods to rapidly develop and test.
- Methods to integrate BIT research and implementation.

Role of Research

- Understand principles
- Greenhouse – Rapid development and testing

A lot of things can be reused...

Intervention elements

- Logging tools (assessments)
- Content delivery (information, text, video)
- Visualization tools
- Notification elements
- Sensor collection (Passive Data)

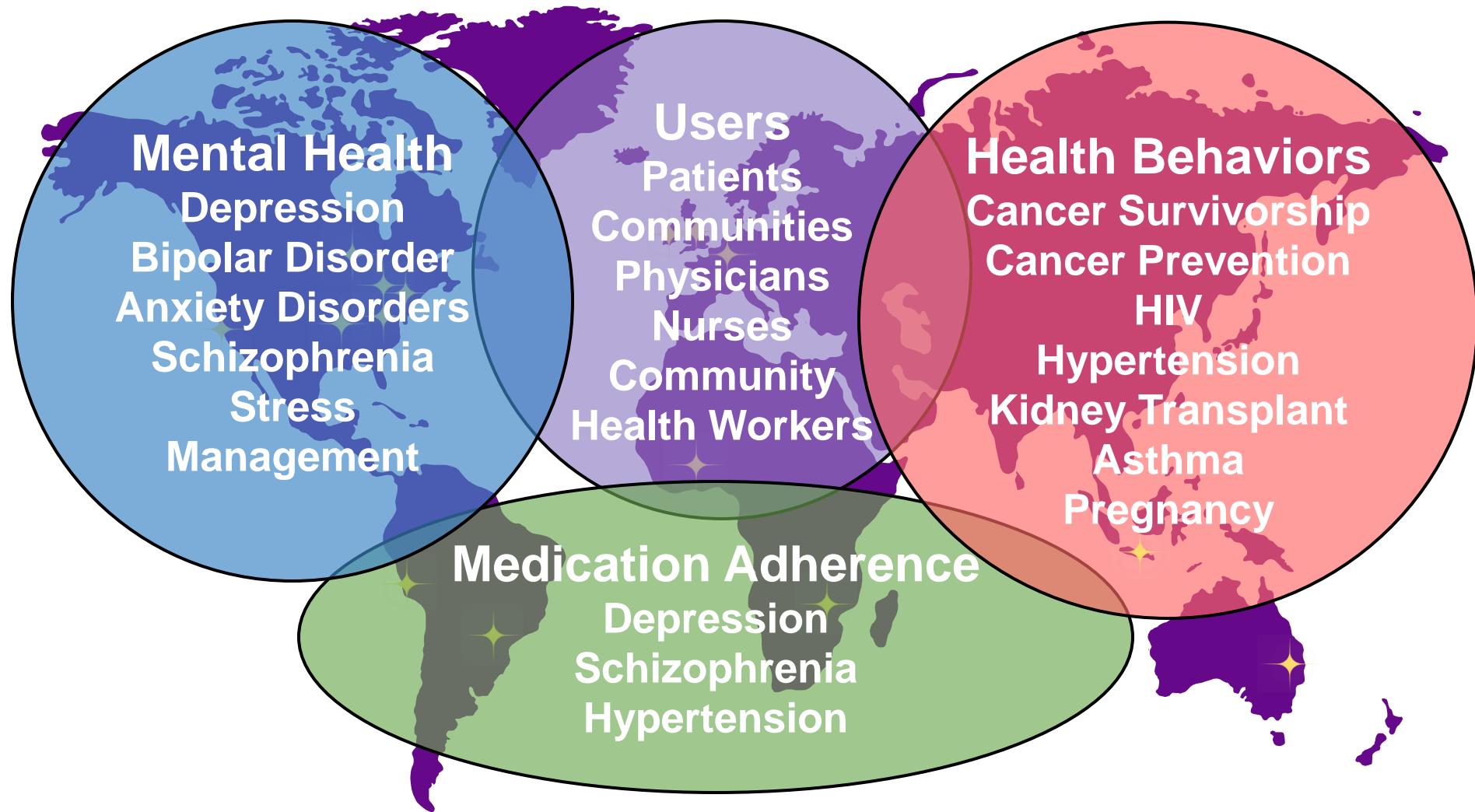
Create infrastructure that supports

- development of BITs
- dissemination of information and expertise
- Collaboration



CBITs Purple Development Framework

NIMH P20; 50+ projects, 25+ NIH grants





Where do we go from here?



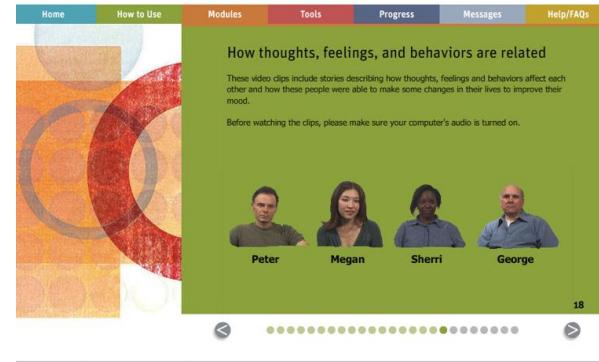
- What research infrastructure is needed for rapid prototyping and testing?
 - What are the needs (use cases)?
- What is the role for academic/industry partnerships?
 - What are possible models?
- How do we integrate research and implementation?



moodManager Adherence

101 Primary Care Pts with MDD

Mohr DC, et al. PLoS One. 2013;8(8):e70086



Logins from previous trials

- Mean number of logins for coached interventions: 2 - 9.1
- Mean number of logins from standalone interventions: <2

Use Variable	Coached mM		mM Only		p
	Median	Range	Median	Range	
Weeks to last use	9	0-12	5	0-11	0.007
Login days	13	0-100	6	1-24	0.01
Lessons used	8.5	0-18	5	0-18	0.03
# Tools Used	159	0-721	39	0-332	0.08