Motivational Psychology for Digital Health Interventions
Session 214, February 22, 2017
Amy Bucher, Ph.D., Behavior Change Design Director, Mad*Pow
@amybphd
Speaker Introduction

Amy Bucher, Ph.D.
Behavior Change Design Director
Mad*Pow
Conflict of Interest

Amy Bucher, Ph.D.

Salary: CVS Health (ended April 2016)

Ownership Interest (stocks, stock options or other ownership interest excluding diversified mutual funds): Stock holder in Johnson & Johnson
Agenda

• The digital health challenge
• How does motivation work?
• Applying motivation to design
  – Challenges
  – Successes
• Recommendations for infusing behavior science into intervention design
Learning Objectives

• Describe the main universal human needs of autonomy, competence, and relatedness that drive intrinsic motivation to engage with interventions and health behavior change
• Describe how the tenets of self-determination theory would influence the design of concrete features, functionality, and language in digital health interventions if applied to enhance patient engagement and outcomes
• Evaluate digital health interventions using the framework of self-determination theory to determine their ability to engage users and drive lasting behavior change
# Realizing the Value of Motivational Psychology in Digital Health Interventions

<table>
<thead>
<tr>
<th></th>
<th>Engagement</th>
<th>Adherence (To medication, treatment)</th>
<th>Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Treatment/Clinical</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Prevention &amp; Patient Education</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Savings</td>
<td>Powered by scalable technology</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Leading | Lagging
The digital health challenge
The Digital Health Explosion

Mobile health revenues have soared from $104 million in 2010\(^1\) to a projected $77 billion in 2017\(^2\)

And investment in digital health remains high

From: https://rockhealth.com/reports/2016-ytd-digital-health-funding-10-things-you-should-know/, retrieved 11/7/16
The Promise of Digital Health

Meta-analyses and RCTs show outcomes from use of digital health interventions:

• Improved cardiovascular outcomes:
  – Blood pressure
  – Total cholesterol
  – LDL/HDL ratio
• Reduced weight
• Reduced fasting glucose in people with Type 2 diabetes
• Improvements in low back pain

But engagement is low . . .
People Don’t Participate in Health And Wellness Programs At Work

• Fewer than ½ of employees complete wellness screenings and HRAs when offered
• Just 10% of eligible participants enroll in employer-based weight loss interventions
• Participation in disease management programs is around 16% for eligible employees
• Only 7% of eligible employees participate in smoking cessation programs

And industry attempts to engage users are counter-productive

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>81%</td>
<td>Of employers surveyed offer incentives for participation in wellness programs</td>
</tr>
<tr>
<td></td>
<td>59%</td>
<td>Offer incentives for disease management programs</td>
</tr>
<tr>
<td>2016</td>
<td>90%</td>
<td>Of employers surveyed offer incentives for participation in wellness programs</td>
</tr>
<tr>
<td></td>
<td>36%</td>
<td>Offer these incentives to spouses as well as employees</td>
</tr>
</tbody>
</table>

PwC Health and Well-being Touchstone Survey Results, 2016
We need to rethink how we engage people in their health.
Why engagement matters:

Outcomes = Efficacy × Participation
Mapping Outcomes

- Risk Baseline
- Participation + Engagement
- Behavior Change & Self-Care
- Risk Factor Prevalence
- Health (Biometrics) & Productivity
- Medical Utilization + Costs
- Return on Investment

Leading

Lagging

Timeframe for Impact
# Defining your behaviors

<table>
<thead>
<tr>
<th></th>
<th>New behavior</th>
<th>Familiar behavior</th>
<th>Increase behavior</th>
<th>Decrease behavior</th>
<th>Stop behavior</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>One time</strong></td>
<td>Enroll in health plan</td>
<td>Call doctor for appointment</td>
<td>Sleep an extra hour when sick</td>
<td>Limit liquids the night before a scan</td>
<td>Don't eat dessert tonight</td>
</tr>
<tr>
<td><strong>Period of time</strong></td>
<td>Log symptoms and triggers to help with diagnosis</td>
<td>Take medication for an acute condition</td>
<td>Drink more water during hot weather periods</td>
<td>Limit activity while recovering from injury</td>
<td>Stop drinking while on antibiotics</td>
</tr>
<tr>
<td><strong>From now on</strong></td>
<td>Check blood sugar five or more times a day</td>
<td>Take medication for a chronic condition</td>
<td>Get regular exercise</td>
<td>Limit saturated fats in diet</td>
<td>Quit smoking</td>
</tr>
</tbody>
</table>
Applying the psychology of motivation

• What is motivation?
• Motivational quality
• Levers of motivation
Motivation:

Desire with velocity
The Spectrum of Motivational Quality

Amotivated → Extrinsic → Introjected → Identified → Integrated → Intrinsic

Controlled → Autonomous
Pushing People Along The Spectrum

- Competence
- Autonomy
- Relatedness
Competence

Goal statement: “I am learning, growing, and succeeding.”
Enhance User Ability

• Organ donation
• 401k contributions
• Mammogram appointments
Effects of Baselines on Airline Pilot Behavior

<table>
<thead>
<tr>
<th>Before</th>
<th>After</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring Only</td>
<td>31%</td>
<td>48%</td>
</tr>
<tr>
<td>Feedback</td>
<td>31%</td>
<td>52%</td>
</tr>
<tr>
<td>Personal Target</td>
<td>31%</td>
<td>53%</td>
</tr>
<tr>
<td>Charity Donation</td>
<td>31%</td>
<td>51%</td>
</tr>
</tbody>
</table>

2x weight loss in people who track food 6+ days per week vs. people who track less than 1:

18% of successful dieters kept a calorie diary, vs. 8% of unsuccessful dieters:

People using pedometers keep their physical activity at 27% above baseline levels:

74% of doctors in Ohio agreed that pain medications are overprescribed because of a focus on HCAHPS scores.

Making pain a vital sign caused the opioid crisis. Here’s how.

THOMAS D. GUASTAVINO, MD | PHYSICIAN | OCTOBER 6, 2016

To combat opioid epidemic, HHS moves to remove pain management questions from HCAHPS surveys.

Many clinicians report feeling pressure to overprescribe opioids because scores on the pain management questions are tied to Medicare payments.
FEEDBACK
CALIBRATES
PERFORMANCE
Opower.com
1.4 – 3.3% energy use reduction per household (Alcott, 2011)
Multiple Levels of Feedback
MULTIPLE LEVELS OF FEEDBACK
Provide Just-In-Time Help

TurboTax
http://www.turbotax.com
Badges as Feedback Mechanisms

Foursquare, https://foursquare.com/
“One reported reason for ending these badges is precisely what would be predicted by self-determination theory: users began to ‘game’ the system, looking to circumvent the health behavior simply to get the badge.”

The Starbucks Mobile App

22% of transactions in December 2015¹

8 million mobile transactions per month²

## What If?

Basic Snowball Debt Calculator, Debtpro.co

### Debt Details
- **Number of creditors:** 5
- **Total Debt:** $12,971.00
- **Applied to Debt each month:** $454.00
- **Extra Monthly $$ to apply to debt:** $50.00
- **Extra One-Time $$ to throw at debt:** $250.00

Starting Month: June 2006

### Debt Table

<table>
<thead>
<tr>
<th>Name</th>
<th>Balance</th>
<th>Interest Rate</th>
<th>Monthly Payment</th>
<th>Old Balance</th>
<th>New payment</th>
<th>New Balance</th>
<th>Sort Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Credit Card #1</td>
<td>905.00</td>
<td>12.99%</td>
<td>65.00</td>
<td>0.00</td>
<td>107.52</td>
<td>0.00</td>
<td>4</td>
</tr>
<tr>
<td>Credit Card #2</td>
<td>987.00</td>
<td>18.99%</td>
<td>26.00</td>
<td>0.00</td>
<td>102.46</td>
<td>0.00</td>
<td>2</td>
</tr>
<tr>
<td>Credit Card #3</td>
<td>1,099.00</td>
<td>14.49%</td>
<td>28.00</td>
<td>0.00</td>
<td>42.16</td>
<td>0.00</td>
<td>3</td>
</tr>
<tr>
<td>Credit Card #4</td>
<td>2,500.00</td>
<td>21.33%</td>
<td>35.00</td>
<td>0.00</td>
<td>98.31</td>
<td>0.00</td>
<td>1</td>
</tr>
<tr>
<td>Car Loan</td>
<td>7,500.00</td>
<td>6.49%</td>
<td>250.00</td>
<td>0.00</td>
<td>205.67</td>
<td>0.00</td>
<td>5</td>
</tr>
</tbody>
</table>

Task Order Matters

– Time-consuming, draining tasks? Go hard to easy

– Learning, growth-oriented tasks? Go easy to hard
Duolingo
http://duolingo.com
Does it work?

34 Hours of Duolingo = 1 University Semester

http://duolingo.com/#/effectiveness-study
Competence Rules of Thumb

• **Measure** baseline performance
• Offer **relevant feedback** at multiple levels
• Make **developmentally appropriate demands**
• Create **optimal challenge**
Question 1: Which of the following is a way in which a digital health intervention can support a user's sense of competence?

A. Meaningful choice  
B. Social connections  
C. Timely feedback  
D. Single sign-on (SSO)
Question 1: Which of the following is a way in which a digital health intervention can support a user's sense of competence?

A. Meaningful choice
B. Social connections
C. Timely feedback
D. Single sign-on (SSO)
Autonomy

Goal statement: “I can make my own meaningful choices.”
Shared Rules of Engagement

Patients educated about colonoscopy via Emmi Solutions intervention before undergoing one had better outcomes:

• 18% less sedation medication
• 14% decrease in procedure duration
• 11% more knowledgeable
Step 1 of 2

Create a new medical records order

Add each care provider you want to get information from to the list below. When you submit this order, PatientBank will create requests for medical records and send them to the care providers on your behalf.

<table>
<thead>
<tr>
<th>Care Provider</th>
<th>Requested information</th>
<th>Expected delivery</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gayethri Narayanswamy</td>
<td>All records</td>
<td>20 days</td>
<td>$30</td>
</tr>
</tbody>
</table>

Total: 1 care provider  

$30

[Add another care provider]  [Proceed to checkout]
Minimize External Pressure

• Calibrate reward amounts
• Tie rewards to meaningful behaviors
• Consider non-financial rewards when possible, preferably goal-consistent
### Structure Meaningful Choice

<table>
<thead>
<tr>
<th>Covered Benefits</th>
<th>Bronze</th>
<th>Silver</th>
<th>Gold</th>
<th>Platinum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose</td>
<td>60% of Essential Health Benefits</td>
<td>70% of Essential Health Benefits</td>
<td>80% of Essential Health Benefits</td>
<td>90% of Essential Health Benefits</td>
</tr>
</tbody>
</table>

**Coinsurance**
- Cost to you for health services you will be responsible for:
  - Bronze: You’ll be responsible for approximately 40% of all covered benefits up to your out-of-pocket limit.
  - Silver: You’ll be responsible for approximately 30% of all covered benefits up to your out-of-pocket limit.
  - Gold: You’ll be responsible for approximately 20% of all covered benefits up to your out-of-pocket limit.
  - Platinum: You’ll be responsible for approximately 10% of all covered benefits up to your out-of-pocket limit.

All plans cover preventative services with no coinsurance. You will **not need** to pay any portion for preventative services if you receive those services from a provider within your plan’s network. All plans may have limits or exclusions. You will need to pay for any limits or exclusions on your benefits. These limits may include number of refills for certain drugs, number of visits to certain specialists and number of days covered for certain benefits.

**Cost share subsidy eligible?** Lower copays and other out-of-pocket expenses:
- No. This plan is not eligible for cost share subsidies that could lower your out-of-pocket expenses.
- Yes. If your income is between 100 percent and 250 percent of the federal poverty level, you may be eligible for cost share subsidies to lower the cost of health services.
- No. This plan is not eligible for cost share subsidies that could lower your out-of-pocket expenses.
- No. This plan is not eligible for cost share subsidies that could lower your out-of-pocket expenses.

### Aflac
Emphasize the **benefits** to the preferred choice

Show what’s **missing** from the non-preferred choice

Use design to create **visual appeal**

---

**Experience the difference with Runkeeper Go.**

<table>
<thead>
<tr>
<th>Basic</th>
<th>GO</th>
</tr>
</thead>
<tbody>
<tr>
<td>$0 / Month</td>
<td>$9.99 USD / Month or $39.99 USD / Year</td>
</tr>
<tr>
<td>✓ Track &amp; log activities</td>
<td>✓ Track &amp; log activities</td>
</tr>
<tr>
<td>✓ Basic stats</td>
<td>✓ Basic stats</td>
</tr>
<tr>
<td>Progress Insights</td>
<td>Progress Insights</td>
</tr>
<tr>
<td>Compare workouts</td>
<td>Compare workouts</td>
</tr>
<tr>
<td>Prescribed workouts</td>
<td>Prescribed workouts</td>
</tr>
<tr>
<td>Premium training plans</td>
<td>Premium training plans</td>
</tr>
<tr>
<td>Weather insights</td>
<td>Weather insights</td>
</tr>
<tr>
<td>Live Tracking</td>
<td>Live Tracking</td>
</tr>
</tbody>
</table>

---

[Upgrade to Go]
Value Expression

Personal Choice

Grow the life you want.

Decide What's Important
Grow a tree that reminds you of what's important in life—and why. You choose the areas of life that deserve your focus, attention and time right now.

Discover Your Motivation
Nurture your tree with personalized images, music, motivational messages and connections with supportive friends—whatever inspires you the most.

Take Meaningful Action
Keep your tree green and healthy by taking small actions that support what’s important to you, and by building habits that lead to meaningful daily progress.

http://mindbloom.com
The Autonomy Challenge

How can we offer people meaningful choice within a clinical protocol?
The Secret to Weight Loss

CALORIES IN

Choice of how to influence calories:
• Type of diet to try
• Type of exercise to try

CALORIES OUT

Choices within the program:
• Weight Watchers
• 21-Day Fix
• Jenny Craig

No Choice
What is something you value or believe?

I believe in taking care of my family and modeling good behavior for my kids

What behaviors are you trying to change?

I want to quit smoking

How does that behavior support your value?

I’ll have more energy for my kids & they’ll worry less about my health
Universal Core Values

• Commitment to something greater than oneself

• Self-respect (with humility, self-discipline, and acceptance of personal responsibility)

• Respect and caring for others

• Caring for other living things and the environment

Autonomy Rules of Thumb

• Establish shared rules of engagement for informed decision-making
• Minimize external pressure
• Provide maximum choice where possible
• Tie behaviors to meaningful values or goals
Question 2: Which of the following features in a digital intervention would best support a user's sense of autonomy?

A. Provide normative feedback
B. Allow the user to set his own goal
C. Allow the user to customize the dashboard
D. Suggest activities for the user to try
Question 2: Which of the following features in a digital intervention would best support a user's sense of autonomy?

A. Provide normative feedback
B. Allow the user to set his own goal
C. Allow the user to customize the dashboard
D. Suggest activities for the user to try
Relatedness

Goal statement: “I am part of something bigger than myself.”
Harlow

Maslow

- PHYSIOLOGICAL NEEDS
  - Breathing, food, water, homeostasis, excretion

- SAFETY
  - Security in personal matters, clan, morals, employment, resources, health

- LOVE/BELONGING
  - Friendship, family, intimacy

- SELF-ESTEEM
  - Confidence, achievement, respect

- SELF-ACTUALIZATION
  - Morality, creativity, problem solving
Ostracism Hurts

Cyberball, by Kip Williams, Ph.D
https://cyberball.wikispaces.com/
Relatedness & Social Networking
Social Media Strategy

Reactive

Proactive
Express Warmth In Your Words

Your life, love & legacy.

Cake is the easiest way to discover, share, and store your end of life preferences.

Get Started

JoinCake.com
Convey Involvement

Select a team to join.

Select a team to join.

Select a team to join.

Be a part of something big

There are many ways you can support Big Brothers Big Sisters. Your donation positively impacts a child’s life. Not to mention, it makes you a part of something big. Start something now.

> Donate Online
> Alumni

> Other Ways to Donate
> Why Give

Big Brothers Big Sisters
Normative Feedback Says You Belong

Appreciate Your Body

Our culture focuses so much on how our bodies look that we sometimes lose sight of what our bodies do. Our bodies allow us to do amazing things every day. Not sure what you do or "amazing?"

Check this out:

- Getting around and doing stuff.
- Think about the things that your body allows you to do every day. Whether you are cooking a meal, helping a friend get settled in her new place, or changing a flat tire, your body helps you carry out your daily activities and do the things you need to do. Remember to appreciate all of the "little things" your body helps you do everyday.
- Your body as repair shop.
- Your body has an amazing capacity to heal. From everyday cuts and scrapes to more serious injuries, our bodies can recover from all kinds of things without us doing anything. And, even when our bodies need medicines or other treatments to help us heal, they still manage to keep everything going while we recover.
- The power of touch.
- Whether you’re giving your main squeeze a quick kiss, giving a friend a comforting pat, or giving your kids a hug, your touch is powerful! Research shows that touch helps lower blood pressure, reduce anxiety, and release feel-good hormones. Your body does that!

Focusing on the powerful things your body can do is one way to break the cycle of negative body image.

Try this!

Finding your inner judge on constant auto-play with negative messages about how you look? You would never let your SST go away with talking about herself like that. If your friends inner judge was on overdrive, what would you tell her? Maybe you’d remind her of her innate sense of humor or how important her friendships is to you. Challenge your inner judge by reminding yourself of all of your amazing qualities. The next time your inner judge gets out of control, remind your (and yourself of all your good qualities.

http://women.smokefree.gov/
Normative Feedback: A Delicate Balance

Recent research shows that many people may try to quit smoking **more than thirty times** before they finally quit for good.

"It’s ok . . . Everyone has trouble quitting so I don’t need to try that hard.”

“I’m not alone in this struggle; other people have succeeded and so can I.”
Start a Relationship

- Learn & triage
- Remember over time

TurboTax
http://www.turbotax.com
Personalization Creates a Relationship
Amazon: Leader in Personalization

Connect to the internet with the Alexa App

| Tools of Titans: The Tactics, Routines, and Habits of Billionaires... |
| Payoff: The Hidden Logic That Shapes Our Motivations (TED Books) |
| Influence: The Psychology of Persuasion (Collins Business...) |
| Peak: Secrets from the New Science of Expertise |
| The 7 Habits of Highly Effective People: Powerful Lessons in Persuasion |
| The Paradox of More Is Less, II |

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Price</th>
<th>Rating</th>
<th>ISBN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timothy Ferriss</td>
<td>$15.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dan Ariely</td>
<td>$7.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robert Cialdini PhD</td>
<td></td>
<td>1,278</td>
<td></td>
</tr>
<tr>
<td>Anders Ericsson</td>
<td>$14.99</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stephen R. Covey</td>
<td>$10.20</td>
<td>Prime</td>
<td></td>
</tr>
<tr>
<td>Barry Schwartz</td>
<td>$12.99</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Everything Is Better With Friends

Books

Workouts

Music

Food
Relatedness Rules of Thumb

• Be **responsive and proactive** with social media
• Communicate **warmth**
• Create a sense of **involvement**
• Convey **belongingness**
• Facilitate **social connections**
Question 3: Some studies have shown that digital interventions built from a motivational design framework are more likely to lead to user adherence with prescribed medications and other treatments.

A. True  
B. False
Question 3: Some studies have shown that digital interventions built from a motivational design framework are more likely to lead to user adherence with prescribed medications and other treatments.

A. True  
B. False
Selected Outcomes

• 20% reduced hospital admissions\(^1\)
• $382 reduced medical claims\(^1\)
• 33% lower rate of increase in medical costs\(^2\)
• 24% higher satisfaction with health plan\(^3\)
• 8 consecutive years of positive return on investment (ROI) ranging from a low of 1.16:1 to a high of 2.83:1\(^4\)
• Sustained improvements in aggregate mental and physical health metrics\(^5\)

Digital Health Intervention Selection

Pre-Work

• Define key outcomes of interest
  – How will you measure them?
  – How often?
  – What are leading and lagging indicators of success?

• Understand the evidence base in your area of interest
  – Do the interventions you’re considering draw on the evidence base?
  – What success metrics already exist?
## The Digital Health Motivation Scorecard

<table>
<thead>
<tr>
<th>Does the intervention . . .</th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Help users understand health behaviors in terms of values or goals?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offer users choices within the experience?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Break complicated behaviors into easier steps that people can accomplish?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offer resources and support when needed?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Help people view their progress?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide meaningful, actionable feedback in a timely manner?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Connect users, either socially or psychologically?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reflect an understanding of users over time?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Realizing the Value of Motivational Psychology in Digital Health Interventions

<table>
<thead>
<tr>
<th></th>
<th>Engagement</th>
<th>Adherence (To medication, treatment)</th>
<th>Health Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Treatment/ Clinical</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Prevention &amp; Patient Education</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Savings</td>
<td>Powered by scalable technology</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Leaving | Lagging
Questions?

• Contact Amy Bucher, Ph.D.
  • abucher@madpow.net
  • @amybphd
  • Linkedin.com/in/amybucher

• Please complete online session evaluation