Using mobile technology for injury prevention interventions

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Supporters and partners

JOHN TEMPLETON FOUNDATION

HopeLab

HabitatSeven

Textizen

SurveySignal
Outline

- Background on mobile interventions

- Mobile *data collection* tools
  - Text message based
  - Smartphone app based

- Mobile *intervention* tools
  - Text message based
  - Smartphone app based

- Practical tips for getting started
Background: Mobile interventions

- 91% of Americans own a cell phone (Pew, 2012)
  - 61% of these smartphones (Nielsen, 2013)

- In same room with people 90% of the time
  - 50% of the time within arm’s reach (Dey et al, 2011)

- Mobile interventions part of “mHealth” research, which includes web-based platforms (Kay et al, 2011)

- Public health researchers have used mobile tech for over a decade to enhance physical health outcomes (for list of reviews, see Konrath, 2014)
Scope of prior work

- Several published meta-analyses and reviews in physical health domains (see Konrath, 2014)
  - Emerging research in psychosocial domains (e.g. empathy building / violence prevention)
- Wide range of intervention periods: 2 weeks to 14 months
  - No clear best practices in terms of dosage or duration
  - Likely depends on target population and desired behavior to change
- Majority of research → text messages
  - However, smartphone app interventions are emerging
Advantages of Mobile Interventions

- Can target diverse or specific groups
  - Smartphone penetration is higher among African-Americans and Hispanics compared to Caucasians (Nielsen, 2013)
  - Mobile tech can target specific high risk groups in their natural environments

- Widely used and kept nearby
  - Can collect data from large samples with no face-to-face participant interactions
  - Can help to build good habits and target bad habits via multiple daily interventions
  - New behaviors are generalized across multiple daily situations

- Convenience
  - Participants can access interventions at times that work for them
Disadvantages of Mobile Interventions

- Labor intensive and expensive to implement
- Data analyses can be complex
  - e.g. experience sampling data or app usage metrics
- Tech interventions can quickly become obsolete
- Low control over participant environment, which may weaken effects
  - e.g. receiving intervention message while distracted, socializing, or busy
- Cost of cell phones and usage
  - Can add phones for participants to budgets
- Issues of intrusion and privacy must be considered
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Data collection: Text messaging

- Experience sampling / ecological momentary assessments widely used
  - e.g. palm pilots, daily internet surveys

- Can also use text messages to collect data
  - e.g. my recent study
    - Participants asked to respond to 5 questions 6X / day for 14 days
    - Query message: *Past 2 hrs: Rate mood (M#), Rate connectedness (C#), How many ppl talked to (P#), Mode (f2f, phone, etc), Who was main person (relationship)*
    - Participants trained to respond during baseline session: e.g. *M5 C2 P2 phone mom*
    - High fidelity rates: 93% response rate
    - Incentive structures matter: e.g. daily bonus for all 6 responses
Data collection: Text messaging

Benefits of text messaging
- Relatively inexpensive (compared to app development)
- Relatively easy to program (compared to apps)
- Can be used on any phone

Things to consider
- Limited in terms of data collection
- Limited in terms of type of intervention
  - Tend to be more didactic rather than interactive or game-like
Data collection: Text messaging

- Problem: Lack of easy to use tools for researchers

Options:
- 1) Program bulk text message providers to suit research needs
- 2) More user-friendly newly emerging tools
Data collection: Apps

- Smartphone apps can also be used to collect data.

- Difficult to program, but more flexible data collection options:
  - e.g. different survey response options, physiological data, accelerometer, location, photos, microphone, etc.
Data collection: Apps

- Several programs now available for smartphone based data collection (see overview in Conner, 2013; Konrath, 2014)
- Prices range from free / open source to thousands of dollars for tech supported
- Programming experience needed ranges from low to high
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Intervention: Text messaging

- Tend to use didactic approach
  - e.g. instructions, reminders, facts

- Other methods also possible, but requires sophisticated branching programming
  - e.g. dosomething.org interactive text messages to reduce bullying

- My recent study: Direct instructional approach to reduce aggressive beliefs and behaviors by increasing empathy
  - Rationale: Frequent daily bursts of empathy training can create *empathic habits*, which in turn will lower aggression
## Sample text messages

<table>
<thead>
<tr>
<th>Empathy-building (Treatment)</th>
<th>Self-esteem building (Control)</th>
<th>No intervention (Control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>e.g. Think about someone close to you. Do a small nice thing for this person today. (BEHAVIORAL)</td>
<td>e.g. Think about all you deserve. Do something nice for yourself today. (BEHAVIORAL)</td>
<td>Respond to questions about mood and social interactions only. No training received.</td>
</tr>
<tr>
<td>e.g. Imagine what the last person you interacted with was thinking about. What does the world look like from their perspective? (COGNITIVE)</td>
<td>e.g. During your last social interaction, think of how you could have been more cool, objective, and logical in the conversation. (COGNITIVE)</td>
<td></td>
</tr>
<tr>
<td>e.g. Think about the last time a loved one was upset. Try to understand his or her feelings. (EMOTIONAL)</td>
<td>e.g. Think about a time that you felt powerful, like you had an influence over others. Try to remember how good this felt. (EMOTIONAL)</td>
<td></td>
</tr>
</tbody>
</table>
Results: Aggressive Beliefs

Post-intervention, controlling for pre-intervention baseline

- Control combined
- Empathy condition

Male

Female

$p < .01$

$ns$
Covert follow up

- Member of research team sends rude text message to participant
- We record participant response and code it:
  - **Aggressive** examples
    - Never!
    - *I feel like it is completely within my right to continue*
Covert follow up

- Member of research team sends rude text message to participant

- We record participant response and code it:
  - **Prosocial** examples
    - Stop texting me u jerk!
      - I'm sorry you're having a bad day, but I think you have the wrong number
      - Sorry who is this
Results: 6 month covert follow up

How prosocial or aggressive was response to rude message?

1=aggressive
3=prosocial

Control combined
Empathy condition

p=.02
*not affected by time since intervention
*overall gender differences, but no interaction
Intervention: Text messaging

- Same problem as with text messaging: Need better tools

1) Can program using bulk messaging providers

2) Can use emerging tools, but random assignment capacity is new

3) Can pay a company to custom build for your project needs. Costs can range from $25K to $50K for a fully integrated text message experiment with surveys before and after the intervention
Intervention: Apps

- Much more flexible about what can be done
  - Not limited to didactic approach
  - Can use interactive game-like approaches

- My current research: Create empathy-building game for smartphones to reduce aggressive beliefs and behaviors
Intervention: Apps

- Working with app development company HabitatSeven

- Mini game approach: Design 9 very short and fun games that each focus on separate scientifically-based empathy related skill

- Similar in concept to Dumb Ways to Die app, which aims to reduce train-related accidents in Australia
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Practical tips for getting started

• 1) Consider the costs → resource and time intensive
  ◦ Is using mobile technology justified?

• If you must, here are some practical tips to get started

• Please take a moment to think about your injury prevention topic…
  ◦ You may want to take out a pen and paper
Practical tips for getting started

- 4 different stages of intervention development:
  - A) Pre-development phase
  - B) Develop intervention plan
  - C) User testing
  - D) Feasibility or pilot study
A) Pre-development phase

1) Identify specific target behavior and population

2) Select mode of delivery: text message or smartphone app

3) Decide on outcomes: quantitative or qualitative or both?

4) Identify an appropriate theory to guide intervention, since theory-based mobile interventions are more effective
B) Develop intervention plan

1) Decide on specific intervention features
   - Tracking information: e.g. recording data, seeing own trends, automatic sensing of data
   - Sending information: e.g. receiving direct instruction, tips, information, reminders
   - Involving healthcare providers, if applicable: e.g. remote coaching, symptom monitoring, automated feedback
   - Leveraging social influence: Adding involvement of close others somehow. e.g. social support, competition, positive modeling
   - Entertainment-based programs: As an add on to main content (e.g. daily weather report) or as the main intervention (see gamesforhealth.org)

2) Decide on the appropriate control group (if conducting an RCT)
B) Develop intervention plan

3) Imagine the intervention from the participants’ perspective. What concerns might they have throughout the process? How can they be addressed?

4) Keep it realistic. Consider “must have” versus “should have” versus “could have” versus “would like” features of intervention.

5) Consider user-involved intervention. e.g. they can write their own messages, select their preferred frequency, have messages tailored to their demographics or personal goals.
C) User testing

- Test the program on a small sample (e.g. 5-10 people) to identify:
  - 1) problems with intervention
  - 2) barriers to usage
  - 3) potential drop out points
  - 4) optimal dosage and duration
  - 5) things users liked and disliked

- If possible, make suggested changes and run one additional round of user testing.
D) Feasibility or pilot study

- Run a pilot study with objective and validated outcomes on population of interest.

- Next step is to seek funding for larger randomized control trial.
On campus resources
Welcome to the U-M Mobile Developer Toolkit

This site is designed to encourage all students, faculty and staff to develop and distribute useful mobile apps to the U-M community.

Get Started
Provides information on starting with mobile development at U-M.

Design
Has information on gathering requirements, U-M app design standards, and designing with usability and accessibility in mind.

Develop & Test
Gives you specific instructions for integrating SSO, CoSign and U-M information, plus choosing between platforms or multi-device development.

Distribute
Provides information on getting your app to your users, including internal U-M distribution possibilities.

Special Event
Mobile Developer Community
Next Meeting: January 30
Join us for a meeting where we'll talk about fun mobile stuff!
Learn More »
Mission:
To effectively transfer University technologies to the market so as to generate benefits for the University, the community and the general public.
Save the date: Mar 26-27, 2015

University of Michigan Social Sciences Advanced Institute
Sponsored by UM Office of Research

Goal: To connect researchers with tech developers to discuss evidence-based science and tech practice. The focus is on psychosocial interventions, broadly defined. We have confirmed speakers on topics such as concept development, wire framing, and emerging, innovative tech tools.

Registration opens early November: Limited to only 50 attendees.
Email: positivetech@umich.edu
Website (pending): ssw.umich.edu/positive-tech
Other resources

Background readings:


Tools and tips:

- Center for Behavioral Intervention Technologies (CBITs) at Northwestern University, Creating your Behavior Intervention Technology, http://cbits.northwestern.edu/documents/Create-Your-BIT.pdf
Thank you! Questions and comments welcome.

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