Designing User-Centered Just-in-Time Adaptive Interventions

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Components of Adaptive Interventions

- Decision points
- Tailoring variables
- Intervention options
- Decision rules
- Outcomes

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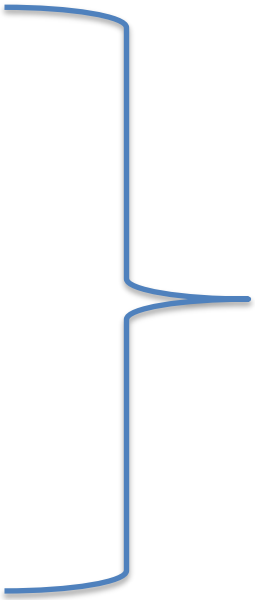


JITAIs:
Real-time


txt2stop (Free et al. 2011)

txt2stop

- 5 messages/day for first 5 weeks
- 3 messages/week for 26 weeks
- + JITAI components:
  - user texts “crave”

    => {message to help manage cravings}
  - user texts “lapse”

    => {encouragement messages to keep trying}

Mobile Therapy (Morris et al. 2010)

Mobile Therapy

Randomly-timed EMA prompts to report mood throughout the day

=> {brief cognitive behavioral exercises}

Characteristics of Early JITAIs

- Information for decision points assessed frequently via EMA or user-initiated self-report
- Proximal outcomes closely tied to target health behaviors
- Tailoring variables based on baseline/static user characteristics
- Ad lib intervention option choice
- Expert-derived decision rules

Downsides of Early JITAIs

- Burden
  - Up to 6 assessments/treatments a day
- Tailoring variables rarely incorporate users' current context
  - Prompts come at bad times / locations
  - Intervention options not tailored to the current context
  - Past responses rarely taken into account
- Decision rules not personalized

How do we do better?

Some Design Considerations

- JITAIs often target long-term health behaviors
- People's goals and capabilities change over time, both short and long-term
- There are both inter and intrapersonal variations in intervention response
- Context matters

JETAI Design Goals

We aim to develop JETAIs that…

- Can be used long-term
- Adjust to an individual's changing goals and capabilities
- Adjust to the changes in context and time-varying intervention response

Where do we start?

Can We Design JETAIs for Long-Term Use?

- 26% of downloaded health apps used only once
- 74% abandoned by 10th use

- Perceived value and burden key factors in adoption and abandonment

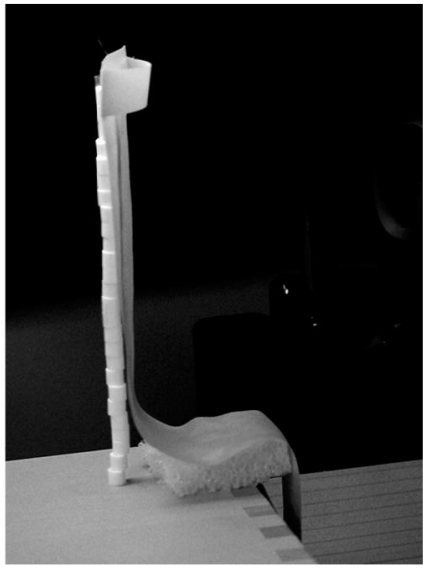
Consumer Health Information Corporation, 2011
Jimison et al., 2008; Or & Karsh, 2009

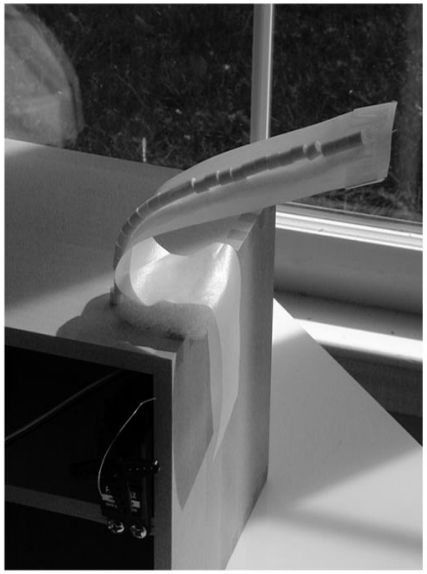
Value-Burden Ratio

Burden

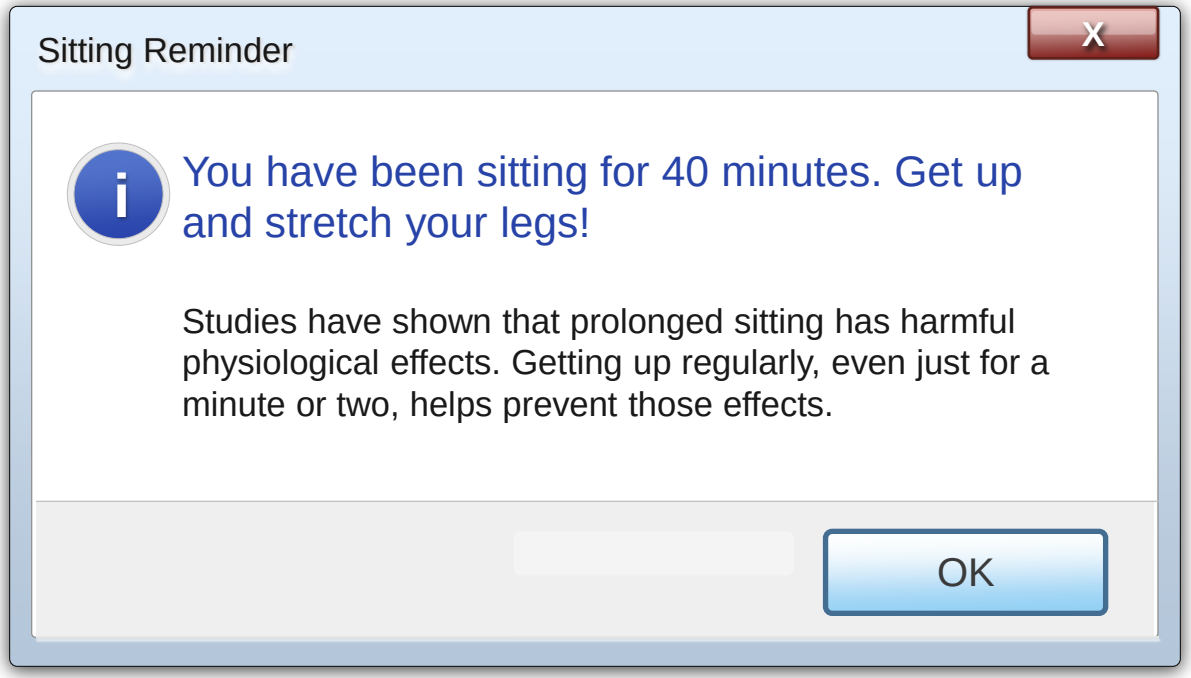
- Perception of burden partly depends on perception of value
- Perception of burden changes
  - over time
  - across contexts
- More burdensome interventions can be more efficacious, at least in the short-term

BreakAway






Jafarinaimi et al., 2005 *Proc. CHI '05*.


Sitting Reminder
X
You have been sitting for 40 minutes. Get up and stretch your legs!
Studies have shown that prolonged sitting has harmful physiological effects. Getting up regularly, even just for a minute or two, helps prevent those effects.
OK

JITAIs need to dynamically balance burden and health outcomes over time.

What This Means

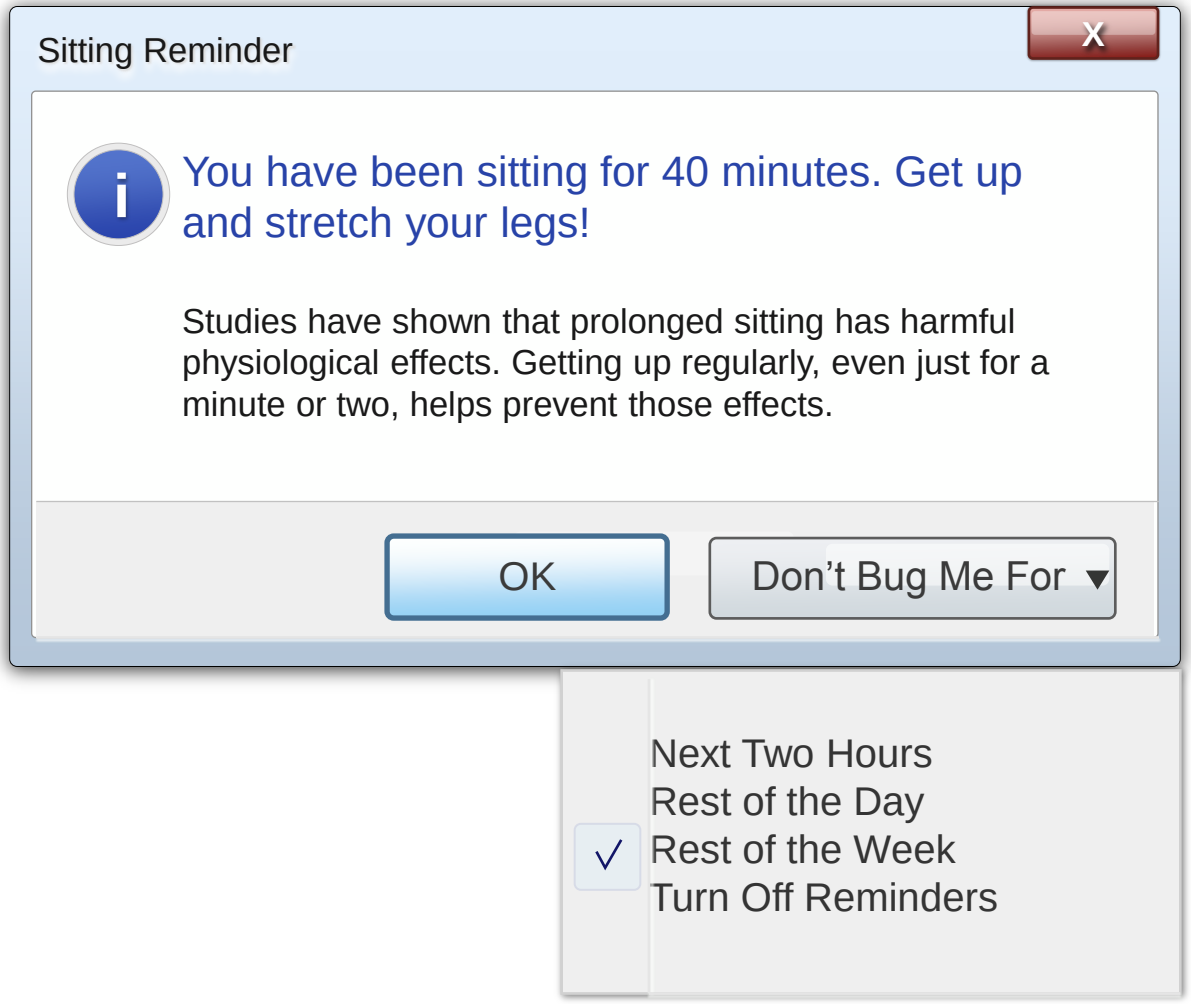
- Online learning algorithms need to optimize multiple proximal outcomes
- Burden needs to be assessed frequently

Implicit Measures of Burden

- Changes in levels of application use
- Patterns of responses to notifications, reminders, etc.

Explicit Measures of Burden

- Self-report (EMA, etc.)
- Explicitly designed interactions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You have been sitting for 40 minutes. Get up and stretch your legs!
Studies have shown that prolonged sitting has harmful physiological effects. Getting up regularly, even just for a minute or two, helps prevent those effects.
OK
Don’t Bug Me For
Next Two Hours
Rest of the Day
Rest of the Week
Turn Off Reminders

Is modeling burden enough?

Additional Potential Outcomes

- Perceived utility
- Engagement
- Habituation
- End-stage disengagement

Summary

- To be truly effective, JETAIs need to be usable long-term
- Long-term use requires dynamic balancing of effectiveness & usability
- Perceived burden and utility key are aspects of usability
- These can be treated as proximal outcomes for online learning

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