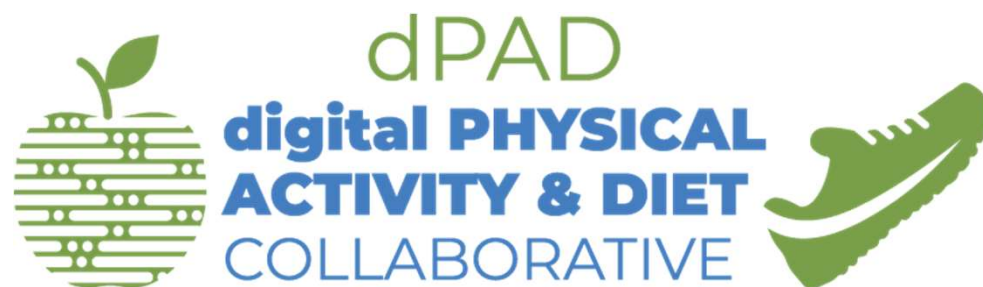


digital Physical Activity & Diet Collaborative

A Joint MD Anderson / UTHealth
Core

8/11/2022



THE UNIVERSITY OF TEXAS
MDAnderson
~~Cancer~~ Center®

UTHealth®
The University of Texas
Health Science Center at Houston
School of Public Health

Aims



- To conduct a needs assessment to identify MD Anderson and UTHealth researchers with relevant interests and identify their needs for training, collaborators, and infrastructure
- To provide training and networking activities to support and connect digital health and obesity researchers
- To create core services based on investigator needs identified in Aim 1, such as:
 - An online resource clearinghouse and collaboration platform,
 - Consultation/navigation services, and
 - Technical services such as usability testing, measurement, accessing/pre-processing of digital device data.

Anticipated Outcomes



- Improve institutional ability to successfully compete for NIH and other funding, including partnerships with industry such as STTR/SBIR grants
- Enhance researchers' competitiveness for funding priorities identified in the *2020-2030 Strategic Plan for NIH Nutrition Research*, which focuses on precision nutrition, implementation science, and individualized approaches to weight management
- Resulting research would lead to highly scalable and cost-effective interventions to decrease obesity and subsequent disease and disability in Texas
- dPAD will interface with the newly formed Texas Network of Obesity Research (TeNOR), involving institutions across the state

Leadership



- MDACC
 - Dr. Karen Basen-Engquist, Lead
 - Dr. Susan Peterson
 - Thuan Le
- UTHealth
 - Dr. Leah Whigham, Co-Lead
 - Dr. Sahiti Myneni, Co-Lead
 - Dr. Deanna Hoelscher

Scope of Work



- Needs assessment survey (February 2022)
- Webinar series
- Digital health training
- Symposia (one virtual, one in-person)
 - September 8-9, UTHealth School of Public Health
 - Abstracts due Friday, 8/12. Send to tale@mdanderson.org
 - <https://redcap.mdanderson.org/surveys/?s=A8LNTPTK984MHKER>
- Provide core services
 - Website, see <http://go.uth.edu/dPAD>
 - Clearinghouse of resources
 - Fee-for-service
 - Limited amount of supplemental funds for researchers

FALL 2022 SYMPOSIUM

September 8, 2022 - 1pm–5pm
September 9, 2022 - 8am–11am

UTHealth School of Public Health Auditorium
1200 Pressler Street
Houston, TX 77030

The dPAD Collaborative invites researchers and trainees to attend the dPAD Fall 2022 Symposium in Houston, Texas to share and connect over obesity-related digital health research.

KEYNOTE SPEAKER

David E. Conroy, PhD
Professor of Kinesiology and
Human Development & Family
Studies, Penn State University





A Counselor in Your Pocket: Just-in-Time Adaptive Interventions for Health Behavior Change

Emily Hébert, DrPH

Assistant Professor, Health Promotion and Behavioral Sciences

UTHealth School of Public Health in Austin

Michael & Susan Dell Center for Healthy Living



Time to Stand!

**Is this an effective
intervention?**





How could we improve it?



How to turn off those annoying stand reminders on Apple Watch

By [Jason England](#) published January 11, 2022

Here's how to stop your Apple Watch nagging you to stand up every hour

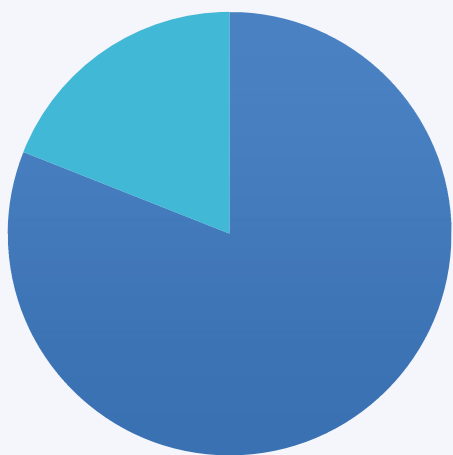


(Image credit: Future)

If you're tired of being told to stand up by your [Apple Watch](#), this is the guide for you. Here's how to disable those reminders.

Apple's take on the smartwatch is the best in its category, thanks to a seamless integration with iPhone, a feature-rich and easy-to-use OS, and a sophisticated suite of sensors that give you greater levels of health tracking than you could possibly get with the competition.

Why use smartphones for health behavior change?

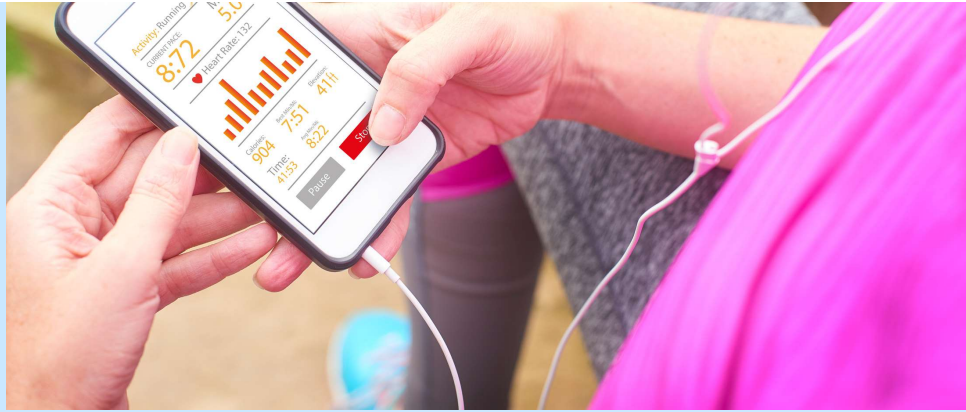


85% of all U.S. adults own smartphones

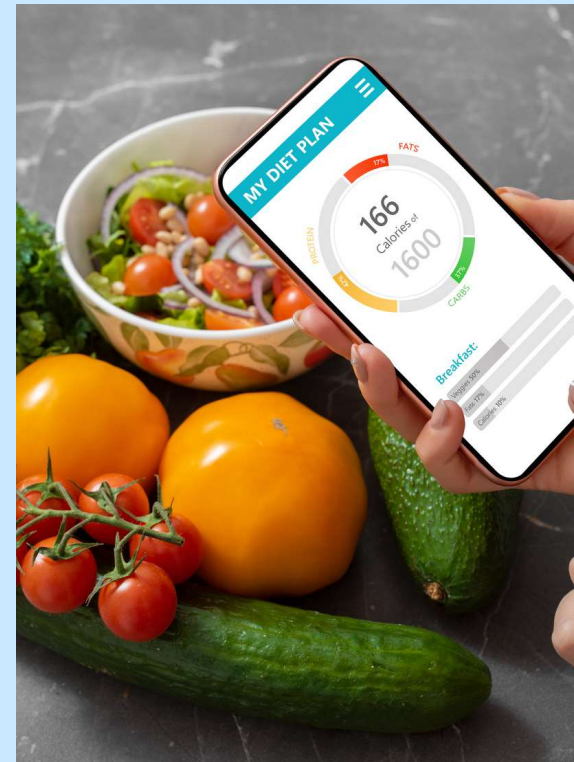
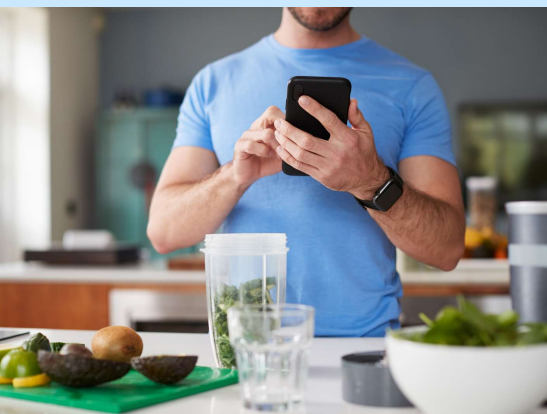


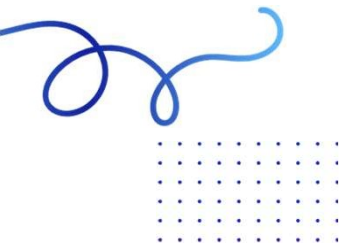
Smartphone ownership is high even among low SES individuals





More data than ever before





Ecological Momentary Assessment

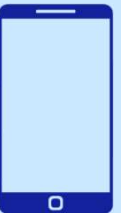


- **Collection of methods using repeated collection of real-time data on subjects' behavior and experience in their natural environments**
- **Also called time diary, experience sampling**



Why use EMA?

- **Retrospective recall is subject to serious bias.**
- **Availability heuristic**
- **Accounts for socioenvironmental characteristics.**
- **Is ideal for studying dynamic behaviors and experiences.**





EMA Sampling Strategies

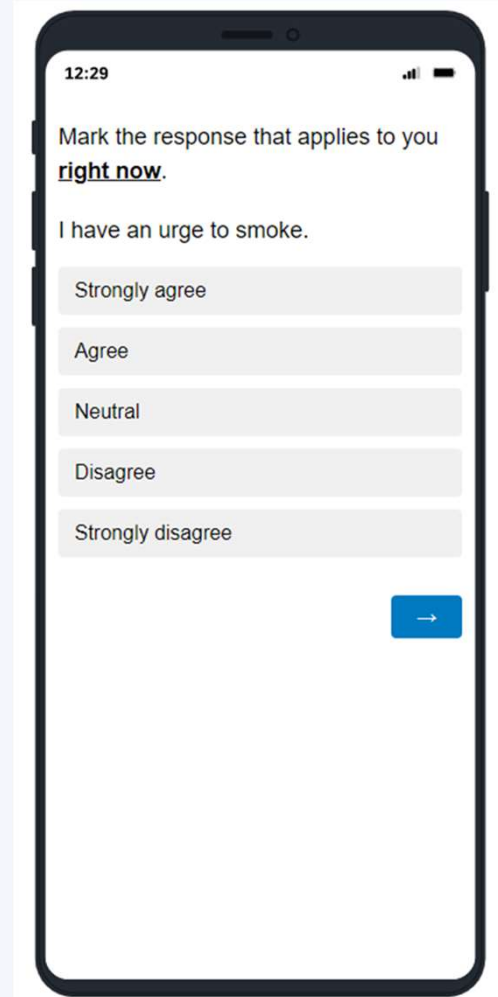
Time-Based

- Fixed schedule
- Random



Event-Based

- Participant-initiated
- Sensor-initiated



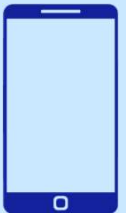


Example EMA Design - Smoking Cessation



5 EMAs/day: 1 daily diary, 4 random EMAs during waking hours

Participant-initiated EMAs: when participant smokes or has urge to smoke





Example EMA Measures - Smoking Cessation



"Core" Items

- Smoking status
- Mood/Affect
- Environment
- Motivation
- Self-efficacy



Daily Diary

- Prior day smoking status
- Medication adherence
- Alcohol Use
- Physical activity
- Sleep quality



Smoking Assessments

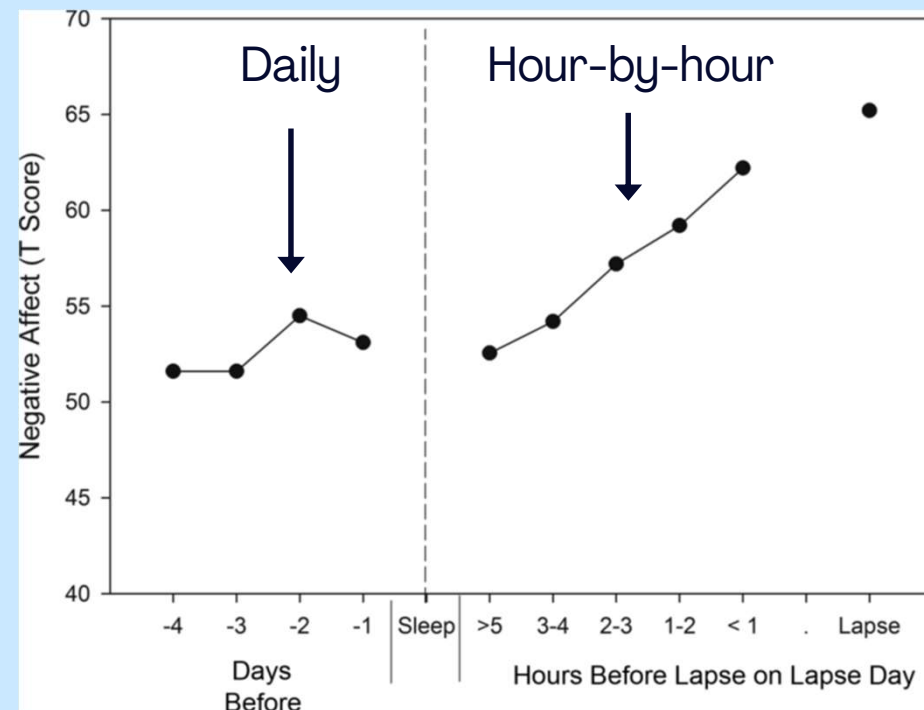
- Smoking experience
- Motivation/intention to quit
- Warning signs
- Coping skills that would have helped



What should you measure, and when?



- **How much does the behavior or situation vary?**
- **Balance participant burden with recall bias.**
- **Don't use EMA to measure things that can be better measured passively.**

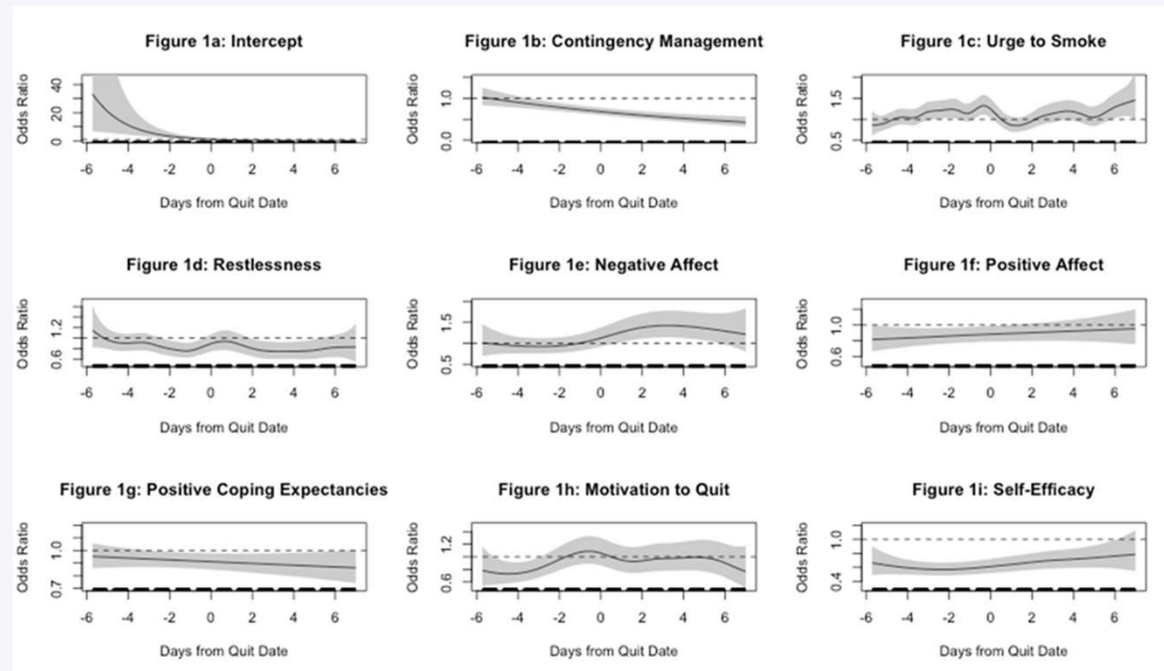


Shiffman & Waters (2004)

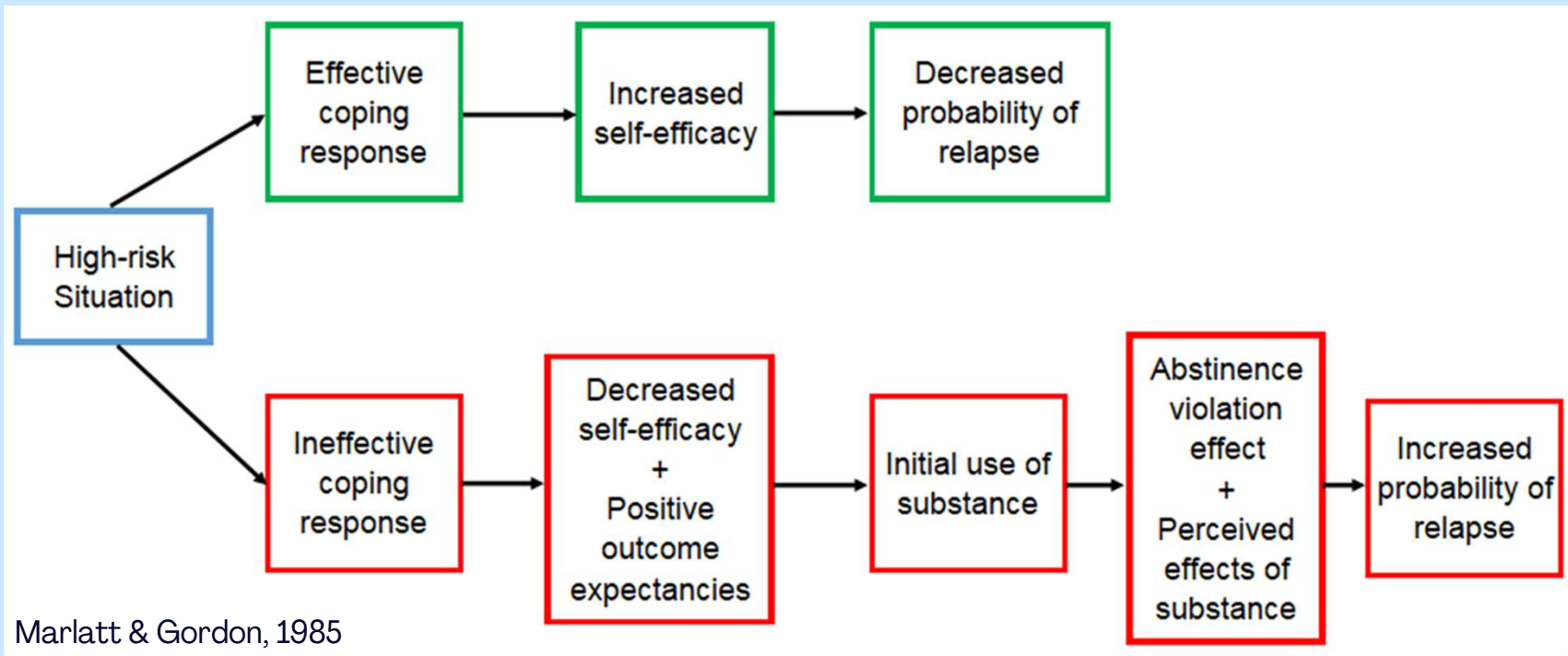
What have we learned from EMA?



- There are multiple dynamic influences on health behaviors.
 - Mood, stress, social context, and environmental cues
- The importance of predictors may change within-person and over time.



Relapse Prevention Model



Real-time reports of smoking lapse contexts suggest that most lapse episodes occur within minutes of the onset of a trigger (Ferguson & Shiffman, 2009).





Just-in-Time Adaptive Interventions (JITAI)



Tailored support delivered in the moments when it is most needed

Uses dynamic information to modify type, amount, and timing of support

Attempts to provide right type of support, at the right time, while eliminating support that is interruptive or not beneficial



Push vs. Pull Intervention Content



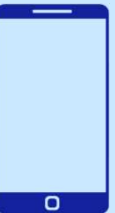
PULL

- Content made available to users on-demand
- Educational materials
- Self-monitoring graphs, charts
- User-triggered coping exercises

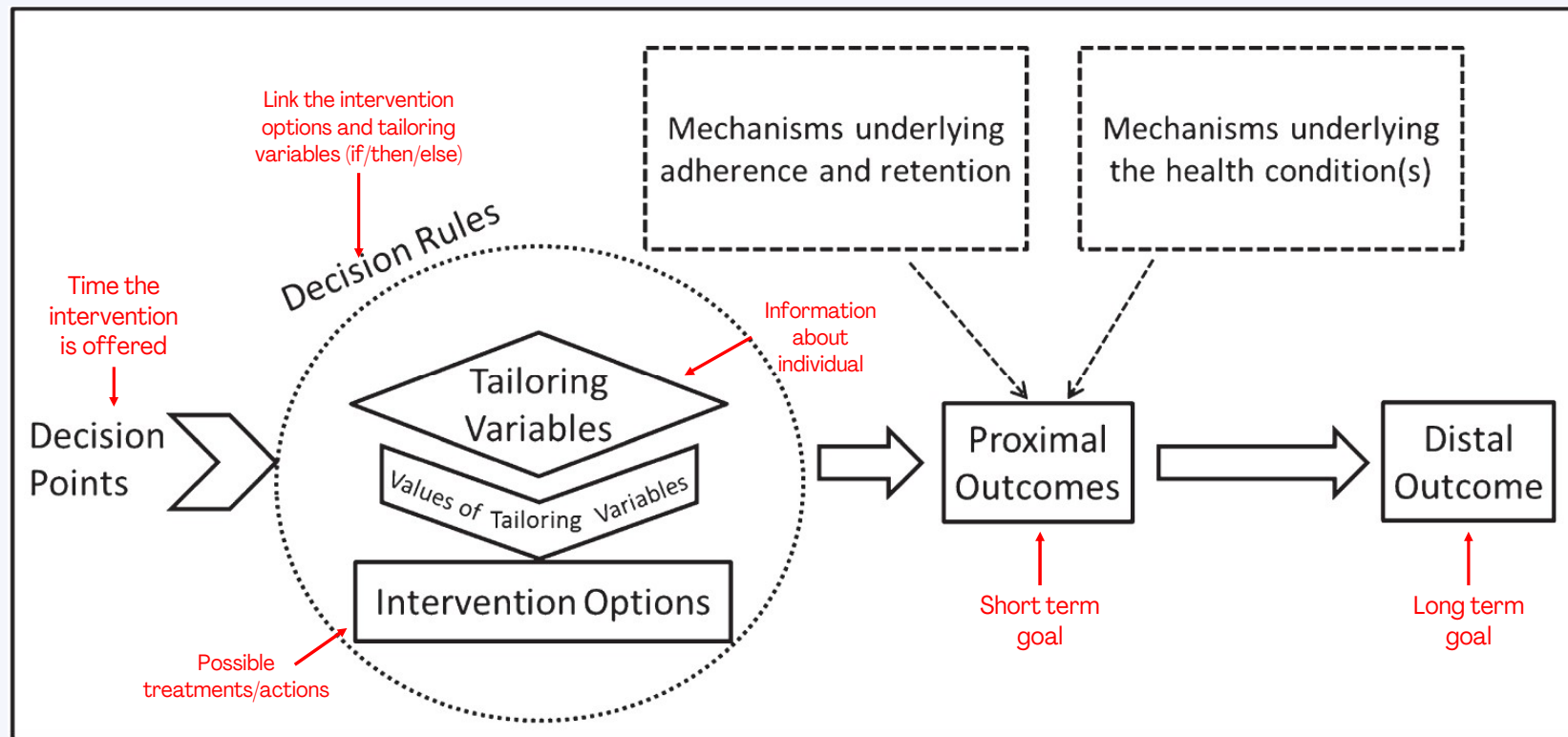


PUSH

- Content automatically "pushed" to user
- Notifications
- Reminders
- Text messages
- Phone calls



Conceptual Model of JITAI Components



Nahum-Shani, et al. (2018). Just-in-time adaptive interventions (JITAI) in mobile health: key components and design principles for ongoing health behavior support. *Annals of Behavioral Medicine*, 52(6), 446-462.



When is a JITAI appropriate?

- **Your behavior or outcome of interest is frequent (e.g., not suited for annual cancer screening)**
- **You have evidence to suggest that it varies over time, depending on context or situation**
- **You have evidence (either from EMA, sensors, or theory) about potential tailoring variables.**



Example tailoring variables

- Demographic characteristics
- Contextual factors (e.g., location, social setting)
- Personal cognitive factors (e.g., mood, stress, motivation)



How could we improve it?

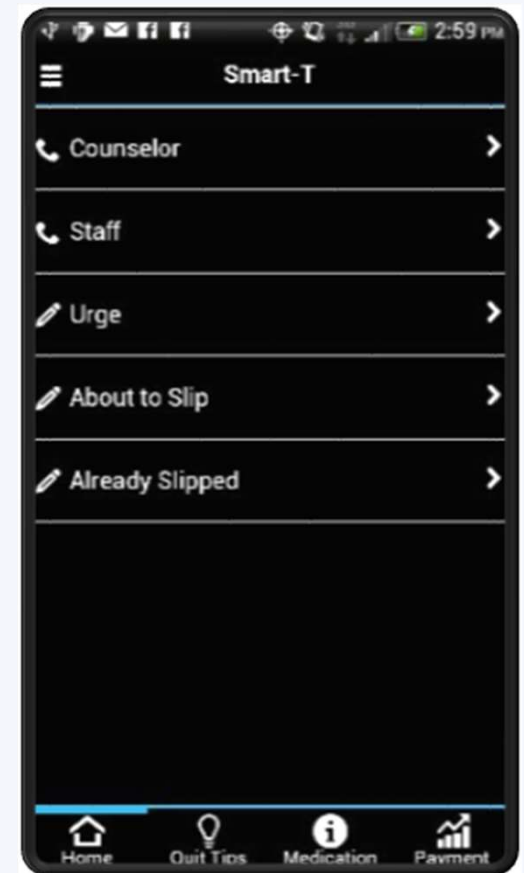
- **Decision Point:**
- **Decision Rule:**
- **Proximal Outcome:**
- **Distal Outcome:**
- **Tailoring Variables:**



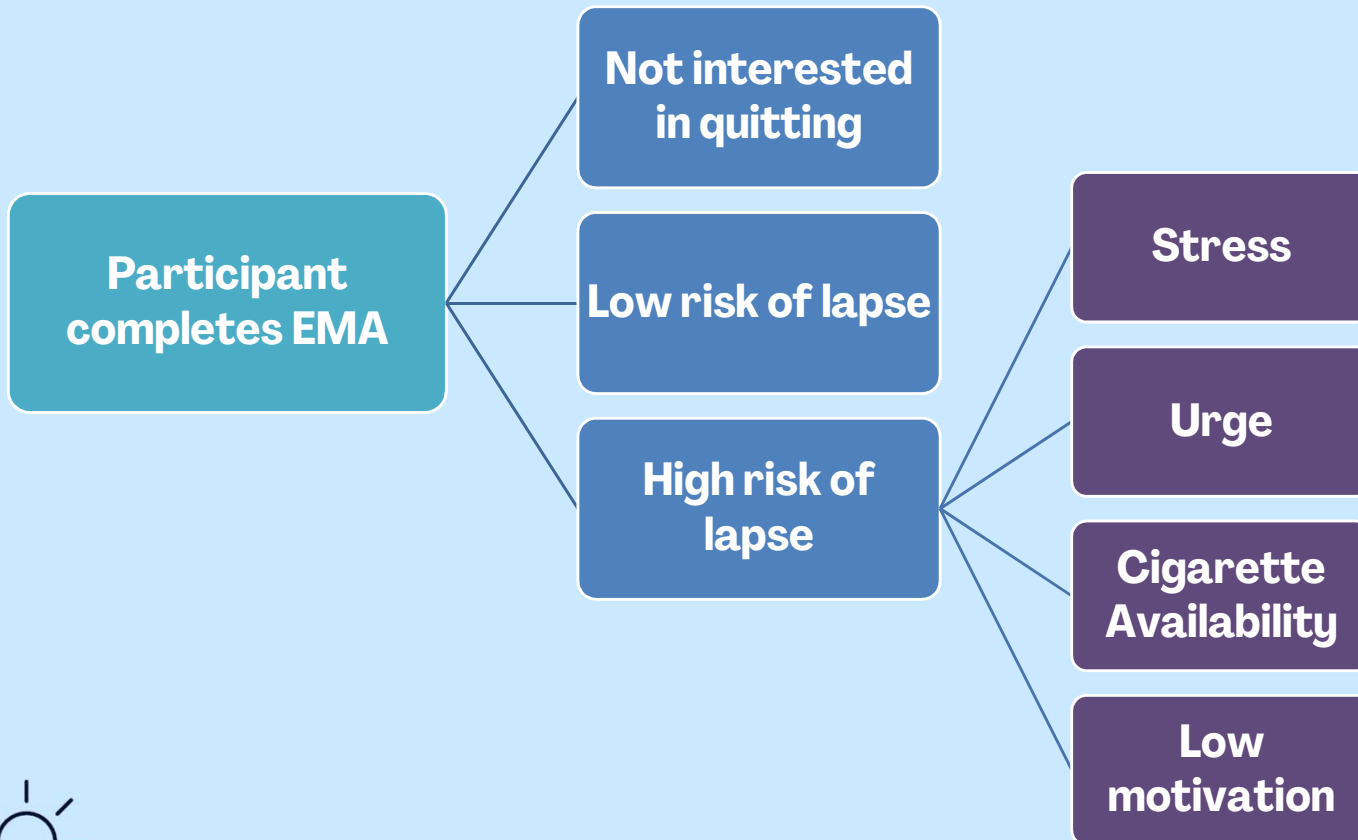
Smart-T: Adjunctive Smartphone-Based Smoking Cessation Treatment



- **Participants (N=59) from a safety-net hospital smoking cessation program**
- **Completed EMAs 5 times a day for 3 consecutive weeks (1 week pre-quit, 2 weeks post-quit)**
- **Used EMA responses to assess current risk of smoking lapse and automatically push tailored messages**



Types of Messages



Don't let negative emotions keep you from a healthier life! When you feel stressed or angry, distract yourself, go for a walk, get out of the situation for a few minutes, try deep breathing exercises.



Do tailored messages reduce smoking lapse triggers?



Addictive Behaviors 78 (2018) 30–35

Contents lists available at ScienceDirect

Addictive Behaviors

journal homepage: www.elsevier.com/locate/addictbeh



ELSEVIER



An ecological momentary intervention for smoking cessation: The associations of just-in-time, tailored messages with lapse risk factors

Emily T. Hébert^{a,*}, Elise M. Stevens^a, Summer G. Frank^a, Darla E. Kendzor^{a,b}, David W. Wetter^d, Michael J. Zvolensky^c, Julia D. Buckner^c, Michael S. Businelle^{a,b}

^a Oklahoma Tobacco Research Center, Stephenson Cancer Center, University of Oklahoma Health Sciences Center, Oklahoma City, OK, United States

^b Department of Family and Preventive Medicine, University of Oklahoma Health Sciences Center, Oklahoma City, OK, United States

^c The University of Houston, College of Liberal Arts and Social Sciences, Department of Psychology, Houston, TX, United States

^d Department of Population Health Sciences and the Huntsman Cancer Institute, University of Utah, Salt Lake City, UT, United States

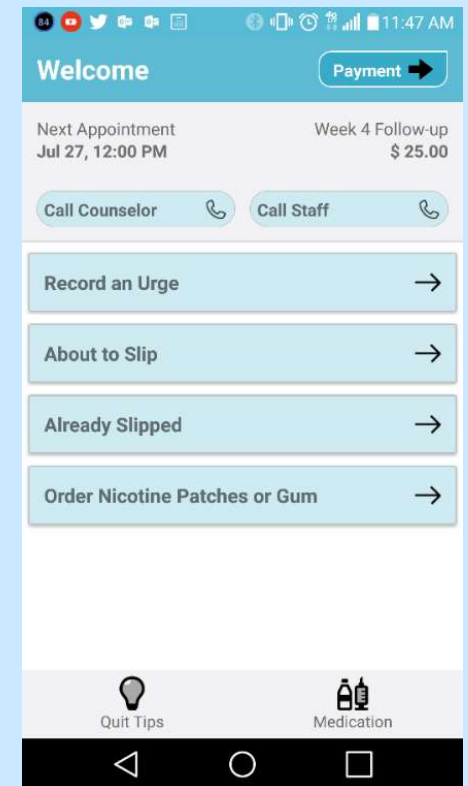
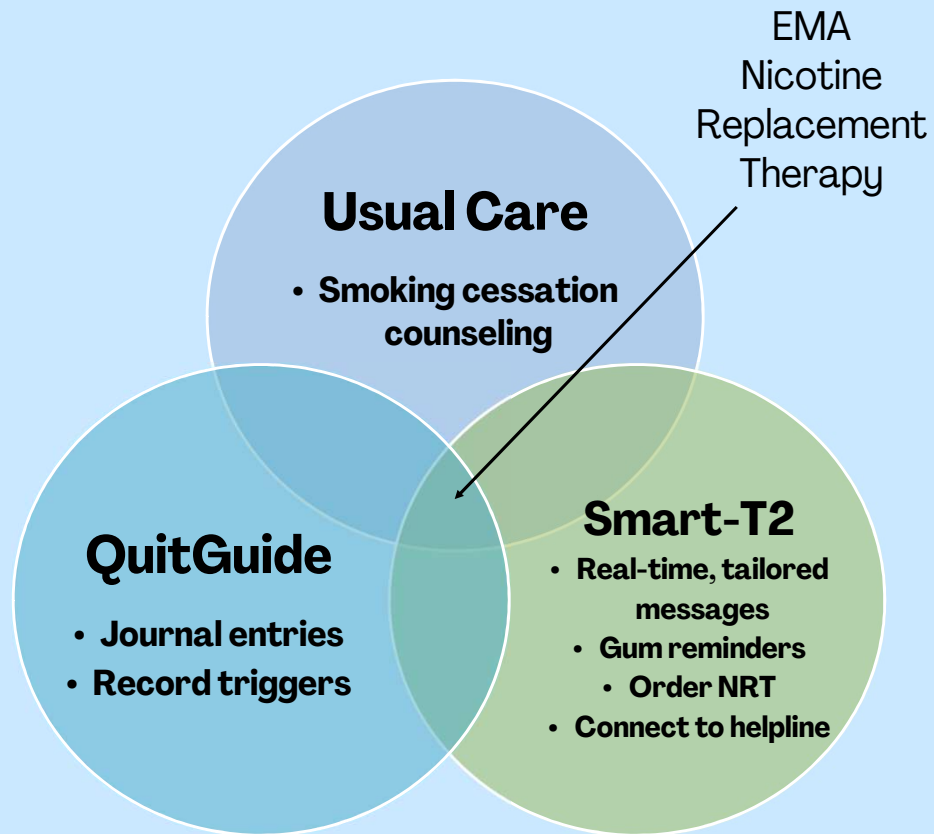
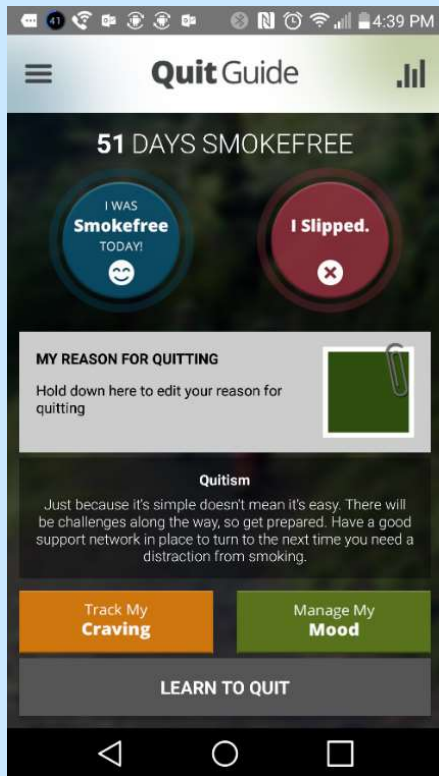
* Department of Psychology, Louisiana State University, Baton Rouge, LA, United States



Messages tailored to the risk factor were more effective in reducing lapse triggers than non-tailored messages.



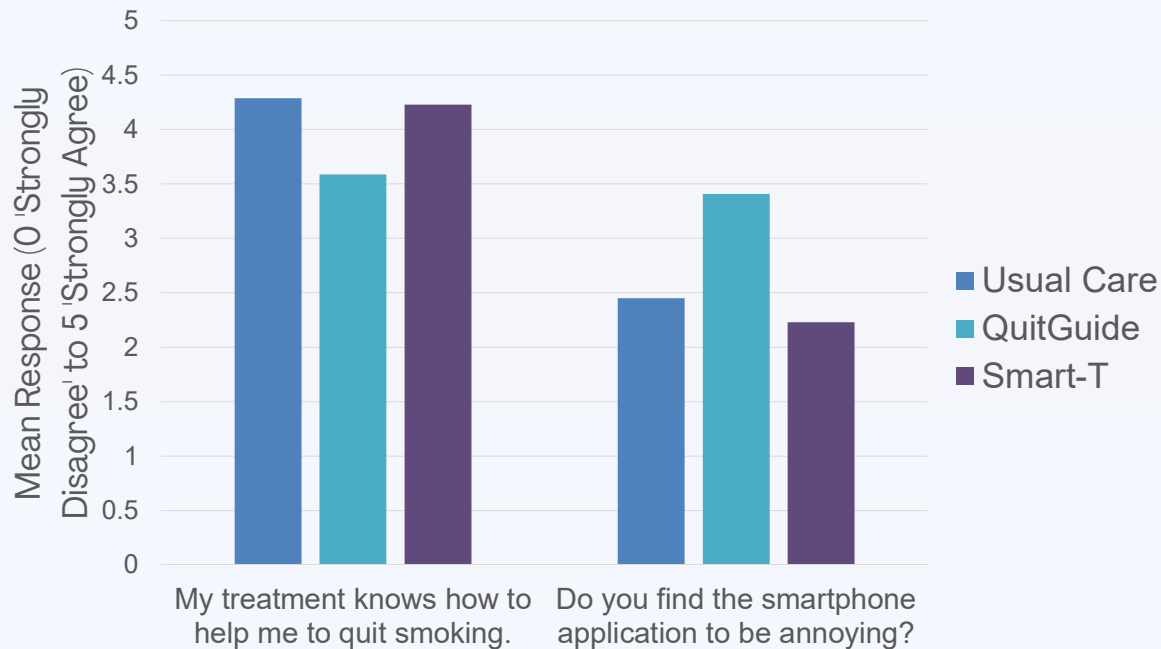
Follow-Up Study: Smart-T2



Original Paper

A Mobile Just-in-Time Adaptive Intervention for Smoking Cessation: Pilot Randomized Controlled Trial

Emily T Hébert¹, DrPH; Chaelin K Ra¹, PhD; Adam C Alexander¹, PhD; Angela Helt¹, MA; Rachel Moisiuc¹, BS; Darla E Kendzor¹, PhD; Damon J Vidrine², DrPH; Rachel K Funk-Lawler³, PhD; Michael S Businelle¹, PhD



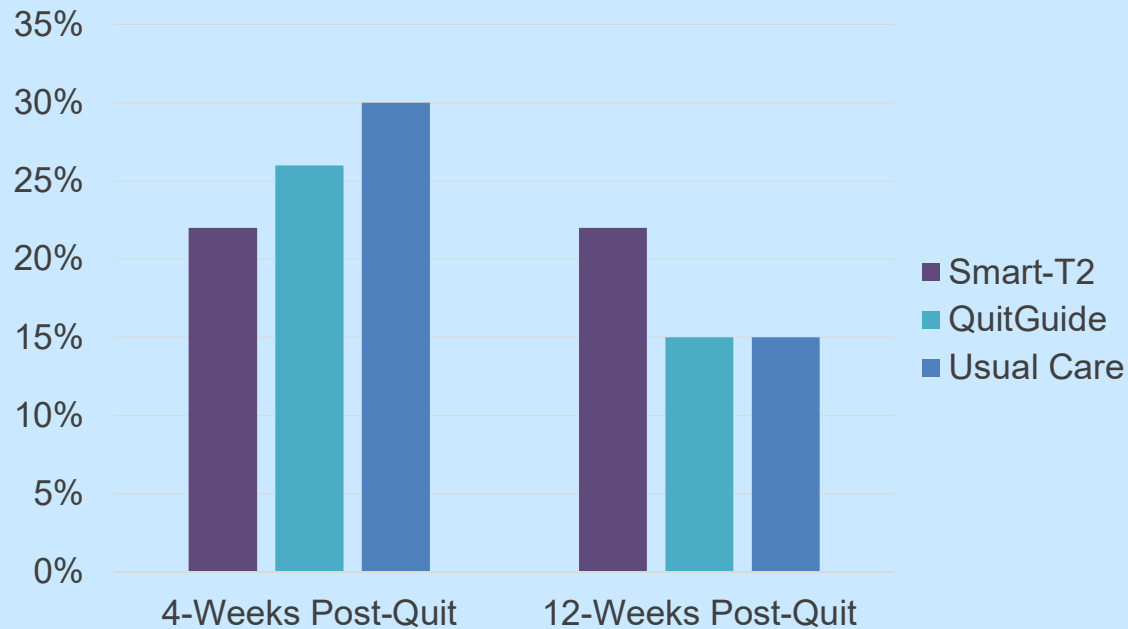
Both app-based interventions (Smart-T2 and QuitGuide) performed at least as well as traditional, in-person counseling in terms of:

- response rates
- loss to follow-up
- participant perceptions of the treatment
- engagement

Smoking Cessation Outcomes



7-Day Point Prevalence Abstinence



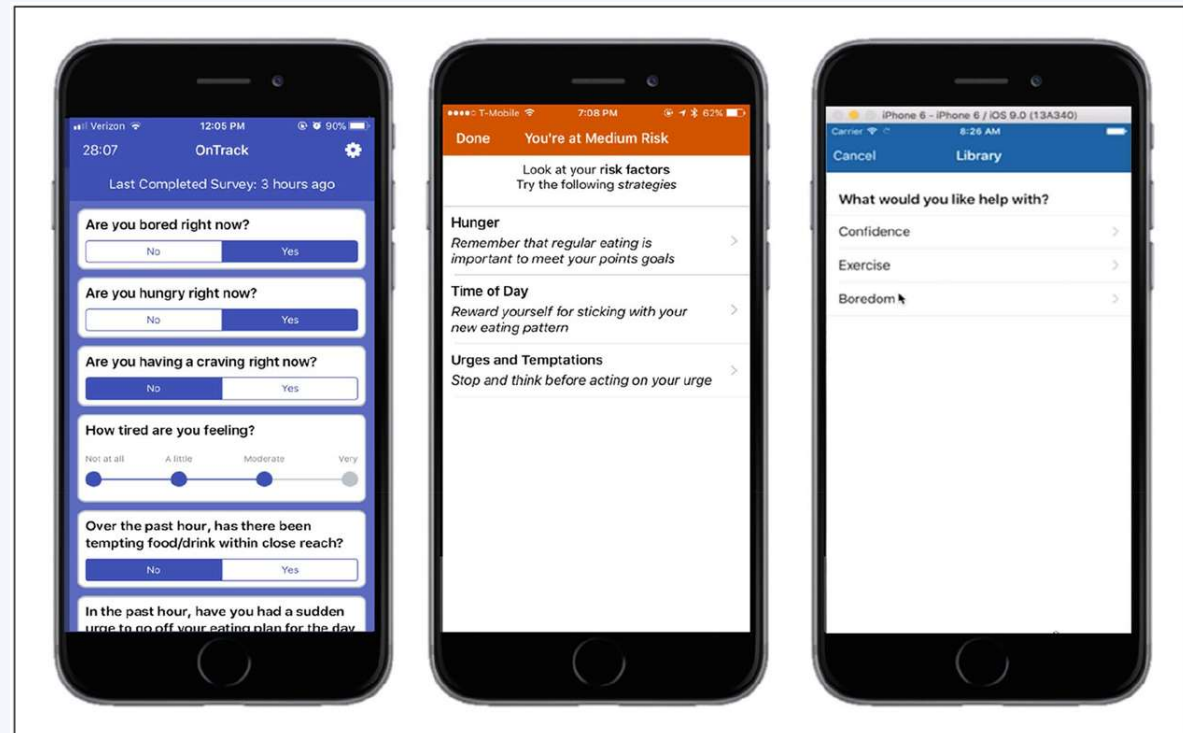
Smartphone-based smoking cessation treatments may be capable of providing similar outcomes to traditional, in-person counseling.



JITAs for Diet and Physical Activity



- **Physical activity and dietary behaviors are dynamic, vary within person, over time, and by context**
- **JITAs have targeted obesity and weight management, physical activity and eating disorders**



Screenshot of *OnTrack*, a JITAI to prevent dietary lapse
Goldstein, Stephanie P., et al. "Refining an algorithm-powered just-in-time adaptive weight control intervention: a randomized controlled trial evaluating model performance and behavioral outcomes." *Health informatics journal* 26.4 (2020): 2315-2331.



JITAI Design Considerations



- **How to deal with habituation?**
- **How to limit participant burden?**
- **How can you optimize your intervention?**

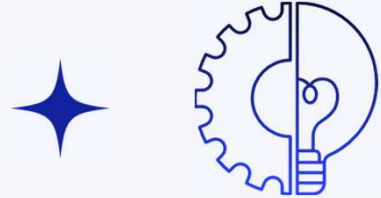


Habituation

the diminishing of a psychological or emotional response to a frequently repeated stimulus



Micro-randomized Trials (MRTs)



EACH DAY OF THE STUDY

6 Observations of Context: location, weather, time of day, day of the week, prior day's step count, prior 30-min step count, variation in prior 30-min step count over past 7 days, movement, usefulness of prompt, self-reports of physical activity from prior evening.

1 Activity Suggestion

5 5 times every day

7 A?

YES

R

8

.3

.3

.4

2 walking suggestion

anti-sedentary suggestion

no suggestion

4

steps in 30 min

3

Total steps taken during study

Klasnja, P., et al.(2015). Microrandomized trials: An experimental design for developing just-in-time adaptive interventions. Health Psychology, 34(S), 1220.

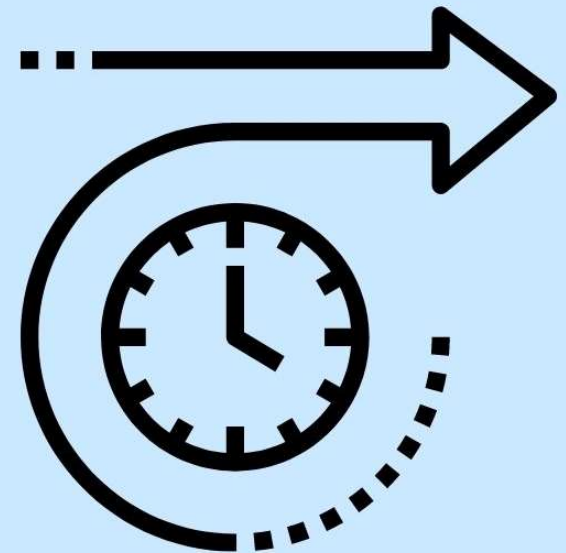
Goal: to optimize mHealth interventions by assessing the effect of intervention components and assessing whether the intervention component effects vary with time or the individuals current context.

Participants are randomized hundreds or thousands of times at each decision point to different intervention options/components.



Future Directions

- **Improving scalability of JITAs**
 - Reducing participant burden
 - Relying more on passively collected data
- **Better prediction of health behaviors**
 - Machine learning



Acknowledgements



- **Michael Businelle, Ph.D.**
- **Darla Kendzor, Ph.D.**
- **Robert Suchting, Ph.D.**
- **Matthew Koslovsky, Ph.D.**



TSET Health Promotion Research Center



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Questions?