# The Effects of Social Media and Apps in the Treatment of Mental Health Disorders

John Torous MD MBI

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# Conflicts of Interest

- Investigator Initiated Study on Abilify MyCite Supported by Otsuka

# Outline

- State of Smartphones and Mental Health
- Digital Phenotyping and Social Media
- App Evaluation
- Informed Consent in the Digital Age

# Finding Focus in Digital Mental Health

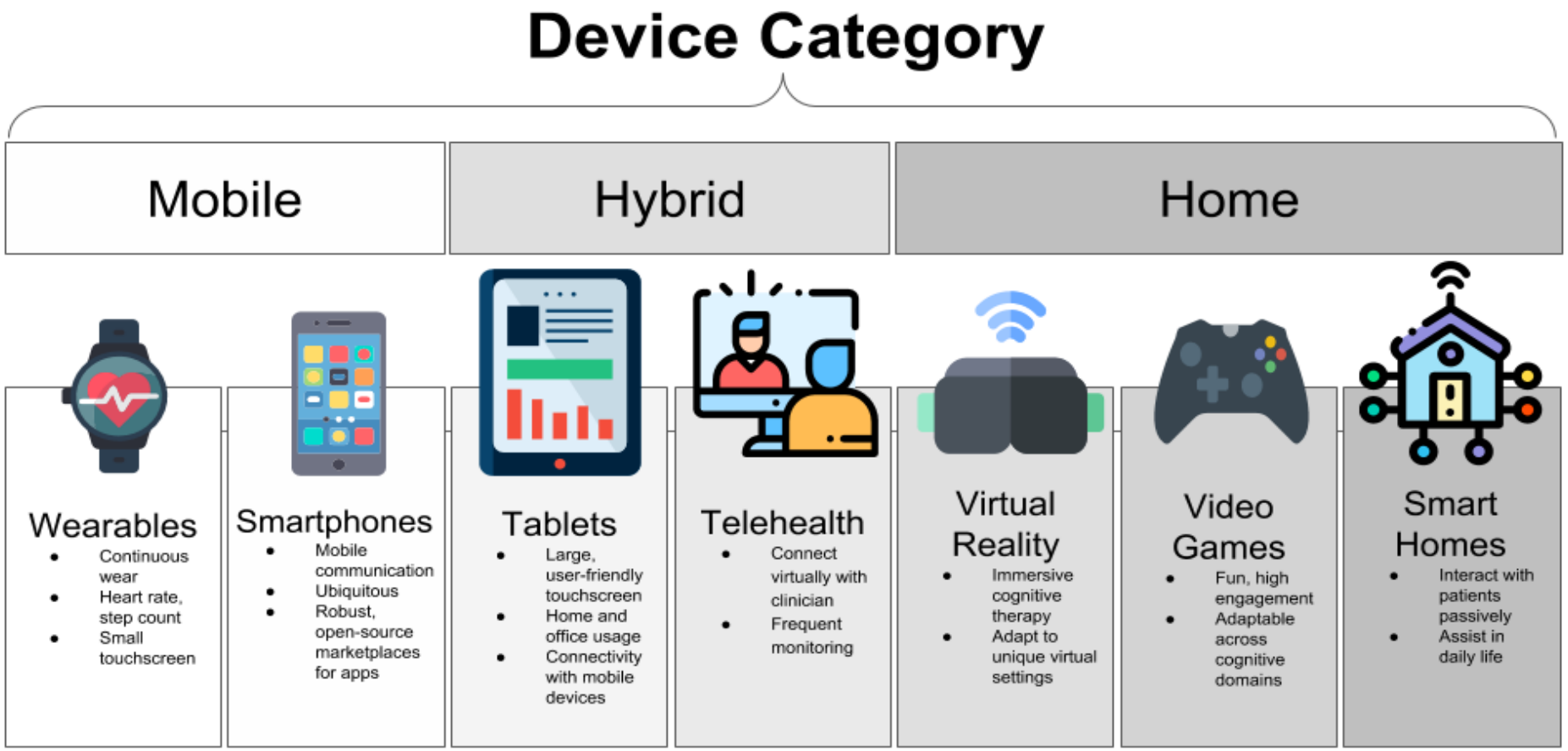


Image by Ryan Hays, BIDMC Digital Psychiatry

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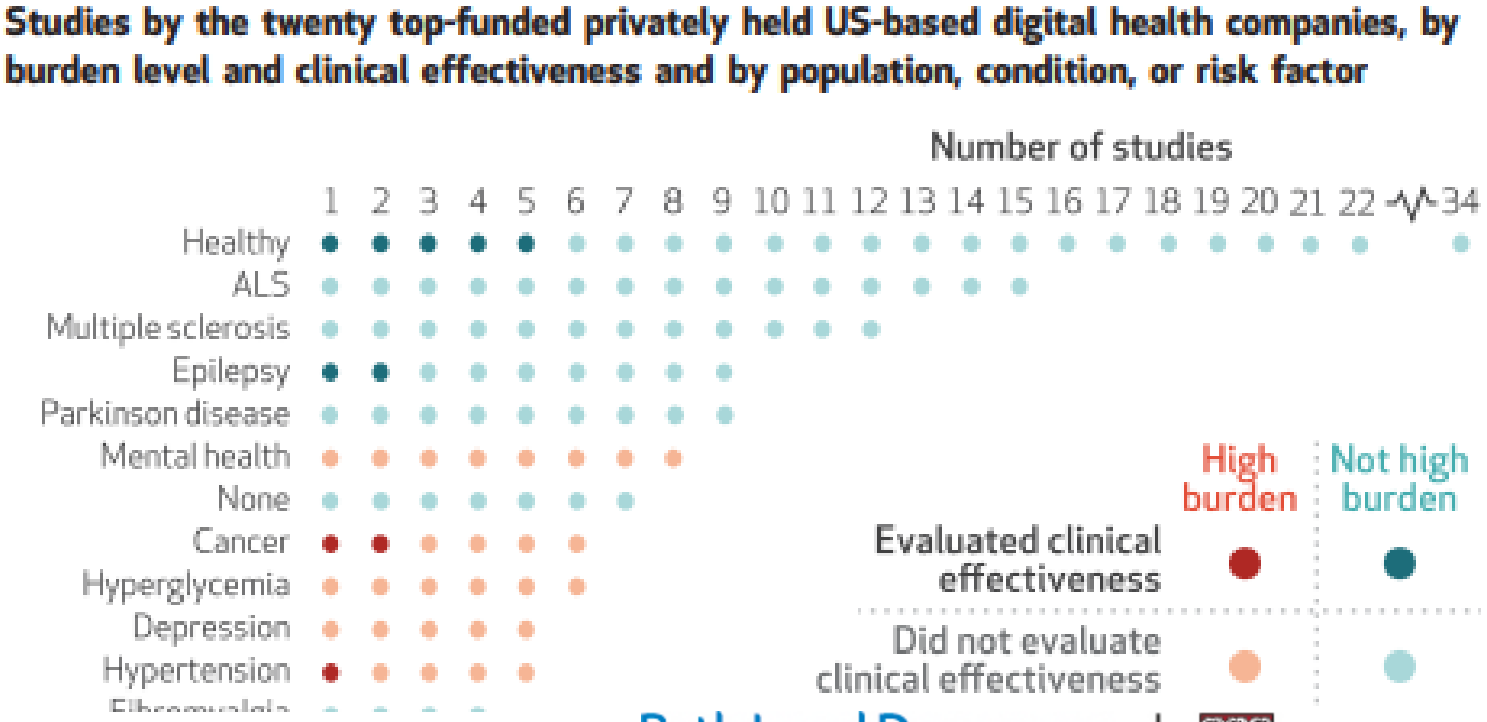
# State of Smartphones and Mental Health

- Number of Mental Health Apps: 10,000
- Number of FDA Approved Mental Health Apps: 1
- Industry Studies ->





Torous J, Roberts LW. Needed innovation in digital health and smartphone applications for mental health: transparency and trust. JAMA psychiatry. 2017 May 1;74(5):437-8.

Safavi K, Mathews SC, Bates DW, Dorsey ER, Cohen AB. Top-Funded Digital Health Companies And Their Impact On High-Burden, High-Cost Conditions. Health Affairs. 2019 Jan 1;38(1):115-23.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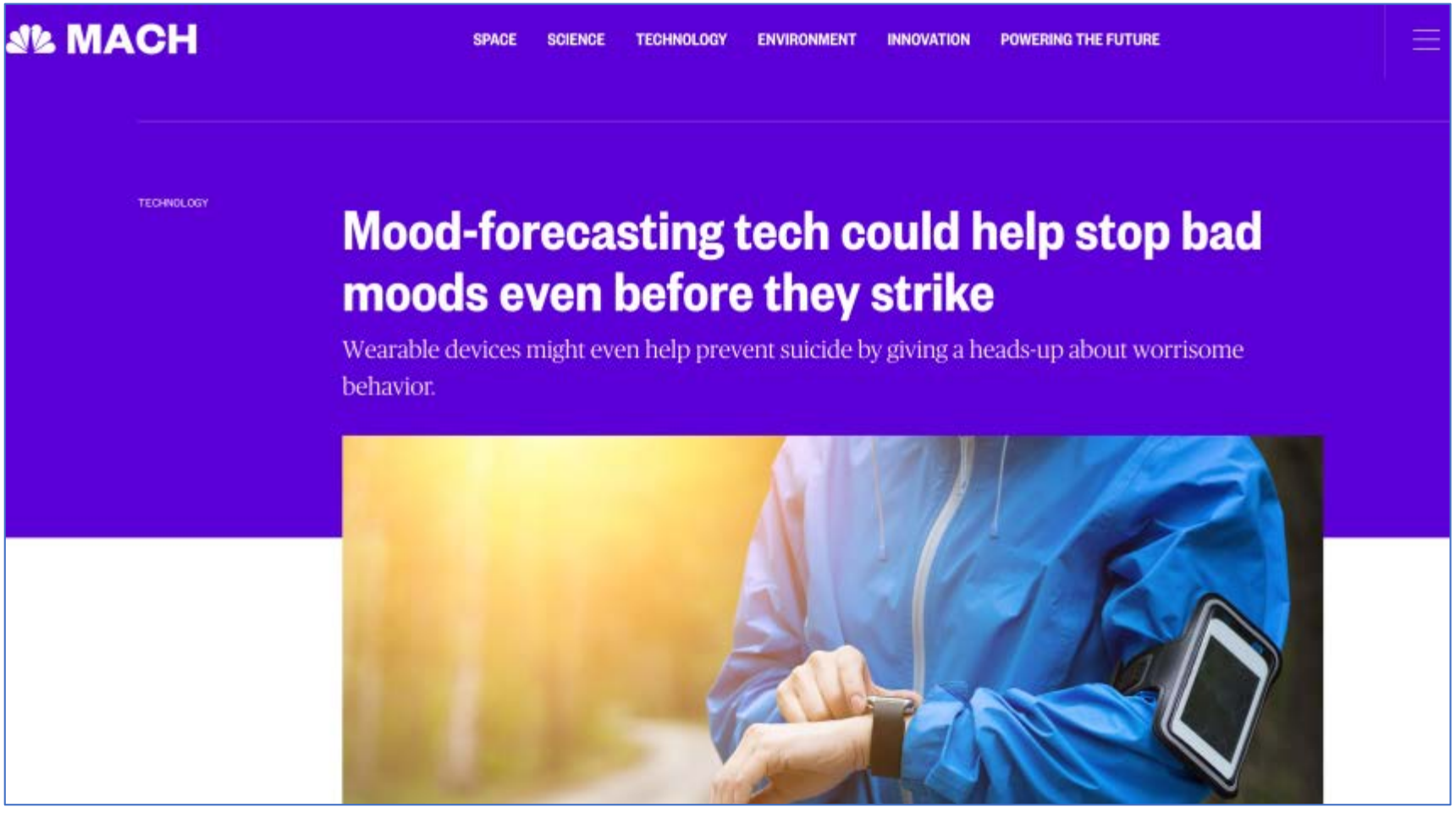
# State of Smartphones and Mental Health




Feb 19th, 2019

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# State of Smartphones and Mental Health

## NHS to launch first internet addiction clinic

**Exclusive: centre in London will focus on gaming disorders, with plans to expand**

June 22, 2018

## Instagram Bans Suicidal or Self-Harm Related Content After Outrage Following Death of 14-year-old UK Girl

Molly Russel's death, which sparked an international outrage against Instagram, was linked to the graphic con that she was posting and apparently consuming on the platform.

News18.com | Updated:February 20, 2019, 1:35 PM IST

Feb 20, 2019

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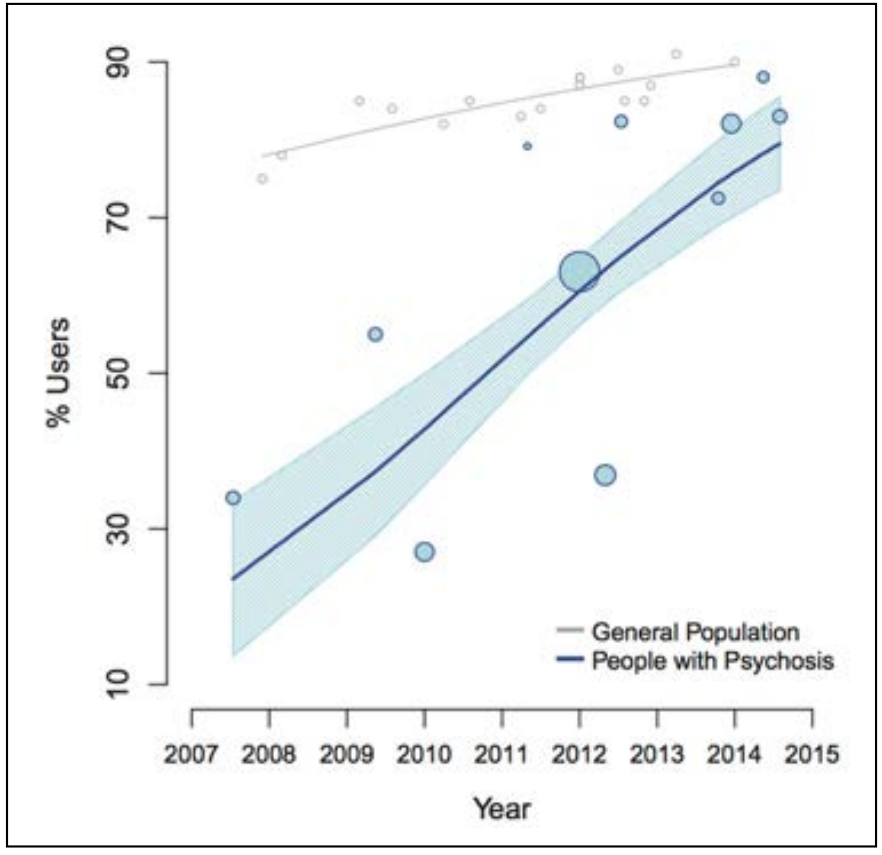
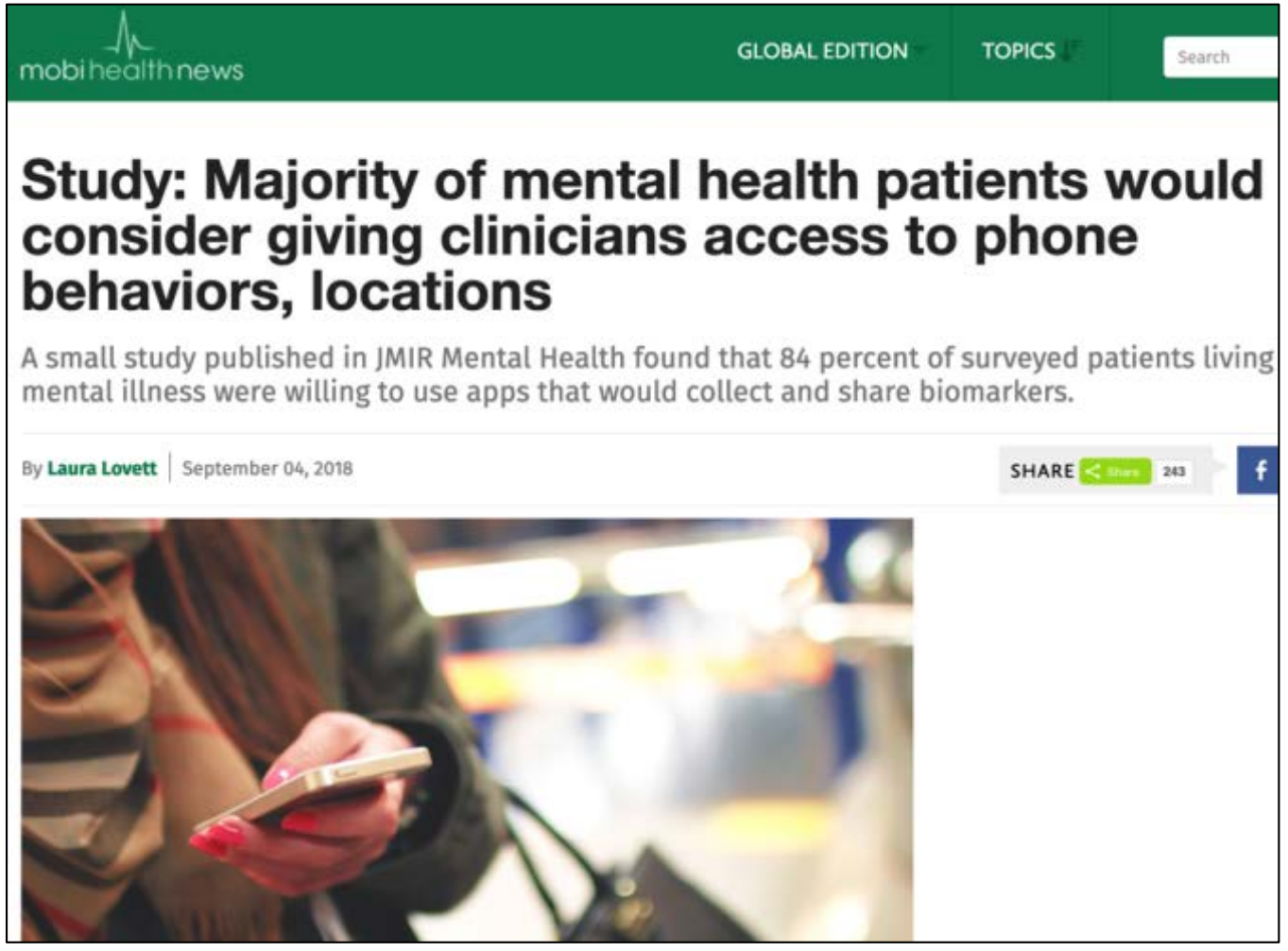
# State of Smartphones and Mental Health




Mobile Phone Ownership and Endorsement of "mHealth" Among People With Psychosis: A Meta-analysis of Cross-sectional Studies.J Firth, J Cotter, J Torous, S Bucci, JA Firth, AR Yung. Schizophrenia Bulletin. 2016



mobihealthnews

GLOBAL EDITION TOPICS Search

## Study: Majority of mental health patients would consider giving clinicians access to phone behaviors, locations

A small study published in JMIR Mental Health found that 84 percent of surveyed patients living mental illness were willing to use apps that would collect and share biomarkers.

By Laura Lovett | September 04, 2018

SHARE 243

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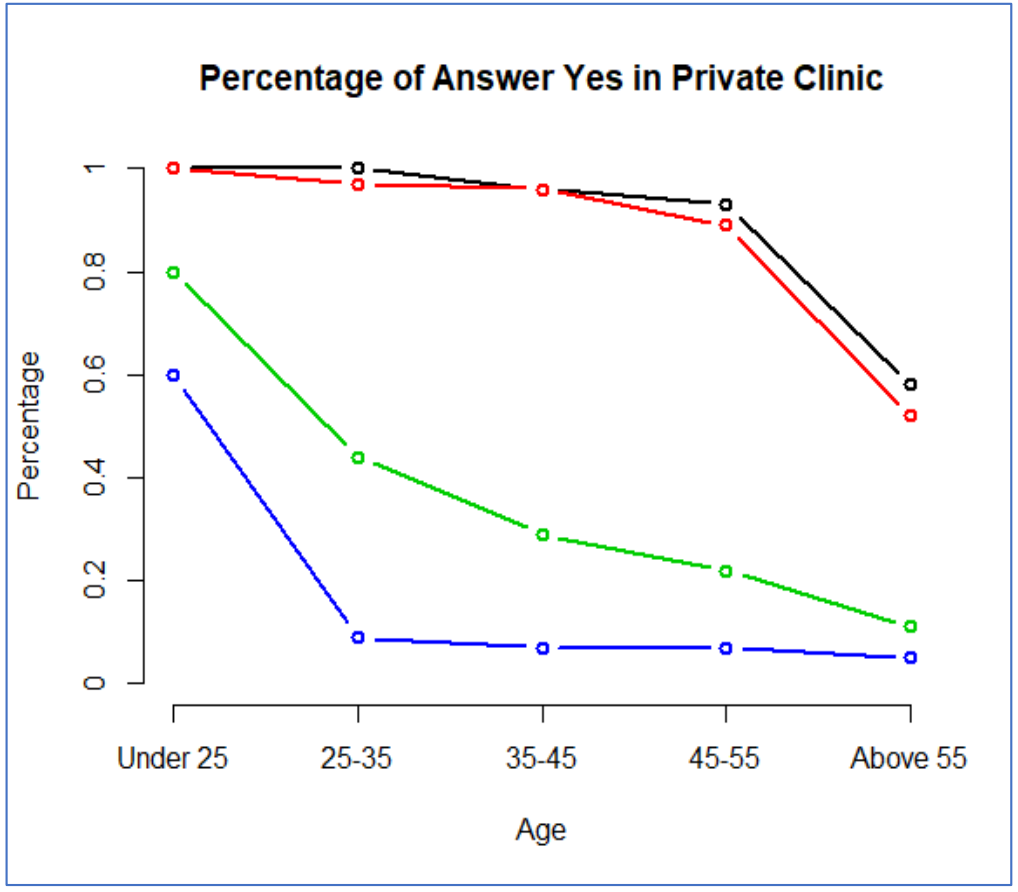
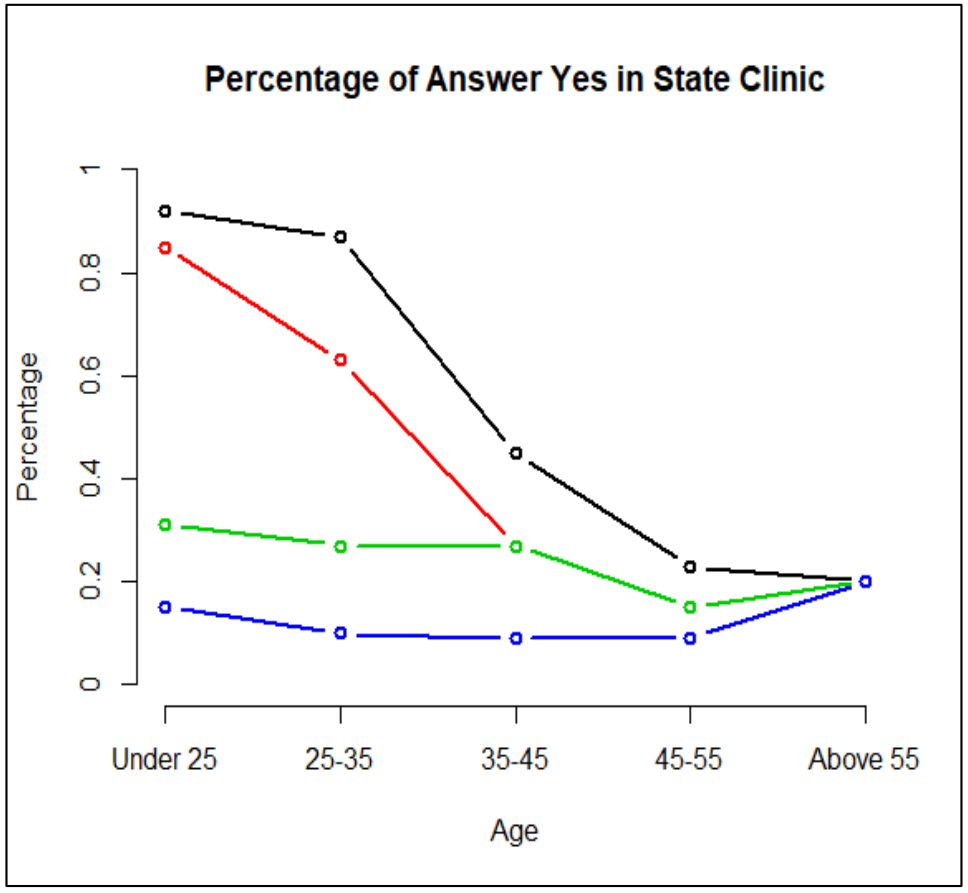
# State of Smartphones and Mental Health

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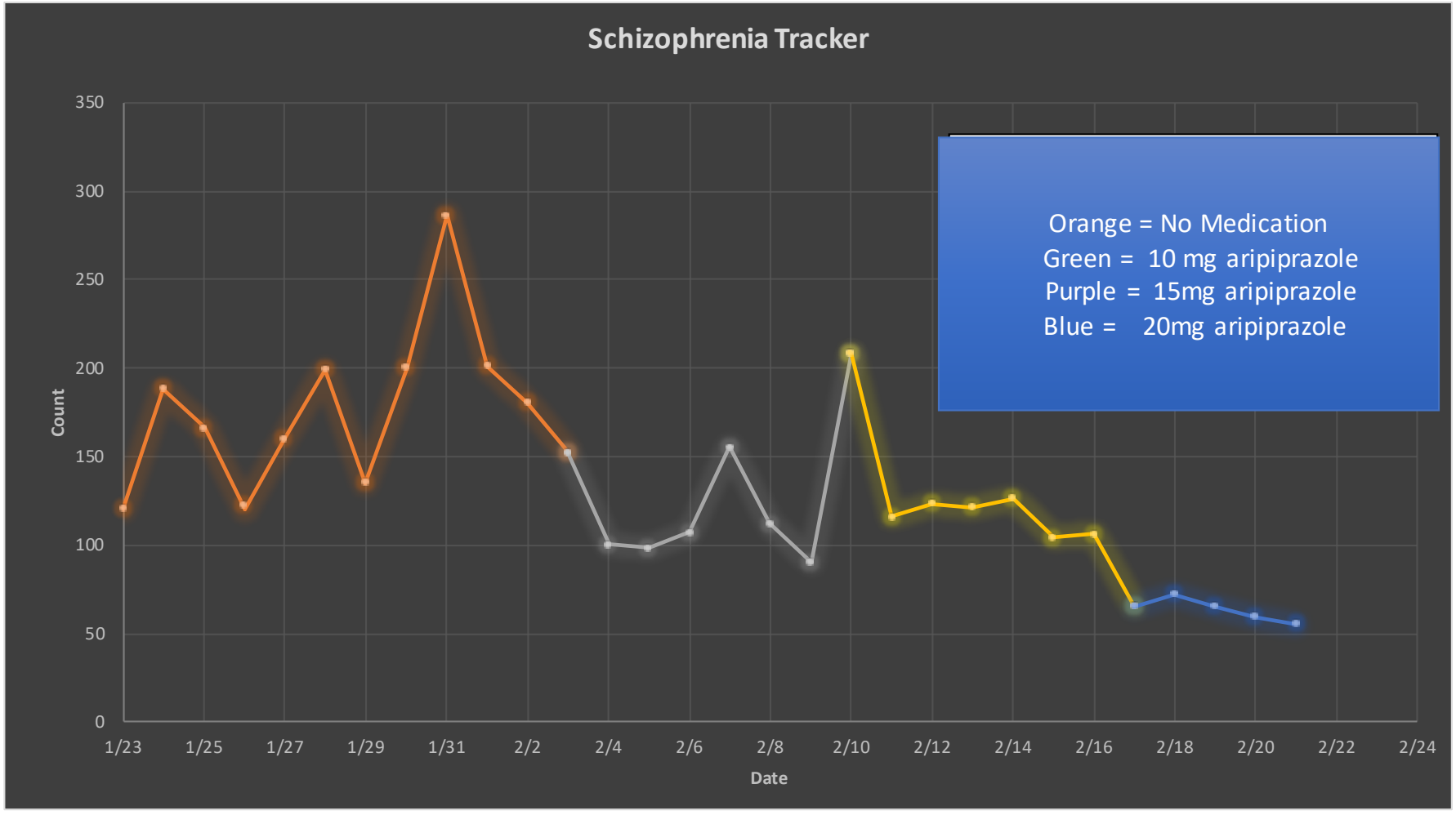


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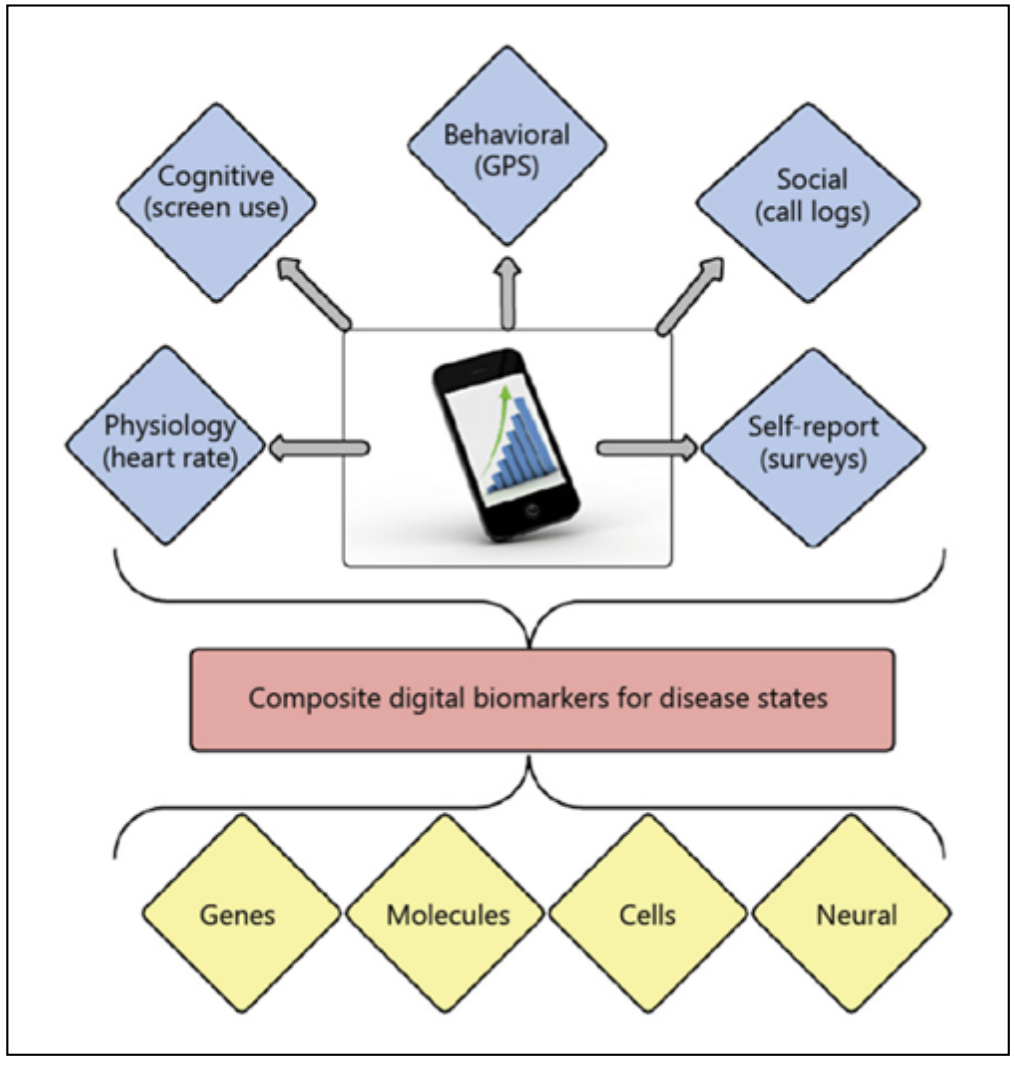


Torous J, Rodriguez J, Powell A. The new digital divide for digital biomarkers. Digital biomarkers. 2017;1(1):87-91.

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Physical Activity

Symptom Surveys

Cognitive Testing

Time Stamps

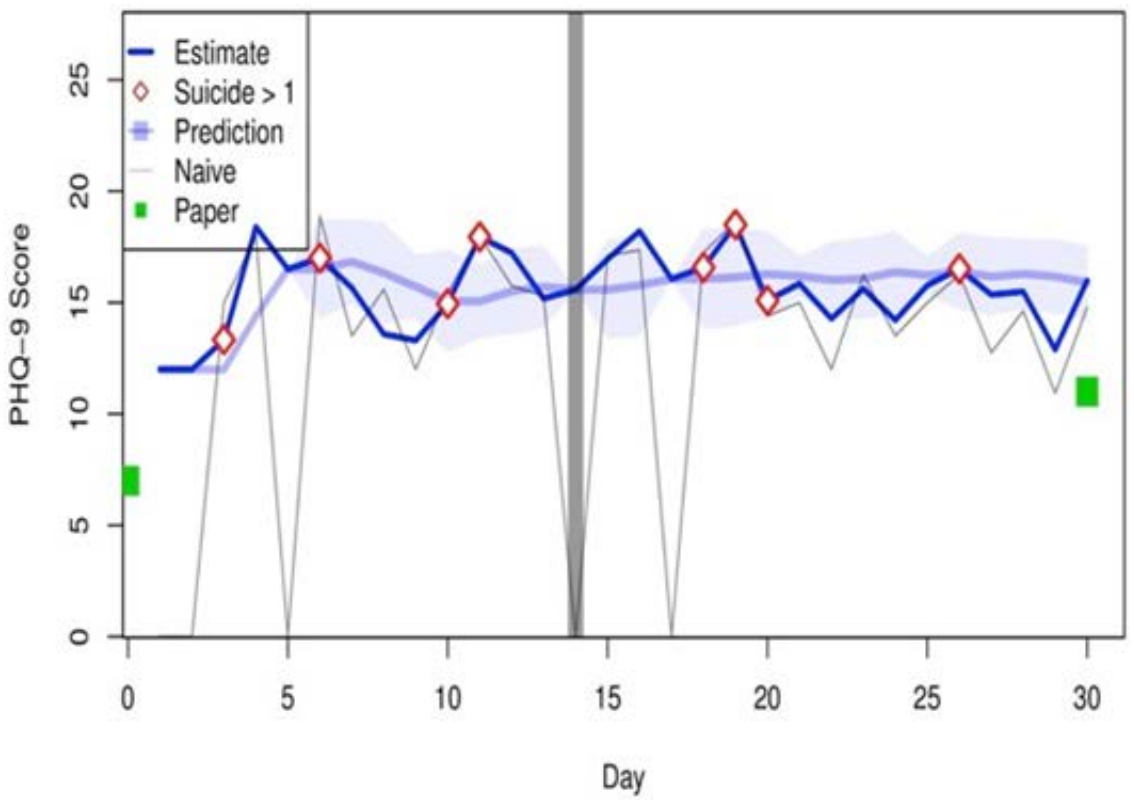
Geo-Location / GPS

**Activity**

**Symptoms**

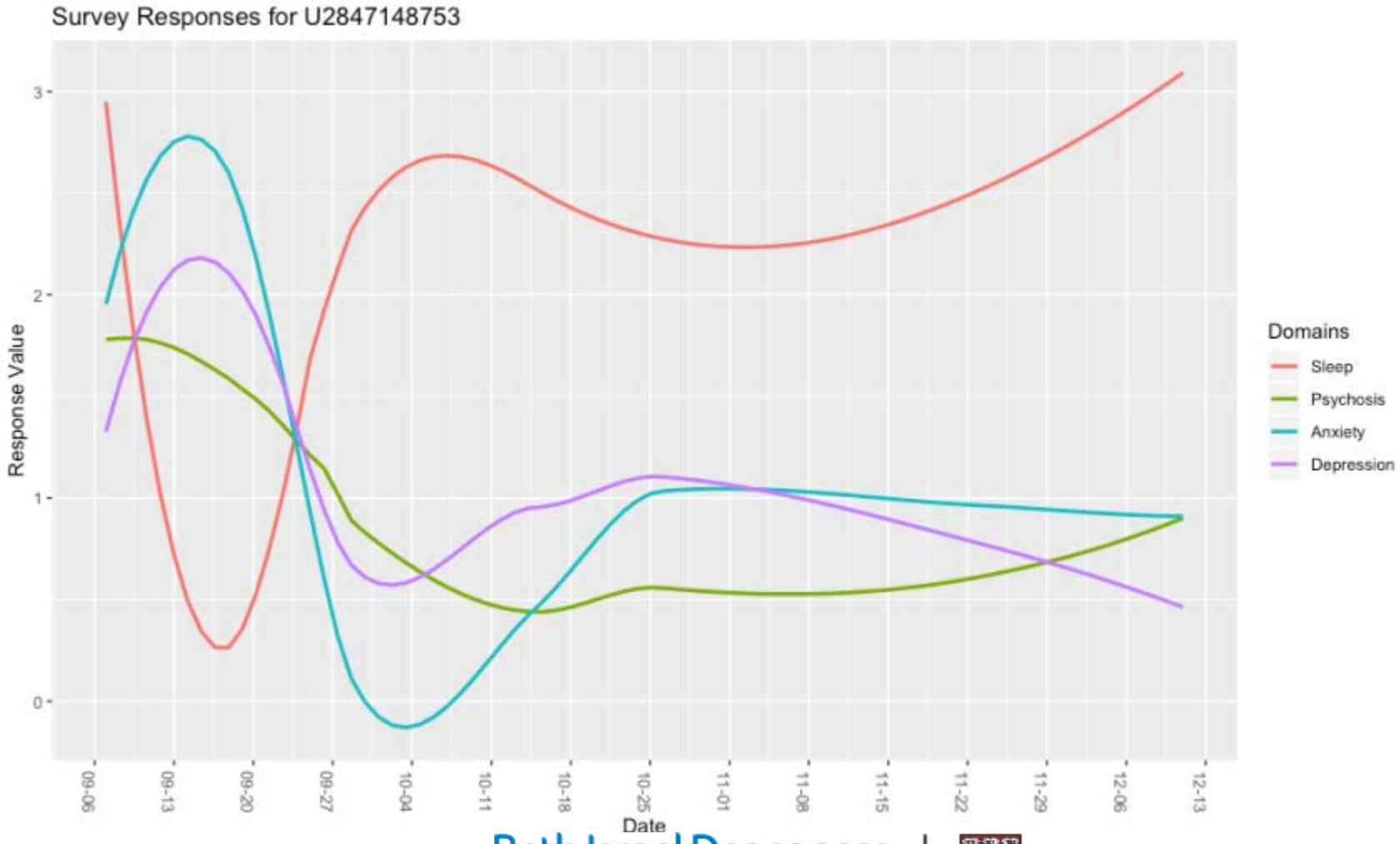
**Environment**

# Smartphones -> New Longitudinal Symptom Data




Torous J, Staples P, Shanahan M, Lin C, Peck P, Keshavan M, Onnela JP. Utilizing a Personal Smartphone Custom App to Assess the Patient Health Questionnaire-9 (PHQ-9) Depressive Symptoms in Patients With Major Depressive Disorder. JMIR Ment Health 2015;2(1):e8

# Smartphones -> New Longitudinal Symptom Data

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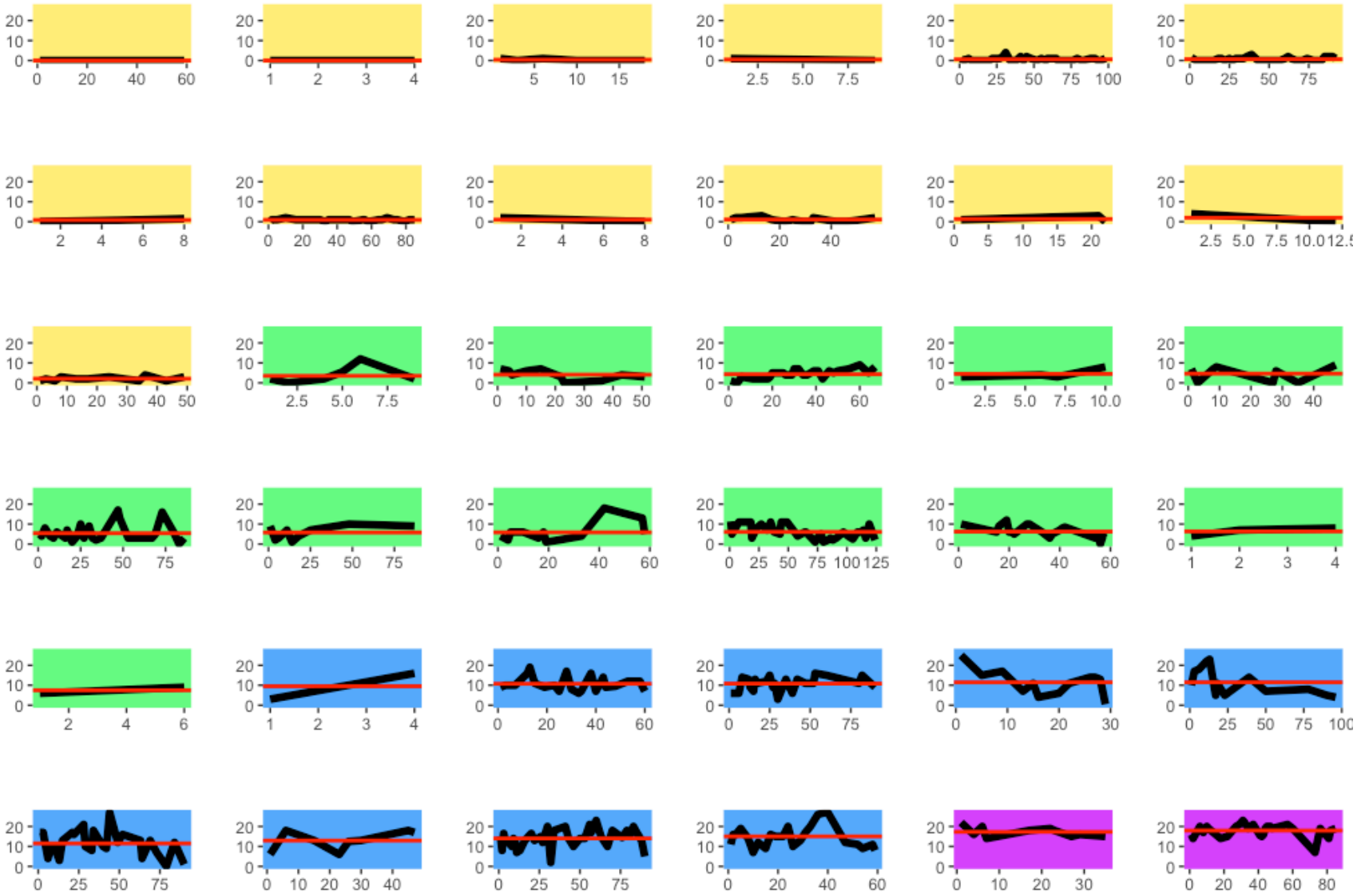
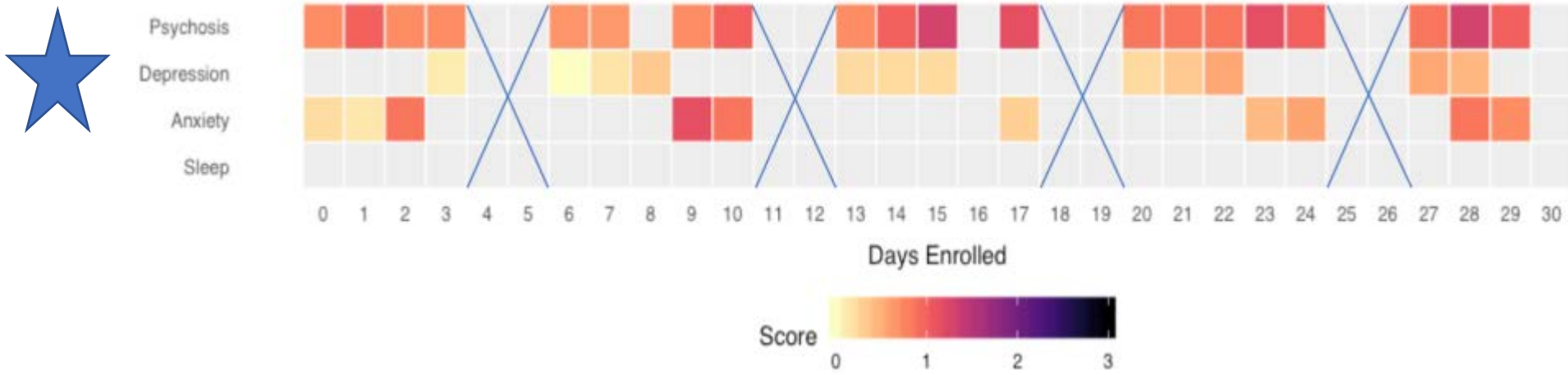
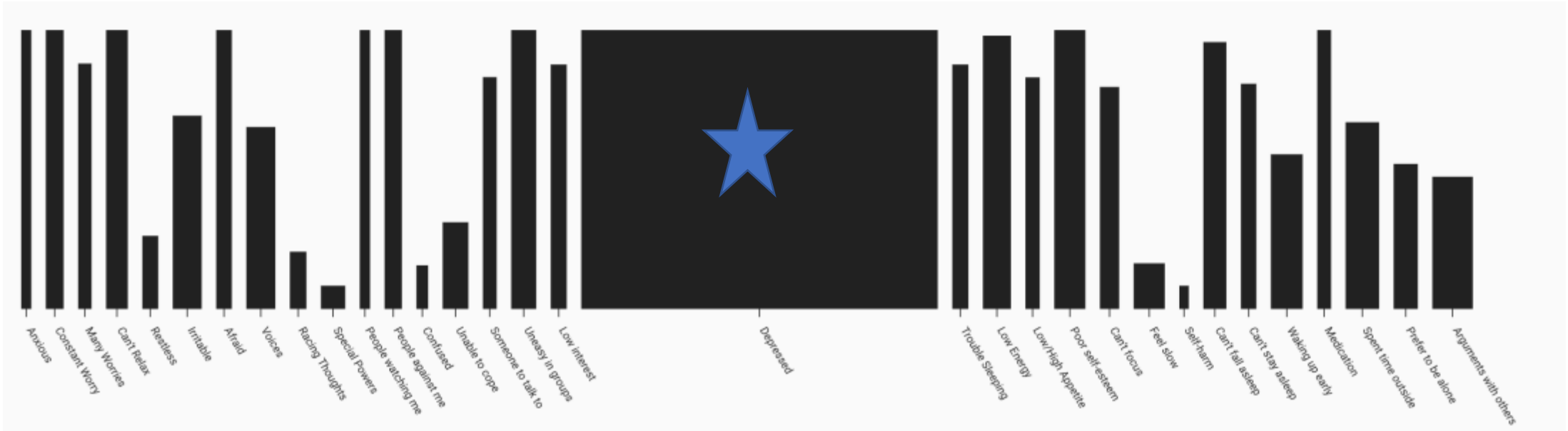


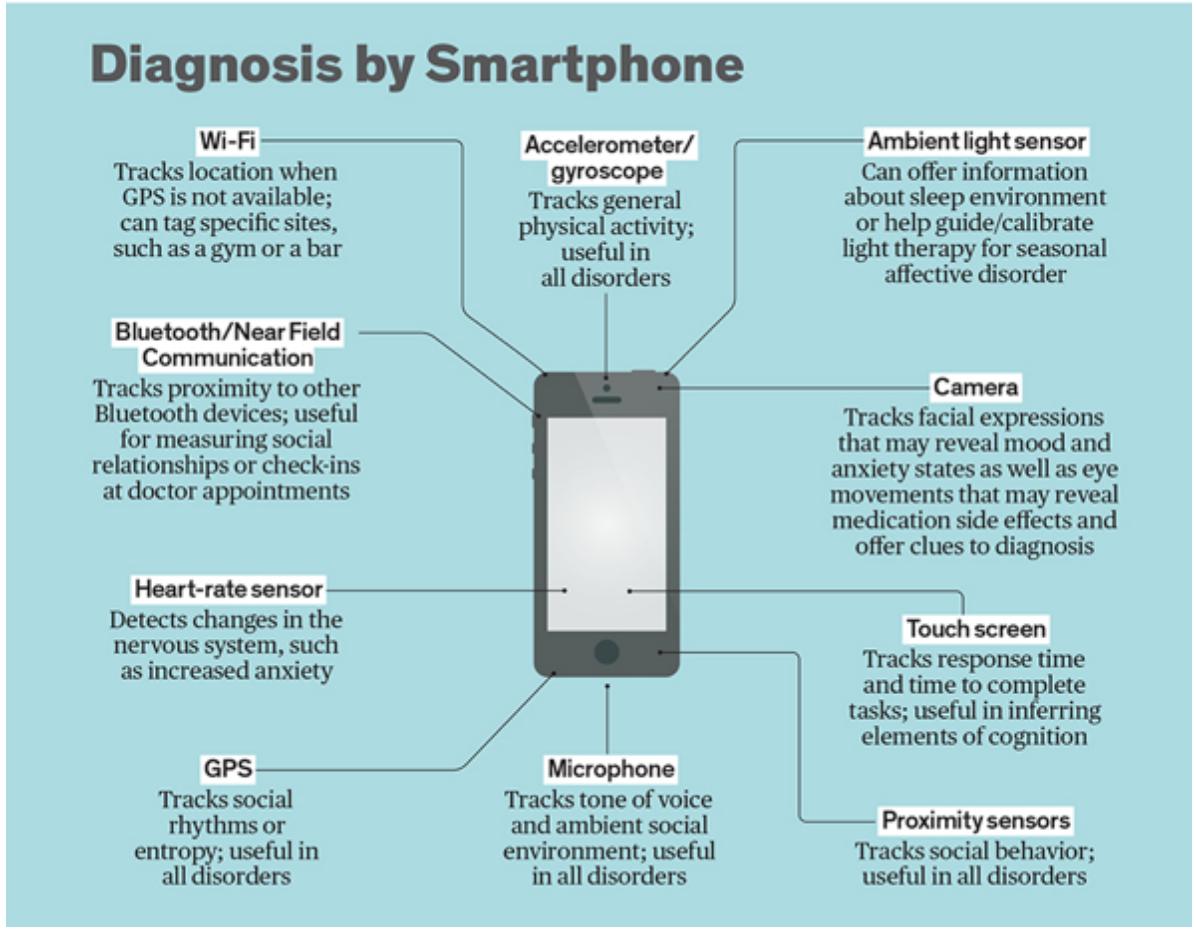
Figure by Philip Henson, BIDMC Digital Psychiatry

# Smartphones -> New Longitudinal Symptom Data



# Smartphones -> New Functional Data




A Software Shrink: Apps and Wearables Could Usher In an Era of Digital Psychiatry. IEEE Spectrum. 2017.

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# Active and Passive (n= 1 example)

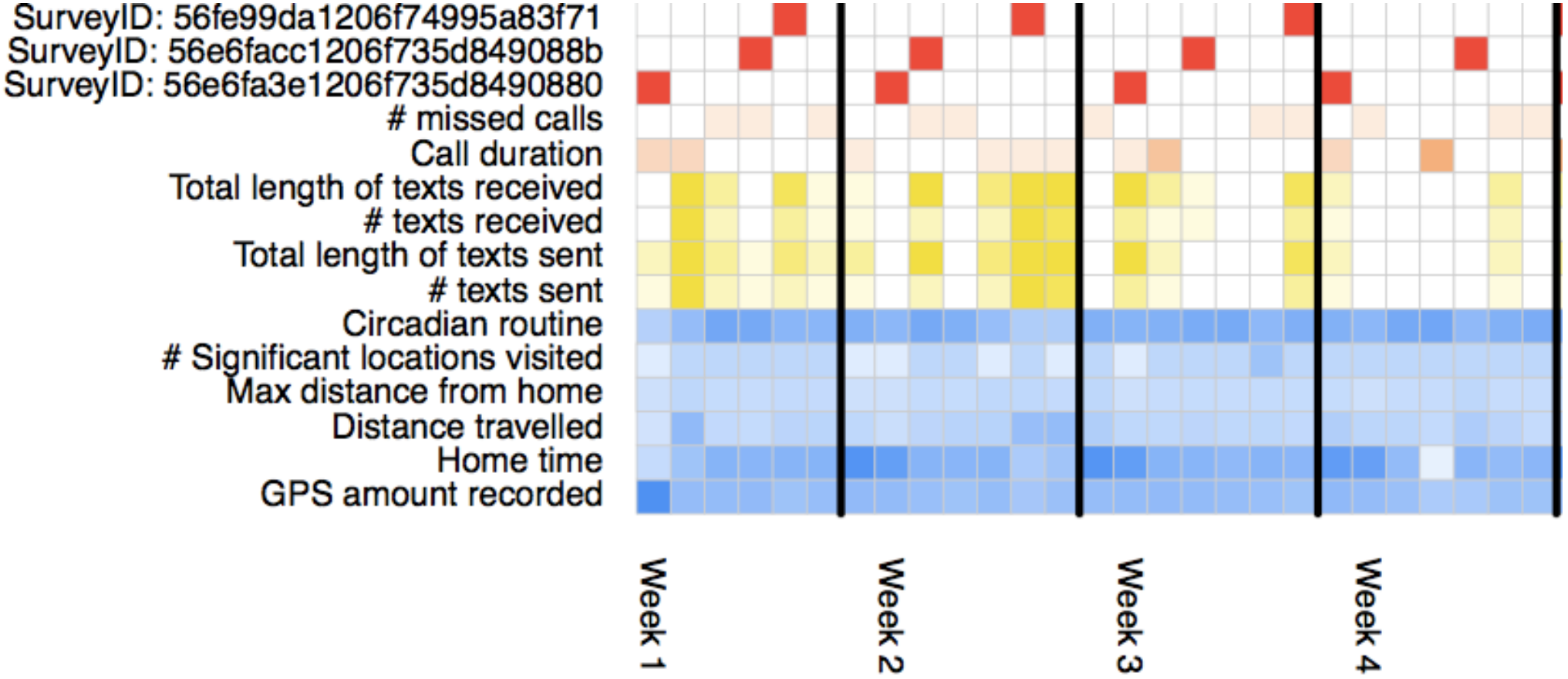


Image by Ian Barnett PhD, UPenn

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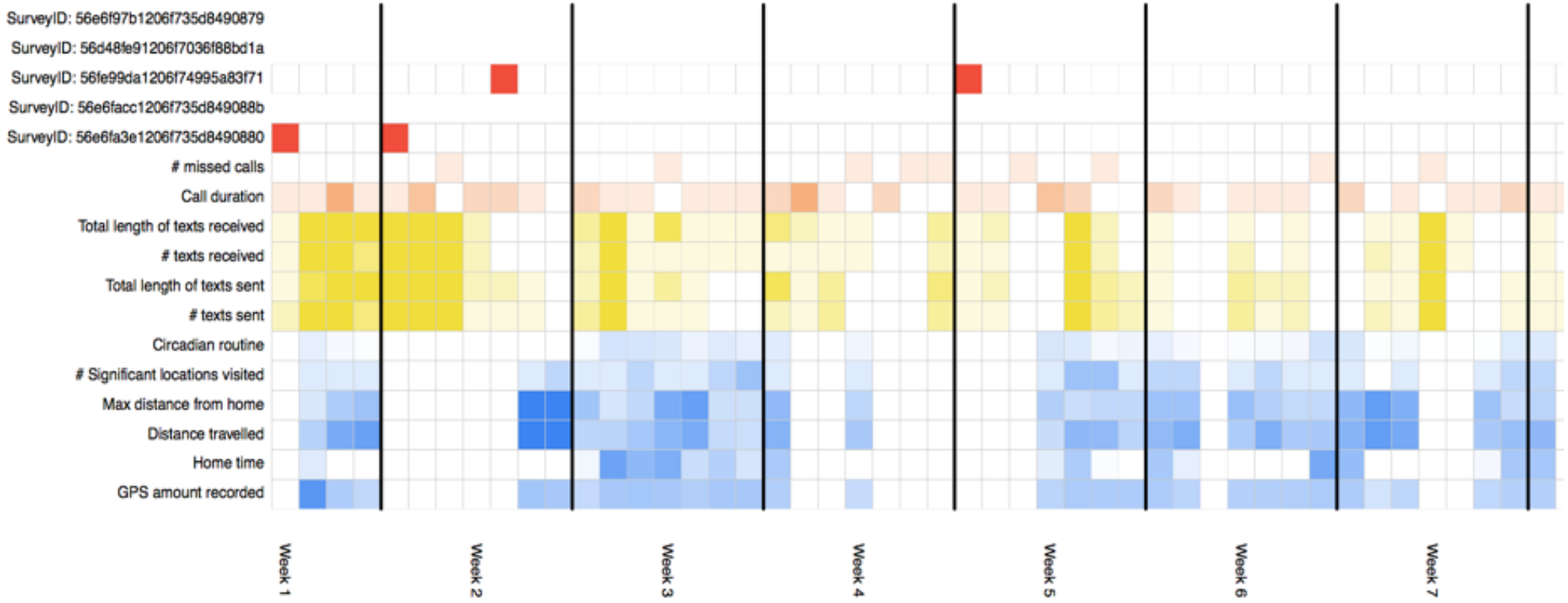


Image by Ian Barnett PhD, UPenn

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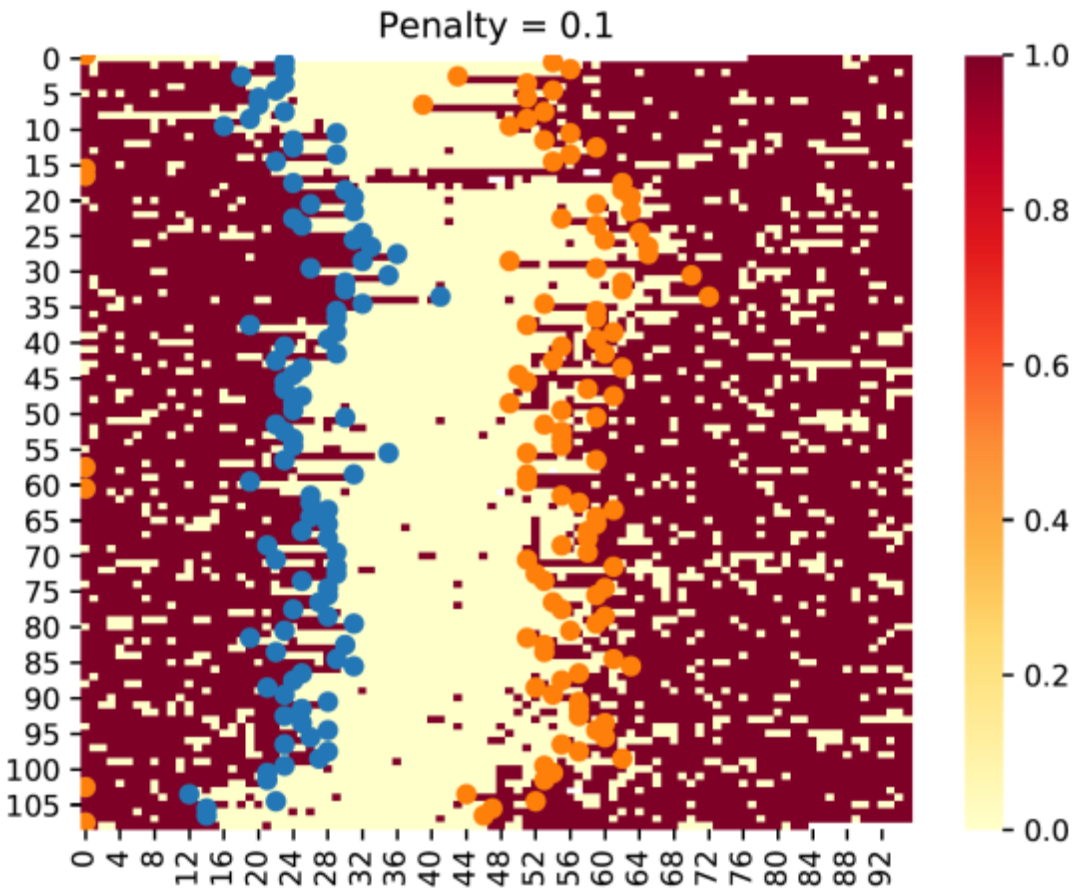
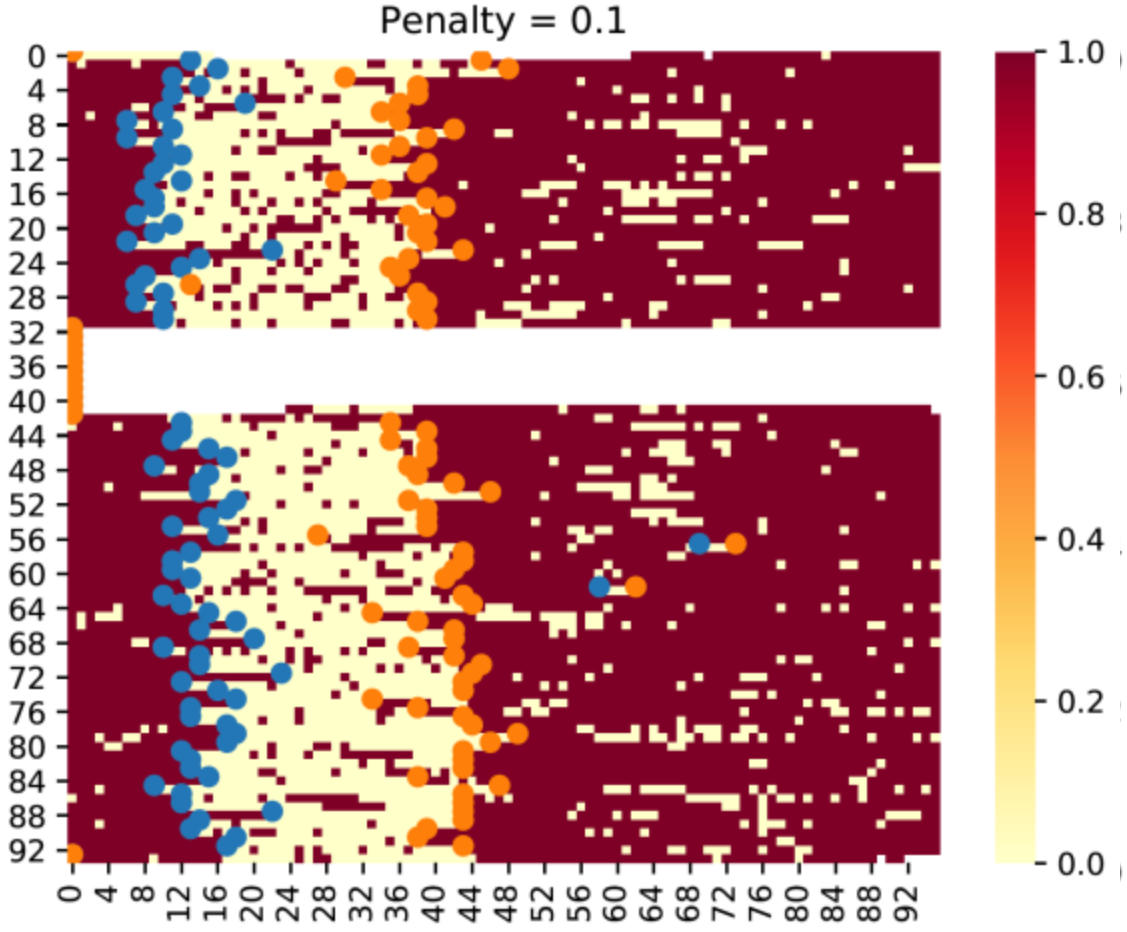
# Towards Sleep from Sensors

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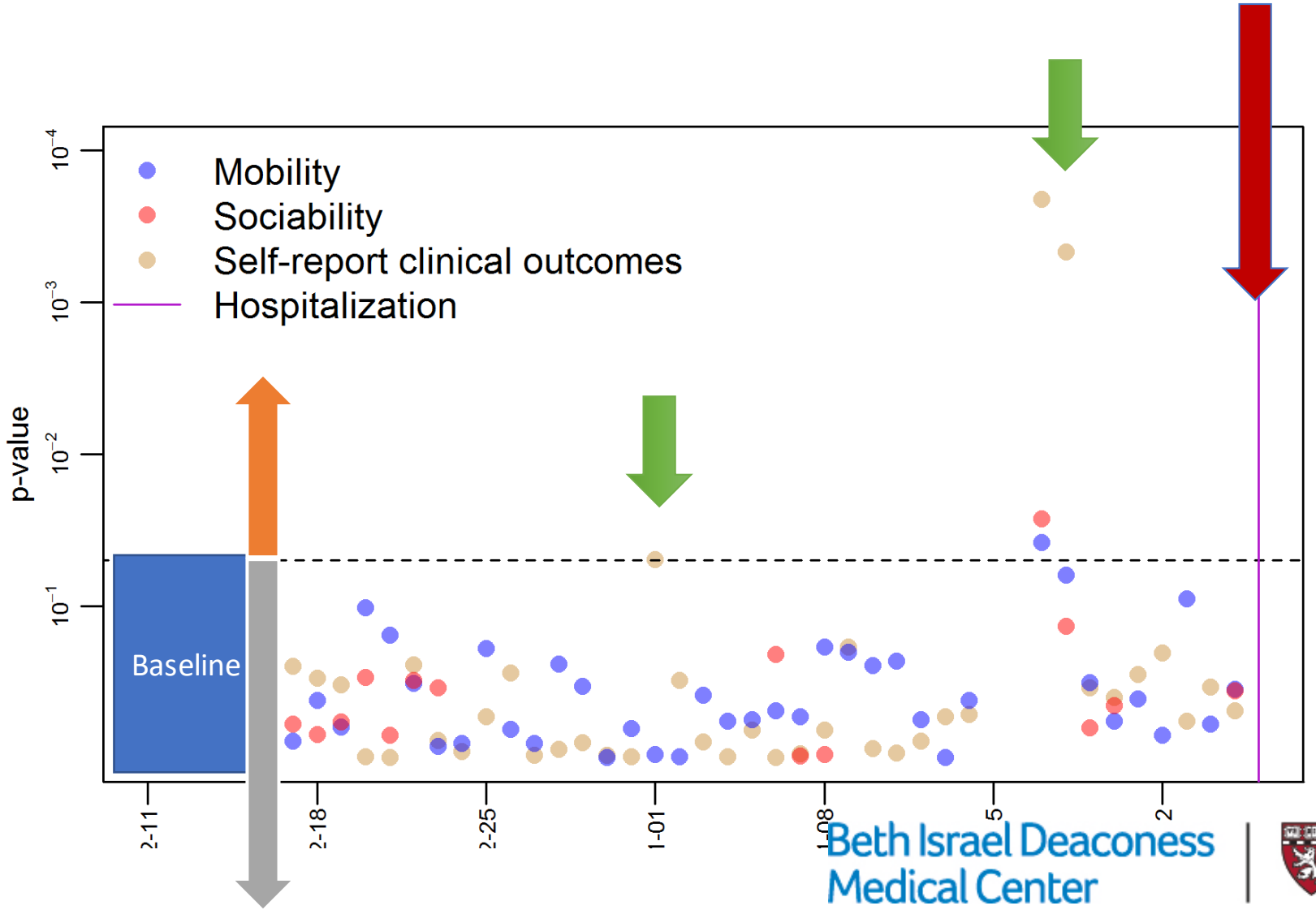
# Smartphones -> New Functional Data

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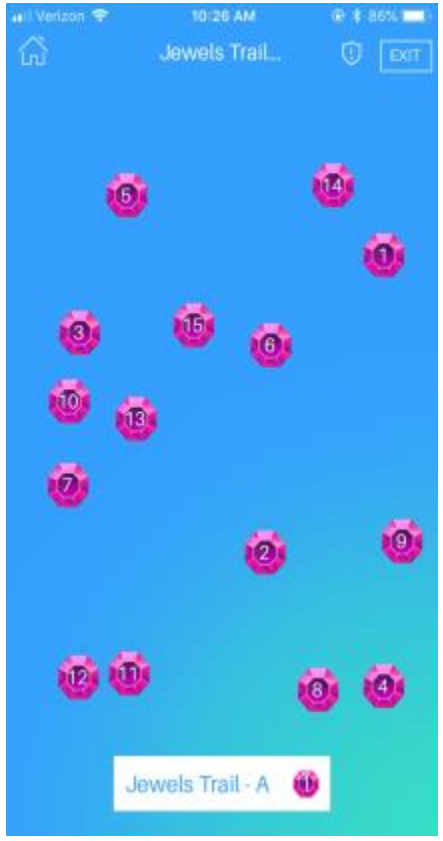
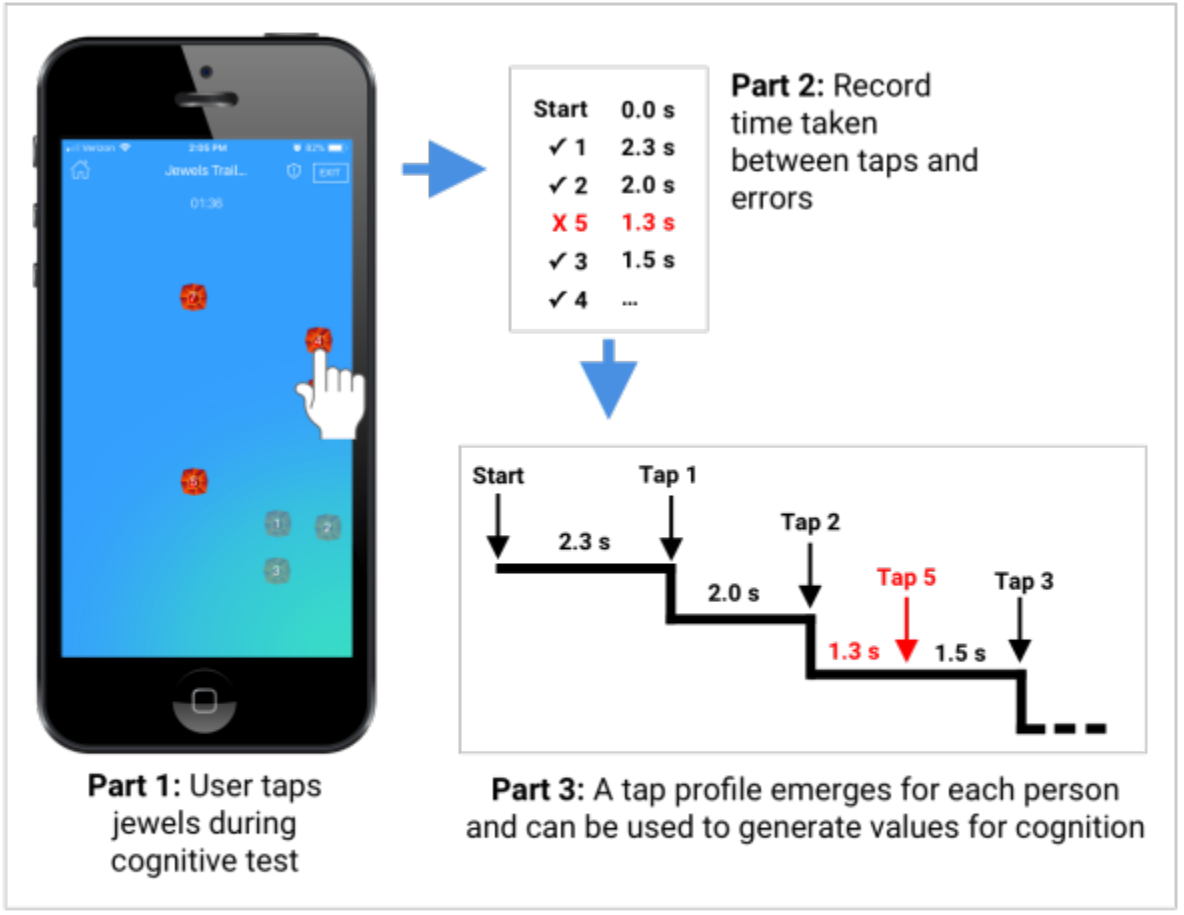
# Smartphones -> New ‘Cognitive’ Data

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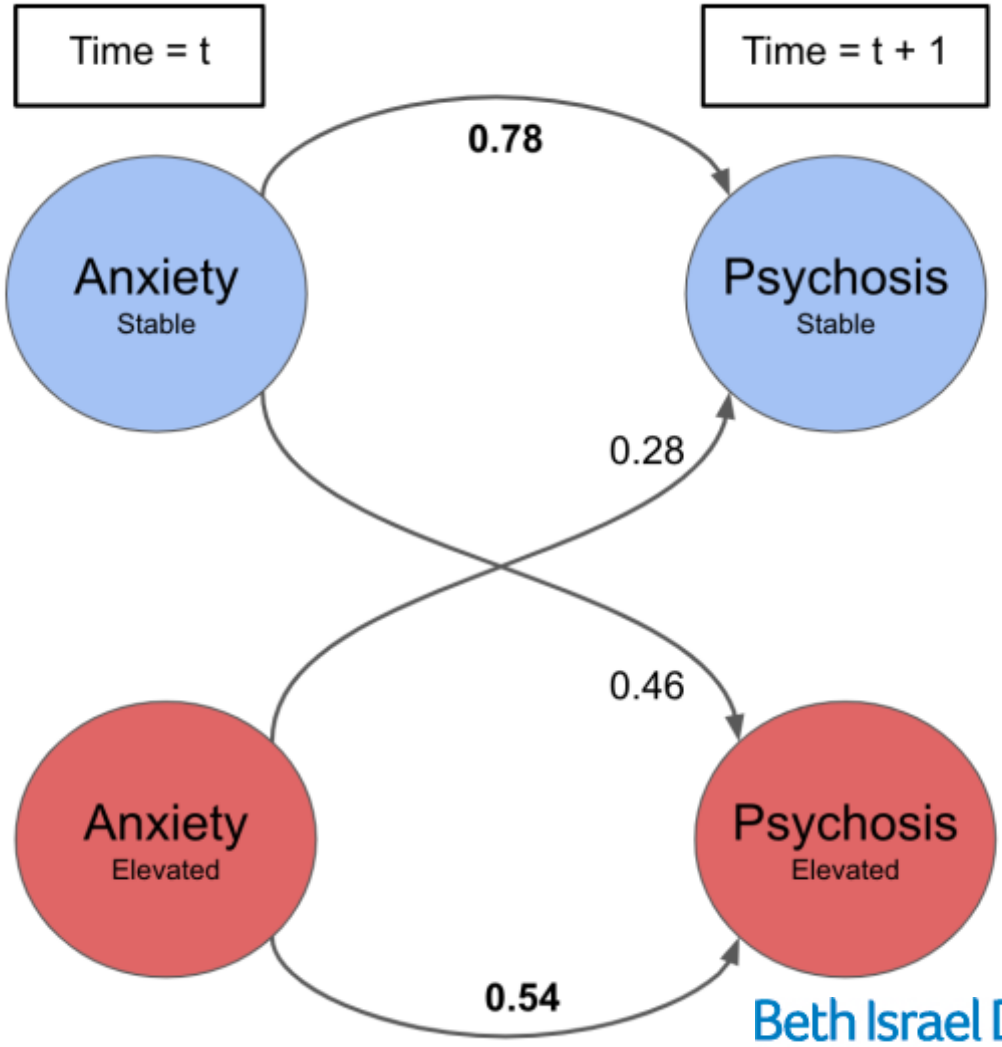
# Prediction of Future Clinical State

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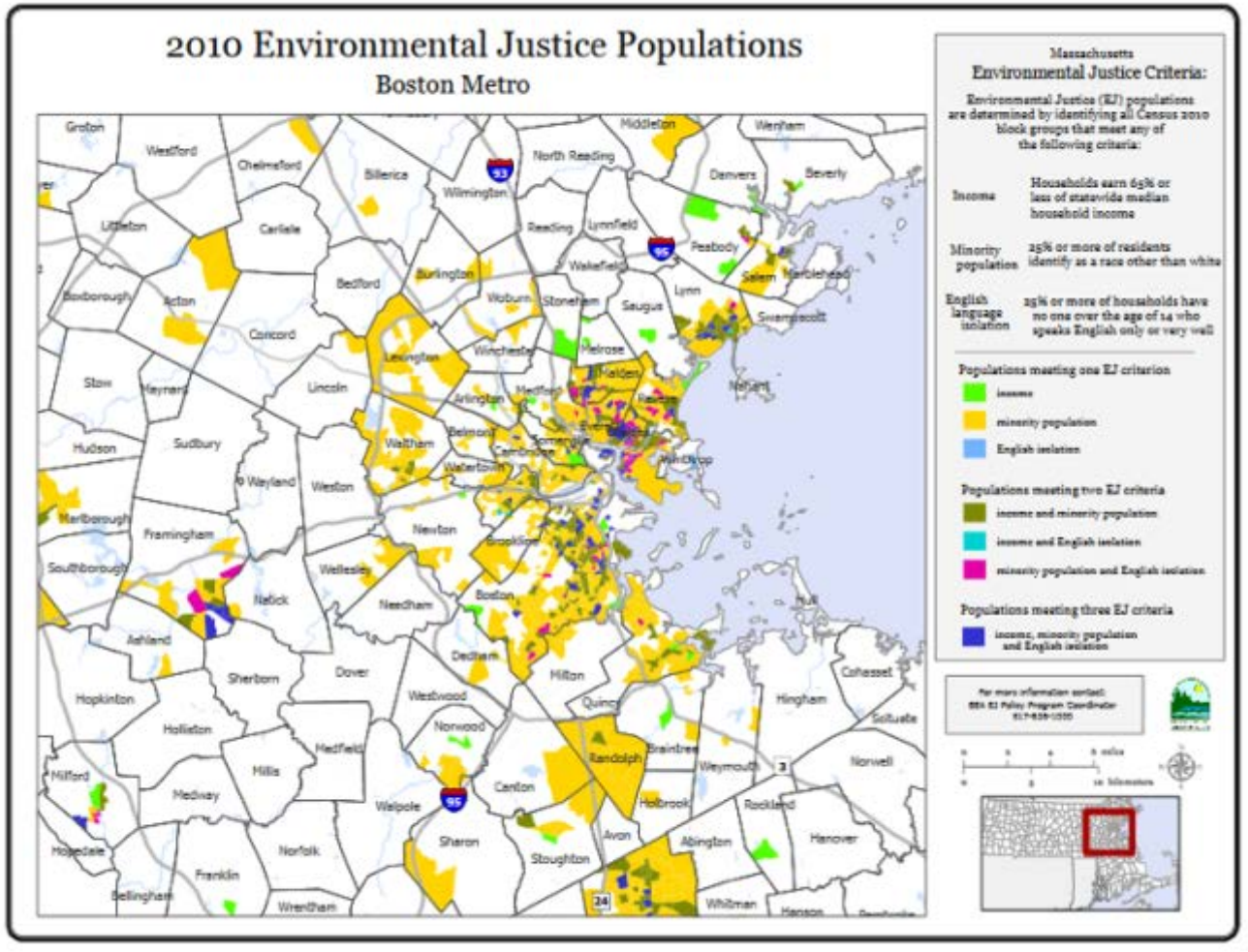
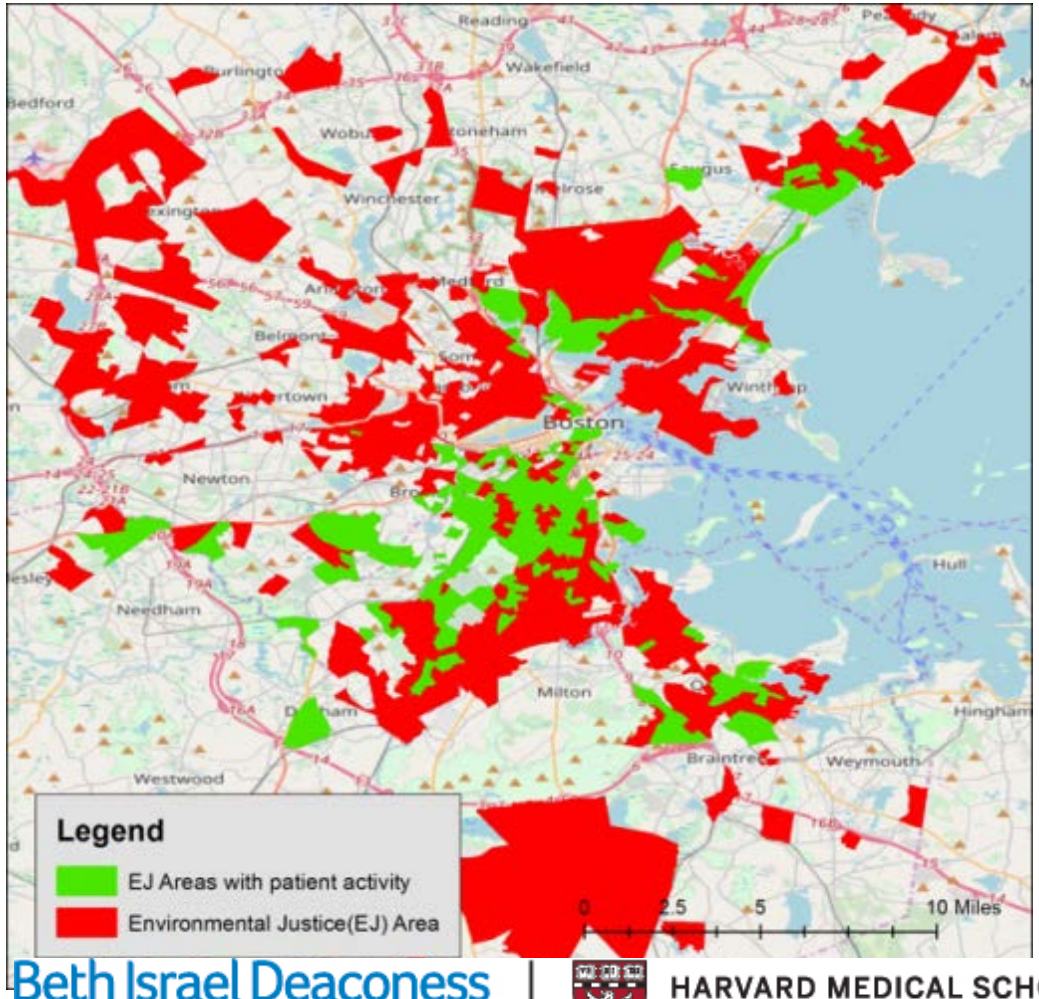
# Towards Population Level Mental Health

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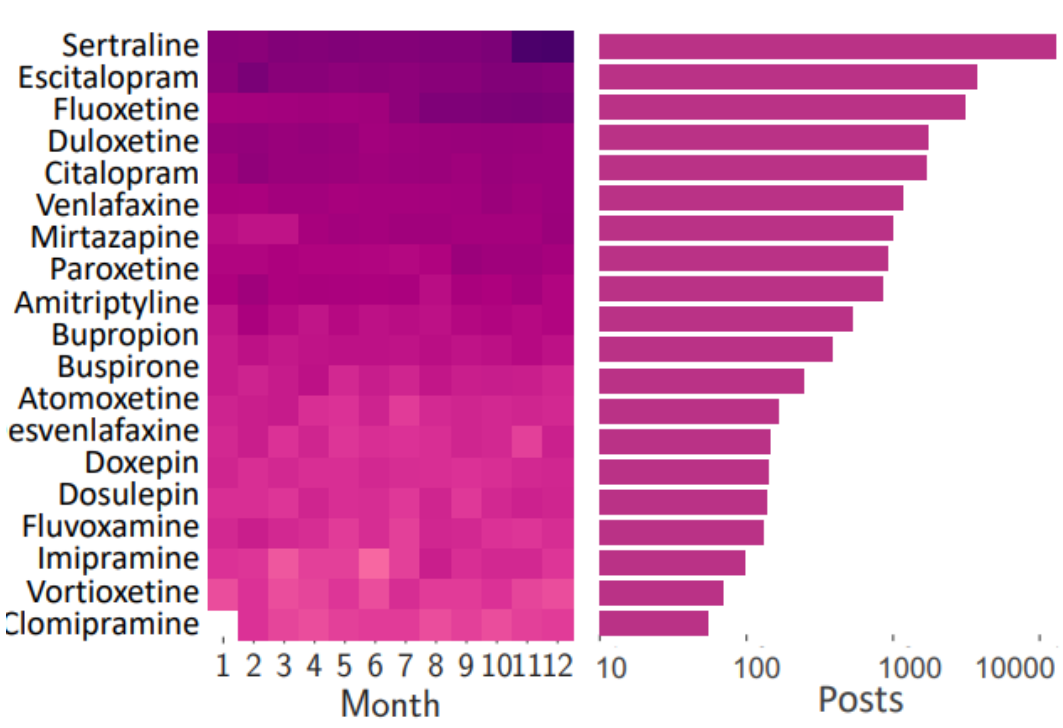
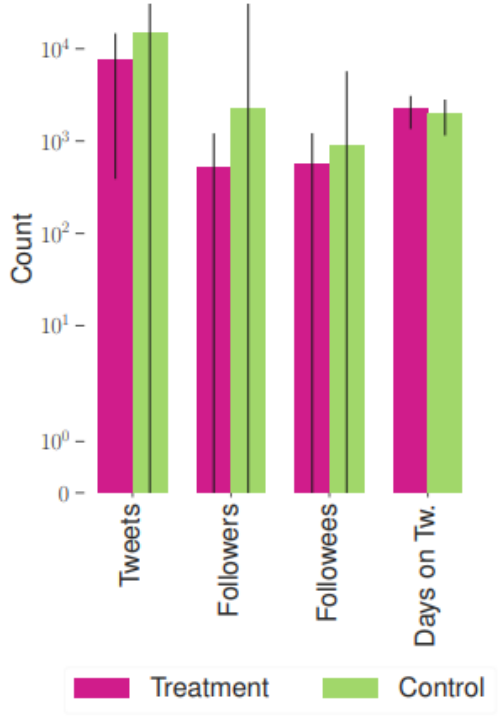
# Social Media Data and Medications

- The above 93,275 medication usage posts were posted by 52,567 unique users from whom we then collect Twitter.




(a)




(b)



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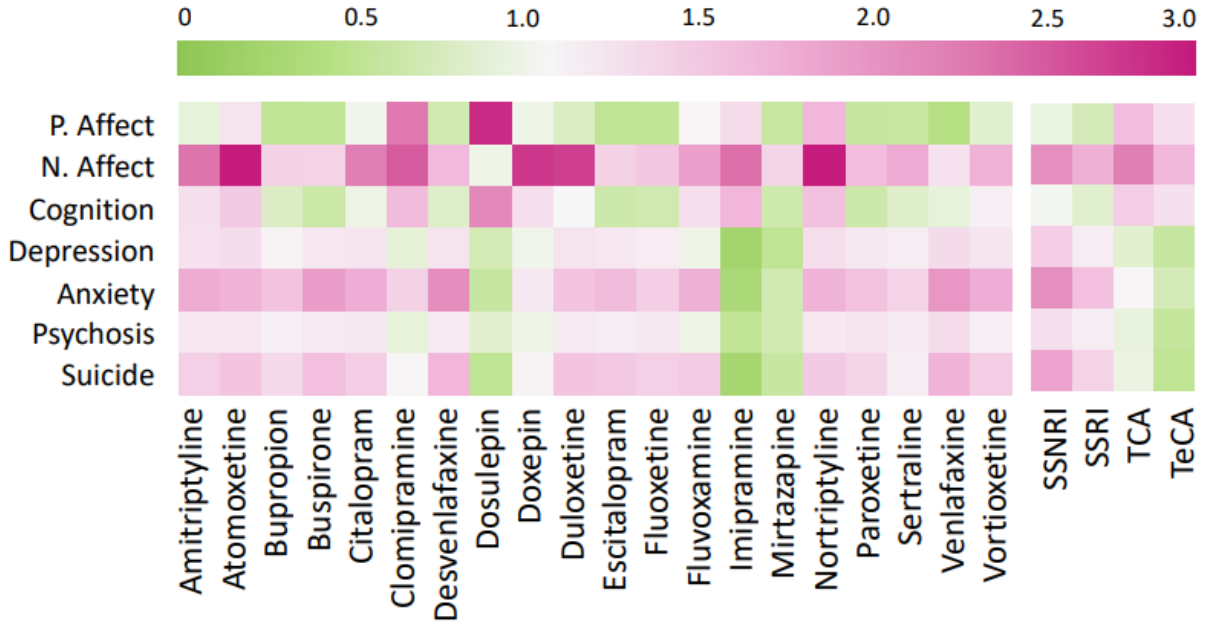
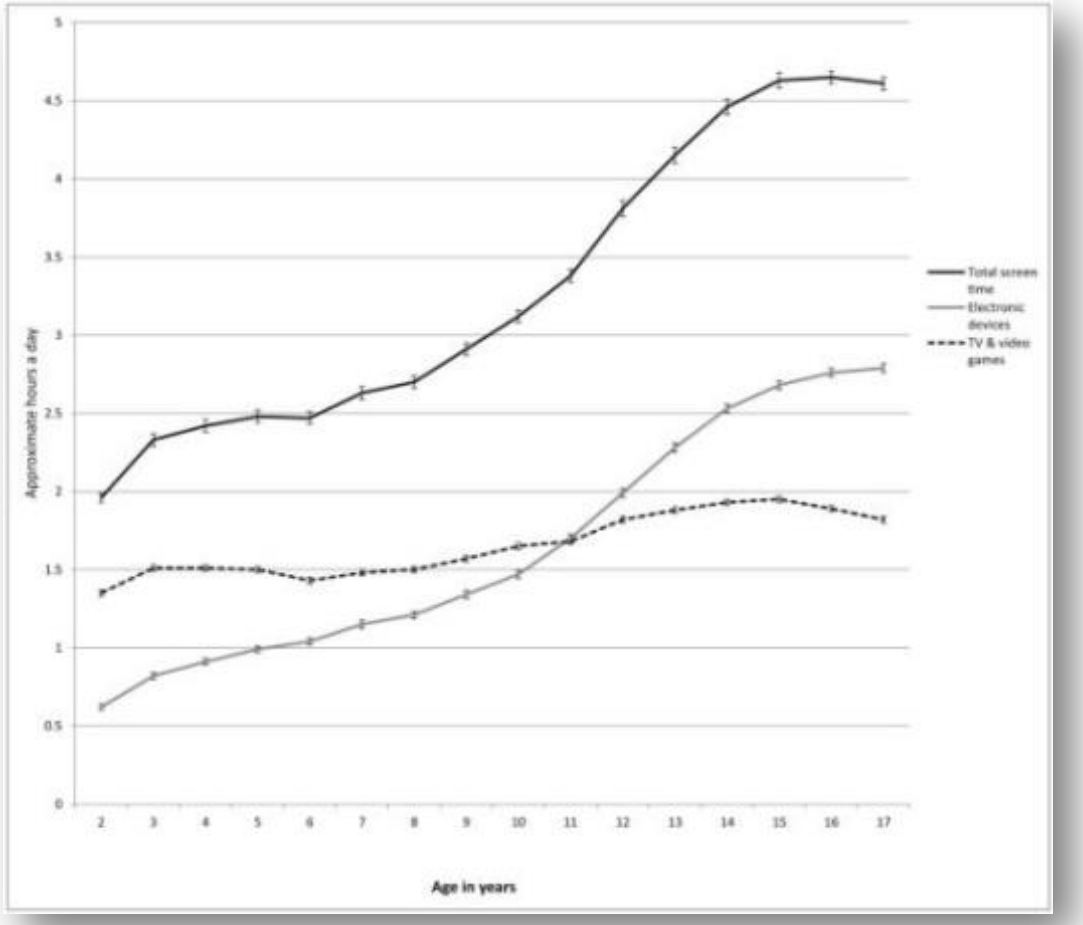
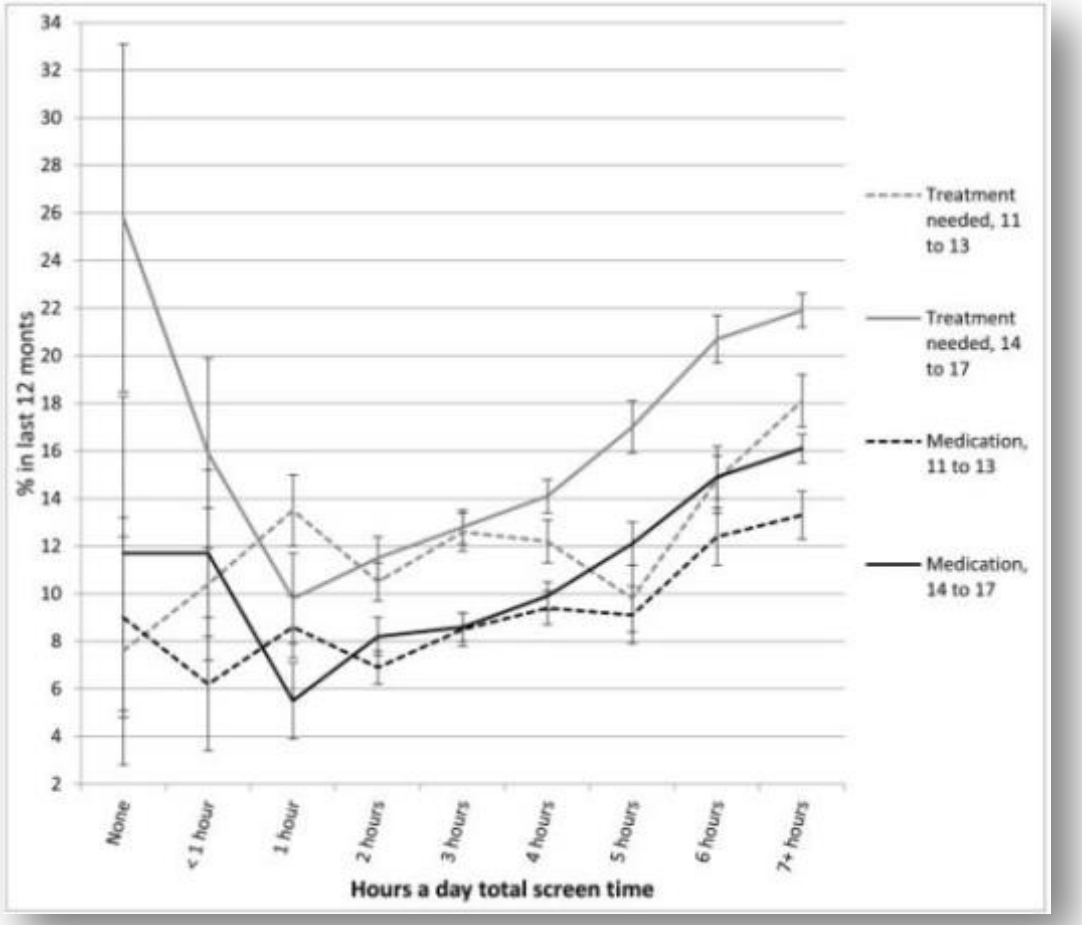



Figure 6: Relative Treatment Effect on the outcomes per 20 most popular drugs (left), and drug families (right).

# Too Much Social Media?




Twenge JM, Campbell WK. Associations between screen time and lower psychological well-being among children and adolescents: Evidence from a population-based study. Preventive Medicine Reports. 2018 Oct 18.

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# Too Much Social Media?

- National survey of 1,787 young adults on use of: Facebook, YouTube, Twitter … Instagram, Snapchat

- People using the most platforms (7 to 11 different ones) had more **x3** risk of depression and anxiety.

Primack BA, Shensa A, Escobar-Viera CG, Barrett EL, Sidani JE, Colditz JB, James AE. Use of multiple social media platforms and symptoms of depression and anxiety: A nationally-representative study among US young adults. Computers in human behavior. 2017 Apr 1;69:1-9.

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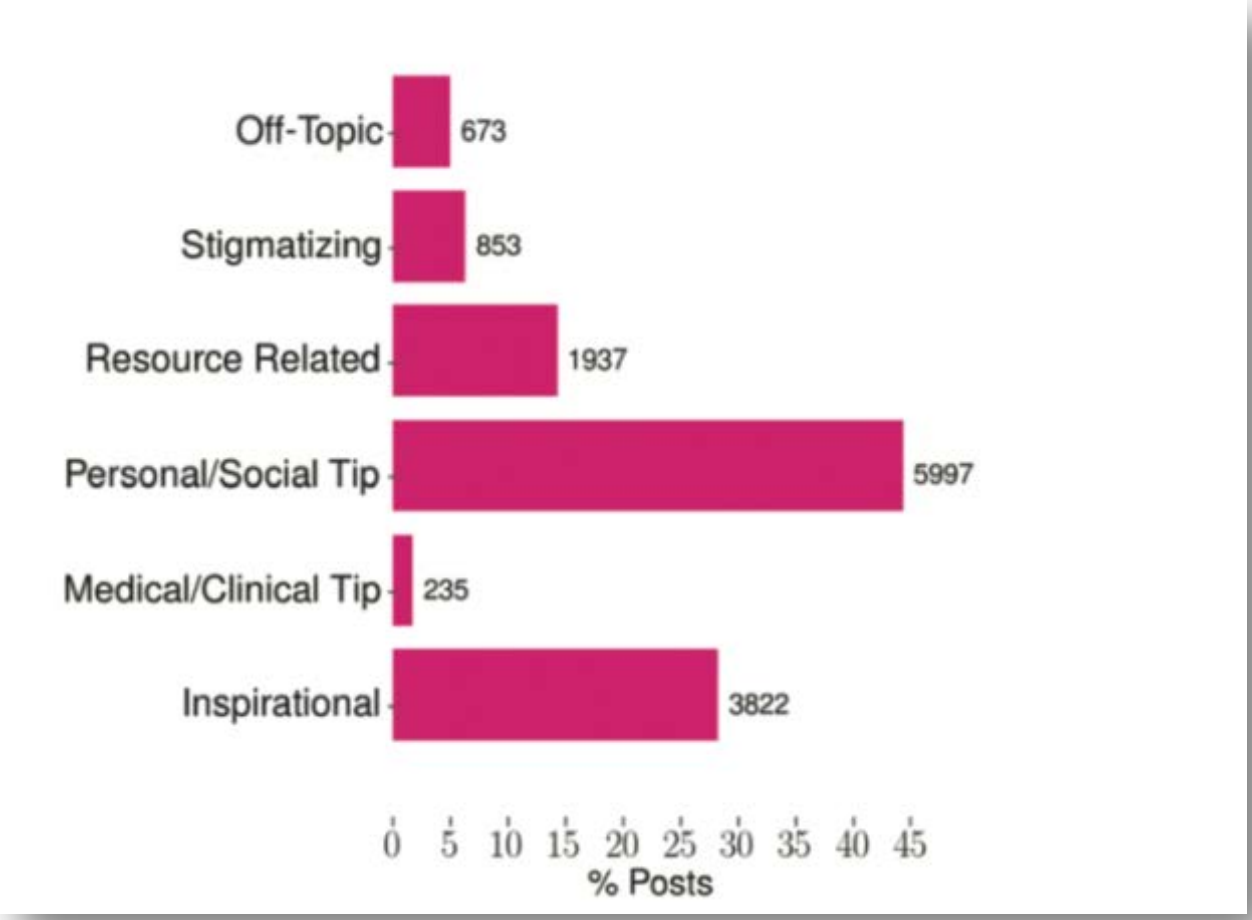
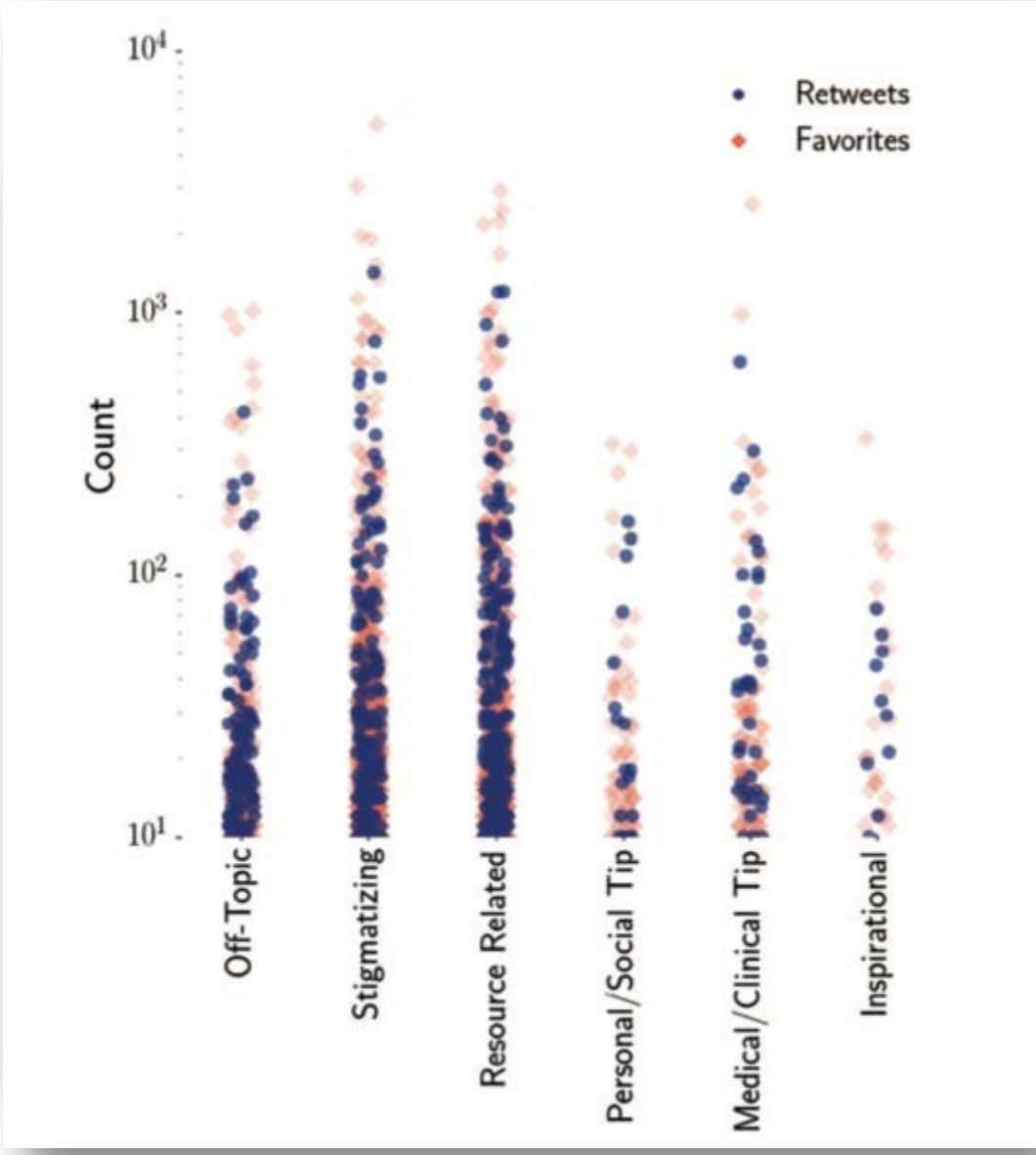
# Social Media and Stigma?




Saha K, Torous J, Ernala SK, Rizuto C, Stafford A, De Choudhury M. A computational study of mental health awareness campaigns on social media. Translational Behavioral Medicine. 2019.

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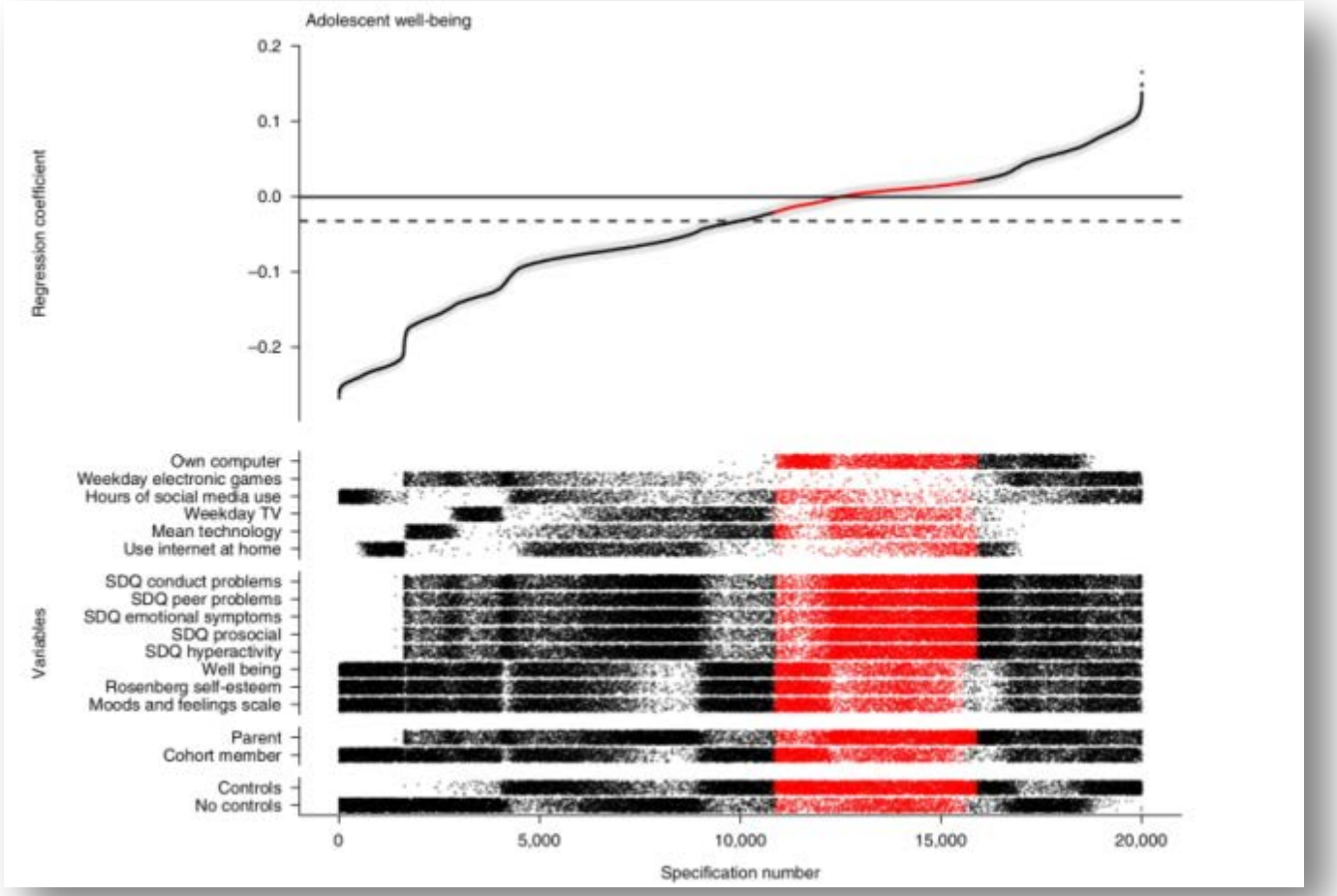
# A Mixed Picture?




Orben A, Przybylski AK. The association between adolescent well-being and digital technology use. Nature Human Behaviour. 2019 Jan 14:1.

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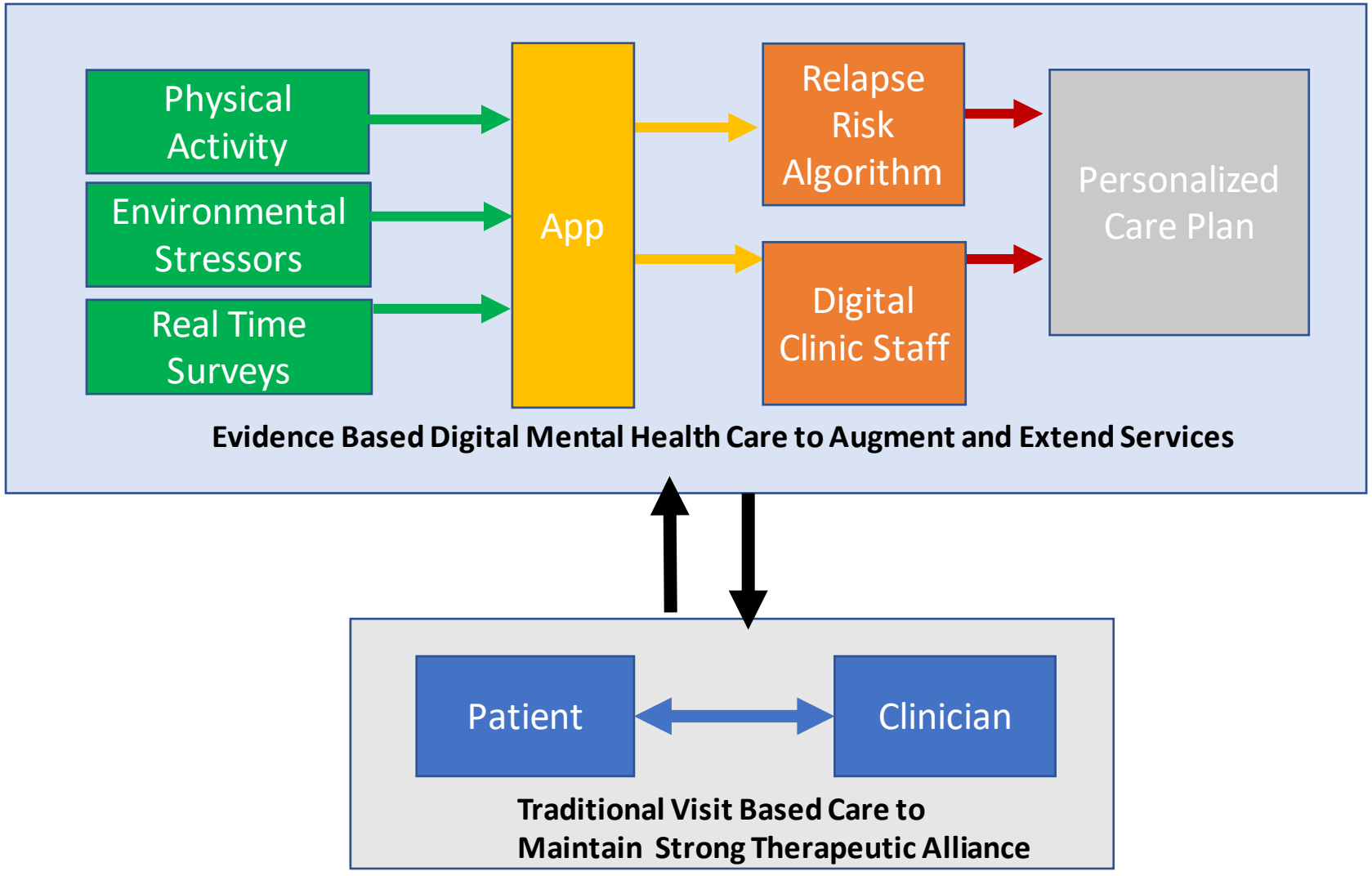
# Towards a Digital Clinic




Torous J, Hsin H. Empowering the digital therapeutic relationship: virtual clinics for digital health interventions. npj Digital Medicine. 2018 May 16;1(1):16.

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# Towards Digital Skills Groups

DOORS
DIGITAL OPPORTUNITIES FOR
OUTCOMES IN RECOVERY SERVICES

**Session 1:** Smartphone Fundamentals and Your Health Goals

Learn how apps may help you towards your health goals // Learn about mental health apps and other digital resources // Access and download apps // Keep your personal data secure //Remove harmful apps // Use alarms, maps, and reminders on the phone available for

**Session 2:** Smartphones for Health and Wellness

Set up mental health apps // Collect your own data on mood, anxiety, sleep, and steps // Learn to use wearables and smartwatches // Learn to explore and discover local services via apps // Learn how to connect with peers and family with apps (without a data plan)

**Session 3:** Smartphones for Personal Health

Access and learn from your personal data // Learn how to share your data with who you want and how to protect what you don't want to share // Customize apps to your needs // Develop a digital mental health toolkit to support your recovery // Evaluate apps that may be of help

**Session 4:** Smartphones for Your Recovery

Develop insights into your recovery with digital data and smartphone tools // Finalize your digital toolkit // Help peers with technology // Use apps to access community resources and services // Action planning with apps // Identify barriers and solutions to technology use

https://www.digitalpsych.org/digital-skills-training.html

# Teaching Digital Skills

4. I know **where** to find helpful health resources on my smartphone

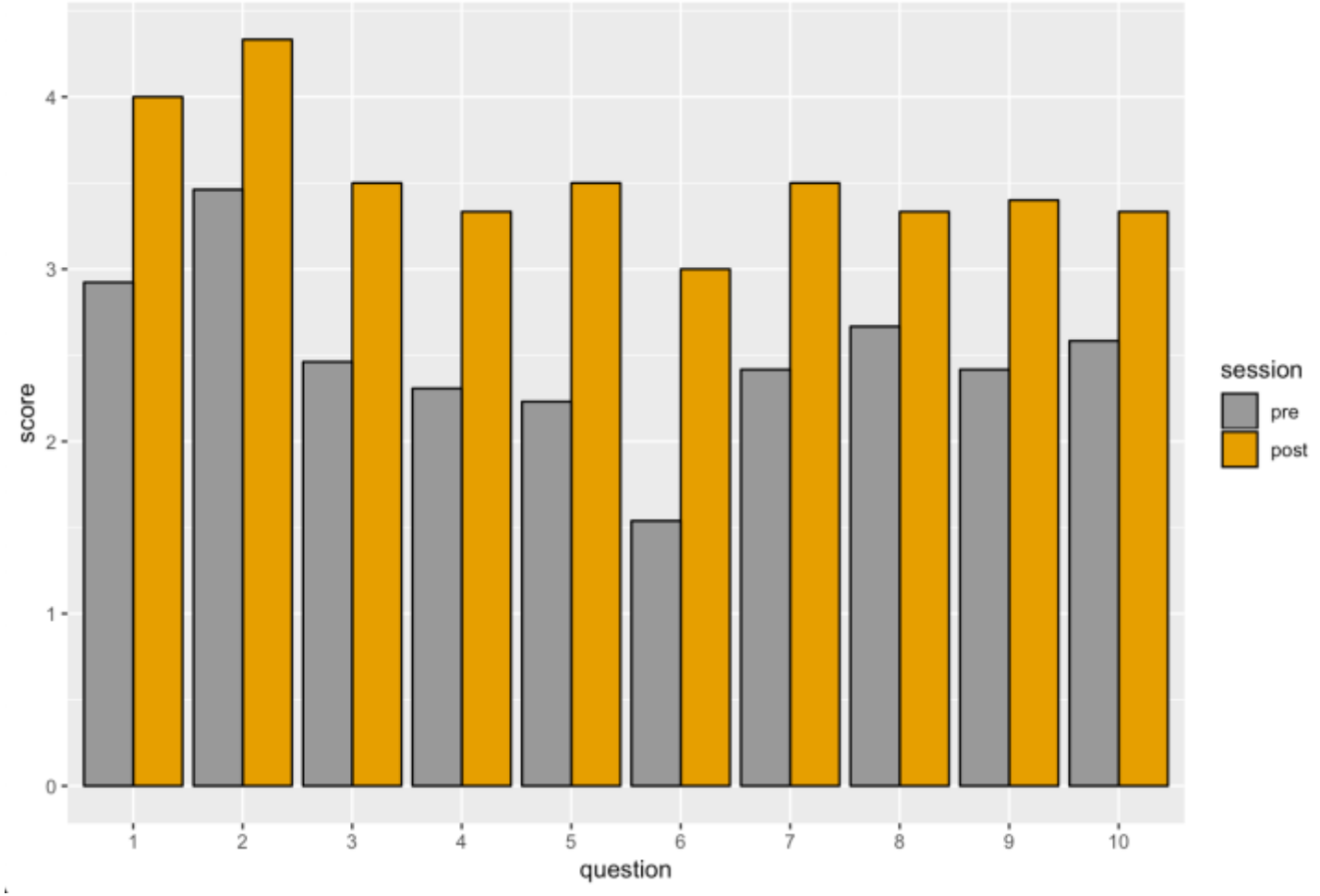
1) ❑ Strongly Disagree
2) ❑ Disagree
3) ❑ Undecided
4) ❑ Agree
5) ❑ Strongly Agree

5. I know **how** to find helpful health resources on my smartphone

1) ❑ Strongly Disagree
2) ❑ Disagree
3) ❑ Undecided
4) ❑ Agree
5) ❑ Strongly Agree

6. I know **how to use** my smartphone to answer my questions about health

1) ❑ Strongly Disagree
2) ❑ Disagree
3) ❑ Undecided
4) ❑ Agree
5) ❑ Strongly Agree

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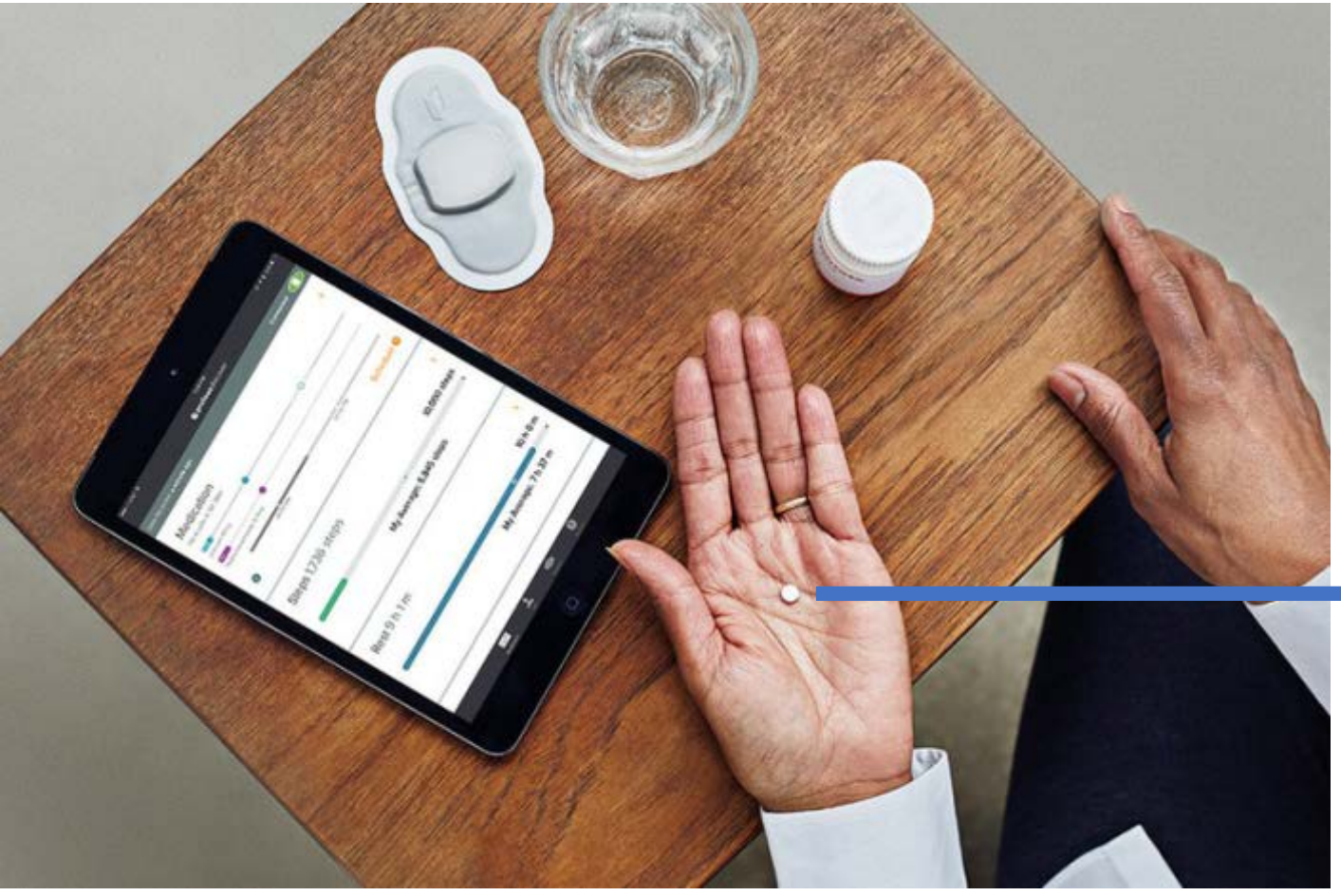
# Towards New Questions

Do you remember why you did not remember to take your medications?

What would you want to learn?

# Towards Digital Pills



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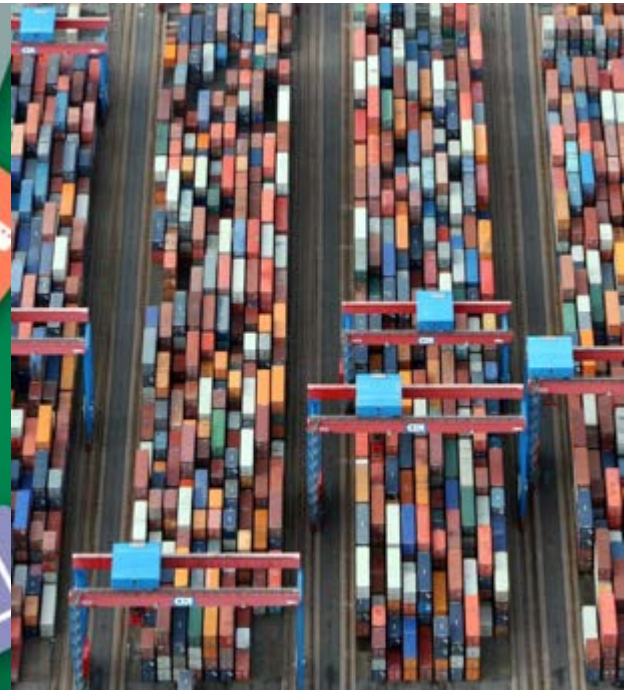
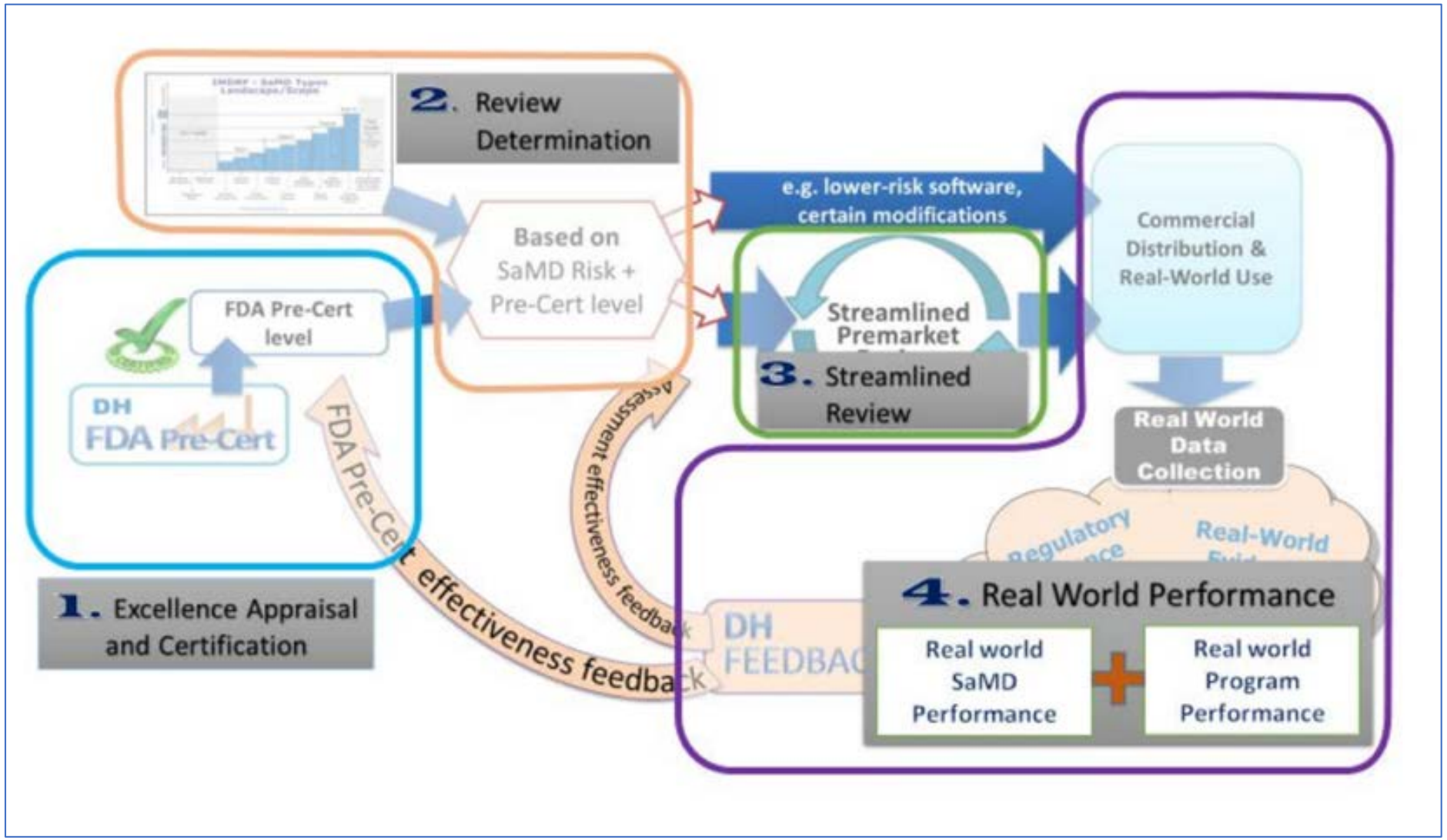
# Smartphone Apps Today

- Estimate to be over 10,000 mental health related apps



Torous J, Roberts LW. Needed innovation in digital health and smartphone applications for mental health: transparency and trust. Jama psychiatry. 2017 May 1;74(5):437-8.

# The FDA To the Rescue ?

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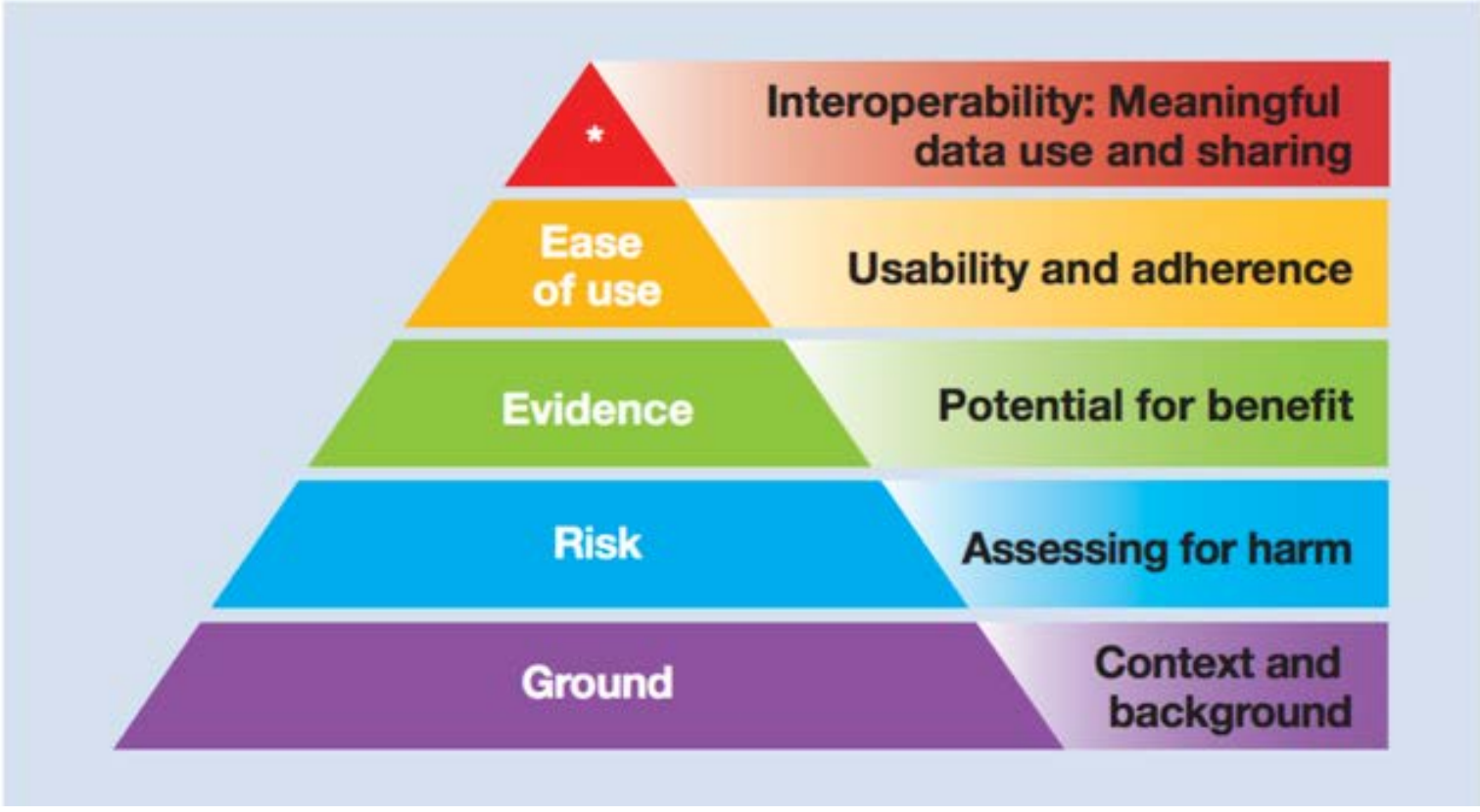
# Informed Decision Making Around Apps




Torous JB, Chan SR, Gipson SY, Kim JW, Nguyen TQ, Luo J, Wang P. A hierarchical framework for evaluation and informed decision making regarding smartphone apps for clinical care. Psychiatric Services. 2018 Feb 15;69(5):498-500.

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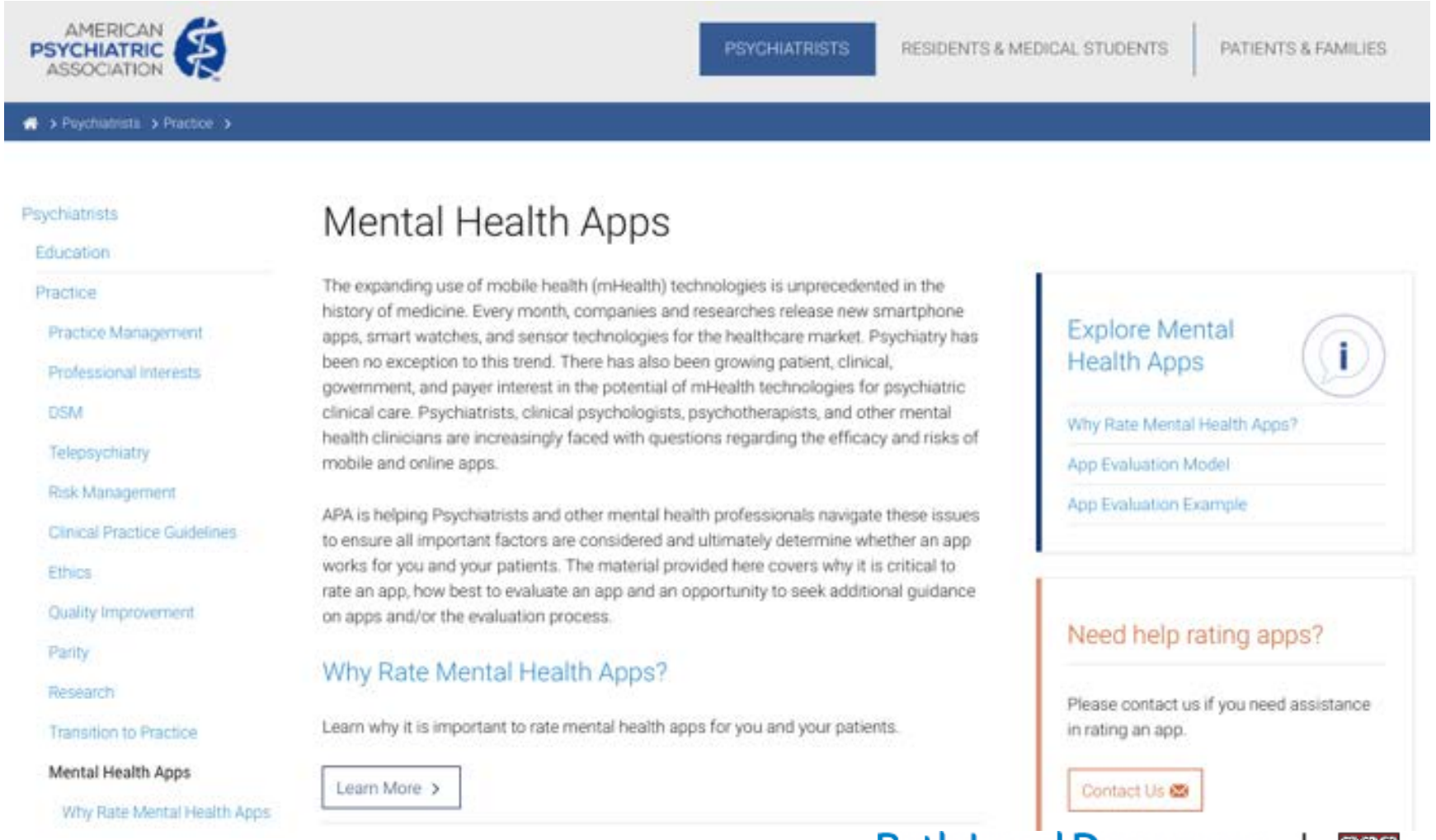
# Informed Decision Making Around Apps

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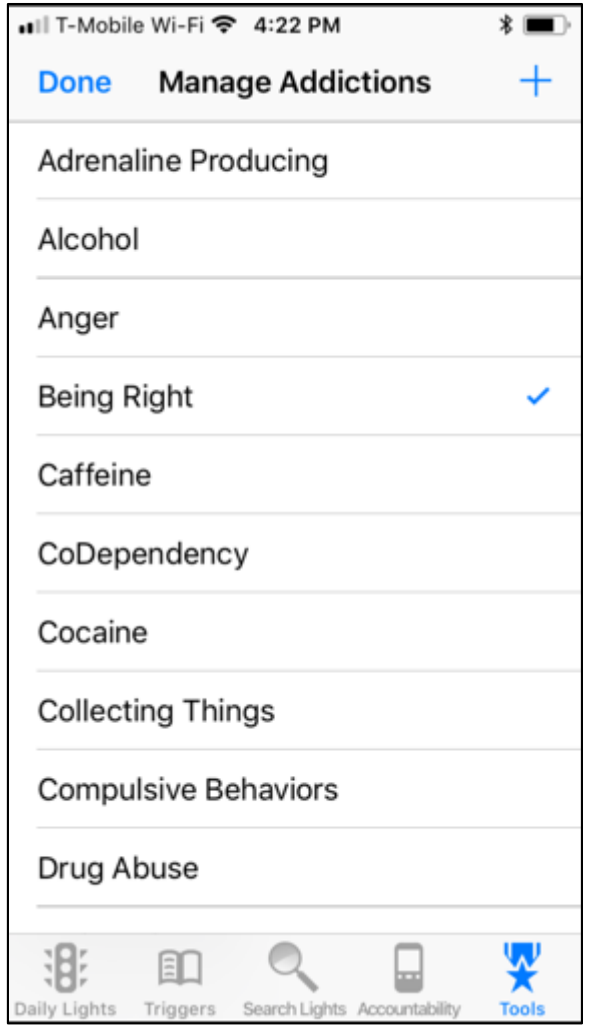
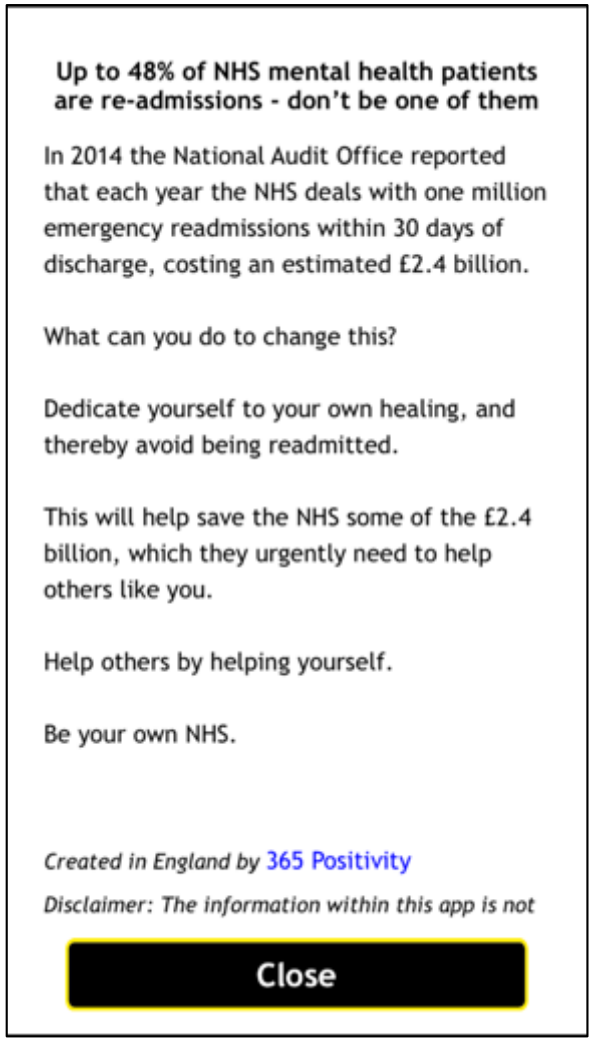
# Informed Decision Making Around Apps: Level 1



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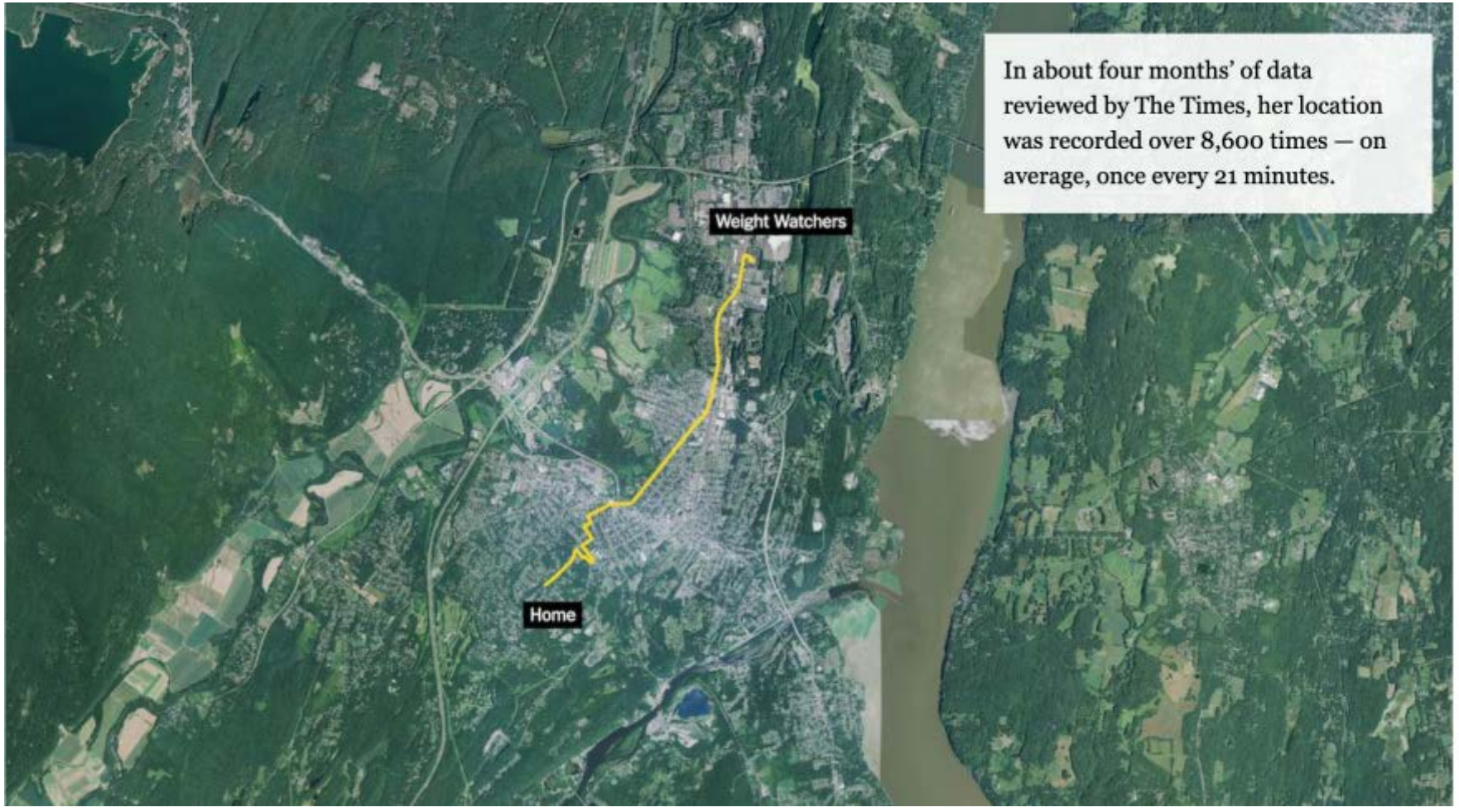
# Informed Decision Making Around Apps: Level 1




https://www.nytimes.com/interactive/2018/12/10/business/location-data-privacy-apps.html

# Informed Decision Making Around Apps: Level 1

?????

Table 2. Counts and Proportions of Apps Transmitting Data to a Third Party and Whether This Was Disclosed in a Privacy Policy

| | No. (%) | | | |
|---|---|---|---|---|
| | Apps With Privacy Policy | | | Apps Without Privacy Policy |
| Destinations | Transmission Occurred, Disclosed in Policy | Transmission Occurred, Not Disclosed in Policy | Transmission Occurred, Policy States Won't | Transmission Occurred |
| Any destination type[a] | 16 (44) | 5 (14) | 3 (8) | 9 (25) |
| Advertising or marketing services | 10 (28) | 2 (6) | 2 (6) | 8 (22) |
| Analytics services | 14 (39) | 5 (14) | 1 (3) | 4 (11) |
| Google destinations | 13 (36) | 5 (14) | 3 (8) | 7 (19) |
| Google advertising services[b] | 6 (17) | 2 (6) | 1 (3) | 6 (17) |
| Google analytics services[c] | 12 (33) | 5 (14) | 1 (3) | 4 (11) |
| Facebook analytics | 9 (25) | 2 (6) | 0 (0) | 1 (3) |
| Others | 15 (42) | 1 (3) | 0 (0) | 4 (11) |
| Mixpanel | 3 (8) | 0 | 1 (3) | 0 |
| AppNexus | 2 (6) | 0 | 0 | 1 (3) |
| Twitter Mopub | 3 (8) | 0 | 0 | 0 |
| Yahoo Flurry Analytics | 3 (8) | 0 | 0 | 0 |
| AdColony | 1 (3) | 0 | 0 | 1 (3) |
| AppsFlyer | 1 (3) | 0 | 1 (3) | 0 |
| Kiip | 1 (3) | 0 | 0 | 1 (3) |
| Branch | 1 (3) | 0 | 0 | 0 |
| AddThis | 1 (3) | 0 | 0 | 0 |
| Amplitude | 1 (3) | 0 | 0 | 0 |
| Manage.com | 1 (3) | 0 | 0 | 0 |
| Singular/Apsalar | 1 (3) | 0 | 0 | 0 |
| UserVoice | 1 (3) | 0 | 0 | 0 |
| Unknown destination[d] | 0 | 0 | 0 | 1 (3) |

[a] Percentage of apps included in study (n = 36).

[b] Identified services were AdSense, AdWords, and DoubleClick.

[c] Identified services were Google Analytics and Crashlytics.

[d] Identity or ownership information for the domain startappexchange.com could not be established.

JAMA Network Open. 2019;2(4):e192542. doi:10.1001/jamanetworkopen.2019.2542



Huckvale, Torous, and Larsen….In Press with JAMA Open

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# Informed Decision Making Around Apps: Level 2

| Search term | Identified in searches (n=1435) | | Screened (n=350) | |
|---|---|---|---|---|
| | Android | iOS | Android | iOS |
| Anxiety | 249 | 200 | 40 | 40 |
| Depression | 250 | 200 | 40 | 40 |
| Schizophrenia | 250 | 32 | 40 | 32 |
| Self-harm | 85 | 29 | 40 | 29 |
| Substance use | 131 | 9 | 40 | 9 |
| **Total** | **965** | **470** | **200** | **150** |

| Coding element | n (%) of apps |
|---|---|
| **3. Positive claims** | **59 (81%)** |
| 3.a. Claims of effectiveness | 47 (64%) |
| 3.a.i. Detection or diagnosis | 7 (10%) |
| 3.a.ii. Improvement in symptoms or mood | 22 (30%) |
| 3.a.iii. Improvement in self-management | 26 (36%) |
| 3.b. Claims of acceptability | 33 (45%) |
| [illegible] | [illegible] |
| 4.a. Scientific language | 32 (44%) |
| 4.a.i. Specific technique described | 24 (33%) |
| 4.a.ii. Evidence from study using app | 2 (2.7%) |
| 4.a.iii. Citation to scientific literature | 1 (1.4%) |
| 4.b. Technical expertise | 23 (32%) |
| 4.b.i. Certification or accreditation | 0 |
| 4.b.ii. Prizes or awards | 2 (2.7%) |
| 4.b.iii. Credible developers | 18 (25%) |
| 4.b.iv. Credible endorsements | 3 (4.1%) |
| 4.c. Lived experience design | 10 (14%) |
| 4.c.i. Lived experience involvement | 6 (8.2%) |
| 4.c.ii. Lived experience developer | 5 (6.8%) |
| 4.d. "Wisdom of the crowd" | 14 (19%) |
| 4.d.i. Download, usage or popularity statistics | 11 (15%) |

Larsen….Torous..et al….In Press with NPJ Digital Medicine

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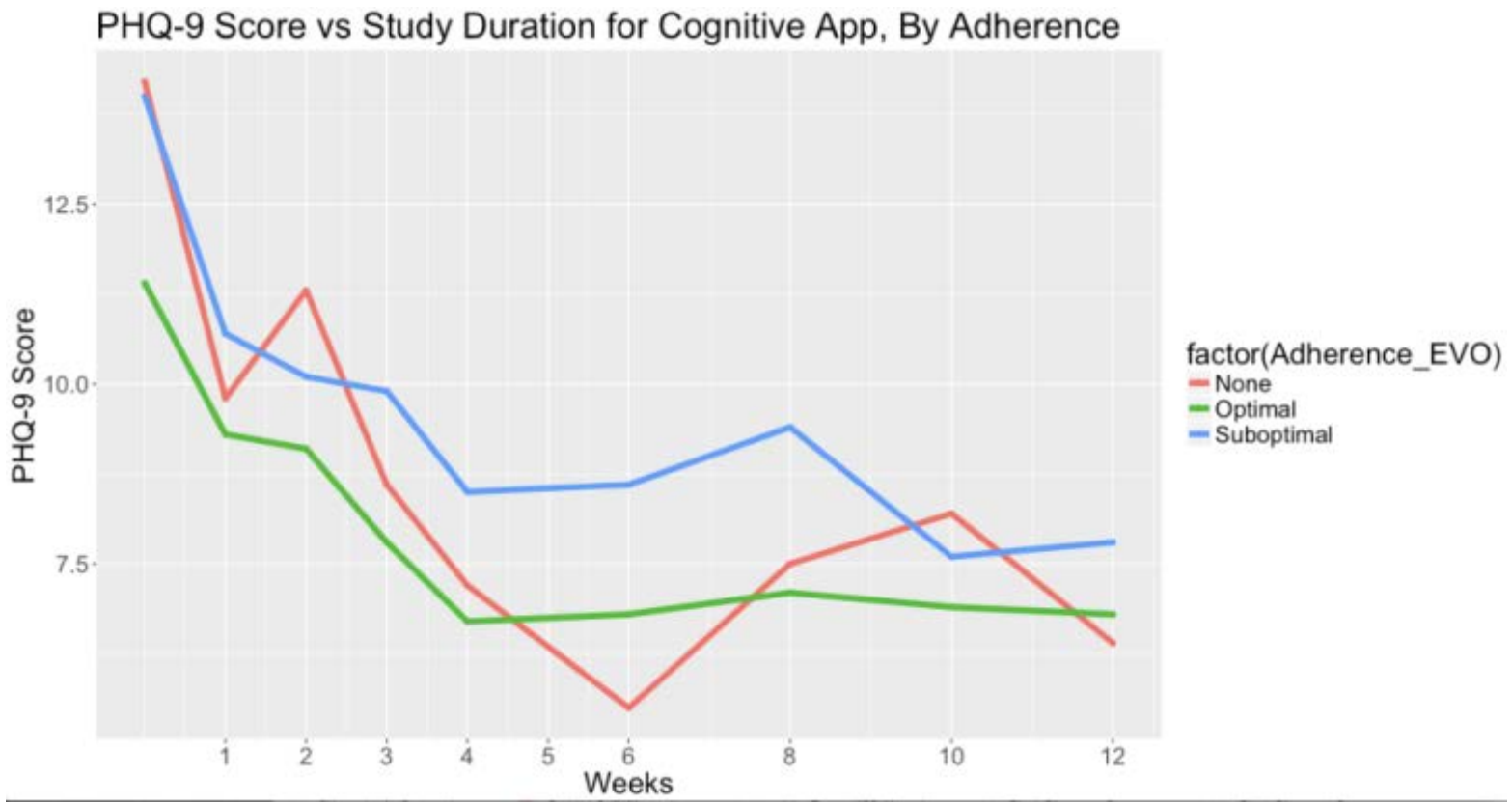
# Informed Decision Making Around Apps: Level 2

Firth J, Torous J, Nicholas J, Carney R, Pratap A, Rosenbaum S, Sarris J. The efficacy of smartphone-based mental health interventions for depressive symptoms: a meta-analysis of randomized controlled trials. World Psychiatry. 2017 Oct 1;16(3):287-98.

# Informed Decision Making Around Apps: Level 2




Arean PA, Hallgren KA, Jordan JT, Gazzaley A, Atkins DC, Heagerty PJ, Anguera JA The Use and Effectiveness of Mobile Apps for Depression: Results From a Fully Remote Clinical Trial J Med Internet Res 2016;18(12):e33

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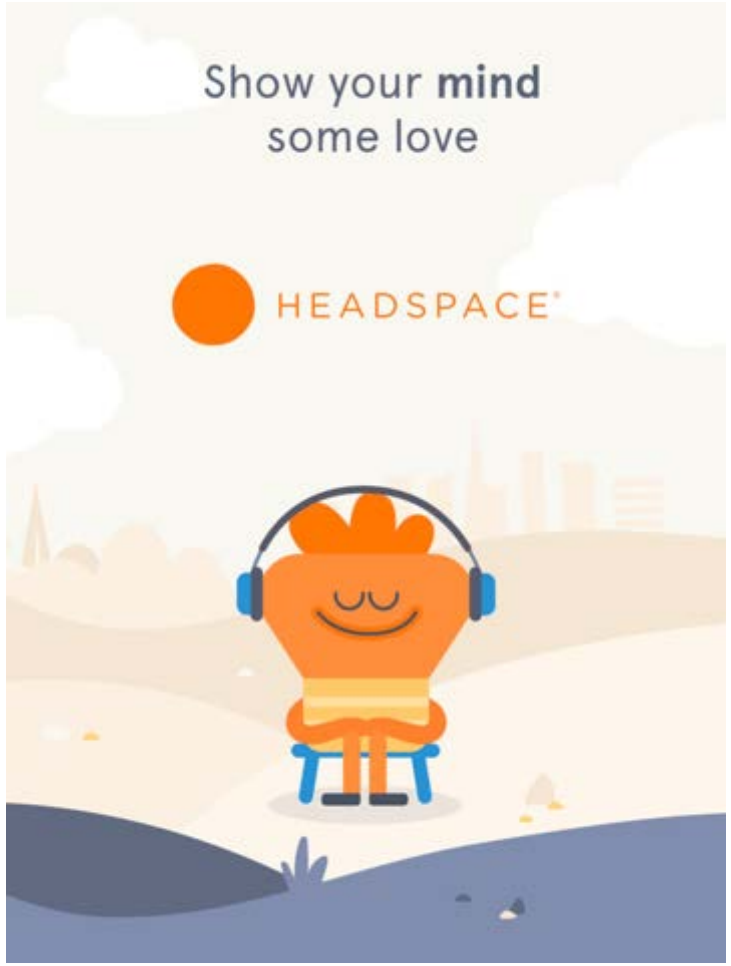
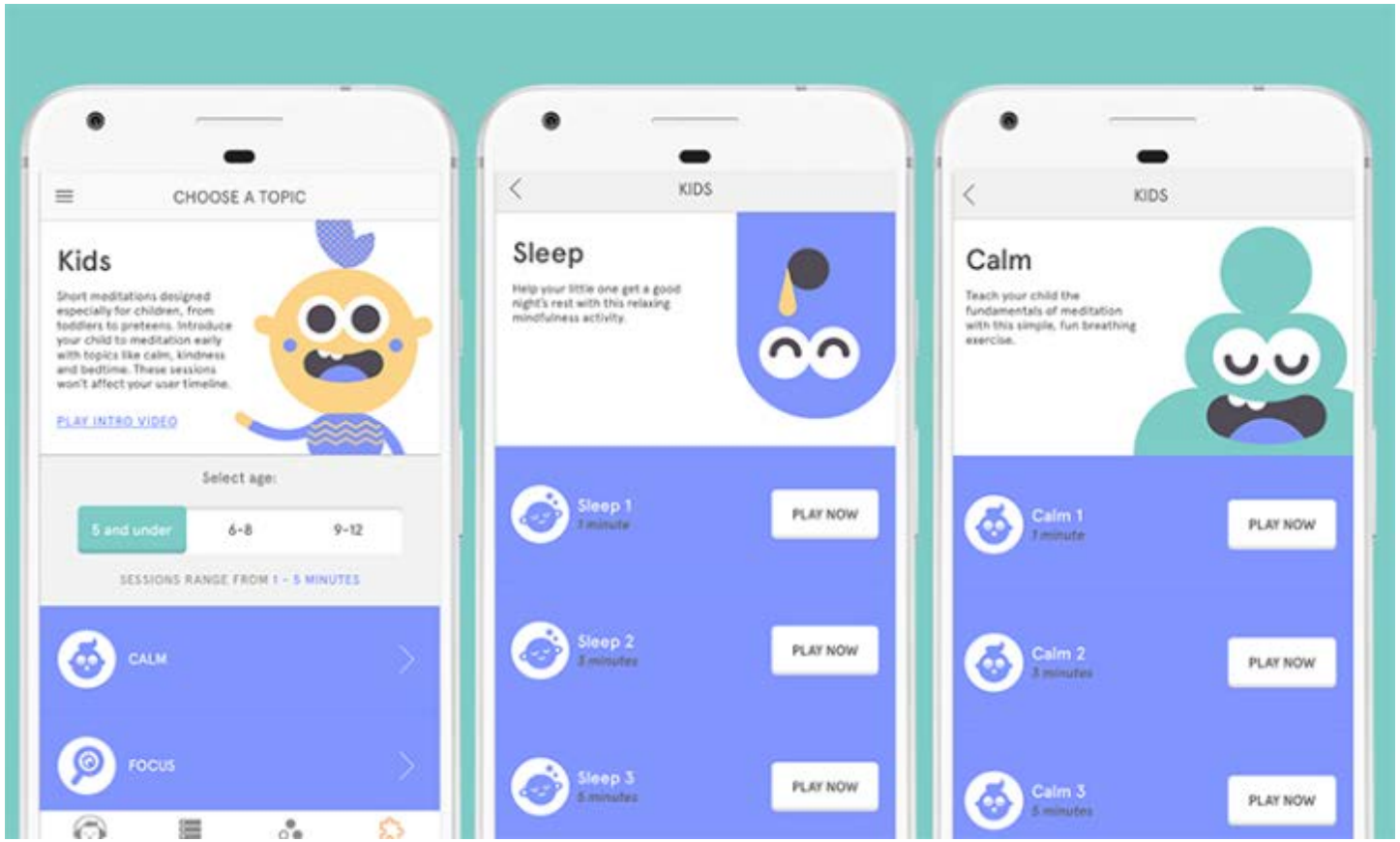
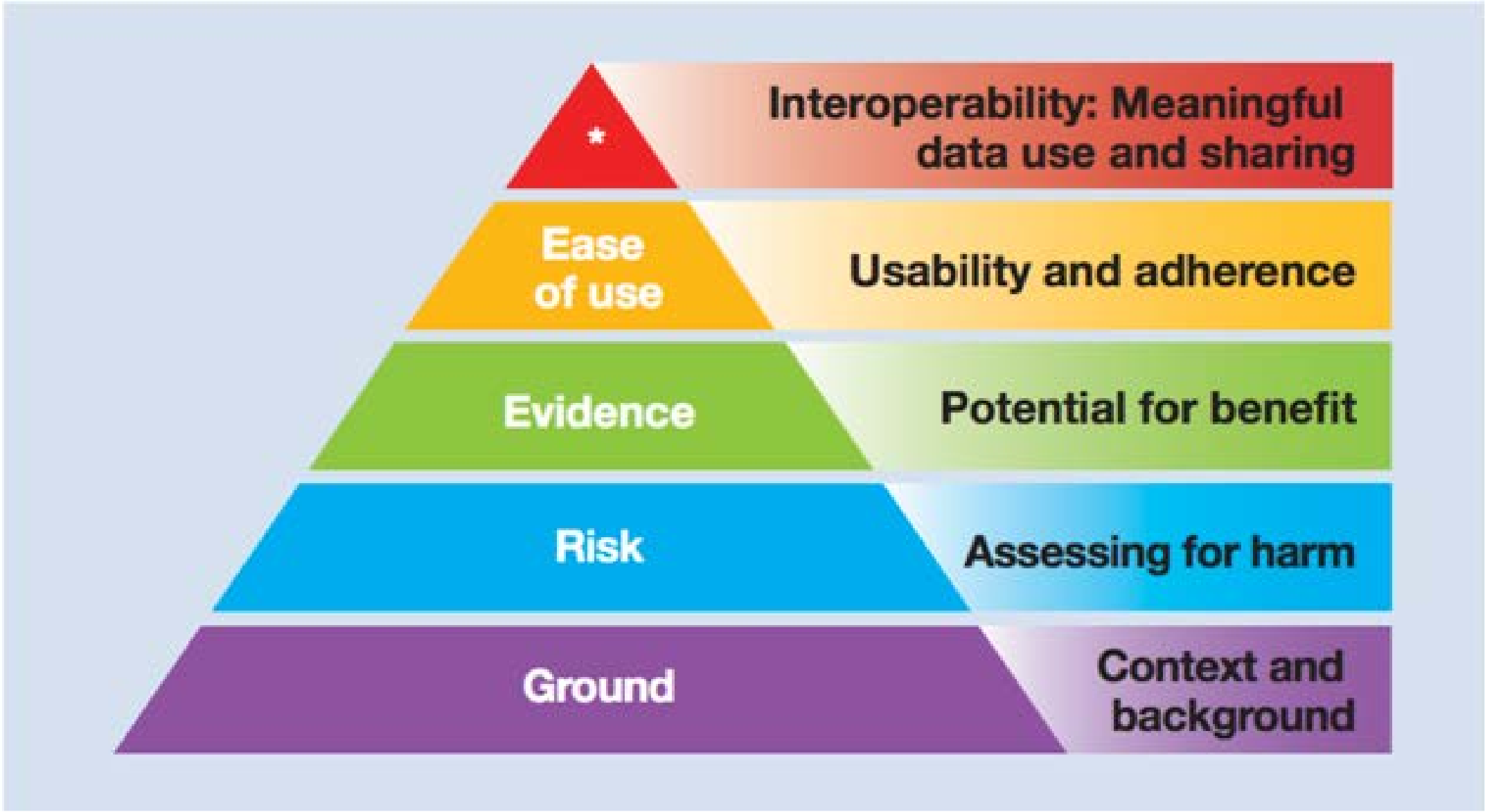
# Informed Decision Making Around Apps: Level 2




Noone and Hogan. A randomised active-controlled trial to examine the effects of an online mindfulness intervention on executive control, critical thinking and key thinking dispositions in a university student sample. BPJ Psychology. 2018


Interoperability: Meaningful data use and sharing
Ease of use
Usability and adherence
Evidence
Potential for benefit
Risk
Assessing for harm
Ground
Context and background

# Informed Decision Making Around Apps: Level 3

VA » Health Care » PTSD: National Center for PTSD » Public » Mobile App: PTSD Coach

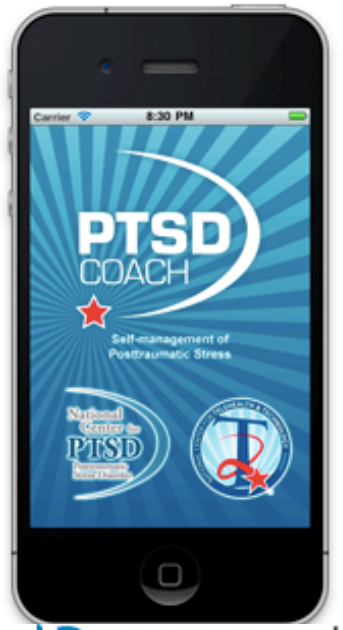
## PTSD: National Center for PTSD

- PTSD
  - PTSD Home
  - For the Public
    - Public Section Home
    - PTSD Overview
    - Types of Trauma
    - Is it PTSD?
    - Treatment and Coping
    - Other Common Problems
    - Family and Friends
    - PTSD and Communities
    - Paginas en Espanol
    - Apps, Videos and More
      - Mobile Apps

PUBLIC *This section is for Veterans, General Public, Family &*

### Mobile App: PTSD Coach

***PTSD Coach has now been downloaded over 100,000 times in 74 countries around the world.***




The PTSD Coach app can help you learn about and manage symptoms that often occur after trauma. Features include:

- Reliable information on PTSD and treatments that work
- Tools for screening and tracking your symptoms
- Convenient, easy-to-use tools to help you handle stress symptoms
- Direct links to support and help
- Always with you when you need it

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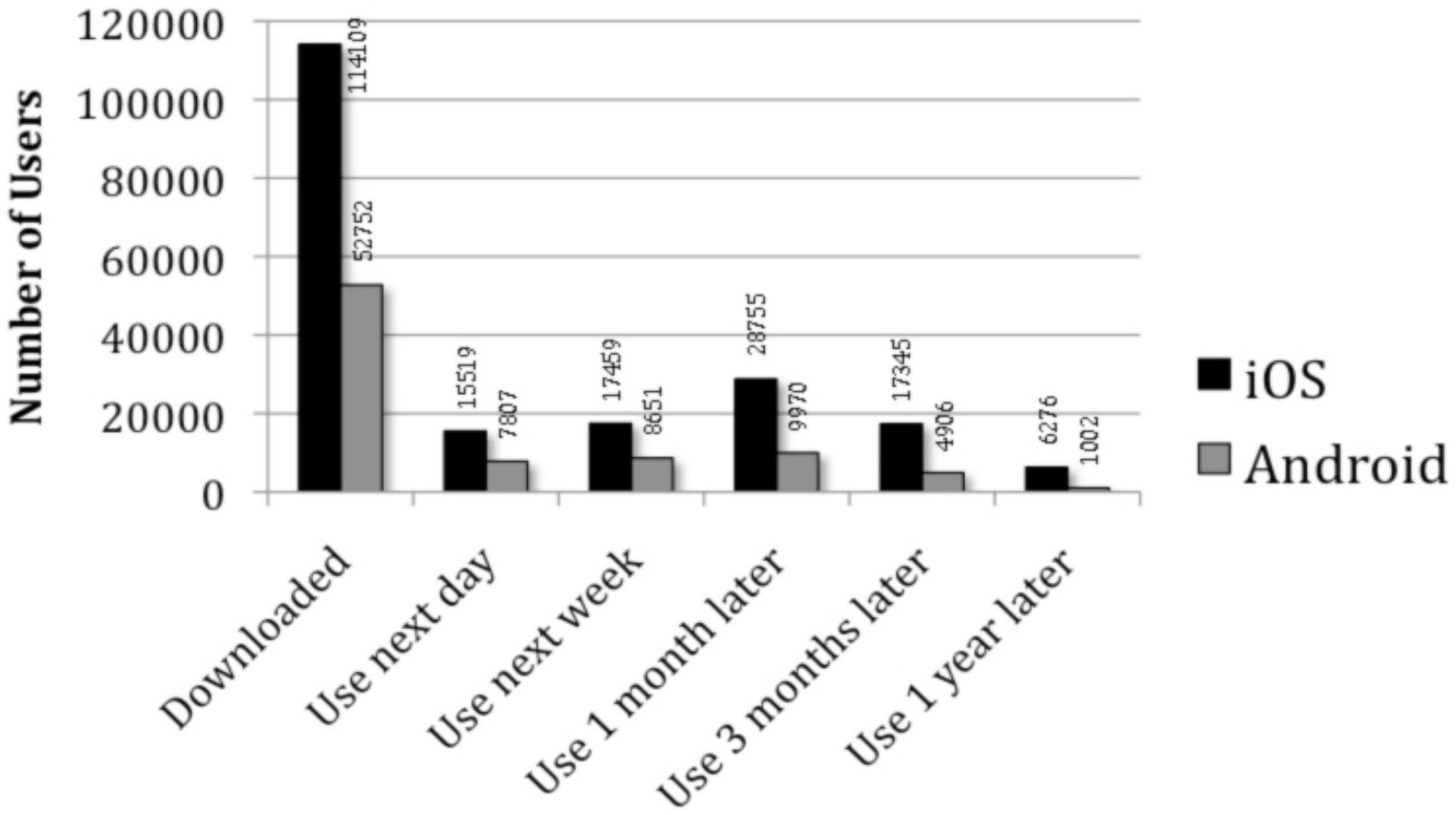
# Informed Decision Making Around Apps: Level 3




Owen et al. mHealth in the Wild: Using Novel Data to Examine the Reach, Use, and Impact of PTSD Coach. JMIR Mental Health. Dec 2015

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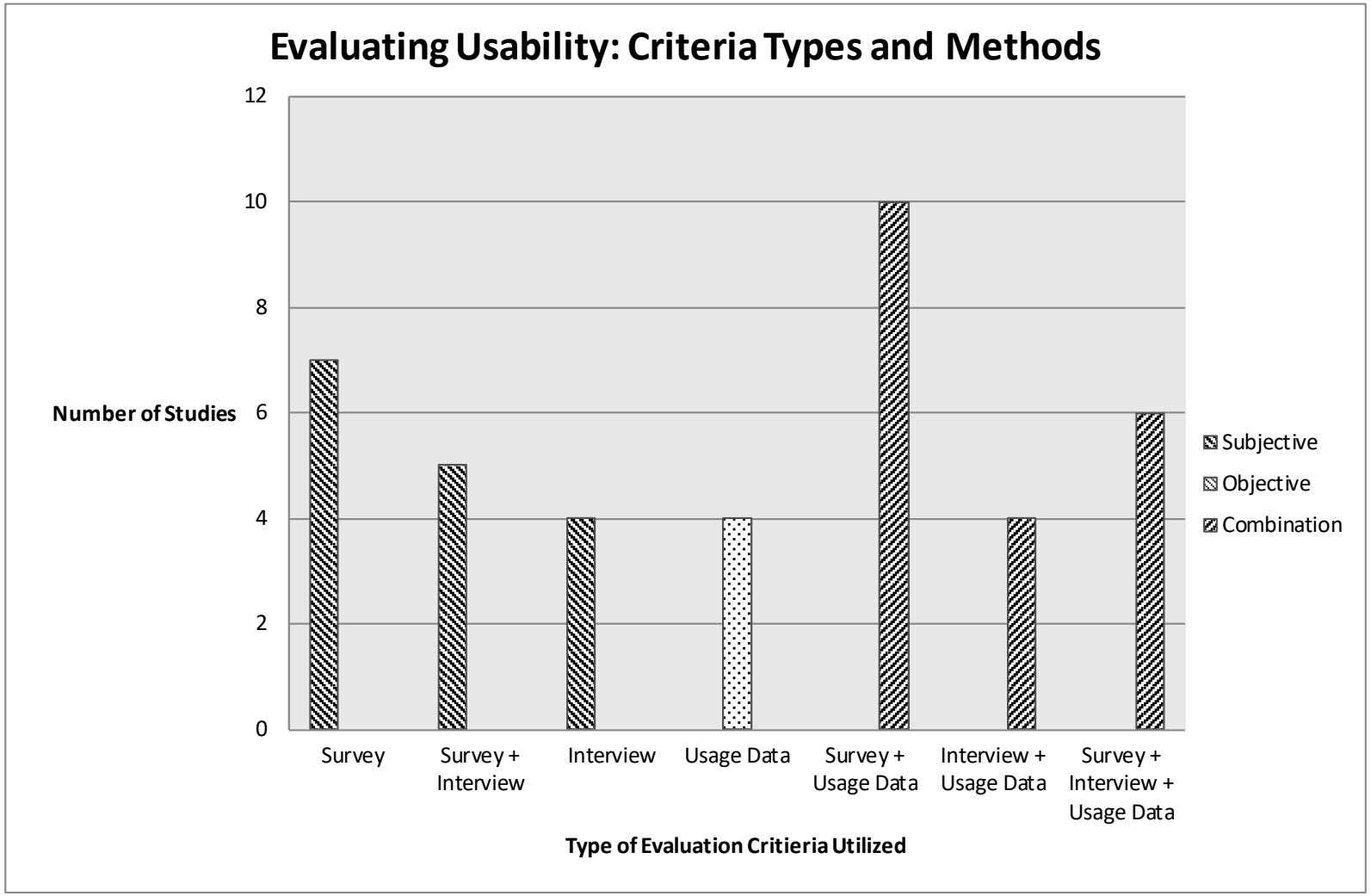
# Informed Decision Making Around Apps: Level 3




Ng, Firth, and Torous. Accept and in Press with Psychiatric Services

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# Informed Decision Making Around Apps: Level 4

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# Informed Decision Making Around Apps: Level 4

BJPsych Open (2019)
5, e15, 1–5. doi: 10.1192/bjo.2018.86

Review

## Digital mental health apps and the therapeutic alliance: initial review

Philip Henson, Hannah Wisniewski, Chris Hollis, Matcheri Keshavan and John Torous

**Background**
As mental healthcare expands to smartphone apps and other technologies that may offer therapeutic interventions without a therapist involved, it is important to assess the impact of non-traditional therapeutic relationships.

**Aims**
To determine if there were any meaningful data regarding the digital therapeutic alliance in smartphone interventions for serious mental illnesses.

**Method**
A literature search was conducted in four databases (PubMed, PsycINFO, Embase and Web of Science).

**Results**
There were five studies that discuss the therapeutic alliance when a mobile application intervention is involved in therapy. However, in none of the studies was the digital therapeutic alliance the primary outcome. The studies looked at different mental health conditions, had different duration of technology use and used different methods for assessing the therapeutic alliance.

**Conclusions**
Assessing and optimising the digital therapeutic alliance holds the potential to make tools such as smartphone apps more effective and improve adherence to their use. However, the heterogeneous nature of the five studies we identified make it challenging to draw conclusions at this time. A measure is required to evaluate the digital therapeutic alliance.

**Keywords**
Smartphone; alliance; Individual Psychotherapy.

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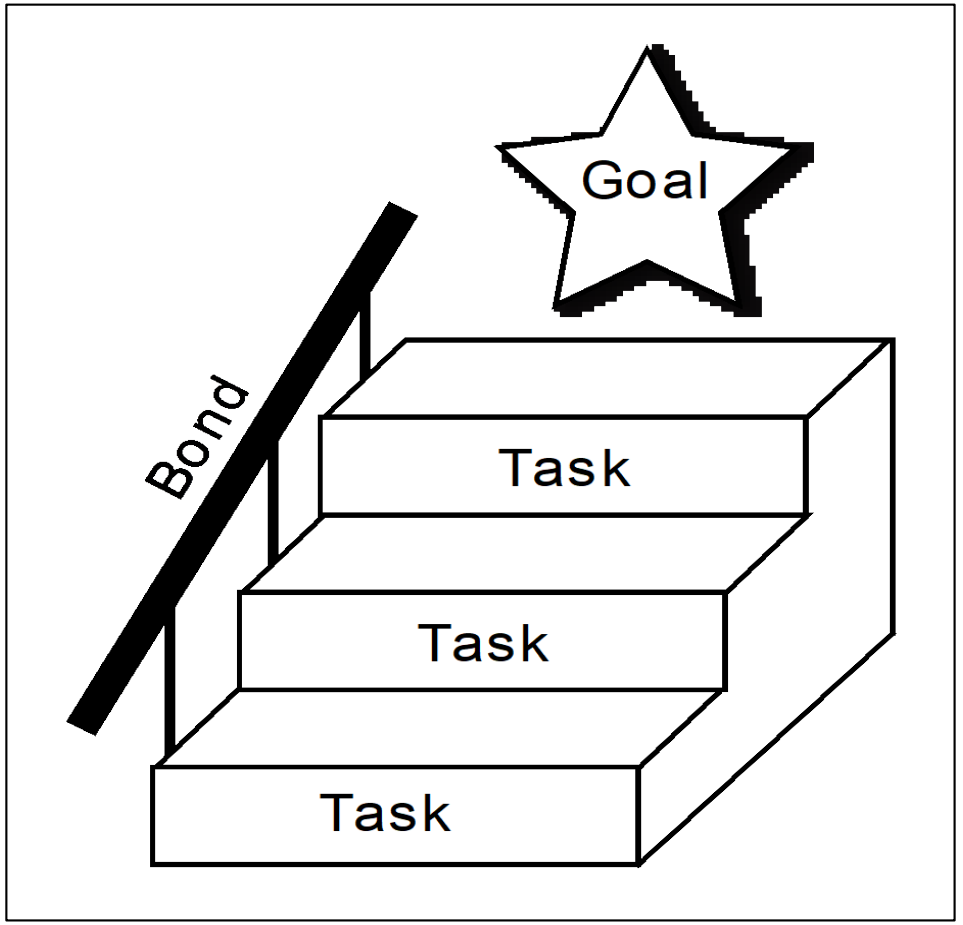


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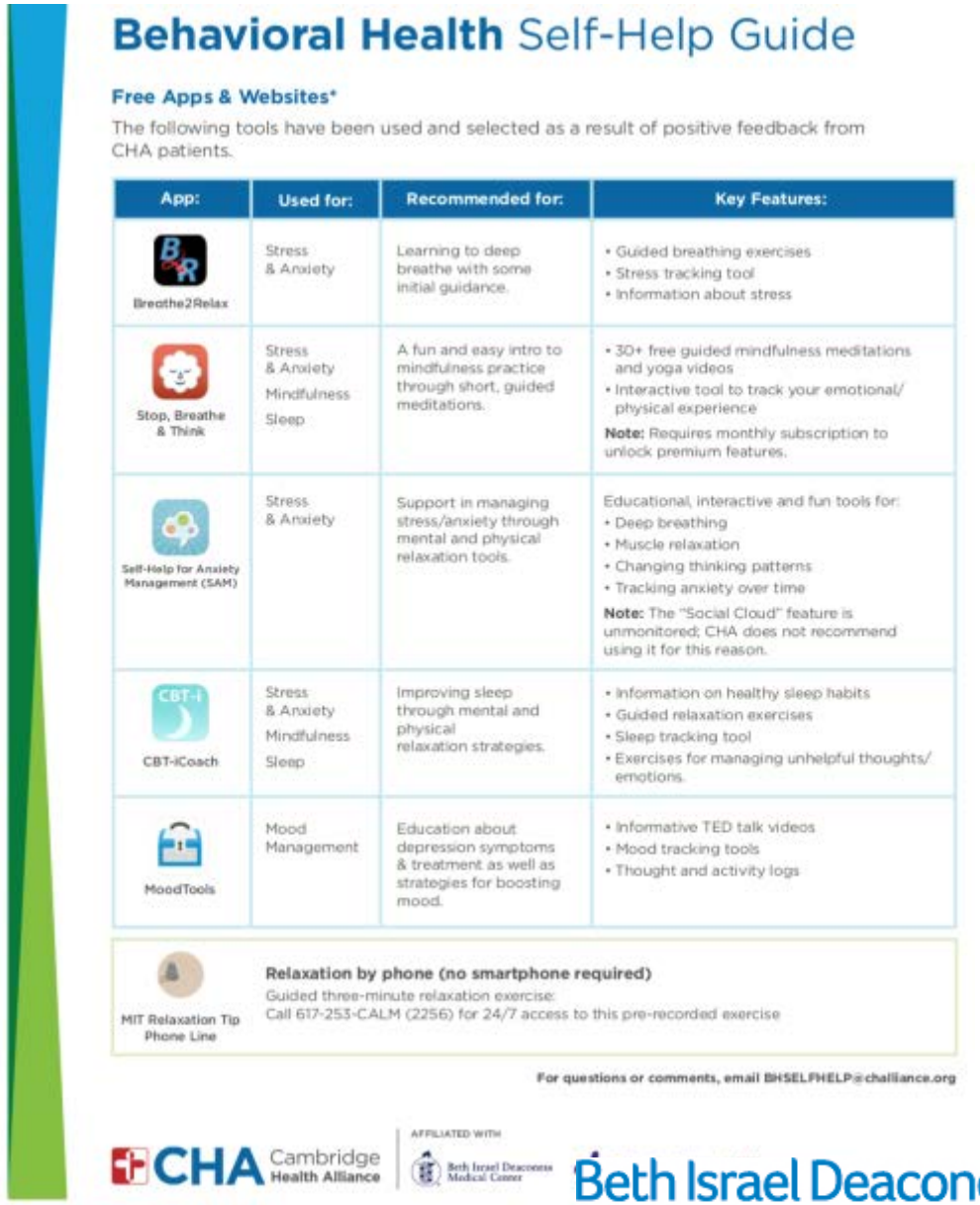
# Informed Decision Making Around Apps

**Evaluation (n=13)**
Breathe2Relax
CBT-iCoach
Mindfulness Coach
MoodTools
Mindshift
Relief Link
T2 MoodTracker
Self-Help for Anxiety Managment (SAM)
ACT Coach
My3
PTSD Coach
quitStart
StayQuit Coach

**Pilot (n=9)**
Breathe2Relax
CBT-iCoach
Mindfulness Coach
MoodTools
Mindshift
Relief Link
T2 MoodTracker
Self-Help for Anxiety Managment (SAM)
quitStart

**Post-Pilot (n=7)**
Breathe2Relax
CBT-iCoach
Mindfulness Coach
MoodTools
T2 MoodTracker
Self-Help for Anxiety Managment (SAM)
Quit Guide*



## Behavioral Health Self-Help Guide

### Free Apps & Websites*

The following tools have been used and selected as a result of positive feedback from CHA patients.

| App: | Used for: | Recommended for: | Key Features: |
|---|---|---|---|
| Breathe2Relax | Stress & Anxiety | Learning to deep breathe with some initial guidance. | • Guided breathing exercises<br>• Stress tracking tool<br>• Information about stress |
| Stop, Breathe & Think | Stress & Anxiety<br>Mindfulness<br>Sleep | A fun and easy intro to mindfulness practice through short, guided meditations. | • 30+ free guided mindfulness meditations and yoga videos<br>• Interactive tool to track your emotional/ physical experience<br>**Note:** Requires monthly subscription to unlock premium features. |
| Self-Help for Anxiety Management (SAM) | Stress & Anxiety | Support in managing stress/anxiety through mental and physical relaxation tools. | Educational, interactive and fun tools for:<br>• Deep breathing<br>• Muscle relaxation<br>• Changing thinking patterns<br>• Tracking anxiety over time<br>**Note:** The "Social Cloud" feature is unmonitored; CHA does not recommend using it for this reason. |
| CBT-iCoach | Stress & Anxiety<br>Mindfulness<br>Sleep | Improving sleep through mental and physical relaxation strategies. | • Information on healthy sleep habits<br>• Guided relaxation exercises<br>• Sleep tracking tool<br>• Exercises for managing unhelpful thoughts/ emotions. |
| MoodTools | Mood Management | Education about depression symptoms & treatment as well as strategies for boosting mood. | • Informative TED talk videos<br>• Mood tracking tools<br>• Thought and activity logs |
| MIT Relaxation Tip Phone Line | **Relaxation by phone (no smartphone required)**<br>Guided three-minute relaxation exercise:<br>Call 617-253-CALM (2256) for 24/7 access to this pre-recorded exercise | | |

For questions or comments, email BHSELFHELP@challiance.org

CHA Cambridge Health Alliance | AFFILIATED WITH Beth Israel Deaconess Medical Center

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Hoffman L, Benedetto E, Huang H, Grossman E, Kaluma D, Mann Z, Torous J. Augmenting Mental Health in Primary Care: A One-Year Study of Deploying Smartphone Apps in a Multi-Site Primary Care/Behavioral Health Integration Program. Frontiers in psychiatry. 2019;10:94.

# Thank You

**Digitalpsych.org ;** ***jtorous@bidmc.harvard.edu***