

Measurement-based Telebehavioral Health

As we are waiting, please put your NAME, LOCATION, ROLE
and FAVORITE SMARTPHONE APP in the TEXT BOX

George 'Bud' Vana MD, MA, FAAP, FAPA, FAACAP
9/21/2021

Objectives

Understand rationale for measurement based behavioral health care

Describe new methods and targets for measurement

Discuss opportunities and barriers in tribal health centers

Disclosures

- No financial conflicts
- Work at Tribal Health Center
- Do not speak for my employer or anyone else
- Pretty idiosyncratic to me
- Additional playful disclosures during talk (about my use of technology)



A PATCH

The nonmedicated MYCITE[®] Patch gets a signal from the smart pill after you swallow it.

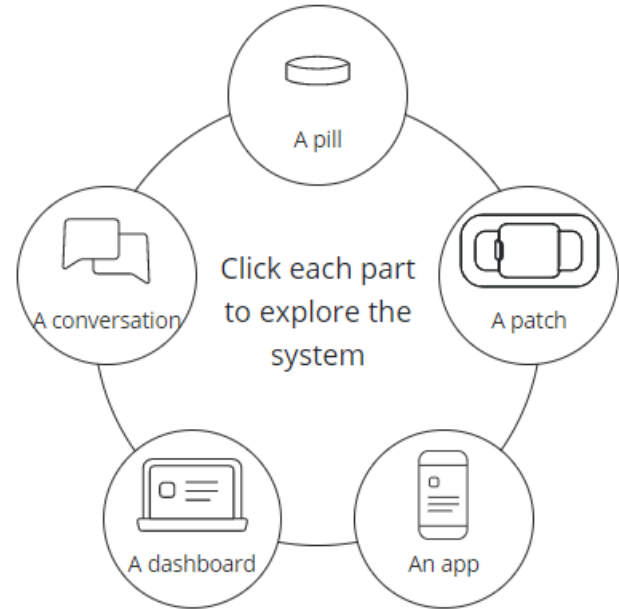
The patch is made up of 2 parts:

- a reusable Bluetooth[®] data pod
- a disposable adhesive strip that holds the pod in place

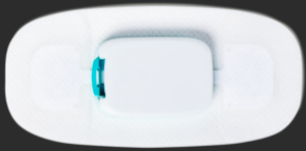
The pod logs when you take your pill. Like an activity tracker, the pod also automatically logs your activity (number of steps you've taken that day) and time spent resting. The pod then sends the information to an app on your smartphone.

The patch can stay on even through water and sweat, and does not need to be taken off in the shower or during exercise.

More questions about the patch?



<https://www.abilifymycite.com/how-mycite-works>



What data would you measure?

Write the data you would like to measure for patients in the chat box!

What data would you measure?

- Sleep
- Activity and exercise
- Medication adherence
- Appointment attendance
- Social engagement
- Mood scores
- Number of anxiety or panic attacks
- Alcoholic beverage use
- Drug use

NOW

- Answers from paper or online validated questionnaires
- Fitbit data
 - Physical activity
 - Sleep
- Breathalyzer sensor
- Pill Sensors (Abilify MyCite)

FUTURE

- All the discrete data on your
 - Smartphone
 - Speech
 - Facial expressions
 - Sensors
 - Smartwatch
 - sensors
 - Web browser
 - Search history
 - Clicks
 - Social media
 - Other targeted apps
- Brain scans
 - Functional MRI
 - EEG

Psychotherapeutic Disclosure

When therapists or psychiatrists reveal something about themselves it's called 'disclosure'.

My disclosure about Psychiatry:

As a field, we have been slow to respond to technological change aside from the medications we prescribe.

So slow that the head of federal mental health research Tom Insel quit the premiere grant funding mechanism (the NIMH) to work for Google (or rather Alphabet) and then quit working with them to start his own tech mental health startup Mindstrong.

There is a tension between academia, research, and business interests in psychiatry and mental health. I believe there is a risk of it paralleling the psychopharmacologic boom of the 1990s and early 2000s without appropriate considerations.

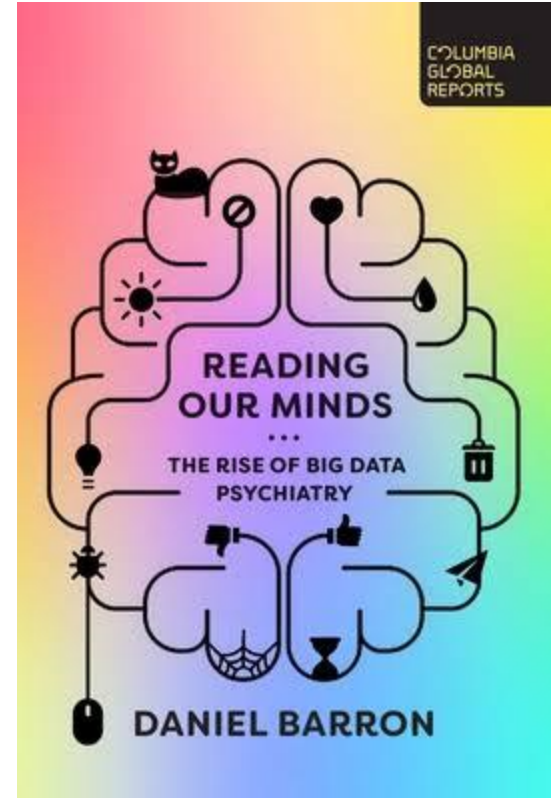
Why should we measure anything?

Example from Reading our Minds:

There was no definition of normal range of blood pressure until death of President Frederick Delano Roosevelt

Led to the Framingham Heart Study

Now we have hypertension biomarker parameters which are studied and updated.



PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

ID #: _____

DATE: _____

Over the last 2 weeks, how often have you been bothered by any of the following problems?
(use "✓" to indicate your answer)






	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite—being so fidgety or	0	1	2	3

So why should we use measurement-based care in psychiatry?

SLIGHTLY BACKWARDS

1. It improves treatment outcomes (Evidence based answer)
2. It will help us understand what we are treating (Philosophical answer)
3. It will help us understand the best treatments (Philosophical answer)

AIMS

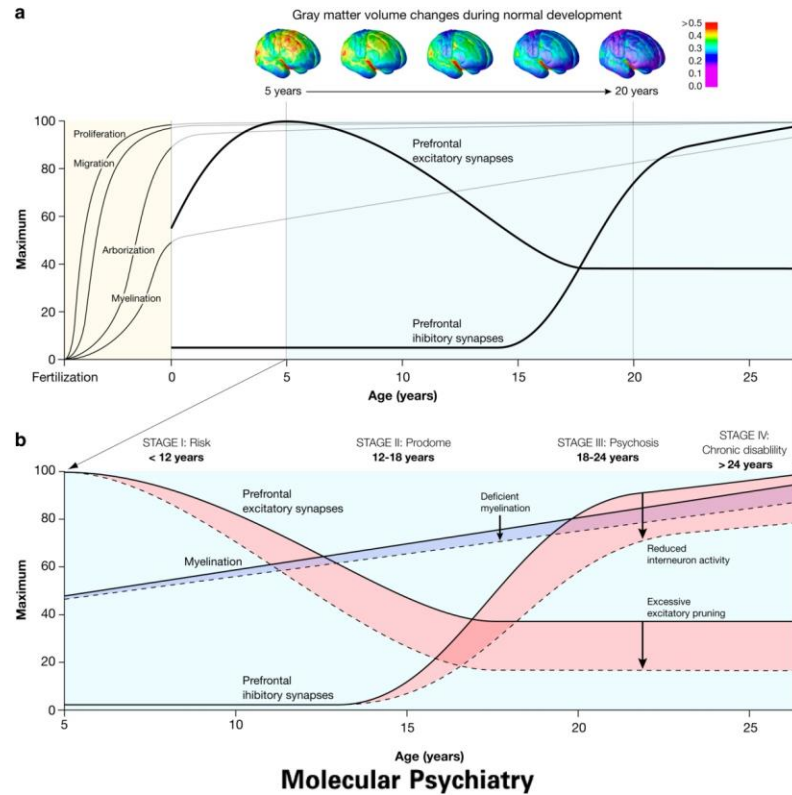
Principles of Care		We apply this principle in the care of		
		None	Some ...our patients	Most/All
	1. Patient-Centered Care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Primary care and behavioral health providers collaborate effectively using shared care plans			
	2. Population-Based Care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Care team shares a defined group of patients tracked in a registry. Practices track and reach out to patients who are not improving and mental health specialists provide caseload-focused consultation, not just ad-hoc advice.			
	3. Measurement-Based Treatment to Target	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Each patient's treatment plan clearly articulates personal goals and clinical outcomes that are routinely measured. Treatments are adjusted if patients are not improving as expected.			
	4. Evidence-Based Care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Patients are offered treatments for which there is credible research evidence to support their efficacy in treating the target condition.			
	5. Accountable Care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Providers are accountable and reimbursed for quality care and outcomes.			

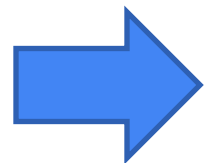
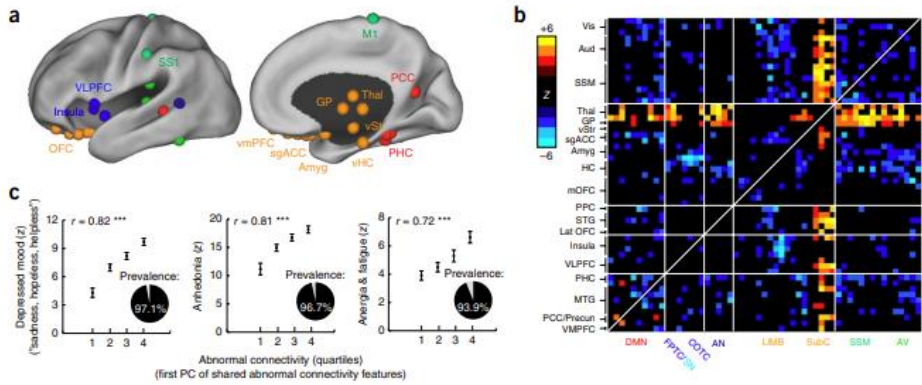
How much more effective is Measurement Based Care?

Review by Fortney and colleagues:

- Deliverable in Primary Care Settings
- Works – improves depression symptoms faster than usual care
- Helps patients who did not initially improve – change treatment plan sooner
- Better couples counseling outcomes
- Bipolar has better outcomes (STEP-BD trial)
- Moderators – immediacy of information (conducted in clinic and visit)
- Secondary Benefits: easier quality improvement, outcomes measuring, values-based purchasing initiative

Schizophrenia as a developmental disorder

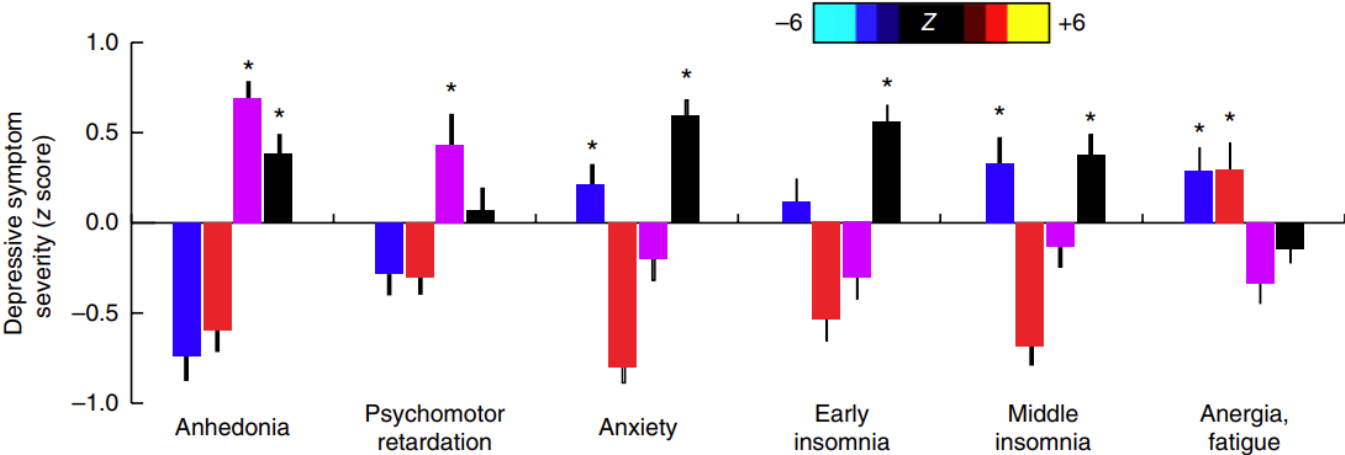




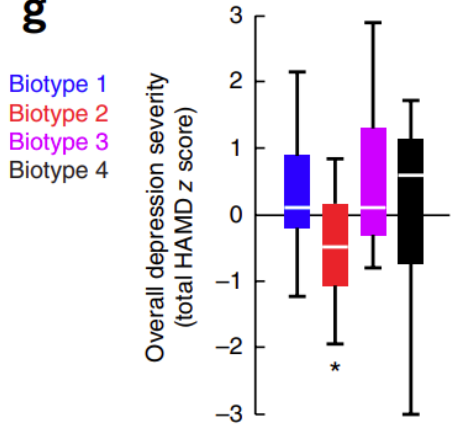
Nature Medicine
 (2017) Jan;23(1):28-38. doi:
 10.1038/nm.4246.

Biological Subtypes of Depression

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g



Nature Medicine (2017) Jan;23(1):28-38. doi: 10.1038/nm.4246.

Technology-Enabled Care: The Future of Our Field

RAVI N. SHAH MD, MBA

I am delighted to introduce this important supplement of *Psychiatric Times*™. In the context of the COVID-19 pandemic, telepsychiatry has passed its tipping point and now become a mainstream method of providing mental health services. In contrast, more complex solutions such as artificial intelligence, technology-enabled care, and smartphone applications are not yet mainstream.

However, the integration of digital technologies into psychiatric care has only just begun. Looking ahead, I believe that technology-enabled care will be the defining advancement of mental health services in this generation. I believe there are 3 key trends that have shaped how we got here and give us clues to what the future holds.

tal health condition, and more than 10% seriously considering suicide.¹

At the same time, the pandemic circumstances have made it easier to talk about these experiences of depression and anxiety, in part, because they were understandable reactions to the various facets of a global crisis. On top of that, celebrities and other influencers have been speaking about their own mental health challenges, thereby normalizing the experience and providing hope for treatment.

For examples, 23-time Olympic gold medalist swimmer Michael Phelps, and singer-songwriter Demi Lovato have both shared their experiences as part of serving as marketing ambassadors for Talkspace. Similarly, tennis player Naomi Osaka, the highest-paid female athlete in the world, recently shared her experience with depression and anxiety in an Instagram post, explain-

ing, earlier this year I published a discussion on this topic after finding that venture capital investors dedicated a record breaking \$637 million to mental health startups in 2019, which was a 23-fold increase from 2013.² Estimates now suggest that venture capital investment topped \$1 billion in 2020 and is poised to surpass \$2 billion in 2021.³

In addition to venture capital, private equity companies are also investing in mental health; they are focusing on consolidating addiction facilities, residential treatment centers, and outpatient mental health clinics. In June 2021, LifeStance Health, one of the nation's largest providers of outpatient psychiatric services, joined the Nasdaq stock exchange in an initial public offering just 4 years after being launched.⁴ This trend will likely continue.

You may be wondering why private

Summary of framework by Dr. Ravi Shah

- Erosion of Stigma
- Private Investment in Mental health
 - Significant investment by non-medical persons
- Smartphone use by majority of Americans (85% own a smartphone)
- Hybrid Care (telemedicine and in person care) forced by Covid-19 Pandemic

An example on next slide

FIGURE.

Imagining Technology-Enabled Care in 2030

“Aaliyah,” a 27-year-old woman presents to Dr Sanchez for outpatient treatment of generalized anxiety disorder. This is what her care looks like.

3.

RESCHEDULING

An unexpected work meeting came up that Aaliyah cannot miss. She logs into the practice portal and reschedules the appointment from Tuesday at 2:00 PM to Thursday at 3:30 PM, which is an open slot that works for her schedule.

1.

TELEPSYCHIATRY

Aaliyah meets the psychiatrist in person for the first visit, as well as quarterly visits, but most follow-ups are conducted via video. This way, she can make the appointments during the workday without requesting time off.

2.

ASYNCHRONOUS MESSAGING

Aaliyah requests her selective serotonin reuptake inhibitor refills through a portal and asks questions via messaging, such as: “I’m much sweatier since starting sertraline. Is that normal?” She expects a response within 1 business day, but understands this messaging is not for complicated questions or emergencies.

4.

MEASUREMENT-BASED CARE

Aaliyah fills out the Generalized Anxiety Disorder-7 questionnaire monthly, to track her progress and ensure she is regularly monitoring her symptoms. The results are sent to Dr Sanchez for review and are automatically populated into Dr Sanchez’s next clinical note. Dr Sanchez also receives a copy in her inbox.

5.

DIGITAL APPLICATIONS

At some point, Aaliyah develops insomnia and uses the patient portal to ask whether she needs to meet the psychiatrist. Dr Sanchez replies, and suggests she try a free insomnia coach app for 8 weeks. He provides a link to the app and asks her to keep him posted.

Brief Summary of Reading our Minds



- Google search history and social media posts
 - More data than simply asking patient about fixed interests, delusions
- Accelerometer, geolocation, call logs
 - More data than asking “have you had less energy or been socializing less?” or could this child who is moving all around the classroom have ADHD?
- Conversational Data
 - Computer analysis of speech can predict psychosis, depression
- Stress Test for the Brain
 - Can we induce hallucinations or delusions in people who are more prone to them?

Treatment at Your Fingertips: Cautious Optimism for Digital Therapeutics to Treat Anxiety

JUDSON BREWER, MD, PhD

As the need grows for equitable, accessible, and affordable mental health treatment, digital therapeutics—app-

history received a new mental health diagnosis, with the greatest health risk being for anxiety disorders.⁴

Digital therapeutics can be designed to specifically target a behavioral or psychological mechanism of action, and they can be developed

slowly than their commercial counterparts, and those that do appear usually fail to attract users and user engagement.⁵ However, both face the same fate: No matter how shiny an app is, it still takes time to run rigorous clinical trials to determine

TABLE. Important Questions to Consider When Evaluating an App

1. What is the proposed mechanism, if any?
2. How anxious is the population that was studied?
3. Are the reported changes in anxiety clinically meaningful?
4. Is the treatment safe (eg, developed by credible teams that include clinicians)?

<https://www.psychiatristimes.com/topics/digital-therapeutics>

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FIGURE. Characteristics of Apps for Anxiety



Commonly included elements:

a be-
hanism
eloped

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<https://www.psychiatrictimes.com/topics/digital-therapeutics>

Digital Phenotype

From Beiwi – a program for Digital Phenotyping

What is digital phenotyping? We define digital phenotyping as the “moment-by-moment quantification of the individual-level human phenotype in situ using data from personal digital devices,” in particular smartphones.

<https://www.hsph.harvard.edu/onnella-lab/beiwe-research-platform/>

Digital Phenotyping of Mental State/The Psychiatric Exam

Speech	Prosody, volume, vowel space, word choice, length of phrases, coherence, sentiment
Voice	Valence, tone, pitch, intonation
Keyboard	Reaction time, attention, memory, cognition
Smartphone	Physical activity, movement, communication, sociality, social media, tweets, emoji, Instagram
Face	Emotion, tics, smiles and length, look at ground, eye movements, eye contact
Sensors	Heart rate, heart rate variability, galvanic skin response, skin temperature, blood pressure, breathing pattern, number of signs, sleep, posture, gestures

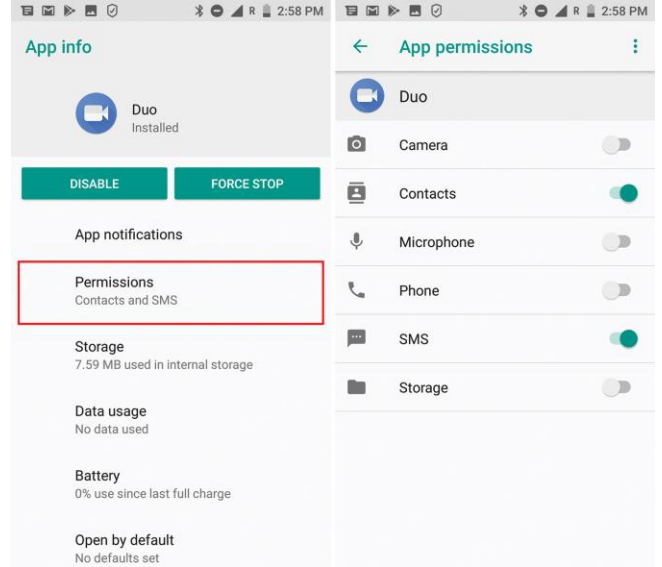
From Deep Medicine (Table 8.1 – p.168)

Personal data

My first 'smart phone'

At the time I had concern about sharing data

Now I sign up for apps without a second thought



Personal data

Actually this was my first smartphone (but I just used it with my calendar), my sister kept using hers until it was no longer supported

The company which makes this phone largely doesn't exist any longer (Palm)

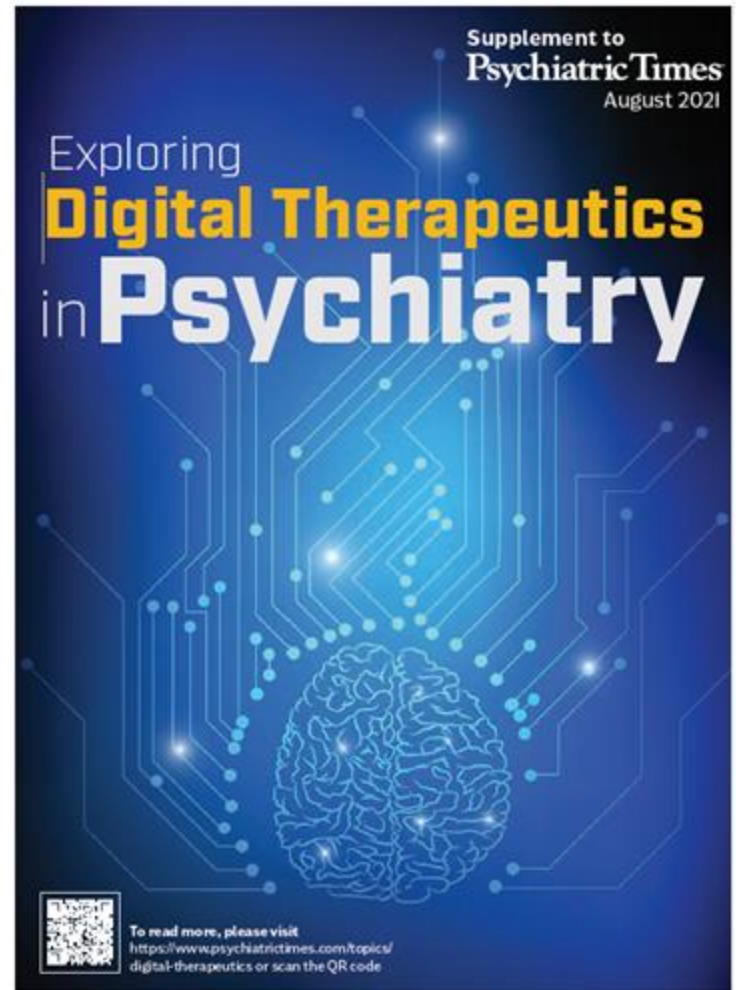


Digital therapeutics

Where academics, big tech and big business meet

Many seeking FDA approval

<https://www.psychiatristimes.com/topics/digital-therapeutics>



Monthly Client Detail Report

[Download PDF Monthly](#) | [Full](#)

Client Name: Jordan Reynolds

Device ID: 001245, Activation Date 02/01/2020, Report Date 02/01/2021

93

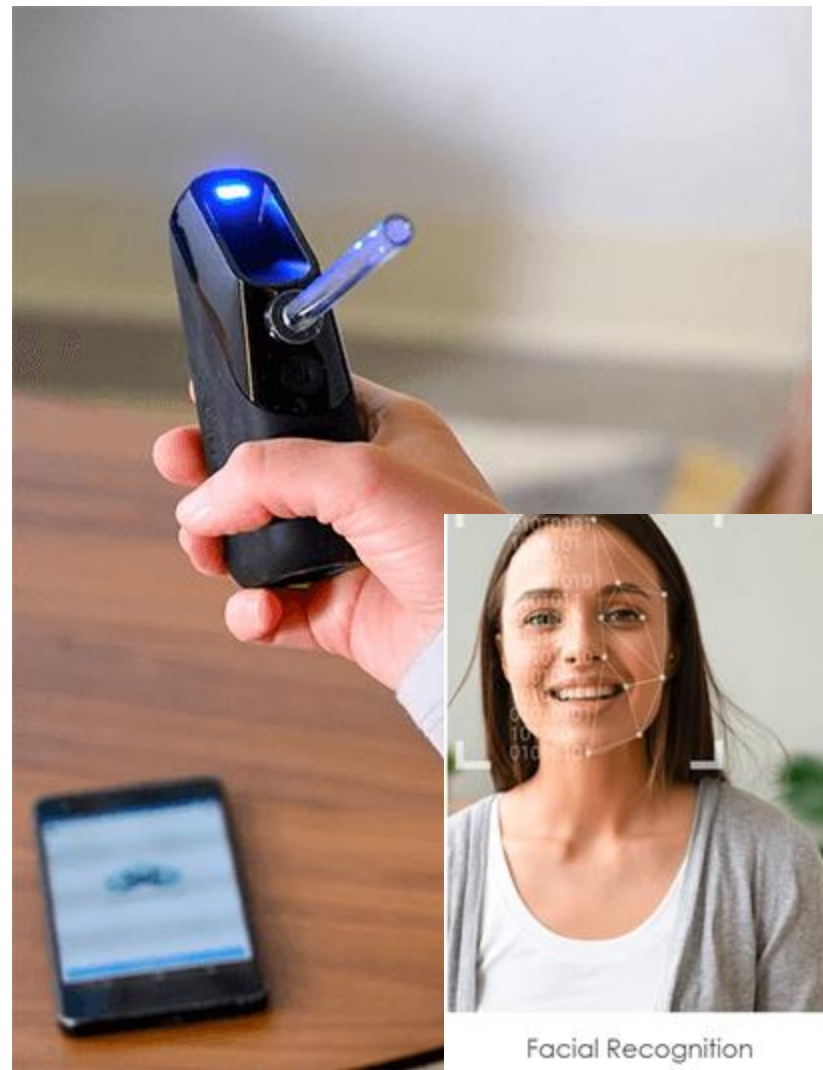
Tests

✔ Compliant Tests Tests that follow testing guidelines	88
- Missed Tests A test was not submitted during schedule time	5
✘ Non-Compliant Tests Positive tests or tests where the identity is declined	0

January 2021

Sun	Mon	Tue	Wed	Thu	Fri	Sat
					1 ✔ 8:03 am ✔ 3:32 pm ✔ 10:47 pm	2 ✔ 9:09 am ✔ 3:07 pm ✔ 10:03 pm
3 ✔ 8:10 am ✔ 3:43 pm ✔ 9:07 pm	4 ✔ 8:01 am ✔ 3:06 pm ✔ 11:20 pm	5 ✔ 11:30 am ✔ 3:14 pm ✔ 9:03 pm	6 ✔ 8:02 am ✔ 5:00 pm ✔ 10:12 pm	7 ✔ 8:00 am ✔ 2:00 pm ✔ 9:00 pm	8 ✔ 8:00 am ✔ 3:30 pm ✔ 10:30 pm	9 ✔ 9:00 am ✔ 3:00 pm ✔ 9:10 pm

soberlink.com



Facial Recognition

Meet Woebot



The clinically validated mental health app for daily life

Woebot is an evidence-based mental health app designed by Stanford-trained researchers and psychologists. It uses brief, text-based conversations based on CBT, DBT and IPT principles to provide psychoeducation tools and resources in moments of need. No referrals necessary.

- ✓ Provides on-demand access to mental health services
- ✓ Delivers the most appropriate therapeutic techniques in the moment
- ✓ Helps patients stay engaged with their mental health outside appointments
- ✓ Helps improve patient outcomes



Awarded FDA Breakthrough Device Designation
Seeking full FDA approval

4.7



ON APP STORE

4.8



ON APP STORE



I go to therapy for one hour, once a week, but with Woebot, I can check in as many times as I want during the day and it's just comforting for me. It fills the gap.

— Lee, Woebot user

Visit www.WoebotHealth.com to learn more

MEET THE FIRST AND ONLY FDA-APPROVED PRESCRIPTION VIDEO GAME

A clinically-validated treatment for inattention in children with ADHD

Our proprietary and patented **Selective Stimulus Management Engine (SSME™)** technology targets each patient's key neural systems related to attentional control in the brain



Proven efficacy and safety profile in
600+ PATIENTS
across
5 CLINICAL STUDIES

Learn more and see the data at
HCPENDEAVORRX.COM

Indication and Important Safety Information

The EndeavorRx® app is a digital treatment indicated to improve attention function as measured by computer-based testing in children ages 8-12 years old with primarily inattentive or combined-type ADHD and should be considered for use as part of a therapeutic program. Patients who engage with EndeavorRx may not display benefits in typical behavioral symptoms, such as hyperactivity.



The most common side effect observed in children in EndeavorRx's clinical trials was a feeling of frustration, as the game can be quite challenging at times. No serious adverse events were observed with its use.

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EndeavorRx®

Patient Smartphone Data

What data would you use from a patient's smartphone if you could?

Objective Data



Medication
ingestion ▼



Activity
(number of steps) ▼



Time spent resting ▼

Patient-reported data



Mood ▼



Rest quality ▼



Reason for a
missed dose ▼

Only functions related to tracking drug ingestion have been evaluated or approved by FDA.

Objective Data



Medication
ingestion ▼



Activity
(number of steps) ▼



Time spent resting ▼

Sounds Pretty Good!

Patient-reported data



Mood ▼



Rest quality ▼



Reason for a
missed dose ▼

Only functions related to tracking drug ingestion have been evaluated or approved by FDA.

Objective Data



Abilify MyCite[®]

(aripiprazole tablets with sensor)

2, 5, 10, 15, 20, 30 mg



Mood ▼



Rest quality ▼



Reason for a missed dose ▼

Only functions related to tracking drug ingestion have been evaluated or approved by FDA.

<https://www.abilifymycitechcp.com/about>

Abilify MyCite

Well - it's sort of what we have been talking about

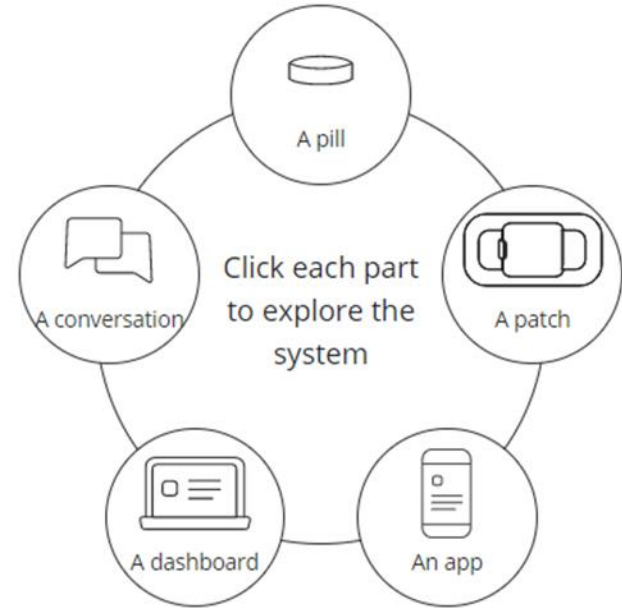
Ethical issues

But maybe a choice for a person with serious mental illness – with a family monitoring a disease with high risk of relapse...

However... are there cheaper options?

... more culturally appropriate options?

...options which work better which do not rely on medication management visits?



Tribal Communities and where the data lives

What are some other concerns you have about data and tribal communities?

Tribal Communities and where the data lives

- Bad experiences with data 'sharing' in past
- IRB at Tribes
- Tribal sovereignty
- Identifying patients as Native American in some places reveals a lot
- Purported benefits to the community

Tribal specific concerns

- Culturally informed care
- Role of spirituality
- Trauma informed care
- Social connectedness and social media
- Families managing disease
- Physical distance and under-served-ness

Summary

- Measurement based care works (especially with the right support staff)
- Understand how apps and measurement tools were developed
- Understand where the data goes in apps
- Discuss privacy and 'harms' of apps with patients
- Ponder where our digital future might go next
- Decide how encounter rate eligible encounters could be enhanced by technology
- Watch for digital regulation and compensation updates

Resources

- Professional organizations – national and state level
- Center for Connected Health Policy - <https://www.cchpca.org/>
- <https://www.ihs.gov/telehealth/resources/>
- IHS Telebehavioral Health Center of Excellence - <https://www.ihs.gov/telebehavioral/>

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