

Affective Computing and Future Health

Rosalind W. Picard, Sc.D., FIEEE

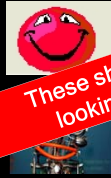
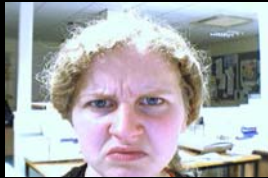
Professor, MIT Media Lab
Faculty Chair, MIT Mind+Hand+Heart
Co-founder and Chairman, **Empatica**, Inc.
Co-founder, **Affectiva** Inc.

AFFECTIVE COMPUTING



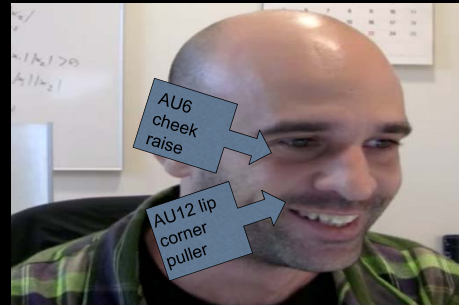
Affective computing is computing that relates to, arises from, or deliberately influences emotion

Intelligent interaction?



These should stop looking happy

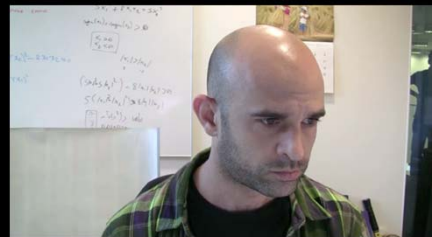
"Singing cheerful songs to a person with a heavy heart is like taking someone's coat in cold weather or pouring vinegar in a wound." Proverbs 25:20 *New Living Translation*



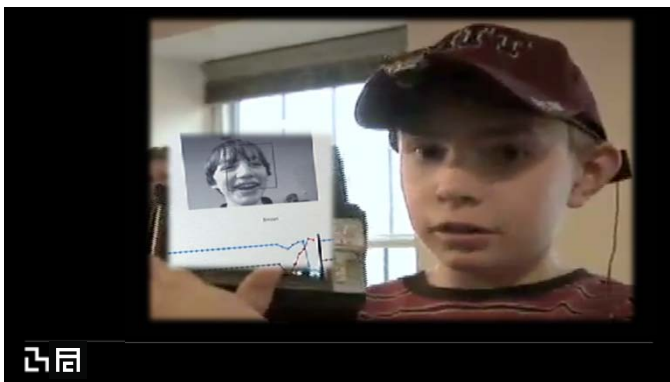
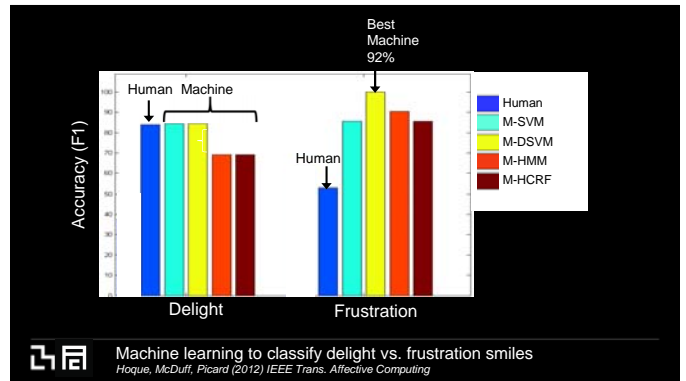
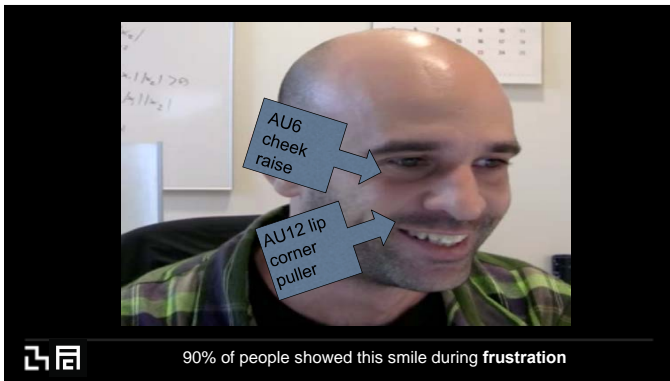
"The true smile of delight?"



We didn't tell him we used "impossible" captchas



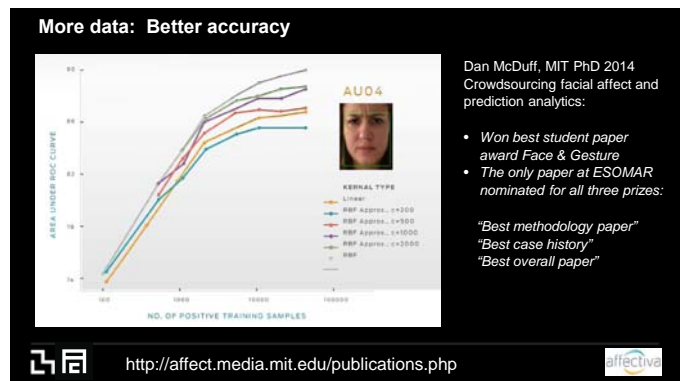
We didn't tell him we used "impossible" captchas



Need: As much data as possible

Opt in online with your webcam

McDuff, el Kaliouby, Picard, "Crowdsourcing Facial Responses to Online Videos,"
IEEE Transactions on Affective Computing, 2012.



Interactive real-time facial emotion recognition affectiva

Demo App
AffectMe
FREE at:

- > 90% accurate on 24 expressions
- > 75 countries
- > 50 B emotion data points measured
- > 1400 brands
- > Used by 1/3 of Fortune Global 100
- > HCI, Gaming, Robots, Medical

@affectiva

Augmented Reality Smart-Glass System empowers children and adults to teach themselves crucial social and cognitive skills

GLASS

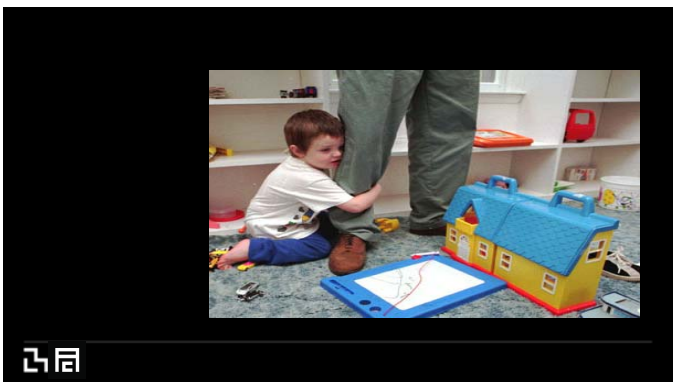
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Real-Time Emotion SDK

Makes it easy to add real-time facial emotion sensing to apps on tablets and smartphones, in games, and more

Get affectiva.com/sdk FREE!

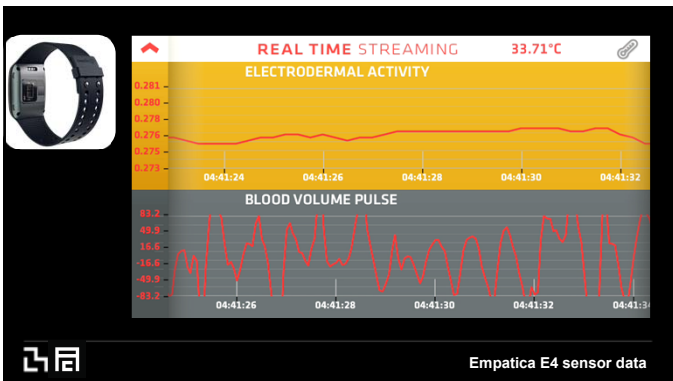
@affectiva

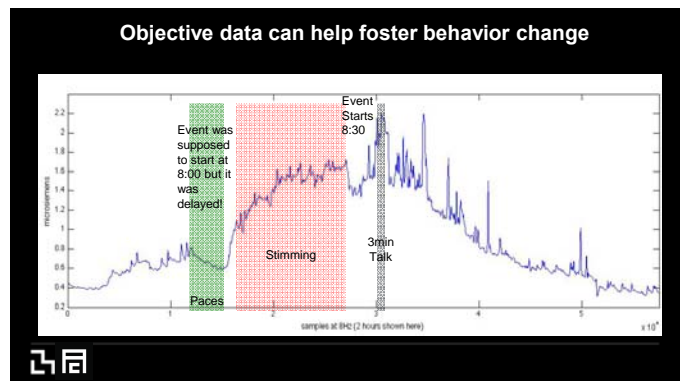
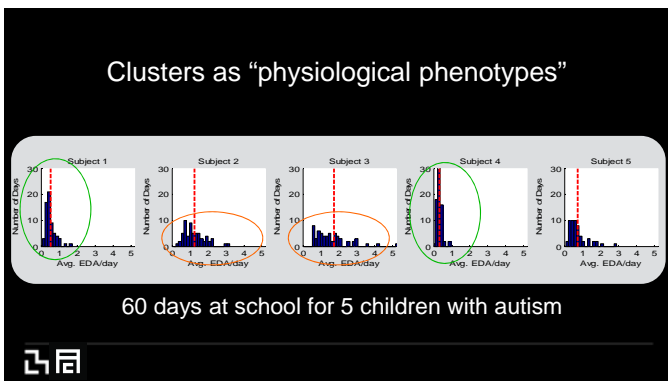
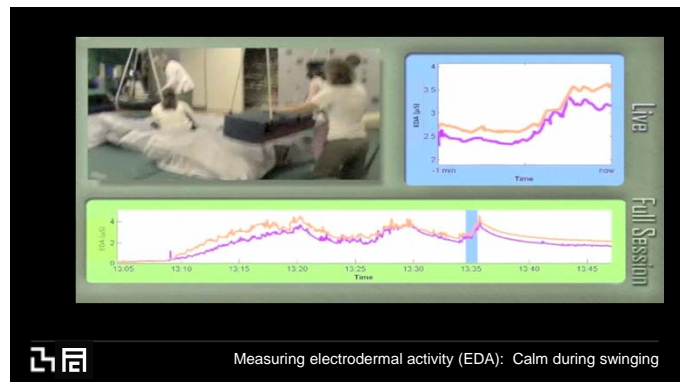
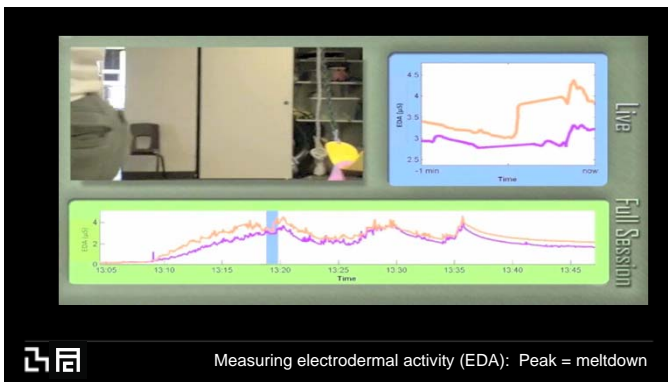
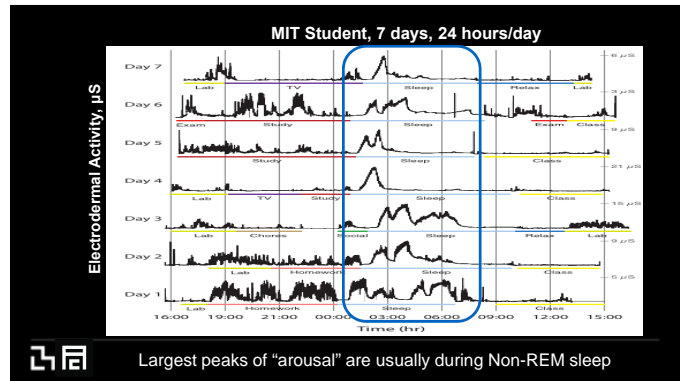
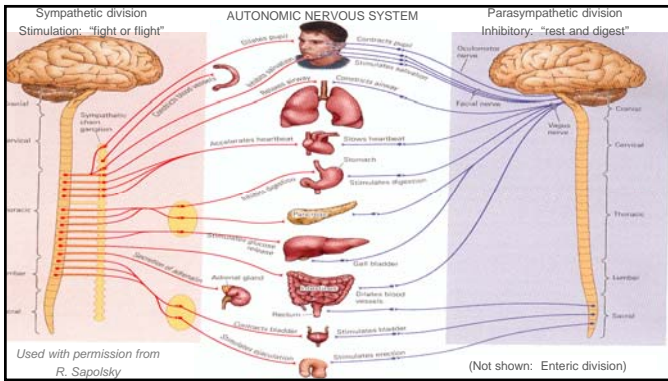


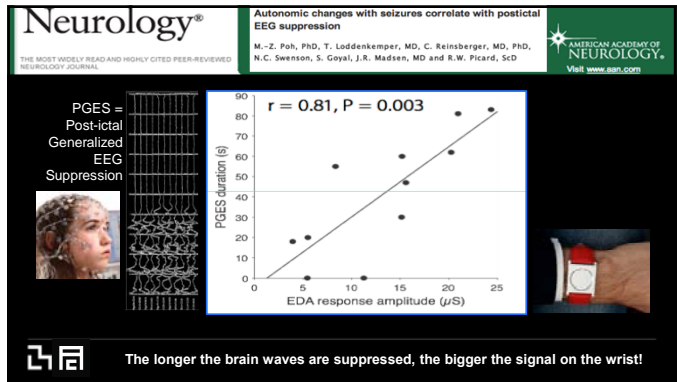
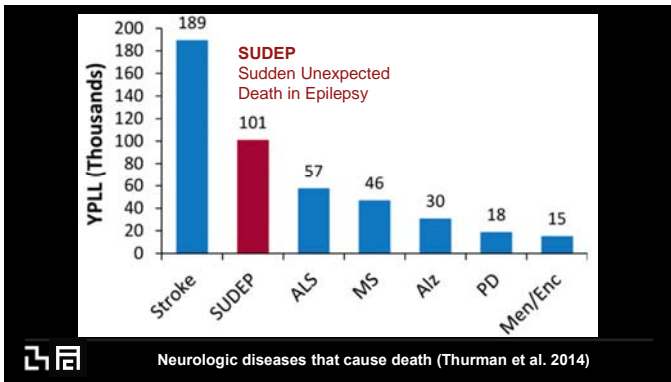
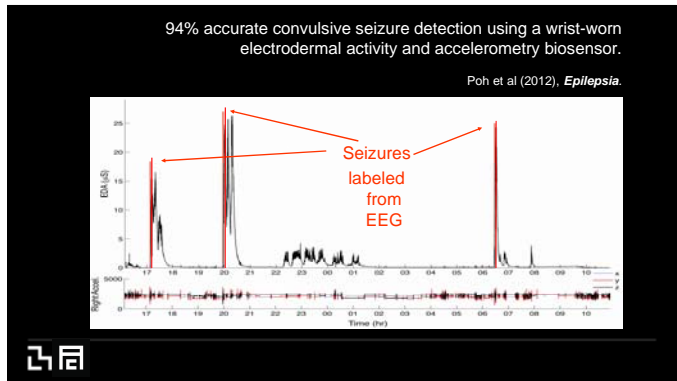
Electrodermal Activity (EDA) Sensors
(old terminology: "galvanic skin response")

Traditional: Biopac, Thought Technology

MIT Media Lab Innovations



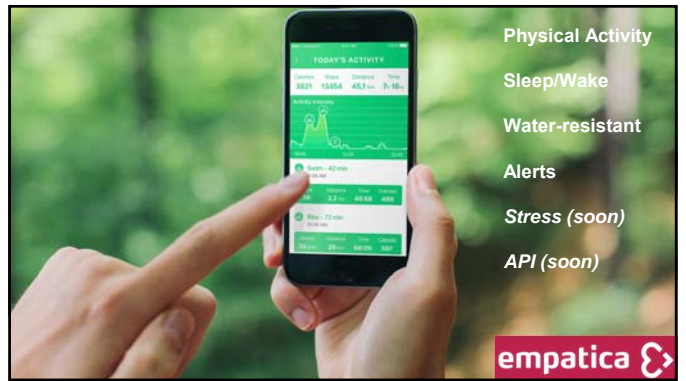




Why we need to tell everyone with epilepsy about SUDEP:

<http://www.epilepsy.com/information/professionals/hallway-conversations/should-patients-or-their-families-be-told-risk-sudep>


- Patients say they want to be told about SUDEP immediately after diagnosis (Stevenson & Stanton, *Epilepsia*, 2014)
- SUDEP can happen immediately after diagnosis, e.g., Henry Lapham, after a few febrile seizures at age 3 and one convulsive seizure at age 4, died a few weeks later (www.sudepglobalconversation.com)
- **Having even one convulsive seizure in the last year puts the patient at heightened SUDEP risk.**
- More people in the USA die of SUDEP every year than of SIDS. (and we tell all parents about SIDS)
- If the patient wasn't told, and dies, perhaps because they skipped some meds (thinking, "no big risk, I'll be in my safe bed") then the doctor and nurse may be held liable.
- Children and parents routinely sign statements, "I have been told of the risk that I might die" for far lower risks (sport fencing, soccer camp, ...)
- **Most SUDEP happens at night, and when patients are unattended. Steps can be taken to reduce risk:** Get a roommate, and/or an alerting device, or get a seizure dog, and take extra precautions to make sure not to miss a dose of medication. Do everything your doctor says to reduce seizure frequency.



Email from a parent using Embrace smartwatch:

We got another alert this morning, ran to her room and **she was face down with a seizure/not breathing!**


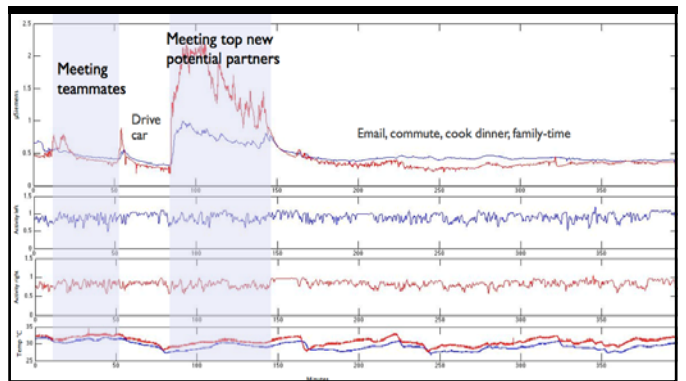
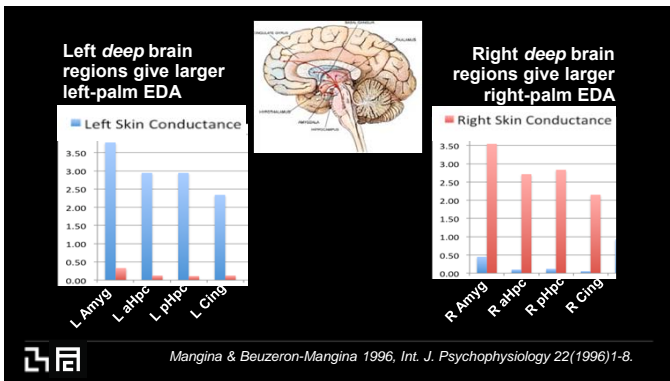
We repositioned her and she is now pink and sleeping.



Deep brain/neural activity -> signals on wrist?

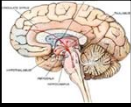
Embryo has three tissue types:

Ectoderm	Skin and neural
Endoderm	Digestive and respiratory track
Mesoderm	Muscle and bone



Growing challenge: the future of mood



Major Depressive Disorder is the leading cause of **disability** in the U.S. for ages 15-44.

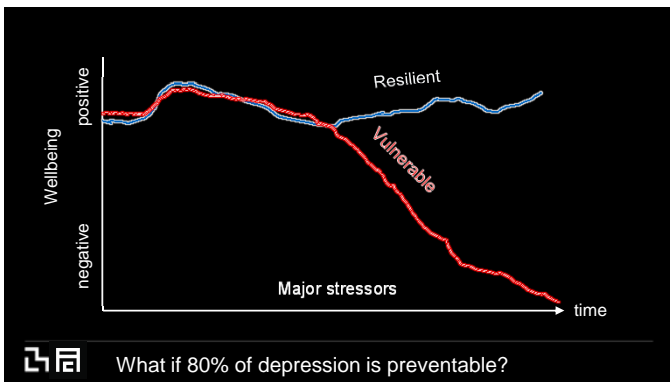
The US suicide rate increased 24% during 1999-2014 (CDC, 2016)

- suicides rose 59% for white men age 45-64
- suicides rose 80% for white women age 45-64
- suicides tripled for young girls, aged 5-14


Suicide is higher in developing countries and growing worldwide (WHO, 2011, 2014)

- By 2020, 1 suicide will happen every 20 seconds
- By 2030, depression will be the #1 disease burden globally; disability and lives lost from **depression** will be greater than from **cancer, accidents, war, and stroke.**

picard@meda.mit.edu
http://artec.media.mit.edu



Future: Forecast when you are likely to get sick or depressed




Ambulatory Measurement

- Physiology
- Behavior
- Social Interaction
- Environment
- Experience Sampling


Lab measurement

- Standardized questionnaires
- Saliva (Melatonin)
- Cognitive and Affective stress tasks

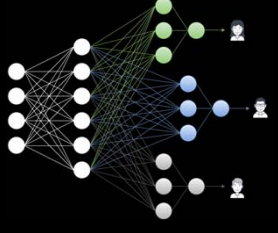
Long-term monitoring & analysis



~1.2 Billion samples per person/year



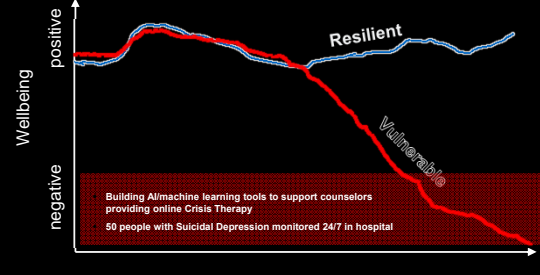
Using wearable + smartphone data + AI/machine learning...



Goal: Predict your physical health, stress, and happy-sad mood for **TOMORROW NIGHT** based on your data through today

Accuracy: **82-87%**

N Jaques, S Taylor, E Nosakhare, A Sano, R Picard. "Multi-task Learning for Predicting Health, Stress, and Happiness." NIPS Workshop on Machine Learning for Health, Barcelona, Spain, December 2016. BEST PAPER AWARD



Wellbeing positive
negative

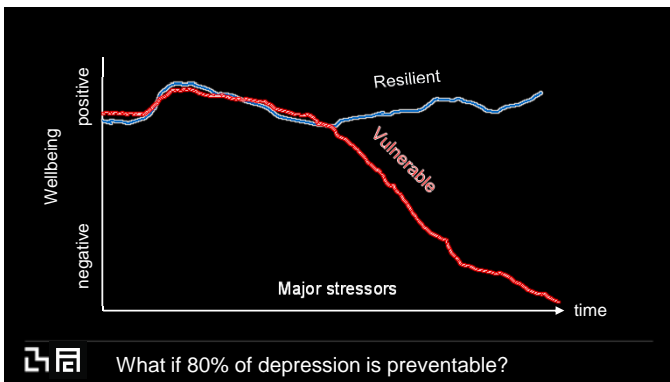
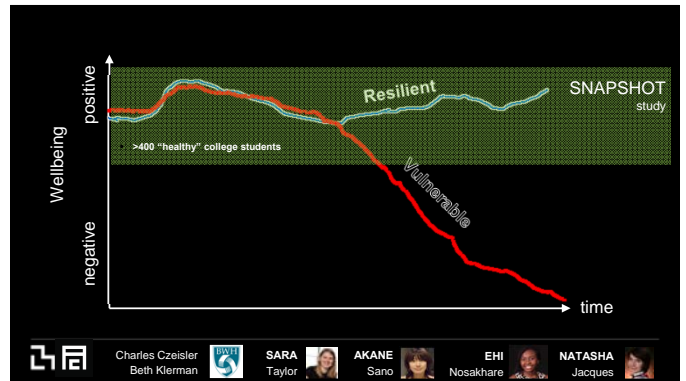
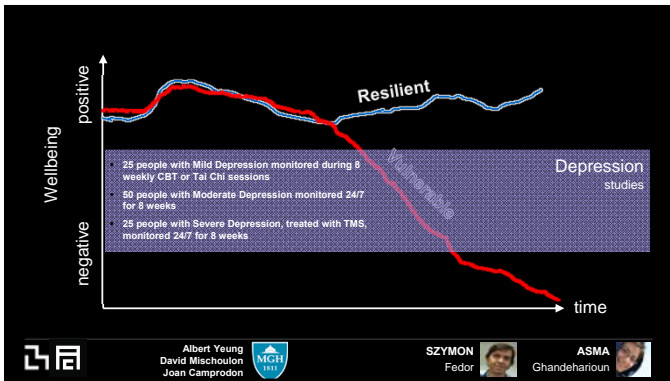
Resilient
Vulnerable

Building AI/machine learning tools to support counselors providing online Crisis Therapy

50 people with Suicidal Depression monitored 24/7 in hospital

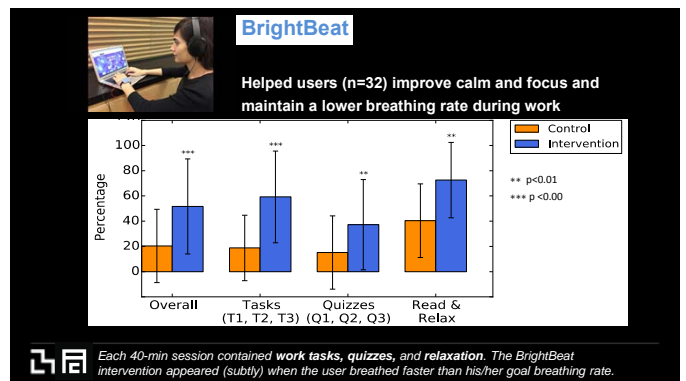
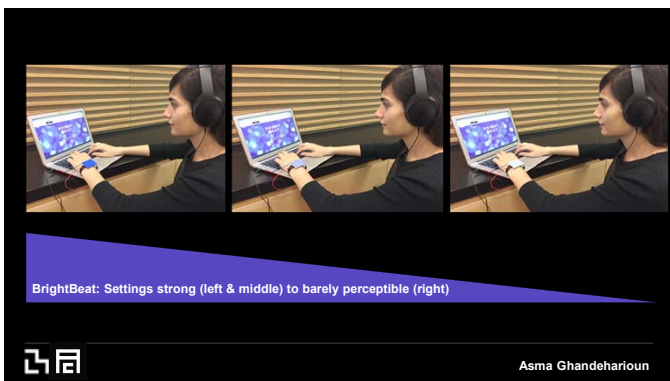
Suicidal ideation study

MATTHEW Nock
KARTHIK Dinakar
SZYMON Fedor
ASMA Ghandeharioun



Can technology **reduce** your stress?

... help you **focus** and be **calm**, slowing your breathing when work is stressful?



ALM check done
ADITS for cancer patient

Meeting top new potential partners
Meeting teammates
Drive

Changes the Life of child

Resilient
Vulnerable
Major stressors

Free publications: affect.media.mit.edu/publications.php
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