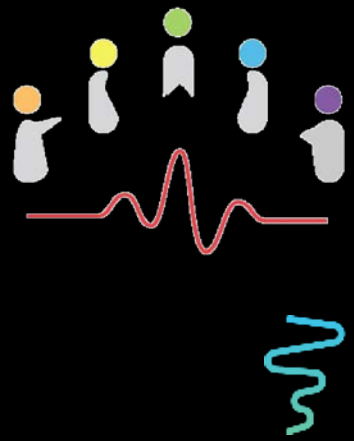
Improving Measurement and Interventions for Behavioral Health



Tanzeem Choudhury

Associate Professor
People-Aware Computing
Cornell University

Co-founder
HealthRhythms Inc

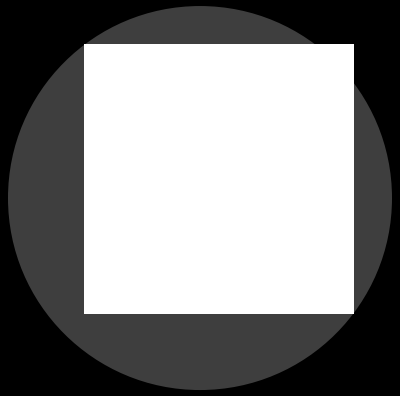
Behavioral Health Measurements

- Sporadic readings
- Self-reported symptoms
- Too little too late

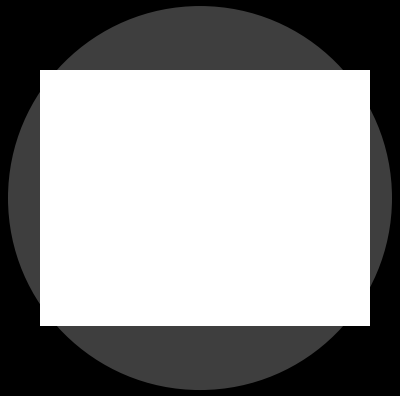

I didn't want to wake up. I was having a much better time asleep
I barely had any social contact last week
My legs bounce, speech goes fast … I even eat too fast
My wife can tell by my walk

Physical Activity

Sleep



Voice



Social Activity

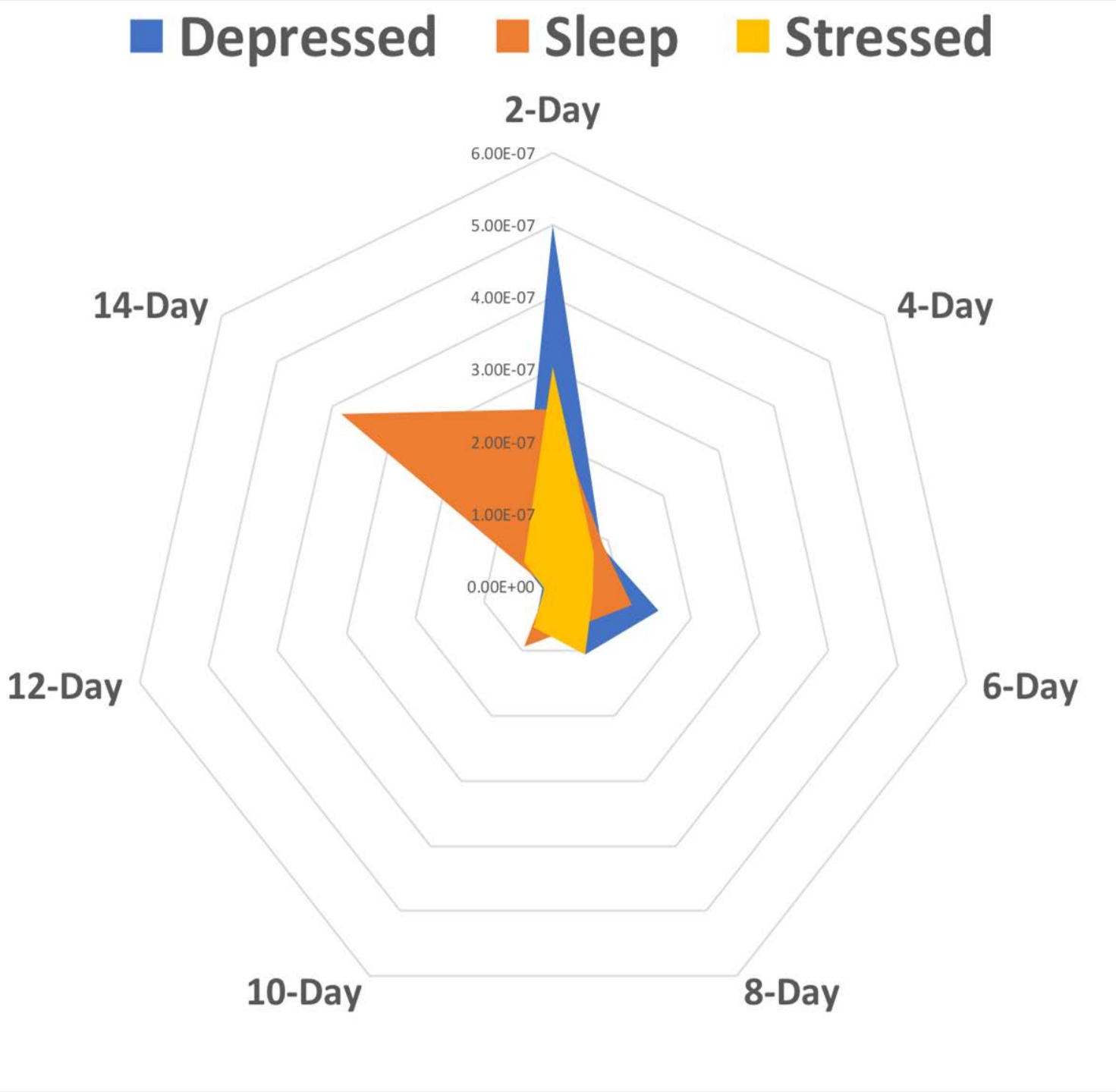
Food

Places

Distance Travelled

Mood

Circadian Rhythms


Depressed
Sleep
Stressed
2-Day
4-Day
6-Day
8-Day
10-Day
12-Day
14-Day
6.00E-07
5.00E-07
4.00E-07
3.00E-07
2.00E-07
1.00E-07
0.00E+00

SRM II–5

Directions:

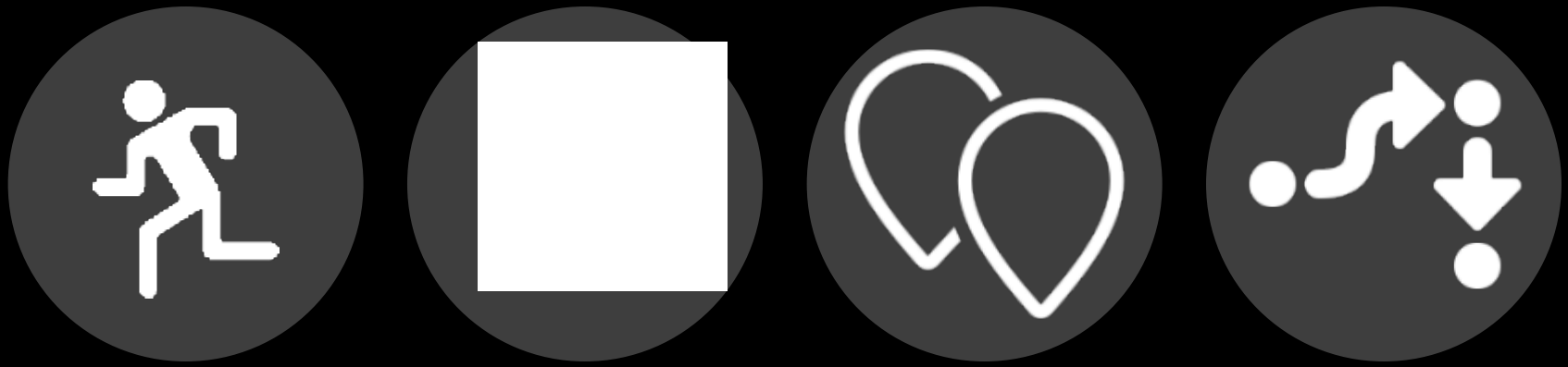
- Write the ideal target time you would like to do these daily activities.
- Record the time you actually did the activity each day.
- Record the people involved in the activity: 0 = Alone; 1 = Others present; 2 = Others actively involved; 3 = Others very stimulating

Date (week of): Feb 18 – 24 2013

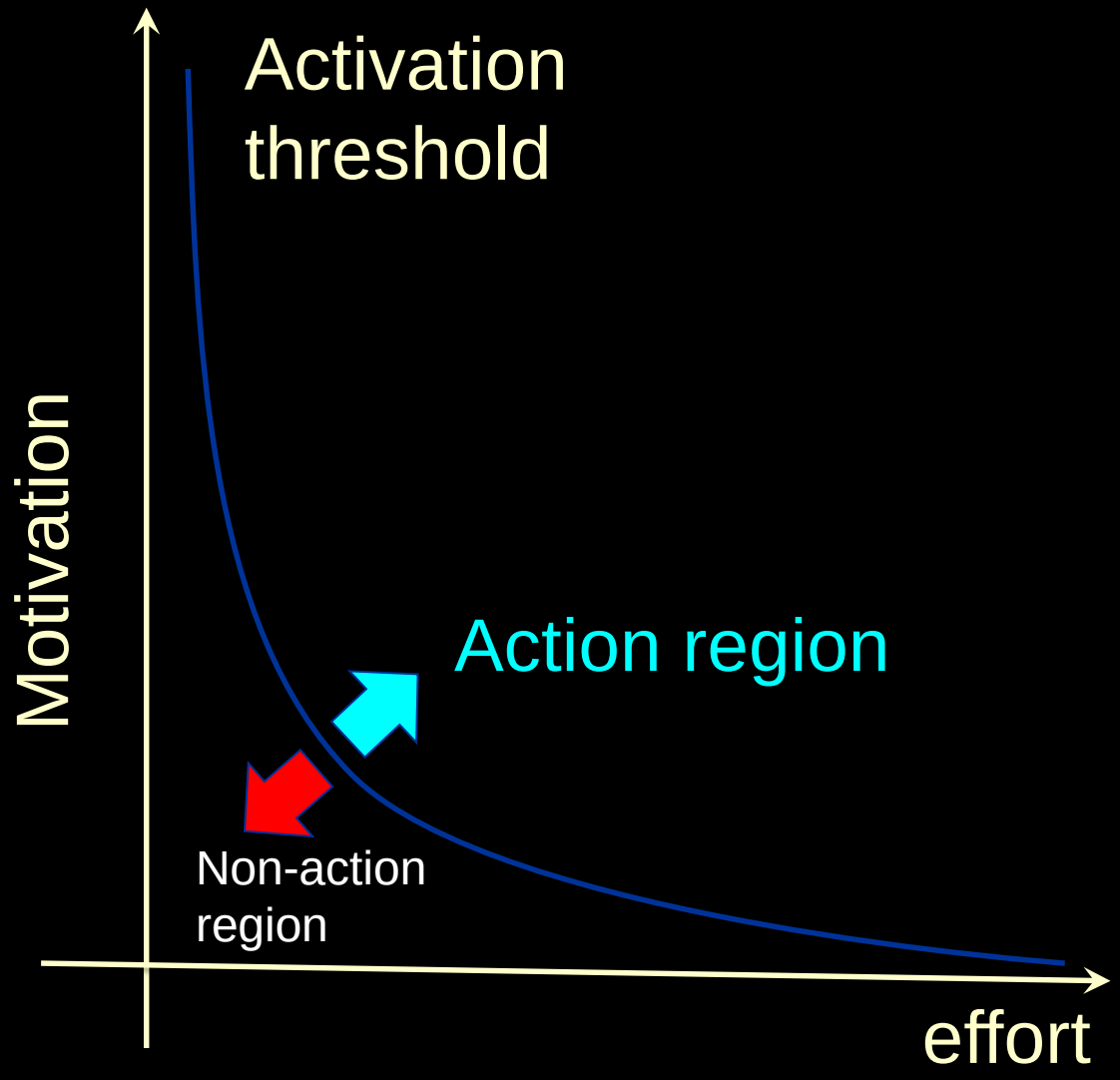
Activity	Target Time	Sunday		Monday		Tuesday		Wednesday		Thursday		Friday		Saturday	
		Time	People	Time	People	Time	People	Time	People	Time	People	Time	People	Time	People
Out of bed	6:30am	8:00am	0	6:15am	0	8:00am	0	6:45am	0	7:00am	0	8:07am	0	7:00am	0
First contact with other person	8:40am	9:00am	2	8:00am	1	11:00am	2	8:32am	2	11:00am	2	1:00pm	1	2:30pm	3
Start work/school/ volunteer/family care	8:40am	10:00am	2	8:10am	2	11:40am	1	8:30am	2	11:40am	1	9:00am	0	7:00am	0
Dinner	5:00pm	6:00pm	0	7:00pm	0	5:40pm	0	5:30pm	0	5:30pm	0	5:30pm	0	6:00pm	0
To bed	12:00am	2:10am	0	3:00am	0	12:30pm	0	2:00am	0	1:00am	0	1:45am	0	12:00pm	0
Rate MOOD each day from –5 to +5 –5 = very depressed +5 = very elated		+1		0		–1		+1		–1		–1		–2	

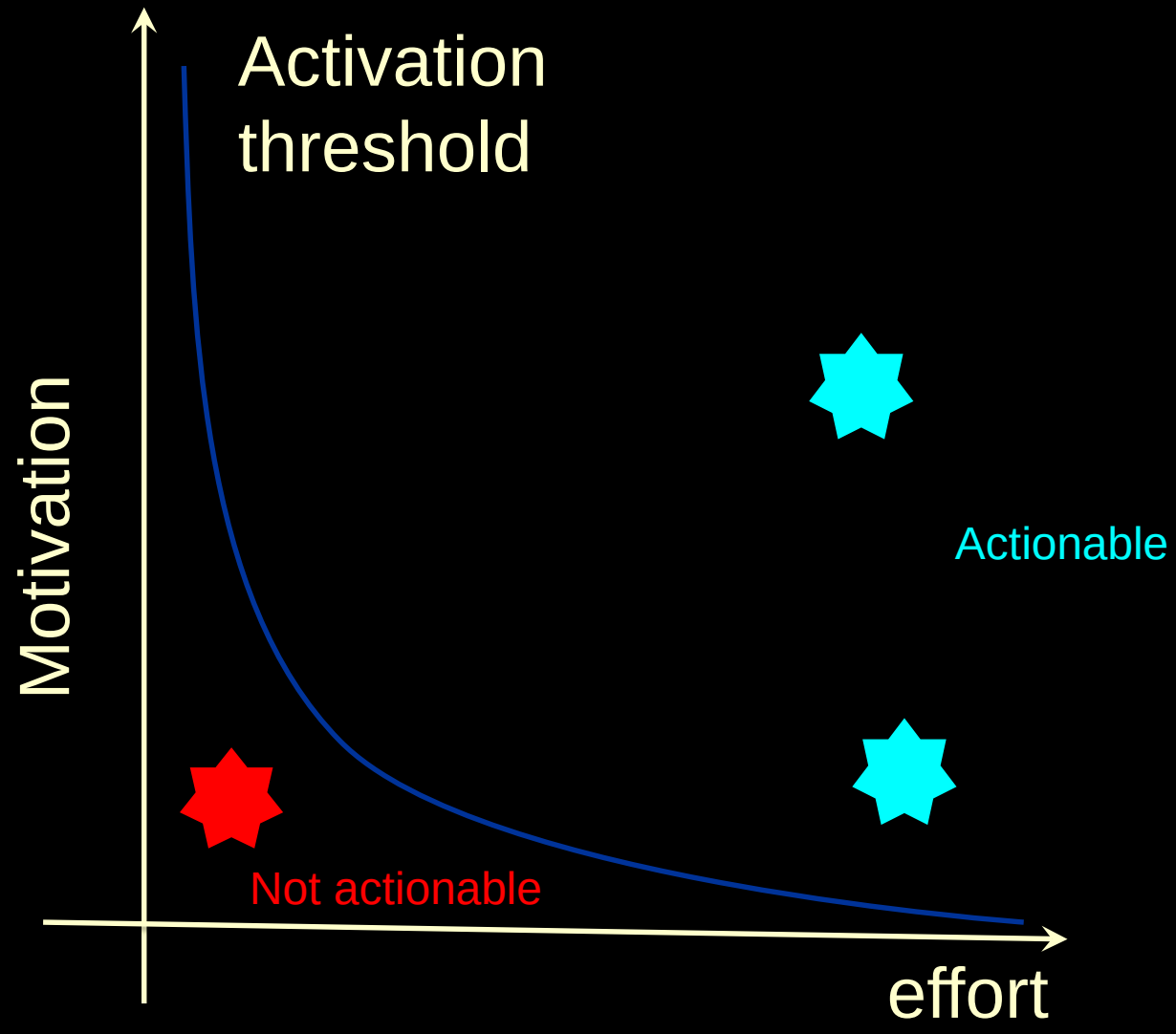
Monk, T.H., Frank, E., Potts, J.M., & Kupfer, D.J. (2002). A simple way to measure daily lifestyle regularity. *Journal of sleep research, 11*(3), 183-190.

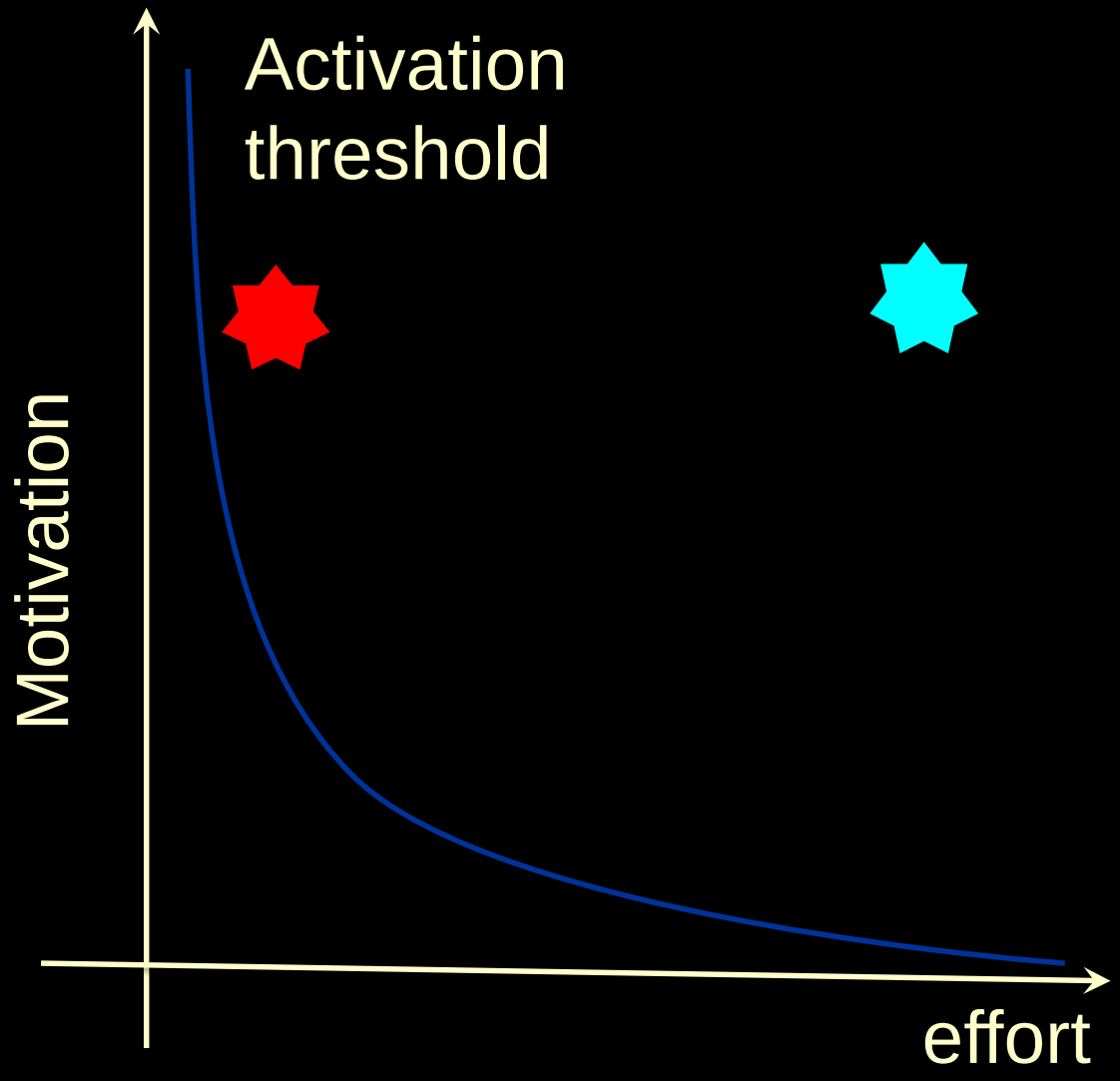
Automatically Infer Rhythmicity

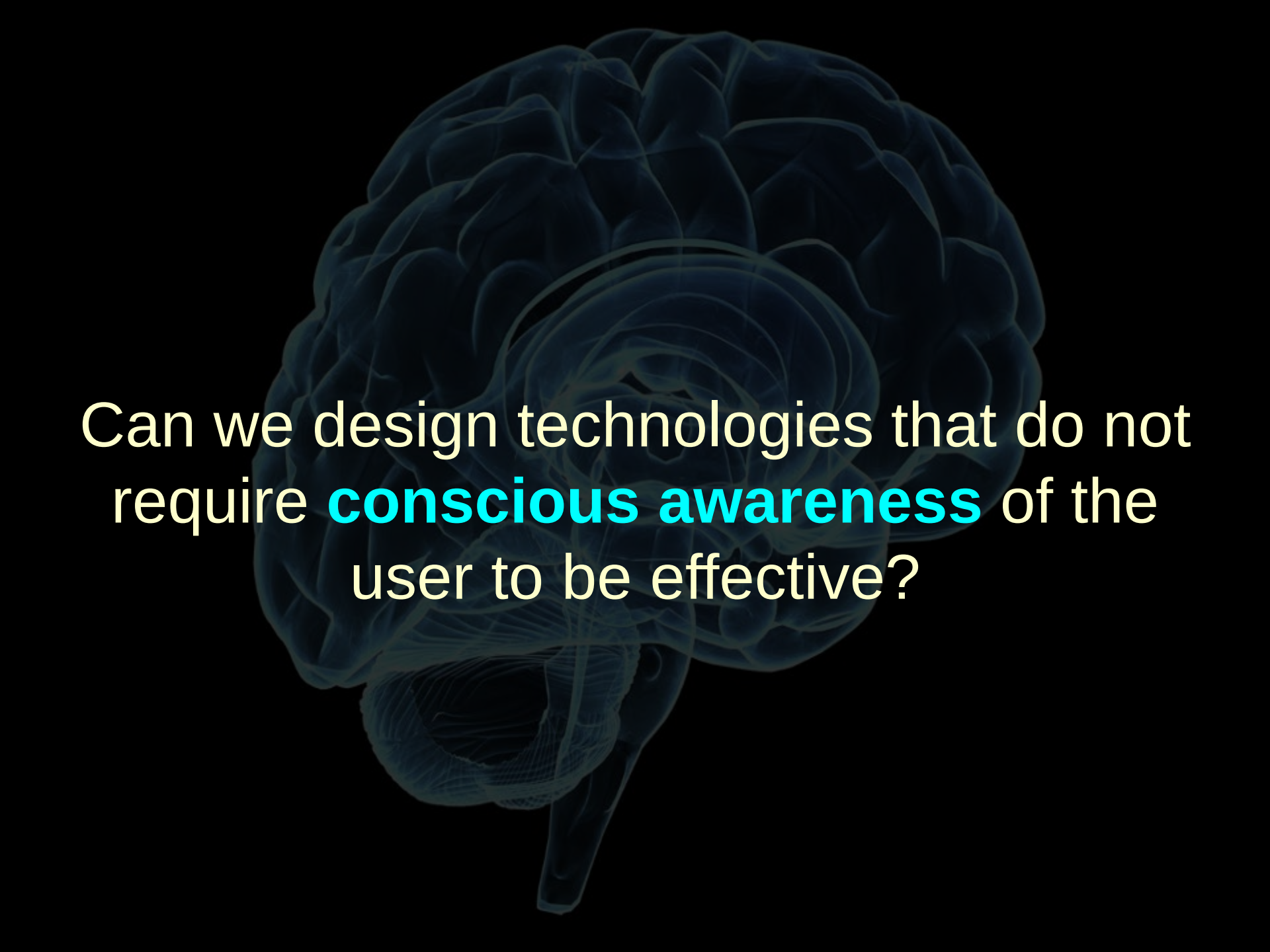


- Infer SRM scores automatically from sensed data (mean error ± 0.9 point)
- Predict stability status with 86% accuracy
- From reactive to proactive care by detecting early warnings signs

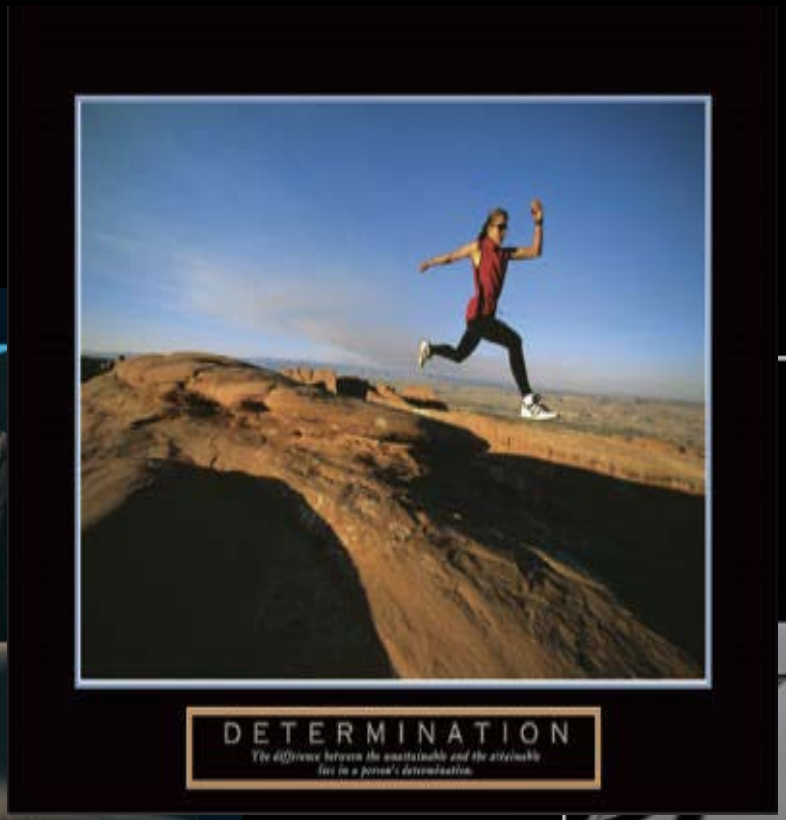

Activation
threshold
Motivation
Action region
Non-action
region
effort


Activation
threshold
Motivation
Actionable
Not actionable
effort


Activation
threshold
Motivation
effort


Can we design technologies that do not require **conscious awareness** of the user to be effective?

Reliance on User's Motivation

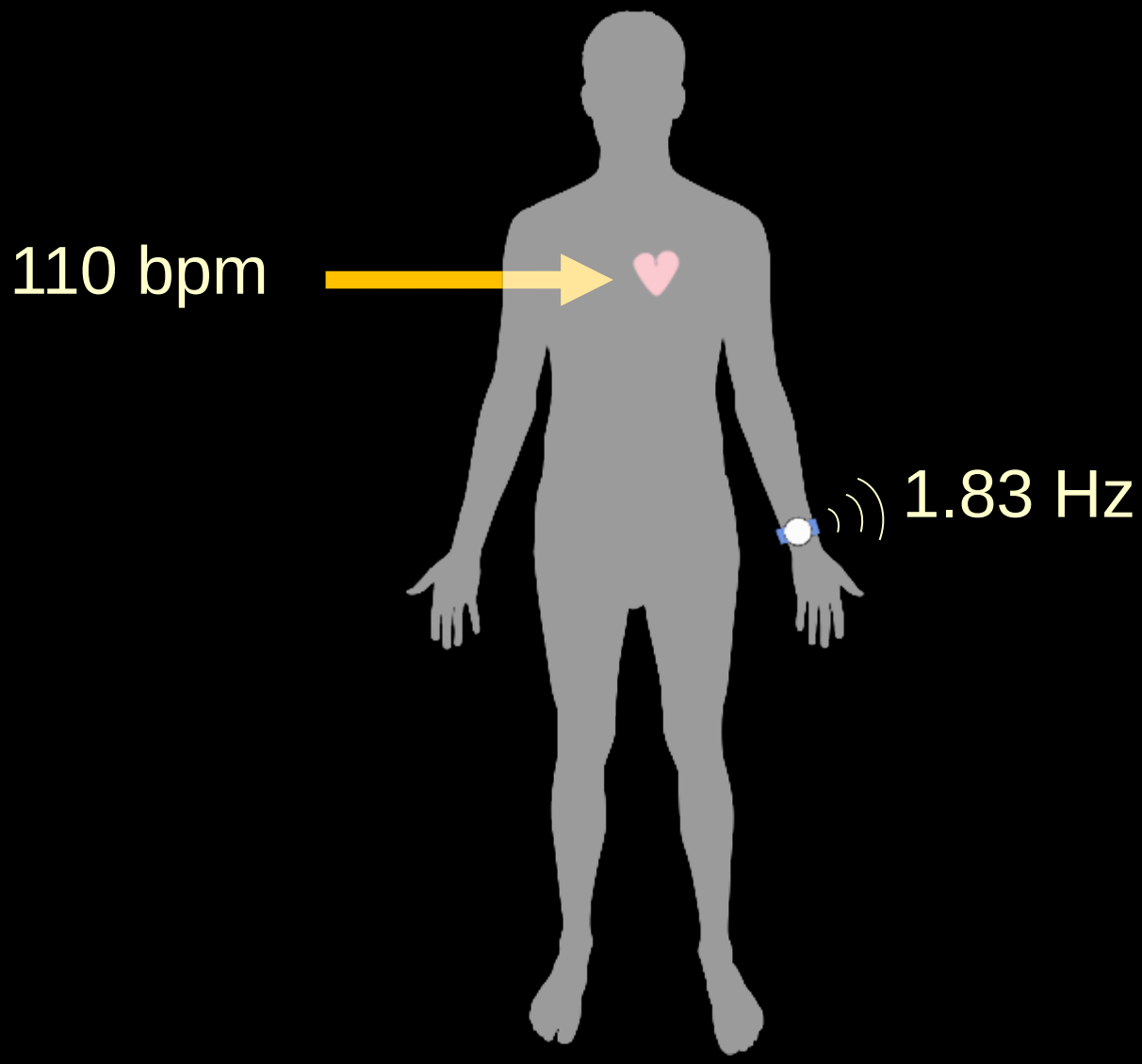


Disruptive Feedback

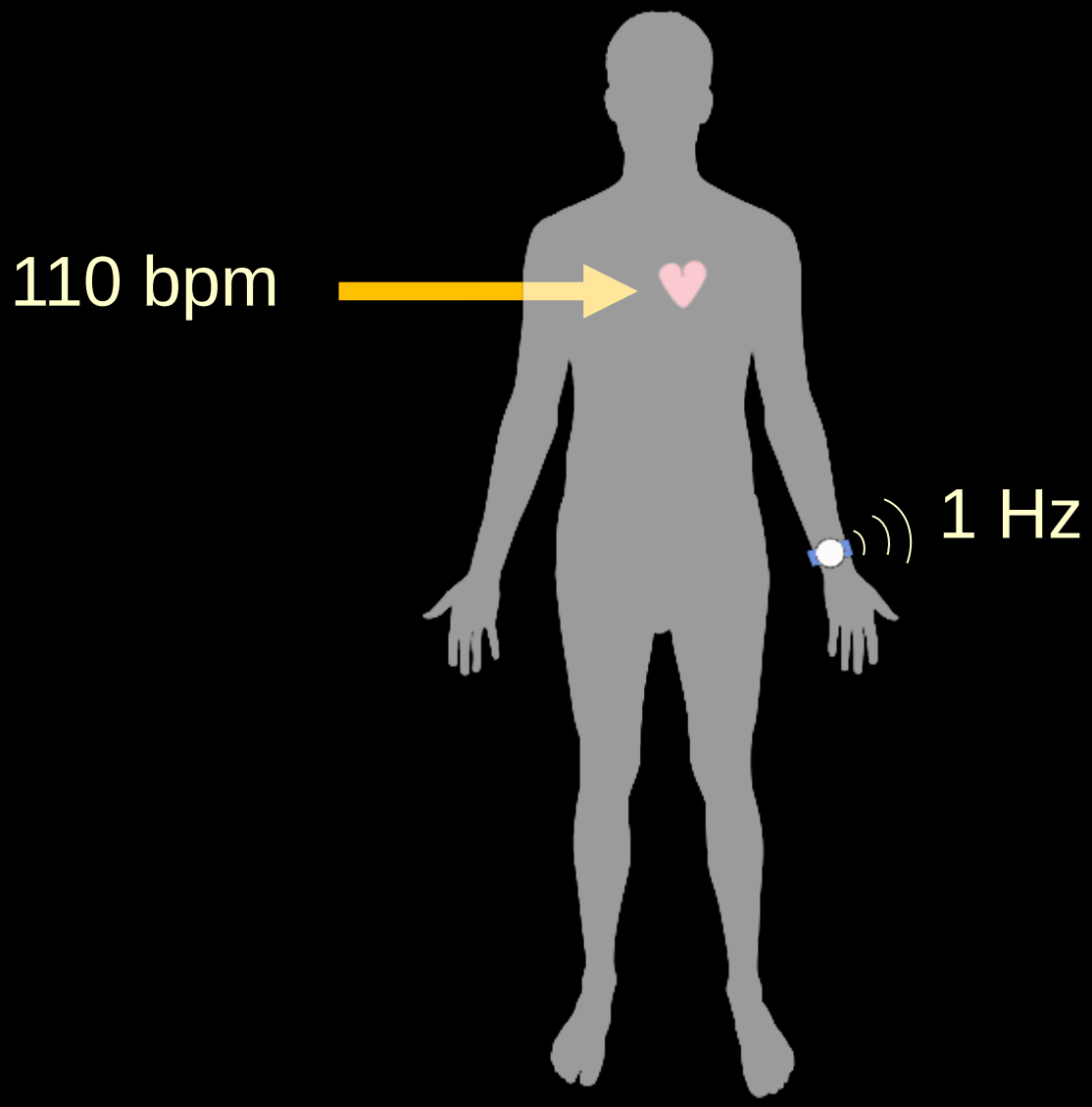
EmotionCheck: Leveraging Bodily Signals to Reduce Anxiety in Real-time

Wristband that produces a subtle haptic stimulation - simulating a slow heart beat (60 bpm).

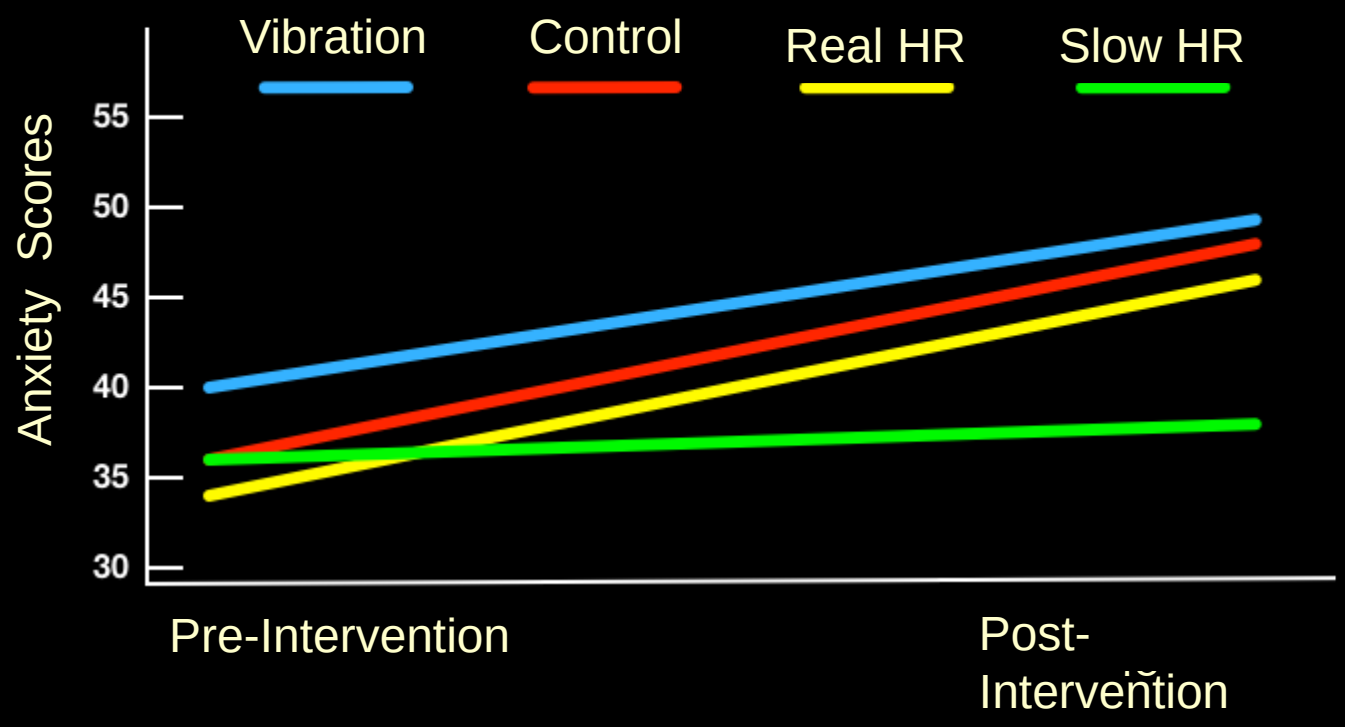
“The vibrations represent your current heart rate”



“The vibrations represent your current heart rate”

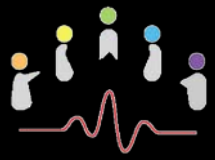


Results


Vibration
Control
Real HR
Slow HR
Anxiety Scores
55
50
45
40
35
30
Pre-Intervention
Post-Intervention

Reflexive not reflective

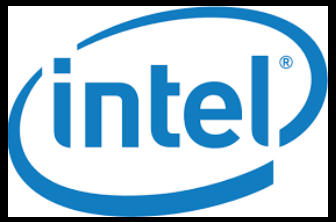
Thank you!



Tauhidur (Rifat) Rahman, Saeed Abdullah, Jean Costa, Vincent Tseng, Alex Adams, Mashfiqui Rabbi, Hane Aung, Mi Zhang, Akane Sano

Mark Matthews, Mike Merrill, Nosh Petigara, Ellen Frank, David Kupfer

Collaborators: Andrew Campbell, David Erickson, Dror Ben-Zeev, Julie Kientz, Shwetak Patel, Malte Jung, Mary Czerwinski, John Kane



Microsoft Research

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