
>56%

Intimate Device

Not only are majority of people using smartphones, but they take it with them everywhere they go, even to bed

Fitbit flex

Misfit shine

Moves App

Nike Fuel

Jawbone Up

activity

social context

significant places

People Aware Computing Group's Mission

Building mobile systems for:

- measuring behavioral indicators of health and …
- engaging users in their own health
- influencing behavior change

MyBehavior

Personalization

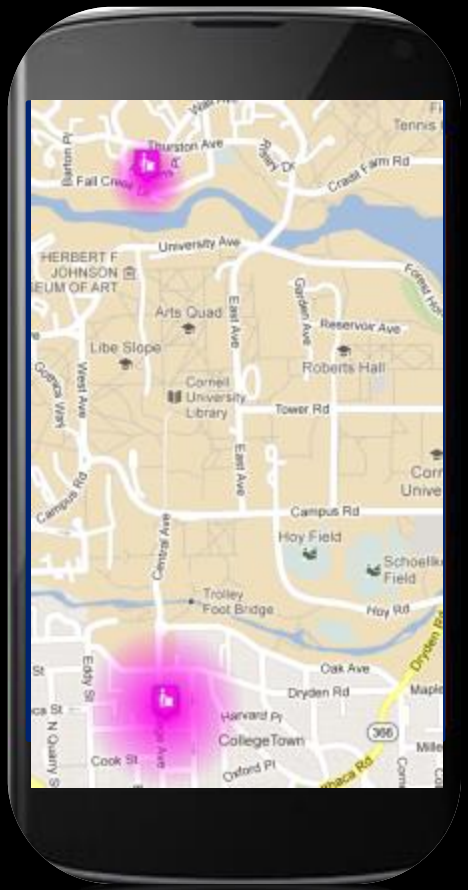
One-size fits all

Personalized coaching and **planning** is hard to achieve at population scale.

Generic suggestions can be hard to act since they are not related to one's life

Personalizing Persuasion

What to change and how?

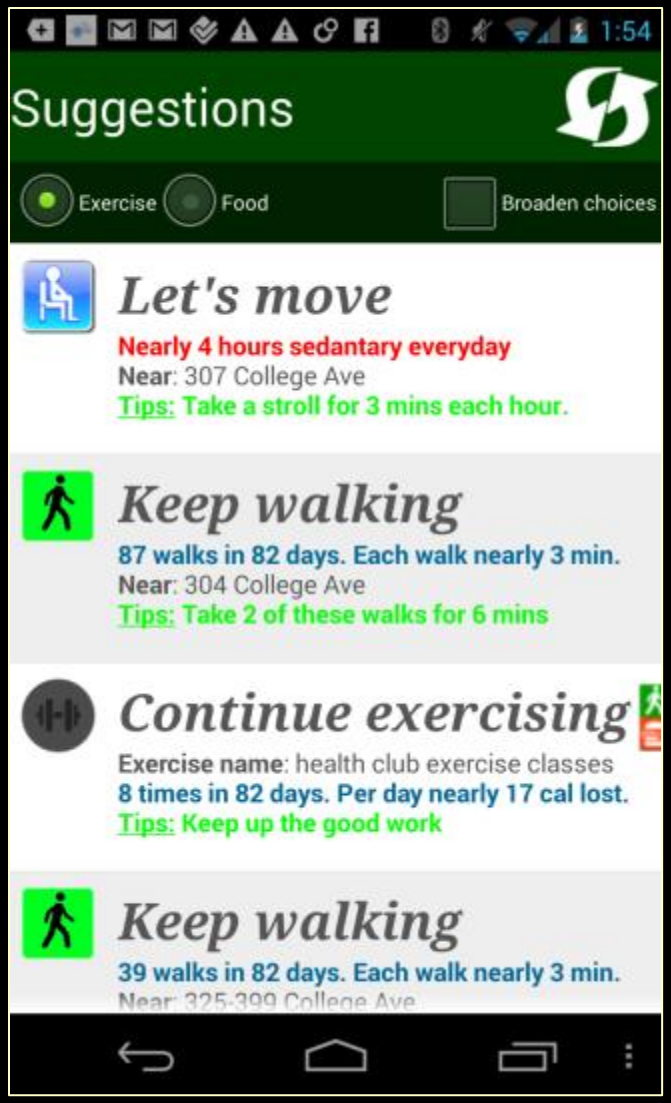


stationary locations

walking behavior

Our unhealthy behavior can be tracked and changed with small adjustments.

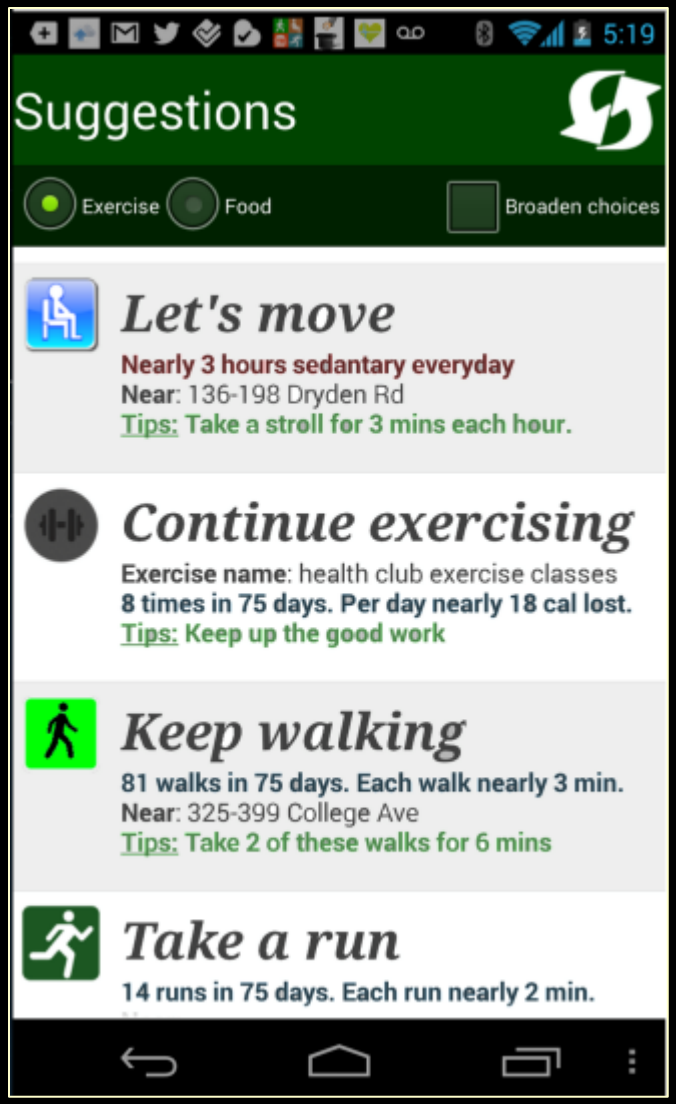
Suggestions are highly contextualized to user, and can be made with little effort



Exploit

Encourage user to **continue most frequent healthy behavior.**

Suggest to **avoid frequent unhealthy** behavior with small changes

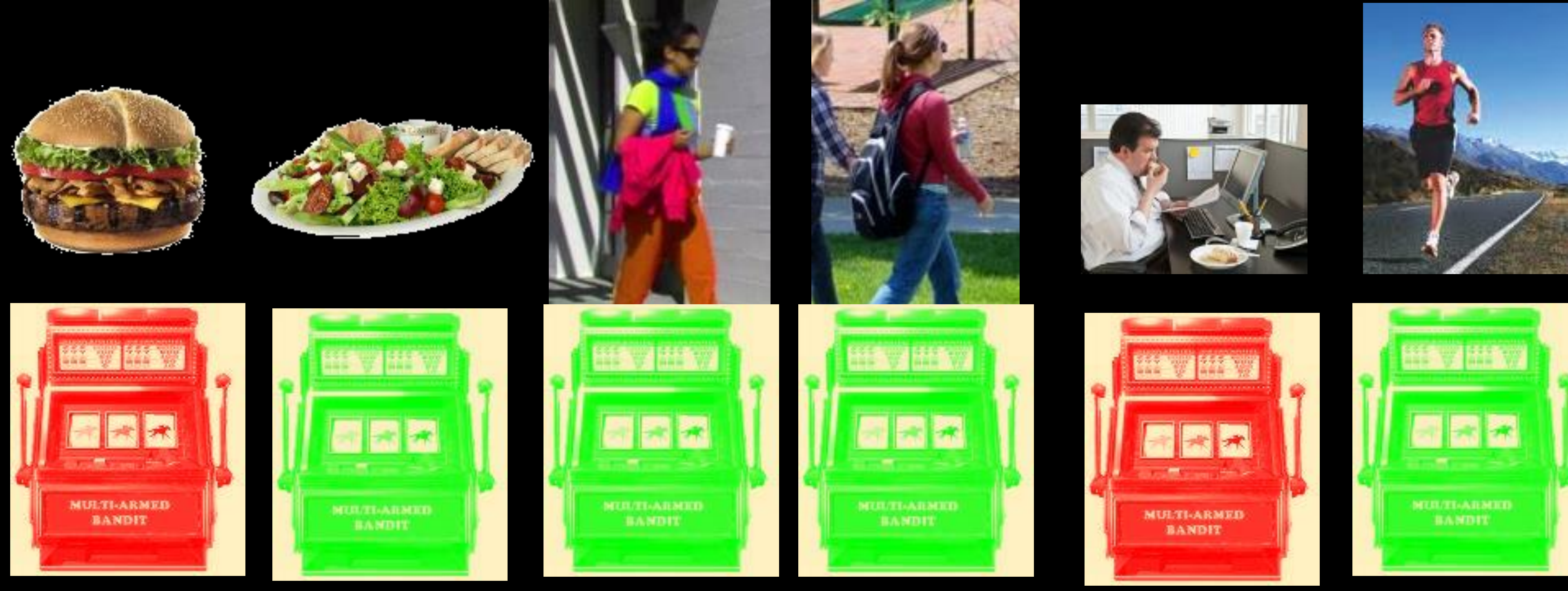


Explore

Gives user's choice to review non-frequent activities

User's can decide what behavior they can choose to make bigger change

More option means user can self-reflect to quickly find combinations for optimal change.


MULTI-ARMED BANDIT
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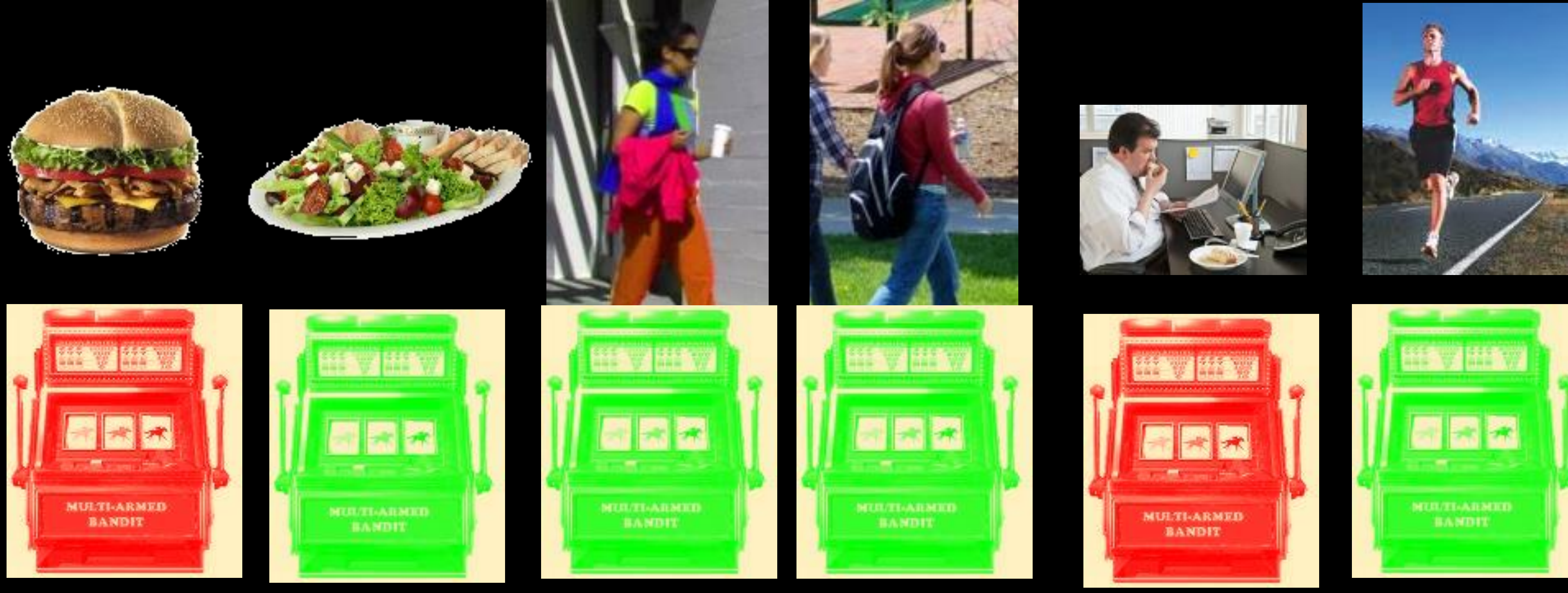
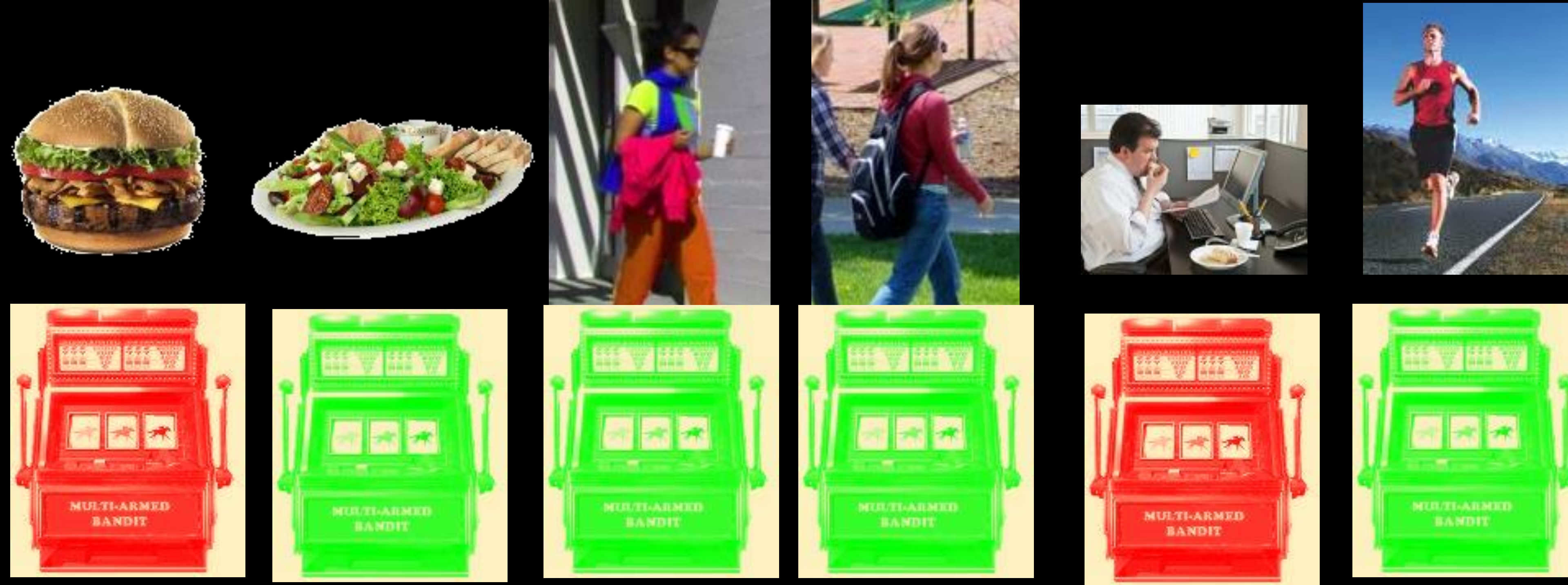
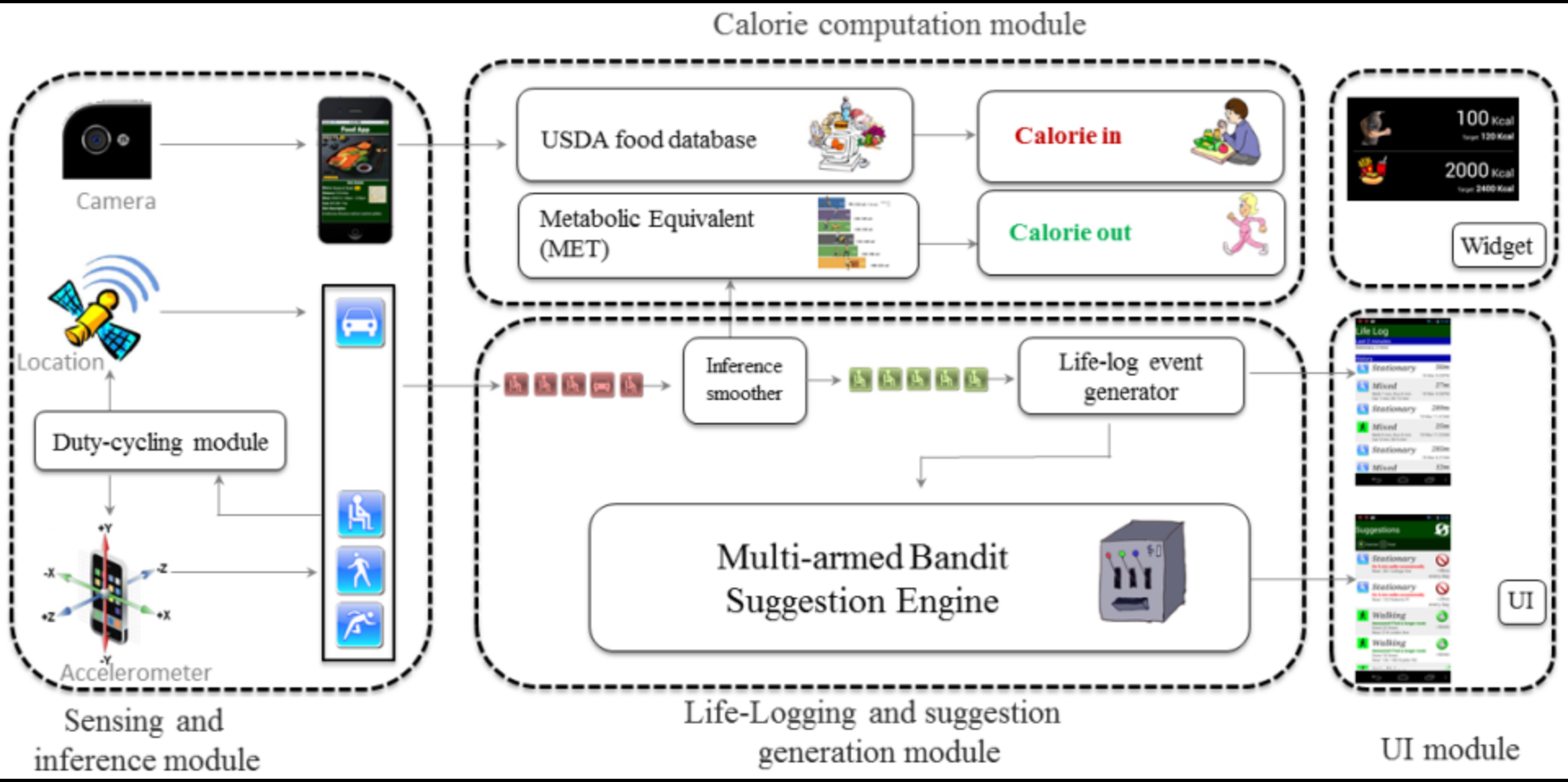


10x 1x 5x 21x 100x 2x

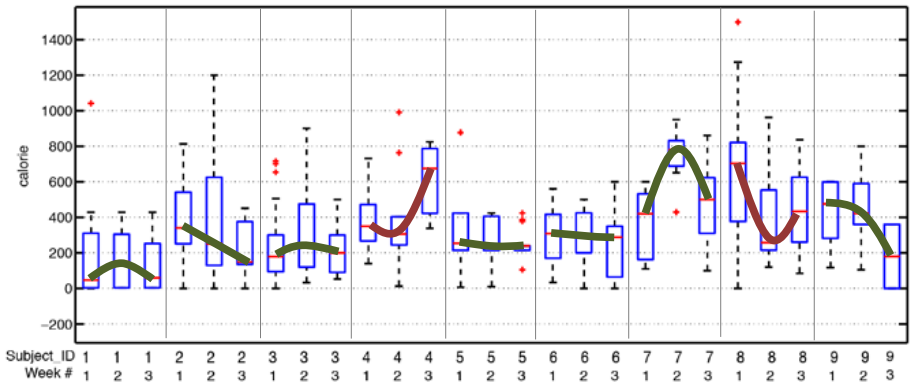


10x	1x	5x	21x	100x	2x
Exploit	**Explore**	**Exploit**	**Exploit**	**Exploit**	**Explore**
3	**2**	**4**	**2**	**1**	**1**
Avoid	**Continue**	**Continue**	**Continue**	**Avoid**	**Continue**

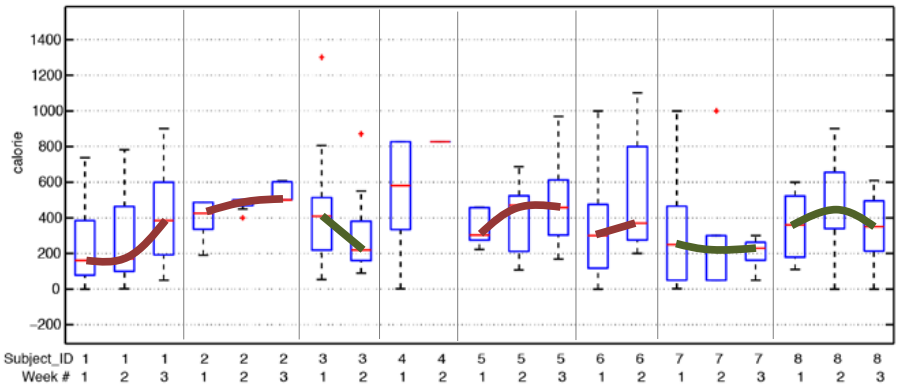

Calorie computation module
Camera
Location
Duty-cycling module
Accelerometer
USDA food database
Metabolic Equivalent (MET)
Calorie in
Calorie out
100 Kcal
2000 Kcal
Widget
Inference smoother
Life-log event generator
Multi-armed Bandit Suggestion Engine
UI
Sensing and inference module
Life-Logging and suggestion generation module
UI module

Are MyBehavior suggestions followed more?

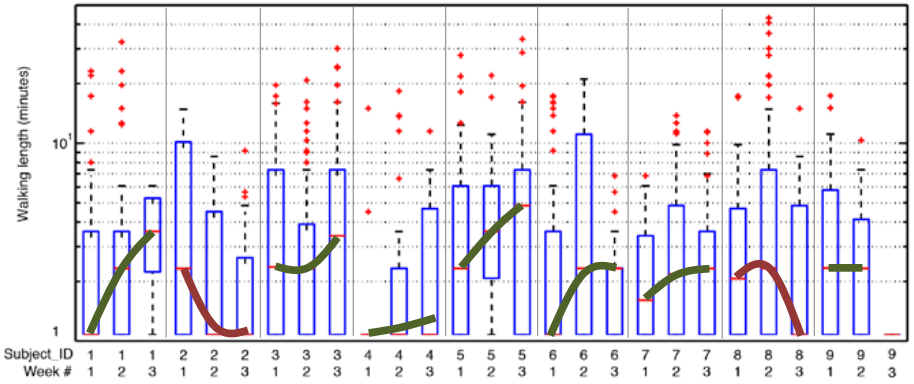
(a) Food: Experiment group



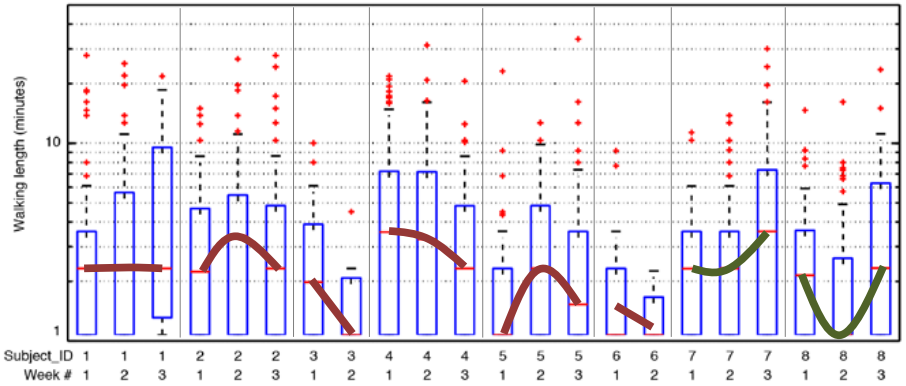
(b) Food: Control group



(c) Walking: Experiment group



(d) Walking: Control group

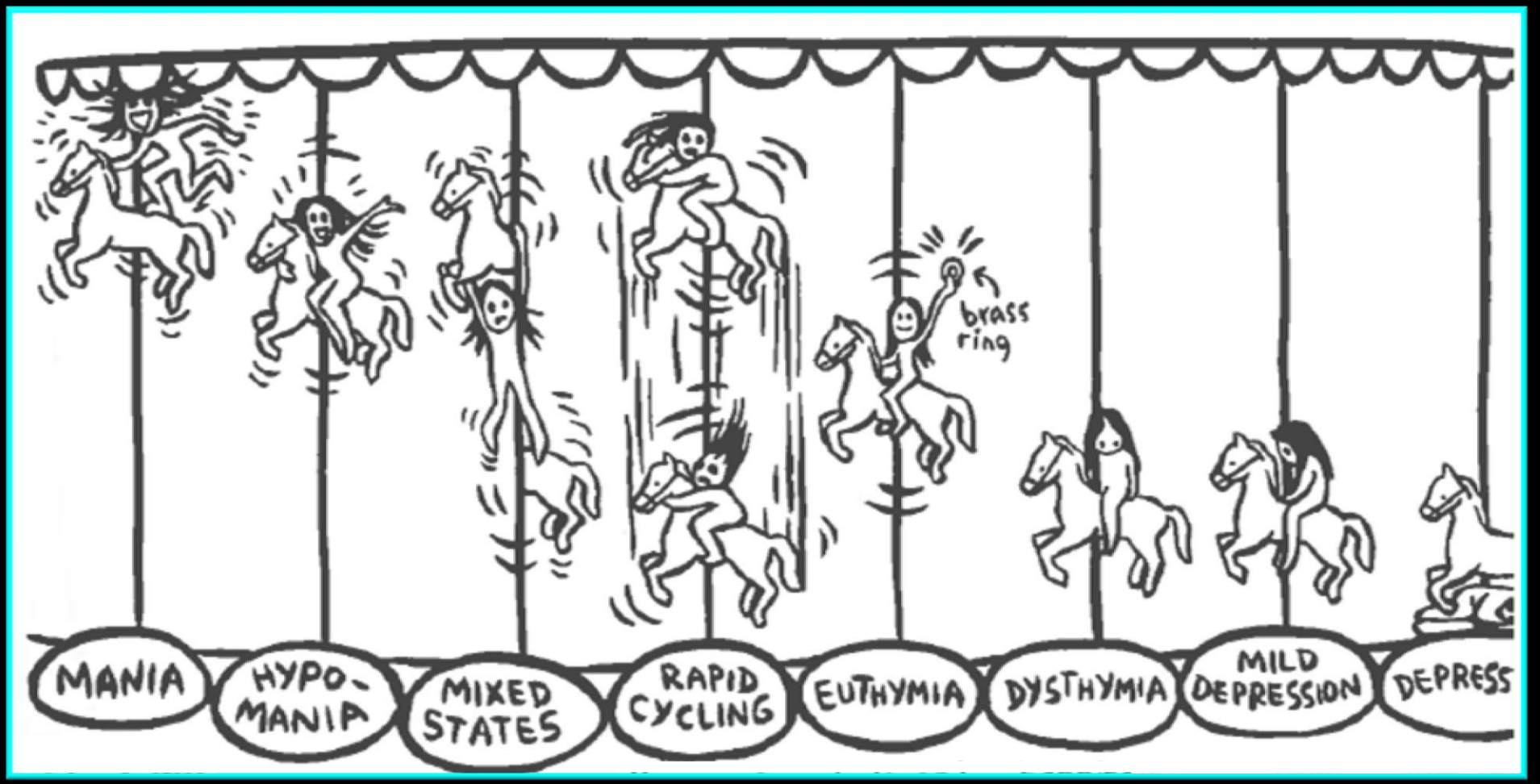


mybehavior summary

personalizing behavior change suggestion to fit your lifestyle

MoodRhythm

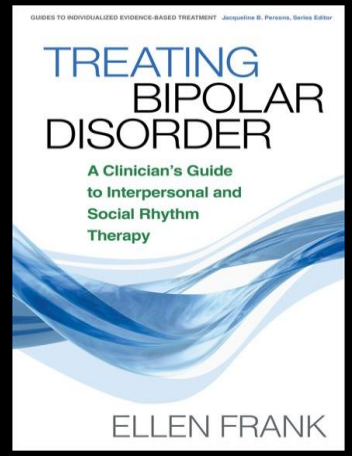

Bell
4:20 PM
RECORD
You got 5/5 tasks done yesterday!
Task
Out of Bed
Target: 08:00
0
08:00 AM
First Contact
Target: 08:30
Start Work
Target: 09:30
3
09:28 AM
Dinner
Target: 18:00
Go to Bed
Target: 23:00
Mood Index
-5 -4 -3 -2 -1 0 1 2 3 4 5


brass ring
MANIA
HYPO-MANIA
MIXED STATES
RAPID CYCLING
EUTHYMIA
DYSTHYMIA
MILD DEPRESSION
DEPRESS

Interpersonal and Social Rhythm Therapy

Hypothesis: Individuals with bipolar disorder have a genetic predisposition to circadian rhythm and sleep abnormalities responsible

Goal: Help patients regularize daily routines, resolve interpersonal problems, and adhere to medication regimens



Quantifying self helps

SRM II–5

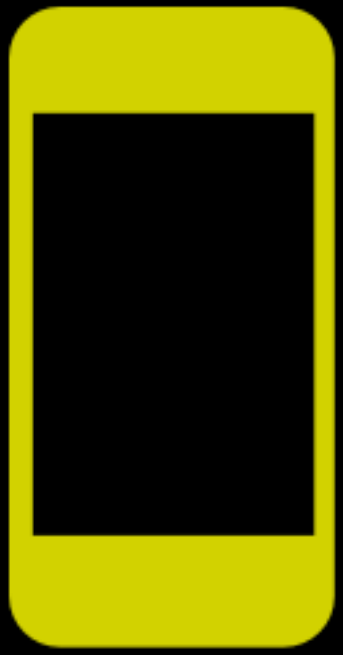
Directions:

- 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

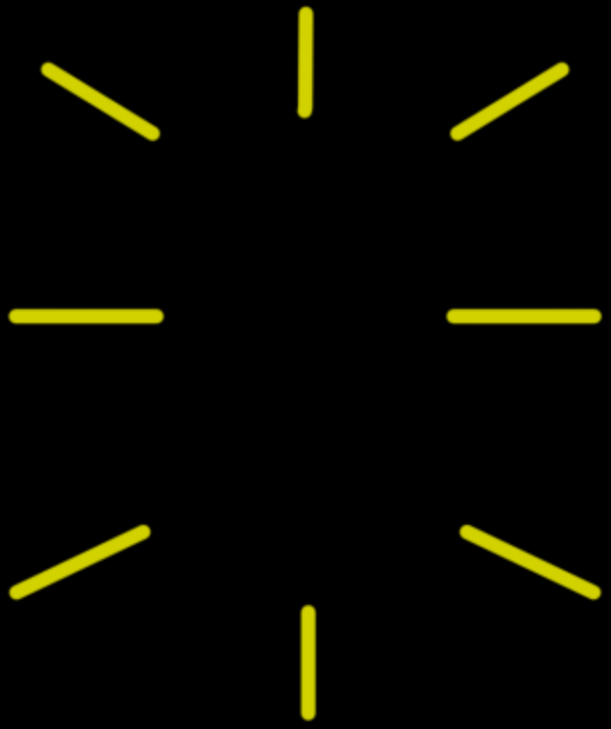
Date (week of): Feb 18 - 24 2013

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	3:30pm	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	

Paper



Phone



Invisible

Record

RECORD

			Accomplished vs Planned
Out of Bed Target: 08:00	0	08:00 AM	9 / 18
First Contact Target: 08:30		!	16 / 28
Start Work Target: 09:30	3	09:28 AM	12 / 14
Dinner Target: 18:00			11 / 13
Go to Bed Target: 22:00	0		22 / 27

Mood Index

-5 -4 -3 -2 -1 0 1 2 3 4 5

Intimate Device

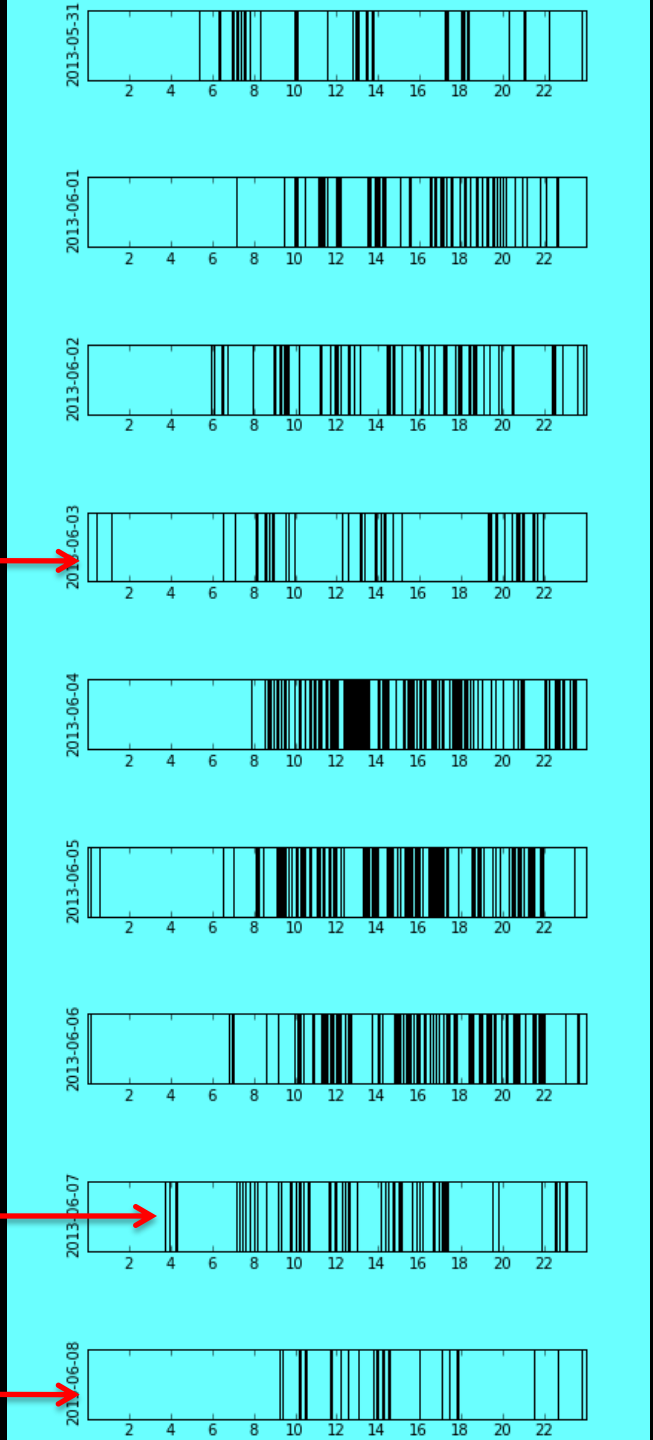
Not only are majority of people using smartphones, but they take it with them everywhere they go, even to bed

What can we tell from when you unlock your phone?

I was sick

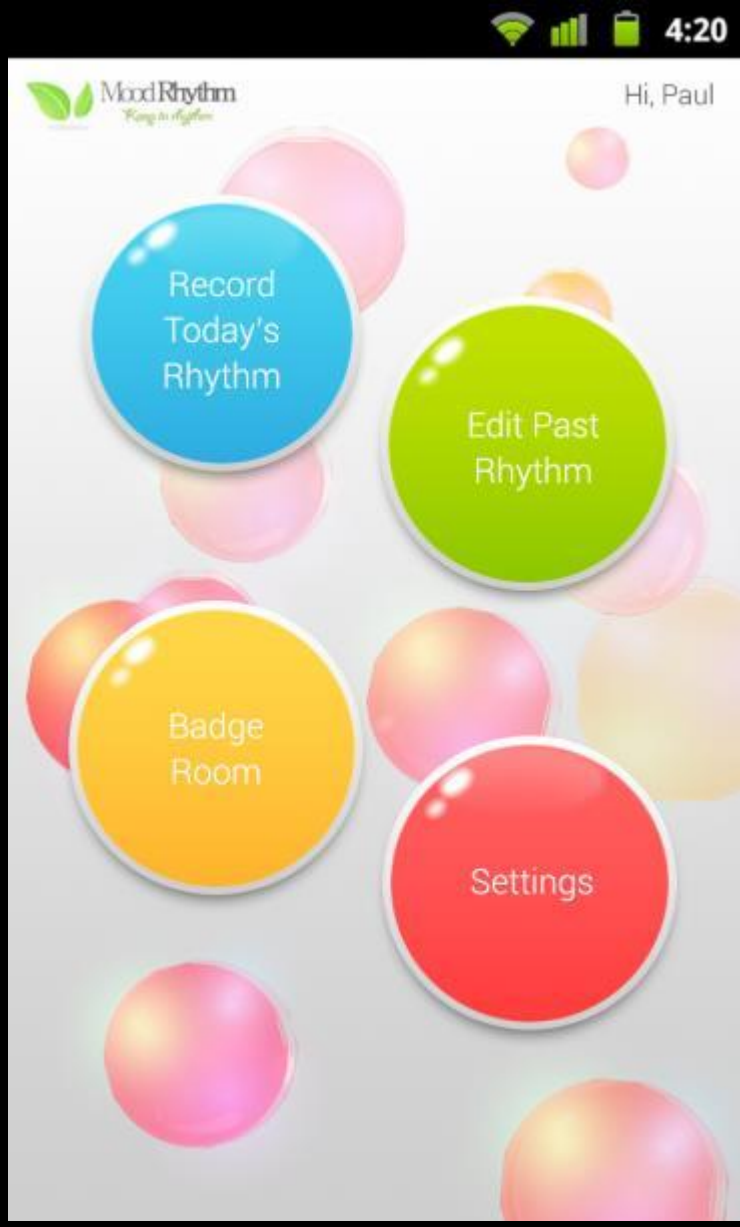
I woke up around 3:50AM because my friend was leaving for plane.

Came back home with sleep debt

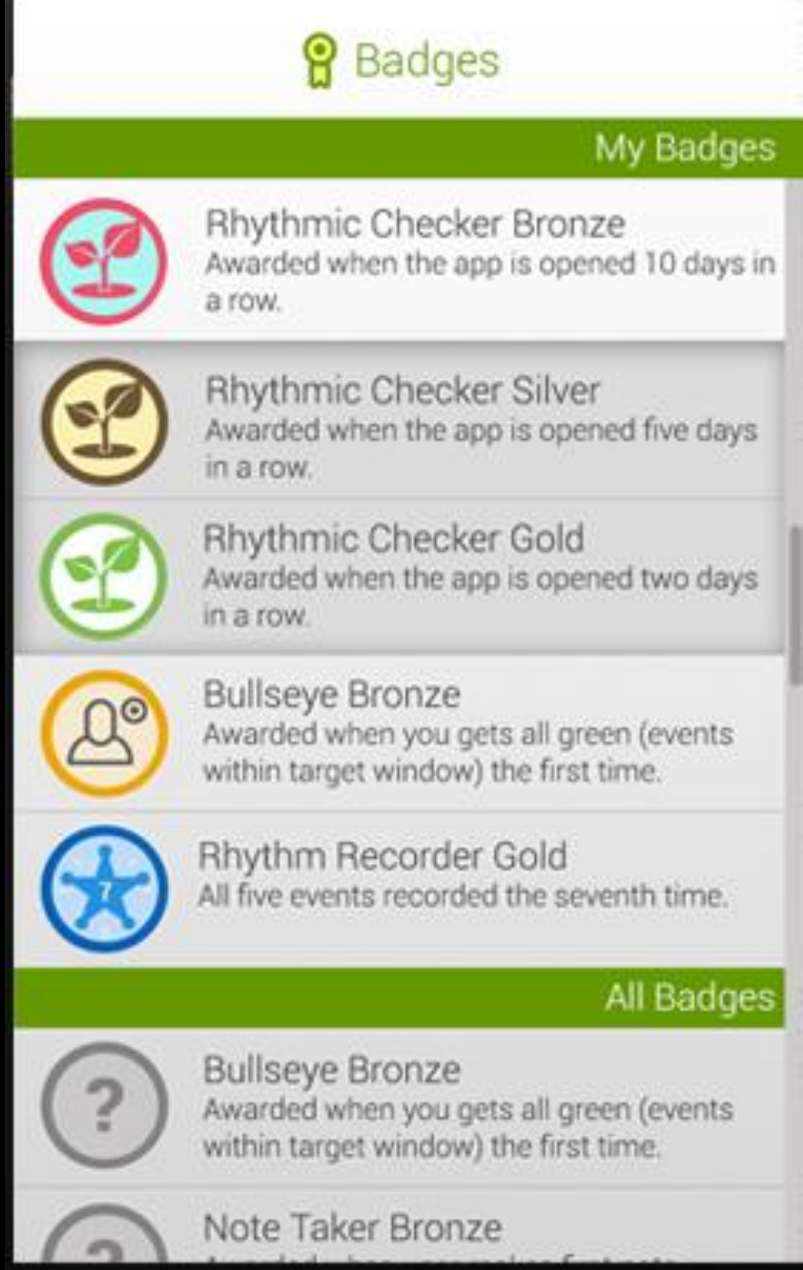


Reflect

- Ideally, SRM data is entered into a database and viewed graphically
  - Virtually never done in clinical practice
- MoodRhythm automatically processes SRM data to yield a numerical metric of stability
  - Determines the color and movement of icons associated with SRM events to show level of goal adherence



Change

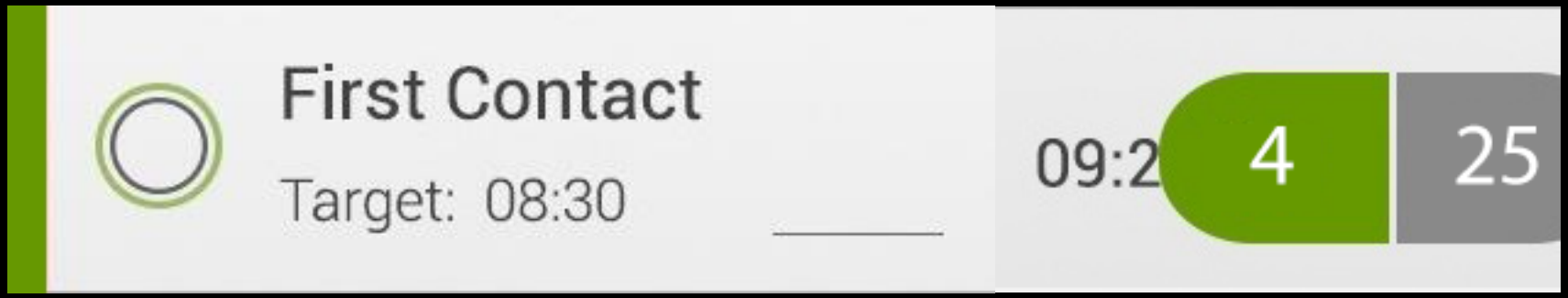


Increased reward sensitivity

Nusslock, R., et al., *Waiting to win: elevated striatal and orbitofrontal cortical activity during reward anticipation in euthymic bipolar disorder adults.* Bipolar Disorders, 2012. **14**(3): p. 249-260.

Participatory Design in Action

- Original SRM streak: recorded longest ever run of days accomplishing a goal
  - *"Sometimes, when you're eking out of a depression, a prior streak like 22 can be overwhelming & unachievable"*



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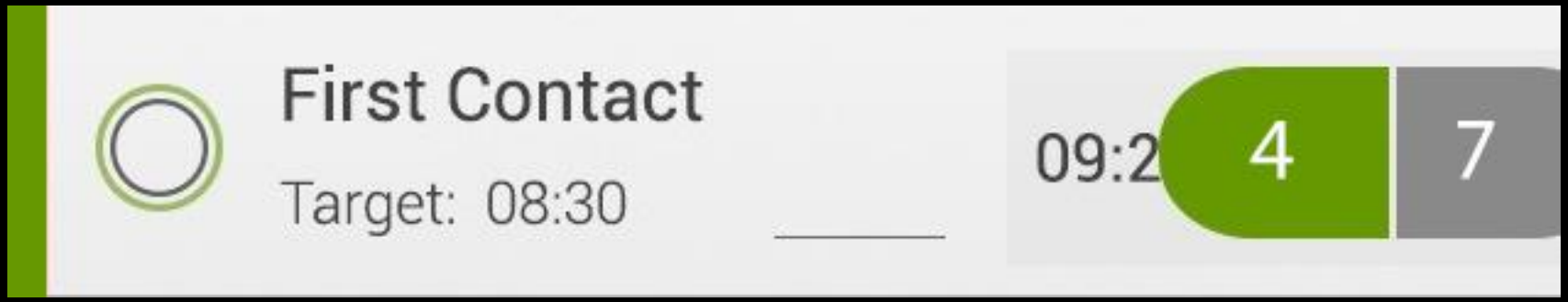
Participatory Design in Action

- After: records weekly streak, then resets
  - *" [A weekly streak] would help to stay in tune with my progress/regression as I eke in/out of a depression/manic phase. It's relative to where I am at that point in my life"*



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