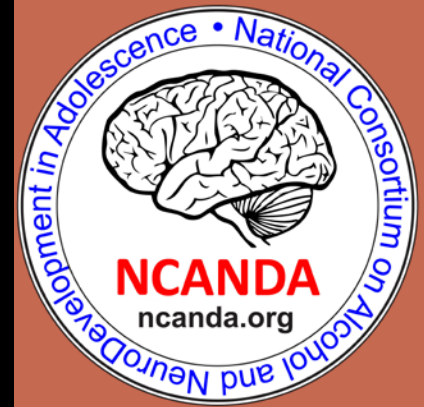# HARNESSING THE POWER OF MOBILE TECHNOLOGY TO MONITOR ALCOHOL USE AND BEHAVIORS IN DAILY LIFE

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University of California San Diego

Fiona Baker, PhD
Ian Colrain, PhD
SRI International

NCANDA
ncanda.org

1

NCANDA INNOVATIONS

- Mobile health application

- Integrating wearable sensors

APP-BASED DATA COLLECTION

- >90% of 18-25 year olds have smartphones[1]
- >96% amenable in our sample

- Brief app responses in lieu of phone calls
- Flexibility in scheduling and response

[1]Pew Research Center, 2016

mNCANDA
MOBILE HEALTH APP

- 5 assessments over 4 weeks
- >9 _____ mpts
- 82 _____ NTS

WEEKLY SU ASSESSMENT
In the last 7 days:

2. How many drinks did you usually have? (on days you drank)

--Select-- ▼

3. What is the most number of drinks you had in one day?

--Select-- ▼

4. How many days did you have more than **5** drinks?

--Select-- ▼

5. What days did you use marijuana?

☐ Sunday
☐ Monday
☐ Tuesday
☐ Wednesday

MyLife Daily Craving
Answer for YESTERDAY

Peak craving for ALCOHOL yesterday

1 ————————[ ]———————— 5

Peak craving for MARIJUANA yesterday

1 ————————[ ]———————— 5

Peak craving for OTHER yesterday

1 ————————[ ]———————— 5

4. How many alcoholic drinks did you have?

--Select-- ▼

5. Did you use marijuana?

◯ Yes

mNCANDA
MOBILE HEALTH APP

- **Reliability & Accuracy**
  - α=.85-.95 with in-person assessment over 4 weeks
  - More proximal and precise assessment of drinking events
    - 30-day alcohol frequency = 0.31 events higher (95% CI=0.05-0.57) via mNCANDA
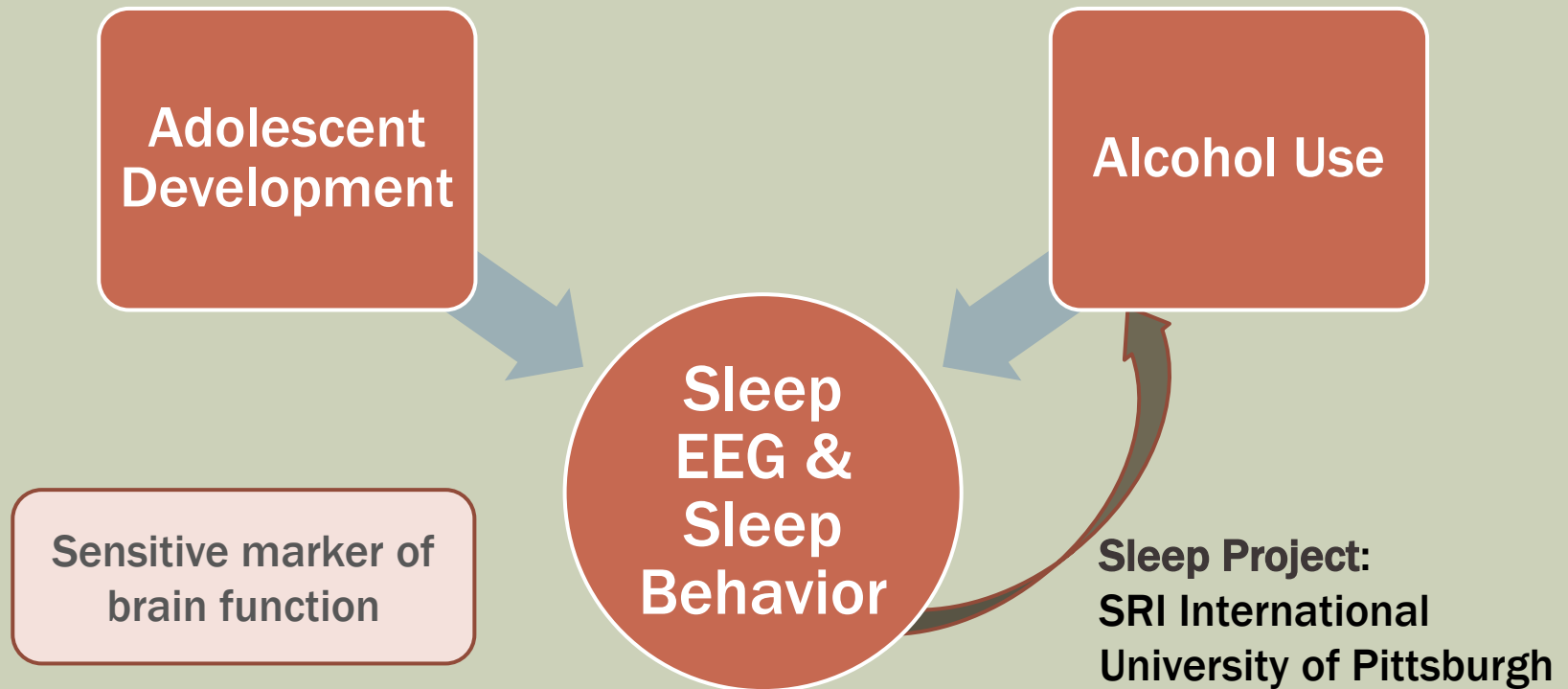- **Efficiency**
 - 2-5 minutes for most responses

WHY CONSIDER SLEEP?

1. Examine the developmental trajectory of functional sleep measures and how they are impacted by alcohol exposure.
2. Examine sleep behavior as a predictor of hazardous alcohol drinking in adolescents.

Adolescent Development

Alcohol Use

Sleep EEG & Sleep Behavior

Sensitive marker of brain function

Sleep Project:
SRI International
University of Pittsburgh

RECORDING SLEEP WITH POLYSOMNOGRAPHY

- Electroencephalograph
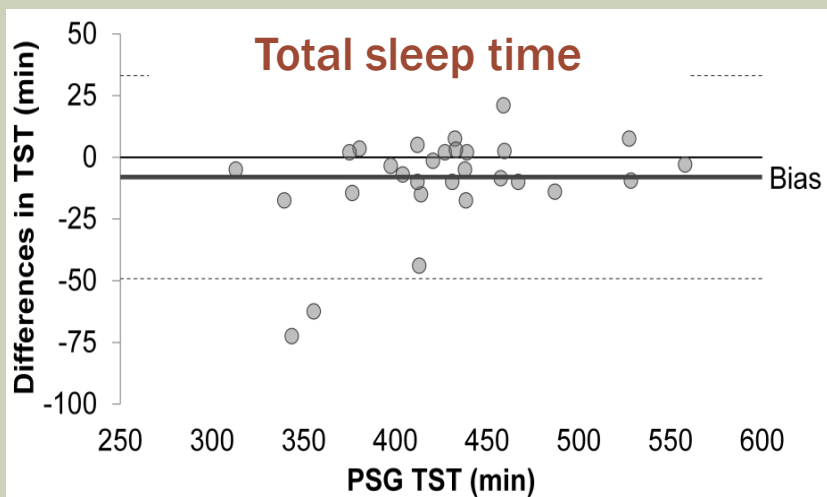
- Electromyograph
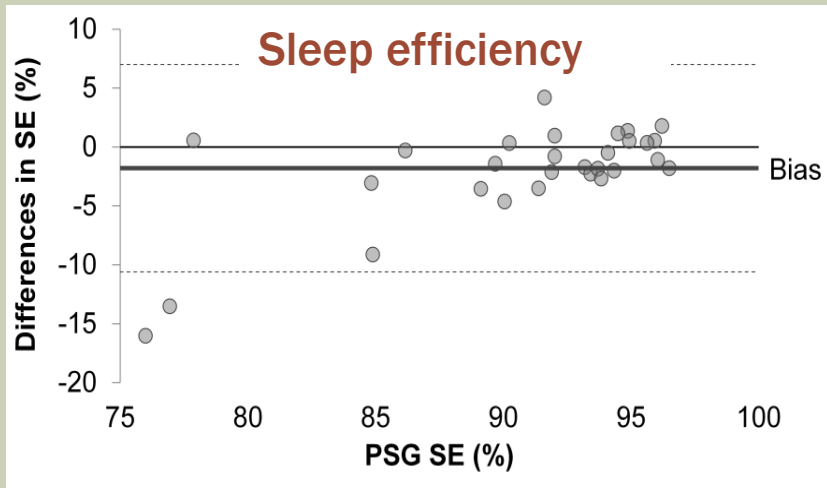
- Electro-oculograph
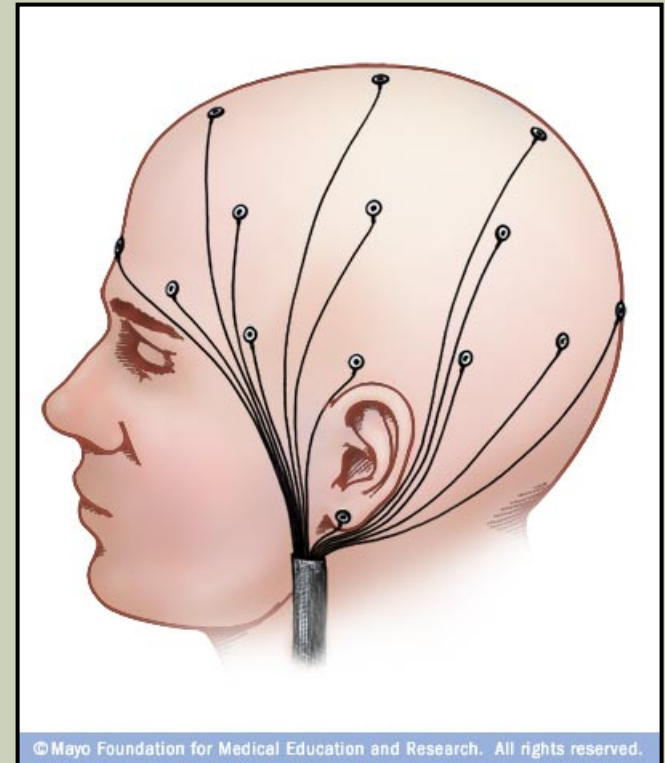
NON-RAPID EYE MOVEMENT (NREM) SLEEP
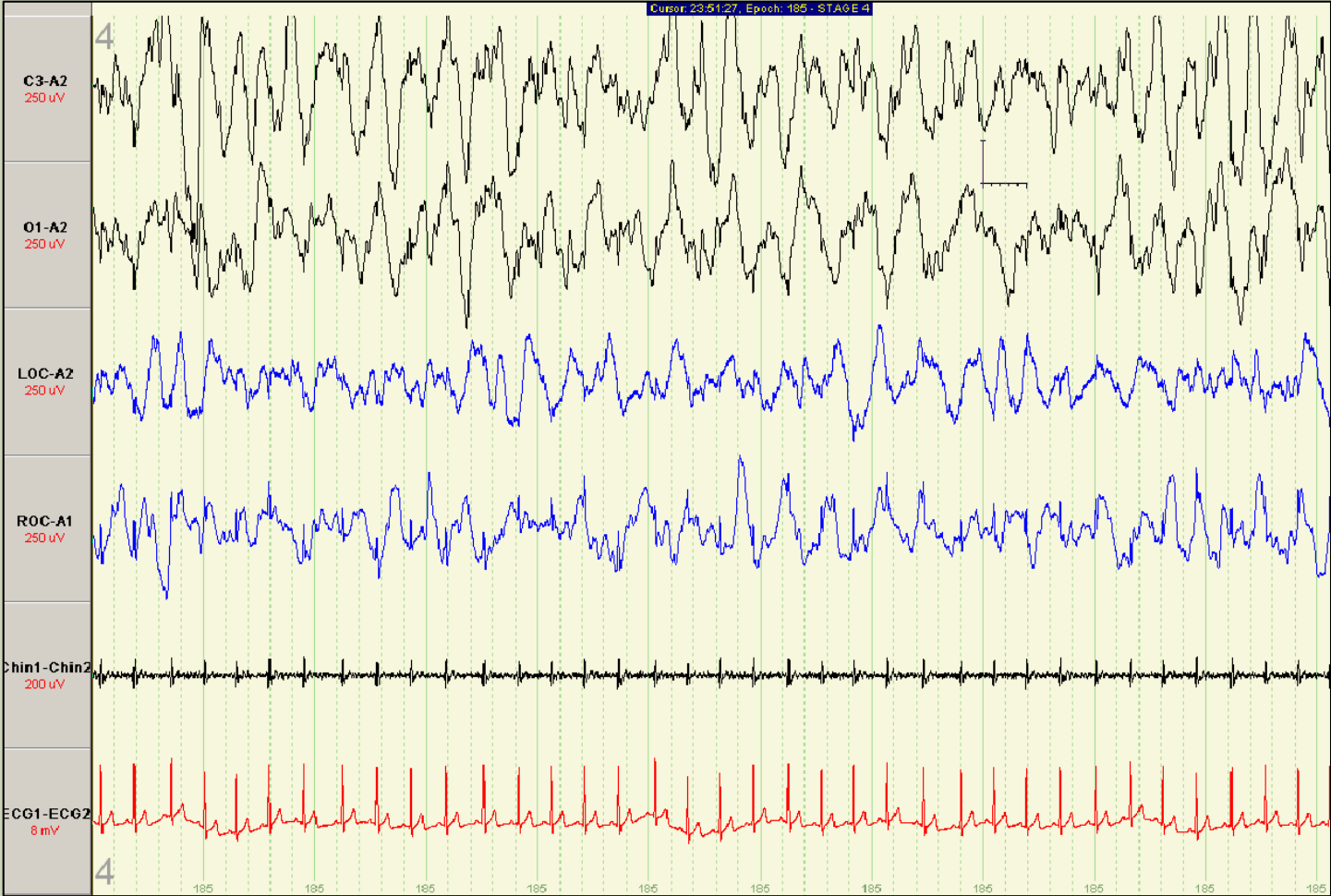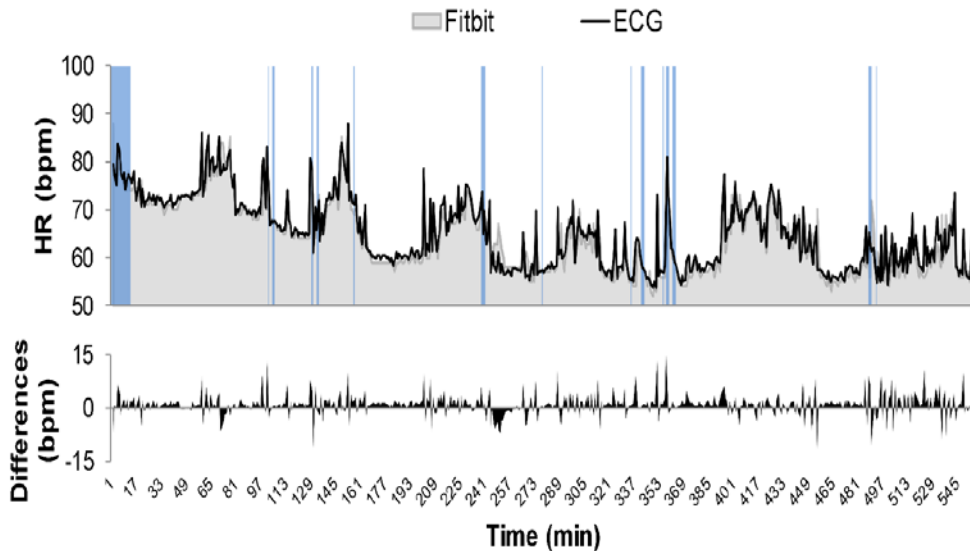
OUT OF THE LAB AND INTO THE HOME

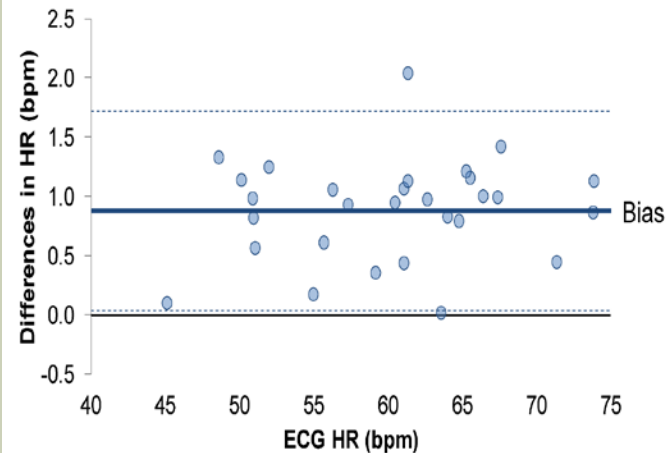# VALIDITY OF *FitBit Charge HR* IN MEASURING SLEEP AND HR

- High sensitivity in detecting sleep
- Lower specificity in detecting wake
- Fitbit approximates sleep-wake detection of PSG

de Zambotti et al. Physiol Behav., 2016

VALIDITY OF *FitBit Charge HR* IN MEASURING SLEEP AND HR

- **Approximates ECG measures of HR during sleep**

de Zambotti et al. Physiol Behav., 2016

LOOKING AHEAD TO NCANDA-2

- Expand FitBit use to all sites
- Integrate wearable measures with mNCANDA assessments

mNCANDA
MOBILE HEALTH APP

- **Ecological Momentary Assessment**
  - Prior to in-person MRI and neuropsych
  - Before & after substance use events
- **FitBit data provides corroborating data**

MyLife Daily Mood Rating
Rate your CURRENT mood:

1. How DOWN/DEPRESSED are you feeling?
--Select-- ▾

2. How ANGRY/MAD are you feeling
--Select-- ▾

3. How STRESSED are you feeling?
--Select-- ▾

4. How HAPPY are you feeling?
--Select-- ▾

5. How TIRED are you feeling?
--Select-- ▾

EMA Assessments

- **Time-sensitive responses**
- **Behavioral triggers**
- **Tailored probes and scheduling**

- **Integrate with wearable biosensors**

Noninvasive Alcohol Monitoring Using a Wearable Tattoo-Based Iontophoretic-Biosensing System

Jayoung Kim,[†,‖] Itthipon Jeerapan,[†,‖] Somayeh Imani,[‡,‖] Thomas N. Cho,[†] Amay Bandodkar,[†] Stefano Cinti,[†] Patrick P. Mercier,[*,‡] and Joseph Wang[*,†]

[†]Department of Nanoengineering and [‡]Department of Electrical & Computer Engineering, University of California, San Diego, La Jolla, California 92093, United States

"UN-AWARE-ABLE" BIOSENSORS
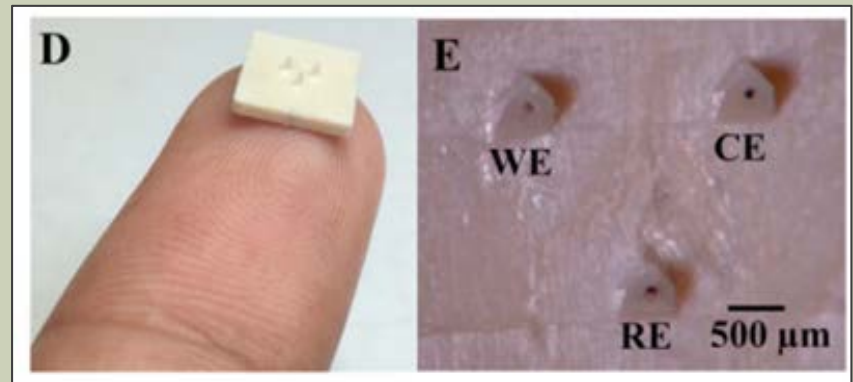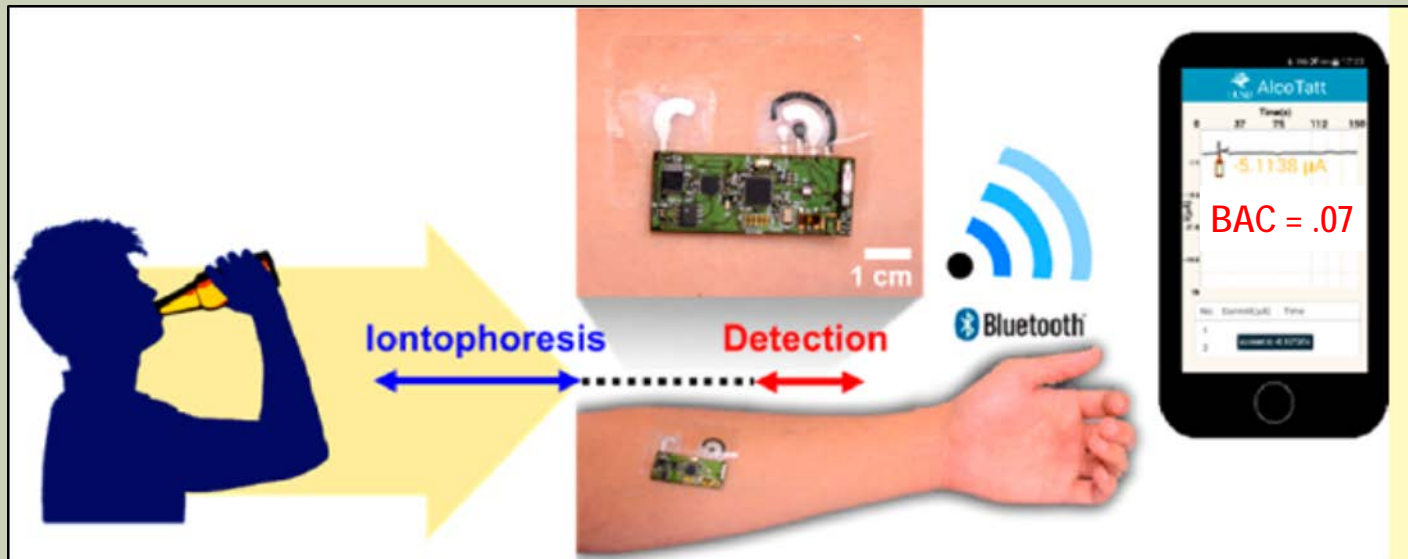
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- U01 AA021691 (Nagel)

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National Institute on Alcohol Abuse and Alcoholism

- ◆ NIAAA Program Staff
- ◆ NCANDA Scientific Advisory Board
- ◆ NCANDA Co-Investigators
- ◆ NCANDA Research Associates