DREAM SWEET DREAMS: A NEW FRAMEWORK FOR SLEEP TRACKING AND BODY CHANGE PREDICTIONS

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OUTLINE

• **Motivations**
  • Why are we interested in this topic?
  • What are we going to do to pursue this topic?

• **Mysleep platform – snap shots**

• **A New Prognosis Health Framework for Sleep**
  • Body change predictions based on generic database and linear regressions
  • Predictions tailored for personalized, precision sleep medicine using neural network

• **Future directions/plans and conclusions**
SLEEP AND CHILDREN DEVELOPMENT

• Sleep is the primary activity of the brain during early development (every living creature needs sleep)
• Circadian rhythms (sleep-wake cycle) regulated by light and dark, start to develop at about six weeks
• Children spend 40% of their time sleeping by the age of two
• Children need on the average of 10 hrs sleep to sustain healthy development by the age of ten.

[national sleep foundation: https://sleepfoundation.org/sleep-topics/children-and-sleep]
Sleep deficiency caused Body changes

[ courtesy of http://www.healthline.com/health/sleep-deprivation/effects-on-body]
WHAT CAN WE DO?

• Use wearables to establish self sleep tracking/monitoring (with parental access)
  • Can we teach children to manage their time e.g. sleep with wearables?

• Use the collected data to predict future sleep related problems
  • Is it possible to establish a personalized and precision sleep medicine framework?
Sleep data was recorded by Actiwatch and displayed by Actiwave. The light blue sections are sleeping periods. The dark blue sections are Actiwatch detached periods. Dark black lines during the sleeping periods are body movements.
WHAT ARE THE FEATURES

- Total sleep time
- Number of wakens in sleep
- Wake up time during sleep
- Sleep stages (REM)

Now we compare these features ...
THE RESULTS?

- We can get good/accurate sleeping hours with both medical devices, and wearables
- We may get REM estimation

Average sleep hours with age information can provide some predictions already
Activity Diary for Thursday, March 16, 2017

I napped today.  

I napped during the day from: \(00\text{ AM}\) to \(00\text{ AM}\)

Number of caffeinated drinks (soda, energy drinks, coffee, tea) I had:

Number of minutes I exercised for:

Sleepiness during the day:
- (1) Very sleepy (fell asleep during activity)
- (2) Sleepy (struggled to stay awake)
- (3) Somewhat sleepy
- (4) Not sleepy

SUBMIT
Last night...

About 1 hour before going to sleep, I did the following activities (Choose all that apply from the options given):

- Watched TV
- Listened to music
- Played video games
- Used my laptop/tablet/computer
- Read
- Homework
- Showered/Took a warm bath
- Played with friends/family
- Snack/dessert
- Texting
- Talked on the phone
- Had caffeinated drink
- Exercised
- Ate a meal
- Other (Fill in reason)

I attempted to fall asleep at: 00:00 PM

Number of minutes it took to fall asleep:

Number of times I woke up during the night:

Total minutes my sleep was interrupted for across all awakenings:

My sleep was interrupted by (Choose all that apply from the options given):

- Noise
- Pets
- Electronics
- Family members
- Dreams
- Worries
- Busy Minds
- Lighting
- Illness
- Bodily pain
- Bathroom
- Temperature (too hot/cold)
- Nothing
- Unknown
- Other (Fill in reason)

Overall, my sleep last night was:

- (1) Very restless
- (2) Restless
- (3) Fair quality
- (4) Sound
- (5) Very sound

This morning...

I woke up this morning at: 00:00 AM

When I woke up, I felt:

- (1) Tired
- (2) Somewhat refreshed
- (3) Refreshed
Body System Simulations

Click each box to start the simulation.
You must complete all 4 in order to proceed.

Reaction Time

Blood Sugar

Heart Rate

Catch a Cold
Sleep is a body changer

Directions: Input average weekly hours of sleep and then click Simulate

- 9-12
- 8
- 7
- 6
- 5
- 4

Simulate  Display Final Graph
PROBABILITY TO CATCH COLD

![Graph showing the probability of catching a cold based on average sleeping hours for the last week. The graph indicates that the probability decreases as the number of sleeping hours increases.]