# Developing non-invasive methods for monitoring sleep using actigraphy

Stephanie Sherman

Greg Hixon and David Schnyer

# Background

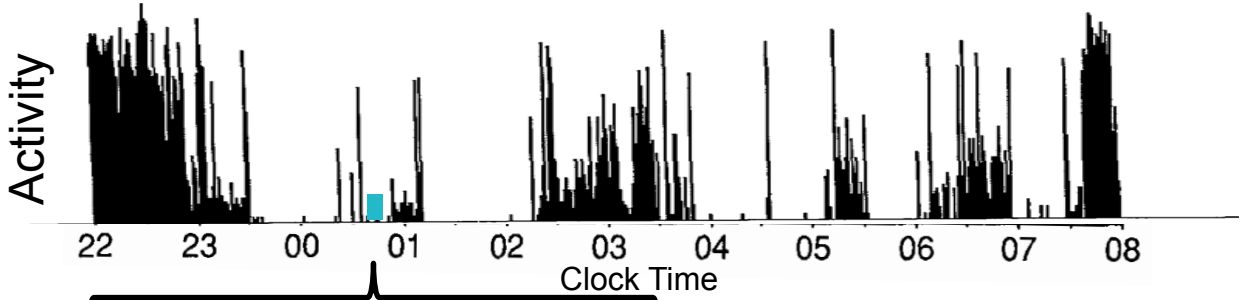
## Polysomnography

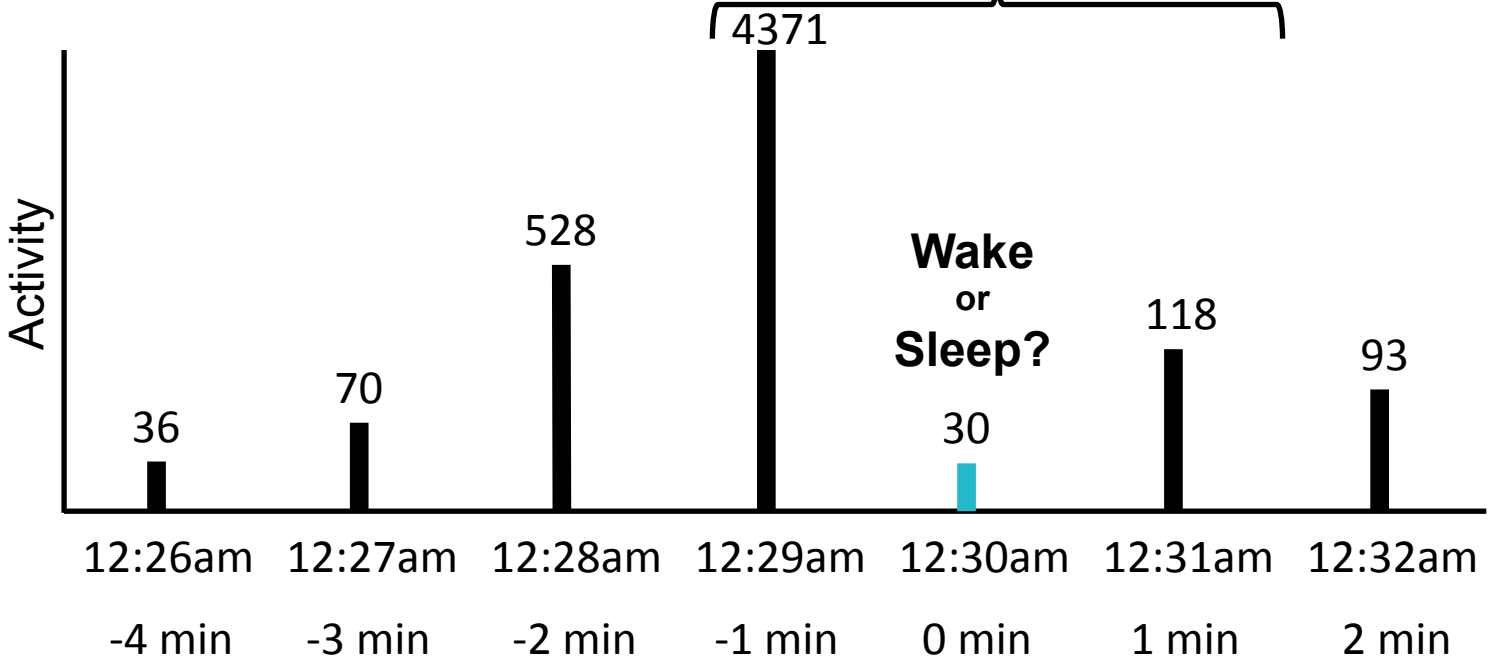
- Gold standard of measuring sleep behavior
- Only method to diagnose sleep disorders – costs $1500

## Actigraphy

- Measures movement
- Can be worn for extended periods of time

# Standard Sleep Algorithm for Actigraph data



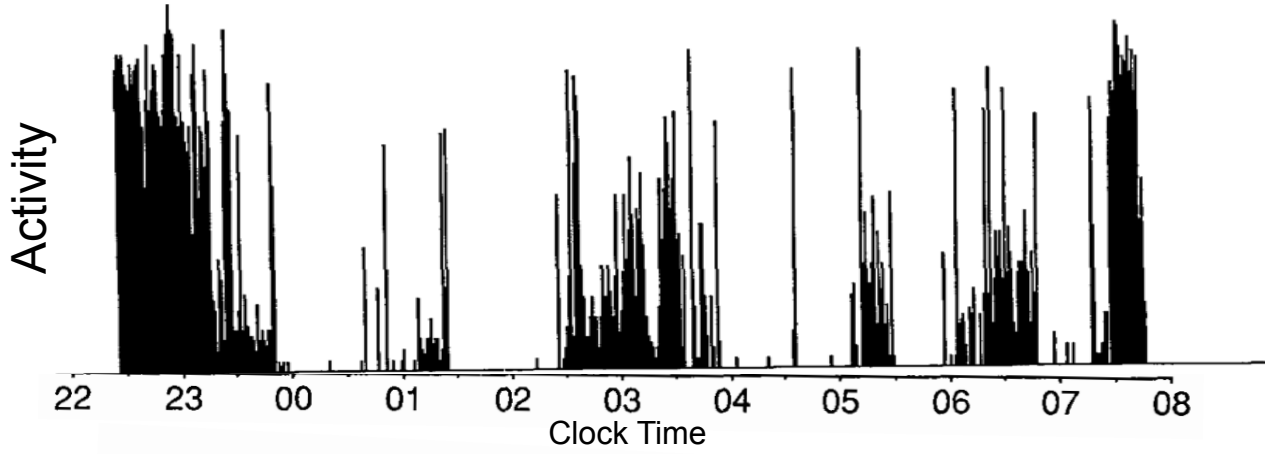




Scaling Factor $( 36W_{-4} + 70W_{-3} + 528W_{-2} + 4371W_{-1} + 30W_{-4} + 118W_{-3} + 93W_{-4} ) =$ **Determination of wake or sleep (D)**

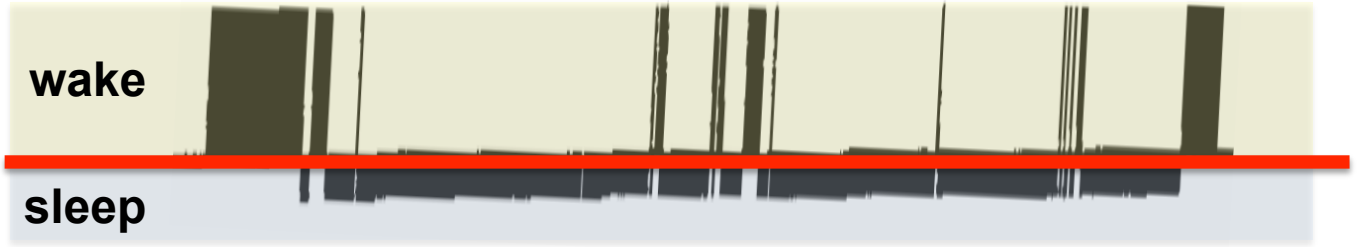
**D ≥ 1 = wake**

**D < 1 = sleep**

# Methods: Simultaneous recording

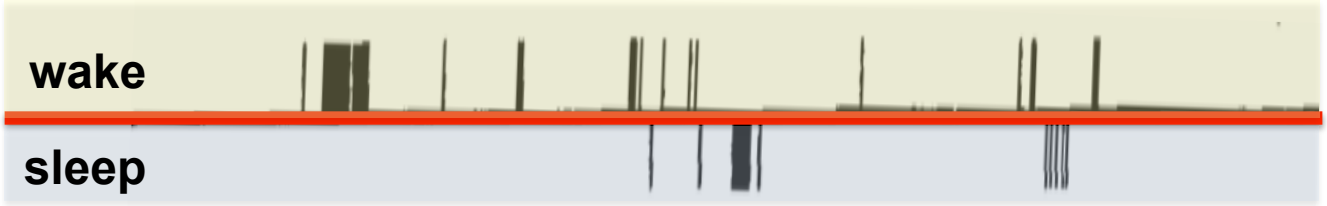



Standard
Sleep Algorithm

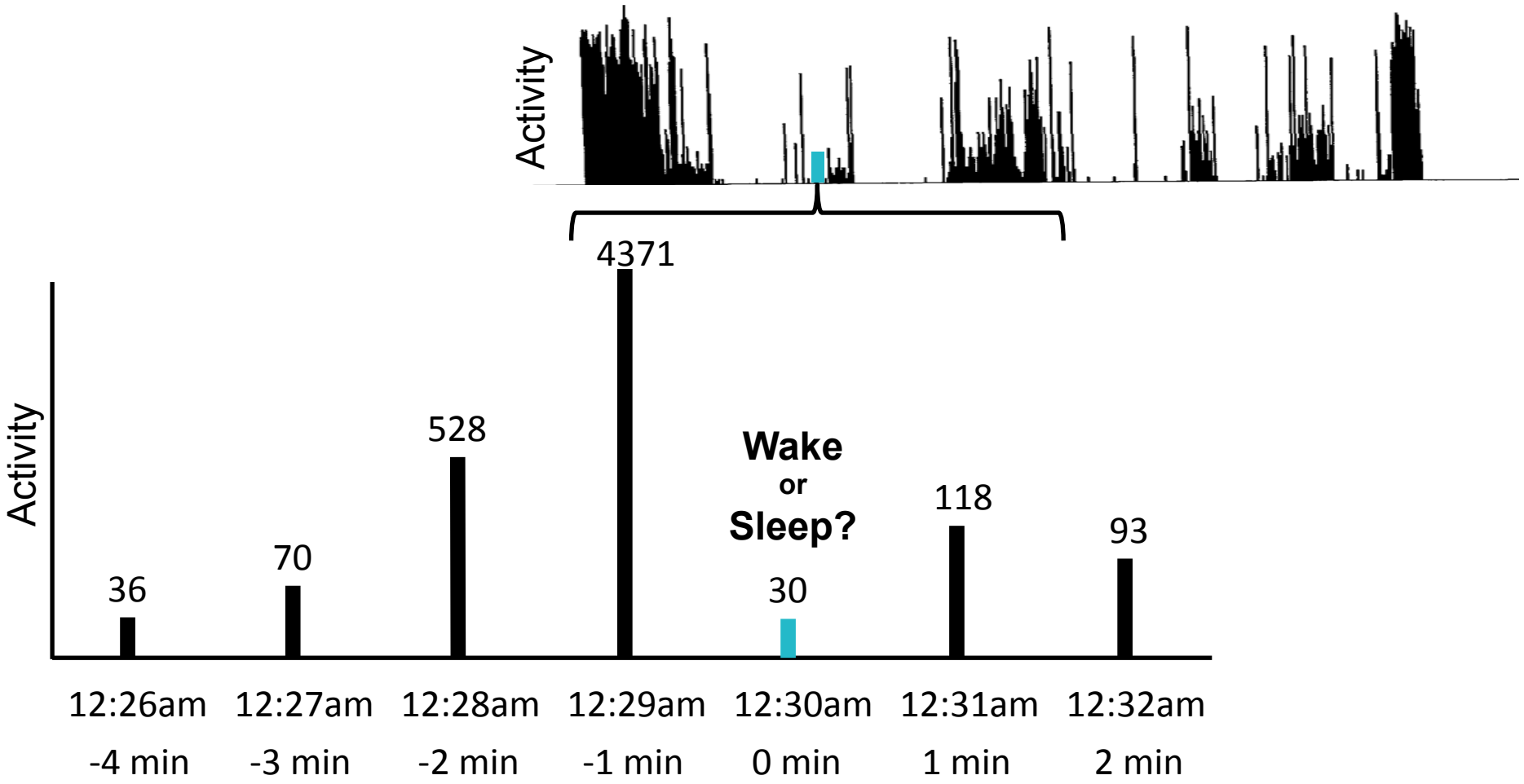



Polysomnography


Difference

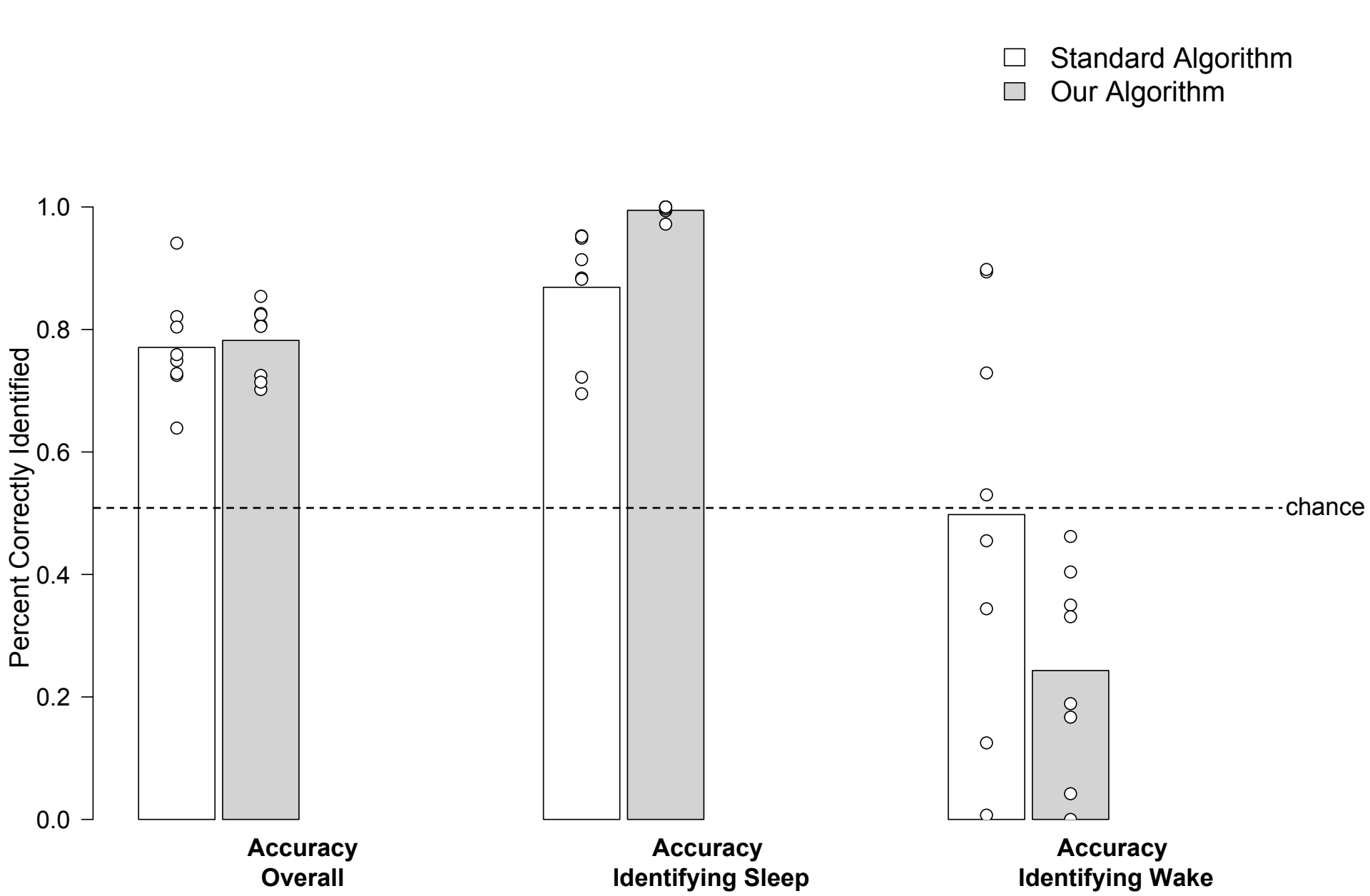


# Our Sleep Algorithm for Actigraph data: Logistic Regression




$36B_{-4} + 70B_{-3} + 528B_{-2} + 4371B_{-1} + 30B_{-4} + 118B_{-3} + 93B_{-4} + \text{Autoregressive Term} =$ **Probability of wake or sleep**

## Logistic Regression




- Leave one out cross validation using logistic regression

# Future Directions

Continuing to optimize algorithm to measures sleep stages

- sleep stages follow a predictive pattern
- change the threshold parameter depending on which stage of sleep is expected

Simultaneously collecting PSG and Actigraph data to apply algorithm to our data

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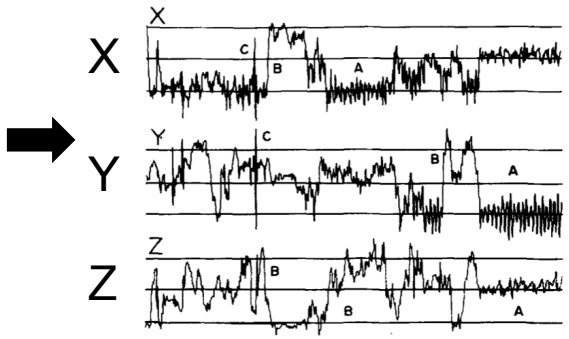
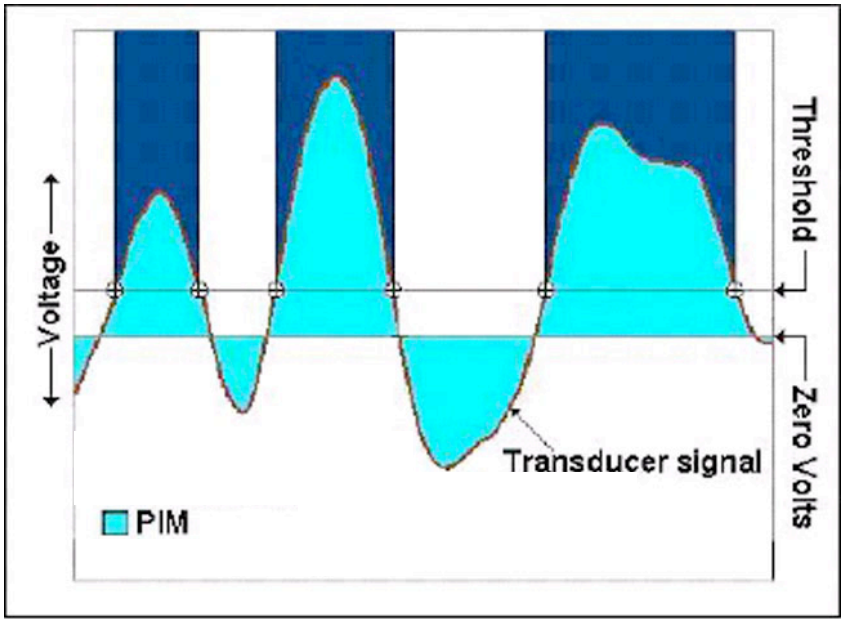
Thank you! Questions?

# Actigraphy: Proportional Integration Mode




One epoch – 1 minute