

SLEEP DATA MINING ALLOWS IN DEPTH UNDERSTANDING OF SLEEP PATTERNS AND PROBLEMS

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Introduction

- ✓ Sleep problems are prevalent and affect quality of life, health, and performance.
- ✓ Evaluation and treatment are restricted due to high costs and limited availability of clinical sleep facilities.
- ✓ The need to close the gap between the needs and the solutions stimulates new technological developments.
- ✓ Large scale solutions using mobile communication and off the shelf sensors provide initial sleep assistance.
- ✓ Sleep data acquisition facilitates better understanding of the normal and disturbed sleep process.
- ✓ SleepRate application offers users sleep evaluation and personalized sleep improvement using a smartphone, heart rate fitness monitors, and computerized CBTI techniques.

Methods

Over 9000 users and 40,000 tracked nights between January 23rd and November 1st 2014.

✓ **EG**: 227 users engaged in sleep assessment and improvement. Provided sleep related main concerns, answered initial questionnaires.

✓ **FG**: 2960 users tracked more than a single night for nightly sleep evaluation only.

All provided nightly information and/or measurements.

Results

EG: age 37.9 (SD16.6), 61% males

| Main Concerns | Trouble falling asleep | Night time awakenings | Early awakenings | Not rested upon wake up | Sleepy during the day | Hard to get up in the morning | Learn more about own sleep | Snoring |
|---------------|------------------------|-----------------------|------------------|-------------------------|-----------------------|-------------------------------|----------------------------|---------|
| yes | 93 | 131 | 113 | 196 | 169 | 137 | 220 | 102 |
| no | 134 | 96 | 114 | 31 | 58 | 90 | 7 | 125 |
| %yes | 41% | 58% | 50% | 86% | 74% | 60% | 97% | 45% |

EG (792 nights) and FG (1108 nights) after November 2nd indicate significant difference (t-test, * for p<0.001)

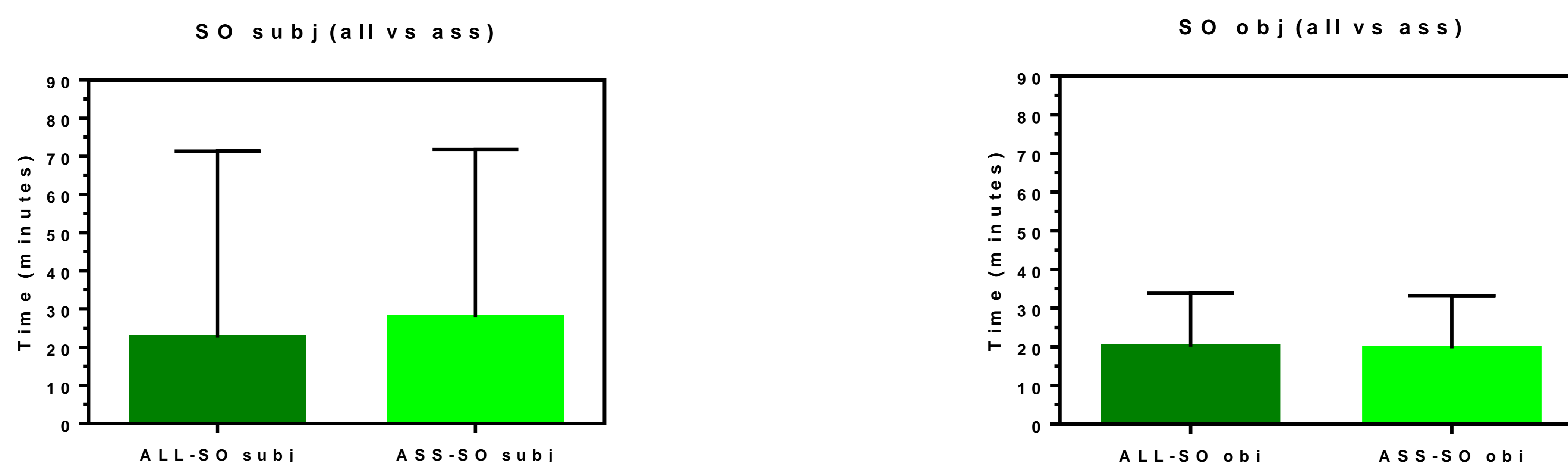
Measured variables:

| | TST (min)* | WASO (min)* | Sympatho-vagal balance* | SWS duration (min)* | Sleep latency (min) |
|----|------------|-------------|-------------------------|---------------------|---------------------|
| FG | 403 | 47 | 17.4 | 114 | 20 |
| EG | 386 | 53 | 22.5 | 102 | 20 |

Reported nightly diary:

| | TIB(min)* | Sleep latency (min)* | WASO (min)* | Sleep Efficiency(%)* | Daytime Sleepiness* | Go to Bed | Wake up |
|----|-----------|----------------------|-------------|----------------------|---------------------|-----------|---------|
| FG | 457 | 18 | 18 | 92 | 25 | 23:00 | 6:30 |
| EG | 467 | 27 | 36 | 85 | 31 | 23:00 | 6:30 |

Users with sleep complaints overestimate their fall asleep time.



Conclusions

- ✓ People sleep less than 7 hours.
- ✓ People engaged in assessment spend more time in bed, sleep less and have lower sleep efficiency.
- ✓ People engaged in assessment report more sleep difficulties and sleep about a quarter of an hour less than the free measurement group.
- ✓ They also have, as a group less SWS and a higher nightly sympatho-vagal balance, indicating hyperarousal. Their sleep problems represent a good enough reason to engage in a sleep improvement program.