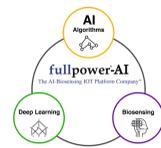




# Sleep Duration effect on Heart and Respiratory Rate in a Large US Sample

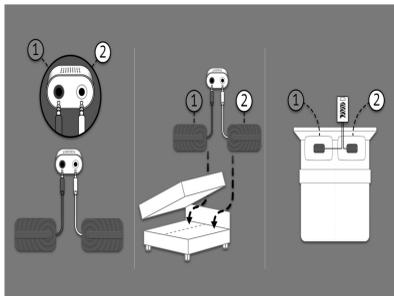


Jennifer Zitser<sup>1,3</sup>, Andrew Cotton-Clay<sup>2</sup>, Susan Baron<sup>2</sup>, Venkat Easwar<sup>2</sup>, Arthur Kinsolving<sup>2</sup>, Philippe Kahn<sup>2</sup>, Clete A. Kushida<sup>1</sup>

<sup>1</sup>Division of Sleep Medicine, Stanford University, Stanford, California, USA, <sup>2</sup>Fullpower Technologies, Inc. Santa Cruz, California, USA, <sup>3</sup>Movement Disorders Unit, Neurology Department, Tel Aviv Medical Center, Israel

## Objective Device Setup Methods

To examine the effect of sleep duration on heart rate (HR) and respiratory rate (RR) in a large U.S. sample of users of a home-based under-mattress monitoring device.

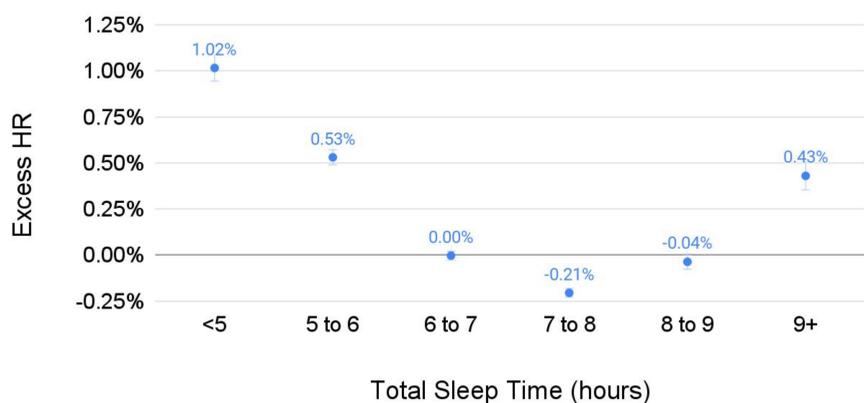


Sleep data from 76,769 users with 14,296,394 total recorded nights from 2021-04-01 to 2022-03-31, were collected through a commercially-available home-sleep monitoring device (Sleeptracker-AI Monitor, Fullpower Technologies, California, USA). The device passively monitors sleep using piezoelectric sensors that register the forces exerted through the mattress. Only subjects with at least 300 nights of recordings during the period were included. In total 18,252 individuals (40% female, 13% unspecified gender, mean age 49) with 5,846,745 recorded nights met this inclusion criterion. Estimated total sleep time (TST) was categorized as one of: <5 hours, 5-6 hours, 6-7 hours, 7-8 hours, 8-9 hours and >=9 hours. Normalized HR and RR for a recording were taken to be the mean HR and RR for that recording as a percentage of the average over all recordings for that subject. Excess HR and RR for a recording was taken to be the excess/deficit of the normalized HR and RR over 100%.

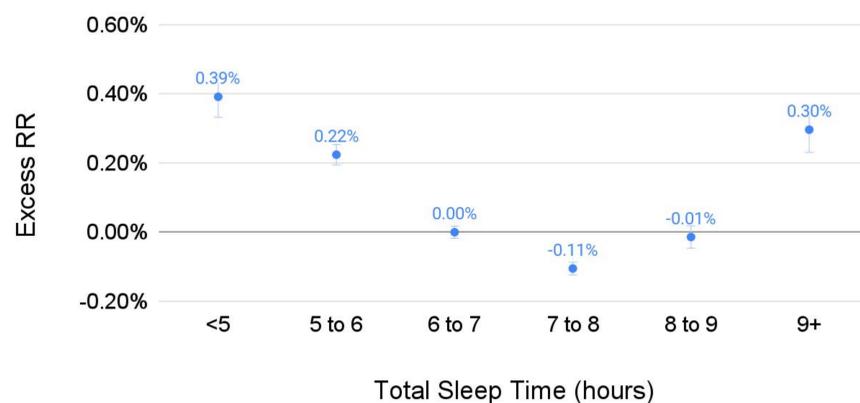
## Results

The mean (standard deviation [SD]) across subjects' average HR values was 63.5 (7.2). For each TST category (<5, 5-6, 6-7, 7-8, 8-9, >9 hours), the average, across subjects, of the excess HR was: +1.02%\* [+0.94,+1.09], +0.53%\* [+0.49,+0.57], -0.00% [-0.03,+0.02], -0.21%\* [-0.23,-0.18], -0.04% [-0.08,+0.00], +0.43%\* [+0.35,+0.51]. Regarding RR, the mean (SD) across subjects' average RR values was 15.3 (2.2). For each TST category, the average, across subjects, of the excess RR was: +0.39%\* [+0.33,+0.45], +0.22%\* [+0.19,+0.25], -0.00% [-0.02,+0.02], -0.11%\* [-0.12,-0.09], -0.01% [-0.05,+0.02], +0.30%\* [0.23,0.36]. Throughout, an \* indicates statistically significantly different from 0% at the p < 0.05 level.

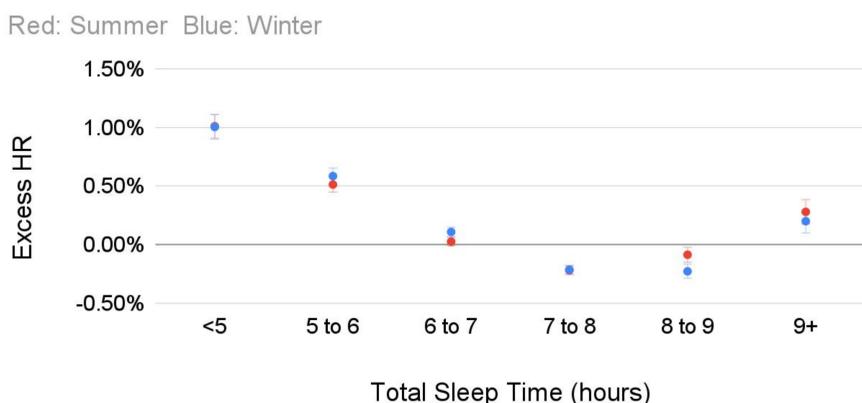
Excess HR by Binned TST: Mean across subjects



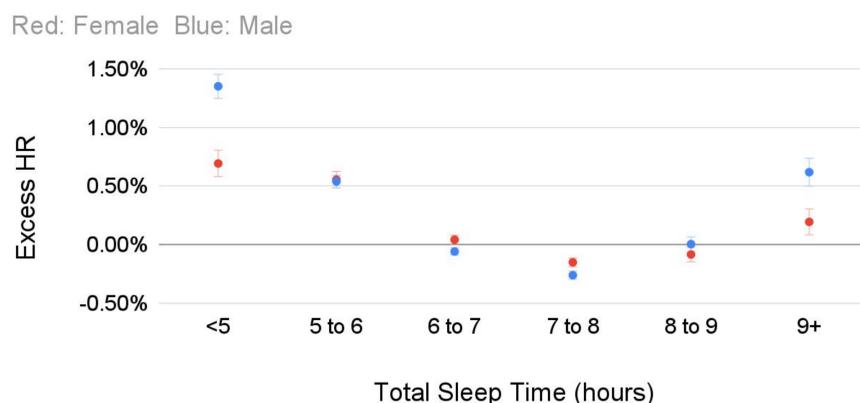
Excess RR by Binned TST: Mean across subjects



Excess HR: Summer vs Winter



Excess HR: Female vs Male



## Conclusions

Subjects had lower HR and RR than their average on nights when they slept 7-8 hours. Interestingly, their HR was higher than average on nights when they slept <6 hours or >=9 hours. Notably, the American Academy of Sleep Medicine recommends >=7 hours of sleep, without an upper limit. Furthermore, these findings may inform on the relationship between extreme sleep duration as a risk factor for cardiovascular events.