

Sleep Dynamics: Interaction of Sleep Patterns with Stress and Well-Being

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BACKGROUND

- Social and academic demands may lead to irregular sleep patterns in college students. The dynamic associations between sleep, health, and well-being is important to understand in this population.
- A variety of lifestyle determinants are likely to account for individual differences and within-person variation in affect and well-being.
- This study looked at the effect quantity of sleep, awakenings, sleep efficiency, and number of reported stressors on well-being.
- Research has focused on the effect of stress on sleep quality, but few studies have looked at the moderating effect of sleep on stress reactivity.

Recent studies have reported the following:

- Sleep deprivation has been shown to affect mental and physical health, stress levels, and cognitive performance (Hirshkowitz & Taskar, 2003).
- Subjective measures of sleep quality are a question of sleeping continually (Akerstedt, Gillberg, & Kecklund, 2007).
- Self-rated stress and self-rated sleep quality have a close relation (Akerstedt, Gillberg, & Kecklund, 2007).
- A positive association between 7-8 hours of sleep, good sleep quality, and self-reported health was found although no significant differences were found between short and long sleepers (Ginter *et al.*, 1996).
- Both quality and quantity of sleep are vital to the optimal functioning of brain activity in regulating emotions (Cheung *et al.*, 2012).

Objectives

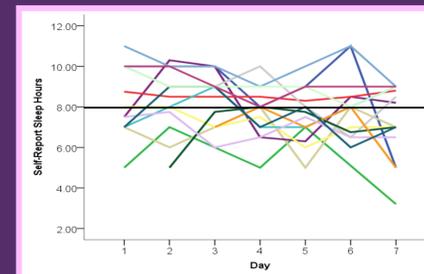
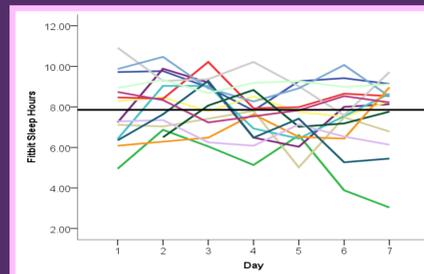
- Evaluate the impact of quantity and quality of sleep on well-being
- Evaluate the impact of sleep on number of reported stressors
- Evaluate if sleep moderates the effect of stress on well-being
- Evaluate the criterion-related validity of Fitbit as a measuring device for sleep hours and quality

METHOD

- At the end of each day, for 7 days, 58 participants reported on daily stressors and sleep behaviours.
- Questions asked:
 - “How well did you sleep last night?”
 - “How many hours of sleep did you get?”
 - “In the last 24 hours, did you experience any stressful events?”
- Participants wore the Fitbit accelerometer all day on their clothing, and at night on their wrists in sleep mode for 7 full days.
- A series of multilevel modeling analyses were conducted in Mplus to evaluate between-person and within-person effects of sleep and stress on well-being.



RESULTS



Daily Variation in Sleep Hours

| Name | ICC |
|-------------------------|------|
| Fitbit Sleep Hours | 0.29 |
| Self-Report Sleep Hours | 0.32 |

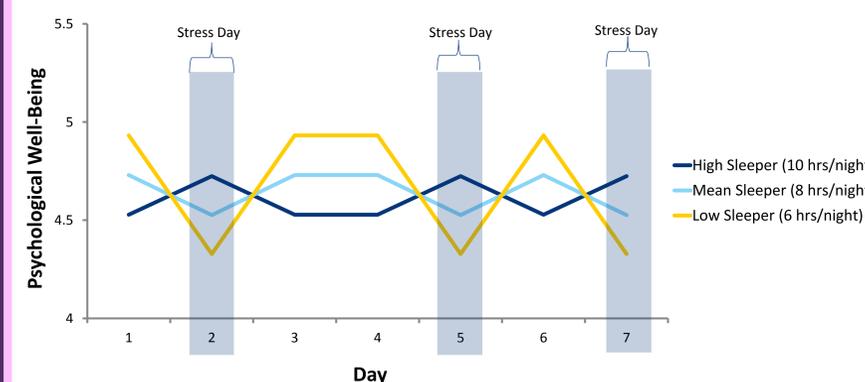
Proportion of between-person variance relative to total variance. Individuals deviated more from themselves than they did from each other.

Table 1. Between-person and within-person effects of sleep on dimensions of well-being and stress

| | PA | | NA | | PWB | | # Stressors | |
|----------------------------|---------|---------|----------|-----------|--------|----------|-------------|--------|
| | WP | BP | WP | BP | WP | BP | WP | BP |
| Sleep – Fitbit | | | | | | | | |
| Sleep Hours | -0.035 | -0.165* | -0.015 | -0.034 | 0.014 | -0.121 | 0.027 | -0.07 |
| Awakenings | 0.002 | -0.015 | -0.003 | -0.003 | 0.017 | -0.019 | -0.002 | -0.002 |
| Efficiency | -0.019 | 0.014 | -0.004 | -0.005 | -0.026 | 0.037 | -0.001 | 0.004 |
| Sleep – Self-Report | | | | | | | | |
| Sleep Hours | -0.053* | -0.096 | -0.044* | -0.016 | 0.008 | -0.016 | -0.036 | -0.007 |
| Awakenings | 0.002 | 0.075 | 0.014 | -0.163*** | -0.023 | 0.011 | 0.049 | -0.073 |
| Quality | -0.022 | 0.218 | -0.092** | -0.035 | 0.02 | 0.551*** | -0.079 | -0.028 |

Note. *p < .05 **p < .01 ***p < .001
PA = positive affect, NA = negative affect, PWB = psychological well-being, WP = within-person, BP = between-person
Table 1 provides estimates of between-person (BP) and within-person (WP) effects on well-being for a one-unit change in the sleep indices.

Figure 1. The Interaction of Sleep, Stress & Psychological Well-Being



DISCUSSION

- The relationship between sleep and stress was examined by evaluating the influence of sleep indices on the following day's perceived stressful events.
- This study assessed whether sleep had an influence on subsequent daily well-being by examining the quality and quantity of the previous night's sleep.

Sleep and Stress

- Daily variations in sleep patterns did not predict number of stressors reported on the following day.
- Average sleep behaviours did not predict stressors reported across the week.

Sleep, Affect, and Psychological Well-being

- Daily variation in self-reported sleep hours and sleep quality was related to lower negative affect.
- Individual differences in average self-reported sleep quality had a positive association with psychological well-being.
- Individual differences in sleep hours (Fitbit) was related to lower positive affect, while within-person variation in sleep hours (self-report) was related to lower positive affect.

Interactions

- Average sleep quantity was shown to moderate the daily effect of stress on psychological well-being (Figure 1).
 - Individuals who slept more on average did not show a negative effect of stress on their psychological well-being
 - The effect of a daily stressor was exacerbated for individuals who slept less on average.
- These results highlight the importance of getting consistently long nights sleep so that well-being is less affected when stressful events arise, therefore maintaining an individuals well-being.
- **Increased number sleep hours buffers the negative effect of stress on psychological well-being.**
- The findings support the work of Drake *et al.* (2003) that suggested that sleep may be thought of as a resource for managing stress and the work of Zohar *et al.* (2005) that longer sleep durations reduce stress reactivity.

REFERENCES

- Akerstedt, T., Gillberg, K., & Kecklund, G. (2007). Sleep and sleepiness in relation to stress and displaced work hours. *Physiology & Behavior*, 92(2). doi :http://dx.doi.org/10.1016/j.physbeh.2007.05.044
- Cheung, S., Esther, L., Hui, H., Mok, D., Wan, J., Wong, M. (2012). The interplay between sleep and mood in predicting academic functioning, physical health and psychological health: a longitudinal study. *Journal of Psychosomatic Research*, 74(4). doi: 10.1016/j.jpsychores.2012.08.014
- Drake, C., Roehrs, T., Roth, T. (2003). Insomnia causes, consequences, and therapeutics. *Depression and Anxiety*, 18, 163-176
- Ginter, D., Pilcher, J., Sadowsky, B. (1996). Sleep quality versus sleep quantity: relationships between sleep and measures of health, well-being and sleepiness in college students. *Journal of Psychosomatic Research*, 42, 583-596
- Hirshkowitz, M., & Taskar, V. (2003). Health effects of sleep deprivation. *Clinical Pulmonary Medicine*, 10(1), 47-52.
- Zohar, D., Epstein, R., Lavie, P., Tzischinsky, O. (2005). The effects of sleep loss on medical residents' emotional reactions to work events. *Sleep*, 28, 47-54.