Life Seems Harder When You Haven't Slept Well

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Abstract

The present study examined the relationship between objective measures of sleep quality and perceptions of task difficulty. Previous research has shown that poor sleep quality (less sleep and more awakenings) is associated with perception of greater task difficulty (Engle-Friedman, 2010). Greater fatigue, which occurs following poor sleep quality (Fogt et al., 2011), predicts estimation of steeper hills and greater distances (Proffitt, 2006). We hypothesized that poor sleep quality would predict perception of greater task difficulty. Participants (n = 19) had their sleep recorded at home through actigraphy and the following morning completed a Perception of Difficulty Assessment. In the Article Task and the Puzzle Task, participants were asked to estimate the number of elements within each item, the amount of time required to complete the tasks, and a difficulty rating for the tasks. In marginally significant findings, shorter sleep onset latency predicted greater estimated time to read the article (r^2 = .18, p = .067). Similarly, a medium effect size (r^2 = .14, p = .120) suggested shorter sleep onset latency predicted a greater estimate of the number of pages in the article. Less total sleep time predicted higher self-reported difficulty rating for reading the article (r^2 = .15, p = .108) and a greater estimate of number of puzzle pieces (r^2 = .11, p = .169) as suggested by medium effect sizes. These findings show that insufficient sleep leads to perceptions of greater task difficulty. Perceptions of lower self-efficacy (Bandura, 1977) resulting from insufficient sleep could lead to reductions in effort and subsequent performance decrements at home, at school, and in the workplace.

Research Objective

- To examine the relationship between objective measures of sleep quality (total sleep time, sleep awakenings, and sleep onset latency) and perception of task difficulty in a sample of good sleepers

Introduction

- Insufficient sleep occurs in approximately 29% of the United States population (National Sleep Foundation, 2009)
- Less total sleep time and greater sleep awakenings are associated with greater perceptions of difficulty of ice-skating maneuvers (Engle-Friedman, Palencar, Riela, 2010)
- Greater fatigue (which results from poor sleep quality) (Fogt et al., 2011) predicts perception of steeper hills and greater distances (Proffitt, 2006)
- Measures of sleep quality
  - Objective, e.g. actigraphy
    - Measures movement
    - Correlates with sleep/wake cycles (Sadeh, 2011)
    - Non-invasive examination of sleep onset latency, total sleep time, and number of nighttime sleep awakenings
- Examine relationship between objective measures of sleep quality (i.e., actigraphy) and perceptions of task difficulty

Hypotheses

H_1: Less total sleep time will predict greater perception of task difficulty.

H_2: Shorter sleep onset latency will predict greater perception of task difficulty.

H_3: Greater number of sleep awakenings will predict greater perception of task difficulty.

Methods

Participants

- Full Rest – Normal home sleep (n = 19)
  - Age 18-29 years (M = 19.63, SD = 3.37)
  - Gender: Female 42% (n = 8), male 58% (n = 11)
  - Ethnicity: East Asian 37% (n = 7), Black 16% (n = 3), Latino 16% (n = 3), Middle Eastern 5% (n = 1), South Asian 11% (n = 2), Caucasian 11% (n = 2), West Indian 5% (n = 1)

Materials

- Actigraph watch: MicroMini-Motionlogger (www.ambulatory-monitoring.com)
  - Monitors movements during sleep, which correlate with sleep-wake rhythms (Sadeh, 2011)
  - Measures of sleep extracted through automatic scoring of zero-crossings mode (ZCM) channel (Krakovská & Mezeiová, 2011)
  - Measures total sleep time, sleep awakenings, sleep efficiency, and sleep onset latency
- Perception of Difficulty Assessment
  - Article Task
    - Participants flip through paper article
    - Asked to estimate number of pages (actual = 35), amount of time required to read, difficult rating for reading, and difficulty rating for writing summary
  - Puzzle Task
    - Participants sift through pieces of unassembled jigsaw puzzle
    - Asked to estimate number of pieces (actual = 100), amount of time required to complete, and difficulty rating for completion

Procedure

- Part of a larger sleep deprivation study
  - Full Rest (control group)
    - Distribution of actigraph watches
    - Sleep as typically would at home during night session
  - Next morning – Breakfast and then Final Assessments - 9 AM
    - Perception of Difficulty Assessment

Statistical analyses: Linear regression

- Predictors: Actigraph variables
  - Total sleep time, number of awakenings per hour sleep, sleep onset latency, sleep efficiency
- Outcomes: Estimates from Perception of Difficulty Assessment
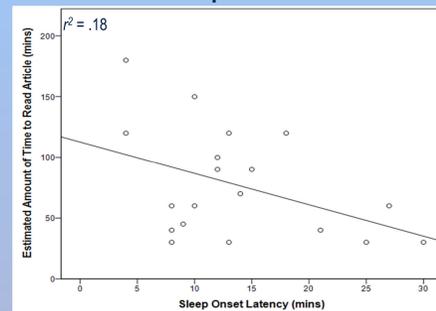 - Article Task and Puzzle Task

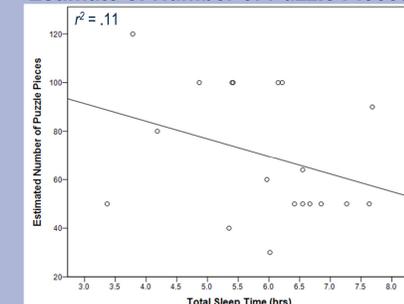*Actigraph watch*
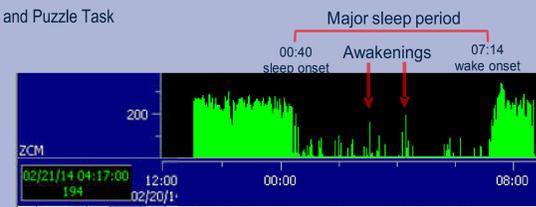
Sample participant actigraph data

Results

Shorter Sleep Onset Latency Predicts Greater Estimated Time Required to Read Article

r^2 = .18

- Shorter sleep onset latency predicted a greater estimate of the amount of time required to read the article in findings trending toward significance, β = −0.43, t(18) = −1.96, p = .067
- Sleep onset latency also explained 18% of the variance in estimated amount of time required to read the article in findings which trended toward significance, r^2 = .18, p = .067

Less Total Sleep Time Predicts Greater Difficulty Rating for Article

r^2 = .15
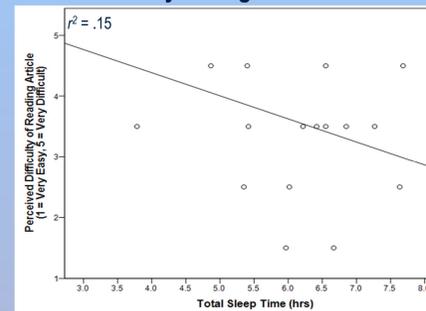
- Less total sleep time predicted a higher self-reported difficulty rating for the article according to a medium effect size, β = −0.38, t(18) = −1.70, p = .108
- Total sleep time explained 15% of the variance in self-reported difficulty rating for the article, r^2 = .15, p = .108
- Note. Rating ranged from 1 = Very Easy to 5 = Very Difficult

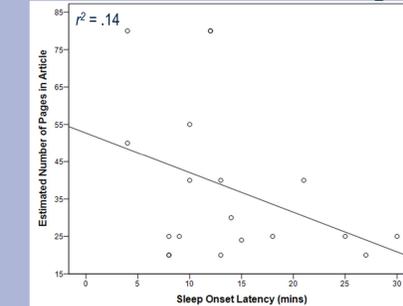### Less Total Sleep Time Predicts Greater Estimate of Number of Puzzle Pieces

r^2 = .11

- Less total sleep time predicted a greater estimate of the number of puzzle pieces according to a medium effect size, β = −0.33, t(18) = −1.44, p = .169
- Total sleep time also explained 11% of the variance in estimated number of puzzle pieces, r^2 = .11, p = .169
- Note. Actual number of puzzle pieces = 100

Shorter Sleep Onset Latency Predicts Greater Estimate of Number of Article Pages

r^2 = .14

- Shorter sleep onset latency predicted a greater estimate of the number of pages in the article according to a medium effect size, β = −0.37, t(18) = −1.64, p = .120
- Sleep onset latency also explained 14% of the variance in estimated number of pages in the article, r^2 = .14, p = .120
- Note. Actual number of pages in the article = 35

Discussion

- Less total sleep time predicts perceptions of greater task difficulty
  - Higher self-reported difficulty rating for reading article
  - Greater estimate of the number of puzzle pieces
- Shorter sleep onset latency predicts perceptions of greater task difficulty
  - Greater estimate of number of pages for article
  - Greater estimate of the amount of time required to read article
  - Chronic insufficient sleep causes shorter sleep latency (Kim et al., 2012)
    - Individuals experiencing shorter sleep latency, perhaps due to chronic sleep restriction, may have perceptions similar to those experiencing acute insufficient sleep
- Number of awakenings during sleep and sleep efficiency were unrelated to perceptions of task difficulty
  - Suggests sleep time, not awakenings, determine perceptions of difficulty
- Implications
  - 29% of adults report getting less sleep than they need each night (National Sleep Foundation, 2009)
  - According to Bandura's self-efficacy theory (Bandura, 1977), greater perceived self-efficacy leads to greater effort in the face of obstacles
    - Millions of American adults with poor sleep quality may be vulnerable to increased perceptions of task difficulty and, as a result, exert less effort
    - Resulting performance decrement creates self-fulfilling prophecy

Limitations

- Sample size was small (n = 19)
  - Limits statistical power
    - Medium effect sizes
  - Outliers have more influence
- Sample lacked age diversity
  - Effects of poor sleep quality on perceptions of task difficulty may vary among older adults

Future Directions

- Examine relationship between sleep quality and actual amount of time required to complete tasks
  - Determine if perceptions predict reality
- Use polysomnography, the gold standard of sleep measurement, instead of actigraphy to measure other sleep variables
- Assess neurological correlates of poor sleep quality and perceptions of task difficulty through neuroimaging
- Conduct experiment to establish causality by experimental manipulation of sleep restriction and/or disrupted sleep and the effects on perceptions of task difficulty

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