Midday Nap? Beware of Sleep Inertia

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ABSTRACT

Objective and subjective effort, mood and self-efficacy in 39 college students were studied twice, once following a no-nap period and once within five minutes of a 45-minute nap. In comparison to performance without a nap, objective performance following a nap was impaired despite higher reported wakefulness and self-efficacy. The findings suggest sleep inertia prevented previously observed nap-taking benefits. Recommendations for nap taking should include time for recovery following even short daytime sleep experiences.

INTRODUCTION

- College students often report sleeping less than they need (Lund et al, 2010)
- Naps may provide sleep restoration and improve performance, effort, and cognitive functioning
  - Improvement may depend on nap length/timing (Naitoh, 1981)
  - A 10-20 minute afternoon nap may improve cognitive functioning but naps longer than 20 minutes can result in loss of productivity due to sleep inertia (Dhand and Sohal, 2007)
- Sleep Inertia
  - Up to 30 minutes after awakening (Dhand and Sohal, 2007)
  - Grogginess after waking
  - Temporary diminished reaction time, attention, mental arithmetic, logic reasoning, and memory (Dinges, Orne & Orne, 1985)
- Differences in subjective and objective sleep inertia dissipation
  - May feel alert but remain impaired on cognitive tasks (Jewett et al.,1999)
- After awakening from a short nap, this project assessed
  - Objective effort
  - Performance
  - Subjective effort
  - Mood
  - Self efficacy

OBJECTIVE

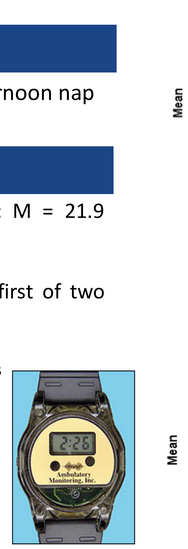
To assess the impact of taking a short afternoon nap on objective and subjective effort, performance, and mood in college students..

HYPOTHESIS

We predicted in comparison to no nap, a short afternoon nap would increase objective effort and performance

METHODS

- 39 undergraduates (20 female, 18 male, 1 other; M = 21.9 years, SD = 5.7)
- Able to nap and who did not nap on the no-nap day
- Randomly assigned to a no-nap or a nap day on first of two assessment days
- Assessment began five minutes after no-nap or nap
  - Mental addition task - chose 1 of 5 difficulty levels for 50 trials
  - Rated the difficulty of 6 everyday tasks
  - Self-efficacy scale
  - Word search task
  - A mirror tracing task
  - Self-rated performance
  - Profile of Mood States (Biehl & Landauer, 1975)
  - Stanford Sleepiness Scale (Hoddes et al., 1973)
- Actigraph watches throughout study
- Assessment elements counterbalanced to control order effects



RESULTS

ANCOVA tests controlled for learning/ order effects because the counterbalanced order of the control & nap.

Improvement - Post-Nap - Subjective Reports

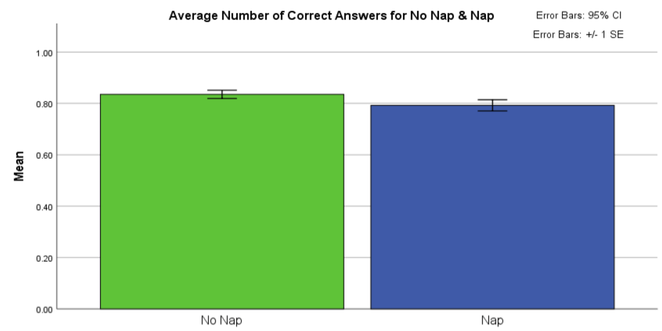
Self-Efficacy:
Participants reported significantly greater current subjective self-efficacy following a nap when compared with no-nap. Following a nap, self-efficacy was significantly greater on 7 out of 8 positive self-efficacy statements in Wilcoxon signed ranks tests ($p < .05$).

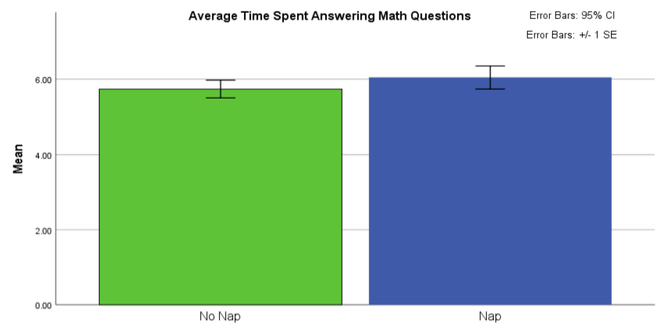
Self-Rated Performance on tasks:
Participants did not rate their performance on tasks differently after they took a nap compared to no-nap ($F(1,36)=.452$, $p>.05$)

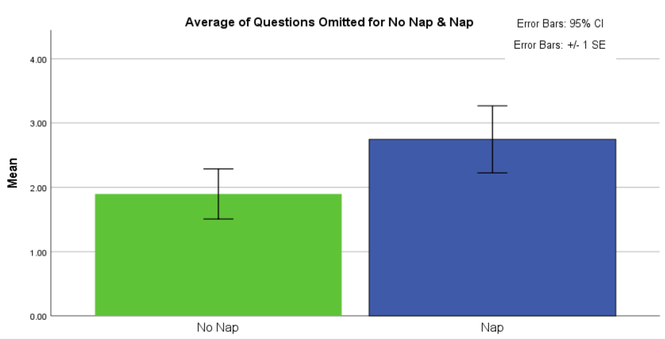
Profile of Moods States:
Participants reported feeling less confused after taking a nap ($M = 8.8$) than following no-nap ($M = 9.0$), $F(1, 37) = 5.432$, $p = .025$, partial eta squared = .128. No significant differences between nap and no-nap on depression, vigor, anger or tension.

Stanford Sleepiness:
Participants reported feeling significantly more active after taking a nap (M = 2.56) than following no-nap [(M = 3.44,Wilcoxon Signed Ranks test Z = -3.151, $p = .002$.]

Impairment - Post-Nap - Objective Effort and Performance







Mirror Task:

After a nap, participants showed more errors in tracing the easy shape (thicker line) ($M = .61$, $SD = .125$), than after no-nap ($M = .65$, $SD = .211$), $F(1, 37) = 12.115$, $p = .001$, partial eta square =.247, observed power = .924.

After a nap, participants showed more errors in tracing the hard shape (thinner line) ($M = .37$, $SD = .127$), than after no-nap ($M = .41$, $SD = .153$) $F(1, 37) = 11.576$, $p = .002$, partial eta square =.238, observed power = .912.

No significant differences:

- Time spent tracing either shape

Math Task:

- More questions were answered incorrectly following a nap ($M = 79.2\%$, SD=13.6%), than following no nap ($M = 83.5\%$, $SD = 10.0\%$), $F(1,37)= 24.650$, $p < .001$, partial eta squared = .400, observed power = .998.
- More time was spent answering math questions following a nap ($M = 6.0$ seconds, $SD = 1.9$) than after no-nap ($M= 5.7$ seconds, $SD = 1.5$), $F(1,37) = 50.239$, $p < .001$, partial eta squared = .576, observed power = 1.00.
- Participants omitted significantly more questions following a nap ($M = 2.7$ questions, $SD = 3.3$) than following no-nap ($M = 1.8$ questions, $SD = 2.4$), $F(1,37) = .524$, $p < .001$, partial eta square = .395, observed power = .998.
- Math difficulty level chosen was equivalent for both conditions

DISCUSSION

- Assessment within 5 minutes of a nap resulted in:
  - Simple addition problems
    - Impaired responding
    - More frequent omissions
    - More time spent on each question
    - No difference in choice of difficulty level
  - Mirror tracing task
    - Impaired responding for both the easy and difficult shapes
  - Significantly greater subjective self-efficacy and feelings of activation
  - Less subjective confusion
- Nap appears to affect objective performance
- Improvement in subjective experience
- Separate processes may underlie subjective and cognitive performance
- Offsetting sleep inertia should be considered in the context of nap-taking

FUTURE DIRECTIONS

- Future studies should investigate:
  - Timing of sleep inertia dissipation after nap-taking
  - Strategies to reduce sleep inertia-related impairments (Hilditch, Dorrian, & Banks, 2016)
- Those taking and encouraging naps are recommended to include time for the dissipation of sleep inertia impacts on objective performance

LIMITATIONS

- Sample size is relatively small
- Only young adults - college students assessed
- Need assessment of sleep inertia impacts at different times after waking

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