Adolescent Sleep

Assumption: Sleep is a fundamental necessity for health.
Assumptions:

- Youth ages 10-17 require ~9 hours of nightly sleep (National Institutes of Health; National Sleep Foundation)

- Studies across various geographic and cultural settings report 54 to 92% of teens obtain insufficient sleep most school nights.
Why be concerned about chronic sleep debt in adolescents?
Hypertension
Poor academic performance
Symptoms of depression
Substance abuse
Common causes of chronic sleep debt in teens

- Behavioral factors (school, work, social, cultural practices)
- Physiological factors (circadian rhythm changes, sleep disorders)
- Environmental factors (technology, noise)
Adolescence is a time when significant social, emotional, physical, and intellectual development occurs.

Behavior patterns established in teen years have long lasting consequences.
Key to addressing chronic sleep debt is to prevent occurrence in the first place

Middle school years are a good time to establish positive health-related behaviors
The purpose of this study was to test a curriculum designed to inform 12 to 14-year old teens about the importance of sleep and motivate them to increase nightly sleep towards a target goal of 9 hours per night.
1. Examine the relationship between total sleep time (TST) and self-reported daytime sleepiness (DS)
2. Create, implement and evaluate the *Sleep For Your Health* curriculum
3. Determine the impact of a school-based sleep curriculum on TST and DS in early adolescence
Theoretical Framework

- Bronfenbrenner - Bio-ecological Systems Theory - predicts most effective health promotion programs must involve coordinated interventions at multiple levels.

Design and Methods

- Design: X---------O---------X
  - Pre-test / sleep intervention / post-test
- IRB approval
- Site selection
- Power analysis (n=40)
- Sample / recruitment
Instruments: Actigraphy

- Wrist actigraph contains a highly sensitive accelerometer that records integrated measures of activity - analyzed in 1 minute epochs to identify periods of sleep
Example of actigraph demonstrating typical adolescent sleep pattern with extended sleep on weekend nights.
Actigraph demonstrating variable times for sleep onset and frequent night awakenings.
Actigraph demonstrating extremely variable times for sleep onset with numerous and prolonged night awakenings (insufficient amount and poor quality sleep).
Cleveland Adolescent Sleepiness Questionnaire (Spilsbury et. al., 2007)

- 16 question survey
- Construction of CASQ demonstrated content validity and reliability
- In original study, negative correlation between CASQ and self-reported TST
Cleveland Adolescent Sleepiness Questionnaire

Today’s Date: (fill in) ____ / ____ / ___

What is your age? (fill in years) _____

What is your sex? (check one) 1. Female 2. Male

We would like to know about when you might feel sleepy during a usual week. For each statement, mark the circle under the response that best fits with how often it applies to you. It’s important to answer them yourself – don’t have people help you. There are no right or wrong answers. For example, if we asked “I sleep with a pillow,” and the response that best fit how often you sleep with a pillow was “often,” you would mark the item as follows:

<table>
<thead>
<tr>
<th>EXAMPLE</th>
<th>Never (0 times per month)</th>
<th>Rarely (less than 3 times per month)</th>
<th>Sometimes (1-2 times per week)</th>
<th>Often (3-4 times per week)</th>
<th>Almost every day (5 or more times per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I sleep with a pillow</td>
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</table>

Sleepiness Questions

<table>
<thead>
<tr>
<th></th>
<th>Never (0 times per month)</th>
<th>Rarely (less than 3 times per month)</th>
<th>Sometimes (1-2 times per week)</th>
<th>Often (3-4 times per week)</th>
<th>Almost every day (5 or more times per week)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I fall asleep during my morning classes</td>
<td></td>
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<tr>
<td>2. I go through the whole school day without feeling tired</td>
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<tr>
<td>3. I fall asleep during the last class of the day</td>
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<td>4. I feel drowsy if I ride in a car for longer than five minutes</td>
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<td>5. I feel wide-awake the whole day</td>
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<tr>
<td>6. I fall asleep at school in my afternoon classes</td>
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</table>
Sleep For Your Health Curriculum

- Grade level appropriate
- Sequential
- Interactive learning strategies
- Small groups - peer led activities
- Reinforced at home and school
What does sleep do for you?

Sleep – Are you in debt? (Sleepy, Dopey, and Grumpy)

Chronobiology – You’ve got rhythm!

Sleep Hygiene – Just do it!

Common sleep disorders – Are you sleeping?

Everything you wanted to know about sleep but were afraid to ask.

6 Sessions
15 minutes per week
Pre- and post-intervention...

Students wore wrist actigraphs; concurrently kept sleep diary for 1 week

Completed CASQ on day acti-watches were returned
Post-intervention: Knowledge assessment and curriculum evaluation

- Students & parents were given a 10 question T/F quiz
- 2 checked response questions
- 3 open-ended evaluation questions
Results:

- n = 48 enrolled
- Comparison (control) group = 26, Experimental group = 22
- 52% male
- Mean age = 159 months (13.26 years)
- 83% white
### Findings: Total Sleep Time

<table>
<thead>
<tr>
<th>N=pre/post</th>
<th>Mean TST pre-intervention</th>
<th>Mean TST post-intervention</th>
<th>Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>441 minutes ± 66 (7.35 hours)</td>
<td>447 minutes ± 67 (7.45 hours)</td>
<td>9 minutes</td>
</tr>
<tr>
<td>47</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Control group</td>
<td>438 minutes ± 75 (7.3 hours)</td>
<td>447 minutes ± 67 (7.45 hours)</td>
<td>9 minutes</td>
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<tr>
<td>26/24</td>
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<tr>
<td>Experiment Group</td>
<td>445 minutes ± 55 (7.42 hours)</td>
<td>467 minutes ± 75 (7.78 hours)</td>
<td>22 minutes</td>
</tr>
<tr>
<td>21/21</td>
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</tbody>
</table>
## Findings: CASQ / Daytime Sleepiness

<table>
<thead>
<tr>
<th></th>
<th>Mean CASQ score pre-intervention (sd)</th>
<th>Mean CASQ score post-intervention (sd)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total 48</td>
<td>31 ± 9</td>
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<tr>
<td>Control group 26</td>
<td>31 ± 9</td>
<td>32 ± 7</td>
</tr>
<tr>
<td>Experimental group 22</td>
<td>30 ± 10 [Possible score range 16-80]</td>
<td>31 ± 11</td>
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Specific Aim 1. Data Analysis

Examine the relationship between total sleep time (TST) and self-reported daytime sleepiness (DS) in 12 to 14-year old adolescents.

Pre-test $r = .014$, ($p=.463$)
Post-test control group $r = - .149$ ($p=.244$)
Experimental group $r = - .024$ ($p=.459$)
Age & Sleep Duration

$r = -.618 \ (p=.003)$

- The older the adolescent, the less their average sleep time
Specific Aim 2. Assessment of Sleep Content Comprehension

- 10 question T/F quiz
- Student score mean = 8.29 ($sd = 1.5$)
- Parent score mean = 9.6 ($sd = 0.5$)
63.2% of students stated they learned “quite a bit” or “way more than expected”

77.8% responded they were trying to get closer to 9 hours of nightly sleep
Data Analysis / Evaluation Survey

- Parent responses (25%)

- 80% learned “a few helpful things” or “quite a bit”

- 80% said they were likely to encourage 9 hours of nightly sleep
Key Findings:

- Mean TST in control group increased 9 minutes / night
- Mean TST in experimental group increased by 22 minutes / night
- 55% experimental group increased sleep by average of 65 minutes / night
- 45% experimental group decreased sleep by average of 49 minutes / night
Limitations

- Not sufficient power to detect a moderate effect size with 48 subjects; most likely due to wide variation in sleep habits.
- Lack of diversity in participants
- Instruments – wrist actigraphy, CASQ, sleep knowledge questionnaire
Limitations

- Low return rate of parental responses
- Did not measure baseline sleep knowledge
- Curriculum not delivered as planned
- Insufficient time to emphasize goal setting each week
Implications:                Total Sleep Time

- TST in both groups increased from October to December
- Further research on seasonal variations in sleep patterns
- Sleepiness is difficult to measure
- No significant correlation between DS, TST or sleep quality as measured by actigraphy
- Highly reliable. ? validity
- Suggest further testing with larger and more diverse samples
Study confirms 12-14 year olds not getting sufficient sleep most nights.

Raises the question whether teens recognize feelings of sleep deprivation.

Approach was acceptable / encourage adoption of sleep information in middle school health curricula.