Sleep the Stress Away? A prospective study of the bidirectional relationship between stress and sleep

Victoria Guinn, Cinnamon Stetler, Ph.D., Madeleine George, B.S., & Lauren Stutts, Ph.D.

Introduction

• Sleep and stress disturbances are on the rise in first year college students and each can negatively affect academic performance (Gorman, Tims, & de Araujo, 2011; Lund, Randel, Whiting, & Macfie, 2014).
• Reports of stress at bedtime have been associated with daytime sleepiness and morning sleepiness was associated with higher stress during the day (Wu, et al., 2010).
• College students are presented with unique stressors that aren’t seen in other populations (Darling, et al., 2007).
• Neuroticism and the cross-sectional relationship between stress and sleep have been controlled for, the prospective relationships are still significant, suggesting that there is a predictive relationship in both directions.
• When neuroticism and the cross-sectional relationship have been controlled for, the prospective relationships are still significant, suggesting that there is a predictive relationship in both directions.
• Because of the variety of stressors that are a part of overall stress, future research could focus on specific stressors or domains of stress over longer periods of time.
• Further research on sleep and stress could inform interventions for colleges.

Aims

Aim 1: Describe cross-sectional relationship between sleep & stress
Aim 2: Describe the prospective relationship between stress and sleep.
Aim 3: Examine whether prospective associations would persist when controlling for neuroticism and autocorrelations between the sleep and stress over time.

Participants

• 245 first-year students from Pennsylvania University
• 178 women (72.7%), 65 men (26.5%), 2 not reported (8%) (Darling, et al., 2007).
• 202 white (82.4%), 8 African American (3.3%), and 33 other (13.5%) (Darling, et al., 2007).

Method

• Online surveys administered via Qualtrics to students in October and December of their first semester at college.
• Pittsburgh Sleep Quality Index (Buysse, et al., 1989) – a 21-item self-report scale that measures sleep over the past month (α = .89 – .95). Scores were measured on a continuous scale with higher scores indicating worse sleep.
• Perceived Stress Scale (Cohen, et al., 1983) – a 10-item self-report scale that measures the overall average of participants in this study since the last assessment (α = .79 – .81).

Results

Table 1 Descriptive Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Summer Mean(SD)</th>
<th>October Mean(SD)</th>
<th>December Mean(SD)</th>
<th>Possible Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroticism</td>
<td>2.96(.71)</td>
<td>5.62(1.77)</td>
<td>6.58(2.13)</td>
<td>1-5</td>
</tr>
<tr>
<td>Sleep (PSQI Total)</td>
<td>1.45</td>
<td>1.40</td>
<td>1.73</td>
<td>4-21</td>
</tr>
<tr>
<td>Perceived Stress</td>
<td>17.35(7.18)</td>
<td>16.64(7.05)</td>
<td>16.00(6.65)</td>
<td>4-40</td>
</tr>
</tbody>
</table>

Aims 1 & 2: Concurrent and Prospective Associations

Pearson’s correlations reveal statistically significant cross-sectional and prospective associations between stress and sleep (Figure 1).

<table>
<thead>
<tr>
<th>STRESS (Oct)</th>
<th>STRESS (Dec)</th>
<th>SLEEP (Oct)</th>
<th>SLEEP (Dec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>r=.50**</td>
<td>r=.39**</td>
<td>r=.55**</td>
<td>r=.36**</td>
</tr>
</tbody>
</table>

** p<.01

Figure 1. Concurrent and prospective correlations between stress and sleep.

Aim 3: Hierarchical Regressions

• Stress levels (r=.59, p<.001) and sleep habits (r=.58, p<.01) tend to stay consistent, over time.
• Two hierarchical regressions were performed controlling for neuroticism and the cross-sectional correlations between stress and sleep.
• Stress in Oct. is predictive of sleep in Dec. (Table 2).
• Sleep in Oct. is predictive of stress in Dec. (Table 3).

Table 2 Hierarchical Regression of Neuroticism and Stress on Sleep

<table>
<thead>
<tr>
<th>Variable</th>
<th>Summer Model</th>
<th>October Model</th>
<th>December Model</th>
<th>Perceived Stress In December</th>
<th>Step 1</th>
<th>Step 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neuroticism</td>
<td>.45</td>
<td>.22</td>
<td>.15*</td>
<td></td>
<td>.058</td>
<td>.025</td>
</tr>
<tr>
<td>Perceived Stress</td>
<td>.082</td>
<td>.022</td>
<td>.28***</td>
<td></td>
<td>.059</td>
<td>.025</td>
</tr>
<tr>
<td>P</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td></td>
<td></td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*p<.05 **p<.01 ***p<.001

Discussion

• The prospective correlations indicate that sleep has a significant effect on stress that stressful, and report poorer sleep (leading to more stress) than individuals who are lower in neuroticism.
• Stress in October appears to be a stronger predictor of stress in December than stress in October is sleep in December. This is not entirely consistent with previous research; previous studies have found that stress is a stronger predictor of other factors (substance use, a medical condition, etc.) in an individual's life may factor into the relationship between stress and sleep in addition to neuroticism.
• Limitations: sample size, only subjective markers of sleep and perceived stress, general attrition rates.
• Because of the variety of stressors that are a part of overall stress, future research could focus on specific stressors or domains of stress over longer periods of time.
• Further research on sleep and stress could inform interventions for colleges.

Table 3 Hierarchical Regression of Neuroticism and Sleep on Stress

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>B</td>
<td>SE B</td>
<td>B SE B</td>
<td>B SE B</td>
<td></td>
<td></td>
</tr>
<tr>
<td>β</td>
<td>β</td>
<td>β</td>
<td>β</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>4.76</td>
<td>5.9</td>
<td>47**</td>
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</tr>
<tr>
<td>Sleep in Dec.</td>
<td>.73</td>
<td>20</td>
<td>22**</td>
<td>.60</td>
<td>.37</td>
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<tr>
<td>Sleep in Oct.</td>
<td>.34</td>
<td>37</td>
<td>.033</td>
<td>.34</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>P</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*p<.05 **p<.01 ***p<.001

References


Acknowledgements

Thank you to my mentor Dr. Cinnamon Stetler, the Duke Endowment for funding, and the students and parents who participated in our research.