Stressed and Losing Sleep: Sleep Duration and Perceived Stress Among Affluent Adolescent Females

Angela M. DeSilva Mousseau, Terese J. Lund, Belle Liang, Renée Spencer & Jill Walsh

To cite this article: Angela M. DeSilva Mousseau, Terese J. Lund, Belle Liang, Renée Spencer & Jill Walsh (2016) Stressed and Losing Sleep: Sleep Duration and Perceived Stress Among Affluent Adolescent Females, Peabody Journal of Education, 91:5, 628-644, DOI: 10.1080/0161956X.2016.1227186

To link to this article: https://doi.org/10.1080/0161956X.2016.1227186

Accepted author version posted online: 22 Aug 2016.
Published online: 03 Oct 2016.

Submit your article to this journal

Article views: 548

View Crossmark data

Citing articles: 1 View citing articles
Stressed and Losing Sleep: Sleep Duration and Perceived Stress Among Affluent Adolescent Females

Angela M. DeSilva Mousseau  
*Rivier University*

Terese J. Lund  
*Wingate University*

Belle Liang  
*Boston College*

Renée Spencer and Jill Walsh  
*Boston University School of Social Work*

This study examined the relationship between stress and sleep duration for adolescent females from affluent backgrounds. Participants were 218 students attending two independent single-sex secondary schools. Ordinary Least Squares (OLS) regression models (cross-sectional and longitudinal) were run to examine the association between stress and sleep duration and to determine whether any associations lasted from the beginning to the end of the academic year. In the cross-sectional models, the relationship between perceived stress and sleep duration was reciprocal and negative. Findings from the longitudinal analyses suggested that perceived stress had lingering negative effects on sleep. Implications for future research and practice are discussed.

In the last two decades, research from developmental science (e.g., Lund & Dearing, 2013; Luthar, 2003; Luthar, Barkin, & Crossman, 2013; Luthar & Becker, 2002; Luthar, Shoum, & Brown, 2006), fueled by interest from the popular press (Levine, 2006), has suggested that affluent youth can demonstrate social and emotional problems equaling or surpassing those of their counterparts from disadvantaged contexts. In particular, adolescent girls growing up affluent have been identified as especially at risk for dysfunction (Lyman & Luthar, 2014). The drive to become “supergirls” (Hinshaw & Kranz, 2009), excelling in all performance domains (e.g., academics, extracurricular activities, etc.), may lead to increased levels of distress (Luthar et al., 2006).

The recent deluge of popular press and scholarly articles on the growing epidemic of sleep deprivation among U.S. high school students (Tanner, 2015) coincides with increasing concern...
over school-related stress, especially among high school females from affluent backgrounds (Luthar et al., 2013). Sleep experts agree that adolescents need at least 9 to 10 hours of sleep per night, on average, for good health and daytime functioning (Meijer, Reitz, Dekovic, van den Wittenboer, & Stoel, 2010), yet most adolescents sleep much less (Centers for Disease Control and Prevention, 2012).

Although sleep deprivation is a growing public health epidemic among all U.S. adolescents (Hansen, Janssen, Schiff, Zee, & Dubocovich, 2005), this is especially true for females (Fredriksen, Rhodes, Reddy, & Way, 2004). In a study of 11,788 adolescents, getting less than the average number of hours of sleep was more common among girls than boys (Sarchiapone et al., 2014). Moreover, an insufficient amount of sleep was associated with potentially severe mental health problems, including anxiety, emotional concerns, and suicidal ideation. On the other hand, adequate sleep amounts have been associated with numerous benefits, including improved psychological health and academic performance (Dewald, Meijer, Oort, Kerkhof, & Bogels, 2009; Fredriksen et al., 2004).

Some studies have shown that reductions in sleep duration from childhood to adolescence may be attributed to effects of a combination of biological changes (e.g., puberty and circadian rhythm changes), which result in normal decreases in the amount of sleep an adolescent receives, and environmental factors that result in sleep deprivation (e.g., early school start times, academic workload, and extracurricular activities). Specifically, puberty triggers a biological shift in the sleep/wake cycle (i.e., the times that adolescents go to sleep and wake up every day), where the adolescent’s natural tendency is to stay awake later at night and to sleep later in the morning than younger children (Millman, 2005). This biological shift in combination with earlier school start times, increased academic workload, and more extracurricular activities forces adolescents into a pattern of functioning with less sleep than they need (Carskadon, Wolfson, Acebo, Tzischinsky, & Seifer, 1998; Dahl & Lewin, 2002; Jenni, Achermann, & Carskadon, 2005). As they get older, adolescents increasingly stay up later and get up earlier on school days, ultimately resulting in a profound cumulative loss of sleep (Wolfson & Carskadon, 1998). Attempts to sleep longer on the weekend to “catch up” on sleep actually cause more disruption and feelings of tiredness in adolescents. In fact, dramatic changes in the sleep cycle can have detrimental effects on adolescents (e.g., extreme tiredness, mood swings, lack of motivation, difficulty concentrating), and it can take several days for their sleep cycles to become regulated again (Taras & Potts-Datema, 2005; Curcio, Ferrara, & DeGennaro, 2006).

**ADOLESCENT STRESS AND SLEEP DURATION**

Research has also suggested that reduced sleep may be linked to psychological stress (Sarchiapone et al., 2014) and increased reactivity to stress (Minkel et al., 2012). The few studies on adolescent populations suggest that the relationship between stress and sleep problems may be bidirectional (Astill, Verhoeven, Vijzelaar, & Van Someren, 2013; Capaldi, Handwerger, Richardson, & Stroud, 2005; Minkel et al., 2012). Not only does stress interfere with the quantity and quality of sleep adolescents receive, many adolescents report feeling more stressed when they do not get enough sleep. Astill and colleagues (2013) found that under stressful conditions (e.g., school examinations) adolescent sleep duration and quality were reduced. Capaldi and colleagues (2005) found increased sleep-wake behavior problems (i.e., the frequency of sleep problems and erratic
behavior attributed to sleep problems during the last two weeks) were associated with decreased cortisol responses to stress.

**ELEVATED STRESS AND INSUFFICIENT SLEEP AMONG AFFLUENT ADOLESCENT FEMALES**

In addition to the increased demands and stress associated with adolescence (Rudolph & Hammen, 1999; Seiffge-Krenke, 2006), females, as compared with males, seem to get more anxious and “stressed” and to rely on more maladaptive coping skills to manage stressors (Grant et al., 2006; Hankin & Abramson, 2001). Further, some literature suggests a connection between perceived stress and shortened sleep for those individuals who use emotion-focused coping (Sadeh, Keinan, & Daon, 2004)—a style that is especially characteristic of girls and women (Li, DiGiuseppe, & Froh, 2006).

Adolescent girls, in general, are pressured to be more ambitious, caring, beautiful, and accomplished than their male peers; that is, girls are pushed to become “supergirls” (Hinshaw & Kranz, 2009). Indeed, adolescent females, particularly those from affluent backgrounds, experience high levels of stress and pressures to be perfect that can have serious detrimental consequences (Luthar & Becker, 2002; Luthar et al., 2006; Lyman & Luthar, 2014; Spencer, Walsh, Liang, Mousseau, & Lund, 2015). For example, these adolescents may experience significant “achievement pressure” to excel in order to secure admission to the highest-ranking colleges (Luthar & Becker, 2002). They often equate achievement failures with personal failures (Luthar & Latendresse, 2005a). These perfectionistic strivings are associated with depression, anxiety, and substance abuse among affluent adolescent females (Luthar & Becker, 2002; Luthar & Latendresse, 2005a). In fact, affluent adolescent girls have been identified as uniquely vulnerable to the impact of pressures to excel and perform compared with affluent boys and youth from more modest means (Lyman & Luthar, 2014).

**CURRENT STUDY**

Given the high levels of perceived stress among females in affluent communities (e.g., Luthar & Becker, 2002; Lyman & Luthar, 2014; Spencer et al., 2015) and the sleep deprivation that is endemic in adolescence (Centers for Disease Control and Prevention, 2012; National Sleep Foundation, 2006), it is important to gain an understanding of the associations between these variables for adolescents from affluent contexts. Despite growing attention to the increased risk for maladjustment among affluent girls (Lyman & Luthar, 2014), no research has examined the role sleep duration may play in the elevated rates of stress and dysfunction documented in this population. The current study sought to address this gap in the research on perceived stress and sleep duration by explicitly examining two specific questions in an affluent population of adolescent girls:

1. What is the contemporaneous relationship between perceived stress and sleep duration?
2. What is the relationship between perceived stress and sleep duration over the course of an academic year?
For question 1, we hypothesized that the contemporaneous associations between sleep duration and perceived stress would be reciprocal and negative, based on previous research (e.g., Astill et al., 2013; Minkel et al., 2012). For question 2, we made no specific hypotheses about directionality and considered our analyses as exploratory, given that longitudinal analyses with these constructs had yet to be published.

METHOD

Participants and Procedure

Study participants included 218 adolescent females in seventh (25.7%), ninth (34.7%), and 11th (39.6%) grades at two independent, single-sex suburban schools, one in the Northeast (48%) and the other in the Midwest (52%). Research has suggested that students at all-girls schools vs. those at coeducational schools enjoy distinct advantages such as greater support from teachers, administrators, and peers (Holmgren, 2014), as well as protective factors that influence their mental health (Cribb & Haase, 2016).

Eighty-two percent of the adolescents self-identified as white, 9% as black, 8% as another race, and 1% did not respond to the question about their race. More than half of the participants’ parents reported a family income greater than $240,000, nearly 30% reported an income between $90,000 and $240,000, and approximately 10% reported an income below $90,000. The median income was $270,000–$285,000. It was slightly higher for the school in the Midwest (approximately $290,000) than the school in the Northeast ($240,000). The median incomes in the geographic regions from which these two samples were drawn are $48,308 (Midwest) and $66,866 (Northeast).

Institutional review board approval was attained, as was written informed consent or assent from all parents/guardians and participants. Response rates were nearly 70% per school with the oldest cohort of girls (i.e., the 11th-grade girls). There were no differences on key demographic variables between those who decided to participate and those who did not. Attrition was minimal; fewer than 10 participants withdrew over 18 months (in all but one case withdrawal was due to students transferring to a new school).

The data collections occurred during regular school weeks during the middle of the semester (not exam times). This study was conducted at two time points during the course of the same academic year: fall and spring semesters (referred to in this study as Time 1 and Time 2, respectively). This study did not include data collected in other academic years. Surveys were administered on school computers via a secure online survey system.

Measures

Sleep Duration

Adolescents’ reports of received sleep quantity and needed sleep quantity were assessed with items from the Youth Risk Behavior Survey—part of the Youth Risk Behavior Surveillance System, which is an epidemiologic surveillance system developed by the Centers for Disease
Control and Prevention (CDC) to monitor the prevalence of youth behaviors influencing health. Received sleep quantity was assessed using the single self-report item: “On an average school day, how many hours do you sleep at night?” Needed sleep quantity was assessed with the question “How much sleep do you need per night during the school week to feel awake and alert during the day?” Although not a primary variable of interest, the latter question provided insight into whether participants believed they needed more sleep than they were getting. Previous research has shown that adolescents are able to recall their typical sleep duration with great accuracy (consistent with sleep amounts reported in sleep diaries or estimated by actigraphy; Wolfson et al., 2003) and therefore it is not uncommon for sleep duration to be measured via one or two self-report items in current research (e.g., Kalak, Lemola, Brand, Holsboer-Trachsler, & Grob, 2014; Mitchell, Rodriguez, Schmitz, & Audrain-McGovern, 2013). Response options were as follows: five hours or less/night; six hours/night; seven hours/night; eight hours/night; nine hours/night; and 10+ hours/night.

This ordinal variable was recoded to approximate a continuous variable. The variable was top- and bottom-coded (5 = 5 or fewer hours of sleep; and 10 = 10 or more hours of sleep); the remaining were coded to reflect the number of hours of sleep (e.g., 6 = 6 hours per night, etc.). This recoding did not change the coefficients in our regression models, but it did allow for more meaningful interpretations of the findings.

Although information can be lost using ordinal variables with a restricted range, it is worth noting that only a small percentage of girls reported sleep levels at the extremes (e.g., 8% reported sleep duration of 5 hours or less a night and 2% reported sleep duration of 10 hours or more a night). In fact, others examining sleep (Burgard & Ailshire, 2013) have top-coded sleep to reduce the impact of outliers in their analyses. Moreover, some researchers using the Youth Risk Behavior Survey to measure sleep (e.g., Lowry et al., 2012) have treated the data similarly (i.e., treating 10 or more hours as 10 hours of sleep).

Perceived Stress

The 14-item Perceived Stress Scale (PSS) measured participants’ perceptions of stress (Cohen, Kamarck, & Mermelstein, 1983). This measure has good reliability and validity and is widely used in psychological research to assess the degree to which situations in one’s life are appraised as stressful during the last month (Cohen et al., 1983). Respondents rated how often they felt a certain way using a five-point Likert-type scale—never (0) to very often (4). Higher scores indicated higher levels of perceived stress. The items are general enough to capture both normative stress and stress common among affluent adolescent females. For example, items asked participants to consider how often in the last month “you found that you could not cope with all the things you had to do” and “you felt nervous and ‘stressed.’” Reliability was good for both T1 ($\alpha = .62$) and T2 ($\alpha = .84$).

Demographic Variables

Demographic variables examined in this study included race, grade, school, and years in school. We included school demographic variables (i.e., school attended and number of years at
a school) to account for the possibility that different academic environments may be associated with different levels of perceived stress and sleep duration due in part to variations in academic culture and school climate.

RESULTS

Preliminary Analyses

Adolescent Sleep Duration

At T1 (fall semester), the average amount of sleep that participants reported receiving on a school night was 7.15 hours \((SD = 1.14)\). Eighty-eight percent of participants reported receiving less than the recommended nine hours of sleep: 23\% had eight hours, 38\% had seven hours, 19\% had six hours, 8\% had five or fewer hours. The average amount of sleep that T1 participants reported needing to feel awake and alert during the day was 8.16 hours \((SD = 1.13)\); they received one hour less of sleep per night than they believed they needed and they believed they needed about three quarters of an hour less of sleep than the recommended amount (9 hours). Difference scores were calculated for the received sleep and needed sleep participants reported \((\text{received sleep minus needed sleep} = \text{difference value})\) to examine whether the differences were significant. These scores were compared against zero \((\text{the ideal, indicating no difference between received and needed sleep})\) in a one-sample \(t\) test; results were significant, \(t(226) = -12.08, p < .001,\) where study participants received significantly less sleep than they believed they needed to feel awake and alert during the day. And again, the amount they thought they needed was lower than the recommended amount. The vast majority of participants reported receiving at least one hour less of sleep than their required amount \((65\%)\). Twenty-five percent of participants reported no discrepancy between their received and needed sleep, and just 10\% reported receiving one to two hours more than their needed sleep.

At T2, seven months later, sleep quantity remained at similar levels below the recommended amount. The average amount of sleep that participants reported receiving on a school night was 6.99 hours \((SD = 1.11)\), with 91\% of participants receiving fewer than the recommended 9 hours of sleep per night. Specifically, 20\% of participants reported receiving eight hours of sleep, 38\% reported seven hours, 26\% reported six hours, and 8\% reported five hours or less. The average amount of sleep that participants reported needing to feel awake and alert during the day was 8.14 hours \((SD = 1.24)\). Consistent with T1, this suggests that at T2 students received more than one hour less of sleep per night than they believed they needed and they believed they needed about three quarters of an hour less of sleep than the recommended amount (9 hours). Difference scores were also calculated between received sleep and needed sleep for T2. When compared with the ideal zero, results from the one-sample \(t\) test indicated that participants received significantly less sleep than they believed they needed, \(t(222) = -13.39, p < .001.\) As with T1, the vast majority of participants reported receiving at least one hour less of sleep than their desired amount \((72\%)\). Eighteen percent reported receiving the exact amount of sleep they thought they needed, and 10\% described receiving one or two hours more than their needed sleep.
Adolescent Perceived Stress

Basic descriptive statistics were also run to depict the perceived stress of study participants. Average reported perceived stress levels for participants were nearly the same from T1 ($M = 27.68$) to T2 ($M = 27.48$). There was, however, more variability in stress scores at T2 ($SD = 8.09$) than at T1 ($SD = 5.86$). Some differences were found in levels of perceived stress across the three grades, where older students reported higher levels of perceived stress (seventh grade, T1 = 24.39 and T2 = 24.63; ninth grade, T1 = 27.77 and T2 = 27.10; and 11th grade, T1 = 29.83 and T2 = 29.55).

Adolescent Sleep Duration and Stress Correlations

Pearson correlation coefficients were calculated to examine the relationships between sleep duration and stress at T1, T2, and across time points. Results indicated that stress and sleep are negatively associated at each time point and across the time points, $T1 \ r(222) = -0.34, p < .001$; $T2 \ r(217) = -0.30, p < .001$; $T1stress/T2sleep \ r(213) = -0.34, p < .001$; $T1sleep/T2stress \ r(213) = -0.17, p < .05$. The weakest correlation was that between T1sleep and T2stress.

Primary Analyses

Given that current research in this area suggests that there is a relationship between sleep and stress (Astill et al., 2013), we examined associations between perceived stress and sleep duration. Cross-sectional and longitudinal Ordinary Least Squares (OLS) regression models were run. Regression diagnostics indicated outliers in the regression models. Models were estimated with and without the outlier(s), and no substantive differences were noted across the models. The outliers were kept in all models to preserve the sample size. The remaining assumptions of OLS multiple regression models were met. Listwise deletion was used to handle missing data, and consequently sample sizes for analyses varied as a function of whether participants had complete data for a particular analytic model. Longitudinal models utilized a lagged regression approach in which earlier outcomes were included in models as statistical controls. For example, when the association between stress at T1 and sleep levels at T2 was examined, prior sleep levels (i.e., sleep at T1) were controlled for. All regression models included race, grade, years in school, and school attending as covariates.

A Bonferroni correction was applied for each hypothesis tested to correct for family-wise error rates (e.g., cumulative Type I error rates; Dunn, 1961). New alpha values were calculated for individual significance tests in order to keep the family-wise alpha value at $p < .05$. In testing our first research question (i.e., cross-sectional associations), four regression models were run. Consequently, we divided .05 by that number to obtain the new alpha value, $p < .0125$. When testing research question number two (i.e., longitudinal associations), we conducted two regression models and, as such, employed the new alpha value of $p < .025$ (.05 divided by 2).
TABLE 1
Cross-Sectional Regression Analysis Summary for Levels of Stress (Fall/T1) Predicting Sleep (Fall/T1)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td>−.07</td>
<td>.14</td>
<td>−.03</td>
<td>−.47</td>
<td>.639</td>
</tr>
<tr>
<td>Other race</td>
<td>.03</td>
<td>.21</td>
<td>.01</td>
<td>.14</td>
<td>.891</td>
</tr>
<tr>
<td>Black</td>
<td>−.70</td>
<td>.28</td>
<td>−.15</td>
<td>−2.51</td>
<td>.013*</td>
</tr>
<tr>
<td>Grade 7</td>
<td>.99</td>
<td>.19</td>
<td>.38</td>
<td>5.20</td>
<td>.000***</td>
</tr>
<tr>
<td>Grade 9</td>
<td>.22</td>
<td>.16</td>
<td>.09</td>
<td>1.39</td>
<td>.167</td>
</tr>
<tr>
<td>Years at school</td>
<td>−.03</td>
<td>.03</td>
<td>−.06</td>
<td>−.90</td>
<td>.371</td>
</tr>
<tr>
<td>Stress T1</td>
<td>−.04</td>
<td>.01</td>
<td>−.22</td>
<td>−3.32</td>
<td>.001**</td>
</tr>
</tbody>
</table>

Note. $R^2 = .28 \ (n = 218, \ p < .01)$. *p < 0.05. **p < 0.01.

Research Question #1

Contemporaneous associations between stress and sleep duration were estimated at T1 and T2, when first taking into account the effects of individual and school factors. At both time points, stress was significantly negatively associated with sleep duration such that increases in stress were predictive of decreases in sleep duration, T1 $β = −.22, \ p < .0125$; T2 $β = −.25, \ p < .001$. The adjusted $R^2$ for the model at T1 was .25 and at T2 was .18 (see Tables 1 and 2). Likewise, at both time points, sleep duration emerged as a significant negative predictor of stress, with increases in sleep duration being predictive of decreases in stress, T1 $β = −.22, \ p < .0125$; T2 $β = −.27, \ p < .001$. The adjusted $R^2$ for the model at T1 was .25 and at T2 was .12 (see Tables 1–4). Together, these findings provide support for a potential reciprocal relationship between sleep duration and stress at a given point in time. As will be described below, this relationship between sleep duration and stress is different when examined over time.

Research Question #2

In order to better test for directionality and to see whether effects lasted over time, longitudinal associations between stress and sleep duration examined whether prior levels of stress predicted

TABLE 2
Cross-Sectional Regression Analysis Summary for Levels of Sleep (Fall/T1) Predicting Stress (Fall/T1)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td>−.80</td>
<td>.74</td>
<td>−.07</td>
<td>−1.09</td>
<td>.279</td>
</tr>
<tr>
<td>Other race</td>
<td>2.13</td>
<td>1.07</td>
<td>.12</td>
<td>2.00</td>
<td>.047*</td>
</tr>
<tr>
<td>Black</td>
<td>−4.39</td>
<td>1.44</td>
<td>−.19</td>
<td>−3.06</td>
<td>.002**</td>
</tr>
<tr>
<td>Grade 7</td>
<td>−4.67</td>
<td>1.00</td>
<td>−.35</td>
<td>−4.69</td>
<td>.000**</td>
</tr>
<tr>
<td>Grade 9</td>
<td>−1.82</td>
<td>.82</td>
<td>−.15</td>
<td>−2.21</td>
<td>.028*</td>
</tr>
<tr>
<td>Years at school</td>
<td>.23</td>
<td>.17</td>
<td>.09</td>
<td>1.32</td>
<td>.188</td>
</tr>
<tr>
<td>Sleep T1</td>
<td>−1.15</td>
<td>.35</td>
<td>−.22</td>
<td>−3.32</td>
<td>.001**</td>
</tr>
</tbody>
</table>

Note. $R^2 = .27 \ (n = 218, \ p < .01)$. *p < 0.05. **p < 0.01.
TABLE 3
Cross-Sectional Regression Analysis Summary for Levels of Stress (Spring/T2) Predicting Sleep (Spring/T2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td>−.29</td>
<td>.14</td>
<td>−.13</td>
<td>−2.03</td>
<td>.044</td>
</tr>
<tr>
<td>Other race</td>
<td>−.20</td>
<td>.21</td>
<td>−.06</td>
<td>−.92</td>
<td>.358</td>
</tr>
<tr>
<td>Black</td>
<td>−.36</td>
<td>.28</td>
<td>−.08</td>
<td>−1.26</td>
<td>.210</td>
</tr>
<tr>
<td>Grade 7</td>
<td>.75</td>
<td>.18</td>
<td>.30</td>
<td>4.11</td>
<td>.000</td>
</tr>
<tr>
<td>Grade 9</td>
<td>.05</td>
<td>.17</td>
<td>.02</td>
<td>.30</td>
<td>.768</td>
</tr>
<tr>
<td>Years at school</td>
<td>−.03</td>
<td>.03</td>
<td>−.06</td>
<td>−.91</td>
<td>.363</td>
</tr>
<tr>
<td>Stress T2</td>
<td>−.03</td>
<td>.01</td>
<td>−.25</td>
<td>−3.86</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note. $R^2 = .21$ ($n = 217, p < .01$). $^p < 0.05, ^{**} p < 0.01$.

later sleep duration and whether prior levels of sleep duration predicted later levels of stress. Specifically, we examined the associations between stress at T1 and sleep at T2 and sleep at T1 and stress at T2. We estimated the OLS models with statistical controls for prior levels of sleep (when predicting sleep) and stress (when predicting stress, i.e., lagged models), as well as individual and school factors (described previously).

Stress at T1 was a significant negative predictor of sleep at T2 ($\beta = −.13, p < .025$) in the OLS lagged regression model accounting for individual and school factors as well as prior (T1) levels of sleep. The adjusted $R^2$ for the full model was .48 (Table 5). In contrast to the cross-sectional models, the reverse was not true. Sleep duration at T1 did not emerge as a significant predictor of stress at T2 ($\beta = .02, p = .80$), after accounting for individual and school factors as well as prior (T1) levels of stress. The adjusted $R^2$ for the full model is .31 (Table 6). These findings suggest that perceived stress has lingering, negative effects on sleep duration, but decreased sleep does not appear to have the same lasting effects on stress.

DISCUSSION

The current study sought to elucidate the potential health risks related to sleep and stress that researchers have begun to find in association with adolescent girls from affluent backgrounds.

TABLE 4
Cross-Sectional Regression Analysis Summary for Levels of Sleep (Spring/T2) Predicting Stress (Spring/T2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td>−1.88</td>
<td>1.10</td>
<td>−.12</td>
<td>−1.71</td>
<td>.089</td>
</tr>
<tr>
<td>Other race</td>
<td>.93</td>
<td>1.62</td>
<td>.04</td>
<td>.57</td>
<td>.569</td>
</tr>
<tr>
<td>Black</td>
<td>−5.10</td>
<td>2.14</td>
<td>−.16</td>
<td>−2.39</td>
<td>.018</td>
</tr>
<tr>
<td>Grade 7</td>
<td>−3.50</td>
<td>1.41</td>
<td>−.19</td>
<td>−2.48</td>
<td>.014</td>
</tr>
<tr>
<td>Grade 9</td>
<td>−2.60</td>
<td>1.25</td>
<td>−.15</td>
<td>−2.09</td>
<td>.038</td>
</tr>
<tr>
<td>Years at school</td>
<td>−.13</td>
<td>.26</td>
<td>−.04</td>
<td>−.50</td>
<td>.619</td>
</tr>
<tr>
<td>Sleep T2</td>
<td>−1.96</td>
<td>.51</td>
<td>−.27</td>
<td>−3.86</td>
<td>.000</td>
</tr>
</tbody>
</table>

Note. $R^2 = .15$ ($n = 217, p < .01$). $^p < 0.05, ^{**} p < 0.01$. 
Our findings help confirm that girls are not getting enough sleep, even in regular, non-exam times during the academic year. Participants reported receiving approximately two hours fewer than the recommended nine hours of sleep per night. Moreover, this shortfall in the first semester remained in the second semester of the academic year. Not only did they fall significantly short of the recommended number of hours of sleep, they reported not getting the amount of sleep they believed they needed to feel fully awake and alert during the school day. Most reported feeling that they needed at least one more hour of sleep than they were getting in the fall and even more in the spring. Individual experiences with and perceptions of sleep shape future sleep behavior for adolescents (Orzech, 2013). These findings suggest that adolescents may need to be better educated about recommendations for sufficient sleep for optimal functioning in order to change their sleep standards and behaviors.

These findings are consistent with reports documenting a chronic and substantial sleep deficit for adolescent females (e.g., National Sleep Foundation, 2006). However, it is striking that compared with the already alarming national trends, a much greater percentage of our population of affluent adolescent females as compared to females from the general adolescent population reported receiving inadequate sleep. According to the CDC (2012), about 70% of adolescent

### Table 5
Longitudinal Regression Analysis Summary for Prior Levels of Stress (Fall/T1) Predicting Sleep (Spring/T2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td>−.18</td>
<td>.12</td>
<td>−.08</td>
<td>−1.50</td>
<td>.134</td>
</tr>
<tr>
<td>Other race</td>
<td>.14</td>
<td>.17</td>
<td>.04</td>
<td>.79</td>
<td>.431</td>
</tr>
<tr>
<td>Black</td>
<td>.08</td>
<td>.23</td>
<td>.02</td>
<td>.32</td>
<td>.750</td>
</tr>
<tr>
<td>Grade 7</td>
<td>.15</td>
<td>.17</td>
<td>.06</td>
<td>.89</td>
<td>.377</td>
</tr>
<tr>
<td>Grade 9</td>
<td>−.07</td>
<td>.13</td>
<td>−.03</td>
<td>−.51</td>
<td>.613</td>
</tr>
<tr>
<td>Years at school</td>
<td>−.01</td>
<td>.03</td>
<td>−.01</td>
<td>−.21</td>
<td>.835</td>
</tr>
<tr>
<td>Sleep T1</td>
<td>.61</td>
<td>.06</td>
<td>.62</td>
<td>10.62</td>
<td>.000**</td>
</tr>
<tr>
<td>Stress T1</td>
<td>−.03</td>
<td>.01</td>
<td>−.13</td>
<td>−2.27</td>
<td>.024*</td>
</tr>
</tbody>
</table>

*Note. \( R^2 = .50 \) (n = 209, \( p < .01 \)). *p < 0.05. **p < 0.01.

### Table 6
Longitudinal Regression Analysis Summary for Prior Levels of Sleep (Fall/T1) Predicting Stress (Spring/T2)

<table>
<thead>
<tr>
<th>Variable</th>
<th>B</th>
<th>SE B</th>
<th>β</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td>−1.06</td>
<td>1.02</td>
<td>−.07</td>
<td>−1.05</td>
<td>.296</td>
</tr>
<tr>
<td>Other race</td>
<td>−1.20</td>
<td>1.47</td>
<td>−.05</td>
<td>−.82</td>
<td>.415</td>
</tr>
<tr>
<td>Black</td>
<td>−1.74</td>
<td>1.97</td>
<td>−.05</td>
<td>−.89</td>
<td>.377</td>
</tr>
<tr>
<td>Grade 7</td>
<td>−1.06</td>
<td>1.41</td>
<td>−.06</td>
<td>−.75</td>
<td>.453</td>
</tr>
<tr>
<td>Grade 9</td>
<td>−1.06</td>
<td>1.14</td>
<td>−.06</td>
<td>−.93</td>
<td>.354</td>
</tr>
<tr>
<td>Years at school</td>
<td>−.27</td>
<td>.23</td>
<td>−.07</td>
<td>−1.17</td>
<td>.245</td>
</tr>
<tr>
<td>Stress T1</td>
<td>.82</td>
<td>.10</td>
<td>.57</td>
<td>8.44</td>
<td>.000**</td>
</tr>
<tr>
<td>Sleep T1</td>
<td>.12</td>
<td>.49</td>
<td>.02</td>
<td>.25</td>
<td>.803</td>
</tr>
</tbody>
</table>

*Note. \( R^2 = .34 \) (n = 207, \( p < .01 \)). *p < 0.05. **p < 0.01.
females in a general population of ninth to 12th grade students received fewer than the recommended nine hours of sleep per night; whereas, nearly 20% more of students in our sample of seventh, ninth, and 11th graders received eight or fewer hours of sleep on school nights (i.e., 88% [at T1] to 91% [at T2]).

There are a number of possible explanations for these findings related to the unique stressors inherent in this population—adolescent females from affluent communities. First, the findings fit with trends that have been observed whereby adolescents growing up in affluent communities may be especially “overscheduled” compared with those from lower income communities (Luthar et al., 2006; Rosenfeld & Wise, 2001). Scholars have suggested that overscheduling students might be driven by the heavy emphasis in affluent families and communities on competing for entry to “top” universities (Luthar & Becker, 2002). As a result, many adolescents feel highly driven to excel in academics and in multiple extracurricular activities, with these pressures beginning as early as the middle school years. In fact, upper SES middle school students have reported being involved in an average of eight hours of extracurricular activities per week (Luthar et al., 2006). Thus, the schedules of high SES students result in late bedtimes and early wake times because of school start times.

Our primary focus was to understand the relationship between perceived stress and sleep duration over the course of an academic year in this population. In the cross-sectional models, the relationship between perceived stress and sleep duration was reciprocal and negative. That is, high levels of stress were associated with fewer hours of sleep and vice versa. This was true in both fall and spring semesters of the academic year. Previous studies with affluent adolescent females have demonstrated that female students were overwhelmed by academic and extracurricular pressures and parent expectations, and the heightened stress associated with these stressors may contribute to inadequate sleep (Galloway, Conner, & Pope, 2013).

In addition to the cross-sectional findings on the immediate effects of stress on sleep duration and vice versa, longitudinal analyses provided clues about the direction and lingering nature of this association. Perceived stress in the fall semester had an enduring impact on the quantity of sleep students received later in the academic year. That is, those with relatively greater perceived stress in the fall were likely to still be suffering the consequences seven months later in the academic year as indicated by their reports of reduced sleep in the spring.

On the other hand, reduced sleep amounts did not have a long-term impact on the stress levels of the adolescent girls. Inadequate sleep in the fall did not seem to influence stress levels in the spring. These findings suggest that although stress can have a long-term impact on sleep, the reverse is not true. Sleep does not seem to have long-term effects on stress, despite the immediate impact it was shown to have (in the cross-sectional analyses).

Although previous studies have been limited to cross-sectional data, they may provide some insight into the psychological mechanisms that impact sleep longitudinally (Jansson & Linton, 2007), including the influence of stress on sleep duration. For example, pre-sleep cognitive arousal has been associated with sleep problems for youth diagnosed with anxiety (Alfano, Pina, Zerr, & Villalta, 2010). Additionally, stress-induced wakefulness has been found to reduce sleep quantity and quality for adults (Sanford, Suchecki, & Meerlo, 2015). Certain personality characteristics related to perceived stress, such as worry and rumination, have also been connected to sleep problems (e.g., Drake, Richardson, Roehrs, Scofield, & Roth, 2004). It is possible that associations that form between these variables become habitual and thus remain over time. For example, research revealed that sleep restriction habits established in adolescence often result in
continuing sleep problems that last well beyond the adolescent years (Marhefka, 2011). In short, poor sleep behaviors may be learned during periods of increased stress, when students do not have peace of mind and the time needed for adequate sleep. Sleep practices may become habitual, so that lack of sleep continues to be a problem even beyond the time of acute stress.

Implications

The findings demonstrate that getting the recommended number of hours of sleep may be an even greater problem among affluent adolescent females than in the general population. Thus, they may need special support to prioritize sleep and practice healthy sleep habits. Indeed, adolescents should be monitored closely for sleep adequacy and taught healthy sleep regimens. Although stressed students may feel tempted to trade sleep for more awake time so that they can get more done, they should be encouraged and supported to strive for the 8 to 10 hours of sleep they need each night, to maintain consistent sleep and wake schedules on school nights and weekends, and to establish pre-sleep rituals (e.g., reading, calming music, warm bath, or relaxation exercises) that can quiet anxious thoughts and prepare the brain for sleep during stressful times (Epstein & Mardon, 2006). Parents should also teach their children to turn off or leave electronic media outside their bedrooms at night, as research has shown that the blue light from devices stimulates the brain to wakeful states and that adolescents who always turned their devices off at night slept better (Chang, Aeschbach, Duffy, & Czeisler, 2015). Being able to maintain good sleep hygiene even during periods of stress may have lasting consequences and benefits.

This population may benefit specifically from exposure to and training in mindfulness-based practices. There are many positive effects associated with mindfulness for adolescents, including improved mood and reduced stress and anxiety (e.g., Broderick & Jennings, 2012). Most recently, research on the impact of mindfulness has demonstrated a positive effect on sleep, where it seems to improve sleep duration and quality even beyond basic sleep hygiene training in some cases (e.g., Bei et al., 2013; Black, O’Reilly, Olmstead, Breen, & Irwin, 2015; Britton et al., 2010; Hubbling, Reilly-Spong, Kreitzer, & Gross, 2014). More specifically, mindfulness meditation appears to improve nervous system and cognitive system processes that relate to arousal and stress by allowing people to be present in the moment without further interpretation (or judgment) of their symptoms (Black et al., 2015).

Such training may help adolescents better manage their stress in the short term and ultimately establish and maintain good sleep habits in the long term, despite the high levels of stress they experience. Further, some research suggests that mindfulness interventions implemented in the school setting can yield improved sleep quality and quantity for adolescents (e.g., Bei et al., 2013). Therefore, schools may consider integrating mindfulness-based sleep interventions into health and wellness curriculums or through guidance and counseling departments.

School policymakers can also play a critical role in addressing the effects of sleep inadequacy. Indeed, school policies can undermine schools’ goals for student performance and health. Sleep deprivation is responsible for harming the cognitive abilities required for learning, school achievement, and future vocational success (Lebel & Beaulieu, 2011). Schools should consider ways to better support students’ health and academic success by implementing homework reductions, limits on extracurricular involvement, as well as delayed school start times or shifts in school day hours. Indeed, a recent policy statement urged secondary schools to delay the start of classes to
8:30 a.m. or later to align school schedules to biological sleep rhythms of adolescents (American Academy of Pediatrics, 2014).

Schools should also consider integrating learning strategy classes into the typical school day for all students to help them establish better work habits. With guidance, students can learn to manage their time effectively, plan and prioritize tasks, organize their thoughts and materials, focus their attention, and reflect on what worked and what did not work so that they can adjust their strategies for managing schoolwork (Center on the Developing Child, 2016). Repeated exposure to and practice of these skills will allow students to complete their homework with more ease and could potentially reduce the amount of time spent completing assignments outside of school.

Limitations and Future Research

Limitations of the current study should be acknowledged. First, correlational data cannot definitively determine causality. Nevertheless, longitudinal studies can help to establish directionality of the effect or temporal ordering, which offers a more nuanced (albeit not causal) understanding of how variables relate to one another (i.e., which variable precedes the other). Future research should continue to build on the current study’s exploration of directionality by examining longitudinal associations in greater depth, including mediation analyses to see whether other factors explain the lasting association. As suggested in this study, one possible explanation for the relationship is that adolescents develop poor sleep habits during times of stress and those sleep habits endure beyond the stressor. Moreover, additional research should be done to see whether the longitudinal, negative association between stress and sleep duration lasts beyond an academic year, assessing the impact of stress over the course of two or more years with summers in between. Indeed, summer vacation may be associated with significant alterations in adolescents’ sleep and stress patterns (National Sleep Foundation, 2006).

An additional consideration is that this study used a self-report item for sleep duration in which adolescents were asked how much sleep they have received, on average, per each school night. It may be argued that this common measure of sleep duration is susceptible to errors associated with self-report and reliability, and perhaps future research should include adolescents’ tracking and recording their sleep for a period of time for the purposes of improving recall. Yet, research has shown that adolescents tend to accurately recall and report their sleep duration. Specifically, Wolfson and colleagues (2003) found that reports of school night sleep did not differ from sleep amounts reported in their sleep diaries or estimated by actigraphy (i.e., a noninvasive method of monitoring human rest/activity cycles). It is not uncommon for sleep duration to be measured via one or two self-report items in current research (e.g., Kalak et al., 2014; Mitchell et al., 2013). Therefore, although other measures of sleep duration are used, we used self-report because it is accurate and demands minimal time and effort from already busy adolescents.

A final consideration is that this study was intentionally conducted on a unique population of adolescents (females from primarily affluent contexts), and more work should be done to ascertain whether these findings are generalizable to other adolescents (e.g., lower income or males). Future studies should include adolescents across school types, gender, SES, and other demographics. Indeed, Luthar and Latendresse (2005b) has documented risks at the SES extremes and calls for more research examining differences between low and high SES students. Research examining
the sleep patterns and associations between sleep and stress for adolescent girls from low-income families should be conducted.

CONCLUSIONS

Despite its limitations, this study represents an essential examination of the role of perceived stress and sleep duration in the lives of affluent adolescent females who struggle with serious health risks in spite of—or even because of—their privileges. Our findings reveal that they report getting well below the recommended amount of sleep and that they feel that they need more sleep to function well at school. Moreover, the findings suggest that perceived stress and sleep duration are linked. In the short term, a vicious cycle may exist whereby stress and reduced sleep may each contribute to increased problems with the other. Stress also seems to have lingering negative consequences on sleep patterns and habits, but sleep duration does not seem to have the same lasting impact. This study contributes to a growing awareness of psychological and health risks among adolescent girls growing up in a culture of affluence and privilege, and it highlights the lingering, negative effects perceived stress may have on sleep duration for this population.

AUTHOR BIOS

Angela M. DeSilva Mousseau is an associate professor in the Division of Education at Rivier University. Her research interests broadly focus on positive youth development and positive education, with a specific emphasis on identity development, sense of purpose, and well-being in adolescents in school settings.

Terese J. Lund is an assistant professor of psychology at Wingate University. Her research interests center on adolescent development in diverse socioeconomic contexts, with a specific focus on parent-adolescent relationships, social-emotional problems, and positive youth development.

Belle Liang is associate professor and director of training in the Counseling Psychology Program of the Lynch School of Education at Boston College. Her research focuses on positive youth development, especially the role of mentoring in cultivating purpose among youth from diverse backgrounds.

Renée Spencer is professor of human behavior in the School of Social Work at Boston University. Her research interests include youth mentoring, adolescent development, and gender. Much of her research focuses on the relational processes at work in more and less successful youth mentoring relationships.

Jill Walsh is a consultant specializing in social media and adolescence. She is also a lecturer in sociology at Boston University. Her research examines how adolescents use visual images to construct the self online, with a particular focus on how these behaviors may affect their developmental paths and processes. She is currently completing two books on young people’s mediated social relationships.
ACKNOWLEDGMENTS

The authors gratefully acknowledge Lisa Damour, Caroline Erisman, and Ann Klotz for their critical contributions. We also thank our graduate assistant team.

FUNDING

This investigation was supported by the Center for Research on Girls.

REFERENCES


