Sleep Hygiene Practices as a Moderator of the Relationship between Stressful Life Events and Academic Engagement in Undergraduate Students

Audrey R. Nelson

University of Arizona

Author Note

[Include any grant/funding information and a complete correspondence address.]

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Abstract

[The abstract should be one paragraph of between 150 and 250 words. It is not indented. Section titles, such as the word Abstract above, are not considered headings so they don’t use bold heading format. Instead, use the Section Title style. This style automatically starts your section on a new page, so you don’t have to add page breaks. Note that all of the styles for this template are available on the Home tab of the ribbon, in the Styles gallery.]

The findings of this study will aid in maximizing academic engagement in college students (cognitive and behavioral functioning in children) by identifying areas for sleep interventions.

Keywords: [Click here to add keywords.]

**Specific Aim 1: To document the (relationship/effects) of stressful life events on academic engagement in undergraduate students.**

*We hypothesize that increased levels of life stressors will be associated with lower (negatively correlate with/result in lower) levels of academic engagement. We believe that academic engagement will be lower in undergraduate students who experience a greater number of stressful life events.*

**Specific Aim 2: To document the (relationship/effects) of sleep hygiene on academic engagement in undergraduate students.**

*We hypothesize that as sleep hygiene is impaired so will academic engagement in undergraduate students. We postulate that academic engagement will be lower in undergraduate students who experience reduced levels of healthy sleep hygiene practices.*

**Specific Aim 3: To determine if sleep hygiene moderates the relationship between stressful life events and academic engagement.**

*We hypothesize that students with higher levels of stressful life events will experience lower academic engagement (with increased deficits in) if they show poor sleep hygiene practices. We postulate that in students exhibiting the poorest sleep hygiene habits, we will see (a more pronounced/the strongest) relationship between reduced academic engagement (associated with) and high levels of stress. Sleep hygiene practices…*

***“Sleeping restfully may therefore be allowing individuals the rejuvenation needed to manage their stress adaptively”***

*Likewise, we postulate that in between-subjects analysis, increased stressful life events and lower sleep hygiene practices will be associated with reduced academic engagement. (No within-subjects analysis because only one point measure.) We believe that there will be an interaction effect of sleep hygiene, stressful live events, and academic engagement in undergraduate students. We believe that there will be an interaction effect of sleep hygiene practices as a moderator of the relationship between stressful live events and academic engagement in undergraduate students.*

**Specific Aim 4: To evaluate the impact of gender, ethnicity, exercise, and age on academic engagement.**

*We hypothesize that*

(Legget et al., 2003) “Multilevel models were run to examine between- and within-person variability in sleep disturbance and life event stress as predictors of depressive symptoms, and an interaction to test sleep disturbance as a moderator is included in a second step.”

Sleep hygiene has been shown to impact the quality of actual sleep **(check current research)**. Positive sleep hygiene practices are associated with improved sleep and consequently with improved performance in activities impacted by sleep. For instance, executive functioning including working memory tasks, reading and math performance, physical conditioning, and emotional regulation.

(Brown et al. 2002 )“Their findings suggest that knowledge of sleep hygiene is related to sleep practices, which, in turn, is related to overall sleep quality. The data from their regression modeling indicated that variable sleep schedules, going to bed thirsty, environmental noise, and worrying while falling asleep contribute to poor sleep quality.”

**Sleep Hygiene**

Research on sleep hygiene has shown that it exacerbates but is not the root cause of sleep disorders such as insomnia. Sleep hygiene includes behaviors related to improved sleep conditions, and, subsequently, sleep quantity and quality. According to Stepanski and Wyatt (2003) the behaviors addressed in sleep hygiene include consistent/variable sleep bedtimes/waking; light and noise, naps/homeostatic pressure, impact of stimulants/depressives including alcohol, caffeine, and prescription medications; exercising close to bed time; spending time in bed while not sleeping, for example, watching television, reading, etc.; performing mental activities, planning, etc. in bed or just before bedtime; and poor sleep conditions/bedding.

Sleep is essential to a variety of life’s activities. Sleep deprivation has been found to impair multiple tasks in the realms of motor performance, cognitive performance, and even mood (Pilcher & Huffcutt, 1996). Some of the areas of cognitive functioning that have been shown to be impacted by sleep disturbances include: working memory, attention, perseveration, cognitive flexibility/inflexibility, creative thinking, decision making, and long-term memory (Alhola & Polo-Kantola, 2007; Harrison & Horne, 1998; Horne, 1988; Redline et al., 2007). In Pilcher and Huffcut’s (1996) meta-analysis of 56 studies examining the impact of sleep loss on performance in adults, they found that cognitive abilities were more impaired than motor abilities. Interestingly, they found that a partial sleep deprivation versus long- or short-term deprivation had the most profound detrimental influence on cognitive performance tasks. This is significant in that, unlike adults, the majority of school age children do not experience full sleep deprivation as measured by above or below 45 total hours of total deprivation. Children of this age range are more likely to experience the partial deprivation of less than five hours of sleep in a 24 hour period. In this light, the findings of Pilcher and Huffcut’s meta-analysis have particular relevance to the functioning of the school age child/adolescent.

Although the research has not been as extensive as with the study of adults, multiple studies have evaluated the impact of sleep on the behavioral and cognitive functioning of children and adolescents (Dahl, 1996; Lavigne et al. 1999; Randazzo, Muehlbach, Schweitzer, & Walsh, 1998; Sadeh, Gruber, & Raviv, 2003; Touchette et al., 2007). Reinforcing the findings of the meta-analysis discussed above, Sadeh et al. (2003) found that even subtle changes in sleep can effect neurobehavioral functioning in children (mean age = 10.6). In this study, sleep habits were either altered by an average of 41 minutes decreased sleep over three nights (restricted sleep group) or by an average 35 minutes increased sleep over the same time period (extended sleep group). Individuals with an increased sleep time showed a better performance on neuropsychological tasks that include skills such as processing speed, attention, memory, and scanning.

Likewise, in another study addressing the relationship between sleep duration and behavioral/cognitive functioning in young children, Touchette et al. (2007) found that a one hour reduction in nightly sleep was correlated with a decreased performance on a picture vocabulary test (a measure of receptive vocabulary and verbal intelligence) and the Block Design subtest of the Wechsler Intelligence Scale for Children – Third Edition (WISC-III) (a measure of visual/spatial skills and nonverbal intelligence). Their results show that decreased duration of sleep may influence language acquisition by impairing the integration of new words into memory. Similar findings by Randazzo et al. (1998) demonstrated in young adolescents that restriction in just one night of sleep showed a decrease in executive function which they described as being involved in the “retrieval of knowledge from long-term memory” along with involvement in other functions (p. 866). Sleep impairments have a profound influence on the functioning of children in various ways but possibly the most significant effect is in the academic setting. One aspect of cognitive functioning that is essential for success in the classroom, and is significantly impacted by insufficient sleep, is working memory. (When transitioning to the college level, students acquire a new level of independence that often involves changes in responsibility and requirements for more self-motivation and self-control. Students need to be responsible for their own learning, engagement, and outcomes. As a result, academic engagement becomes more essential to the success of college students.)

Working memory is vital for academic learning and success, as it is the concurrent storage and manipulation of information that is used in more complex tasks (Baddeley, 1992). A number of key skills that comprise the foundation for scholastic achievement are dependent on this ability to retrieve and process information at the same time. These include reading acquisition, arithmetic fact retrieval, and language comprehension (Fabbri, et al., 2008; Gathercole & Baddeley, 1993; McLean & Hitch, 1999). Arcia, Ornstein, and Otto (1991) documented that working memory tasks such as digit span and symbol-digit coding were highly correlated with achievement scores in both reading and mathematics. They found a positive correlation between the two, in which students who were capable of longer digit sequences performed better on achievement tests. Mclean and Hitch (1999), in comparing arithmetic abilities and working memory tasks, found that those with poorer arithmetic skills also had decreased levels of performance on working memory items. To further support the influence of working memory on academic functioning there is evidence that phonological working memory is essential in learning new words and, subsequently, in reading development (Gathercole & Baddeley, 1993). Similarly, de Jong (1998) found that students with reading disabilities exhibited working memory deficits across the board, both in language memory tasks and numerical memory tasks. The findings of these studies suggest general working memory impairment in students that are underachieving academically.

Numerous studies have discussed the negative impact of impaired sleep on working memory. Turner, Drummond, Salamat, and Brown (2007) reported that specifically the span of working memory is associated with total sleep deprivation. In another study, working memory scanning speed showed no learning improvement when the participant was sleep deprived, whereas performance improved over time when the subject got adequate sleep (Casement, Broussard, Mullington, & Press, 2006). Casement et al. found a 58% increase in learning for adults who had 8 hours of sleep a night as compared to those that only had 4 hours. Perhaps the most significant aspect of the findings in this study is that the lower sleep group did not show deficits when compared to their baseline. It was only over the course of days and in the context of progressive learning that there appeared to be a differential impact. This effect may be due to other moderating features such as time of day for testing which will be discussed below.

In childreneven small sleep deficits have been found to impair working memory tasks (Sadeh, Gruber, & Raviv, 2003). Sadeh et al. (2003) documented increased memory performance in children with only a half hour sleep extension. Seventy-seven children in the fourth or sixth grade were evaluated using an actigraph watch (which measures motor activity and sleep-wake patterns in a child’s natural setting) and a sleep-wake diary (which documented self-reported assessments of daytime fatigue, perceived duration to fall asleep, etc.). The watch was worn by participants for five nights, two of which were meant to establish a baseline and three nights to evaluate the treatment conditions. In order to assess their neurobehavioral functioning, the children were given a series of six tests including three that involved working memory: symbol-digit substitution (where the child must identify a rearranged group of digits and symbols from a short presentation of a nine figure sequence), visual digit span (where the child must recall a visually displayed sequence of numbers), and serial digit learning (where the child must recall verbally presented sequences of numbers). Neurobehavioral functioning was first assessed on the second morning to establish baseline and then again on the sixth morning (at the same time of day) after the treatment of either one hour sleep restriction or extension had been in effect for three nights. The study found that with just a 35 minute sleep extension children showed a significant improvement in memory related activities such as digit span forward as compared to children with no change in sleep duration or sleep restriction.

**Stress/Stressful Life Events**

**Exercise**

**Exercise and Academics**

A study completed by Swedish researchers Kall et al. (2013) utilized a school-based physical activity intervention “School in Motion” program for a group of 5th graders in a cross-sectional design to determine whether it impacted the students’ odds of reaching the national goals in areas such as Swedish, English, and mathematics. Their findings indicate that “The results of this study showed that a school-based physical activity intervention program designed to make students more physically active during the school day significantly improved the children’s academic achievement.” And “However, our findings are in line with those of other previous studies,4,5,10,18-26 and thus, contribute to the body of evidence for a link between exercise and learning. Because time devoted to physical activity could instead be time devoted to academic work, physical education is sometimes seen as a competitor of academic studies. One could question whether schoolbased physical activity is provided at the expense of time dedicated to academic learning. However, previous studies have demonstrated that increases in time spent in physical education are not likely to detract from students’ academic effort.5,30,31 At the time of our study, the intervention school did not have a regulated time plan, and the play and motion activities did replace some academic time. Only a little extra time for some classes was added to the ordinary schedule.” Benefits to physical activity on academic achievement were noted as potentially improved concentration and enhanced behaviors conducive to learning, increasing self-efficacy, reducing stress, and enhancing mental health.

From Kall “The author of a previous study38 suggested that increased physical activity during the school day may induce arousal and reduce boredom, which may result in increased concentration and an increased attention span. A more motivating school environment may have encouraged the students in the present study to engage more fully in schoolwork and may have thus been a mediating factor contributing to the results observed. However, all these effects may also have been the result of the intervention having a direct or indirect impact on the children’s academic achievement. Biological effects, such as increased cerebral blood flow and angiogenesis (a primer for neuronal plasticity), may also have contributed to enhancements of the prerequisites for learning. In combination or separately, these mechanisms may be the underlying factors mediating the link between exercise and academic achievement. The literature provides evidence that fitness and exercise may boost brain function and cognition.23,39,40”

**Exercise and Stress**

**Academic Engagement**

***Quote from Legget article 2016 pg 125 “Consistent with existing work (Devanand et al., 2002; Kessler, 1997; Kraaij et  al., 2002), stressful life events were associated with higher levels of depressive symptoms, and a time when individuals were experiencing above average levels of stress was also associated with more depressive symptoms. Similarly, restless sleep was associated with more depressive symptoms, and times when individuals reported worse sleep than was typical for them were associated with increased depressive symptoms. We uniquely find that variability over time in stress and sleep, and not just the average level of these factors, appeared to be related to depressive symptoms. In addition, we found a significant interaction between stressful life events and restless sleep at the within-person level showing that restless sleep strengthens the association between life events and depressive symptoms. In other words, those experiencing stress above what is typical for them are at particular risk for elevated depressive symptoms if they are sleeping more restlessly than usual. Sleeping restfully may therefore be allowing individuals the rejuvenation needed to manage their stress adaptively. Further, this association shows that stressors and risk factors may not always act independently of one another, and intervening on one risk factor, such as sleep disturbance, may have a positive impact on the entire pathway of biopsychosocial risk to depressive symptoms.”***

The current study looks at how sleep, exercise and positive executive functioning study habits mediate the relationship between stress and coping strategies. Research has shown that certain coping strategies are correlated with more positive outcomes, while other coping strategies can result in more deleterious outcomes for adolescents. In a study completed by Sulkowski et al. in 2010, they found that of the four evaluated coping strategies (Denial, Emotional, Reactive, and) the tendency towards behaviors associated with bulimia were higher in those students with the purportedly less functional emotional coping strategy. The other coping strategies were not found to be mediating factors in the relationship between stressful life events and bulimic behaviors. It calls into question whether the impact of other protective factors such as positive sleep behaviors, regular exercise, and if faced with similar stressors are the listed preventative factors associated or impact the likelihood of utilizing a more positive coping strategy. The implications of providing a predictive model of the likelihood of utilizing positive coping strategies can be seen in being able to tease apart the protective factors that can be most highlighted for intervention.

Coping:

Coping is the response to perceived threat. The oft cited “fight or flight” **saying** is a simplification of the tendency to respond in different ways when a situation is perceived as threatening. Carver and his colleagues (1989) created a coping inventory to help identify the various ways in which people tend to respond in situations of stress. They built on the initial writings of Lazarus (1966) who explained the relationship of stress and coping as having three steps including: primary appraisal, secondary appraisal, and coping **(Expand on the three steps of cooing – find original study)**. Lazarus and Folkman’s (1980) development of a coping measure called Ways of Coping. This measure was revised in 1985. **Highlighted** **(use a word similar to found/embedded)** in the Ways of Coping measure is a distinction between problem-focused coping and emotion-focused coping. Taking action and problem solving are the focus of problem-focused coping, while emotion-focused coping is more of a tendency to place emphasis on ways to diminish emotional distress. Carver et al.’s inventory was in response to the conflicting research indicating that coping strategies were more complex than a two-pronged concept and that other proposed coping characteristics (denial, social support) were not falling under emotion-focused coping like several researcher proposed they belonged. Their inventory evaluated and broke down coping into several major factors including a four-factor pattern: Factor 1 included active coping, planning, and suppression of competing activities; Factor 2 included seeking social support and focus on emotions; Factor 3 included acceptance, restraint coping, and positive reinterpretation and growth; and finally, Factor 4 included denial, mental disengagement, behavioral disengagement, and turning to religion.

**Look at Carver study to explain personality characteristics linked to the various types of coping – see discussion. Also, look at page 12 to discuss differences between women and men in coping strategies. This page also looks at the benefit of seeking social support across multiple types of strategies. Page 13 addresses the coping style as dictated by their belief that the situation is amenable to change. “Ways to deal with life’s adversity” Discussion states “It is time to give more thought to what self-regulatory functions are implicit to people’s coping efforts.” (Page 15)**

Methods

**(Sulkowski et al.) My current study: “2.1. Participants and procedures**

**Participants included 147 female undergraduates from a large**

**university in the Southeastern United States. All participants were**

**enrolled in educational psychology classes and received course credit**

**for their participation. Students were offered an alternative activity**

**for earning extra credit if they preferred not to participate in the**

**study. Participants ranged in age from 18 to 25 years. Due to missing**

**data or failure to meet age criteria (older than 25 years), 12 of the**

**participants (8% of the initial sample) were omitted from the study.**

**Participants were ethnically diverse, as 64% listed their ethnic**

**background as White/Caucasian, 19% as Black/African American, 10%**

**as Hispanic/Latino, 3% as Asian, and 4% as Mixed/Other. A university**

**institutional review board approved all study procedures.**

**2.2. Measures**

**2.2.1. Stress**

**The Undergraduate Stress Questionnaire (USQ; Crandall, Preisler,**

**& Aussprung, 1992) contains a list of 82 common life stressors that**

**undergraduate students may encounter. Participants are instructed to**

**indicate whether they have experienced each life event within the**

**past semester by checking “yes” or “no.” The USQ demonstrated good**

**reliability in the current study (α=.89).”**

(Legget et al., 2003) “The sample includes 3,597 adults aged 25 years or older who were surveyed up to five times over 25 years. Multilevel models were run to examine between- and within-person variability in sleep disturbance and life event stress as predictors of depressive symptoms, and an interaction to test sleep disturbance as a moderator is included in a second step.”

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Tables

Table 1

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