Sleep Hygiene Practices and Exercise as Mediators (Self Care Practices) of the Relationship between Stressful Life Events and Academic Engagement in Undergraduate Students

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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.

**Talk about sleep and its impacts on life’s functions, then move into how sleep hygiene is related to sleep, and then discuss sleep hygiene and related research.**

**Sleep**

Impact of sleep on academic engagement/achievement. Sleep is essential for the consolidation of memory, learning, decision making, alertness, mood, and cognitive performance (Banks & Dinges, 2007; Pilcher & Walters, 1997)… Deficits in sleep have been shown to negatively impact academic performance (Gomes et al. 2011; Gilbert & Weaver, 2010). Specifically, sleep quality and duration are correlated with lower academic achievement and course grades in college students (Pilcher, Ginter, & Sadowsky, 1997\* check for this). It is also important to note that college students do not have good insight into the impact of sleep loss on their cognitive functioning, believing their abilities and functioning to be much higher than those students with adequate sleep levels (Pilcher & Walters, 1997).

Prevalence of poor sleep quality in adolescents/undergraduate students: talk about brown & buboltz research and Gilbert & Weaver’s quote: “Strikingly, 70% of our sample had clinically poor sleep quality, defined as GSQ scores two standard deviations above the mean of the control group of the original Buysse and colleagues (1989) PSQI validation study.”

Gilbert & Weaver (2010): “Not surprisingly then, both sleep deprivation and poor sleep quality are particularly prominent in young adult and college student populations (Brown et al., 2001; Jensen, 2003; Lack, 1986; Markel, 2003). One recent study found that university students report at least twice as many sleep difficulties as the general population (Brown et al., 2001).” “One study of college students found that sleep loss results in a preference for cognitive tasks Downloaded by [University of Arizona] at 13:55 27 September 2017 Sleep Quality and Academic Performance 297 demanding minimal effort so that adequate performance can be maintained (Engle-Friedman et al., 2003), suggesting that sleep loss may also constrain the academic, extracurricular, and perhaps even the vocational choices of at least some sleep-deprived students.” “Brown & Buboltz (2002b, p. 33) stated “at least two thirds of college students report occasional sleep disturbances, and about one third of those report regular, severe sleep difficulties. The problem is even more evident in a recent study that found that only 11% of the students surveyed met the criteria for good sleep quality (Buboltz, Brown, & Soper, 2001). The rest of the sample had moderate-to-severe sleep complaints.”

In their research, Gilbert & Weaver (2010) postulated that sleep quality may be more salient than psychopathologies, such as depression, as a predictor of poor academic performance. They noted that few university psychologists are assessing sleep when working with college students, and “sleep quality is seldom a direct target of therapeutic interventions.” (pg. 298) Controlling for depression, Gilbert & Weaver evaluated the effects of sleep quality and sleep deprivation on the academic performance of university undergraduates. Participants (mean age = 19.46), screened to rule out depression, were provided multiple measures to determine a global sleep quality (GSQ) score. Additionally, information related to gender, age, and GPA was collected. A significant negative correlation between GSQ and GPA was found, indicating that poorer sleep quality was associated with decreased performance. Sleep length was also found to be a predictor of GPA. Their findings suggest that impaired sleep significantly impacts performance independent (irrespective?) of the influence of depression, sleep habits of undergraduate students are poor, and sleep education programs at the college level that focus on sleep hygiene may be beneficial as a therapeutic practice to address the needs of this at-risk population.

Sleep difficulties are a growing problem, particularly with undergraduate students whose sleep schedules, sleep environments, increased autonomy (social life), and circadian shifts result in circumstances of reduced sleep times and sleep quality (Brown & Buboltz, 2002; Brown et al. 2001; Pilcher et al. 1997 ). In an effort at identifying the sleep habits of university students, Bulboltz et al. (2001) found that although students averaged just over 8 hours of sleep per night regardless of it being a weekend or weekday, students showed close to a two hour shift to later sleep onset and wake times on the weekend, indicators of sleep disturbances or problems with sleep were reported by 73% of the students. Additionally, issues regarding sleep quality versus sleep quantity were identified, with students reporting morning fatigue and difficulties with sleep onset latency (the time it takes to fall asleep). Notably, students perceived themselves as getting less sleep during the week than they actually received, perhaps impacting the level of perceived daytime sleepiness. (women reported more symptoms than men) Look at Brown articles and report more about sleep levels with undergraduate students.

As compared to clinical populations who seek out support for sleep difficulties such as insomnia or other sleep disorders, (i.e. insomnia), college students may be less aware that their current functioning may be impaired because of sleep difficulties. For instance, sleep deprived students have been shown to rate themselves higher in cognitive performance when sleep as compared to non-sleep deprived students, even though their performance was significantly more impaired (Pilcher & Walters, 1997). Consequently, it is important to help educate and support healthy sleeping habits for these students in the form of educational sleeping programs focused on effective sleep hygiene (Brown & Bulboltz, 2002).

Brown & Bulboltz 2002: “Many students are unaware that their academic difficulties may be related to their sleep habits. In fact, many rate their cognitive abilities higher when they are sleep deprived, while objective evidence indicates they perform worse than those who obtain 8 hours of sleep (Pitcher & Walters, 1997).” (find this article and quote it). “Research in clinical populations indicates that psychoeducational programs are among the most effective means to reduce sleep difficulties (Morin, Culbert, & Schwartz, 1997; Murtagh & Greenwood, 1995) and are clearly more effective than sleep medications (Bootzin & Perlis, 1992; Morin et al., 1994; Morin & Wooten,1996).” Additionally, students with misperceptions of positive sleep behaviors are more likely to have more impaired sleep habits (\*Hicks, Lucero-Gorman, & Bautista, 1999 – get this article and check this anecdote). Addressing sleep disorders in these students can help with not only school failure, but with school retention rates. Since it is difficult to restructure the schedule of university classes to cater to the needs of sleep deprived and often prohibitive, a more student-directed intervention may be more effective and less prohibitive schedule-wise. One suggested method to address the sleep disorders of university students is a psychoeducational program proposed by Brown & Buboltz (2002) based on educating students on positive sleep hygiene practices. They suggest that this program may be implemented as part of residence housing or freshman orientation programs. Brown & Buboltz (2002a) provide a good example of a potential sleep education program in their paper “Applying…” (this can lead into the topic of sleep hygiene).

A noted limitation of the research of Gilbert & Weaver is the potential for mediating factors influencing the relationship between sleep quality and academic performance. As an example, they suggest that poor sleep may lead to negative? behaviors (i.e. truancy) that may be the true source of lower performance. In their research, Gomes et al. (2011) also evaluated the impact of sleep on undergraduate students; however, they looked to tease out potential mediating factors by including the variables of attendance, study time, substance usage, exercise, neuroticism, age, and sex, among others, in the study to help determine the specific impact of aspects of impaired sleep on college students and whether sleep shows a significant impact when including other potential predictors of performance (total of 30 potential predictors, four of which were sleep related). Using stepwise multiple regression, they found 5 significant predictors of school marks in order of significance: previous academic achievement, class attendance, frequency of enough sleep, night outings, and sleep quality. When comparing alongside a swath of potential predictors, two of those found to be significant were *(directly related to)* sleep variables. *(the association between exercise and GPA was found to be nonsignificant. Also, the other two potential sleep predictors (sleep phase and regularity of sleep schedule) were not found significant which may prove to be problematic as far sleep hygiene is concerned, but possibly not)*.

The findings of Gomes et al. (2011) are in line with a review of the effects of sleep reduction by Banks & Dinges (2007) that discussed how sleep reductions of only a few hours per night accumulated over several nights, can lead to neurobehavioral deficits similar to those found with full sleep deprivation. Specifically, they explained how research has shown that a reduction in sleep over the course of multiple nights can result in impairments in mood, alertness, cognitive functioning, and health factors including detrimental effects on endocrine (increased weight gain and BMI), immune, and cardiovascular responses/systems.

Oginska & Pokorski (2006) also provide support for the negative impact of sleep deprivation, in the form of insufficient sleep, on cognitive and affective functioning. By addressing three age groups (adolescents age 14-16, university students age 20-27, and young employees age 30-45) they were able to determine that adolescents showed the biggest discrepancy between the amount of sleep they desired and the amount of sleep they were getting a night. When looking at the impact of sleep deficits across all groups, deficits resulted in universal decline in aspects such as daytime fatigue, apathy, feeling drowsy upon waking, concentration issues, fatigue upon awakening, overall weakness, and reduced inclination to put forth effort. Relating these deficits to the multi-faceted construct of academic engagement, it can be seen that impaired sleep has a myriad of implications in the success and engagement of undergraduate students. Feeling fatigued, lacking concentration, and reduced effort were found to be the areas most correlated with sleep loss in university students. Issue/Deficits? of this kind can impact many of life’s functions, including academic engagement and subsequent scholastic success. More specifically, deficits in these areas may have the greatest impact on the “skills engagement” factor of academic engagement, which is defined by concepts such as “putting forth effort,” “listening carefully in classes,” and “coming to class every day.” *Apathy was correlated with sleep loss in the adolescent group but was not on of the strongest correlates for the (university) student group. “Emotional engagement” is the factor most tied to the concept of apathy with items such as “finding ways to make the course interesting to me.” These results suggest that emotional engagement may not reflect the same impact of sleep loss as other areas of academic engagement.(check the apathy aspect – can’t tell if it was correlated from the paper. Check and change sentence if needed)* Consequently, skills engagement characteristics of attendance and active engagement in the form of taking notes, completing homework, and being organized are likely the areas of engagement most influenced by issues with sleep quality and quantity.

Decreased levels of rapid eye movement (REM) sleep, a stage of sleep characterized by increased dreaming, can also show detrimental effects on the consolidation of learning (find this and check - De Koninck J, Lorrain D, Christ G, Proulx G, Coulombe D. Intensive language learning and increases in rapid eye movement sleep: Evidence of a performance factor. Int J Psychophysiol. 1989;8:43-47.). Since this stage of sleep is often found later in a night’s sleep, reductions in overall sleep or in the early morning when it is occurs most, can have a detrimental effect on learning and retention of knowledge (Find this and check- Smith C, Lapp L. Increases in number of REMS and REM density in humans following an intensive learning period. Sleep. 1991).

In looking further into the aspects of sleep most impacted by disordered sleep behaviors, Pilcher et al. (1997) found that not only is sleep quantity a factor in influencing many of life’s functions, but that sleep quality is important with health, mood, life satisfaction, and even more influential on levels of sleepiness.

Gomes et al. : “A concise, up-to-date, discussion about the main theoretical viewpoints on the effects of sleep deprivation on cognitive functions may be found elsewhere (Lim & Dinges, 2010).” “found significant associations between sleep patterns and academic achievement measures, such as grade point averages (GPAs; for an overview see Curcio et al., 2006; Dewald et al., 2010; Gomes et al., 2002; Wolfson & Carskadon, 2003). Although the focus of the present paper is on undergraduates, it is worth mentioning that the relationships between sleep parameters and school performance have been more regularly investigated in children and adolescents of several age and educational levels (Bruni et al., 1995; Buckhalt et al., 2009; Dewald et al., 2010; Giannotti & Cortesi, 2002; Hofman & Steenhof, 1997; Meijer & Wittenboer, 2004; Pagel & Kwiatkowski, 2010; Pagel et al., 2007; Ravid et al., 2009; Roberts et al., 2001; Wolfson & Carskadon, 1998). In addition, a growing number of experimental studies on younger children and adolescents show, for instance, that sleep facilitates memory (Kopasz et al., 2010), and that sleep restriction or extension in school-aged children by only 1 h during consecutive nights leads to differential impact on neurobehavioral measures (Sadeh et al., 2003). However, it cannot be assumed that the effects of sleep on cognition or academic performance are the same in all ages or at all stages of human development (Dewald et al., 2010). For example, academic outcome measures seem to be differentially influenced by sleep, depending on student educational level and age (Pagel et al., 2010), and recent reviews (Diekelmann et al., 2009; Kopasz et al., 2010) report that procedural memory consolidation in children may not benefit from sleep to the same extent as it does in adults.” “Specifically, in samples of university students observed in their natural environment, poorer academic results have been consistently associated with shorter sleep duration (Borisenkov et al., 2010; Jean-Louis et al., 1996; Kelly et al., 2001; Medeiros et al., 2001; Trockel et al., 2000), with later sleep-wake schedules (Elliason et al., 2010; Johns et al., 1976; Medeiros et al., 2001, 1996; Smith et al., 1989; Trockel et al., 2000), and/or with related variables, such as delayed sleep phase (Lack, 1986) and eveningness orientation (Bes¸oluk et al., 2011; Borisenkov et al., 2010; Medeiros et al., 2001; Randler & French, 2006; Smith et al., 1989). Eveningness preference has also been found to be associated with other variables apparently related to academic achievement, such as procrastination (Digdon & Howell, 2008; Hess et al., 2001).” “Summarizing the vast literature on sleep and chronobiology, we may assume that four fundamental sleep patterns are expected to be associated with academic achievement: sleep quantity, sleep quality, sleep regularity, and sleep phase schedules. Specifically, sleep restriction, poor sleep quality, and irregular and late sleep schedules are expected to be associated with poorer school performance.” Look up and discuss these articles: “Trockel et al. (2000) analyzed the associations of first-year undergraduate academic performance with health-related variables relative to exercise, nutrition, sleep habits, mood states, perceived stress, time management, social support, religious or spiritual habits, extra number of hours worked per week, sex, and age. Multiple regression analyses selected five significant predictors, two of which were sleep variables (weekday and weekend wake-up times), that accounted for the highest proportion of explained variance in GPA. In a study focused on links between alcohol use, sleep, and academic performance in college students, Singleton and Wolfson (2009) found Scholastic Aptitude Test scores were the strongest predictor of GPA, with the other significant predictors being sex, alcohol consumption, sleep duration, and daytime sleepiness.”

**Sleep Hygiene**

Our behaviors and choices are integral to the quality and quantity of sleep we receive. Certain conditions and practices have been found to be more conducive to getting a good night’s rest (Bootzin. … find this and others). For instance, light, noise, caffeine, alcohol, sleep schedules, delayed circadian phase, discomfort, rumination, naps, exercise near bedtime, being upset at bedtime have all been associated with impaired sleep (Brown & Bulbitz, 2002 – look at this more; Bootzin?; Brown et al. 2001). There are various measures we can take in order to optimize our sleep, and, consequently, improve aspects that benefit from adequate optimized sleep. (discuss the common disturbances of sleep more with research)

Delayed Sleep Phase Syndrome (DSPS) is characterized by later sleep onset and wake times, and has been associated with negative academic performance (find a reference). Brown et al. (2001) looked specifically at how college students are experiencing DSPS. There findings showed that 11.5% of participants had symptoms consistent with DSPS. The difference between weekday and weekend bedtimes and wake times showed significance, indicating that in both cases students showed a phase delay. Additionally, students reported sleep disrupting behaviors such as napping during the day, issues with sleep latency, in addition to general sleep difficulties. As discussed in previous

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 (commonly? –check if this is the study for the survey I am using and specify if so) 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. Make sure I put this section in quotes if needed. Look further into this research and then discuss the study by Mastin et al. (2006) that developed the SHI measure I will be using. Discuss in detail the International Classification of Sleep Disorders from the American Sleep Disorders Association (1990), whose criteria were used to develop the SHI. Highlight the different criteria, how they differ/are similar to that used in Stepanski & Wyatt, and determine if I want to look at the two factor model of SH from Cho et al (2013). Provide some evidential research for the various components of SHI and how they specifically impact sleep. Address the issue of exercising near bedtime as an item of SHI, and the potential confounding aspects of that item.

Brown & Buboltz give a great summary of sleep hygiene factors – reference that here.

In a study looking at the impacts of sleep hygiene on infants and children, Mendell et al. (2009) found that poor sleep hygiene practices were associated with reduced sleep quantity and quality. For instance, late bedtimes were associated with extended sleep latency times. Additionally, obtaining less sleep (shorter night’s rest) was associated with late bedtimes, caffeine consumption, lack of a consistent bedtime routine, and having a television in the bedroom.

Sleep hygiene interventions offer an affordable, non-clinical way to address health needs for adults (Irish et al. 2015). Irish: “Recent public health campaigns have advanced general knowledge about the importance of good sleep, though they are often focused on adequate sleep duration rather than good sleep quality, and the effectiveness of these campaigns is generally unclear. Less is known regarding scientifically valid strategies by which the average person might effectively improve their sleep. Relatively few studies have investigated the efficacy of sleep hygiene interventions in nonclinical samples [16e20]. Overall, this work has provided some preliminary support for the use of sleep hygiene education in nonclinical populations, but the findings are inconsistent. Taken together with findings in clinical samples, these data raise an interesting question.”

Young adults show significantly lower awareness and use of beneficial sleep hygiene practices than adults of other ages (Cho et al., 2013; Voinescu & Szentagotai-Tatar, 2015).

The Sleep Hygiene Index has been found to be significantly correlated to sleep quality, subjective daytime sleepiness, \_\_\_\_\_\_\_\_\_ (Brown et al., 2002; Cho et al., 2013; Mastin et al. 2006). Based on an evaluation of the Sleep Hygiene Index, Cho et al. (2013) proposed that the Sleep Hygiene Index would be more appropriately broken down into two factors, including “sleep disturbing behavior” and “irregular sleep-wake schedule.” (decide if I want to look further into the two factor model)

Write a whole paragraph on this article: (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 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; Pilcher & Walters, 1997). 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. Look at some of the research on the impact of sleep in adults, and in other areas than working memory, for instance: mood, attention, grades, self-esteem, etc. Also, pull information related to circadian shifts in adolescents and the impact that has for college students. (look at my comprehensive exams for this.)

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, (discuss academic achievement here instead of working memory) 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.

**Sleep Habits in Adolescents and Young Adults**

Adolescents show a phase shift in their sleeping habits, including later bedtimes and earlier wake times. This phase delay has been documented in several studies (look up my comprehensive exam question addressing this) (Carskadon, etc) and impacts that length and quality of sleep that adolescents receive. Pair this with the responsibilities that come with independence during college and many students struggle to have healthy sleep practices that promote academic achievement and engagement. For instance, undergraduate students show a pattern of reduced sleep quantity and quality (Gaultney, 2010; Orzech et al. 2011; ). In a study by Orzech et al. (2011)**,** they foundthat pulling all-nighters was associated with lower GPAs, and interviews with students indicated experiences of impaired memory, concentration, and focus as a result of sleep loss. Using a simple sleep education intervention the researchers saw improvements in the sleep length, latency, and other sleep practices of the participating college students. Other research has indicated a link between reduced sleep and reduced academic performance, as well (Gaultney, 2010). Gaultney **(**2010)

Summarize all the research on how much sleep undergraduate students are getting overall. (Brown & Bulboltz articles)

**Stress/Stressful Life Events**

**Stress & Academic Engagement**

**Stress & Sleep**

Minkel et al. (2012) looked at impacts of sleep deprivation on the ability to manage stress. Discuss this research in detail.

**Exercise**

Gender and exercise in college students: Buckworth & Niggs 2004.

Similar to sleep, exercise has been shown to positively impact a myriad of life’s functions including mood, mental health, telomere length, cognitive functioning, attention, cardiovascular health, stress levels, and self-esteem (Dunn et al. 2001; Galper et al. 2006; Manger & Motta, 2005; Puterman et al. 2010; Spence et al. 2005; VanKim & Nelson, 2013; )

**Exercise and Academics/Achievement**

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 school-based 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.” The authors noted benefits to physical activity on academic achievement 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”

Physical exercise and fitness has been shown to have a myriad of beneficial impacts on cognition, executive control, learning, academic achievement, mood, self-esteem, and general health (Fedeway & Ahn, 2011; Hillman, Erickson, & Kramer, 2008; Kristjansson et al., 2010; Pontifex et al. 2009). In a meta-analysis looking at the effects of physical activity/fitness on children’s achievement, Fedewa & Ahn (2011) analyzed 59 studies from 1947 to 2009 and found a significantly positive effect on both achievement and cognitive outcomes. Their overall results were similar to previous meta-analyses that indicated a similar effect of exercise on cognitive outcomes (Sibley & Etnier, 2003; Etnier et al, 2006). Although most areas of evaluated physical activity yielded significantly positive results, the meta-analysis showed that aerobic exercises resulted in the largest impact on cognitive outcomes and academic achievement. One area of physical activity that did not show significant results was that of flexibility. A study completed by Pontifex et al. 2009 also found positive effects of aerobic activity. In their study aerobic exercise showed a larger reduction in response times for working memory than in those conditions with resistance exercises or seated rest. Additionally, the analysis by Fedewa & Ahn suggested an increase in achievement as activity levels increase. It is also interesting to note that the area of achievement most affected in these children was mathematics, followed by positive effects on reading achievement and IQ. Finally, the authors note that the effects were as significant or more so on children with learning or physically disabilities. Fedewa: “Physical education is therefore assumed to be a threat to academic subjects, as time spent in physical activity could be time devoted to learning reading, science, and mathematics.”

Fedewa pg 522 “smaller studies have associated time spent in physical activity and/or the level of children’s physical fitness with higher cognitive performance. Similar findings are reported throughout the literature in this area, suggesting that an increase in physical activity and fitness level is positively associated with higher cognitive functioning and achievement scores in elementary and middle school-age children (Burton & VanHeest, 2007; Sibley & Etnier, 2003).”

Fedewa: “, a number of recent studies have addressed the question of whether physical fitness enhances cognitive or achievement outcomes for children (e.g., Castelli, Hillman, Buck, & Erwin, 2007; Coe, Pivarnik, Womack, Reeves, & Malina, 2006; Eveland-Sayers, Farley, Fuller, Morgan, & Caputo, 2009). Thus, the inclusion of these recent studies is critical to inform the relationship between physical activity/ fitness and children’s cognitive functioning. Given budget constraints and increasing.” “the purpose of this study was to quantitatively synthesize the research on physical activity and children’s cognitive outcomes and to discuss implications for educators and other stakeholders in children’s academic achievement.”

**Exercise and Study Skills**

**Exercise and Classroom Participation**

**Exercise and self-esteem**

One of the factors of Academic Engagement is “perfomance engagement” and a component of that is “Being confident that I can learn and do well in the class”. Self-esteem is intrinsically linked to self-confidence (find supporting evidence). The effects of exercise on global self-esteem were evaluated in a study be Spence et al. 2005. They did a quantitative review of the research and found a small but significant increase in self-esteem associated with exercise and a larger effect size when there were significant changes in physical fitness.

Kristjansson et al. 2008, showed not only a positive correlation between physical activity and academic achievement, but a similar link between physical activity and increased self-esteem in a study evaluating adolescents in Iceland. However, they found that self-esteem was a weak mediator of the relationship between physical activity and increased academic, stating, “the influence that health behaviors have on academic achievement appears mostly to take place outside the impact of self-esteem.” (can look at this study to review use of mediators). Kristjansson: “In a study of preadolescent children’s health behavior, self-esteem, and academic achievement, Tremblay, Inman, and Willms (2000) found that the relationship between physical activity and academic achievement was weak but that participation in physical activity was positively related to higher levels of self-esteem. Similar findings regarding the association between health behavior and high levels of self-esteem have been reported by other investigators (e.g., Huntsinger &Luecken, 2004).” “Despite these limitations, the fact that self-esteem did not, for the most part, mediate the impact of the health-behavior variables on academic achievement supports the notion that adolescent engagement in healthy behavior remains important if societies wish to simultaneously improve both the health status and academic-achievement goals of young people. The fact that health behavior also strongly influences self-esteem only reinforces the significance of this fact. Furthermore, the influence that health behaviors have on academic achievement appears mostly to take place outside the impact of self-esteem.”

**Amount of Exercise**

**Fedewa: “**In terms of how much physical activity to provide students, a related finding of the current analysis revealed that physical activity provided three times per week exerted the strongest effect on children’s cognitive outcomes and achievement. Although few researchers have examined the relationship between the amount of physical activity and children’s cognitive outcomes and achievement, there is evidence that more physical activity produces higher achievement scores (Coe et al., 2006; Shephard, 1997). One proposed reason for this is that increased activity may enhance arousal and minimize fatigue and boredom (Shephard, 1996). An alternative explanation by Shephard (1996) proposes that increased physical activity leads to higher levels of self-esteem, optimizing students’ academic achievement. Other, more neurological, theories tout that changes in brain structure, function, and neurotransmitter concentrations occur in individuals who are more physically active (Hillman et al., 2004; Hillman et al., 2006; see Trudeau & Shephard, 2010). All of these hypotheses could serve as possible explanations for the current findings, but more research is needed to investigate the complex relationship between physical activity dosage and cognitive outcomes in children.”

**Exercise and Stress**

Exercise has been shown to improve emotional well-being in a variety of ways. For instance as a study by Manger & Motta (2005) indicated, a 12-session aerobic exercise intervention improved the symptoms of Post-traumatic Stress Disorder (PTSD), anxiety, and depression. Puterman et al. (2010) found a significant moderating effect of exercise on the impact of perceived stress levels on telomere length (TL), stating that, “Vigorous physical activity appears to protect those experiencing high stress by buffering its relationship with TL (telomere length).” Another study (VanKim & Nelson, 2013) showed that in a sample of over 14,000 undergraduate students those that met the most vigorous levels of physical activity were less likely to indicate perceived stress and poor mental health. No differences based on sex or ethnicity were identified. They discussed how poor mental health and perceived stress are highly correlated so consequently showed similar magnitude and directionality for the association with vigorous physical activity. Additionally, their study suggests that socializing partially moderates the relationship between mental health/perceived stress and physical activity. Vankim and Nelson discussed the following “Approximately a third of young adults (ages 18–24 years) in the United States attend college, representing a critical mass of the young adult population.11 In addition to decreased PA, the transition to college can be academically and socially stressful for students.12 In a study assessing cardiovascular health among college students, nearly 60% of participants reported high or very high stress.13 Increases in reported stress could be attributed to the set of academic and social stressors within the college setting, such as examinations, interpersonal relationships, and the transition to living independently.12 Relatedly, college can also be a period of increased risk for poor mental health and depression.14,15 A nationally representative study of college students found that 4.8% reported symptoms of poor mental health and depression,14 and a study of adolescents and young adults (ages 15–24 years) from the National Comorbidity Survey found that 5.8% met Diagnostic and Statistical Manual of Mental Disorders (Third Edition Revised) criteria for major depression and 2.1% met criteria for minor depression in the past 30 days.15 Recent national data from the Behavioral Risk Factor Surveillance System indicates that compared to other adult age groups, young adults (ages 18–24) have the highest prevalence of depressive symptoms that do not meet the criteria for major depression.16 The ability to cope with the stressors associated with the college environment is important for maintaining both mental and physical health.” And for discussion: “Interventions aiming to improve mental well-being of college students should also consider promoting physical activity. At least some of the positive benefits of physical activity may arise from social interactions.” It has also been noted that physical activity shows a decline as students advance in age with less likelihood of participating in vigorous exercise at the college level than in earlier years (Vankim & Nelson, 2013; Nelson et al., 2007; Troiano et al. 2007). Consequently, research such as this can help identify the areas of personal care that will have the greatest impact on undergraduate’s academic engagement and subsequent college outcomes. Understanding the pathways for student achievement and engagement can help focus intervention efforts to highlight areas that will be the most beneficial and effective. Nelson et al.: “Vigorous physical activity (VPA) declines from adolescence into adulthood and social disparities in VPA exist. Physical activity is understudied in the college setting. Fewerstudents engaged in VPA in college compared with high school (males 74% to 52%; females 68% to 44%). Athletics was associated with VPA, but 51% participated in high school and 15% in college. Among females, African Americans, Asians, and students of lower socioeconomic position (SEP) were less likely to engage in VPA in college, adjusting for high school VPA. Among males, Asians and older students were less likely to engage in VPA.”

**Exercise – Discussion:**

Buckworth & Niggs found that different sedentary behaviors were negatively correlated with exercise or physical activity, (showing that discretionary time of college students is often utilized based on gender), with females more likely to watch television and males more likely to spend time on the computer versus exercising. However, “Time spent studying was positively correlated with days per week of strength training for females, and with typical duration of exercise for both males and females.”

Buckworth & Niggs 2004: “Participation in exercise during college students’ discretionary time may be positively modified by targeting sedentary activities, as has been demonstrated in studies with children in which increased physical activity was an outcome of strategies to reduce time in sedentary behaviors.20 Based on our findings, college health promotion specialists should consider designing interventions that pose physical activities as more accessible and more rewarding than using the computer for male students and watching television for female students. Future research should include the development of instruments to detect a more extensive range of sedentary activities typical of college students, as Lee and King30 have done for older adults, that can be evaluated in terms of perceived choice and reinforcement value. Decreasing accessibility and rewards from major competing sedentary activities while increasing the accessibility and reinforcement values of exercise and physical activity can have immediate and long-term health benefits for college students.”

Trost et al. 1999 stated the following based on their research on 6th grade students: “These findings are consistent with previous studies using self-reported physical activity and suggest that interventions to increase physical activity in preadolescent youth should endeavor to boost physical activity self-efficacy by offering a wide selection of enjoyable, developmentally-appropriate physical activity options.”

Oginska & Pokorski 2007: “As Dement (1997) pointed out, although people get a great deal of information about two other health basics, nutrition and physical fitness, the society “remains a vast reservoir of ignorance about sleep deprivation and sleep disorders,” and “we must realize that we cannot be healthy unless our sleep is healthy.””

**Academic Engagement**

Academic engagement is a broad concept including aspects of behavior and intrinsic characteristics that lend themselves to learning and academic success. There have been a variety of ways in which the research on student engagement has focused and defined academic engagement, including motivation, participation, instructor relationships, achievement, and study skills (Zepke & Leach, 2010; Handelsman et al., 2005; NSSE, 2000)

Zepke & Leach 2010: “One aspect of this challenge is a drive to improve student success, understood as increasing or widening participation, achieving high levels of course completion and attaining a passport to employment with a positive attitude to lifelong learning (Yorke, 2006).” And “Student engagement, then, is a far reaching construct that can be variously defined. Chapman (2003) offers a possible definition – students’ cognitive investment in, active participation in and emotional commitment to their learning. The Australian Council of Educational Research proposes another: ‘students’ involvement with activities and conditions likely to generate high quality learning’ (ACER, 2008: vi). We accepted both definitions. They are inclusive, enabling a range of research perspectives to be considered.”

Marks 2000: “Focusing on student engagement in relation to classroom instruction, this study conceptualizes engagement as a psychological process, specifically, the attention, interest, investment, and effort students expend in the work of learning. Defined in this way, engagement implies both affective and behavioral participation in the learning experience. The conception is consistent with other researchers' definitions of engagement: students' "involvement with school" (Finn, 1989, 1993); their "psychological investment in and effort directed toward learning, understanding, or mastering the knowledge, skills, or crafts that academic work is intended to promote" (Newmann, Wehlage, &Lamborn, 1992, p. 12); and students' "interest" and "emotional involvement" with school, including their "motivation to learn" (Steinberg, 1996). Engagement is an important facet of students' school experience because of its logical relationship to achievement and to optimal human development.” and “How children and adolescents choose to allocate their attention depends on the interaction of several factors: their natural inclinations, the satisfaction they have derived from paying attention in other settings, and the value they attach to the activity based on its relevance to a future they anticipate (Csikszentmihaiyi, 1990).” And “The disengagement portrayed by these researchers is still a pervasive problem, particularly in U.S. secondary schools (Newmann, 1992; Sax et al., 1997; Steinberg, 1996). Chronic disengagement reportedly afflicts 40% to 60% of secondary school students (Sedlak et al., 1986; Steinberg, 1996), an estimate that excludes repeated absentees and dropouts.^ No comparable estimate of disengagement exists for students in elementary schools. However, critics have indicted these schools for providing meaningless instructional activities that disillusion students about the usefulness of school and for failing to equip them with the skills they need to succeed in later grades (Finn, 1993; Goodlad, 1984; Sedlak et al., 1986).” And “When high levels of classroom engagement occurred, observers ascribed it to the uppertrack status of the class, students' self-selection into a program of special interest to them, or, occasionally, teachers' instructional styles, including the expectations they held for students (Oakes, 1985; Powell et al., 1985).” And “Although much of the research on student engagement has focused primarily on the influence of student background factors, it is important to 156 Student Engagement in Instructional Aclivity expand that inquiry to learn whether schools and families can enhance engagement through particular efforts. One way to approach this is to examine the major theoretical perspectives that explain student engagement through comprehensive frameworks, specifically those proposed by Bronfenbrenner (1979), Finn (1989, 1993), and Newmann (1981, 1992).” And “More complex and cognitively challenging class work, according to this theoiy, has the potential to engage students more deeply. Overall, however, schooling fails as a developmental context. Bronfenbrenner specifically laments that students do not do "real" work (i.e., work another actually depends on) and do not participate in a "curriculum for caring" (i.e., giving care in the community).”

Students tend to show more engagement when they have self-selected courses that are of specific interest to them (Marks, 2000; Handelsman et al. 2005 - ? check if they reference this under emotional factor). Additionally, doing well in a class is not only a classifying attribute of engagement, but often a positive outcome of increased academic engagement.

Disengagement at the college level can lead to failing grades, higher dropout rates,

Unlike previous research focusing on motivation as a defining characteristics of academic engagement at the college level, Handelsman et al. (2005) approached engagement as a more multi-faceted concept in the creation of a measure on student course engagement. They chose to look at the “micro” level of a student’s engagement rather than evaluate engagement from the “macro level” which has been addressed by previous research looking at engagement from the perspective of the institution to determine effective programs to enhance engagement in their students (Froh & Hawkes, 1996; NSSE, 2000). Their research indicated four distinct factors of college student engagement: Factor 1 – “skills engagement”, Factor 2 – “emotional engagement”, Factor 3 – “participation/interaction engagement”, and Factor 4 – “performance engagement.”

As suggested by Handelsman et al. (2005), we took the approach of evaluating students on the “micro” level, believing that this approach affords more opportunities for interventions and allows for the evaluation of the potential impact from personal care variables such as sleep hygiene and exercise.

***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 hygiene and physical activity mediates the relationship between stress and academic engagement. Research has shown that academic engagement is correlated with positive outcomes for achievement, and, in turn, future employment status (cite). With 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 improved academic engagement? The implications of providing a predictive model of the likelihood of being academically engaged can be seen in being able to tease apart the protective factors that can be most highlighted for intervention.

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. \_\_\_\_\_\_\_\_\_\_\_\_ 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 student course engagement (academic engagement) into several major factors including a four-factor pattern: Factor 1 included study skills, effort, work completion, attendance, and taking and reviewing notes; Factor 2 included emotional aspects such as desiring to learn and finding ways to make a course interesting or relevant to their lives; Factor 3 included participatory aspects such as participating in discussions, asking questions, and seeking help when necessary; and finally, Factor 4 included performance on tests, grades, and confidence about abilities in the specific course.

Methods

*Participants*

The current research will be based on previously collected data. Participants included 206? undergraduate students who were part of the educational psychology research pool at a large southeastern university. The participating students were provided the option of completing a research review paper or participating in this study to fulfill a research requirement for their course. This option was provided to students in 3-4 classes over the course of multiple semesters. Volunteers were also obtained from psychology and education courses.

The participants were asked to first complete a consent form and then multiple questionnaires either at home (if they were part of the educational psychology research pool), or for those students outside the research pool, during a period provided during their class period. Participants were asked to complete all questionnaire answers on a Scantron sheet and return them during the next class period. The participants were instructed to include their names only on the consent form, and on no other documents.

*Measures*

The included questionnaires were meant to determine the following: student’s demographics including age, ethnicity, class standing, and gender; the Undergraduate Stress Questionnaire to measure recent stressful life events, the Sleep Hygiene Index (SHI) to measure positive sleep practices, the Leisure Time Exercise Questionnaire to evaluate exercise habits; and the Student Course Engagement Questionnaire to determine levels of academic engagement.

*Undergraduate Stress Questionnaire (USQ)*. An actigraph is a watch-like device that measures motor activity and information on sleep-wake patterns. Some of its measures include sleep duration, sleep latency, total sleep time excluding identified wake periods, and rising time. The actigraph has been shown to have good reliability and validity in laboratory settings (Wood et al., 2008). It also has been shown to be highly correlated with the biophysiological sleep measure of polysomnography (de Souza et al., 2003). Due to its small size and ease of use the actigraph is commonly being used in sleep research, particularly in naturalistic settings (Sitnick et al., 2008). The primary downfall of the actigraphy instrument is its potentially inaccurate assessment of wake periods where no movement is present. Since the watch registers motor activity, wakefulness and waking epochs may not be documented accurately. For this reason, the present study will utilize sleep diaries and the Sleep Habits Survey as well.

*Sleep Hygiene Index (SHI)*. In order to assess (use a different word to change from article) the use of sleep hygiene practices, the current study utilized the Sleep Hygiene Index (SHI). The SHI is a self-report measure comprised of 13 items rated on a five-point scale ranging from 0 (never) to 4 (always). It is a brief measure in comparison to previous, lengthier assessment instruments, showing satisfactory validity and reliability, including good test-retest reliability (Mastin et al. 20016; Cho et al., 2013). Items are based on “the diagnostic criteria for inadequate sleep hygiene in the International Classification of Sleep Disorders (American Sleep Disorders Association, 1990)” (Mastin et al. 2006). High scores indicate more maladaptive sleep hygiene practices, while lower scores demonstrate better sleep hygiene. The total score ranges from 0-52.

*Leasure Time Exercise Questionnaire (LTEQ).*  The Sleep Habits Survey is a questionnaire that includes items pertaining to daytime functioning as well as academic success (Wolfson et al., 2003). The scale also includes a circadian preference measure. Wolfson et al. (2003) found the Sleep Habits Survey to be highly correlated with both diary and actigraph measures, specifically so on school nights when schedules are more predictable versus weekend nights when estimates may be more open to error.

Alhola and Polo-Kantola (2007) showed that both auditory and visual tasks of this kind were impacted as a result of sleep quantity. We will adapt different sequences for each testing session in an attempt to account for any possible practice effect. We will use the same three versions for each subtest to remain consistent across participants.

*Student Course Engagement Questionnaire (SCEQ).* Carskadon et al.’s (1993) CMEP includes 10 items that are worded in language easily understood by young children. For children who are not able to read the questionnaire can be given orally. Multiple studies have found high validity for this scale when compared to other similar measures for adults such as the Morningness-Eveningness Questionnaire (MES; Ishihara et al., 1990; Kim et al., 2002). The questions on this measure include bedtime preferences, alertness reports, and preference times for different activities (Carskadon et al., 1993).

**Exercise – Methods**

In research by Galper et al. they classified physical activity into four groups including inactive (< 1), insufficiently active (1-10), sufficiently active (11-19), and highly active (>=20) based on miles per week of walking, jogging, and running. They found no significant differences between the sufficiently active and highly active groups when it came to the impact on depressive symptoms and emotional well-being. Galper et al.: “The analyses presented here show that depression and emotional well-being reached a plateau at 11–19 miles per week of walking, jogging, and running on the PAI (see Figs. 2 and 4). It is noteworthy that this weekly dose of physical activity is equivalent to 1100 –1900 kcal·wk1 , or approximately 2–3 miles or 30 min of aerobic activity on most days of the week, which is “sufficiently active” to attain most health benefits according to current public health recommendations for physical activity in adults (22,32). However, some research suggests that the intensity, frequency, or duration of physical activity may be independently associated with health outcomes (7,16). We were not able to examine these parameters because they are not part of the PAI. If we had been able to investigate other measures or categories of physical activity, we may have found different dose–response relationships. For instance, our results may have been more consistent with evidence of a nonlinear dose–response relationship (7)”

**(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.”

# [Heading 1]

[The first two heading levels get their own paragraph, as shown here. Headings 3, 4, and 5 are run-in headings used at the beginning of the paragraph.]

## [Heading 2]1

[To add a table of contents (TOC), apply the appropriate heading style to just the heading text at the start of a paragraph and it will show up in your TOC. To do this, select the text for your heading. Then, on the Home tab, in the Styles gallery, click the style you need.]

[Heading 3]. [Include a period at the end of a run-in heading. Note that you can include consecutive paragraphs with their own headings, where appropriate.]

[Heading 4]. [When using headings, don’t skip levels. If you need a heading 3, 4, or 5 with no text following it before the next heading, just add a period at the end of the heading and then start a new paragraph for the subheading and its text.] (Last Name, Year)

[Heading 5]. [Like all sections of your paper, references start on their own page. The references page that follows is created using the Citations & Bibliography feature, available on the References tab. This feature includes a style option that formats your references for APA 6th Edition. You can also use this feature to add in-text citations that are linked to your source, such as those shown at the end of this paragraph and the preceding paragraph. To customize a citation, right-click it and then click Edit Citation.] (Last Name, Year)

Discussion

Although, based on the current research it is difficult to make a claim of cause and effect. For instance, are the students who practice healthier personal care through sleep and exercise intrinsically the same individuals who are likely to actively participate and do well in school, or is there some aspect of sleep hygiene and physical activity that promotes a student’s academic engagement? Based on research that indicates increases in achievement, self-esteem, etc. following interventions of increased physical activity or improved sleep hygiene habits (cite) the benefit of practices and interventions to promote these behaviors becomes evident.

Fedewa: may be useful as part of discussion: “It is interesting that individualized physical activity interventions showed no significant impact on children’s cognitive outcomes or academic achievement. However, the effect of physical activity programs was largest when a small-group intervention was conducted, followed by a moderate effect for a medium-group intervention (10–30 children). This finding was not surprising given the effectiveness on children’s outcomes when provided smallgroup instruction and intervention. Research investigating the promotion of physical activity in children point to the effect of peer influence—perhaps a reason for the small group effect found in this analysis. Salvy and colleagues (2009) showed that the presence of a peer increased the motivation of overweight youth to be physically active. This finding has been consistent in the literature, emphasizing the importance of peer influence for youth’s involvement in physical activity, particularly for elementary and middle-school youth (Beets, Vogel, Forlaw, Pitetti, & Cardinal, 2006; Bukowski, Hoza, & Boivin, 1994). These findings have several implications, as individualized physical activity interventions for children can be both costly and time consuming. According to these findings, using small group physical activities will result in higher cognitive and achievement outcomes than even medium group (i.e., classroom size) interventions. Thus, an effective means of using limited school resources may be to target children who could most benefit—both academically and physically. Implementing physical activity interventions for those children most at risk will allow for both a smaller group size and significant achievement gains.”

Troiani et al 2007: “However, 'adherence to physical activity recommendations according to accelerometer-measured activity is substantially lower than according to self-report. Great care must be taken when interpreting self-reported physical activity in clinical practice, public health program design and evaluation, and epidemiological research.”

Marks 2000: “Although research examining the effect of engagement on achievement is comparatively sparse, existing studies consistently demonstrate a strong positive relationship between engagement and performance across diverse populations (Finn, 1989, 1993; Finn & Rock, 1997). Nonetheless, the process of disengagement can begin in the early school years if students do not fit in, participate, and succeed (Finn, 1989). Lack of engagement adversely affects student achievement and initiates a downward spiral that may lead to dysfunctional school behavior and, ultimately, culminate in some students leaving school entirely (Finn, 1989; Newmann, 1981, 1992; Steinberg, 1996; Wehlage, Rutter, Smith, Lesko, & Fernandez, 1989).”

Oginska & Pokorski 2006: “In experimental studies on performance impairments induced by different doses of sleep debt, Van Dongen et al. (2003) observed significant effects of individual variability of sleep need, as well as of “substantial traitlike interindividual differences in vulnerability to sleep loss.” “

Limitations

Kristjansson: “The interpretation of these results should be considered in light of several methodologic limitations. First, similar to most previous studies that have examined the relationship of health behavior to academic achievement, we used cross-sectional data. We also studied a comparatively homogeneous group of adolescents whose unique cultural and school experiences limit generalization of our findings to other populations. Second, although our measures were valid and reliable, the data we collected came from self-reports of behavior from adolescents, where the possibility of response error should be considered. For example, girls are more likely than boys to underreport their weights by an average of 1 to 2 kg, and underreporting is more common among heavier respondents (Spencer, Appleby, Davey, & Key, 2002). However, because this was not a gender-specific study, we do not believe this was a problem, other than that stronger relationships might have been discovered between BMI and self-esteem and academic achievement. Third, because our measure of academic achievement was based on student self-estimates of their grades, it is possible that students may have overestimated their academic performance. However, previous work (Schiller, 2002) suggests that such self-reports of academic performance among high school students are plausible because they compare favorably when checked for correspondence against individual transcript-based data.”

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Footnotes

Marks 2000 – “More complex and cognitively challenging class work, according to this theoiy, has the potential to engage students more deeply. Overall, however, schooling fails as a developmental context. Bronfenbrenner specifically laments that students do not do "real" work (i.e., work another actually depends on) and do not participate in a "curriculum for caring" (i.e., giving care in the community). Providing Social Support and Authentic Work Focusing on the problem of student alienation, Newmann (1981, 1989a, 1989b) locates the sources of student disengagement in alienating characteristics of bureaucratically organized schools, namely, meaningless, lowlevel school work and impersonal relationships with teachers and other 157 Marks students. Building on this earlier work, Newmann et al. (1992) articulate a theory of student academic engagement that draws on the sociological theory of Merton (1968) and the psychological theory of Connell (1989). The researchers propose three bases for student academic engagement: (1) the fundamental human need to develop and express competence, (2) school membership, and (3) authentic academic work. Because the need for competence is generally inherent, most students begin their school careers motivated to learn. For many students, however, their experience of school dulls that motivation or even suppresses it entirely. For these students to become academically engaged would rec]uire a reversal of the alienating experiences, a sense of membership in school to replace impersonality and isolation and authentic academic work to replace low-level school work (Newmann, 1989a; Newmann et al., 1992). Authentic academic work involves students intellectually in a process of disciplined inquiry to solve meaningful problems, problems with relevance in the world beyond the classroom and of interest to them personally.”

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