June 2021

Sleep Hygiene Practices and Subjective Well-Being as Predictors of High School Students' Obtaining Sufficient Sleep During the School Week

Erin M. Brennan
University of South Florida

Sleep Hygiene Practices and Subjective Well-Being as Predictors of High School Students' Obtaining Sufficient Sleep During the School Week

by

Erin M. Brennan

A thesis submitted in partial fulfillment
of the requirements for the degree of
Educational Specialist
Department of Educational and Psychological Studies
College of Education
University of South Florida

Co-Major Professor: Kathy L. Bradley-Klug, Ph.D.
Co-Major Professor: Emily J. Shaffer-Hudkins, Ph.D.
Robert F. Dedrick, Ph.D.

Date of Approval:
June 18th, 2021

Keywords: health psychology, positive psychology, health, wellness

TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

Sleep is critically important to human health. However, the quantity and quality of sleep can vary within and among individuals over time, affecting overall wellness. Adolescence is a critical time for development, both for physical health, as well as health-related behaviors and habits. Physical health is known to be influenced by health-related behaviors such as sleep hygiene, which promotes good sleep. Physical health and engagement in health-related behaviors also are known to influence other aspects of well-being, namely subjective well-being, or happiness. Adolescents are often characterized by their changing sleep needs, patterns, and habits. This study is a secondary analysis of data, and utilized data already collected as part of a larger study. This non-experimental observational study utilized self-reported measures to characterize the sleep patterns in 450 high school students to examine the typical hours of sleep per night students report obtaining, and the extent to which they report obtaining the recommended hours of sleep per night. The study also examined demographic characteristics, sleep hygiene factors, and subjective well-being as potential predictors of sufficient sleep (defined as 8 or more hours per night). This study found an average of 7 hours and 29 minutes of sleep per night reported by the high school students in the sample, with 32% of the sample reporting sufficient sleep (i.e., sleep for 8 or more hours per night). A binomial logistic regression analysis was used to examine the predictive power of a model including race, gender, socioeconomic status, grade level, sleep hygiene factors, and subjective well-being, on sufficient sleep. The model was not significant for the purpose of predicting sufficient sleep in the sample. The predictive power of the model was found to have an

overall success rate of 64.3%. Future research is needed to identify a model with a higher success rate for predicting sufficient sleep in high school students, and to address the high rates of insufficient sleep in this population.

CHAPTER 1

INTRODUCTION

Statement of the Problem

Health promoting behaviors are the activities that facilitate a healthy lifestyle and contribute positively to one's health, such as eating a balanced and nutritious diet, exercising for an hour or more per day, and getting the recommended amount of sleep each night. Engagement in health promoting behaviors is linked to positive subjective well-being, which is commonly defined as satisfaction with life, and positive affect (e.g., feelings of happiness) as opposed to negative affect (e.g., feelings of sadness; Diener, 2000; Diener & Chan, 2011; Suldo, 2016; Suldo; Shaffer 2008, Suldo et al. 2016). Put simply, those who engage in behaviors known to improve their physical health also report feeling happy and satisfied with their lives (Kern et al. 2015; Lyubomirsky et al. 2005; Shaffer-Hudkins, 2011; Smith, 2019). An example of a category of health promoting behaviors is sleep hygiene (e.g., having a standard bedtime routine). Sleep hygiene involves the sleep environment (e.g., going to bed in a safe, comfortable, quiet place), and other behaviors or conditions that promote good sleep, including physiological factors (e.g., not going to bed hungry), cognitive and emotional factors (e.g., going to bed with a clear mind, rather than anxiety about the next day), bedtime routines, and sleep stability (i.e., having a regular and consistent bedtime and wake time; Hauri, 1977; Lemola et al. 2013; Stepanski & Wyatt, 2003; Weinberg et al. 2016). Sleep hygiene also involves refraining from engagement in sleep inhibiting behaviors, such as consuming caffeine or other stimulating substances in the evening, taking daytime naps, or going to bed with loud music playing (Hauri, 1977b; Lemola et al. 2013;

Stepanski & Wyatt, 2003; Weinberg et al. 2016). Healthy sleep is defined as sleep which facilitates a quality sleep cycle, which typically includes obtaining 8 to 10 hours of sleep per night among teenagers aged 13-18 (Paruthi et al. 2016) and a regular sleep-wake schedule. Quality sleep is undisturbed and facilitates sufficient time in the various necessary sleep stages. Research has found that high school students in particular do not obtain sufficient amounts of sleep, with estimates of about 70% of high school students sleeping less than 8 hours per night (Eaton et al. 2008; Wheaton et al. 2018).

Research has shown a relationship between sleep hygiene practices, including sleep quantity and sleep quality (Brick et al. 2010; Brown et al. 2002; LeBourgeois et al. 2005; Suen et al. 2010), and sleep quality and subjective well-being (Gadermann et al. 2016; Lai, 2018; Weinberg et al. 2016). Studies also have found links between health promoting behaviors and subjective well-being (Shaffer-Hudkins, 2011; Smith, 2019), however the role of sleep hygiene behaviors on levels of subjective well-being in high school students has not been explored specifically. Previous research in youth has focused on early adolescents, namely middle school students (i.e., students in grades 6 through 8), which is understood to be a different developmental stage from high school aged adolescents (i.e., students in grades 9 through 12).

Considering the high rates of inadequate sleep among high school students, the negative effects of inadequate sleep, the associations between sleep and subjective well-being, and the importance of subjective well-being to long-term outcomes, further research is needed in high school students to explore the relationship among sleep hygiene factors and between sleep hygiene and subjective well-being.

Subjective Well-Being

Subjective well-being can be thought of simply as happiness. Scientifically, it is a construct composed of self-reported levels of affect and satisfaction with life, with higher levels of positive affect (e.g., feelings of pleasure) and satisfaction with life and lower levels of negative affect (e.g., feelings of sadness) contributing to better subject well-being, and lower levels of positive affect and satisfaction with life and higher levels of negative affect contributing to worse subjective well-being (Diener, 2000; Diener & Chan, 2011; Suldo, 2016; Suldo & Shaffer, 2008; Suldo et al. 2016). Subjective well-being is an important construct of study in adolescent populations because it is known to be associated with several important long-term outcomes, including mortality (Moor et al. 2014), physical health (Diener & Chan, 2011), academic achievement (Suldo et al. 2006), mental health (Suldo et al. 2011), and even relationship satisfaction (Suldo & Huebner, 2004).

Sleep Hygiene

For the purpose of this study, sleep hygiene referred to the behaviors and practices known to positively influence sleep quality, such as consistent sleep times, reduced caffeine intake, reduced exposure to light and noise near bedtime, and a sense of safety during sleep (Hauri, 1977a; Lemola et al. 2013; Stepanski & Wyatt, 2003; Weinberg et al. 2016). Sleep hygiene and quantity are important constructs of study in adolescent populations as they have well established implications for long term outcomes, including emotional (Vriend et al. 2015) and cognitive functioning (De Bruin et al. 2017; Vriend et al. 2015), including functions related to academic performance, such as attention, response inhibition, memory, and problem solving (Cassoff et al. 2014), as well as physical health outcomes, such as body mass index and cardiovascular disease (Cappuccio et al. 2008; Cespedes et al. 2016; Fatima et al. 2015; Feliciano et al. 2018; Taveras et

al. 2014). Sleep quantity in high school students is also related to risk-taking behaviors (Meldrum & Restivo, 2014; Wheaton et al. 2016).

The Connection between Subjective Well-Being and Sleep Hygiene

The relationship between subjective well-being and sleep hygiene has been documented in studies focusing on middle school students. In one study examining the relationship between various health promoting behaviors, including sleep hygiene, and subjective well-being in middle school students, Shaffer-Hudkins (2011) found that the number of hours of sleep reported by participants was significantly and positively associated with their reported levels of subjective well-being, with those reporting higher average hours of sleep per night reporting higher levels of subjective well-being than those reporting lower average hours of sleep per night. Although the study provides support for the relationship between sleep hygiene and subjective well-being in middle school students, further exploration of other components of sleep hygiene as well as exploration in high school student samples is warranted.

Theoretical Frameworks

The present study aimed to examine the sleep hygiene practices, a specific health-promoting behavior of high school students, as well as the association of sleep hygiene practices and hours of sleep per night with the subjective well-being of high school students in grades 9 through 12. Although the constructs are related, they also are distinct from one another. For that reason, the present study utilized two distinct theoretical frameworks, PERMA Theory (Seligman, 2012) and the Health Promotion Model (Murdaugh et al. 2019; Pender, 2011), to support the exploration of both sleep and subjective well-being within this sample.

Well-being, as theorized by Seligman (2012), is a construct composed of five measurable elements proposed as an alternative or improvement on the study of happiness as the focus of

positive psychology. In his original theory, Authentic Happiness (Seligman, 2002), happiness included three elements: positive emotions, engagement, and meaning. Originally, happiness was measured by life satisfaction alone. The problem with measuring life satisfaction alone is that it usually only reflects how the rater feels, or their mood, which tends to be fickle in the moment that they complete the rating. In addition, Seligman argued that happiness simply did not account for much outside of positive emotion and pleasant feelings, missing the influence of other factors of positive psychology which affect individuals' overall sense of well-being. Therefore, Seligman proposed a new theory that described a more complex approach to understanding and measuring the construct of well-being and included the need for consideration of multiple elements. Specifically, in order to meet the requirements of an element of the construct of well-being, the potential element must contribute to well-being, be commonly desired and pursued for its own sake, and not overlap in terms of measurement or definition with any other elements (Seligman, 2012).

Seligman (2012) identified five measurable elements to the construct of subjective well-being, adding two to his original three and using a mnemonic, coined it PERMA theory: positive emotions, engagement, [positive] relationships, meaning, and accomplishment, all possessing each of the above criteria. Positive emotions remained included in PERMA theory but of importance, was no longer considered a primary determinant. Engagement was also retained by Seligman when he determined the five elements of well-being. Seligman (2012) describes engagement as a sense of 'flow' experienced when one is so absorbed in an activity in which they lose their sense of self-consciousness. Meaning is the final element from the original Authentic Happiness theory that made the cut for PERMA theory. Simply, meaning describes a sense of belonging and purpose in life. Positive relationships were one of the two new additions to PERMA theory. The connections

humans have with one another through relationships is part of what makes them humans. The interactions and relationships shared with others, or the lack of, influence well-being. Accomplishment, as the final element of well-being, can be described by the drive to win for winnings sake. Taken together, these elements compose the construct of subjective well-being, which is an important outcome associated with health, therefore worthy of examining as it relates to the health promotion practices of high school students.

The Health Promotion Model (Murdaugh et al. 2019; Pender, 2011) has a history dating back to the 1980s when it was first developed for use in the nursing profession to help improve patient health by targeting modifiable behaviors that influenced their health. It has changed over time to reflect new knowledge and perspectives related to health and health promoting behaviors, but at its core, the Health Promotion Model facilitates health behavior change in individuals by targeting the affective, cognitive, and social influences on engagement in the related behaviors. This is done by identifying current health-related behaviors (e.g., physical activity), setting goals (e.g., increase physical activity), identifying personal influences (e.g., perceived benefits of behavior, barriers, self-efficacy, and activity related affect), interpersonal influences (e.g., social norms, social support, role models), situational influences, and level of commitment to their plan of action.

The Health Promotion Model takes into account various influences on individuals' willingness to engage and actual engagement in health promoting behaviors, including cognitive, affective, and social factors, and the PERMA Model considers multiple factors influencing subjective well-being. It is clear that there is overlap among the influences considered by each model (e.g., affective influences on engagement in health promoting behaviors may include affect related to engagement in behaviors such as feeling happy after physical activity, which would be

taken into account when measuring levels of emotions or positive affect under the PERMA Model; social influences on engagement in health promoting behaviors may overlap with the positive relationships described in the PERMA model; cognitive influences on engagement in health promoting behaviors may include finding a sense of meaning or desire for achievement).

Because there is overlap among the factors influencing both health related behaviors and subjective well-being, it is helpful to consider the theoretical perspectives of both the Health Promotion Model and the PERMA Model when considering the relationship between health-related behaviors (e.g., sleep hygiene) and subjective well-being. Therefore, this study utilizes both the PERMA Model and the Health Promotion Model as frameworks for examining subjective well-being and health promoting behaviors, specifically sleep hygiene practices, and the relationship between them in high school students.

Research Questions

The purpose of this thesis was to examine the sleep hygiene practices and hours of sleep obtained, and the relationship between sleep and subjective well-being in students in grades 9 through 12, by addressing the following questions:

(1) How many hours of sleep per night do students report obtaining during the school week?

(2) To what degree do students obtain the recommended number of hours of sleep per night?

(3) To what extent, if any, are the following sleep hygiene factors related to the degree to which students obtain the recommended number of hours of sleep per night: physiological, behavioral arousal, cognitive/emotional, environmental, sleep stability, daytime sleep, substances, and bedtime routine after controlling for demographic differences?

(4) To what extent, if any, is the number of hours of sleep obtained per night related to subjective well-being in students, after controlling for demographic differences?

Hypotheses

Based on previously conducted research examining the relationship between sleep and well-being in various groups, it was hypothesized that the high school students in the sample will report hours of sleep less than what is recommended for their age group at high rates. It also was hypothesized that after controlling for the demographic differences in the sample, that engagement in sleep hygiene factors and levels of subjective well-being would successfully predict reports of sufficient sleep. Specifically, based on previous research, it was expected that a positive relationship would be found between subjective well-being and the number of hours of sleep reported in the current study sample, such that those obtaining the recommended hours of sleep per night also would have higher reported levels of subjective well-being compared to those who did not obtain the recommended hours of sleep per night. It also was hypothesized that obtaining the recommended number of hours of sleep per night would be associated with higher engagement in other sleep hygiene factors compared to those who did not obtain the recommended hours of sleep per night.

CHAPTER 2

LITERATURE REVIEW

The purpose of this chapter is to provide a comprehensive literature review of sleep and well-being, and links between the two constructs. A rationale for examining positive indicators of sleep (i.e., sleep hygiene) and well-being (i.e., subjective well-being) also is provided. This chapter also will provide summaries of research, including methodologies and results, which have examined the relationship between sleep and well-being. Differences in demographic features (e.g., gender, race, socioeconomic status) in relation to sleep and well-being will be presented as well, to examine the potential role of such factors on the relationship between these two constructs.

Sleep Hygiene

Overview

The practice of good sleep hygiene habits (e.g., going to bed at the same time every night) has been identified as an important health promoting behavior. The American Academy of Sleep Medicine's consensus statement suggests that adolescents aged 13 to 18 years should obtain 8 to 10 hours of sleep per 24 hours (Paruthi et al. 2016). The literature highlights high rates of poor sleep in adolescents, specifically, insufficient number of hours of sleep per night, with estimates of 70% of students in grades 9 through 12 in the United States getting less than 8 hours of sleep on school nights (Carskadon et al. 2006; Eaton et al. 2008; Wheaton et al. 2018), and a high rate of unidentified, and therefore untreated, sleep disorders in this population (Owens, Maxim, et al.

2000). Although the effect of the current global pandemic on adolescent sleep has not yet been reported, a meta-analysis of studies examining sleep in adults conducted by Jahrami et al. (2021) has recently reported that about 40% of adults in the general population may be experiencing sleep problems during the pandemic, with rates of about 75% among COVID-19 patients. This meta-analysis sampled studies of adults from the general population, health care providers, and COVID-19 patients from countries across the world (K=44, N=54,231). Of note, meta-analyses examining the rate of sleep problems among the general adult population prior to the pandemic report estimates of about 15% (Cao et al. 2017). With such increases in sleep problems among adults during this time, it is likely that a similar increase in sleep problems is being experienced among adolescents as well.

The importance of sleep for adolescents cannot be overemphasized. The relationship between sleep and mental health, emotions, mood, and behaviors is well documented in sleep literature (Alfano et al. 2009; Gadermann et al. 2016; Lai, 2018; Weinberg et al. 2016; Wolfson et al. 2015). For example, Kaneita et al. (2007) found that students in grades 7 through 12 who slept fewer than 7 hours or more than 9 hours, had more mental health problems than students who slept between 7 and 9 hours in a sample of 99,668 students in grades 7 through 12 in Japan. They also reported an inverse relationship between mental health and insomnia symptoms, with those reporting worse mental health also reporting more symptoms of insomnia. Fitzgerald et al. (2011) reported similar findings in their study of sleep patterns and suicidal ideation. In their sample of 26,936 American public and private high school students, they found that students, aged 12 to 18 years, with sleep problems (defined as 5 or fewer hours, or 10 or more hours of total sleep time per night) had increased risk of suicidal ideation, compared to students without sleep problems (i.e., those who reported between 8-10 hours of total sleep time).

The amount of sleep recommended for children and adolescents has changed over time. In a systematic literature review conducted by Matricciani et al. (2011) identified 32 sets of recommendations for children and adolescents published between 1897 and 2009, 15 of which included recommendations for ages 14 to 18 years old, and identified a general decrease in the recommended number of hours over time. The number of hours recommended for ages 14 to 18 years old has ranged from 8 hours to 10 hours over the course of the century, however the study identified a trend toward a decreasing number of hours recommended over time, specifically a decrease at a rate of about 0.35 minutes per year. They also found that recommended hours of sleep has consistently been about 37 minutes greater than the actual hours of sleep in the specific age-group populations at the time.

In terms of how sleep recommendations are determined, Matricciani et al (2011) also examined the methods and rationales reported by the 35 publications for the basis of their recommendations, and found that only one provided a rationale, basing their recommendations on the actual sleep of a sample of healthy children (Seham & Seham, 1926). The remaining recommendations were not based on empirical evidence but rather on 'rules of thumb' and 'expert opinion'. In fact, the most recent recommendation for adolescent sleep duration, published by the American Academy of Sleep Medicine (Paruthi et al., 2016), reports that their method for determining their recommendations was by a panel of experts reviewing the scientific evidence addressing the relationship between sleep duration and health. This resulted in the recommendation for teens aged 13 to 18 years old to obtain 8 to 10 hours of sleep per night, which was used as the reference for the purposes of the present study.

The literature clearly supports the association between poor sleep and poor mental health, but it also suggests causation of (poor) mental health by poor sleep in some cases. For example, as

a result of their randomized controlled trial, Hiscock et al. (2015) showed that the frequency and severity of symptoms in their sample of 244 children aged 5 to 12 years with Attention Deficit Hyperactivity Disorder (ADHD) was significantly decreased following a behavioral sleep intervention (i.e., sleep hygiene). Specifically, they reported that the sleep hygiene intervention decreased sleep problems, decreased ADHD symptom frequency and severity, as measured by parent and teacher-rated ADHD rating scale IV (DuPaul et al. 1998), improved behavior, as measured by the Strengths and Difficulties questionnaire (Goodman, 1997), and improved working memory, as measured by the Working Memory Test Battery for Children (Pickering & Gathercole, 2001) at 3 months and 6 months following the intervention.

In addition to mental health, the literature also highlights the relationship between sleep and academic performance. Dewald et al. (2010) conducted a meta-analysis showing the association between sleep quality and school performance, reviewing 16 studies (N=13,631) that included students with mean ages between 8 and 18 years. The researchers excluded from their meta-analysis studies with specified samples of individuals with psychiatric illness or sleep disorders. All studies included in the meta-analysis used standardized test scores, grade point averages, or questionnaires to directly assess school performance, and used self-report, parent-report, or polysomnography to measure sleep quality. They found that the literature consistently showed significant positive relationships between school performance and sleep quality.

There is a clear relationship between sleep quality and mental health and sleep quality and school performance. Fortunately, sleep quality is amenable to intervention, suggesting potential improvement of aforementioned outcomes. As will be discussed more in depth in the next section, sleep hygiene practices are associated with sleep quality. Thus, sleep hygiene is an important and fortunately changeable factor related to mental health and academic success.

Knowledge of good sleep hygiene practices has been identified in the literature as a factor influencing engagement in sleep hygiene practices. For example, Brown et al. (2002) conducted a study of the relationships between sleep hygiene awareness, sleep hygiene practices, and sleep quality in university students. In their study of 124 undergraduate students (mean age=19.46, *SD*=2.70) , sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI; (Buysse et al. 1989)), and knowledge about good sleep hygiene and self-reported engagement in sleep hygiene practice using the Sleep Hygiene Awareness and Practice Scale (SHAPS; Lacks & Rotert, 1986). Brown et al. (2002) found that awareness and knowledge about sleep hygiene predicted sleep hygiene practices, which predicted sleep quality. These findings suggest that because sleep quality is predicted by sleep hygiene, and sleep hygiene can be predicted with knowledge of sleep hygiene, education about sleep hygiene could serve as a feasible intervention for improving sleep quality.

There is limited evidence to suggest males and females engage in sleep hygiene practices differently. For example, a study of adolescents aged 15-17 years old by Galland et al. (2017) found that females were more likely to engage in behaviors that contribute to poor sleep hygiene, like drinking caffeine in the evening, than males. However, research in this area is limited and therefore warrants additional exploration.

Measurement

The gold standard measure of sleep is polysomnography (Ibáñez et al. 2018; Marino et al. 2013). Polysomnography involves multiple objective physiological measurements, including brain function, eye movement, muscle activity, and heart and respiratory function, all of which typically occur during a subjects' overnight sleep study that takes place in a controlled setting (usually referred to as a sleep lab) under the supervision of a sleep technician. Another objective, validated, and accepted measure of sleep is actigraphy (Marino et al. 2013) Actigraphy uses specific

algorithms and measures wrist movements, using a type of wristwatch, as a proxy for sleep and wakefulness. In a study of diverse participants, actigraphy was found to be a very sensitive and accurate measure of sleep and wake times and total sleep time, as compared to the gold standard, polysomnography (Marino et al. 2013). Because measurement using actigraphy involves less equipment and the devise can be worn by the subject at home, it is considered to be much more feasible than polysomnography. However, both methods tend to be expensive and inaccessible for the purpose of measuring sleep in non-clinical populations (i.e., sleep which is not necessarily disordered or impairing). Although technological improvements are happening rapidly and the availability of 'smart' watches that can monitor physical health, including sleep, are on the rise, the quality of such measures are still under review and the cost remains to be a limitation. Therefore, subjective self-reported measures of sleep hygiene practices are often a more feasible indicator of sleep quality.

Multiple studies (Brick et al. 2010; Brown et al. 2002; Suen et al. 2010) examining sleep hygiene and objective measures of sleep quality in non-pediatric populations provide evidence to support the relationship between the two constructs. In a study examining the relationship between sleep quality and sleep hygiene in medical students conducted by Brick et al. (2010), poor sleep hygiene behaviors, such as infrequent exercise, watching television or studying in bed, and tobacco use, were associated with poor sleep quality. Similarly, Suen et al. (2010) conducted a study of the relationship between sleep quality and sleep hygiene knowledge and practice in a sample of 400 university students in Hong Kong (M=20.7 years, SD=1.6 years). The researchers measured sleep quality using the PSQI (Buysse et al. 1989), and measured engagement in sleep hygiene practices using 22 items selected by the researchers to assess the number of nights per week the participant engaged in behaviors known to promote or compromise quality sleep (higher scores indicated more

frequent engagement in sleep hygiene practices). Suen et al. (2010) found after adjusting for age, gender, year of study, and type of residence, sleep hygiene practice and sleep quality were significantly associated (p<0.001), such that those with better sleep quality as measured by the PSQI (Buysse et al. 1989) also reported higher engagement in sleep hygiene practice. The authors report the results of a regression analysis indicating an increase of 1 point on the sleep hygiene practice measure (i.e., engagement in one more sleep promoting practice one night per week) resulted in a 0.08-point decrease in the PSQI (Buysse et al. 1989) score (lower scores indicate better sleep quality). In a study conducted by Brown et al. (2002; described in more detail in the previous section), university students completed the PSQI and the SHAPS (Lacks & Rotert, 1986), measures of sleep quality, and knowledge about sleep hygiene and the extent to which respondents engage in sleep hygiene practices respectively. Similar to the measure used in the study conducted by (Suen et al. 2010), engagement in sleep hygiene practices was assessed by asking participants to identify the number of nights per week they engaged in a series of practices known to promote or compromise sleep, and knowledge was assessed in part by asking participants to rate how beneficial they believed each of a series of practices (e.g., taking a nap) were to sleep using a 7-point Likert scale (e.g., *(1)behavior is very beneficial to sleep* to *(7) behavior is very harmful to sleep*). Brown et al. (2002) reported significant findings linking sleep hygiene knowledge to practice (p=.001).

Research to date on the topic of sleep hygiene indicates that adolescent self-reported measures are generally valid and reliable measures of sleep hygiene for this population (LeBourgeois et al. 2005; Lewandowski et al. 2011; Storfer-Isser et al. 2013). In one study, LeBourgeois et al. (2005) examined sleep hygiene and sleep quality using the self-reported Adolescent Sleep Hygiene Scale (ASHS; LeBourgeois et al. 2005) and Adolescent Sleep-Wake

Scale (ASWS; LeBourgeois et al. 2005) respectively, in 1348 adolescents aged 12 to 17 years from Southern Mississippi and Rome, Italy. In addition to identifying differences in sleep quality across the cultures, with Italian adolescents reporting better sleep quality, the researchers were able to account for significant variance in sleep quality with sleep hygiene, after controlling for demographics (17% of variance for Italians and 16% of variance for Americans). Although this research relied on self-reported measures of sleep quality, the findings support the idea that sleep hygiene, a modifiable set of behaviors, has an important influence on sleep quality in adolescents.

To examine the psychometric properties of available subjective parent- and child-report pediatric sleep measures, Lewandowski et al. (2011) conducted an evidence-based review of sleep related measures using criteria developed by the Society of Pediatric Psychology Assessment Task Force (Cohen et al. 2008). Based on the criteria, the authors examined the available literature on each measure for the following: 1) availability of the measure with instructions on its use and in scoring, 2) use of the measure by investigators other than the developer with findings published in a peer-reviewed journal, and 3) existence of validity and reliability data of the measure.

According to Cohen et al. (2008), to be properly evaluated and rated requires the availability of "sufficient detail about the measure to allow critical evaluation and replication (e.g., measure and manual provided or available upon request)" (p. 913). The lowest rating of 'promising assessment tool' was given to measures which were presented in at least one peer-reviewed article by investigators other than the measure developers, reporting vague or moderate psychometric properties. Measures rated as 'approaching well-established' were published in two or more peer-reviewed articles by investigators other than the measure developers, reporting vague or moderate psychometric properties. To be considered 'well-established' the measure must be reported in two

or more peer reviewed articles by investigators other than the measure developers, and report detailed statistical plans and findings of good psychometric properties in at least one of the articles.

In total, Lewandowski et al. (2011) identified 21 subjective parent- and/or child- report sleep measures, four of which were identified as measures of 'sleep habits and hygiene'. Of the four, only one assessment tool, the ASHS (LeBourgeois et al. 2005), was identified for use with adolescents and the only measure for youth self-report. The ASHS (LeBourgeois et al. 2005) and sufficient information about the tool were available and readily accessible for use, as well as one peer-reviewed article by investigators other than the tool developer. Using the above criteria, the review rated the ASHS (LeBourgeois et al. 2005) as 'approaching well-established' due to the fact that while the measure was presented in two peer-reviewed articles, and found to have good reliability, the validity of the measure was found to be only moderate, suggesting that more research needs to be done on this measure. Similar limitations of the measure were identified by Spruyt and Gozal (2011) in their review of subjective pediatric sleep questionnaires as diagnostic or epidemiological tools. Specifically, the authors note that although the literature supports the reliability of the tool, the ASHS (LeBourgeois et al. 2005) lacked evidence of validity, confirmatory analyses, and standardization of norms.

Storfer-Isser et al. (2013) conducted a study examining the psychometric properties of the ASHS (LeBourgeois et al. 2005) using a sample of 514 adolescents, ages 16 to 19 years, ultimately determining the measure was psychometrically sound for use in research and in assessing sleep hygiene in adolescents. Participants in the study completed the self-report measure and used wrist actigraphy which provided objective data on their sleep. Behavioral reports from caretakers also were collected as part of the study. As a result of confirmatory factor analyses, items were removed and/or loaded onto different factors, resulting in a revised six-factor, 24-item model with adequate

fit. The six factors were: Physiological, Sleep Stability, Sleep Environment, Daytime Sleep, Behavioral Arousal, and Cognitive/Emotional.

In order to ensure that the measure truly assesses sleep hygiene practices in the intended population, internal consistency reliability of the ASHS (LeBourgeois et al. 2005) total score and subscales were examined using Cronbach's alpha. Analyses showed strong internal consistency of the scale (α=.84), as well as for six of the eight subscales. Specifically, the six subscales found to have strong internal consistency included physiological (α=.60), behavioral arousal (α=.62), cognitive/emotional (α=.81), sleep environment (α=.61), daytime sleep (α=.78), and sleep stability (α=.68). Concurrent validity of the ASHS (LeBourgeois et al. 2005) with actigraphy-based sleep variables as well as self-reported daytime sleepiness was assessed using correlations. The authors report significant positive correlations between total scores and objective measures of sleep duration (r=.16) and sleep efficiency (r=0.12). In addition, the authors found that the total scores were negatively correlated with self-reported daytime sleepiness (r=-0.26), supporting the notion that better sleep hygiene is associated with lower levels of daytime sleepiness. These data indicate that the items composing the total score and each of the domains adequately measure what they propose to measure, supporting their use as valid and reliable self-reported measures of sleep hygiene practices in adolescents.

Validity was further assessed by categorizing participants as having good sleep hygiene or poor sleep hygiene based on top and bottom sample-based quintiles of the ASHS (LeBourgeois et al. 2005) total scores, and examining their relationship with objective measures of sleep using actigraphy. Those with good sleep hygiene had longer duration of sleep, earlier bedtime, shorter sleep onset latency, and less daytime sleepiness as compared to those with poor sleep hygiene,

confirming the concurrent validity of the ASHS (LeBourgeois et al. 2005) with actigraphy measures of sleep.

Convergent validity was assessed using correlations with behavioral outcomes based on the Child Behavior Checklist (CBCL; Achenbach, 1999). The total ASHS (LeBourgeois et al. 2005) score was significantly correlated with behavioral problems and school competency (p<.001) as measured with the CBCL (Achenbach, 1999). Those with higher ASHS (LeBourgeois et al. 2005) total scores had lower internalizing (p<.001) and externalizing behavior scores (p<.001), and higher school competency scores (p<.001) on the CBCL (Achenbach, 1999), supporting the hypothesis that sleep hygiene practices are related to important outcomes, including behavioral, social, and academic.

Given the extensive research on the psychometric properties of the ASHS (LeBourgeois et al. 2005) as an acceptable self-report measure, this measure was chosen for use in the larger study from which data for this study will be analyzed. The ASHS (LeBourgeois et al. 2005) was used to examine the sleep hygiene practices and sleep quantity of high school students in the sample in the present study.

Subjective Well-Being

Overview

Subjective well-being is considered by many to be the scientific term for happiness. According to Diener (2000), subjective well-being refers to the perceived evaluation of an individual's own life, including evaluation of their own positive and negative emotions, overall satisfaction with their life, and satisfaction with various domains of their life (e.g., work or relationships). Greater subjective well-being is typically conceptualized as having high levels of satisfaction with life and positive affect, and low levels of negative affect, while lower subjective

well-being is characterized by reduced levels of satisfaction with life and positive affect, and increased levels of negative affect.

As basic needs are increasingly met for people in the developing world, increased focus has been put on the other factors that contribute to a good life, namely, levels of happiness (Inglehart, 1990). In fact, Suh et al. (1998) conducted a study examining how important happiness is to individuals. The researchers surveyed over 7000 college students from over 40 countries across the world. They found that regardless of the country, most of their sample rated happiness as being highly important, with 69% of the sample giving it the highest rating available. As the importance of happiness becomes more salient in our progressing society, scientists have begun trying to harness its power to improve life. As the global COVID-19 pandemic is changing the way many citizens of the world experience life, work, education, socialization, and engagement in health-promoting behaviors during lockdowns, focus is being put on subjective well-being as an important factor contributing to physical and mental health and wellness. In efforts to understand what happiness is, what factors influence it, and how to measure it, positive psychologists have endeavored to define the construct of happiness scientifically.

Influencing Factors

Contrary to what may be expected, multiple studies (Brickman et al. 1978; Diener, 1984; Lyubomirsky & Ross, 1999) have found that external factors such as life circumstances (e.g., wealth) and major life events (e.g., winning the lottery or becoming paralyzed) have little influence on subjective well-being once basic needs have been met (Costa et al. 1987; Diener & Oishi, 2000; Diener et al. 1993; Diener & Suh, 1999; Myers, 2000; Schimmack & Oishi, 2005). This suggests that subjective well-being is largely influenced by factors other than life circumstances or major life events. For example, a comparison study of subjective well-being and the components of the

construct (i.e., life satisfaction, affect) in Russian adults before and during the COVID-19 global pandemic was conducted by Rasskazova et al. (2020). Using data collected prior to the pandemic (between 2017 and fall 2019) the researchers were able to compare differences in reported life satisfaction and affect among the cohorts. The study included 457 people in the pre-pandemic sample (M=29 years) and 409 people in the pandemic sample (M=32.9 years; range=18-64). Notably, there was a statistically significant difference in the ages of the groups (p<0.01). In analyses comparing levels of subjective well-being among the groups, the researchers found insignificant differences in subjective well-being between the groups (p>0.20). However, in breaking the construct down to its parts, the researchers found that measures of life satisfaction and negative affect were largely unchanged among the groups; however, reported levels of positive affect were significantly lower (p<0.01). The authors also collected and examined data related to anxiety about the pandemic and coping skills from the pandemic group and found that the utilization of coping strategies moderated the effect of increased anxiety related to the pandemic on levels of positive affect. Put simply, pandemic-related anxiety was associated less strongly with lower levels of positive affect when utilization of coping strategies was higher (Rasskazova et al, 2020). This study provides support for the idea that subjective well-being is not influenced by life circumstances or major events alone.

A similar study conducted by Von Soest et al. (2020) to examine differences in life satisfaction and well-being before and during the pandemic focused on adolescents, and reported findings that contradict those reported by Rasskazova et al. (2020) in the study described above. Survey data collected from lower secondary students in Norway in 2018, before the start of the pandemic (N=13,790) and after the start of the pandemic (N=19,799) were compared. The researchers measured life satisfaction using a self-reported measure that instructed participants to

rate their satisfaction with life on a 0 to 10 scale (where 0 is the worst possible life and 10 is the best possible life). A rating of 6 or higher on the life satisfaction measure is considered ‘high life satisfaction’. Although the study showed that even during the pandemic restrictions, a majority of the sample reported high life satisfaction, the authors report a decrease in the number of students with high life satisfaction in the pandemic group. While 88% of boys (M=7.45, SD=1.86) and 78% of girls (M=6.94, SD=1.98) reported high life satisfaction prior to the pandemic, this rate decreased to 71% of boys (M=6.54, SD=2.06) and 62% of girls (M=6.05, SD=1.96) during the pandemic restrictions. Notably, they found that lower life satisfaction was significantly associated with increased concern about illness and infection, suggesting that although the circumstance led to a decrease in life satisfaction regardless of level of concern about the virus, this anxiety may be an area of intervention for some students.

The researchers also administered a 6-item questionnaire to assess subjective well-being using a 5-point scale (where 1 is 'not at all’ and 5 is ‘all the time’). The authors report a similar decline on this measure, with significantly lower ratings for both boys and girls during pandemic restrictions (p<0.001). Interestingly, the authors also examined the role of socioeconomic status on life satisfaction and subjective well-being before and during the pandemic restrictions and found that the differences in ratings related to socioeconomic status were significantly reduced during the pandemic restrictions. The authors offer differences in the effect of the pandemic on families of different means as a possible explanation. Specifically, the authors suggest that the students from homes of lower means were less negatively affected by the social restrictions of the pandemic than were students from families who were accustomed to participating in (typically expensive) extracurricular leisure activities, such as organized sports and travel, while students from lower income families may not have experienced such a change.

In efforts to identify the proportion of variability in well-being attributable to genetics, as opposed to external factors, researchers have utilized studies of monozygotic and dizygotic twins. Many studies have concluded that about 38% to 55% of variability in positive or negative emotionality or life satisfaction can be predicted by genetics (Stubbe et al. 2005; Tellegen et al. 1988), leaving about 45-62% of variability in these traits up to external or environmental factors.

Measurement

The literature on subjective well-being has generally conceptualized it as a combination of multiple factors (Diener, 2000; Diener & Chan, 2011; Suldo, 2016; Suldo & Shaffer, 2008; Suldo et al. 2016), specifically life satisfaction, positive affect, and negative affect. Multiple psychometrically sound self-reported measures of life satisfaction are available for use in adolescent populations, including Student's Life Satisfaction Scale (Huebner, 1991), Multidimensional Students' Life Satisfaction Scale (Huebner, 1994), and Brief-Multidimensional Students Life Satisfaction Scale (Seligson et al. 2003). The most common measure of positive and negative affect in youth is the Positive and Negative Affect Scale for Children and Adolescents (PANAS-C; Laurent et al. 1999), which was modified from the adult version, the Positive and Negative Affect Schedule (Watson et al. 1988).

Implications

In a review of the literature, Lyubomirsky et al. (2005) summarized longitudinal, cross-sectional, and experimental research findings attempting to answer the question "which comes first: happiness or success?". They reported that, consistently, studies have found associations between happiness and success in work, love, and health domains (Kern et al. 2015). The findings reported in the review by Lyubomirsky et al. (2005) suggest that happiness often precedes success in the various studies conducted. Interestingly, experimental studies conducted found that both

short-term and long-term happiness precede successful outcomes (Futterman et al. 1994; Hirt et al. 1996; Tice & Wallace, 2000). This research suggests that the notion of success leading to happiness may be inaccurate; rather, success follows happiness, which has implications for the well-being of students. If happiness, or subjective well-being, predicts success, and subjective well-being is malleable, it may be an area of intervention for improving various outcomes which tend to define success, such as career or academic success, good mental and physical health, and social or romantic success.

Sleep and Subjective Well-Being

Multiple studies examining the relationship between sleep quality and subjective well-being in adult populations have found a strong link between the two constructs (Gadermann et al. 2016; Lai, 2018; Weinberg et al. 2016), as well as studies of sleep hygiene and subjective well-being in adult populations (Barber et al. 2014; Levy, 2003; Peach et al. 2016), providing further evidence in support of the important role of sleep on subjective well-being. Although there is strong evidence in the literature supporting the relationship between sleep and subjective well-being in adults, there is a lack of studies examining the relationship between these constructs in youth, particularly in high school students.

In a study examining the relationship between health-promoting behaviors and subjective well-being, Shaffer-Hudkins (2011) obtained self-report measures of multiple health promoting behaviors, including dietary habits, physical habits, sleep hygiene, safety habits, and attitudes toward substance use from 246 middle school students (grades 6 through 8). To examine subjective well-being, Shaffer-Hudkins (2011) calculated a composite score based on its three components: global life satisfaction, positive affect, and negative affect, using the Students' Life Satisfaction

Scale (SLSS; Huebner, 1991), and the Positive and Negative Affect Scale for Children (PANAS-C; Laurent et al. 1999).

In order to assess sleep in the sample, the author asked five sleep-related questions regarding hours of sleep per night, and bedtime and wake-times on school days and weekends. However, only one item was used in analysis, specifically the question regarding hours of sleep per night ("how many hours of sleep do you usually get?") with 4 response options including: less than 7 hours, 7-8 hours, 9 hours, and 10+ hours). Descriptively, 13% of the sample reported getting less than 7 hours of sleep per night, 61% getting 7-8 hours of sleep per night, 19% getting 9 hours of sleep per night, and 7% getting ten or more hours per night. The sample also reported inconsistencies in wake times between school days and weekends. Notably, all participants reported waking up before 8 am on school days, with most waking up before 6 am, while 61% reported waking up later on weekends.

Shaffer-Hudkins (2011) calculated a correlation coefficient to examine the strength and direction of the relationship between sleep and subjective well-being. A small but significant relationship between average hours of sleep per night and subjective well-being (r=.23, p<.05), as well as between average hours of sleep per night and positive affect (r=.28, p<.05), and negative affect (r=-.14, p<.05) was reported. Specifically, those participants with more hours of sleep per night reported higher levels of subjective well-being and positive affect and lower levels of negative affect. In addition, through calculation of intercorrelations between health-promoting variables, significant relationships between sleep and physical activity (r=.14, p<.05), safety habits (r=.34, p<.05), and attitudes towards substance use (r=-.25, p<.05), but not healthy diet (r=.07) were found, suggesting that more sleep per night is associated with more physical activity and safety habits, and negative attitudes toward substance use. Although the individual health

promoting behaviors examined did not uniquely predict subjective well-being, a simultaneous regression found that a linear combination of the five health-promoting behaviors accounted for 15% of the variance in subjective well-being, and attitudes toward substance use explained much of the variance (ß=-.28, p<.0001).

This study by Shaffer-Hudkins (2011) provides evidence to support the relationship between physical health and well-being in adolescent students. Importantly, it highlights the role of sleep on well-being. Although this study contributed important findings to the literature about the relationship between health-promoting behaviors and subjective well-being, it was not without limitations. The study utilized a single, subjective self-reported question about the average amount of sleep each night, using a four-point Likert-type scale for response options, limiting the reliability and precision of the variable. Further, the questions failed to assess other factors influencing sleep in youth, such as consumption of caffeinated drinks in the evenings, sleep environment, and latency of sleep onset. In addition, the study focused specifically on students in middle school (i.e., grades 6 through 8), leaving questions about sleep and subjective well-being unanswered among high school students (i.e., students in grades 9 through 12). This research certainly provided justification for further exploration of the role of sleep and sleep behaviors on subjective well-being in youth, particularly in high school students and with examination of sleep hygiene behaviors.

In order to address this gap in the literature, Smith (2019) replicated the study by Shaffer-Hudkins (2011) in students in grades 9 through 12 and included a measure of sleep hygiene, the ASHS (LeBourgeois et al. 2005). In this sample of 450 high school students, Smith (2019) reported strong estimates of reliability of the ASHS (LeBourgeois et al. 2005) subscales (Cronbach's α ranged from .52 - .88). This study found that subjective well-being was positively and significantly

correlated with six of the eight subscales of the ASHS (LeBourgeois et al. 2005), including behavioral arousal (r=.11, p<.05), sleep environment (r=.10, p<.05), sleep stability (r=.14, p<.05), daytime sleep (r=.10, p<.01), bedtime routine (r=.17, p<.05), and cognitive/emotional factors (r=.47, p<.01), in addition to a positive and significant correlation to physical activity. However, further exploration of the relationship between sleep hygiene and subjective well-being in this sample is warranted in order to inform policy and practices affecting high school students (e.g., school start times, social-emotional learning curriculum, health interventions).

Purpose of the Study

The present study explored the relationship between sleep hygiene practices and subjective well-being among high school students in grades 9 through 12. Data from surveys administered to students in these grades were examined. This study investigated the association between hours of sleep obtained and subjective well-being, as well as the influence of engagement in sleep hygiene practices, and levels of subjective well-being, on the likelihood of obtaining recommended hours of sleep. Additionally, the present study explored the roles of demographic variables, including gender, race, grade, and socioeconomic status, on sleep and subjective well-being.

Considering the documented relationship between sleep and well-being, and now taking into account the current circumstances much of the world is experiencing with the global pandemic resulting in increased sleep problems and decreased life satisfaction, understanding the role of sleep hygiene on sleep and subjective well-being in high school students is more important than ever, as findings from this study may influence interventions which promote good sleep and ultimately improved subjective well-being.

CHAPTER 3

METHOD

This study examined the sleep hygiene behaviors and subjective well-being of students in grades 9 through 12 through an analysis of data from self-reported surveys and questionnaires measuring each construct as part of a larger study examining the relationship between mental and physical wellness. Sleep hygiene describes the habits and practices that contribute to healthy sleep, including exercise, exposure to natural light, limiting naps, and avoiding caffeine and food close to bedtime. Subjective well-being refers to one's self-reported level of happiness as determined from measures of life satisfaction, positive affect, and negative affect. The relationship between sleep hygiene and reported levels of subjective well-being, as well as the role of demographic categories on the relationship, were examined. This chapter describes the design of the study, the setting and participants, and the survey administration protocol. In addition, procedures used during recruitment, methods by which data were collected, and the data analyses are described. Finally, the quality of the study and important ethical considerations are discussed.

Setting

This study utilized data collected as part of a larger study conducted by researchers at a large, urban university in west central Florida between March and May of 2019. Prior to beginning, and throughout implementation of the larger study, the Principal Investigator (PI) obtained and maintained approval from the USF Institutional Review Board (IRB; Pro 00038119) as well as

approval from the school districts in which data were collected. The goal of the original study was to investigate the relationship between 12 health-promoting behaviors and subjective well-being in a sample of students in grades 9 through 12, and to contribute to the knowledge base regarding the relationship between physical and mental wellness.

The following sections of this chapter describe the participants in the larger study and the relevant measures used in that investigation that informed the research questions for this study.

Participants

Between March and May of 2019, 450 students (*M*=15.70 years old; range: 14-20 years old) from five high schools (grades 9 through 12; one located in Western Pennsylvania, one in Western Florida, and three in Central Florida) provided parental consent and assent to participate in the larger study. See Table 1 for study sample and descriptive data. Participating students were required to be English speaking due to measures used being available and validated only in English. Due to the reading achievement level necessary for survey completion, students were excluded from participation if they were served exclusively in self-contained academic special education programs.

Measures

Demographic Information

Demographic data were collected on all participants in the original study. The demographic form, developed specifically for the original study, included four questions pertaining to the students' gender, age, race/ethnicity, and grade level. Each item on the demographic form used multiple choice response options. Participants completed this form after providing assent to participate in the study. Additionally, socio-economic status was collected for each participant and

was determined based on students' eligibility for free or reduced-price lunch, as reported by school personnel. A copy of the demographic form is provided in Appendix A.

Sleep Hygiene

The Adolescent Sleep Hygiene Scale (ASHS; LeBourgeois et al. 2005) was used to measure levels of engagement in sleep hygiene practices. The ASHS is a 28-item self-report measure of sleep-facilitating and sleep-inhibiting habits practiced by adolescents. The scale covers 9 domains: physiological, cognitive, emotional, sleep environment, daytime sleep, substances, bedtime routine, sleep stability, and bed/bedroom sharing. All items are rated based on frequency over the past month on a 6-point Likert scale that includes the following options, "Always", "Frequently-if not always", "Quite Often", "Sometimes", "Once in a While", and "Never". The scale provides a mean domain score for each domain as well as a total sleep hygiene score, of which higher scores indicate better sleep hygiene. This measure has good internal consistency (α=.80). For the purpose of this current study, the total sleep score was used for data analysis. A copy of this measure can be found in Appendix B.

Subjective Well-Being

The subjective well-being variable was calculated using the standardized scores from the Students' Life Satisfaction Scale (SLSS; (Huebner, 1991) and Positive and Negative Affect Schedule for Children (PANAS-C; (Laurent et al. 1999). Specifically, the associated z-scores for SLSS total scores and the positive affect sub-score from the PANAS-C were added together, and the associated z-score from the negative affect sub-score from the PANAS-C was subtracted (identical to procedures utilized in multiple other studies (Antaramian, 2015; Antaramian et al. 2010; Suldo & Shaffer, 2008; Suldo et al. 2016).

Students' Life Satisfaction Scale (SLSS; Huebner, 1991). The SLSS is a 7-item self-report measure of life satisfaction during the past several weeks, specifically applicable to students. Students are asked to what extent they agree or disagree with each of the 7 statements (e.g., "My life is going well", "I would like to change many things in my life", "I have what I want in life"). The measure utilizes a six-point Likert scale with response options including "Strongly Disagree", "Disagree", "Slightly Disagree", "Slightly Agree", "Agree", and "Strongly Agree" for each item. The SLSS has high internal consistency (α =.82) and test-retest reliability (correlation coefficient =.74), indicative of acceptable reliability across items and time. The SLSS also is positively correlated with other measures of life satisfaction, including the Andrews-Whithey life satisfaction item (r=.62). A copy of this measure can be found in Appendix C.

Positive and Negative Affect Schedule for Children (PANAS-C; (Laurent et al. 1999). The PANAS-C is a 10-item measure of positive (e.g., cheerful) and negative (e.g., miserable) affect in youth. The measure utilizes a 5-point Likert scale for response options for each item (i.e., "Very Slightly", "A Little", "Moderately", "Quite a Bit" and "Extremely") with regard to their feelings and experienced emotions during the past few weeks. The measure provides a total score for each of the two subscales, with 5 items contributing to the positive affect subscore, and 5 items contributing to the negative affect subscore, based on the average responses. Both the positive affect subscale and the negative affect subscale of the PANAS-C have high internal consistency (α = .89 and α = .91, respectively; Suldo et al. 2016). A copy of this measure can be found in Appendix D.

Procedures

Procedures Used in Larger Study

The PI met with administrators from each of the involved school districts in order to establish collaborative research-based partnerships and obtain a letter of support for the study. Notably, the PI provided the school districts with a professional development seminar related to physical and mental health. Once the collaboration was established, the study PI and school administrators developed timelines and determined how recruitment and data collection would occur at each individual school. Informed consent letters were distributed to interested students with intent to be sent home to their parents after study procedures and rationale were provided by the principal investigator to students in their classrooms. Of the 1,801 students who were recruited, 456 students (25.32%) returned consent forms and 450 ultimately completed participation in the study. See Table 1 for rate of consent by school. Signed assent was obtained at the time of survey administration from students who provided signed parental consent. Surveys were administered and completed on paper during students' health and/or physical education class, and the approximate completion time was 25 minutes. Students received a healthy snack as an incentive for survey completion. Copies of the consent and assent forms used can be found in Appendices E and F, respectively.

In order to protect privacy, participants were assigned an alphanumeric participant identification code at the time of data collection. All electronic data are stored in secured and encrypted databases, and physical data are stored in restricted access and locked facilities, accessible only to approved research team members.

Table 1.

Response Rate of Participants at Each School in Sample.

Location (School)	Teachers	Classes	Students Per Class	Participants Recruited	Participants Consented	Response Rate
Western PA (A)	3	15	18-35	351	142	40.46%
Central FL (B)	3	12	32-40	460	30	6.52%
Central FL (C)	3	12	19-31	301	64	21.26%
Central FL (D)	4	17	32-35	545	167	30.64%
Western FL (E)	1	4	34-40	144	53	36.80%
Total	14	49		1,801	456*	25.32%

Note. FL=Florida. PA=Pennsylvania. *Final sample included 450 students.

Data Entry

Data from the ASHS (LeBourgeois et al. 2005), SLSS (Huebner, 1991), the PANAS-C (Laurent et al. 1999), and Demographic form were collected on paper survey packets and were entered into a password protected Excel database by the PI or other IRB approved study personnel during May 2019. Data entered into the Excel database were imported into a database in the Statistical Package for Social Sciences (SPSS; version 24; IBM Corp, 2016).

Overview of Secondary Data Analyses

Permission was obtained from the PI of the larger study for a secondary analysis to be conducted by this researcher (already an approved member of the study staff team that collected the dataset analyzed by Smith, 2019). On June 11th, 2020, a modification was opened under the local IRB to change the PI of the study to this researcher; this modification was approved on June 15th, 2020, allowing access to the full dataset. For the purposes of this secondary analysis, use of the data related to the measures specific to this study, described previously, was extracted from the larger data set and used to create a secondary data file. The secondary data file included de-identified data and was used to conduct all analyses. Confirmation that additional approvals were not needed for this secondary analysis was obtained from the local IRB. Please see Appendix G for relevant correspondence.

All electronic data that were entered are stored in an encrypted electronic file. All de-identified raw data are stored behind locked doors to which only the PI has access. All self-identifying information (e.g., signed consent and assent forms) are kept in a locked file cabinet behind locked doors to which only the PI has access. The raw data will be kept in these secure locations for 5 years, post completion of the study. At the 5-year-point, physical documents will be shredded. Electronic records that contain identifying information (e.g., names of participants; survey data) are stored on a password protected computer and on a secured server that is backed up routinely.

Analysis Plan

The purpose of this thesis was to examine the sleep hygiene practices and hours of sleep obtained, and the relationship between sleep hygiene and sleep obtained, as well as the relationship between sleep obtained and subjective well-being in students in grades 9 through 12, by addressing the following questions (see Table 2 for details on variables of interest):

(1) How many hours of sleep per night do students in the sample report obtaining?

(2) To what degree do students in the sample obtain the recommended number of hours of sleep per night?

(3) To what extent, if any, are the following sleep hygiene factors related to the degree to which students obtain the recommended number of hours of sleep per night: physiological, behavioral arousal, cognitive/emotional, environmental, sleep stability, daytime sleep, substances, and bedtime routine?

(4) To what extent, if any, is the number of hours of sleep obtained per night related to subjective well-being in students?

In order to answer each of the research questions, the analysis plan described in the section below was utilized.

Research Question 1. *How many hours of sleep per night do students in the sample report obtaining during the school week?* To answer this question, data regarding the bedtime and wake times reported by students were analyzed. Responses to items 30 and 31 of the ASHS, regarding the bedtime and wake times during the school week, were analyzed to answer this question. For these items, participants indicated their response by writing in their bedtime and wake time (using the hh:mm am/pm format, e.g., 10:30 pm, 6:00 am). The number of hours of sleep per night variable was composed by calculating the number of hours between the responses to items 30 and 31 (e.g., 7.5 hours). To determine the descriptive characteristics of sleep quantity within this sample, means, standard deviations, and additional descriptive data (e.g., skew, kurtosis) were calculated.

Research Question 2. *To what degree do students in the sample obtain the recommended number of hours of sleep per night during the school week?* To answer this research question, the number of hours of sleep per night variable was calculated using the difference between participants' responses to items 30 and 31 of the ASHS, which assess their bedtime and wake time during the school week, respectively, which was then compared to the number of hours of sleep per night recommended (i.e., 8-10; Paruthi et al. 2016). Using this process, a new variable, *sufficient sleep*, was coded to reflect participants obtaining between 8 or more hours of sleep per night, and participants obtaining fewer than 8 hours of sleep per night (0=insufficient sleep, 1=sufficient sleep). To determine the descriptive characteristics of sleep quantity within this sample, means, standard deviations, and additional descriptive data (e.g., skew, kurtosis) were

calculated. The frequency and percent distribution of the responses were calculated to answer this question.

Research Question 3. *To what extent, if any, are the following sleep hygiene factors related to the degree to which students obtain the recommended number of hours of sleep per night: physiological, behavioral arousal, cognitive/emotional, environmental, sleep stability, daytime sleep, substances, and bedtime routine, after controlling for demographic differences?* To answer research question 3, a binary logistical regression was used to calculate the likelihood of students obtaining the recommended hours of sleep per night (i.e., sufficient sleep or insufficient sleep) given their engagement in each of the assessed sleep hygiene factors (i.e., scores on each of the 8 ASHS subscales), after controlling for the effect of demographic characteristics, including grade level, gender, socioeconomic status, and race/ethnicity. This analysis allowed for the examination of the relationship between engagement in sleep hygiene factors and level of recommended sleep obtained each night.

Research Question 4. *To what extent, if any, is subjective well-being related to the degree to which students obtain the recommended number of hours of sleep per night after controlling for demographic differences?* To answer research question 4, a logistical regression was used to calculate the likelihood of students obtaining the recommended hours of sleep per night given their level of subjective well-being, after controlling for the effect of demographic characteristics, including grade level, gender, socioeconomic status, and race/ethnicity. This analysis allowed for the examination of the relationship between subjective well-being and the level of recommended sleep obtained.

Table 2.

Variables of Interest.

Demographics			
Construct	Measure	Variable Coding/Scoring	Range
Gender	Demographic Form	Male *(0)* Female *(1)*	Dummy coded; 0, 1
Age	Demographic Form	6-point scale ranging from 14 to 19.	14-19
Race/ethnicity	Demographic Form	Respondents selected all that apply of a series of races and ethnicities and a new dummy coded variable was created for each race/ethnicity: White African American Hispanic Multiracial Due to small portions of some races endorsed, those who selected solely Asian, Pacific Islander, American Indian/Pacific Islander or other, were coded as Other.	Dummy coded; 0, 1
Grade level	Demographic Form	4-point scale ranging from 9^{th} to 12^{th} grade	9, 10, 11, 12
Socioeconomic Status		Free or reduced-price lunch *(0)* Non-free or reduced-price lunch *(1)*	
Sleep			
Construct	Measure	Variable Coding/Scoring	Range
Sleep Hygiene	ASHS (total score; 27 items)	Average of all subscale scores	1-6
Physiological Factor	ASHS subscale	Average of 5 items of the subscale, each item using a 6-point scale (1=never, 0% of the time to 6=always, 100% of the time), with higher scores indicating higher engagement in sleep hygiene practices related to physiological factors.	1-6

Table 2 (Continued)

Variables of Interest.

Sleep			
Construct	Measure	Variable Coding/Scoring	Range
Behavioral Arousal Factor	ASHS subscale	Average of 3 items of the subscale, each item using a 6-point scale (1=never, 0% of the time to 6=always, 100% of the time), with higher scores indicating higher engagement in sleep hygiene practices related to behavioral arousal.	1-6
Cognitive/Emotional Factor	ASHS subscale	Average of 6 items of the subscale, each item using a 6-point scale (1=never, 0% of the time to 6=always, 100% of the time), with higher scores indicating higher engagement in sleep hygiene practices related to cognitive/emotional factors.	1-6
Sleep Environment Factor	ASHS subscale	Average of 5 items of the subscale, each item using a 6-point scale (1=never, 0% of the time to 6=always, 100% of the time), with higher scores indicating higher engagement in sleep hygiene practices related to sleep environment.	1-6
Daytime Sleep Factor	ASHS subscale	Average of 2 items of the subscale, each item using a 6-point scale (1=never, 0% of the time to 6=always, 100% of the time), with higher scores indicating higher engagement in sleep hygiene practices related to daytime sleep.	1-6
Substances Factor	ASHS subscale	Average of 2 items of the subscale, each item using a 6-point scale (1=never, 0% of the time to 6=always, 100% of the time), with higher scores indicating higher engagement in sleep hygiene practices related to substances.	1-6
Substances – Abstains	ASHS subscale	Items used to calculate the ASHS substances factor subscale were collapsed into two categories: “abstained” (1=complete abstinence from product; endorsement of ‘never’ on both substance use items) and “utilized” (0=utilization of any product/endorsement of any response other than ‘never’ on either of the substance use subscale items).	Dummy coded; 0, 1

Table 2 (Continued)

Variables of Interest.

Sleep			
Construct	Measure	Variable Coding/Scoring	Range
Bedtime Routine Factor	ASHS subscale	6-point scale (1=never, 0% of the time to 6=always, 100% of the time; reverse scored), with higher scores indicating higher engagement in sleep hygiene practices related to bedtime routines.	1-6
Sleep Stability Factor	ASHS subscale	Average of 3 items of the subscale, each item using a 6-point scale (1=never, 0% of the time to 6=always, 100% of the time), with higher scores indicating higher engagement in sleep hygiene practices related to sleep stability.	1-6
Weekday Bedtime	ASHS (1 item)	Qualitative response in which respondents indicated the time (hh:mm) of their weekday bedtime.	12:00 am – 11:59 pm
Weekday Wake time	ASHS (1 item)	Qualitative response in which respondents indicated the time (hh:mm) of their weekday wake time.	12:00 am – 11:59 pm
Weekend Bedtime	ASHS (1 item)	Qualitative response in which respondents indicated the time (hh:mm) of their weekend bedtime.	12:00 am – 11:59 pm
Weekend Wake time	ASHS (1 item)	Qualitative response in which respondents indicated the time (hh:mm) of their weekend wake time.	12:00 am – 11:59 pm
Weekday hours of sleep	ASHS	This variable was calculated by subtracting the weekday wake time response from the weekday bedtime response.	0-24
Weekend hours of sleep	ASHS	This variable was calculated by subtracting the weekend wake time response from the weekend bedtime response.	0-24
Weekday Sleep Sufficiency	ASHS	This variable was coded based on the weekday hours of sleep variable; weekday hours of sleep of 8 or more hours will be coded as *sufficient (1)*, and weekday hours of sleep less than 8 hours will be coded as *insufficient (0)*.	Dummy coded; 0, 1

Table 2 (Continued)

Variables of Interest.

Sleep			
Construct	Measure	Variable Coding/Scoring	Range
Weekend Sleep Sufficiency	ASHS	This variable was coded based on the weekend hours of sleep variable; weekend hours of sleep of 8 or more hours will be coded as *sufficient (1)*, and weekend hours of sleep less than 8 hours will be coded as *insufficient (0)*	Dummy coded; 0, 1
Subjective Well-Being			
Construct	Measure	Variable Coding/Scoring	Range
Subjective Well-Being	SLSS, PANAS-C	This variable was calculated by subtracting the standardized PANAS-C Negative Affect subscale score from the sum of the standardized PANAS-C Positive Affect subscale score and the standardized SLSS score.	z-score
Life Satisfaction	SLSS	Average of all 7 items (each scored on a 6-point scale; 1=*strongly disagree*, 6=*strongly agree*; two items reverse scored); Higher scores indicate higher life satisfaction.	1-7
Positive Affect	PANAS-C subscale	Average of 12 items composing the subscale (each scored on a 5-point scale (1=*very slightly or not at all* to 5=*extremely*)	1-5
Negative Affect	PANAS-C subscale	Average of 15 items composing the subscale (each scored on a 5-point scale (1=*very slightly or not at all* to 5=*extremely*)	1-5

Note. ASHS= Adolescent Sleep Hygiene Scale; SLSS=Students' Life Satisfaction Scale; PANAS-C=Positive and Negative Affect Schedule for Children.

Ethical Considerations

The USF IRB and the participating districts granted approval for the original, larger study prior to data collection. Parent consent and student assent was obtained for all participants prior to data collection, and copies of these forms are presented in the appendices. The PI of this study was a member of the research team for the larger study and received approval from USF IRB to conduct this secondary data analysis (see Appendix G).

CHAPTER 4

RESULTS

The purpose of this chapter is to present the results of the analyses used to answer the research questions of this study. Descriptive statistics were utilized to assess the number of hours of sleep per night students in the sample reported obtaining during the school week and the frequency with which the number of hours of sleep per night were considered sufficient, based on recommendations by the American Academy of Sleep Medicine (Paruthi, 2016). To answer research questions 3 and 4, and to examine the relationship between engagement in sleep hygiene factors and likelihood of obtaining sufficient sleep, and the relationship betwee subjective well-being and the likelihood of obtaining sufficient sleep, after controlling for demographic characteristics, binary logistic regression analyses were calculated.

Treatment of the Data

Data Entry

All data were entered into a Microsoft Excel database during the spring of 2019 by the PI of the larger study. Data were checked for data entry errors by research team members; specifically, 20% of entered data (i.e., 90 survey packets) were audited for accuracy by team members.

For the purposes of this secondary analysis of the data, the de-identified raw data from only the variables of interest (i.e., demographics, Student Life Satisfaction Scale (SLSS), Positive and

Negative Affect Schedule (PANAS), and Adolescent Sleep Hygiene Scale (ASHS)) were extracted from the larger data set and used for analysis. These data were then examined by the present researcher for scores outside of expected ranges. When scores outside of range were identified, the survey packet was checked for the correct response and re-entered into the database. Then, variables of interest were calculated (i.e., SLSS total score, PANAS Positive Affect and Negative Affect subscale scores, ASHS sub-scores, hours of sleep, and sufficient sleep). The data were then imported into SPSS (version 26) for analyses.

Additional Treatment of the Data

To assess univariate normality of each variable, box and whisker plots were examined, and skewness and kurtosis of each of the measures were calculated. Skewness and kurtosis values for the hours of sleep per night variable, subjective well-being, and the ASHS subscale scores were within the normal ranges, while 2 of the ASHS subscale scores were outside of the normal range. Specifically, ASHS Sleep Environment subscale scores produced a skewness value outside of the normal range (skewness=1.28, *kurtosis*=1.67), and the ASHS Substances subscale scores produced skewness and kurtosis values outside of the normal ranges (*skewness*=-4.81, *kurtosis*=26.57). The latter is likely due to the infrequent number of participants who endorsed high scores on these measures (e.g., limited utilization of tobacco or alcohol).

Notably, a small portion of the sample endorsed smoking or chewing tobacco or drinking alcohol in the evening. Specifically, 92.7% and 90.6%, respectively, endorsed 'never' engaging in those behaviors, with the remaining sample endorsing engagement between 'always' and 'once in a while' on the 6-point Likert scale. Due to the limited number of participants in the sample endorsing the use of substances as assessed by the ASHS Substances subscale, responses to these items were collapsed into two categories, specifically, "abstained" (i.e., 1=complete abstinence

from product; endorsement of 'never' on both substance use items) or "utilized" (i.e., 0=utilization of any product/endorsement of any response other than 'never' on either of the substance use subscale items), such that greater scores indicated abstinence from substances. Ultimately, 86.7% (*n*=390) of the sample reported completely abstaining from substances in the evening, while 13.3% (*n*=60) reported utilization of substances.

Data also were analyzed for the presence of multivariate outliers as determined by the range of standardized residuals between -3.29 and 3.29 (Tabachnick, Fidell, & Ullman, 2007). All data were within normal range, with the exceptions of ASHS Sleep Environment subscale, which contained 4 outliers, and ASHS Physiological subscale, which had 1 outlier. The following analyses were conducted with and without the outliers and the results were virtually the same, therefore the outliers were left in the data and the following results reflect this inclusion.

Missing Data

Missing values were addressed by the use of pairwise deletion; scale scores and subscale scores (i.e., SLSS, PANAS positive and negative affect scores, and ASHS subscale scores) were deleted when 30% or more of the items were missing for a particular case. This resulted in the pairwise deletion of 21 cases from the ASHS Sleep Stability subscale, 6 cases from the ASHS Sleep Environment subscale, 3 cases from the ASHS Cognitive/Emotional and Physiological subscales, and 2 from the ASHS Behavioral Arousal subscale. Notably, a portion of the sample lacked complete data for the items composing the hours of sleep variables. Specifically, 6.22% (*n*=28) of participants from the original data set had missing data.

Composition of the Sleep Hygiene Variables

Each of the 7 ASHS sub-scale scores (i.e., physiological factor, behavioral arousal factor, cognitive/emotional factor, sleep environment factor, sleep stability factor, daytime sleep factor,

substances factor, and bedtime routine factor) were calculated using the mean of their related items. One item which composed the bedtime routine factor score, was reverse scored. See Table 2 in Chapter 3 and Appendix B for more information. Due to low rates of endorsement of the items composing the ASHS substances subscale, the variable was recoded by collapsing the responses to these items into two categories: "abstained" (i.e., 1=complete abstinence from product; endorsement of 'never' on both substance use items) or "utilized" (i.e., 0=utilization of any product/endorsement of any response other than 'never' on either of the substance use subscale items), as described in further detail previously.

To examine the number of hours of sleep per night reported by students in the sample, a *weekday hours of sleep* variable was calculated using items 30b and 31b of the ASHS, which assessed participants' school night bedtime and wake time, respectively. Wake time (i.e., item 31b) was subtracted from bedtime (i.e., item 30b) in order to calculate the number of hours of sleep usually obtained.

The number of hours of sleep was then coded based on the recommendations by the American Academy of Sleep Medicine for 8 to 10 hours of sleep per night for the age group of the sample. Values in *weekday hours of sleep* were coded as *sufficient* if they were 8 or more, and *insufficient* if they were less than 8.

Composition of the Subjective Well-Being Variables

Prior to conducting data analyses, the SLSS total score was calculated using the mean of the 7 items of the SLSS, and the PANAS Positive Affect and Negative Affect sub-scale scores were calculated using the mean of the 12 and 15 related items, respectively. The subjective well-being composite variable was created using SLSS total scores and PANAS Positive Affect and Negative Affect subscale scores. First, standardized z-scores were calculated from the aggregate data for

each score (i.e., SLSS total score, Positive Affect sub-score, and Negative Affect sub-score). Then, the composite subjective well-being scores were calculated by subtracting the standardized Negative Affect z-score from the sum of the standardized Positive Affect z-score and the standardized SLSS total z-score (i.e., (*zSLSS + zPositive Affect*) – *zNegative Affect*). This procedure is aligned with those of multiple prior studies (Antaramian, 2015; Antaramian et al. 2010; Shaffer-Hudkins, 2011; Suldo & Shaffer, 2008; Suldo et al. 2016).

Descriptive Results

The study sample included a total of 450 students with a mean age of 15.69 (*SD*=1.23) from 5 high schools (i.e., grades 9 through 12) in Pennsylvania and Florida. Half of the total sample were students in the 9th grade (50.0%). The sample was racially diverse, with 38.9% of students identifying as Caucasian, 24.7% as Hispanic or Latino, 22.4% as African American or Black, and 6.2% indicating another race. About 7.8% of the sample self-identified as more than one race. Nearly half of the sample was eligible for free or reduced-price lunch (45.2%), and slight majority of the sample were female (56.0%). A summary of the descriptive results, including demographic characteristics and other variables interest, can be found in Table 3.

The results of the Adolescent Sleep Hygiene Scale can be found in Table 3. The average physiological factor score for the sample was 4.34 (*SD*=0.90), 3.09 (*SD*=1.23) for the behavioral arousal factor, 3.76 (*SD*=1.09) for the cognitive/emotional factor, 4.86 (*SD*=1.01) for the sleep environment factor, 3.01 (*SD*=1.28) for the sleep stability factor, 3.98 (*SD*=1.67) for the daytime sleep factor, 5.84 (*SD*=0.58) for the substances factor, and 3.79 (*SD*=1.83) for the bedtime routine factor.

Research Question 1

Research question 1 asks "*How many hours of sleep per night do students in the sample report obtaining during the school week?"* The demographic characteristics for the total sample are displayed in Table 3. Means and standard deviations for hours of sleep per night during the school week, as well as on weekends, were computed for the entire sample where data were available. The school day number of hours of sleep per night within the sample ranged from 3 hours and 30 minutes to 12 hours. The mean school day number of hours of sleep reported by the sample was 7 hours and 29 minutes, with a standard deviation of 1 hour and 16 minutes.

For exploratory purposes, these calculations were repeated on the weekend bedtime and wake times. There were higher rates of missing data for the weekend bedtime and wake time variables, resulting in a smaller sample size (*N*=379). The weekend number of hours of sleep per night within the sample ranged from 3 hours to 16 hours and 30 minutes. The mean weekend number of hours of sleep reported by the sample was 9 hours and 37 minutes, with a standard deviation of 2 hours.

Research Question 2

Research question 2 asks, "*To what degree do students in the sample obtain the recommended number of hours of sleep per night during the school week?"* The majority of the sample reported insufficient weekday hours of sleep per night (i.e., less than 8 hours; 61.8%), while 38.2% reported sufficient weekday hours of sleep per night (i.e., 8 or more hours). For exploratory purposes, these calculations were repeated for the weekend hours of sleep variables. In contrast to weekday sleep, on the weekends, a majority of the sample reported sufficient sleep (85.5%), compared to 14.5% reporting insufficient sleep.

Table 3.

Description of the Sample.

Variable	*N*	*Mean (SD)*	*Skewness*	*Kurtosis*
Age	450	15.69 (1.23)	0.49	-0.48
Hours of sleep per night (school days)	421	7:29 (1:16)	0.37	1.95
Hours of sleep per night (weekends)	379	9:37 (2:00)	-0.01	0.80
ASHS subscales				
Physiological factor	448	4.34(0.90)	-0.53	0.31
Behavioral Arousal factor	448	3.09(1.23)	0.04	-0.83
Cognitive/Emotional factor	447	3.76(1.09)	-0.29	-0.47
Sleep Environment factor	448	4.86(1.01)	-1.28	1.67
Sleep Stability factor	428	3.01(1.28)	0.17	-0.89
Daytime Sleep factor	450	3.98(1.67)	-0.46	-1.04
Substances factor	448	5.84(0.58)	-5.04	29.63
Bedtime Routine factor	450	3.79(1.83)	-0.18	-1.37
Subjective Well-Being	450	5.61(1.62)	-0.66	0.44

	N	*%*
Grade level		
9th	225	50.0
10th	101	22.4
11th	70	15.6
12th	54	12.0
Gender (female)	252	56.0
Socioeconomic status (non-free/reduced price lunch)	244	54.2
Race		
Caucasian	175	38.9
African American or Black	101	22.4
Latino-a/Hispanic	111	24.7
Other	28	6.2
Multiracial	35	7.8
Substances factor (abstains)	390	87.1
Sufficient sleep (school days)	161	38.2
Insufficient sleep (less than 8 hours)	260	61.8
Sufficient sleep (weekends)	324	85.5
Insufficient sleep (less than 8 hours)	55	14.5

Notes. Other includes Asian (*n*=11), American Indian/Alaskan Native (*n*=7), Pacific Islander (*n*=2), and other (*n*=8).

Logistic Regression Findings

Prior to conducting the logistic regression analyses for questions three and four, assumptions were checked to ensure there were no violations. First, the data were checked for normality, as described previously. Next, the data were checked for violations of multicollinearity. All of the independent variables were entered into a correlation matrix (see Table 4) and correlation coefficients were examined using a maximum threshold of 0.90 to determine high correlations between variables (Tabachnick, Fidell, & Ullman, 2007). No two predictor variables were highly correlated (correlation coefficient range: .000 (race-other and gender) to .507 (ASHS Physiological factor and ASHS Sleep Environment factor)). See Table 4 for results of the correlation matrix among independent variables. Further, in order to detect any out-of-range variance inflation factors (VIF; i.e., scores greater than 4.000), multiple linear regression analyses were run using all of the continuous independent variables, with each independent variable being set as the dependent variable for one analysis. These data are summarized in Table 5. No VIFs approaching or exceeding 4.000 were detected (*range:* 1.014 for ASHS Bedtime Routine factor with subjective well-being set as the dependent variable, to 1.675 for ASHS Physiological factor with ASHS Sleep Stability factor set as the dependent variable), thus it was determined that no violations of the assumption of multicollinearity occurred in the data.

The dichotomous sufficient sleep variable was set as the dependent variable for the logistic regressions. Each nominal independent variable used in these analyses were dichotomized and treated as dummy variables, with one variable missing to serve as the reference group. Female gender was included in the model, with 1 indicating female and 0 indicating not female, and the male gender variable was left out of the model to serve as a reference. For the race variables, multiple races indicated were grouped into one category due to small sample sizes; specifically,

participants who indicated their race as 'other'(*n*=8), 'Asian' (*n*=11), 'Pacific Islander (*n*=2)' or 'American Indian or Alaskan Native' (*n*=7), were combined into a racial group called 'other' (*n*=28). Because 'Caucasian' had the largest sample amongst the race variables (*n*=175), it was used as the reference group and left out of the model. In addition to 'other', 'African American or Black' (*n*=101), 'Latino/a-Hispanic' (*n*=111), and 'multiracial' (*n*=35) were each included as dummy variables in the model. The socioeconomic status variable was measured based on students' eligibility for free or reduced-price lunch. The non-free/reduced-price lunch group served as the reference group for this variable and was left out of the model due to its larger sample size (*n*=244), and the free/reduced-price lunch variable was included in the model (*n*=206).

Research Question 3

Research question 3 asks, "*To what extent, if any, are the following sleep hygiene factors related to the degree to which students obtain the recommended number of hours of sleep per night: physiological, behavioral arousal, cognitive/emotional, environmental, sleep stability, daytime sleep, substances, and bedtime routine, after controlling for demographic differences?"* A binary logistic regression analysis was conducted to investigate if demographic characteristics, including grade level, gender, socio-economic status (i.e., eligibility for free/reduce priced lunch), and race, as well as engagement in sleep hygiene factors (i.e., physiological factor, behavioral arousal factor, cognitive/emotional factor, sleep environment factor, sleep stability factor, daytime sleep factor, and substances factor) could predict sufficient sleep. The outcome of interest was sufficient sleep, which was determined based on the hours between reported bedtime and wake times and categorized as sufficient if the number was 8 or more hours, or insufficient if it was fewer than 8 hours. The possible predictor variables were grade level, gender, socioeconomic status, race, and the ASHS physiological factor, behavioral arousal factor,

Table 4.

Intercorrelations between Predictor Variables (N=448).

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. ASHS Physiological factor	1															
2. ASHS Behavioral Arousal factor	.372**	1														
3. ASHS Cognitive/Emotional factor	.374**	.446**	1													
4. ASHS Sleep Environment factor	.507**	.379**	.332**	1												
5. ASHS Sleep Stability factor	.213**	.404**	.295**	.207**	1											
6. ASHS Daytime Sleep factor	.495**	.265**	.230**	.436**	.229**	1										
7. ASHS Bedtime Routine factor	-.056	-.062	-.073	-.017	.029	.026	1									
8. ASHS Substances factor	.261**	.034	.095*	.240**	.093	.122**	.056	1								
9. Subjective Well-Being	.068	.067	.393**	.082	.128**	.101*	.196**	.078	1							
10. Grade	.100*	.055	.019	.132**	.055	.083	.064	.010	-.040	1						
11. Gender	.097*	.090	-.141**	.033	.045	-.141**	.093*	.114*	-.180**	.025	1					
12. Race – Asian	.080	.036	.086	.037	.021	.056	-.028	.031	-.028	-.019	.018	1				
13. Race – African American or Black	-.159**	-.031	-.099*	-.261**	-.029	-.285**	-.047	.029	.057	-.096*	.003	-.053	1			
14. Race – Hispanic/Latino	-.089	-.064	-.030	-.081	-.017	-.120*	.018	-.045	-.032	-.036	-.076	-.120*	-.258**	1		
15. Race - Other	-.003	.036	.016	.024	.034	.053	-.054	.008	-.063	-.094*	.000	.084	-.073	-.170**	1	
16. Free/reduced-price lunch	-.072	-.040	-.074	-.136**	-.051	-.141**	.016	.034	-.004	-.002	.066	.066	.176**	.016	.005	1

**. Correlation is significant at the .01 level (2-tailed).

*. Correlation is significant at the .05 level (2-tailed)

Table 5.

Variable Inflation Factors (VIF) Calculated by Multiple Regression Analyses.

Dependent Variable	*Independent Variables*	*VIF*	*Dependent Variable*	*Independent Variables*	*VIF*
Subjective Well-Being	ASHS Physiological factor	1.669	ASHS Sleep Environment factor	ASHS Sleep Stability factor	1.243
	ASHS Behavioral Arousal factor	1.492		ASHS Daytime Sleep factor	1.362
	ASHS Cognitive/Emotional factor	1.355		ASHS Bedtime Routine factor	1.066
	ASHS Sleep Environment factor	1.539		Subjective Well-Being	1.266
	ASHS Sleep Stability factor	1.241		ASHS Physiological factor	1.515
	ASHS Daytime Sleep factor	1.432		ASHS Behavioral Arousal factor	1.478
	ASHS Bedtime Routine factor	1.014		ASHS Cognitive/Emotional factor	1.611
ASHS Physiological factor	ASHS Behavioral Arousal factor	1.504	ASHS Sleep Stability factor	ASHS Daytime Sleep factor	1.416
	ASHS Cognitive/Emotional factor	1.565		ASHS Bedtime Routine factor	1.065
	ASHS Sleep Environment factor	1.392		Subjective Well-Being	1.263
	ASHS Sleep Stability factor	1.243		ASHS Physiological factor	1.675
	ASHS Daytime Sleep factor	1.278		ASHS Behavioral Arousal factor	1.390
	ASHS Bedtime Routine factor	1.065		ASHS Cognitive/Emotional factor	1.604
	Subjective Well-Being	1.261		ASHS Sleep Environment factor	1.539
ASHS Behavioral Arousal factor	ASHS Cognitive/Emotional factor	1.480	ASHS Daytime Sleep factor	ASHS Bedtime Routine factor	1.064
	ASHS Sleep Environment factor	1.497		Subjective Well-Being	1.265
	ASHS Sleep Stability factor	1.137		ASHS Physiological factor	1.495
	ASHS Daytime Sleep factor	1.432		ASHS Behavioral Arousal factor	1.519
	ASHS Bedtime Routine factor	1.066		ASHS Cognitive/Emotional factor	1.620
	Subjective Well-Being	1.243		ASHS Sleep Environment factor	1.463
	ASHS Physiological factor	1.658		ASHS Sleep Stability factor	1.229
ASHS Cognitive/ Emotional factor	ASHS Sleep Environment factor	1.529	ASHS Bedtime Routine factor	Subjective Well-Being	1.204
	ASHS Sleep Stability factor	1.230		ASHS Physiological factor	1.672
	ASHS Daytime Sleep factor	1.431		ASHS Behavioral Arousal factor	1.519
	ASHS Bedtime Routine factor	1.049		ASHS Cognitive/Emotional factor	1.595
	Subjective Well-Being	1.058		ASHS Sleep Environment factor	1.538
	ASHS Physiological factor	1.617		ASHS Sleep Stability factor	1.241
	ASHS Behavioral Arousal factor	1.388		ASHS Daytime Sleep factor	1.429

Notes. VIF=Variable inflation factor; ASHS=Adolescent Sleep Hygiene Scale

cognitive/emotional factor, sleep environment factor, sleep stability factor, daytime sleep factor, and abstaining from substances.

The omnibus test was used to assess the significance of each step, which indicated that block 1 (demographics) was not significant (p=.616). No demographic variables included in this block of the model (i.e., gender, FRL eligibility, grade level, other race, African American or Black

race, Hispanic or Latino race and multiracial) were found to be significant. The results from this block of the logistic regression analysis can be found in Table 6.

Table 6.

Logistic Regression Analysis of High School Student's Levels of Sufficient Sleep – Block 1 (N=450).

Predictor	*B*	*SE B*	*Wald's* χ^2	*df*	*p*	*Odds ratio*
Constant	-.413	.295	1.960	1	.162	.662
Race – Other	-.058	.476	.015	1	.903	.944
Race – African American or Black	-.464	.289	2.565	1	.109	.629
Race – Hispanic/Latino-a	-.386	.274	1.993	1	.158	.680
Race – Multiracial	-.299	.429	.486	1	.486	.742
Free/reduced price lunch eligibility (1=FRL)	.192	.220	.765	1	.382	1.212
Gender (1=female)	.241	.214	1.268	1	.260	1.272
Grade level	-.042	.099	.184	1	.668	.958
Test			χ^2	*df*	*p*	
Overall model evaluation			5.365	7	.616	
-2 Log Likelihood			518.191			

Note. SE= standard error; FRL=free/reduced-price lunch; Race-other includes Asian, American Indian/Alaska Native, Pacific Islander, and other race. *Cox and Snell* R^2=.014, *Nagelkerke* R^2=.018.

At the second block of the logistic regression analysis, which in addition to the demographic variables included in block 1, included the ASHS subscales physiological factor, behavioral arousal factor, cognitive/emotional factor, sleep environment factor, sleep stability factor, daytime sleep factor, substance (abstains), and bedtime routine factor. The omnibus test was again used to assess the significance of the model, which at this block was found to not be significant (p=.057). The model found the substance factor to be significant (p=.049), with an unstandardized B value of 0.752, suggesting that a one-point increase on the substance factor (i.e., abstaining from substances) would result in a 0.752-point increase in the log-odds of sufficient sleep (*Exp(B)*=2.120; *95% CI*=1.022 – 4.542). No other variables were found to have a significant effect on the model. The results from this block of the logistic regression analysis can be found in

Table 7. At this block, the predictive power of the model was found to have an overall success rate of 66.2%.

Table 7.

Logistic Regression Analysis of High School Student's Levels of Sufficient Sleep – Block 2 (N=450).

Predictor	*B*	*SE B*	*Wald's* χ^2	*df*	*p*	*Odds ratio*
Constant	-2.655	.849	9.771	1	.002	.070
Race – Other	-.099	.498	.039	1	.843	.906
Race – African American or Black	-.172	.334	.266	1	.606	.842
Race – Hispanic/Latino-a	-.170	.295	.333	1	.564	.844
Race – Multiracial	-.156	.444	.124	1	.725	.855
Free/reduced price lunch eligibility (1=FRL)	.222	.227	.955	1	.329	1.248
Gender (1=female)	.239	.235	1.029	1	.310	1.270
Grade level	-.070	.103	.463	1	.496	.933
Physiological factor	-.109	.162	.453	1	.501	.897
Behavioral Arousal factor	.054	.110	.239	1	.625	1.055
Cognitive/Emotional factor	.074	.123	.365	1	.546	1.077
Sleep Environment factor	.051	.144	.123	1	.725	1.052
Sleep Stability factor	.145	.097	2.234	1	.135	1.156
Daytime Sleep factor	.141	.086	2.671	1	.102	1.151
Substances (1=abstains)	.752	.381	3.891	1	.049	2.120
Bedtime Routine factor	.066	.061	1.175	1	.278	1.068
Test			χ^2	*df*	*p*	
Overall model evaluation			24.518	15	.057	
-2 Log Likelihood			499.037			

Note. SE= standard error; FRL=free/reduced-price lunch; Race-other includes Asian, American Indian/Alaska Native, Pacific Islander, and other race. *Cox and Snell* R^2=.060, *Nagelkerke* R^2=.082.

Research Question 4

Research question 4 asks, "*To what extent, if any, is subjective well-being related to the degree to which students obtain the recommended number of hours of sleep per night, after controlling for demographic differences?"* In order to answer this question, subjective well-being was added to the model described in the previous section, which included demographic variables, specifically gender, free/reduced-price lunch eligibility, grade level, African American or Black race, Hispanic

race, other race, and multiracial, as well as the ASHS subscales physiological factor, behavioral arousal factor, cognitive/emotional factor, sleep environment factor, sleep stability factor, daytime sleep factor, substances (abstains), and bedtime routine factor. The omnibus test was again used to assess the significance of the model, which in this block, was again significant (p=.038). No variables were found to have a significant effect on the model. The model found the substance factor to be approaching significance (p=.054), with an unstandardized B value of 0.732, suggesting that a one-point increase on the substance factor (i.e., abstaining from substances) would result in a 0.732-point increase in the log-odds of sufficient sleep (*Exp(B)*=2.080; *95% CI*=1.022 – 4.446). Subjective well-being was not significant in this model; however, it had a positive relationship to sufficient sleep, such that a one-point increase in subjective well-being could predict a 0.098-point increase in the log-odds of sufficient sleep (unstandardized *B*=0.098, *SE*=0.059, *Exp(B)*=1.103, *95% CI*=0.976 – 1.230, p=.096). The results from this logistic regression analysis can be found in Table 8. The predictive power of the model was found to have an overall success rate of 64.7%. The model was better at correctly predicting insufficient sleep (86.5%) than it was at predicting sufficient sleep (29.3%). See Table 9 for more details.

For exploratory purposes, following the logistic regression analysis, the relationships between each of the individual independent variables and the dependent variable, sufficient sleep, were examined using correlation analyses. The correlational analyses found that demographic variables, specifically, African American or Black race, Hispanic or Latino, other race, multiracial, gender, grade level, nor free/reduced-price lunch eligibility, were not significantly correlated with sufficient sleep (p>.05). These findings are consistent with the results of the logistic regression analysis which found that the demographic variables did not significantly contribute to the predictive power of the model. The correlation analyses did not find a significant correlation

Table 8.

Logistic Regression Analysis of High School Student's Levels of Sufficient Sleep – Block 3 (N=450).

Predictor	*Pearson Correlation*	*B*	*SE B*	*Wald's* χ^2	*df*	*p*	*Odds ratio*
Constant		-2.326	.874	7.081	1	.008	.098
Race – Other		-.062	.501	.015	1	.901	.940
Race – African American or Black	.038	-.202	.336	.360	1	.549	.817
Race – Hispanic/Latino-a	-.061	-.160	.296	.292	1	.589	.852
Race – Multiracial	-.043	-.184	.447	.170	1	.680	.832
Free/reduced price lunch eligibility (1=FRL)	.007	.200	.228	.768	1	.381	1.221
Gender (1=female)	.023	.280	.238	1.390	1	.238	1.324
Grade level	.032	-.063	.103	.380	1	.538	.939
Physiological factor	.002	-.094	.163	.331	1	.565	.911
Behavioral Arousal factor	.081*	.073	.111	.430	1	.512	1.075
Cognitive/Emotional factor	.108*	-.012	.133	.008	1	.928	.988
Sleep Environment factor	.116*	.049	.144	.118	1	.732	1.051
Sleep Stability factor	.125**	.139	.098	2.015	1	.156	1.149
Daytime Sleep factor	.134**	.135	.086	2.456	1	.117	1.145
Substances (1=abstains)	.152*	.732	.380	3.706	1	.054	2.080
Bedtime Routine factor	.037	.042	.062	.452	1	.501	1.043
Subjective Well-Being	.115*	.098	.059	2.771	1	.096	1.103

Test	χ^2	*df*	*p*
Overall model evaluation	27.334	16	.038
-2 Log Likelihood	496.222		

Note. SE= standard error; FRL=free/reduced-price lunch; Race-other includes Asian, American Indian/Alaska Native, Pacific Islander, and other race. *Cox and Snell* R^2=.067, *Nagelkerke* R^2=.091. *. Correlation is significant at the 0.05 level (2-tailed); **. Correlation is significant at the 0.01 level (2-tailed).

Table 9.

The Observed and Predicted Frequencies for Sufficient Sleep by Logistic Regression.

	Predicted		
Observed	Sufficient	Insufficient	% Correct
Sufficient	44	106	29.3
Insufficient	33	211	86.5
Overall % correct	-	-	64.7

Note. Sensitivity = 44/(44+106)=29.53%; *Specificity* = 211/(33+211) = 85.60%; *False positive* = 33/(33+44)=44.30%; *False negative* = 106/(106+211)=33.55%.

between sufficient sleep and the physiological factor, sleep environment factor, nor the bedtime routine factor (p>.05). The analyses found significant correlations between sufficient sleep and the following sleep hygiene variables: behavioral arousal factor (r=.108, p=.027), cognitive/emotional factors (r=.116, p=.018), sleep stability factor (r=.134, p=.007), daytime sleep factor (r=.152, p=.002), and abstaining from substances (r=.115, p=.019). The analysis found the correlation between sufficient sleep and subjective well-being to be significant (r=.097, p=.047). See Table 8 (Pearson Correlation) for more details. In order to examine the potential effect of the 8 hour-threshold on the outcome variable, the correlations were also calculated between variables of interest (i.e., demographics, sleep hygiene factors, and subjective well-being) and the hours of sleep continuous variable, however, no notable differences were found. See Appendix H for results of the correlation analyses.

Summary of Findings

In summary, 61.8% of the participants in the sample reported obtaining insufficient amounts of sleep during the school week, with the sample average being less than the lower limit of the recommended hours of sleep per night (M=7 hours and 29 minutes, SD=1 hour and 16 minutes). The logistic regression model, which included race, gender, grade level, sleep hygiene factors, and subjective well-being was significant (p=.038); however, no variables were found to significantly contribute to the model.

Although not significant in the final model, subjective well-being showed a positive relationship to sufficient sleep, suggesting that increased levels of subjective well-being increase the likelihood of reporting sufficient sleep. Additionally, the model found abstaining substances to be approaching significance, suggesting that and increase on the substance factor (i.e., abstaining from substances) would result in an increase in the likelihood of reporting sufficient sleep.

While the variables in the model were not found to be significant predictors of sufficient sleep, exploratory analyses of the relationships between each of the independent variables and sufficient sleep found that 5 of the sleep hygiene variables as well as subjective well-being, were positively and significantly correlated to sufficient sleep. These analyses also found that there were no significant correlations between sufficient sleep and any of the demographic variables examined.

CHAPTER 5

DISCUSSION

Summary of the Study

The purpose of the current study was to examine the amount of sleep high school students report obtaining, and the degree to which that reported amount meets the recommendations for sleep duration for their age group. The current study also aimed to examine potential predictors of sufficient sleep. Specifically, this study described the self-reported sleep duration and sleep hygiene practices of high school students, and explored models aimed to predict the likelihood of obtaining sufficient sleep by examining demographic characteristics, such as race, gender, socioeconomic status, and grade level, as well as sleep hygiene factors and subjective well-being. This chapter summarizes the results of the study and discusses how they align with or diverge from prior research. In addition, this chapter discusses the limitations of the study, implications of the findings, and potential directions for future research.

Examination of the Results

Participants' report of sleep

This study aimed to describe the typical duration of sleep reported by a sample of high school students, as well as the rate at which high school students report obtaining the recommended amount of sleep for their age group. As hypothesized, the findings from this study are aligned with prior research highlighting the high rates at which adolescents do not obtain the recommended

hours of sleep per night (Eaton et al. 2010; Wheaton et al. 2018). Overall, only 38.2% of students in the current sample reported obtaining the recommended hours of sleep per night for their age group during the school week; that is to say, 61.8% of students in the sample reported sleeping for fewer than 8 hours on school nights. Examination of the hours of sleep per night variable found that students in the sample reported an average of about 7.5 hours of sleep per night on school days, about a half hour less than the lower limit of the recommended range. The findings from this present study are consistent with a study of sleep in adolescents in a national representative sample by Wheaton et al. (2018), illustrating that 72.7% of high school students across the country reported short sleep duration, defined as less than 8 hours per night for the age group of the sample (13-18 years old). Similarly, these findings are consistent with findings from a study of high school students by Eaton et al. (2010), which found the majority of their sample reported insufficient sleep, defined as fewer than 8 hours per night. These findings also are consistent with a study by Shaffer-Hudkins (2011) who reported that the majority of her middle school sample (61%) obtained between 7 and 8 hours of sleep per night.

The study by Shaffer-Hudkins (2011) was different from the present study regarding the sample, which included middle school students, and the method of measurement of sleep duration. That study measured hours of sleep by utilizing a question asking how many hours of sleep the respondent usually obtained, as opposed to the present study that asked respondents for their typical bedtimes and wake times. In addition, Shaffer-Hudkins (2011) utilized response options that specified a range of hours (e.g., less than 7 hours, 8 to 9 hours, 9 hours or 10 or more hours), as opposed to the present study that left bedtime and wake time open for respondents to write in their responses. The method used in the Shaffer-Hudkins of assessing typical sleep duration is common among some studies (Eaton et al. 2010; Wheaton et al. 2018), while other studies utilized

the same methods as this present study, in which hours of sleep were calculated based on bedtimes and wake times (Norell-Clarke & Hagquist, 2017).

The present study found that hours of sleep per night and rates of sufficient sleep differed between school days and weekends, with an average of about 7.5 hours and 38% reporting sufficient sleep on school days, and an average of about 9.5 hours and 85% reporting sufficient sleep on the weekends. These findings are consistent with other studies examining the sleep patterns in adolescents. Adolescents are known to experience a change in their circadian rhythm cycle, specifically a delay in the onset of sleep, such that they are more likely to go to sleep and wake up later than children and adults (Carskadon 1990; Dahl & Carskadon 1995). In addition to these normal biological changes, many other factors may contribute to such changes in sleep schedules, such as school start times. With school demands, students may feel pressure to adjust their wake time to accommodate the imposing school schedules but may be less inclined to go to sleep earlier, resulting in shorter sleep duration during the school week. A study examining the sleep patterns in adolescents found that high school seniors slept about 2 hours less per night during the first week of the school year than they did during the month prior (Hansen et al. 2005). Adolescents have been known to engage in recovery or catch-up sleep on the weekends (Carskadon, 1990, Wolfson & Carskadon, 1998; Carskadon & Acebo, 1997; Mindel, Owens, & Carskadon, 1999; Carskadon, Acebo, & Seifer, 2001). In fact, the same study of high school seniors (Hansen et al. 2005), found that the students reported sleeping significantly longer (30 minutes, on average) on weekends during the school year than they did on during the summer, suggesting the role of school start times on the change in sleep patterns and the possibility of sleep recovery occurring in the population. Shaffer-Hudkins (2011) also reported that students in their sample of middle school students reported later bedtimes and wake times on the weekends

compared to weekdays. Although the present study did not examine bedtimes specifically, the contrast in the hours of sleep per night on school days and weeknights is consistent with the findings from other studies examining the sleep patterns of adolescents and finding increased durations in the absence of school schedule demands.

The results of the ASHS subscales found the highest levels of reported engagement in the substances factor, with a mean score of 5.84 (*SD*=0.58), indicating that most of the sample reported abstaining from using substances like tobacco and alcohol in the evenings. The lowest level of average reported engagement was on the sleep stability factor of the ASHS (*M*=3.01, *SD*=1.28); scores on this scale range from 1 to 6, with higher scores indicating better sleep stability. At the time of this analysis, normative data or cutoff scores or ranges for this measure and its subscales do not yet exist. However, a study by Galland et al. (2017) examined the sleep hygiene practices of adolescents aged 15 to 17 years (*M*=16.9 years, *SD*=9 months) in New Zealand using the ASHS and published their findings. The findings from the present study are consistent with those reported by Galland et al. (2017). The most notable difference between the two samples can be seen in the Daytime Sleep factor, on which the present study found a mean score of 3.98 (*SD*=1.67), compared to a mean score of 5.35 (*SD*=1.02) reported by Galland et al. (2017). This difference suggests that the present sample reported greater levels of engagement in daytime sleep or naps than the sample reported by Galland et al. (2017). The reason for the difference between the samples is not clear, however, examination of school start and end times, bedtime and wake times, and engagement in afterschool activities, could possibly provide insight into the napping behaviors of the adolescents in the samples.

Findings from logistic regressions

The present study sought to examine the predictability of sufficient sleep in a sample of high school students, using a model including demographic variables, sleep hygiene factors, and subjective well-being. To examine this model, a logistic regression analysis was conducted to compute odds ratios for the association between sleep hygiene factors and subjective well-being, and sufficient sleep, after controlling for demographic characteristics. The findings from this study indicate that the model including demographic characteristics such as race, gender, socioeconomic status, and grade level, combined with sleep hygiene factors and subjective well-being did not predict sufficient sleep in high school students, as no variables included in the model were found to be significant. This finding is somewhat inconsistent with studies examining the associations between sleep quality, including duration, and sleep hygiene behaviors (Brick et al. 2010; Brown et al. 2002; Suen et al. 2010) which found positive and significant relationships between sleep hygiene and sleep duration, as well as studies examining the relationship between sleep and subjective well-being (Gadermann et al. 2016; Lai, 2018; Shaffer-Hudkins, 2011; Weinberg et al. 2016) which found positive and significant relationships between sleep and subjective well-being. The predictive power of the model, that included demographic characteristics, sleep hygiene factors, and subjective well-being, had an overall success rate of 64.3%, with better success predicting insufficient sleep than sufficient sleep.

The only variable included in the model that approached significance was the substance abstains factor, which suggested that students who abstained from tobacco or alcohol in the evenings had greater odds of reporting sufficient sleep compared to students who utilized tobacco or alcohol in the evenings. These findings are consistent with the findings reported in the meta-analysis by Bartel, Gradisar, and Williamson (2015) examining protective and risk factors for

adolescent (mean age between 12 and 18 years) sleep. Specifically, the study reported that tobacco use was significantly associated with decreased sleep time across several studies (Pasch et al. 2012; Saxvig et al. 2012; Loessl et al. 2008; Chung & Cheung, 2008; Megdal & Schermhammer, 2007); however, they also reported that alcohol was not related to any sleep variables, including total sleep time (Pasch et al. 2012; Saxvig et al. 2012; Loessl et al. 2008; Chung & Cheung, 2008; Oshima et al. 2012). The inconsistencies in findings related to substance use may be attributed to the self-report nature of the measures; youth may be inaccurate reporters of substance use for multiple reasons, including fear of consequences for breaking laws or school rules for example. Additionally, it is important to note that due to low rates of substance utilization endorsed by the sample, findings related to this variable should be interpreted with caution.

The present study found that none of the demographic characteristics examined significantly contributed to the model predicting sufficient sleep, including race, gender, socioeconomic status, and grade level. Findings from prior studies regarding demographic differences in rates of obtaining recommended hours of sleep are mixed. Eaton et al. (2010) and Wheaton et al. (2018) found differences in rates of obtaining the recommended hours of sleep among demographic characteristics. Specifically, both studies found that female students, Black students, and students in grades 11 and 12 were more likely to report insufficient sleep when compared to male students, White students, and students in grades 9 and 10, respectively. However, Brick, Seely, and Palermo (2013) reported that gender was not a significant predictor of sleep quality which included sleep duration, in their study of medical students. They did not examine differences among races. The inconsistencies in the findings related to demographic differences in obtaining sufficient sleep suggest that perhaps the relationship between demographic

characteristics and sufficient sleep is moderated by another variable which has not yet been examined.

In a previous study of the present sample by Smith (2019), demographic characteristics were examined as predictors of sleep hygiene factors using regression analyses. Specific demographic characteristics were identified as unique predictors of multiple factors of sleep hygiene. For example, African American and Hispanic ethnicities were identified as unique predictors of the physiological factor of sleep hygiene, such that students who identified as African American or Hispanic reported lower rates of engagement in the physiological factor of sleep hygiene compared to White students. Also, the study identified gender as a unique predictor of the daytime sleep factor of sleep hygiene, such that female students had lower engagement in daytime sleep when compared to male students. Although there are differences in the levels of sleep hygiene engagement by race and gender, consistent with some prior research, these differences did not significantly contribute to the model predicting sufficient sleep examined in the present study. However, the present study did identify similar, albeit not significant, associations between these variables and sufficient sleep. Specifically, in the first block of the logistic regression, both Hispanic or Latino and African American or Black ethnicity/race were found to have negative relationships with the outcome variable, such that students who identified as Hispanic or Latino or African American or Black had lower odds of reporting sufficient sleep compared to white students. To further examine the relationship between sufficient sleep and demographic characteristics, a series of correlations were conducted among the independent variables and sufficient sleep. The findings from these correlation analyses are consistent the findings from the logistic regression analyses, which found no significant relationships between demographic characteristics, such as race, gender, socioeconomic status, and grade level, and sufficient sleep.

Because previous research in the current sample found significant associations between demographic characteristics and sleep hygiene factors, and because prior research indicates a positive relationship between sleep hygiene engagement and sleep quality including duration, it was hypothesized that demographic characteristics, including race and gender, would predict sufficient sleep, which was not supported by the findings of this study.

Limitations and Delimitations

Regarding limitations to the current study, it should be noted that because the nature of the present study is a secondary analysis of data, the collection of data was not in the control of the present researcher. Therefore, any limitations and delimitations of the original study design and data collection could not be changed.

Although the original researchers made every effort to choose schools that represent the general population, findings may not be generalizable outside of the sample. Specifically, the sample included an inflated representation of 9th grade students, likely due to the popularity of the health class during which data were collected amongst younger students. While it was expected that this overrepresentation of 9th grade students would skew the data, perhaps due to the expected differences in 9th graders need for sleep due to their age and adjustment to the high school experience, no significant differences in sleep were identified based on grade level.

Another limitation of this study is the self-report nature of the data collected. This study relied on the use of self-rated behaviors, attitudes, perceptions, and symptoms. Because measures rely on the participants' ability to recall and report information accurately and honestly, there is a risk of inaccuracy due to subjective measurements by the participants themselves. The self-reported hours of sleep may have impacted the results and may be different than more objective measures of sleep quality. Also, the measure of hours of sleep used in this study does not account

for time in bed not sleeping or irregular sleep patterns, which likely influenced outcomes of the study. Another limitation of this measure is the lack of consideration of technology on students' sleep, specifically 'screen-time' which is known to inhibit sleep. The use of phones, tablets, computers, and TVs among adolescents has become increasingly common over time and should be considered when examining their sleep hygiene practices, and its exclusion likely influenced the results of this study. Another possible limitation of the study which also relates the measure used to assess sleep is that "school day" and "weekend" were not specifically defined for the participants completing the measure and indicating their bedtime and wake times. The question asks raters "During the school week… my usual school night bedtime is…, My usual school day wake time is…" and "On weekends my usual weekend bedtime is…, My usual weekend wake time is…" but does not define school week, school day, or weekend. These may be interpreted differently (e.g., interpreting Friday as a school day but having a much later bedtime on Friday than other school nights, or interpreting Sunday as a weekend but have a much earlier bedtime on Sunday than other weekend nights).

Regarding interpretations of this study's findings, it is necessary to highlight the difference between prediction and explanation. This study sought to identify variables that predict sufficient sleep in high school students; it did not attempt to explain how to obtain sufficient sleep or show causation between any of the variables of interest and sufficient sleep. Therefore, the findings from this study should be interpreted with caution.

Contributions to the Literature

The present study contributes to what is known in the literature about engagement in sleep hygiene practices and rates of sufficient sleep obtained by high school students, as well as the relationship between engagement in such sleep hygiene factors to obtaining the recommended

hours of sleep, as well as the relationship between students' levels of subjective well-being and levels of sufficient sleep. The findings of this study regarding the hours of sleep reported on school days and weekends, as well as the rates of sufficient sleep, add to the literature identifying high rates of insufficient sleep in adolescents. The results of the logistic regression add to what is known about predicting sufficient sleep. This PI is not aware of any other study that has examined this combination of demographic variables, sleep hygiene factors, and subjective well-being for the purpose of predicting sufficient sleep in high school students,'. The model identified in this study did not significantly predict sufficient sleep in high school students using the included variables. However, these findings can be used to inform future research aiming to create a model to predict sufficient sleep in high school students. The model in the present study may be refined in order to produce a model that better predicts sufficient sleep in this population. As the importance of sleep and of subjective well-being to several outcomes (e.g., longer life, physical health, academic achievement, and relationship satisfaction) in adolescence and throughout life is well established in the literature, a better understanding of the connection between the constructs in this population may help to inform practices aimed at improving well-being and sleep, as well as influence policy affecting student sleep and well-being, such as school start times and curriculum development. The findings from this study also may inform future research examining recommended sleep hygiene practices for improved sleep and well-being in students.

Implications for School Psychologists

As is clear from the present study, rates of insufficient sleep on adolescents are common. Knowing that students may not be getting the recommended hours of sleep can be useful information in serving this population. School psychologists are in a unique position to promote healthy and sufficient sleep as they work with adolescents, as well as many of the people involved in their care

and education, including parents, teachers, and school administration. School psychologists may also work with school resource officers or other law enforcement, and have relationships with community health care providers and mental health providers. Because of the potential involvement of school psychologists in the lives of students (e.g., academic, social, and mental and physical health), they are in an ideal position to provide education on the importance of sleep and training on how to promote healthy sleep. For example, they may provide professional development to teachers and other school staff, including resource officers or other community law enforcement, about how to identify the effects of insufficient sleep, such as behavioral problems or increased risk-taking behaviors, so that such professionals may become attuned to recognizing the role of sleep in the lives of their students. They also may provide training and education to parents and caregivers about the importance of sleep and how to facilitate it for their student, for example by means of sleep hygiene education or behavioral training for setting and enforcing bedtimes for their children. Of course, they may also provide direct services to students by providing them with education and training on sleep and sleep promoting behaviors, or indirectly by developing or utilizing already developed curricula aimed at increasing knowledge of the importance of sufficient sleep and how to obtain it. School psychologists also may influence policy related to the academic or school-related factors that affect students' obtaining sufficient sleep, such as school start times, which tend to not align with high school students' sleep patterns and circadian rhythms, and academic and extracurricular involvement, that can be particularly demanding for high school students.

Directions for Future Research

Although this study contributes to the literature findings that support the idea that high school students do not obtain the recommended number of hours of sleep, as well as model that

does not predict sufficient sleep in high school students, it also generates many unanswered questions as well as opportunities for further exploration.

First, the data from the present study were collected prior to the global pandemic; therefore, a replication of the study could provide new insight into how sleep and sleep hygiene practices have been affected by the changes in how adolescents socialize, learn, and engage in physical activity. For example, since the pandemic different students are learning in many different settings, including in-person, online, hybrid, synchronous, and asynchronous, all of which may have different effects on the wake times, sleep needs, and sleep of students. In addition, the changing family dynamics with many parents working from home, could result in changes in bedtime enforcement. Future research should examine the many different factors may influence students' sleep in a pandemic and post-pandemic world.

Because the current body of literature on the Adolescent Sleep Hygiene Scale lacks normative data or cut-off scores indicating 'good' or 'poor' sleep hygiene, future research may seek to develop norm referenced data or cut-off scores so that scores from the measure can be interpreted more accurately. Additionally, future research may examine or develop alternative measures of sleep hygiene and sufficient sleep on high school students that are valid, reliable, and feasible for both research and practice. The use of more objective measures of sleep duration than self-reported bedtimes and wakes times provide an opportunity to examine the sleep characteristics of this population more accurately. Future research may even consider to use of 'smart' technology, such as mobile phone applications and 'smart' watches which have become increasingly common even among students over the past decade and can easily and accurately measure biometrics including sleep.

In addition, future research may explore the factors contributing to adolescent engagement in sleep hygiene practices and the individual relationship of each factor to sufficient sleep, as well as identifying other factors that predict sufficient sleep. Finally, because the logistic regression found the model to not significantly predict sufficient sleep in high school students, future research may focus on refining the model in order to produce one that better predicts sufficient sleep in this population. In addition to identifying other factors that might predict sufficient sleep, future research should also examine potential interactions between factors and non-linear relationships, that could lead to new insights regarding the prediction of sufficient sleep in this population.

Finally, future may research may seek to develop behavioral interventions aimed at improving sleep in adolescent populations. It is important that outcomes of interest to students are considered in order to gain student buy-in (e.g., mood, athletic performance, etc.) and that interventions are feasible for students (e.g., asking students to begin implementing a bedtime routine instead of asking them to refrain from using their cell phones near bedtime). Such studies may utilize self-monitoring methods for measuring sleep such as sleep diaries, which may further engage the participants.

Summary

Changes in sleep patterns and associated behaviors are common during adolescence when circadian rhythm changes occur delaying sleep onset, and psychosocial factors such as changes in desires for socialization, academic factors, and other obligations such as school start times effect when and how much adolescents sleep. Sufficient sleep is associated with several desirable outcomes, including health, behavior, cognition, emotional regulation, and mental and physical health, while insufficient sleep, or sleeping fewer hours than what is recommended, is associated with increased risk of accidents and injuries, learning problems, and poor physical and mental

health. While the sample average approached the lower limit of the recommended hours of sleep, findings from the present study contribute to the evidence that adolescents do not obtain sufficient hours of sleep, specifically the finding that the majority of the sample obtained fewer than the recommended hours of sleep per night. The effects of insufficient sleep on adolescents may be evident in their behavior, their academic performance, and their physical and mental health, any of which may be experienced by their parents and family members, friends, teachers, peers, health care providers, and perhaps even law enforcement. It is essential for professionals who work with adolescents to understand the rates at which adolescents experience insufficient sleep and the effect that insufficient sleep can have on them. In addition to characterizing the amount of sleep and rates of sufficient sleep in high school students, this study also aimed to identify a model that could be used to predict sufficient sleep in students. The identified model, which did not significantly predict sufficient sleep, included demographic characteristics, sleep hygiene factors, and subjective well-being. Findings from this research provide further evidence that adolescents do not obtain recommended hours of sleep, and a basis for future research examining factors that may or may not predict sufficient sleep in high school students. Future research is needed to identify factors that may better predict or influence sufficient sleep in high school students.

REFERENCES

Achenbach, T. M. (1999). The Child Behavior Checklist and related instruments.

Alfano, C. A., Zakem, A. H., Costa, N. M., Taylor, L. K., & Weems, C. F. (2009). Sleep problems and their relation to cognitive factors, anxiety, and depressive symptoms in children and adolescents. *Depression and Anxiety, 26*(6), 503-512.

Antaramian, S. (2015). Assessing psychological symptoms and well-being: Application of a dual-factor mental health model to understand college student performance. *Journal of Psychoeducational Assessment, 33*(5), 419-429.

Antaramian, S. P., Huebner, E. S., Hills, K. J., & Valois, R. F. (2010). A dual-factor model of mental health: Toward a more comprehensive understanding of youth functioning. *American Journal of Orthopsychiatry, 80*(4), 462-472.

Barber, L. K., Rupprecht, E. A., & Munz, D. C. (2014). Sleep habits may undermine well-being through the stressor appraisal process. *Journal of Happiness Studies*, *15*(2), 285-299.

Bartel, K. A., Gradisar, M., & Williamson, P. (2015). Protective and risk factors for adolescent sleep: a meta-analytic review. *Sleep medicine reviews*, *21*, 72-85.

Brick, C. A., Seely, D. L., & Palermo, T. M. (2010). Association between sleep hygiene and sleep quality in medical students. *Behavioral Sleep Medicine, 8*(2), 113-121.

Brickman, P., Coates, D., & Janoff-Bulman, R. (1978). Lottery winners and accident victims: Is happiness relative? *Journal of Personality and Social Psychology, 36*(8), 917-927.

Brown, F. C., Buboltz Jr, W. C., & Soper, B. (2002). Relationship of sleep hygiene awareness, sleep hygiene practices, and sleep quality in university students. *Behavioral medicine, 28*(1), 33-38.

Buysse, D. J., Reynolds III, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatry research, 28*(2), 193-213.

Cao, X.-L., Wang, S.-B., Zhong, B.-L., Zhang, L., Ungvari, G. S., Ng, C. H., Li, L., Chiu, H. F., Lok, G. K., & Lu, J.-P. (2017). The prevalence of insomnia in the general population in China: A meta-analysis. *PloS one, 12*(2), e0170772.

Cappuccio, F. P., Taggart, F. M., Kandala, N.-B., Currie, A., Peile, E., Stranges, S., & Miller, M. A. (2008). Meta-analysis of short sleep duration and obesity in children and adults. *Sleep, 31*(5), 619-626.

Carskadon, M., Mindell, J., & Drake, C. (2006). Sleep in America Poll: Teens. *Washington, DC: National Sleep Foundation*.

Carskadon, M. A. (1990). Patterns of sleep and sleepiness in adolescents. *Pediatrician, 17*(1), 5-12.

Carskadon, M. A., Acebo, C., Richardson, G. S., Tate, B. A., & Seifer, R. (1997). An approach to studying circadian rhythms of adolescent humans. *Journal of biological rhythms, 12*(3), 278-289.

Carskadon, M. A., Acebo, C., & Seifer, R. (2001). Extended nights, sleep loss, and recovery sleep in adolescents. *Archives italiennes de Biologie, 139*(3), 301-312.

Cassoff, J., Bhatti, J., & Gruber, R. (2014). The effect of sleep restriction on neurobehavioural functioning in normally developing children and adolescents: Insights from the attention behaviour and sleep laboratory. *Pathologie Biologie, 62*(5), 319-331.

Cespedes, E. M., Hu, F. B., Redline, S., Rosner, B., Gillman, M. W., Rifas-Shiman, S. L., & Taveras, E. M. (2016). Chronic insufficient sleep and diet quality: contributors to childhood obesity. *Obesity, 24*(1), 184-190.

Chung, K. F., & Cheung, M. M. (2008). Sleep-wake patterns and sleep disturbance among Hong Kong Chinese adolescents. *Sleep, 31*(2), 185-194.

Cohen, L. L., La Greca, A. M., Blount, R. L., Kazak, A. E., Holmbeck, G. N., & Lemanek, K. L. (2008). Introduction to special issue: Evidence-based assessment in pediatric psychology. *Journal of Pediatric Psychology, 33*(9), 911-915.

Costa, P. T., McCrae, R. R., & Zonderman, A. B. (1987). Environmental and dispositional influences on well-being: Longitudinal follow-up of an American national sample. *British journal of Psychology, 78*(3), 299-306.

Dahl, R. E., & Carskadon, M. A. (1995). Sleep and its disorders in adolescence. *Principles and practice of sleep medicine in the child*, *2*, 2-3.

De Bruin, E. J., van Run, C., Staaks, J., & Meijer, A. M. (2017). Effects of sleep manipulation on cognitive functioning of adolescents: A systematic review. *Sleep medicine reviews, 32*, 45-57.

Dewald, J. F., Meijer, A. M., Oort, F. J., Kerkhof, G. A., & Bögels, S. M. (2010). The influence of sleep quality, sleep duration and sleepiness on school performance in children and adolescents: A meta-analytic review. *Sleep medicine reviews, 14*(3), 179-189.

Diener, E. (1984). Subjective well-being. *Psychological Bulletin, 95*(3), 542-575.

Diener, E. (2000). Subjective well-being: The science of happiness and a proposal for a national index. *American Psychologist, 55*(1), 34-43.

Diener, E., & Chan, M. Y. (2011). Happy people live longer: Subjective well-being contributes to health and longevity. *Applied Psychology: Health and Well-Being, 3*(1), 1-43.

Diener, E., & Oishi, S. (2000). Money and happiness: Income and subjective well-being across nations. In *Culture and subjective well-being* (pp. 185-218). MIT press.

Diener, E., Sandvik, E., Seidlitz, L., & Diener, M. (1993). The relationship between income and subjective well-being: Relative or absolute? *Social indicators research, 28*(3), 195-223.

Diener, E., & Suh, E. (1999). Societies we live in: International comparisons. In *Well-being: The foundations of hedonic psychology* (pp. 434-452). Russell Sage Foundation.

DuPaul, G. J., Power, T. J., Anastopoulos, A. D., & Reid, R. (1998). *ADHD Rating Scale—IV: Checklists, norms, and clinical interpretation*. Guilford Press.

Eaton, D. K., Kann, L., Kinchen, S., Shanklin, S., Ross, J., Hawkins, J., Harris, W. A., Lowry, R., McManus, T., & Chyen, D. (2008). Youth risk behavior surveillance--United States, 2007. *Morbidity and mortality weekly report. Surveillance summaries (Washington, DC: 2002), 57*(4), 1-131.

Fatima, Y., Doi, S., & Mamun, A. (2015). Longitudinal impact of sleep on overweight and obesity in children and adolescents: a systematic review and bias-adjusted meta-analysis. *Obesity reviews, 16*(2), 137-149.

Feliciano, E. M. C., Quante, M., Rifas-Shiman, S. L., Redline, S., Oken, E., & Taveras, E. M. (2018). Objective sleep characteristics and cardiometabolic health in young adolescents. *Pediatrics, 142*(1).

Fitzgerald, C. T., Messias, E., & Buysse, D. J. (2011). Teen sleep and suicidality: Results from the Youth Risk Behavior surveys of 2007 and 2009. *Journal of Clinical Sleep Medicine, 7*(4), 351-356.

Futterman, A. D., Kemeny, M. E., Shapiro, D., & Fahey, J. L. (1994). Immunological and physiological changes associated with induced positive and negative mood. *Psychosomatic Medicine, 56*(6), 499-511.

Gadermann, A. M., Guhn, M., Schonert-Reichl, K. A., Hymel, S., Thomson, K., & Hertzman, C. (2016). A population-based study of children's well-being and health: The relative importance of social relationships, health-related activities, and income. *Journal of Happiness Studies, 17*(5), 1847-1872.

Galland, B. C., Gray, A. R., Penno, J., Smith, C., Lobb, C., & Taylor, R. W. (2017). Gender differences in sleep hygiene practices and sleep quality in New Zealand adolescents aged 15 to 17 years. *Sleep Health, 3*(2), 77-83.

Goodman, R. (1997). The Strengths and Difficulties Questionnaire: a research note. *Journal of child psychology and psychiatry, 38*(5), 581-586.

Hauri, P. (1977a). Current concepts: the sleep disorders. *Kalamazoo, MI: The Upjohn Company*.

Hauri, P. (1977b). *Current concepts: The sleep disorders*. The Upjohn Company.

Hirt, E. R., Melton, R. J., McDonald, H. E., & Harackiewicz, J. M. (1996). Processing goals, task interest, and the mood–performance relationship: A mediational analysis. *Journal of Personality and Social Psychology, 71*(2), 245-261.

Hiscock, H., Sciberras, E., Mensah, F., Gerner, B., Efron, D., Khano, S., & Oberklaid, F. (2015). Impact of a behavioural sleep intervention on symptoms and sleep in children with

attention deficit hyperactivity disorder, and parental mental health: Randomised controlled trial. *British Medical Journal, 350,* h68.

Huebner, E. S. (1991). Initial development of the student's life satisfaction scale. *School Psychology International, 12*(3), 231-240.

Huebner, E. S. (1994). Conjoint analyses of the students' life satisfaction scale and the Piers-Harris self-concept scale. *Psychology in the Schools, 31*(4), 273-277.

Ibáñez, V., Silva, J., & Cauli, O. (2018). A survey on sleep assessment methods. *PeerJ, 6*, e4849.

Inglehart, R. (1990). *Culture shift in advanced industrial society*. Princeton University Press.

Jahrami, H., BaHammam, A. S., Bragazzi, N. L., Saif, Z., Faris, M., & Vitiello, M. V. (2021). Sleep problems during COVID-19 pandemic by population: A systematic review and meta-analysis. *Journal of Clinical Sleep Medicine, 17*(2), 299-313.

Kaneita, Y., Ohida, T., Osaki, Y., Tanihata, T., Minowa, M., Suzuki, K., Wada, K., Kanda, H., & Hayashi, K. (2007). Association between mental health status and sleep status among adolescents in Japan: a nationwide cross-sectional survey. *The Journal of clinical psychiatry, 68*(9), 1426-1435.

Kern, M. L., Waters, L. E., Adler, A., & White, M. A. (2015). A multidimensional approach to measuring well-being in students: Application of the PERMA framework. *The journal of positive psychology, 10*(3), 262-271.

Lacks, P., & Rotert, M. (1986). Knowledge and practice of sleep hygiene techniques in insomniacs and good sleepers. *Behaviour research and therapy, 24*(3), 365-368.

Lai, C. C. (2018). The mediating role of sleep quality in the relationship between personality and subjective well-being. *SAGE Open, 8*(2).

Laurent, J., Catanzaro, S. J., Joiner Jr, T. E., Rudolph, K. D., Potter, K. I., Lambert, S., Osborne, L., & Gathright, T. (1999). A measure of positive and negative affect for children: Scale development and preliminary validation. *Psychological Assessment, 11*(3), 326-338.

LeBourgeois, M. K., Giannotti, F., Cortesi, F., Wolfson, A. R., & Harsh, J. (2005). The relationship between reported sleep quality and sleep hygiene in Italian and American adolescents. *Pediatrics, 115*(Supplement 1), 257-265.

Lemola, S., Ledermann, T., & Friedman, E. M. (2013). Variability of sleep duration is related to subjective sleep quality and subjective well-being: an actigraphy study. *PloS one, 8*(8), e71292.

Levy, N. E. (2003). Examining the relationship between health-related behaviors and subjective well being among college students [Unpublished doctoral dissertation, Colorado State University].

Lewandowski, A. S., Toliver-Sokol, M., & Palermo, T. M. (2011). Evidence-based review of subjective pediatric sleep measures. *Journal of pediatric psychology, 36*(7), 780-793.

Loessl, B., Valerius, G., Kopasz, M., Hornyak, M., Riemann, D., & Voderholzer, U. (2008). Are adolescents chronically sleep-deprived? An investigation of sleep habits of adolescents in the Southwest of Germany. *Child: care, health and development, 34*(5), 549-556.

Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin, 131*(6), 803-855.

Lyubomirsky, S., & Ross, L. (1999). Changes in attractiveness of elected, rejected, and precluded alternatives: A comparison of happy and unhappy individuals. *Journal of Personality and Social Psychology, 76*(6), 988-1007.

Marino, M., Li, Y., Rueschman, M. N., Winkelman, J. W., Ellenbogen, J., Solet, J. M., Dulin, H., Berkman, L. F., & Buxton, O. M. (2013). Measuring sleep: accuracy, sensitivity, and specificity of wrist actigraphy compared to polysomnography. *Sleep*, *36*(11), 1747-1755.

Matricciani, L. A., Olds, T. S., Blunden, S., Rigney, G., & Williams, M. T. (2012). Never enough sleep: a brief history of sleep recommendations for children. *Pediatrics*, *129*(3), 548-556.

Megdal, S. P., & Schernhammer, E. S. (2007). Correlates for poor sleepers in a Los Angeles high school. *Sleep medicine*, *9*(1), 60-63.

Meldrum, R. C., & Restivo, E. (2014). The behavioral and health consequences of sleep deprivation among US high school students: relative deprivation matters. *Preventive medicine*, *63*, 24-28.

Mindell, J. A., Owens, J. A., & Carskadon, M. A. (1999). Developmental features of sleep. *Child and adolescent psychiatric clinics of North America*, *8*(4), 695-725.

Moor, I., Lampert, T., Rathmann, K., Kuntz, B., Kolip, P., Spallek, J., & Richter, M. (2014). Explaining educational inequalities in adolescent life satisfaction: do health behaviour and gender matter? *International journal of public health*, *59*(2), 309-317.

Murdaugh, C. L., Parsons, M. A., & Pender, N. J. (2019). *Health promotion in nursing practice*. Pearson New York, NY.

Myers, D. G. (2000). The funds, friends, and faith of happy people. *American Psychologist*, *55*(1), 56-67.

Norell-Clarke, A., & Hagquist, C. (2017). Changes in sleep habits between 1985 and 2013 among children and adolescents in Sweden. *Scandinavian journal of public health*, *45*(8), 869-877.

Oshima, N., Nishida, A., Shimodera, S., Tochigi, M., Ando, S., Yamasaki, S., ... & Sasaki, T. (2012). The suicidal feelings, self-injury, and mobile phone use after lights out in adolescents. *Journal of pediatric psychology, 37*(9), 1023-1030.

Owens, J. A., Maxim, R., Nobile, C., McGuinn, M., & Msall, M. (2000). Parental and self-report of sleep in children with attention-deficit/hyperactivity disorder. *Archives of Pediatrics and Adolescent Medicine, 154*(6), 549-555.

Owens, J. A., Spirito, A., & McGuinn, M. (2000). The Children's Sleep Habits Questionnaire (CSHQ): Psychometric properties of a survey instrument for school-aged children. *Sleep, 23*(8), 1043-1052.

Paruthi, S., Brooks, L. J., D'Ambrosio, C., Hall, W. A., Kotagal, S., Lloyd, R. M., Malow, B. A., Maski, K., Nichols, C., & Quan, S. F. (2016). Recommended amount of sleep for pediatric populations: A consensus statement of the American Academy of Sleep Medicine. *Journal of Clinical Sleep Medicine, 12*(6), 785-786.

Peach, H., Gaultney, J. F., & Gray, D. D. (2016). Sleep hygiene and sleep quality as predictors of positive and negative dimensions of mental health in college students. *Cogent Psychology, 3*(1), 1168768.

Pender, N. J. (2011). Health promotion model manual.

Pickering, S., & Gathercole, S. E. (2001). *Working memory test battery for children (WMTB-C)*. Psychological Corporation.

Rasskazova, E. I., Leontiev, D. A., & Lebedeva, A. A. (2020). Pandemic as a challenge to subjective well-being: Anxiety and coping. *Counseling Psychology and Psychotherapy, 28*(2).

Saxvig, I. W., Pallesen, S., Wilhelmsen-Langeland, A., Molde, H., & Bjorvatn, B. (2012). Prevalence and correlates of delayed sleep phase in high school students. *Sleep medicine*, *13*(2), 193-199.

Schimmack, U., & Oishi, S. (2005). The influence of chronically and temporarily accessible information on life satisfaction judgments. *Journal of Personality and Social Psychology*, *89*(3), 395-406.

Seham, M., & Seham, G. (1926). The Tired Child. Philadelphia: Lippincott Company.

Seligman, M. E. (2002). Authentic Happiness: Using the new positive psychology to realize your potential for lasting fulfillment. New York: Simon and Schuster.

Seligman, M. E. (2012). Flourish: A visionary new understanding of happiness and well-being. Simon and Schuster.

Seligson, J. L., Huebner, E. S., & Valois, R. F. (2003). Preliminary validation of the brief multidimensional students' life satisfaction scale (BMSLSS). *Social Indicators Research*, *61*(2), 121-145.

Shaffer-Hudkins, E. J. (2011). *Health-promoting behaviors and subjective well-being among early adolescents* [Doctoral dissertation, University of South Florida]. Scholar Commons. https://scholarcommons-usf-edu.ezproxy.lib.usf.edu/etd/3341/

Smith, N. D. W. (2019). *Health-promoting behaviors and subjective well-being among high school students* [Doctoral dissertation, University of South Florida]. Scholar Commons. https://scholarcommons-usf-edu.ezproxy.lib.usf.edu/etd/8075/

Spruyt, K., & Gozal, D. (2011). Pediatric sleep questionnaires as diagnostic or epidemiological tools: a review of currently available instruments. *Sleep medicine reviews*, *15*(1), 19-32.

Stepanski, E. J., & Wyatt, J. K. (2003). Use of sleep hygiene in the treatment of insomnia. *Sleep medicine reviews, 7*(3), 215-225.

Storfer-Isser, A., Lebourgeois, M. K., Harsh, J., Tompsett, C. J., & Redline, S. (2013). Psychometric properties of the adolescent sleep hygiene scale. *Journal of Sleep Research, 22*(6), 707-716.

Stubbe, J. H., Posthuma, D., Boomsma, D. I., & De Geus, E. J. (2005). Heritability of life satisfaction in adults: A twin-family study. *Psychological Medicine, 35*(11), 1581-1588.

Suen, L., Tam, W., & Hon, K. (2010). Association of sleep hygiene-related factors and sleep quality among university students in Hong Kong. *Hong Kong Medical Journal, 16*(3), 180-185.

Suh, E., Diener, E., Oishi, S., & Triandis, H. C. (1998). The shifting basis of life satisfaction judgments across cultures: Emotions versus norms. *Journal of Personality and Social Psychology, 74*(2), 482-493.

Suldo, S., Thalji, A., & Ferron, J. (2011). Longitudinal academic outcomes predicted by early adolescents' subjective well-being, psychopathology, and mental health status yielded from a dual factor model. *The Journal of Positive Psychology*, *6*(1), 17-30.

Suldo, S. M. (2016). Promoting student happiness: Positive psychology interventions in schools. Guilford Publications.

Suldo, S. M., & Huebner, E. S. (2004). Does life satisfaction moderate the effects of stressful life events on psychopathological behavior during adolescence? *School Psychology Quarterly, 19*(2), 93-105.

Suldo, S. M., Riley, K. N., & Shaffer, E. J. (2006). Academic correlates of children and adolescents' life satisfaction. *School Psychology International, 27*(5), 567-582.

Suldo, S. M., & Shaffer, E. J. (2008). Looking beyond psychopathology: The dual-factor model of mental health in youth. *School Psychology Review, 37*(1), 52-68.

Suldo, S. M., Thalji-Raitano, A., Kiefer, S. M., & Ferron, J. M. (2016). Conceptualizing high school students' mental health through a dual-factor model. *School Psychology Review, 45*(4), 434-457.

Tabachnick, B. G., Fidell, L. S., & Ullman, J. B. (2007). Using multivariate statistics (Vol. 5, pp. 481-498). Boston, MA: Pearson.

Taveras, E. M., Gillman, M. W., Peña, M.-M., Redline, S., & Rifas-Shiman, S. L. (2014). Chronic sleep curtailment and adiposity. *Pediatrics, 133*(6), 1013-1022.

Tellegen, A., Lykken, D. T., Bouchard, T. J., Wilcox, K. J., Segal, N. L., & Rich, S. (1988). Personality similarity in twins reared apart and together. *Journal of Personality and Social Psychology, 54*(6), 1031-1039.

Tice, D. M., & Wallace, H. (2000). Mood and emotion control: Some thoughts on the state of the field. *Psychological Inquiry, 11*(3), 214-217.

Von Soest, T., Bakken, A., Pedersen, W., & Sletten, M. A. (2020). Life satisfaction among adolescents before and during the COVID-19 pandemic. *Journal of the Norwegian Medical Association, 140*(10).

Vriend, J., Davidson, F., Rusak, B., & Corkum, P. (2015). Emotional and cognitive impact of sleep restriction in children. *Sleep medicine clinics*.

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063-1070.

Weinberg, M. K., Noble, J. M., & Hammond, T. G. (2016). Sleep well feel well: An investigation into the protective value of sleep quality on subjective well-being. *Australian journal of psychology*, *68*(2), 91-97.

Wheaton, A. G., Jones, S. E., Cooper, A. C., & Croft, J. B. (2018). Short sleep duration among middle school and high school students—United States, 2015. *Morbidity and Mortality Weekly Report*, *67*(3), 85.

Wheaton, A. G., Olsen, E. O. M., Miller, G. F., & Croft, J. B. (2016). Sleep duration and injury-related risk behaviors among high school students—United States, 2007–2013. *Morbidity and Mortality Weekly Report*, *65*(13), 337-341.

Wolfson, A. R., Harkins, E., Johnson, M., & Marco, C. (2015). Effects of the young adolescent sleep smart program on sleep hygiene practices, sleep health efficacy, and behavioral well-being. *Sleep Health*, *1*(3), 197-204.

Wolfson, A. R., & Carskadon, M. A. (1998). Sleep schedules and daytime functioning in adolescents. *Child development*, *69*(4), 875-887.

APPENDICES

Appendix A. Demographic Form

Demographics Survey

Please check the box that is most appropriate for you.

1) What is your age?

- ☐ 14
- ☐ 15
- ☐ 16
- ☐ 17
- ☐ 18
- ☐ 19

2) What grade are you in?

- ☐ 9th
- ☐ 10th
- ☐ 11th
- ☐ 12th

3) What is you gender?

- ☐ Male
- ☐ Female
- ☐ Other

4) Which race/ethnicity best describes you? (check all that apply)

- ☐ American Indian or Alaskan Native
- ☐ Asian
- ☐ African American or Black
- ☐ Pacific Islander
- ☐ Hispanic/ Latino-a
- ☐ Caucasian/ White
- ☐ Other

Appendix B. Adolescent Sleep Hygiene Scale

Adolescent Sleep Hygiene Scale

Directions: Using the choices below, circle *how often* **the following things have happened** *during the past month*.

Never – has not happened
Once in Awhile – happened 20% of the time
Sometimes – happened 40% of the time
Quite Often – happened 60% of the time
Frequently, if not always – happened 80% of the time
Always – happened 100% of the time

		Never (0%)	Once in Awhile (20%)	Sometimes (40%)	Quite Often (60%)	Frequently, if not Always (80%)	Always (100%)
During the day…							
1.	…I take a nap that lasts ***more than*** 1 hour.	N	O	S	Q	F	A
2.	…I play or exercise for ***more than*** 20 minutes.	N	O	S	Q	F	A
After 6:00 in the evening…							
3.	…I have drinks with caffeine (for example: cola, root beer, iced tea, coffee).	N	O	S	Q	F	A
4.	…I take a nap.	N	O	S	Q	F	A
5.	…I do some kind of physical activity (for example: exercise, play sports).	N	O	S	Q	F	A
6.	…I smoke or chew tobacco.	N	O	S	Q	F	A
7.	…I drink beer (or some other drinks with alcohol).	N	O	S	Q	F	A
During the 1 hour before bedtime…							
8.	…I do things that make me feel ***calm or relaxed*** (for example: taking a hot bath/shower, listening to soft music, reading).	N	O	S	Q	F	A
9.	…things happen that make me feel ***strong emotions*** (sadness, anger, excitement).	N	O	S	Q	F	A
10.	…I am ***very active*** (for example: playing outside, running, wrestling).	N	O	S	Q	F	A
11.	…I do things that make me feel ***very awake*** (for example: playing video games, watching TV, talking on the telephone).	N	O	S	Q	F	A
12.	…I drink ***more than*** 4 glasses of water (or some other liquid).	N	O	S	Q	F	A

		Never (0%)	Once in Awhile (20%)	Sometimes (40%)	Quite Often (60%)	Frequently, if not Always (80%)	Always (100%)
I go to bed…							
13.	…and do things in my bed that keep me awake (for example: watching TV, reading).	N	O	S	Q	F	A
14.	…and think about things I ***need*** to do.	N	O	S	Q	F	A
15.	…feeling upset.	N	O	S	Q	F	A
16.	…and replay the day's events over and over in my mind.	N	O	S	Q	F	A
17.	…and worry about things happening at home or at school.	N	O	S	Q	F	A
18.	…with a stomachache.	N	O	S	Q	F	A
19.	…feeling hungry.	N	O	S	Q	F	A
I fall asleep…							
20.	…while listening to loud music.	N	O	S	Q	F	A
21.	…while watching TV.	N	O	S	Q	F	A
22.	…in a ***brightly*** lit room (for example: the overhead light is on).	N	O	S	Q	F	A
23.	…in ***one place*** and then move to ***another place*** during the night.	N	O	S	Q	F	A
24.	…in a room that feels ***too hot*** or ***too cold***.	N	O	S	Q	F	A
I sleep…							
25.	…in a home where someone smokes cigarettes, cigars, or a pipe.	N	O	S	Q	F	A
I…							
26.	…get ***too little*** sleep.	N	O	S	Q	F	A
27.	…use a bedtime routine (for example: bathing, brushing teeth, reading).	N	O	S	Q	F	A
28.	…use my bed for things ***other than sleep*** (for example: talking on the telephone, watching TV, playing video games, doing homework).	N	O	S	Q	F	A
29.	…check my clock several times during the night.	N	O	S	Q	F	A

		Never (0%)	Once in Awhile (20%)	Sometimes (40%)	Quite Often (60%)	Frequently, if not Always (80%)	Always (100%)
During the school week, I…							
30.	…stay up ***more than 1 hour*** past my ***usual*** bedtime. My usual ***school night*** bedtime is ____:____ am pm	N	O	S	Q	F	A
31.	…"sleep in" ***more than 1 hour*** past my ***usual*** wake time. My usual ***school day*** wake time is ____:____ am pm	N	O	S	Q	F	A
On weekends, I…							
32.	…stay up ***more than 1 hour*** past my ***usual*** bedtime. My usual ***weekend*** bedtime is ____:____ am pm	N	O	S	Q	F	A
33.	…"sleep in" ***more than 1 hour*** past my ***usual*** wake time. My usual ***weekend*** wake time is ____:____ am pm	N	O	S	Q	F	A

Scoring of the Adolescent Sleep Hygiene Scale (ASHS)

- The ASHS provides 8 subscale scores and an overall sleep hygiene score.
- Higher scores indicate better success on each of these dimensions of sleep hygiene.
- Response options are scored as follows:
    - Never (6 point)
    - Once in Awhile (5 points)
    - Sometimes (4 points)
    - Quite Often (3 points)
    - Frequently, if not Always (2 points)
    - Always (1 points)
- Reverse-code item 27

Physiological Factor (mean of 5 items)

3 After 6:00 in the evening, I have drinks with caffeine (e.g., cola, root beer, iced tea, coffee)
10 During the 1 hour before bedtime, I am very active (e.g., playing outside, running, wrestling)
12 During the 1 hour before bedtime, I drink more than 4 glasses of water (or some other liquid)
18 I go to bed with a stomachache
19 I go to bed feeling hungry

Behavioral Arousal Factor (mean of 3 items)

11 During the 1 hour before bedtime, I do things that make me feel very awake (e.g., playing video games, watching TV, talking on the telephone)
13 I go to bed and do things in my bed that keep me awake (e.g., watching TV, reading)
28 I use my bed for things other than sleep (e.g., talking on the telephone, watching TV, playing video games, doing homework)

Cognitive/Emotional Factor (mean of 6 items)

14 I go to bed and think about things I need to do
16 I go to bed and replay the day's events over and over in my mind
29 I check my clock several times during the night
9 During the 1 hour before bedtime, things happen that make me feel strong emotions (e.g., sadness, anger, excitement)
15 I go to bed feeling upset
17 I go to bed and worry about things happening at home or at school

---

Sleep Environment Factor (mean of 5 items)

20 I fall asleep while listening to loud music
21 I fall asleep while watching TV
22 I fall asleep in a brightly lit room (e.g., the overhead light is on)
24 I fall asleep in a room that feels too hot or too cold
23 I fall asleep in one place and then move to another place during the night

---

Sleep Stability Factor (mean of 3 items)

30 During the school week, I stay up more than 1 hour past my usual bedtime
32 On weekends, I stay up more than 1 hour past my usual bedtime
33 On weekends, I "sleep in" more than 1 hour past my usual wake time

Daytime Sleep Factor (mean of 2 items)

1 During the day, I take a nap that lasts more than 1 hour
4 After 6:00 in the evening, I take a nap

Substances Factor (mean of 2 items)

6 After 6:00 in the evening, I smoke or chew tobacco
7 After 6:00 in the evening, I drink beer (or some other drinks with alcohol)

Bedtime Routine Factor (value for 1 item)

27 I use a bedtime routine (e.g., bathing, brushing teeth, reading)

TOTAL ASHS SCORE – (mean of all 8 subscales)

Items that are not part of a subscale or the total ASHS score but were included in the ASHS due to theoretical interest:

- During the day, I play or exercise for more than 20 minutes
- After 6:00 in the evening, I do some kind of physical activity (e.g., exercise, play sports)
- During the 1 hour before bedtime, I do things that make me feel calm/relaxed (e.g., taking a hot bath/shower, listening to soft music, reading)*
- I sleep in a home where someone smokes cigarettes, cigars or a pipes
- I get too little sleep
- During the school week, I "sleep in" more than 1 hour past my usual wake time

Appendix C. Adolescent Sleep Hygiene Scale Copyright Permission

AMERICAN ACADEMY OF PEDIATRICS LICENSE
TERMS AND CONDITIONS

Aug 10, 2021

This Agreement between erin brennan ("You") and American Academy of Pediatrics ("American Academy of Pediatrics") consists of your license details and the terms and conditions provided by American Academy of Pediatrics and Copyright Clearance Center.

License Number	5125440114320
License date	Aug 10, 2021
Licensed Content Publisher	American Academy of Pediatrics
Licensed Content Publication	Pediatrics
Licensed Content Title	The Relationship Between Reported Sleep Quality and Sleep Hygiene in Italian and American Adolescents
Licensed Content Author	Monique K. LeBourgeois,Flavia Giannotti,Flavia Cortesi,Amy R. Wolfson,John Harsh
Licensed Content Date	Jan 1, 2005
Licensed Content Volume	115
Licensed Content Issue	Supplement 1

Licensed Content Pages	9
Type of Use	Dissertation/Thesis
Requestor type	Individual
Format	Print, Online, and Electronic
Portion	Full article
Title	Sleep Hygiene Practices and Subjective Well-Being as Predictors of High School Students' Obtaining Sufficient Sleep During the School Week
Institution name	University of South Florida
Expected presentation date	Aug 2021
Order reference number	1
Requestor Location	erin brennan 4201 n nebraska ave TAMPA, FL 33603 United States Attn: erin brennan
Total	0.00 USD

Terms and Conditions

AAP TERMS ANDCONDITIONS

The American Academy of Pediatrics grants permission to use the content cited above for the purpose stated. This letter shall serve as a receipt for payment of the permissions fee(s)

and as an approval agreement.

1. The following credit line must appear:
   Reproduced with permission from Journal <Journal>, Vol. <Vol>, Page(s) <Pages>, Copyright © <Year> by the AAP
2. The requester guarantees to reprint the materials exactly as originally published. Obvious typographical errors maybe corrected. No deletions, alterations, or other changes may be made to the information or statistical data without the written consent of the American Academy of Pediatrics.
3. Rights granted herein are not exclusive and the American Academy of Pediatrics reserves the right to grant the same permission to others. Permission is granted for only the reproduction media specified.
4. Original artwork or copies of articles cannot be supplied, but PDF files may be downloaded from www.aappublications.org . Quantities of reprints and eprints can be obtained by contacting Terry Dennsteadt, Reprint Sales Manager – AAP Journals, The Walchli Tauber Group, Inc., 2225 Old Emmorton Road, Suite 201, Bel Air, MD 21046. 443.512.8899 x 112 office, 443.512.8909 fax, terry.dennsteadt@wt-group.com.
5. This permission is granted on a one-time, annual basis only. Reproduction of this material is confined to the purpose and/or media for which permission is hereby given. Future use of this material is subject to the conditions stated herein. *Gratis permissions are not issued for use in materials available for commercial sale, even for educational use*.
6. If the permission fee for the requested use of our material is waived in this instance, please be aware future requests for AAP materials are subject to fees.
7. Reservation of Rights: Publisher reserves all rights not specifically granted in the combination of (i) the license details provided by you and accepted in the course of this licensing transaction, (ii) these terms and conditions and (iii) CCC's Billing and Payment terms and conditions.
8. License Contingent Upon Payment. Provided that you have disclosed complete and accurate details of your proposed use, no license is effective unless and until full payment is received from you(either by publisher or by CCC) as provided in the CCC's Billing and Payment terms and conditions. If full payment is not received on a timely basis, then any license preliminarily granted shall be deemed automatically revoked and shall be void as if never granted. Further, in the event that you breach terms and conditions or any of CCC's Billing and Payment terms and conditions, the license is automatically revoked and shall be void as if never granted.
9. Warranties: Publisher makes no representations or warranties of any kind, express or implied, including but not limited to, accuracy, timeliness or completeness of the information contained in the licensed materials, or merchantability, title or fitness of a use for a particular purpose.
10. Indemnity: You hereby indemnify and agree to hold harmless publisher and CCC, and their respective officers, directors, employees and agents, from and against any and all claims arising out of your use of the licensed material other than specifically authorized pursuant to this license.
11. No Transfer of License: This license is personal to you and may not be sublicensed, assigned or transferred by you to any other person without publisher's written permission.
12. No Amendment Except in Writing: This license may not be amended except in writing signed by both requestor and publisher.
13. This permission, if permission has been granted for use of figures/tables/images, does not cover any third party copyrighted work which may appear in the material requested and does not apply to materials credited to publications other than American Academy of Pediatrics (AAP) journals. For materials credited to non-AAP journal publications, you will need to obtain permission from the publication referenced in the

material legend or credit line before proceeding with usage of the materials. You agree to hold harmless and indemnify the AAP against any claims arising from your use of any content in your work that is credited to non-AAP sources.

14. This permission does not apply to and is not valid for photographs depicting identifiable individuals, including images where individuals' eyes have been blacked out or images depicting victims of abuse.
15. If the requester is translating the material, the following translation disclaimer must be included:
    The materials reused with permission from the American Academy of Pediatrics ("AAP") appeared originally in English, published by the AAP. The AAP assumes no responsibility for any inaccuracy or error in the contents of these materials, including any inaccuracy or error arising from the translation from English.
16. **Other Terms and Conditions:**

v1.4

Questions? customercare@copyright.com or +1-855-239-3415 (toll free in the US) or +1-978-646-2777.

Appendix D. Student Life Satisfaction Scale

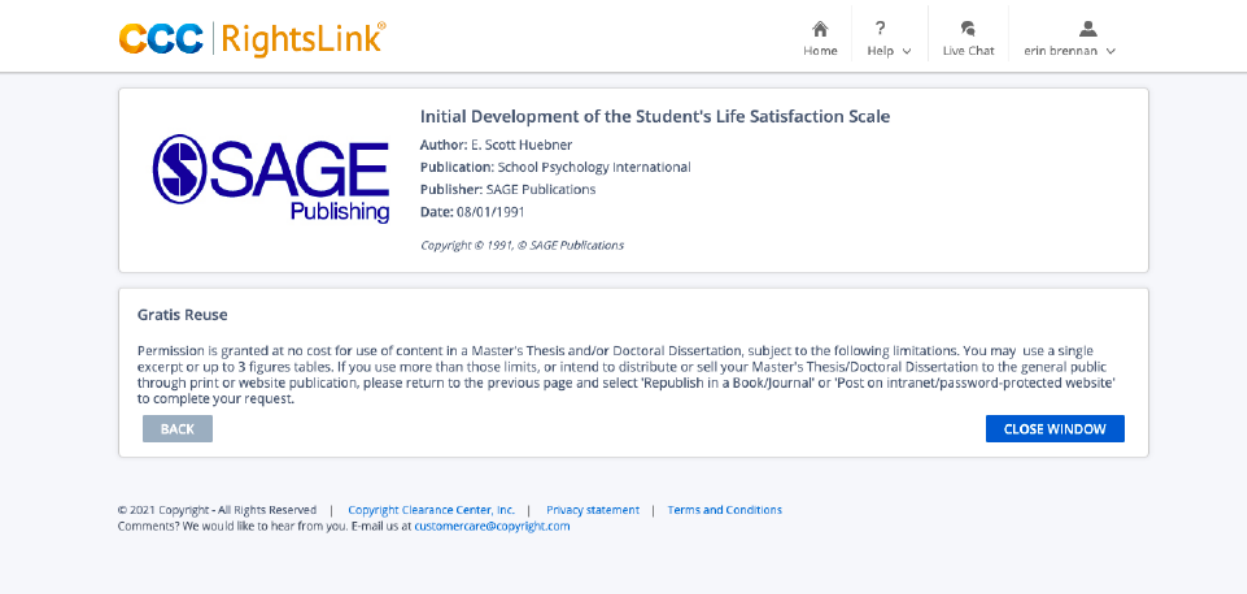
Students' Life Satisfaction Scale

We would like to know what thoughts about life you've had during the past several weeks. Think about how you spend each day and night and then think about how your life has been during most of this time. Here are some questions that ask you to indicate your satisfaction with life. In answering each statement, circle a number from (**1**) to (**6**) where (**1**) indicates you **strongly disagree** with the statement and (**6**) indicates you **strongly agree** with the statement.

*This measure is free to the public domain.

	Strongly Disagree	**Disagree**	**Slightly Disagree**	**Slightly Agree**	**Agree**	**Strongly Agree**
1. **My life is going well**	**1**	**2**	**3**	**4**	**5**	**6**
2. **My life is just right**	**1**	**2**	**3**	**4**	**5**	**6**
3. **I would like to change many things in my life**	**1**	**2**	**3**	**4**	**5**	**6**
4. **I wish I had a different kind of life**	**1**	**2**	**3**	**4**	**5**	**6**
5. **I have a good life**	**1**	**2**	**3**	**4**	**5**	**6**
6. **I have what I want in life**	**1**	**2**	**3**	**4**	**5**	**6**
7. **My life is better than most kids'**	**1**	**2**	**3**	**4**	**5**	**6**

Appendix E. Student Life Satisfaction Scale Copyright Permission



Appendix F. Positive and Negative Affect Scale for Children

Positive and Negative Affect Scale for Children

This scale consists of a number of words that describe different feelings and emotions. Read each item and then circle the appropriate answer next to that word. Indicate to what extent you have felt this way during the past few weeks.

	Feeling or emotion:	**Very slightly or not at all**	**A little**	**Moderately**	**Quite a bit**	**Extremely**
1.	Interested	1	2	3	4	5
2.	Sad	1	2	3	4	5
3.	Frightened	1	2	3	4	5
4.	Excited	1	2	3	4	5
5.	Ashamed	1	2	3	4	5
6.	Upset	1	2	3	4	5
7.	Happy	1	2	3	4	5
8.	Strong	1	2	3	4	5
9.	Nervous	1	2	3	4	5
10.	Guilty	1	2	3	4	5
11.	Energetic	1	2	3	4	5
12.	Scared	1	2	3	4	5
13.	Calm	1	2	3	4	5
14.	Miserable	1	2	3	4	5
15.	Jittery	1	2	3	4	5
16.	Cheerful	1	2	3	4	5
17.	Active	1	2	3	4	5
18.	Proud	1	2	3	4	5
19.	Afraid	1	2	3	4	5
20.	Joyful	1	2	3	4	5
21.	Lonely	1	2	3	4	5
22.	Mad	1	2	3	4	5
23.	Disgusted	1	2	3	4	5
24.	Delighted	1	2	3	4	5
25.	Blue	1	2	3	4	5
26.	Gloomy	1	2	3	4	5
27.	Lively	1	2	3	4	5

Appendix G. Positive and Negative Affect Scale for Children Copyright Permission

AMERICAN PSYCHOLOGICAL ASSOCIATION LICENSE
TERMS AND CONDITIONS

Aug 10, 2021

This Agreement between erin brennan ("You") and American Psychological Association ("American Psychological Association") consists of your license details and the terms and conditions provided by American Psychological Association and Copyright Clearance Center.

License Number	5125440681942
License date	Aug 10, 2021
Licensed Content Publisher	American Psychological Association
Licensed Content Publication	Psychological Assessment
Licensed Content Title	A measure of positive and negative affect for children: Scale development and preliminary validation.
Licensed copyright line	Copyright © 1999, American Psychological Association
Licensed Content Author	Laurent, Jeff; Catanzaro, Salvatore J.; Joiner Jr., Thomas E.; Rudolph, Karen D.; Potter, Kirsten I.; Lambert, Sharon; Osborne, Lori; Gathright, Tamara
Licensed Content Date	Sep 1, 1999
Licensed Content Volume	11
Licensed Content Issue	3

Type of Use	Thesis/Dissertation
Requestor type	Academic institution
Format	Electronic
Portion	Measure, scale or instrument
Rights for	Main product
Duration of use	life of current edition
Creation of copies for the disabled	no
With minor editing privileges	no
In the following language(s)	Original language of publication
With incidental promotional use	no
The lifetime unit quantity of new product	100000 or more
Title	Sleep Hygiene Practices and Subjective Well-Being as Predictors of High School Students' Obtaining Sufficient Sleep During the School Week
Institution name	University of South Florida
Expected presentation date	Aug 2021
Order reference number	1

Portions	Appendix D
	erin brennan 4201 n nebraska ave
Requestor Location	TAMPA, FL 33603 United States Attn: erin brennan
Total	0.00 USD

Terms and Conditions

RightsLink Plus Terms and Conditions
American Psychological Association

The publisher for this copyrighted material is the American Psychological Association ("APA"). By clicking "accept" in connection with completing this licensing transaction, you agree that the following terms and conditions apply to this transaction (along with the Billing and Payment terms and conditions established by the Copyright Clearance Center, Inc. ("CCC") at the time that you opened your CCC account.

APA hereby grants you a non-exclusive license to use this material, subject to the conditions below.

1. Limited License.
   Licenses are for one-time use only with a maximum distribution equal to the number that you identified in the licensing process; any form of republication must be completed with 12 months from the date hereof (although copies prepared before then may be distributed thereafter); and any electronic posting is limited to a period of 12 months.

2. Credit Lines and Translation Disclaimer.
   The reproduced material must include one of the following credit lines:

   For English language content: Copyright © [year] by [Copyright Owner]. Reproduced [or Adapted] with permission. [Full bibliographic citation.]

   For translated language content: This material originally appeared in English as [full bibliographic citation]. Copyright © [year] by [Copyright Owner]. Translated and reproduced [or adapted] with permission. [Copyright Owner] is not responsible for the quality or accuracy of this translation. This translation cannot be reproduced or distributed further without prior written permission.

3. Author Permission.
   You must obtain the author's (or, in case of multiple authorship, one author's) permission. A good faith effort must be made to locate the author and obtain the

author's permission. Author permission is not required for the reuse of small excepts or 1 to 3 figures or 1 to 3 tables; or for course pack or electronic reserve use.

4. Geographic Rights.
   Licenses may be exercised anywhere in the world.

5. Book Edition Limit.
   If the APA content will be reproduced in a book, then permission is limited to the life of the current edition.

6. Online Use Limitations.
   APA full-text articles or book chapters may only be posted on a secure and restricted web site. The credit line specified in Section 2 shall appear on the first screen on which the APA content appears and shall be amended to include the following additional wording: No further reproduction or distribution is permitted without written permission from the American Psychological Association.

7. Reservation of Rights.
   APA reserves all rights not specifically granted in the combination of (i) the license details provided by you and accepted in the course of this licensing transaction, (ii) these terms and conditions and (iii) CCC's Billing and Payment terms and conditions.

8. License Contingent on Payment.
   While you may exercise the rights licensed immediately upon issuance of the license at the end of the licensing process for the transaction, provided that you have disclosed complete and accurate details of your proposed use, no license is finally effective unless and until full payment is received from you (either by APA or by CCC) as provided in CCC's Billing and Payment terms and conditions. If full payment is not received on a timely basis, then any license preliminarily granted shall be deemed automatically revoked and shall be void as if never granted. Further, in the event that you breach any of these terms and conditions or any of CCC's Billing and Payment terms and conditions, the license is automatically revoked and shall be void as if never granted. Use of materials as described in a revoked license, as well as any use of the materials beyond the scope of an unrevoked license, may constitute copyright infringement and APA reserves the right to take any and all action to protect its copyright in the materials. "$0.00" fee means that APA waived the fee.

9. License Revocation.
   APA or CCC may, within 60 days from the date of license, deny the permissions described in this License at their sole discretion, for any reason or no reason, with a full refund payable to you. Notice of such denial will be made using the contact information provided by you. Failure to receive such notice will not alter or invalidate the denial. In no event will APA or CCC be responsible or liable for any costs, expenses or damage incurred by you as a result of a denial of your permission request, other than a refund of the amount(s) paid by you to CCC for denied permissions.

10. Warranties.
    APA warrants that it has, to the best of its knowledge, the rights to license reuse of this content. However, you must ensure that the material you are requesting is original to APA and does not carry the copyright of another entity (as credited in the published version). If any part of the material you have requested indicates that it was reprinted or adapted with permission from another source, then you should also seek permission from that original source to reuse the material.

11. Indemnity.
    You hereby indemnify and agree to hold harmless APA and CCC, and their respective officers, directors, employees and agents, from and against any and all claims arising out of your use of the licensed material other than as specifically authorized pursuant to this license.

12. No Transfer of License.
    This license is personal to you, but may be assigned or transferred by you to your employer or a business associate if you give prompt written notice of the assignment or transfer to the APA. No such assignment or transfer shall relieve you of the obligation to pay the designated license fee on a timely basis (although payment by the identified assignee can fulfill your obligation).

13. No Amendment except in Writing.
    This license may not be amended except in a writing signed by both parties (or, in the case of APA, by CCC on APA's behalf).

14. Objection to Contrary Terms.
    APA hereby objects to any terms contained in any purchase order, acknowledgement, check endorsement or other writing prepared by you, which terms are inconsistent with these terms and conditions or CCC's Billing and Payment terms and conditions. These terms and conditions, together with CCC's Billing and Payment terms and conditions (which are incorporated herein), comprise the entire agreement between you and APA (and CCC) concerning this licensing transaction. In the event of any conflict between your obligations established by these terms and conditions and those established by CCC's Billing and Payment terms and conditions, these terms and conditions shall control.

15. Jurisdiction.
    This license transaction shall be governed by and construed in accordance with the laws of the District of Columbia. You hereby agree to submit to the jurisdiction of the federal courts located in the District of Columbia for purposes of resolving any disputes that may arise in connection with this licensing transaction.

Other Conditions:

v1.2

Questions? customercare@copyright.com or +1-855-239-3415 (toll free in the US) or +1-978-646-2777.

Appendix H. Parent Consent Form

Parental Permission for Children to Participate in Research Involving Minimal Risk

Information for parents to consider before allowing your child to take part in this research study

Pro # __00038119_____

The following information is being presented to help you and your child decide whether or not he/she wishes to be a part of a research study. Please read this information carefully. If you have any questions or if you do not understand the information, we encourage you to ask the researcher.

We are asking you to allow your child to take part in a research study called: **Health-Promoting Behaviors and Subjective Well-Being Among High School Students**

The person who is in charge of this research study is Nicholas David W. Smith. This person is called the Principal Investigator. However, other research staff may be involved and can act on behalf of the person in charge. He is being guided in this research by Dr. Kathy L. Bradley-Klug.

The research will be conducted in XXXX County School District.

This research is being sponsored by the Florida Association of School Psychologists.

Purpose of study:

By doing this study, we hope to learn we hope to learn more about what leads to happiness and health during the teenage years. The information that we collect may help us better understand why we should monitor student' healthy behaviors and their happiness. This research will be conducted through having participants complete a series of survey packets.

Why is your child being asked to take part?

We are asking your child to take part in this research study because he/she is enrolled at XXXX County School District and is currently enrolled in a HOPE class.

Study Procedures:

If your child takes part in this study, s/he will be asked to: complete several surveys that will ask about their thoughts, actions, and attitudes towards school, family, and life in general. They will also be asked to complete questions about their daily eating, exercise, sleep, safety habits, and utilization of various substances. Your child will not be asked to complete any other activities aside from

completing the survey packet. Participation in this study will take place during one single HOPE class instructional period during the week of March 15th, 2019.

Total Number of Participants

A total of 400 individuals will participate in the study at all sites.

Alternatives / Voluntary Participation / Withdrawal

If you decide not to let your child take part in this study, that is okay. Instead of being in this research study your child can choose not to participate. You should only let your child take part in this study if both of you want to. You or child should not feel that there is any pressure to take part in the study to please the study investigator or the research staff.

If you decide not to let your child take part:

Your child will not be in trouble or lose any rights he/she would normally have.

Your relationship with your child's school will not change.

Your decision to participate or not to participate will not affect your student's status, course grade, recommendations, or access to future courses or training opportunities.

Alternatives to participating in the study include: not participating in this research study.

You can decide after signing this informed consent form that you no longer want your child to take part in this study. We will keep you informed of any new developments which might affect your willingness to allow your child to continue to participate in the study. However, you can decide you want your child to stop taking part in the study for any reason at any time. If you decide you want your child to stop taking part in the study, tell the study staff as soon as you can.

Benefits

The potential benefits to your child include:

We cannot promise that your child will receive benefit from taking part in this research study. Howev the information that we collect may help us better understand why we should check student's healt behaviors and happiness.

Risks or Discomfort

There are no known risks to those who take part in this study.

Compensation

Your child will receive some competition (e.g., pencil) for taking part in this study. If you stop participating before the study is over, they will still receive the compensation.

Costs

It will not cost you anything to let your child take part in the study.

Conflict of Interest Statement

No member of the research team or an immediate family member hold equity interest in, receive personal compensation from, or have a business relationship (e.g., hold a position such as officer,

director, partner, trustee, board member, scientific advisory board member, etc.) with an entity (e.g., the sponsor, provider or manufacturer of the product being investigated or equipment/services being offered, or the holder of any ownership interest in a product being investigated) related to the research outlined in this this study.

No member of the research team or an immediate family member have a proprietary interest (including trademark, patent, copyright, licensing agreement or other intellectual property) associated with the research outlined in this proposal (e.g., the drug or device).

Privacy and Confidentiality

We will do our best to keep your child's records private and confidential. We cannot guarantee absolute confidentiality. Your child's personal information may be disclosed if required by law. Certain people may need to see your child's study records. These individuals include:

- The research team, including the Principal Investigator, study coordinator, and all other research staff.
- Certain government and university people who need to know more about the study, and individuals who provide oversight to ensure that we are doing the study in the right way.
- Any agency of the federal, state, or local government that regulates this research.
- The USF Institutional Review Board (IRB) and related staff who have oversight responsibilities for this study, including staff in USF Research Integrity and Compliance.
- The sponsors of this study: the Florida Association of School Psychologists.

We may publish what we learn from this study. If we do, we will not include your child's name. We will not publish anything that would let people know who your child is. All data will be destroyed five years after the final report is filed to the University of South Florida Institutional Review Board.

You can get the answers to your questions, concerns, or complaints.

If you have any questions, concerns or complaints about this study, or would like to review the study materials please call Nicholas David W. Smith at (724) 599-4315 or email him at smithn1@mail.usf.edu

If you have questions about your child's rights, or have complaints, concerns or issues you want to discuss with someone outside the research, call the USF IRB at (813) 974-5638 or contact by email at RSCH-IRB@usf.edu.

You can refuse to sign this form. If you do not sign this form your child will not be able to take part in this research study. However, your child's care outside of this study and benefits will not change. Your authorization to use your child's health information will not expire unless you revoke (withdraw) it in writing. You can revoke this form at any time by sending a letter clearly stating that you wish to withdraw your authorization to use your child's health information in the research. If you revoke your permission:

- Your child will no longer be a participant in this research study;
- We will stop collecting new information about your child;

- We will use the information collected prior to the revocation of your authorization. This information may already have been used or shared with others, or we may need it to complete and protect the validity of the research; and
- Staff may need to follow-up with your child if there is a medical reason to do so.

To revoke this form, please write to:
Dr. Kathy Bradley-Klug, Ph.D.
Attn: Nicholas Smith
For IRB Study # **00038119**
University of South Florida
College of Education-EDU 105
4202 E. Fowler Ave.
Tampa, FL 33620

While we are conducting the research study, we cannot let you see or copy the research information we have about your child. After the research is completed, you have a right to see the information about your child, as allowed by USF policies. You will receive a signed copy of this form.

Consent for My Child to Participate in this Research Study

I freely give my consent to let my child take part in this study**.** I understand that by signing this form I am agreeing to let my child take part in research. I have received a copy of this form to take with me.

_____ _____
Signature of Parent of the Child Taking Part in Study Date

_____
Printed Name of Parent of the Child Taking Part in Study

Statement of Person Obtaining Informed Consent

I have carefully explained to the person taking part in the study what he or she can expect from their child's participation. I confirm that this research subject speaks the language that was used to explain this research and is receiving an informed consent form in their primary language. This research subject has provided legally effective informed consent.

_____ _____
Signature of Person Obtaining Informed Consent Date

_____
Printed Name of Person Obtaining Informed Consent

Appendix I. Student Assent Form

Assent of Children to Participate in Research

Title of study: Health-Promoting Behaviors and Subjective Well-Being Among High School Students

Why am I being asked to take part in this research?
You are being asked to take part in a research study about what leads to happiness and health during the teenage years. You are being asked to take part in this research study because you are currently enrolled in XXX School District. If you take part in this study, you will be one of about 400 people to do so.

Who is doing this study?
The person in charge of this study is Nicholas David W. Smith. He is being guided in this research by Dr. Kathy L. Bradley-Klug. However, other research staff may be involved and can act on behalf of the person in charge.

What is the purpose of this study?
By doing this study, we hope to learn we hope to learn more about what leads to happiness and health during the teenage years. The information that we collect may help us better understand why we should monitor student' healthy behaviors and their happiness. This research will be conducted through having participants complete a series of survey packets.

Where is the study going to take place and how long will it last?
The study will be take place in XXXX County School District. You will be asked to participate in one visit which will take about 50 minutes. The total amount of time you will be asked to volunteer for this study is 50 minutes during one school day while you are in your HOPE class during the week of March 15, 2019.

What will you be asked to do?
You will be asked to complete several surveys that will ask you about your thoughts, actions, and attitudes towards school, family, and life in general. You will also be asked to complete questions about your daily eating, exercise, sleep, safety habits, and utilization of various substances. You will not be asked to complete any other activities aside from completing the survey packet.

What things might happen if you participate?
To the best of our knowledge, your participation in this study will not harm you.

Is there benefit to me for participating?
We cannot promise that you will receive benefit from taking part in this research study. However, the informati that we collect may help us better understand why we should check student's healthy behaviors and happiness.

What other choices do I have if I do not participate?
You do not have to participate in this research study. Your decision to participate or not to participate will not affect your student status, course grade, recommendations, or access to future courses or training opportunities

Do I have to take part in this study?
You should talk with your parents or guardian and others about taking part in this research study. Your parent guardian must have signed a parental consent form for you to participate in this study. If you do not want to ta part in the study, that is your decision. You should take part in this study because you want to volunteer.

Risks or Discomfort
There are no known risks to those who take part in this study.

Will I receive any compensation for taking part in this study?
You will receive some competition (e.g., pencil) for taking part in this study. If you stop participating before t study is over, you will still receive the compensation.

.
Who will see the information about me?
Your information will be added to the information from other people taking part in the study so no one will know who you are.

Can I change my mind and quit?
If you decide to take part in the study, you still have the right to change your mind later. No one will think bad of you if you decide to stop participating. Also, the people who are running this study may need for you to stop. this happens, they will tell you when to stop and why.

What if I have questions?

You can ask questions about this study at any time. You can talk with your parents, guardian or other adults about this study. You can talk with the person who is asking you to volunteer by calling Nicholas Smith at (724) 599-4315 or email him at smithn1@mail.usf.edu. If you think of other questions later, you can ask them. If you have questions about your rights as a research participant, you can also call the USF IRB at (813) 974-5638 or contact by email at RSCH-IRB@usf.edu.

Assent to Participate

I understand what the person conducting this study is asking me to do. I have thought about this and agree to ta part in this study. I have been given a copy of this form.

_____ _____
Name of person agreeing to take part in the study Date

Signature of child agreeing to take part in the study: _____

_____ _____
Printed name & Signature of person providing Information (assent) to subject Date

Appendix J. IRB approval to conduct secondary analysis

From: "Larsen, Gina" <glarsen@usf.edu>
Subject: Re: Pro00038119 - Secondary Analysis of Data
Date: March 15, 2021 at 11:38:21 AM EDT
To: "Brennan, Erin" <erinbrennan@usf.edu>

Good Morning Erin,

Thank you for your email.

If the data is truly already de-identified (i.e. you are not going back into the identifiable dataset to extract the data), then it is fine for you to conduct additional analyses of the de-identified data, as the data are no longer treated as human subjects research data once de-identified.

Please let me know if you have any additional questions.

Thank you,
Gina

Gina Larsen, M.A., CIP
IRB Manager - Social Behavioral
USF Research Integrity & Compliance
University of South Florida
Tampa campus
+1-813-974-8360 (office)
glarsen@usf.edu

UNIVERSITY of SOUTH FLORIDA

From: Brennan, Erin <erinbrennan@usf.edu>
Sent: Monday, March 15, 2021 2:38 PM
To: RSCH IRB <RSCH-IRB@usf.edu>
Subject: Pro00038119 - Secondary Analysis of Data

Hello,

I am the PI of an approved study (Pro00038119) of which data collection has already been completed. I am writing to get confirmation that it is okay for me to conduct a secondary analysis of the data using a de-identified dataset extracted from the original data set, examining questions which I believe fall within the aims of the original study (to examine the relationship between various factors of physical health and subjective well-being). No new data will be collected.

Please let me know if any other information is needed in order to confirm that a reanalysis of this data is okay without any other submissions for approval.

Thank you!
Erin Brennan

Appendix K. Supplementary Table.

Table A1.

Correlation analyses between variables of interest and continuous and dichotomous sleep outcome variables

	Sufficient sleep (dichotomous)		Hours of sleep (continuous)	
Predictor	*Pearson Correlation*	*p*	*Pearson Correlation*	*p*
Race – Other	.038	.432	.033	.503
Race – Black	-.061	.209	-.013	.797
Race – Hispanic/Latino-a	-.043	.382	-.016	.749
Race – Multiracial	.007	.888	-.022	.650
FRL eligibility (1=FRL)	.023	.638	.072	.139
Gender (1=female)	.032	.515	.042	.387
Grade level	.002	.967	-.001	.982
Physiological factor	.081	.097	.090	.067
Behavioral Arousal factor	.108	.027	.124	.011
Cognitive/Emotional factor	.116	.018	.128	.009
Sleep Environment factor	.125	.011	.086	.078
Sleep Stability factor	.134	.007	.174	.000
Daytime Sleep factor	.152	.002	.185	.000
Substances (1=abstains)	.115	.019	.132	.007
Subjective Well-Being	.097	.047	.136	.005

Note. SE= standard error; FRL=free/reduced-price lunch; Race-other includes Asian, American Indian/Alaska Native, Pacific Islander, and other race. **. Correlation is significant at the 0.01 level (2-tailed); *. Correlation is significant at the 0.05 level (2-tailed).