SLEEP ATTITUDES IN ADOLESCENTS: DEMOGRAPHIC DIFFERENCES AND ASSOCIATIONS WITH SLEEP HEALTH

by

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ABSTRACT

About 70-90% of adolescents in the United States receive less than the recommended 8 hours of sleep on a nightly basis despite its importance in everyday functioning (Keyes et al., 2015). Health-related attitudes are modifiable and predict actual health behaviors and previous research suggests that there are differences in how people value sleep (Ruggiero et al., 2019). Although previous work has examined sleep attitudes in teenagers, this has yet to be examined quantitatively in relation to actual sleep behavior. The purpose of this study is to examine how adolescents prioritize sleep and how this relates to other sleep outcomes.

Participants included 649 adolescents from the United States (ages 13-18, M = 16.2, SD = 1.08; female = 79.7%; white = 45.2%) and were recruited through advertisements distributed throughout Instagram. Participants completed a brief 15-minute online survey to assess sleep outcomes and sleep attitudes. Adolescents completed the Charlotte Attitudes Towards Sleep Scale, the Pittsburgh Sleep Quality Index, the Sleep Timing Questionnaire, the Adolescent Sleep Hygiene Scale, the MacArthur Scale of Subjective Social Status – Youth Version, and sociodemographics.

A series of regression models were conducted examining sleep outcomes predicted by adolescent sleep attitudes while adjusting for sociodemographics. An additional regression model was conducted examining adolescent sleep attitudes predicted by perceived socioeconomic status while adjusting for sociodemographics. Results suggested that teens who reported more positive attitudes towards sleep also reported longer sleep duration, better sleep quality, shorter sleep latency, earlier weekday and weekend bedtimes, and better sleep hygiene. There were also no significant differences in sleep atttitudes across sociodemographics. Follow-up exploratory analyses examined the two sleep attitudes subscales as independent predictors and outcomes and the pattern of findings remained unchanged.

This study helps address the lack of research surrounding sleep attitudes in an adolescent sample. Results showed that sleep attitudes significantly predict sleep outcomes, but no significant differences were found across sociodemographic groups once accounting for covariates. Overall, findings from this study advance research on sleep attitudes by examining attitudes in a youth sample and suggest that sleep attitudes are a possible modifiable target to minimize sleep health difficulties.

INTRODUCTION

Inadequate sleep is a growing problem among adolescents in the United States. About 70-90% of adolescents receive less than the recommended minimum 8 hours of sleep each night despite its importance in everyday functioning (Keyes et al., 2015; Owens et al., 2014; Palmer et al., 2020; Smaldone et al., 2007). Both psychological and physiological consequences can arise due to insufficient sleep. Common consequences of poor sleep for adolescents include lack of motivation, decreased levels of attention, poor judgment and decision-making, and poorer academic outcomes (Owens et al., 2014). Additionally, teens who receive less than 8 hours of sleep have an increased risk of suffering from numerous psychiatric symptoms and disorders, including anxiety, depression, and suicidal ideation (Owens et al., 2014; Palmer & Alfano, 2020). A large body of research also shows a relationship between sleep duration and obesity risk which has become a public health crisis in the United States affecting around 21 percent of adolescents (CDC, 2021). Of concern, cardiovascular disease, type 2 diabetes (St-Onge et al., 2016), and overall mortality (Gallicchio & Kalesan, 2009; Cappuccio et al., 2010) are also associated with insufficient sleep.

Despite the high prevalence rates and negative consequences of insufficient sleep among teens, very little research has examined how teens prioritize or value sleep. Importantly, prior research has shown that health-related attitudes are modifiable and predict actual health behaviors (Kim 2016; Rise et al., 2008; Valdiserri et al., 1989), and recent research suggests that there are inter-individual differences in how adults value sleep (Ruggiero, Peach, & Gaultney, 2019). As a result, it is likely important to understand how teens value and prioritize sleep given the high rates of insufficient sleep in this age group. The current study will assess sleep-related

values in a sample of adolescents and examine how they relate to reported sleep patterns. Additionally, there are discrepancies in sleep health in teens across gender, race, ethnicity, and socioeconomic status, so research on sleep attitudes and possible demographic differences is important to identify which groups might be at risk. Thus, the current study will also examine how sleep attitudes may vary based on gender, race, ethnicity, and socioeconomic status.

Sleep Health Attitudes

Previous research has shown that health attitudes can be altered through interventions and can predict actual health behaviors. The theory of planned behavior outlines several factors that influence an individual's intentions to engage in a health behavior, including the person's attitudes toward the behavior, their subjective norms with respect to the behavior, and perceived control over the behavior (Ajzen, 1991; Eagly & Chaiken, 2007). As a result, attitudes likely play a major role in predicting sleep health behaviors, and a better understanding of the attitudes that individuals have about sleep may be an important step to improving and tailoring interventions aimed at improving sleep.

Sleep attitudes can be defined as "the propensity to evaluate [sleep] with some degree of favor or disfavor that is formed, informed, and expressed by cognitive, affective, and behavioral processes" (Eagly & Chaiken, 2007). To date, there have been very few studies on sleep attitudes. However, numerous public policies in the United States prioritize convenience and work productivity over sleep, such as early school start times and nine-to-five work schedules. These societal norms that de-prioritize sleep health along with poor access to sleep education may directly impact sleep attitudes among many Americans (Barnes & Drake, 2015).

Preliminary studies in adults have shown that people indeed hold attitudes about the perceived benefits of sleep (e.g., “I think sleep is a restorative process for my body”) and about the perceived time commitment of sleep (e.g., “I often pick other activities over going to bed early”; Peach, Gaultney, and Ruggiero, 2018). And, these sleep attitudes predict sleep duration, sleep quality, and sleep hygiene (e.g., behavioral practices that impede or promote proper sleep; Peach & Gaultney, 2017; Peach, Gaultney, & Ruggiero, 2018; Ruggiero, Peach, & Gaultney, 2019). Positive sleep attitudes have also been associated with longer sleep duration and greater sleep quality via sleep hygiene (Ruggiero et al., 2020), although the majority of studies have focused on adults. Some preliminary work has examined sleep attitudes in teenagers, but this work has solely been qualitative (e.g., focus groups, interviews; Owens et al., 2006; Vandendriessche et al., 2022). This preliminary data suggests that teens do hold attitudes about sleep, but these attitudes have yet to be quantitatively examined or examined in relation to actual sleep behaviors. Further research needs to be conducted on sleep attitudes and their impact on sleep outcomes in adolescents to better understand possible intervention or prevention points that can improve overall sleep health.

Adolescent Sleep

During adolescence, there are several neurobiological and psychosocial developmental changes directly and indirectly influence sleep. The recommended amount of sleep that adolescents should receive on a nightly basis is between 8-10 hours (Paruthi et al., 2016); however a large portion of teenagers report getting less than this amount and the number of teens obtaining adequate sleep has been declining over the last several decades (71.5% in 1991 to 63% in 2012; Keyes et al., 2015; CDC, 2019). Several factors can hinder the ability for adolescents to

get the recommended amount of sleep (Crowley et al., 2018). With the onset of puberty (which typically begins during the ages of 8-13 years old; Hopkins Medicine, 2020), youth begin to experience a decline in homeostatic sleep pressure (body's natural drive for sleep) and a delay in the daily onset of melatonin, which makes it more difficult to fall asleep at an early time (Crowley et al., 2018). These factors, in combination with early school start times, exposure to light in the evening through increased screentime (which can further suppress melatonin), and increased academic and social demands, leads to truncated sleep opportunities. It is important to note that some of these factors that influence adolescent sleep are biological and resistant to change (e.g., delays in melatonin onset), however, because of practical limitations, effective societal-level solutions such as later start times have been slow to adopt and have been met with pushback (Owens et al., 2014). In addition, many teens obtain inadequate sleep even when they are not in school (e.g., weekends, summer break), suggesting that other factors are also important for sleep health (Bartel, Gradisar, & Williamson, 2015). As a result, finding individual and modifiable differences that may help promote healthy sleep is an important step to understanding sleep problems in adolescents.

In addition, parents usually have some control over their child's health behaviors, but the onset of adolescence increases childrens' desire to be independent from parents and have full control over their own health decisions (WHO, 2003). Adolescence marks a period in which teens begin to have more control over their life decisions, inlcuding those related to health behaviors (Viner & Macfarlane, 2005). For example, adolescents engage in riskier behaviors during this period due to the maturation of the limbic system, which is matched by a still-immature prefrontal cortex (Albert, Chein, & Steinberg, 2013; Clark & Loheac, 2007; Gardner &

Steinberg, 2005). Teens also go through a phase in which they experience feelings of invincibility which can result in increased risk-taking behavior and decreased perceived risk (Greene et al., 2000; Moffat & Jhonson, 2001; Wickman et al., 2008). In addition, teenagers' future orientation is still developing which means that they are more likely to have difficulties considering the long-term consequences of decisions (Nurmi, 1991; Steinberg et al., 2009). These developmental changes may be important regarding sleep health, due to a large portion of sleep-related adverse outcomes that happen over the long term such as increased risk for cancer (Medic, Wille, & Hemels, 2017). Despite several established causes of poor sleep and potential consequences among teenagers, little is known about sleep attitudes during adolescence.

Health Disparities and Sociodemographic Influences on Sleep Attitudes

Health disparities have been documented based on racial, ethnic, gender and socioeconomic status among adults. For instance, lower socioeconomic status has also been associated with greater unhealthy behaviors such as smoking, less exercise, and poor diet (Pampel, Krueger & Denney, 2010). Further, adults with no high school education had worse health than those with a high school degree (Howard, Sentell, & Gazmararian, 2006). Research also demonstrates that those of a racial minority group have poorer health outcomes than white individuals (Dubay & Lebrun, 2012) and an increased risk for mental health disorders (Williams et al., 2010). In addition, a more masculine gender expression during the teenage years was associated with substance use and abuse and poor diet choices (Shakya et al., 2019). Despite there being health disparities across sociodemographics, similar disparities have also been observed when it comes to sleep.

Research has also shown sociodemographic disparities in sleep. For instance, lower education level and being of a minority group were associated with longer sleep latency (i.e., time taken to fall asleep) in adults (Grandner et al., 2013) and poor sleep quality was more prevalent amongst African American adults than White adults (Durrence & Lichstein, 2010). Further, in youth samples between the ages of 6-19 years, White youth obtain sufficient sleep at a higher rate than minority youth, and Hispanic youth obtained more sleep than Black youth (Guglielmo et al., 2018).

Some demographic differences in health and sleep may be due to differences in sleep attitudes among these groups. For example, adult White participants have more positive attitudes towards sleep compared to self-identified minorities, and this difference was stronger when examining White participants with a high socioeconomic status compared to minority participants and participants with a lower socioeconomic status (Ruggiero, Peach, & Gaultney, 2019). In addition, adult males had less positive attitudes towards sleep compared to females (Ruggiero, Peach, & Gaultney, 2019), and other research suggests that obtaining less sleep is perceived as being a masculine characteristic (Warren & Campbell, 2021). Therefore, sleep attitudes should be further examined across different groups.

Little research has examined sleep attitudes among youth samples nor how they may vary based on race, ethnicity, gender, and socioeconomic status. There is a need for research that examines demographic differences in sleep attitudes in teenagers, when youth are beginning to gain autonomy over their sleep schedules and start to make their own health decisions. Such research can help identify youth who may be more at risk for unhealthy sleep behaviors and can inform interventions that can directly target attitude change to improve overall sleep health.

Current Study

Adolescence is a period in which autonomy over behavior increases and neurobiological changes result in an increase in risk-taking behavior, which can affect decision-making with long-term health implications. Insufficient sleep in adolescents has been an ongoing problem in the United States with higher rates of insufficient sleep among non-white youth and youth with a lower socioeconomic status. Health attitudes have been shown to be modifiable and could improve health behaviors (Kim 2016). Therefore, examining sleep attitudes could lead to possible intervention targets to improve sleep amongst teens. Given the lack of research examining the role of sleep attitudes on sleep outcomes more broadly across the lifespan, and that little research has examined sleep attitudes in youth in particular, the present study will explore whether sleep attitudes predict sleep outcomes in adolescents. This relationship between sleep attitudes and sleep outcomes might possibly not exist due to developmental, social and environmental influences such as biological changes and peer influence. Other factors such as cognitive development and the impact of mentla health on sleep health can possibly influence this relationship as well. The second purpose of this study was to examine gender, race, ethnicity, and socioeconomic status differences in sleep attitudes. It is hypothesized that more unfavorable sleep attitudes would be significantly associated with a shorter sleep duration, poorer sleep quality, later sleep timing, longer sleep latency, and poorer sleep hygiene behaviors. Additionally, based on prior findings in adults, it is hypothesized that minority, lower SES, and male participants would have less favorable sleep attitudes than female participants. Exploratory analyses also examined whether attitudes about the health benefits of sleep or attitudes towards

the perceived time commitment involved in sleep differentially predict sleep health outcomes, or differ across sociodemographic groups.

METHOD

Participants and Procedure

Participants were recruited through online advertisements (e.g., Instagram) and snowball sampling (initial partcipants refer other potential participants. Participants were included if they were: (1) currently residing in the United States, (2) enrolled in high school or a high school equivalent (e.g., homeschooled), (3) between the ages of 13-18, and (4) speak fluent English (to ensure consent and questionnaire comprehension). Participants were also required to have access to a smartphone or a computer with internet access so that they are able to access the questionnaire. Participants provided their consent prior to taking the survey, and similar to prior studies using similar methods (Palmer et al., 2022), passive parental consent was used in which parents or legal guardianas were informed about the activity their child was participating in. Participants were provided with an information sheet to give their parents, which included details about the study, a copy of the questionnaire, and contact information for the study team. The survey took approximately 15 minutes to complete and participants were automatically entered to win one of eight $25 Amazon gift cards. All participants completed the survey between March-June, 2023.

The total sample size for our primary analysis was determined through power analyses using G*Power version 3.1.9.7 (Faul et al., 2007). Using an error probability of .05 and 80% power, the current analyses would be adequately powered to detect small-medium effects with a sample size ranging between n = 128-395. Additional participants (resulting in a minimum of 500) was collected to account for participants that may need to be removed for substantial missing data or failed attention checks. Instagram advertisements were tailored to attempt to

recruit a racially/ethnically diverse sample by using images of teenagers from different backgrounds.

A total of 1184 participants completed the survey. Some participants were removed from the final analytic sample for not providing parent email addresses (*n* = 449), being outside of the age range (n = 5), providing an invalid email address (n = 8), or for extensive missing data (i.e., completed the assent but then did not complete any of the questionnaires (n = 57). In addition, a total of 7 participants failed attention checks and were removed from analyses, and 9 participants were deleted due to unusual responses or response bias. The final analytic sample included 649 adolescents between the ages of 13-18. Participants were primarily female (79.7%; 8% male; 7.9% self-identified as non-binary or genderqueer), white (45.2%; 26% Hispanic), and financially well off (41.7%) with the ability to buy the things they need while sometimes being able to buy special things. Descriptive statistics for the current sample is provided in Table 1.

Measures

Participants first completed the sleep attitudes scale, then the sleep outcomes scales and lastly answered sociodemographics questions.

Charlotte Attitudes Towards Sleep Scale (CATS)

The CATS Scale (Peach & Gaultney, 2017) is a 10-item self-report measure designed to assess sleep attitudes. Five items are used to measure one's attitude "regarding the enjoyment and restful benefits of sleep" (The Benefits Subscale) and five items are used to measure sleep attitudes "related to the time investment that sleep requires that may shape or contribute to one's overall evaluation of sleep as favorable or unfavorable" (The Time Commitment Subscale). An

overall sleep attitudes score can be averaged from all 10 items ranging from 1 = strongly disagree to 7 = strongly agree with higher scores indicating more favorable attitudes towards sleep. The two separate subscales were also independently averaged. The Benefits Subscale consisted of 5 items (α = .85), the Time Commitment Subscale consisted of 5 items (α = .72), and the overall CATS scale consisted of 10 items (α = .73).

Pittsburgh Sleep Quality Index (PSQI)

The PSQI (Buysse et al., 1989) consists of 19 self-rated items which cover seven domains of sleep quality in the past month. For the purposes of the current study, the following subdomains were used: sleep duration, sleep quality, and sleep latency. Sleep duration was assessed using the following question: "During the past month, how many hours of actual sleep did you get at night?". Sleep quality was assessed using the sum of all subscale scores to create a total score. Lastly, sleep latency will be assessed using the following question: "During the past month, how long (in minutes) has it usually taken you to fall asleep each night?". An overall score ranging between 0 = Better to 3 = worse will be calculated for each subscale and overall scale.

Sleep Timing Questionnaire (STQ)

The STQ (Monk et al., 2003) consists of 18 questions regarding "good night time" (GNT; "the time at which you are finally in bed and trying to fall asleep") and "good morning time" (GMT; "the time at which you finally get out of bed and start your day"). Participants report these times in clock time (HH:MM). Two GNT items was used to measure sleep timing on weekends and weekdays: "On the night before a work day or school day, what is your **usual**

GOOD NIGHT TIME?" and "On a night before a day off (e.g., weekend), what is your **usual** GOOD NIGHT TIME?"

Adolescent Sleep Hygiene Scale (ASHS)

The MacArthur SSS Scale – Youth Version (Goodman et al., 2001) is designed to measure subjective social status among adolescents. It is composed of 2 images of ladders; the first ladder is a measure of perceived socioeconomic status and assesses familial placement in US society whereas the second ladder assesses personal placement in the school community. The Socioeconomic Status subscale item reads "Imagine that this ladder pictures how American Society is set up. At the top of the ladder are the people who are the best off—they have the most money, the highest amount of schooling, and the jobs that bring the most respect. At the bottom are the people who are the worst off – they have the least amount money, little or no education, no job or jobs that no one wants or respects. Now think about your family. Please tell us where you think your family will be on this ladder." Each rung of the ladder corresponds with a number ranging from 1 (bottom rung) through 10 (top rung) with higher scores indicating a higher level of social status. Scores for the Socioeconomic Status Ladder were used in the current study.

Demographics

Data on participants' race (White, African-American, American Indian, Asian, Biracial or mixed race, other), ethnicity (Hispanic, Non-Hispanic), gender identity (Male, Female, Other), age, and financial strain was collected along with the other variables. The following item was used to assess financial strain: "What best describes your family's financial situation?" (1 = "We have a hard time buying the things we need" to 4 = "We have enough money to buy almost anything we want").

Data Analytic Plan

Descriptive statistics (i.e., means, standard deviations, and ranges) and preliminary bivariate associations (i.e., correlations, t-tests) will be examined for all variables of interest. Given the lack of research on sleep attitudes in teens, a table with descriptive statistics for all individual items in the sleep attitude scale along with the subscale and total scores was calculated. To examine whether sleep attitudes predict sleep outcomes, a series of regression models will be conducted. Each model will include sleep attitudes as the predictor variable, and sociodemographic characteristics as covariates (i.e., age, gender, race/ethnicity, financial strain, perceived socioeconomic status). Each model will include a sleep behavior as a dependent variable (sleep duration, sleep quality, sleep latency, sleep timing, and sleep hygiene). Follow-up exploratory analyses will also examine the two sleep attitude subscales as independent predictors.

To examine differences in sleep attitudes between gender and race/ethnicity, several ANCOVAs will be conducted with participant's gender, race (White vs. non-White youth), and ethnicity (Hispanic vs. non-Hispanic) as the predictors. Follow-up exploratory analyses will examine White, Black, and Asian youth separately. A regression model with only perceived socioeconomic status as the predictor will also be conducted. Each model will include the other sociodemographic characteristics as covariates (i.e., age, gender, race/ethnicity, financial strain, and SES). Follow-up exploratory analyses will examine the sleep attitude subscales as independent outcomes.

Table 1. Descriptive Statistics for Sociodemographics and Sleep Outcomes.

Variables	%(n)	Mean	Std. Dev.	Range
Age		16.2	1.08	13-18
Gender				
Male	8% (52)			
Female	79.7% (333)			
Race				
White	45.2% (188)			
African-American/Black	19% (79)			
American Indian/Alaska Native	1% (4)			
Asian	19.2% (80)			
Biracial or Mixed	8.4% (35)			
Other	7.2% (30)			
Ethnicity				
Hispanic	26% (108)			
Non-Hispanic	74% (307)			
Financial Situation [a]		2.38	.86	1-4
Subjective Social Status [b]		6.02	1.71	1-10
Sleep Duration		6 hrs, 26 min	1.53	3-12 hrs
Sleep Quality		8.17	3.4	1-19
Sleep Latency		31.17 min	35.21	0-180 min
Sleep Bedtime (Weekday)		11:20 pm	1:39	5:45 pm – 8 am
Sleep Bedtime (Weekend)		12:03 am	1:39	5 pm – 6 am
Sleep Hygiene		4.18	.58	2.48 – 5.47

Note. Higher scores on financial situation and Subjective Social status indicate the family is more financially well off. Higher scores on sleep quality indicate worse overall sleep quality. Higher scores on sleep hygiene indicate better sleep hygiene behaviors.

[a] 1 = I have a hard time buying the things I need, 2 = I have just enough money for the things I need, 3 = I have no problem buying the things I need, and I can also sometimes buy special things, 4 = I have enough money to buy almost anything I want.

[b] 1 = Least better off, 10 = Better off.

RESULTS

Preliminary Analyses

Basic data checks for outliers and assumptions of normality, linearity, multicollinearity, and homoscedasticity were conducted. All analyses were conducted using IBM SPSS Statistics (Version 29). Due to skewness in responses for the sleep attitudes Benefits subscale, the scale was transformed using a reciprocal transformation. The skewness problem was fixed and all analyses were conducted with the transformed and non-transformed variable. All results remained unchanged, so results using the non-transformed variable is reported for all analyses. All descriptive statistics are reported in Table 1. In addition, descriptive statistics for the sleep attitudes total scale, subscales, and individual items is presented in Table 2.

First, a series of bivariate correlations were conducted among all variables of interest. These indicated a significant but small correlation between the sleep attitudes Benefits Subscale and the Time commitment subscale. Additionally, participants with shorter sleep duration, worse sleep quality, short sleep latency, later weekend and weekday bedtimes, and worse sleep hygiene reported more negative attitudes for both the sleep attitudes subscales and overall scale. Older adolescents were associated with shorter sleep duration and poorer sleep quality, and participants with a better financial situation also reported greater subjective social status. All sleep variables were associated with one another in expected directions, as shorter sleep duration, poorer sleep quality, longer sleep latency, and later sleep timing were all associated with one another. In addition, participants reporting better sleep hygiene also reported longer sleep duration, better sleep quality, shorter sleep latency, and earlier sleep timing. All bivariate correlations are reported in Table 3.

Next, a series of independent-samples t-tests and one-way ANOVAs were conducted to examine differences in sleep attitudes and sleep health between gender, race, and ethnicity. All t-tests and ANOVA's are reported in Tables 4 and 5. Findings suggest that Non-white youth reported more positive sleep attitudes for the Sleep Benefits subscale, but also shorter sleep duration, longer sleep latency, and worse sleep hygiene than white youth. Follow-up analyses examined racial categories separately (Non-Hispanic White, African American/Black, and Asian), and Black and Asian teens reported shorter sleep duration, earlier bedtimes compared to White teenagers. Black teenagers reported worse sleep hygiene compared to White and Asian teenagers. Black teens reported worse overall sleep quality, and more positive sleep attitudes for the Time Commitment, Benefits of Sleep, and overall scale compared to White and Asian teenagers, but these differences were marginal. Post-hoc analysis were significant but main effects were marginal. T-tests show that females reported a shorter sleep duration compared to male participants, and marginally poorer sleep quality and sleep hygiene. Female participants also reported more positive sleep attitudes for the Sleep Benefits subscale, but more negative attitudes on the Time Commitment subscale, although these differences were marginal. No differences in sleep attitudes emerged between non-Hispanic and Hispanic youth.

Primary Analyses

Sleep Attitudes Predicting Sleep Behaviors

To examine whether sleep attitudes predict sleep health among adolescents, a series of regression models was conducted. These findings are presented in Table 9. Each model included sleep attitudes as the predictor variable, one of the six sleep behaviors as outcomes, and sociodemographic characteristics as covariates (i.e., age, gender, race/ethnicity, financial strain,

perceived socioeconomic status). As predicted, the overall model was statistically significant for sleep duration, sleep quality, sleep latency, weekday sleep timing, weekend sleep timing, and sleep hygiene. This supports our first hypothesis in which sleep attitudes significantly predicts sleep outcomes. Additionally, after adjusting for covariates, adolescents reporting more positive sleep attitudes also reported longer sleep duration, better sleep quality, shorter sleep latency, earlier weekday and weekend bedtimes, and better sleep hygiene. This is consistent with other adult-focused research that found that sleep attitudes predict several aspects of sleep, including sleep duration, sleep quality, and sleep hygiene (Peach & Gaultney, 2017; Peach, Gaultney, & Ruggiero, 2018; Ruggiero, Peach, & Gaultney, 2019). This implies that having positive sleep attitudes should be taken into account when promoting healthy sleep habits in teenagers. These findings are presented in Tables 6-8. Follow-up exploratory analyses examined the two sleep attitudes subscales as independent predictors and the pattern of findings remained unchanged. More positive attitudes towards the benefits of sleep and towards the time commitment needed for sleep both predicted better sleep health, including longer sleep duration, better sleep quality, shorter sleep latency, earlier weekday and weekend bedtime, and better sleep timing.

Sociodemographic Differences in Sleep Attitudes

To examine differences in sleep attitudes between gender, race/ethnicity, and socioeconomic status in sleep attitudes, ANCOVAs were conducted with participant's gender, race (White vs. non-White youth), and ethnicity as the quasi-independent variables. The first model included gender as the predictor, sleep attitudes as the outcome, and age, race (White, Non-White), financial strain, perceived SES, and ethnicity as the covariates. The second model included race (White, Non-White) as the predictor, sleep attitudes as the outcome, and age,

financial strain, perceived SES, and gender as the covariates. The third model included race (Non-Hispanic White, Black, Asian) as the predictor, sleep attitudes as the outcome, and age, financial strain, perceived SES, and gender as the covariates. The fourth model included ethnicity as the predictor, sleep attitudes as the outcome, and age, financial strain, perceived SES, and gender as the covariates. Follow-up exploratory analyses examined White, Black, and Asian youth separately. A regression model with perceived socioeconomic status as the predictor was also conducted with sociodemographic characteristics as covariates (i.e., age, gender, race/ethnicity, financial strain, and SES). No models were statistically significant. Differences in sleep attitudes between males/females, White/non-White, and Hispanic/non-Hispanic adolescents was not present, nor was perceived socioeconomic status a significant predictor of overall sleep attitudes. This is in contrast to previous research conducted in adult samples which has found demographic differences in sleep attitudes (Ruggiero, Peach, & Gaultney, 2019). Follow-up exploratory analyses examined the two sleep attitudes subscales as independent outcomes and the findings were unchanged. Lastly, moderation analyses were conducted to examine whether sociodemographics moderated the interaction between sleep attitudes and sleep outcomes while accounting for sociodemographics as covariates. Results showed that a significant moderation effect was observed for gender (β = -1.51, *SE* = .62, p = .02) in the relationship between sleep attitudes and sleep quality. Sleep attitudes did not significantly predict sleep quality for males (β = -.17, *SE* = .58, p = .77), but it did significantly predict it for females (β = -1.68, *SE* = .21, p = .00). The more positive female's sleep attitudes were, the better their sleep quality. A significant moderation effect was also observed for ethnicity (β = .49, *SE* = .21, p = .02) in the relationship between sleep attitudes and weekend bedtimes. Sleep attitudes negatively predicted weekend

bedtimes for Hispanics (β = -.96, *SE* = .18, p = .00) and non-Hispanics (β = -.48, *SE* = .12, *p* = .00). More positive sleep attitudes predicted earlier weekend bedtimes for both groups.

Table 2. Descriptive statistics for all CATS scale individual items along with the subscale and total score.

Variable	Mean	Std. Dev.	Range
CATS - Sleep is a necessity	6.41	1.16	1-7
CATS - I am inclined to skip sleep in order to socialize longer.	3.63	1.7	1-7
CATS - Getting a good night's sleep makes me happy.	5.9	1.27	1-7
CATS - I usually choose school work as a more important activity than my sleep schedule.	3.26	1.86	1-7
CATS - I look forward to a full night of sleep.	5.72	1.35	1-7
CATS - In the past, I haven't made time for adequate sleep in my schedule.	2.32	1.62	1-7
CATS - I often pick other activities over going to bed early.	2.43	1.55	1-7
CATS - Getting a full night of sleep is satisfying to me.	5.94	1.29	1-7
CATS - I enjoy a good night's sleep.	6.24	1.12	1-7
CATS - I sleep less so I have more hours during the day to get work accomplished.	3.31	1.9	1-7
CATS – Sleep Benefits Subscale	6.04	.98	1-7
CATS – Time Commitment Subscale	2.99	1.18	1-7
CATS – Overall Mean Score	4.51	.81	1-7

Note. Higher scores indicated more positive attitudes.

Table 3. Bivariate correlations between sociodemographics, adolescent sleep attitudes, and sleep outcomes.

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	-											
2. Financial Situation	-.15**	-										
3. Subjective Social Status	-.02	.41**	-									
4. CATS Sleep Benefits	.05	-.04	.01	-								
5. CATS Time Commitment	-.02	-.05	.04	.12**	-							
6. CATS Overall Mean	.01	-.06	.04	.69**	.8**	-						
7. Sleep Duration	.15**	-.14**	-.09	-.26**	-.41**	-.45**	-					
8. Sleep Quality	.13*	-.14**	-.11*	-.22**	-.35**	-.39**	.65**	-				
9. Sleep Latency	.06	-.08	-.09	-.25**	-.16**	-.27**	.27**	.64**	-			
10. Sleep Timing (Weekday)	.01	-.06	-.02	-.18**	-.33**	-.34**	.47**	.32**	.13**	-		
11. Sleep Timing (Weekend)	.01	-.03	-.09	-.23**	-.24**	-.31**	.34**	.24**	.18**	.5**	-	
12. Sleep Hygiene	.01	.28**	.05	.11*	.23**	.23**	-.37**	-.43**	-.28**	-.16**	-.23**	-

Note. Higher scores for CATS overall and subscales indicated more positive sleep attitudes. Higher scores for sleep duration, sleep quality, and sleep latency indicate worse sleep with scores ranging between 0 = Better to 3 = worse. Higher scores for sleep hygiene indicate better sleep practices and habits.

*. Correlation is significant at the 0.05 level (2-tailed)

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4. Independent samples t-test comparing adolescent sleep attitudes and sleep outcomes by gender, race, and ethnicity.

Variables	Gender					Race (White/Non-White)					Ethnicity				
	Male	Female				White	Non-White				Hispanic	Non-Hispanic			
	M (SD)	M (SD)	t	df	p	M (SD)	M (SD)	t	df	p	M (SD)	M (SD)	t	df	p
CATS Overall Mean	4.59 (.76)	4.54 (.83)	.39	382	.69	4.49 (.85)	4.55 (.79)	-.64	413	.52	4.55 (.89)	4.51 (.78)	.39	412	.7
CATS Sleep Benefits	5.9 (.92)	6.13 (.91)	-1.72	383	.09	5.96 (1.02)	6.16 (.85)	-2.18	414	.03	6.01 (.99)	6.09 (.91)	-.800	413	.42
CATS Time Commitment	3.27 (1.11)	2.95 (1.22)	1.82	382	.07	3.02 (1.18)	2.93 (1.19)	.79	413	.43	3.09 (1.19)	2.93 (1.18)	1.14	412	.25
Sleep Duration	.65 (.95)	.98 (.99)	-2.2	375	.03	.78 (.89)	1.05 (1.06)	-2.77	406	.006	.95 (1)	.91 (.99)	.42	406	.68
Sleep Quality	1.27 (.6)	1.31 (.66)	-.39	382	.06	1.35 (.67)	1.31 (.66)	.63	413	.53	1.34 (.63)	1.32 (.68)	.26	412	.8
Sleep Latency	1.5 (.96)	1.57 (1)	-.49	380	.63	1.67 (.99)	1.47 (.99)	2.04	411	.04	1.69 (1)	1.52 (1)	1.45	410	.15
Sleep Timing (Weekday)	23:04 (1:19)	23:18 (1:28)	-1.11	376	.27	23:10 (1:21)	23:24 (1:33)	-1.69	407	.09	23:15 (1:36)	23:18 (1:25)	-.31	406	.76
Sleep Timing (Weekend)	23:57 (1:16)	24:01 (1:38)	-.23	374	.82	23:54 (1:36)	24:09 (1:36)	-1.53	405	.13	24:01 (1:47)	24:01 (1:31)	-.08	404	.93
Sleep Hygiene	4.33 (.57)	4.15 (.59)	1.93	369	.054	4.29 (.52)	4.09 (.60)	3.66	400	<.001	4.13 (.51)	4.21 (.59)	-1.24	400	.22

Note. Higher scores for CATS overall and subscales indicated more positive sleep attitudes. Higher scores for sleep duration, sleep quality and sleep latency indicate worse sleep with scores ranging between 0 = Better to 3 = worse. Higher scores for sleep hygiene indicate better sleep practices and habits.

Table 5. One-way Analysis of Variance (ANOVA) examining adolescent sleep attitudes and sleep outcomes by race.

	Race (Non-Hispanic White, Black, Asian)							
	White	Black	Asian					
Variables	M (SE)	M (SE)	M (SE)	Sum of Squares	df	Mean Square	F	p
CATS Overall Mean	4.48 (.07)	4.69 (.09)	4.42 (.09)	3.4	2	1.7	2.78	.06
CATS Sleep Benefits	5.98 (.08)	6.26 (.10)	6.14 (.10)	3.96	2	1.98	2.52	.08
CATS Time Commitment	2.98 (.10)	3.14 (.13)	2.7 (.13)	7.67	2	3.83	2.74	.07
Sleep Duration	,69 (.08)	1.17 (.11)	1 (.11)	12.13	2	6.06	6.65	.002
Sleep Quality	8.13 (.3)	8.63 (.38)	7.36 (.38)	63.84	2	31.92	2.88	.06
Sleep Latency	1.66 (.09)	1.57 (.11)	1.32 (.11)	5.84	2	2.92	2.99	.052
Sleep Timing (Weekday)	23:14 (.12)	22:59 (.16)	22:45 (.15)	32.82	2	16.41	8.81	<.001
Sleep Timing (Weekend)	23:50 (.13)	24:05 (.17)	24:13 (.17)	6.23	2	3.12	1.35	.26
Sleep Hygiene	4.37 (.05)	3.84 (.06)	4.27 (.06)	13.71	2	6.85	22.62	<.001

Note. Higher scores for CATS overall and subscales indicated more positive sleep attitudes. Higher scores for sleep duration, sleep quality and sleep latency indicate worse sleep with scores ranging between 0 = Better to 3 = worse. Higher scores for sleep hygiene indicate better sleep practices and habits.

Table 6. Regression analyses examining sleep outcomes predicted by adolescent sleep attitudes while adjusting for sociodemographics.

	Sleep Duration					Sleep Quality				
Variable	Beta	SE	β	p	95% CI	Beta	SE	β	p	95% CI
Age	.12	.04	.13	.006	.03, .2	.41	.15	.13	.008	.11, .71
Gender	.24	.13	.08	.06	-.02, .5	.7	.47	.07	.14	-.23, 1.63
Race	.24	.09	.12	.01	.06, .42	-.06	.34	-.01	.85	-.73, .60
Ethnicity	-.11	.11	-.05	.28	-.32, .09	.08	.39	.01	.85	-.68, .83
Financial Situation	-.12	.06	-.1	.05	-.23, -.002	-.42	.22	-.11	.049	-.85, -.001
SSS	-.01	.03	-.02	.63	-.07, .04	-.08	.11	-.04	.46	-.29, .13
Sleep Attitudes	-.56	.06	-.47	<.001	-.67, -.46	-1.5	.2	-.36	<.001	-1.89, -1.11

Note. SSS = Subjective Social Status.

Table 7. Regression analyses examining sleep outcomes predicted by adolescent sleep attitudes while adjusting for sociodemographics.

	Sleep Latency					Sleep Timing (Weekday)				
Variable	Beta	SE	β	p	95% CI	Beta	SE	β	p	95% CI
Age	.05	.05	.06	.29	-.04, .14	195.72	276.30	.04	.48	-347.64, 739.08
Gender	.06	.15	.02	.7	-.23, .35	751.98	867.26	.04	.39	-953.54, 2457.49
Race	-.16	.11	-.08	.13	-.37, .05	303.42	617.2	.03	.62	-910.34, 1517.18
Ethnicity	-.17	.12	-.08	.15	-.41, .06	-621.14	703.71	-.05	.38	-2005.02, 762.74
Financial Situation	-.05	.07	-.04	.46	-.18, .08	312.15	392.14	.05	.43	-459.03, 1083.32
SSS	-.03	.03	-.05	.36	-.09. 03	-33.76	194.31	-.01	.86	-415.89, 348.37
Sleep Attitudes	-.27	.06	-.22	<.001	-.34, -.15	-2420.99	364.67	-.33	<.001	-3138.12, -1703.85

Note. SSS = Subjective Social Status.

Table 8. Regression analyses examining sleep outcomes predicted by adolescent sleep attitudes while adjusting for sociodemographics.

	Sleep Timing (Weekend)					Sleep Hygiene				
Variable	Beta	SE	β	p	95% CI	Beta	SE	β	p	95% CI
Age	183.02	265.34	.04	.49	-338.78, 704.83	.01	.03	.03	.59	-.04, .07
Gender	-117.09	826.69	-.007	.89	-1742.89, 1508.71	-.16	.08	-.09	.06	-.32, .006
Race	1135.67	591.76	.1	.06	-28.11, 2299.46	-.2	.06	-.17	<.001	-.31, -.08
Ethnicity	-131.40	682.99	-.01	.85	-1474.60, 1211.8	.08	.07	.06	.23	-.05, .21
Financial Situation	66.48	375.26	.01	.86	-671.51, 804.48	.23	.04	.33	<.001	.15, .3
SSS	-242.15	186.9	-.07	.2	-609.71, 125.41	-.04	.02	-.11	.03	-.07, -.003
Sleep Attitudes	-2286.02	348.87	-.33	<.001	-2972.12, -1599.92	.18	.03	.26	<.001	.12, .26

Note. SSS = Subjective Social Status.

Table 9. Regression analyses examining adolescent sleep attitudes predicted by perceived socioeconomic status while adjusting for sociodemographics.

	Sleep Attitudes				
Variable	Beta	SE	β	p	95% CI
Age	.01	.04	.02	.77	-.07, .09
Gender	-.07	.13	-.03	.56	-.32, .17
Race	.04	.09	.02	.69	-.14, .21
Ethnicity	-.07	.10	-.04	.51	-.27, .13
SSS	.03	.03	.05	.36	-.03, .08
Financial Situation	-.07	.06	-.08	.2	-.18, .04

Note. SSS = Subjective Social Status.

DISCUSSION

This study explored whether sleep attitudes predict sleep health in adolescents and whether sociodemographic differences in sleep attitudes exist. It was hypothesized that (1) more negative sleep attitudes would be significantly associated with a shorter sleep duration, poorer sleep quality, later sleep timing, longer sleep latency, and poorer sleep hygiene behaviors, and, (2) minority, lower SES, and male participants would have less favorable sleep attitudes.

The first hypothesis was confirmed with all sleep behaviors which showed that adolescents with more positive sleep attitudes reported longer sleep duration, better sleep quality, shorter sleep latency, earlier bedtime during weekdays and weekends, and better sleep hygiene. This is in line with previous research looking at adults that have shown that sleep attitudes predict sleep outcomes such as sleep duration, sleep quality, and sleep hygiene (Peach & Gaultney, 2017; Peach, Gaultney, & Ruggiero, 2018; Ruggiero, Peach, & Gaultney, 2019). This suggests that having positive attitudes towards sleep is an important factor to consider when promoting healthy sleep patterns in teenagers. Follow-up analyses examined the time commitment and benefits of sleep subscale as separate predictors and found similar findings as the overall scale.

Prior research has found demographic differences in sleep attitudes in adults suggesting that these may be important to consider in youth samples as well, and may partly explain demographic differences in sleep health. Our second hypothesis was not supported. Non-white youth reported more positive attitudes about the benefits of sleep compared to white youth, however this was not significant when accounting for other demographic characteristics as covariates. Unlike results seen among adult samples, the current study suggests that in

adolescents, no significant differences exist in sleep attitudes between males and females, between white and non-white participants, or between non-Hispanic and Hispanic participants. Similarly, perceived socioeconomic status also did not significantly predict sleep attitudes. Follow-up analyses were also conducted examining the different attitude subscales and also did not find significant differences in sleep attitudes across demographic groups. Moderation analyses were conducted to examine whether sociodemographics moderated the relationship between sleep attitudes and sleep outcomes. Gender significantly moderated the relationship between sleep attitudes and sleep quality. More positive sleep attitudes predicted better sleep quality only in females. A significant moderation effect was also observed for ethnicity in the relationship between sleep attitudes and weekend bedtimes. More positive sleep attitudes for both Hispanics and non-Hispanics predicted earlier weekend bedtimes.

The reason why these demographic differences did not emerge in this adolescent sample is not clear, but it is possible that the support and structure of living at home and the continued parental monitoring that may occur may minimize the influence of SES disparities in sleep attitudes compared to adults. For example, SES may impact sleep attitudes more directly if participants experience interference with daily work schedules or responsibilities that might require a de-prioritization of sleep, whereas adolescents may largely hold the same daily schedule (e.g., attending school each day) regardless of SES. Other explanations for a lack of significant differences in socioeconomic status could also be that there might be other factors that were not assessed in this study that might play a larger role in shaping sleep attitudes among adolescents. Previous research has shown that youth may develop many of their attitudes through observing the behaviors of others and pick up on messages expressed by their parents or other

noteworthy individuals such as their peers (Maccoby, 1994; Maccoby & Martin, 1983). This is supported by recent research demonstrating that both teens and their parents hold similar attitudes towards sleep, suggesting that parents might influence their child's sleep attitudes (Alvarado et al., 2023). Future studies should continue to examine social influences on sleep attitudes, including peers and popular press/media.

Past studies have also examined cultural differences in sleep health which suggests that cultural factors have the potential to shape adolescents attitudes towards sleep (Jeon et al., 2021). Although the current study did examine broad demographic characteristics such as gender, race, and ethnicity, cultural factors that may more directly impact sleep attitudes were not examined. For example, prior research indicates that being able to withstand periods of sleep loss is considered a masculine trait (Warren and Campbell, 2021), suggesting that adherence to gender roles may more directly relate to sleep attitudes. While differences between male vs. female-identifying participants was not significant in the current study, marginal differences suggested that females reported more positive attitudes towards the benefits of sleep, but were also less likely to indicate that they made time for sleep compared to males. While these findings are marginal and should be interpreted with caution, future studies should examine how gender roles may shape sleep attitudes among teens. Other cultural values that may more directly relate to sleep attitudes may vary by other demographic characteristics (e.g., race, ethnicity). For example, in prior research, familism has been associated with better health behaviors among adolescents (Unger et al., 2002). Having strong family values and support systems may positively influence teenagers' sleep behaviors. Teenagers who prioritize healthy sleep habits might be more likely to be raised in an atmosphere that has structured routines and family involvement.

Strengths and Limitations

To our knowledge, this is the first quantitative study to examine sleep attitudes in adolescents, and this study builds on preliminary data in adults. Some strengths and limitations should be considered when interpreting the results. Using Instagram advertisements to recruit adolescent participants resulted in the recruitment of a relatively diverse sample of adolescent participants across several demographic domains such as race, ethnicity, and socioeconomic status. However, 87% of the sample was female, suggesting some selection bias in our recruitment method. Subjective measures were also used to assess sleep outcomes and socioeconomic status, so it is not clear if results would replicate using objective measures of sleep (e.g., actigraphy) or examining income or parental education. In addition, the use of social media to recruit participants limited our sample to those with access to cellphones, the internet, or social media, which might not be representative of the general US population. In addition, the current study was correlational, so our ability to determine causation is limited. For example, although it was hypothesized that better sleep attitudes would promote better sleep behaviors, it is possible that sleep health may influence sleep attitudes.

Implications and Future Research

The findings of this study could have important implications for interventions aimed at improving sleep health in adolescents and future research. Developing interventions that aim not only to improve sleep hygiene behaviors and sleep knowledge but also to help shape adolescent attitudes is a potential next step to promote healthy sleep practices in teenagers. This relationship between sleep attitudes and sleep behaviors could be bidirectional, with attitudes influencing

sleep behaviors and sleep behaviors, in turn, shaping attitudes. Employing longitudinal studies and sleep attitude interventions are great next steps to help understand whether attitudes predict behavior or vice versa. These results highlight the significant role that sleep attitudes have in predicting sleep outcomes in adolescents. Future studies should expand upon the CATS scale given that a subset of sleep attitudes were examined. Exploring additional facets of sleep attitudes such as the perceived significance of sleep for health, cognitive functioning, sleep goals, and perceived control over one's sleep would help researchers better understand sleep attitudes. Furthermore, future research should also examine these associations longitudinally to determine how these attitudes develop, and examine influences on these values. For example, parents, peers, or teachers may model or express attitudes. In addition, incorporating objective sleep measures such as actigraphy can help researchers better understand the relationship between sleep attitudes and sleep outcomes in adolescents. Finally, this study collected data from youth across the United States, but recruiting specialized populations (e.g., adolescents with sleep disorders, those who hold jobs outside of school, youth participating in extracurriculars with a high time burden) and across cultures that differ in their sleep health and health-related attitudes is an important next step to determine how the development of these attitudes may vary across youth.

Conclusion

This study helps address the lack of research surrounding sleep attitudes in an adolescent sample. Results showed that sleep attitudes are a significant predictor of sleep outcomes, but no significant differences were found across sociodemographic groups once accounting for covariates. This suggests that sleep health disparities in adolescents may be related to factors

other than sleep attitudes (e.g., discrimination, stress), or that factors outside of gender, race/ethnicity, and SES predict sleep attitudes in adolescents. Overall, findings from this study advance research on sleep attitudes by examining attitudes in a youth sample and suggests that sleep attitudes are a possible modifiable target to minimize sleep health difficulties.

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