Title

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Journal

Sleep Health, 5(1)

ISSN

2352-7218

Authors

Gunn, Heather E
O'Rourke, Flannery
Dahl, Ronald E
et al.

Publication Date

2019-02-01

DOI

10.1016/j.sleh.2018.09.001

Peer reviewed

HHS Public Access

Author manuscript

Sleep Health. Author manuscript; available in PMC 2020 February 01.

Published in final edited form as:

Sleep Health. 2019 February ; 5(1): 58–63. doi:10.1016/j.sleh.2018.09.001.

Young adolescent sleep is associated with parental monitoring

Heather E. Gunn, Ph.D.[1,b], **Flannery O'Rourke, B.A.**[2], **Ronald E. Dahl, M.D.**[3], **Tina R. Goldstein, Ph.D.**[1], **Dana L. Rofey, Ph.D.**[1], **Erika E. Forbes, Ph.D.**[1,2], and **Daniel S. Shaw, Ph.D.**[2]

[1]Department of Psychiatry, School of Medicine, University of Pittsburgh, Pittsburgh, Pennsylvania, USA;

[2]Department of Psychology, University of Pittsburgh;

[3]School of Public Health, University of California, Berkeley.

Abstract

Objectives: Insufficient sleep can increase risk for adverse psychological and physical outcomes. Parental monitoring of daily activities is associated with youth health behaviors. We examined parental monitoring of waking and bedtime behaviors and sleep in a community sample of high-risk youth.

Methods: One-hundred sixty-five 10–14 year olds from low SES families participated (11.8 years ± 1.16; 52% female; 78% Black/African American). Parents and youth evaluated *parental monitoring of waking activities*. *Parent expectations about bedtime* and *parent knowledge about adolescent's bedtime and sleep routine* were independently rated. Youth sleep was assessed via parent report and actigraphy over 7 days.

Results: More parental knowledge about bedtime was associated with longer parent-reported sleep duration (β = .18, $p < .05$). Parental monitoring of waking activities (youth reported) was associated with more actigraph-assessed sleep over 7 days ($B = 2.73$, SE = .91), weekdays ($B = 2.44$, SE = .01), and weekends ($B = 3.88$, SE = .1.41, all p's < .05) while parent reported monitoring was associated with more sleep on weekdays only ($B = 2.10$, SE = .87, $p < .05$). Parental knowledge and expectations about bedtime behaviors were not associated with actigraph-assessed sleep (p values >.05). Parental monitoring of waking and bedtime behaviors were not associated with sleep duration variability (p values > .05).

Conclusions: Parental monitoring of waking activities may indirectly influence adolescent sleep via increased structure and felt security in the parent-adolescent relationship. Youth perception of monitoring may be particularly relevant for youth sleep duration.

Correspondence to: Heather E. Gunn.

[b]Permanent address of first author: Box 870348, The University of Alabama, Tuscaloosa, AL 35487-0348

Keywords

adolescent sleep; parent monitoring; low socioeconomic status; actigraphy; high risk

Only 35% of young adolescents (10 – 14-year-olds) obtain the optimal amount of sleep, which is approximately 9 or more hours on school nights (1, 2). Adolescents with short sleep duration (about 6 hours) have an increased likelihood of prehypertension (3), psychopathology, and other emotional difficulties (4). Young adolescents also have more sleepiness in response to sleep loss than older adolescents (5). Several factors contribute to short sleep durations and inconsistent sleep schedules including school start times (6), an increase in extracurricular and social activities, and a biological shift towards delayed bedtimes (For review, see (7)). However, in young adolescents, parental monitoring and structure may be relevant for sleep duration and timing (8) because it is one way that parents can foster the security and consistency that are necessary for good sleep (9).

Parental monitoring safeguards children from high-risk behaviors and promotes positive health outcomes. Monitoring is an active process that involves seeking information about companions and structuring activities and time. Therefore, parental monitoring is linked to many youth outcomes including substance use and delinquency (10) and health behaviors (11). More parental monitoring was associated with healthier eating and exercise habits in young children (11), and with fewer high-risk sexual behaviors in older adolescents (12). Similar opportunities for monitoring occur around children's sleep, although these are studied less frequently.

Positive social and emotional family characteristics, which likely foster the emotional security necessary for good sleep (9), are associated with fewer awakenings and a longer sleep duration in children (13, 14). Providing the structure to facilitate consistent sleep timing and adequate sleep duration may also foster emotional security. Therefore, parents who are aware of bedtime activities, demonstrate expectations about bedtime, and monitor children's waking activities may have children with adequate sleep.

Indeed, more parent-set rules regarding daytime activities and bedtime were linked to more weekday sleep in 12–19 year olds (8) and 13–18 year olds (15). In a nationally representative sample of children (6–17 year olds), enforcing a bedtime rule was associated with a longer sleep duration by up to one hour compared to not having a bedtime rule (16). Parental monitoring may also be a social zeitgeber ("time giver")—a behavior or interaction that influences sleep timing and circadian rhythmicity (17). For example, more monitoring of sleep timing (e.g., parent-set bedtimes) was associated with an earlier chronotype in 11–20 year olds (18). In contrast, 12–16 year olds with more autonomy over *waking* activities had greater shifts towards evening preference than would be expected due to developmental changes alone (19). Similarly, adolescents and children (6 to 19 year olds) who spent more time watching television had shorter sleep durations on weekdays (13, 16). This suggests that parents may indirectly affect sleep by *not* monitoring waking activities.

A limited number of studies suggest that *parent* perception of parental monitoring has direct and indirect links to sleep in youth across a wide age range. Youth and parent perception of

parental monitoring are not necessarily concordant, especially in younger adolescents. While youth perception of parental monitoring is predictive of other health behaviors (20), few studies have examined youth-assessed parental monitoring and youth sleep. In a recent prospective study, more youth-assessed parental monitoring of waking activities was associated with earlier self-reported bedtimes in 12–15 year olds (21). Nevertheless, parenting monitoring practices vary across adolescence and we know relatively little about parental monitoring and its association with objectively-assessed sleep in young adolescents (10 – 14 year olds). Adolescents in this age range are on the cusp of more autonomy and self-reliance (22), which lays the foundation for independence-seeking and health-risk behaviors in later adolescence. Degree of parental involvement in daily routines and health-related behaviors could influence short- and long-term outcomes.

Finally, it is important to examine parental monitoring practices and sleep in youth who are from low socioeconomic and single parent households, as these youth are at high risk for developing health and emotional struggles, perhaps, in part because of insufficient sleep. In 10–12 year olds, for example, a lower income-to-needs ratio (one index of SES) was associated with fewer actigraph-assessed sleep minutes throughout the night (23). Moreover, compared to two-parent homes, adolescents from single-parent households had more bedtime variability (24). Single-parents may have fewer resources for monitoring, which could increase sleep timing variability.

The current study utilized a multi-method approach to unpack the association between parental monitoring and youth sleep in a sample of young adolescents at high risk for developing emotional and health problems. We examined the association between parent-*and* child-assessed parental monitoring of waking activities and sleep duration. We also examined independently rated parental monitoring of bedtime activities and youth sleep duration. Sleep duration, which is linked to psychological (e.g.,(4)) and health outcomes (e.g.,(3)) was assessed via actigraphy and parent report. Given the differences in weekday (school day sleep) and weekend sleep duration in school-aged youth (25), we examined parental monitoring and sleep duration over seven days, on school nights, and on weekend nights. We also examined average sleep duration variability since it is associated with psychological well-being (26). Lastly, sleep duration varies by adolescent age (13) and gender (27); therefore, we examined interactive effects of age and gender and covaried for both in all models.

We investigated two primary hypotheses. First, we expected higher levels of parental monitoring of youth daily activities (e.g., knowledge of whereabouts and peers) would be associated with longer sleep durations and less sleep duration variability among youth. Second, we expected that higher levels of parental monitoring of bedtime activities (e.g., knowledge and expectations about pre-bedtime activities) would be linked to longer sleep durations and less sleep duration variability among youth.

Methods

Participants

Participants were 165 youth between the ages of 10 and 14 years old (M = (11.8 years, SD = 1.16; 52% female) in a longitudinal study on the short- and long-term effects of a preventive intervention focused on improving patterns of sleep, physical activity and emotion regulation. Ethnicity and race was self-identified and 78.6% Black/African-American, 15.7% White, and 5.7% Biracial. The current analyses utilize baseline data. Eighty-seven percent of participants were recruited from two pediatric clinics serving low-income children in an urban area. The remainder were siblings of children who participated in two other longitudinal studies by one of the study authors (9.1%), or referrals from the community (3.6%). Recruitment at pediatric centers was in person and based on screenings with parents during well-child check-up visits. Screenings for all other participants were by phone. Inclusion criteria was based on poverty status, as indicated by household income that was at or below 150% of the United States Department of Health & Human Services guidelines, and parent endorsement of a problem in one of 3 domains: sleep, physical activity, and/or emotion regulation. A problem in a domain was defined by endorsement of two or more items from domain specific questionnaires. Four items were selected from the Children's Sleep Habits Questionnaire (28) to assess sleep problems (e.g., "My child has difficulties going to bed and/or going to sleep at night"). Four items were chosen from the Modifiable Activity Questionnaire for Adolescents (29) to assess physical activity (e.g., "How many times in the past 14 days has your child done at least 20 minutes of exercise hard enough to make him/her heart beat faster?"), and four items were selected from the Child Behavior Checklist (30) to assess emotion regulation (e.g., "Has temper tantrums or hot temper"). One parent was invited to complete the study; however, the participating parent was most often the child's mother (90.9%). Children or parents with severe mental health concerns, health problems, or neurodevelopmental disorders that would prohibit them from completing the assessment protocol, or potentially benefiting from the intervention were not eligible for participation. The Institutional Review Board approved the study. Parents provided written formal consent for themselves and their child. Youth participants provided assent to participate. Participants were compensated for their time.

Procedure

Parent-youth dyads completed a two-hour in-home assessment. During the assessment, dyads completed questionnaires on physical activity, emotion regulation, adjustment, stressors, and most germane to the current study, parental monitoring and sleep. Dyads completed a 5-minute discussion on bedtime activities during school nights that was video-recorded for later coding (described below). During the assessment, youth were given an activity-tracking armband monitor to wear on their upper arm for the next seven days to assess physical activity and sleep. Monitors were collected from families seven days following the in-home assessment.

Most participants (84%) completed the study during the school year. Because rules about sleep may vary during the summer versus the school year, participants who completed the study during the school year (n = 134) were compared to those who completed the study

during the summer (n = 25) on all independent and dependent variables. Out of eight tests comparing the two groups, summer versus school-year groups differed only on whether parents had expectations about bedtime (described below). Parents of summer participants were rated as having *more* expectations about bedtime (M = .88, SD = .33 versus M = .61, SD = .49). Accordingly, for analyses regarding expectations about bedtime, we included a binary summer versus school year variable as a covariate.

Measures

Parental monitoring of waking activities.—Parental monitoring of waking activities was assessed with separate measures for children and parents derived from the Parental Monitoring Interview (31). Parents rated the frequency (on a scale of 0 – 5, higher scores indicate higher frequency) of monitoring on their child's whereabouts and activities using six items (e.g., *When your child is going to a friend's house, how often do you check to see if a parent or another adult will be there?)*. Youth also rated the degree to which their waking behaviors are monitored (e.g., *How often does at least one of your parents know what you are doing when you are away from home?*). Items from each subscale were summed to yield two independent variables: parent-reported parental monitoring of waking activities and youth-reported parental monitoring of waking activities. Internal reliability was acceptable for both subscale measures: youth report (5 items) α = .69; parent report (6 items) α = .66 and is consistent with other studies using the Parental Monitoring Interview (e.g., (31, 32)). Parent- and child-reported scores for monitoring of waking activities were not significantly correlated (r = .122, p = .110) and were examined separately to identify whether differential perceptions of monitoring were differentially associated with youth sleep.

Parental monitoring of bedtime activities was assessed via a 5-minute discussion between parent and youth dyads. They were given written prompts to discuss three topics regarding bedtime on school nights: 1) Describe what happened at bedtime on the most recent school night; 2) Describe what usually happens on a school night, including the process of getting ready for bed, time in bed ready to fall asleep, and 3) Tell us if there is a set bedtime hour and how this was decided. Investigators on the Health Promotion project developed a coding schema to independently evaluate behaviors from the video-recorded discussions on eight domains: Rule-setting, enforcement, monitoring, compliance, troubleshooting, routine quality, sleep problems, and observed sleepy behavior. A trained, independent coder assigned ratings for behaviors characteristic of that domain (described below). Eighteen percent of videos were double-coded for reliability. The average intraclass correlation coefficient across all coded behaviors was .84

We selected two independently-rated behaviors from the monitoring domain to evaluate degree of parental monitoring at bedtime: *parent expectations about bedtime* and *parent knowledge about adolescent's bedtime and sleep routine*. Parent expectations about bedtime were independently rated on a scale of 0 to 3, where 0 is no expectations about bedtime and 3 represents clear, parent-defined expectations about bedtime activities (e.g., timing on showering, eating, reading, media use in child's room). As the parent expectations variable was not normally distributed, a dichotomous variable was generated indicating presence or absence of expectations about bedtime. Parent knowledge about bedtime was rated similarly

where 0 is no parental awareness of the bedtime routine and 3 represents high parental awareness about all of the child's behaviors and activities as part of the sleep routine.

Sleep.—All adolescents were instructed to wear SenseWear Pro_3 Armband™ device (BodyMedia Inc., Pittsburgh, PA, USA) for seven days. SenseWear (SW) utilizes five mechanisms within its armband to detect activity and calculate sleep: a 2-axis accelerometer, heat flux sensor, a galvanic skin response sensor, skin temperature sensor, and a near-body ambient temperature sensor. The data from the five sensors and information on gender, age, height, weight, and handedness are then used to estimate energy expenditure, physical activity, and to distinguish wake from sleep using an advanced proprietary algorithm. Binary classifications of sleep versus wake were determined in 60-second epochs (Sense Wear professional 7.0 software). The algorithm determines sleep versus wake based on movement and pre-set thresholds. The actigraphy device has demonstrated reliable total sleep time estimates in youth and did not demonstrate systematic bias in total sleep time in young adolescents in comparison to polysomnography (33). Sense Wear detects and records when the participant is not wearing the device. The device was worn, on average, 88% of the time. Three actigraph-assessed dependent variables were examined separately in mixed models: 7-day sleep duration; weekday sleep duration and weekend total sleep duration. Analyses for 7-day and weekday sleep include 113 participants who wore the device for 4 or more days (i.e., 75% of the time). Analyses with weekend sleep data include 104 participants who wore the device 75% of the time. Weekday sleep duration includes Sunday – Thursday; weekend sleep duration includes Friday and Saturday.

Sleep duration variability and parent-reported usual total sleep duration were examined separately as between-person variables. Daily sleep duration variability is the mean of the differences between each night's sleep duration and the average sleep duration (26). Higher numbers indicate more sleep duration variability. Parent-reported usual total sleep duration was assessed from a single item from the Children's Sleep Habits Questionnaire (28), "What is your child's usual total sleep duration?"

Data analysis plan

Data were checked for normality visually and using statistical diagnostics (e.g., casewise diagnostics to flag outliers). Analyses were conducted with SPSS version 24. With 4 predictors examined in separate models and a minimum of 100 participants for each test, there was sufficient power to detect small-medium effects (34). To test the independent effects of each predictor, independent monitoring variables were examined separately. We employed linear regression and linear mixed modeling. Linear mixed modeling (i.e., multilevel modeling) was used for models predicting 7-day sleep duration, school-day sleep duration, and weekend sleep duration to adjust for interdependence in repeated sleep assessments. Compound symmetry was the covariance structure. Fixed effects included one of four independent variables, age, gender, and study day. Day was the repeated effect. We used maximum likelihood method to estimate parameters. Linear regression was used for models predicting parent-reported sleep duration and sleep variability (between-person sleep outcomes). Exploratory preliminary analyses revealed no significant age*parental

monitoring or gender*parental monitoring interactions on any sleep outcome. However, we retained age and gender of the child as covariates in all models.

Results

Family Demographics—Family demographics are presented in Table 1. The majority (approximately 75%) of young adolescents lived with one parent. Approximately 70% of the parents completed high school and some college. Parents earned, on average, $20,000/year. Correlations among study variables, means, and standard deviations for independent and dependent variables are presented in Table 2. Over the 7-day period of participation, the youth in this study slept, on average, 6.23 hours and this was similar across weekdays and weekends. Average parent-reported sleep duration was 508 minutes (about 8.5 hours).

Parent reported usual sleep duration—Results of linear regression analyses of parental monitoring variables, parent-reported sleep duration and duration variability are in Table 3. Youth age had an inverse association with parent-reported sleep duration; parent-reported sleep duration was shorter in older children. Youth gender was not associated with parent-reported sleep duration. There were no significant associations between youth- or parent-assessed monitoring and parent-reported sleep duration. However, more parent knowledge about sleep was associated with a longer sleep duration. Independently rated parental expectations about sleep was not associated with parent-reported sleep duration.

Sleep duration variability—Youth gender was not associated with sleep duration variability. Youth age had a positive linear association with more variability in sleep duration. There were no significant associations between parental monitoring of daytime activities (youth- or parent-assessed) and sleep duration variability and no associations between independently rated parental knowledge or parental expectations about sleep and sleep duration variability.

Actigraph-assessed sleep duration—Female sleep duration was about 20 minutes greater over the 7-day period and during the week than for males. Actigraph-assessed sleep duration was associated with a shorter sleep duration (11–12 minutes) over the 7-day period and weekdays in older children. Neither age nor child gender was associated with weekend sleep duration. Results from mixed modeling analyses on the within subjects actigraph-assessed sleep outcome, total sleep duration, are presented in Table 4. After accounting for covariates, greater youth-assessed parental monitoring was associated with longer actigraph-assessed sleep duration across the week, during the weekdays, and weekends. Parent-assessed parental monitoring was associated with longer weekday sleep duration, but was not associated with 7-day sleep duration or weekend sleep duration.

Discussion

We examined whether sleep duration and duration variability was associated with parent- and youth-reported parental monitoring of waking activities. We also examined independently rated parental monitoring of bedtime behaviors and its association with sleep duration and duration variability. Consistent with hypotheses, more parental monitoring of waking activities, whether youth- or parent-reported, was associated with longer weekday

sleep duration. More youth-reported parental monitoring of waking activities was also associated with longer sleep durations over the 7-day period and on the weekends. Contrary to our expectations, parental monitoring of daytime activities and bedtime activities were not associated with sleep duration variability. Moreover, neither parental knowledge about bedtime nor parental expectations about bedtime was associated with actigraph-assessed sleep duration. However, greater independently rated parental knowledge about bedtime activities was associated with longer parent-reported sleep duration.

Our finding that parent- and youth-assessed monitoring of waking activities was associated with longer sleep duration on weekdays, is consistent with previous findings. In a nationally representative sample of youth 6–17 years old, parental monitoring of (and limitations on) waking activities that influence sleep (e.g., caffeine, television, and smart phone use) was associated with a longer sleep duration (16). Our finding suggests that knowledge of child's whereabouts is similarly linked to longer weekday sleep duration.

Youth-assessed parental monitoring of waking activities was also associated with longer sleep duration on the weekends. Parent-assessed monitoring of waking activities was unrelated to weekend sleep duration. Others have found no association between family rules (e.g., monitoring) and weekend sleep (13); however, family monitoring is often parent reported. Child perception of parental monitoring may be more closely linked to the child's sleep habits, especially on the weekends when demands on waking behaviors are less likely. Perhaps a child's perception that their parent is monitoring the timing of socializing with friends contributes more directly to bedtime (and thus, total sleep time) than the parents' perception of their degree of monitoring. Our findings suggest that children who "appreciate" they are being monitored during the day have longer sleep periods on the weekdays and weekends. Monitoring is likely a dynamic, dyadic process between parents and children (35) and favorable outcomes likely depend on the dyadic context. Moreover, parents who monitor waking activities, such as whereabouts and peer relationships, are also more likely to provide structure surrounding bedtime and sleep. Structure and monitoring are important components of felt security. Therefore, our findings are consistent with theory that interpersonal security is necessary for sleep (9).

To that end, surprisingly, independently rated parent knowledge and parent expectations about sleep were not associated with the actigraph-assessed sleep outcomes. The discussion between parents and youth about bedtime provided an ecologically valid "window" into how bedtime is managed. Behavioral coding has many benefits, which include independent ratings of an interpersonal process; however, it is possible that the discussion format did not capture the full range of parental monitoring at bedtime. It is also possible that parental monitoring at bedtime is less important for youth sleep than general monitoring of daytime behaviors. However, youth with longer a parent-reported sleep duration were more likely to have parents who were more knowledgeable about their sleep. Knowledge about sleep was rated by an independent observer, which suggests this finding was not due to reporting bias. Therefore, greater parental knowledge about one's sleep habits was linked to the parent's subjective report of sleep duration.

The examination of children's sleep presents a unique challenge because parents are a common source of reporting (36), in addition to data collected via actigraphy and daily diaries. In this study, parent-reported sleep duration for youth was 8.5 hours while SenseWear-assessed duration was about 6.5 hours, well below the recommendation of 9 hours per night. It is not uncommon to have discrepant reports of children's sleep based on diverging methods and/or informants. Parents can underreport sleep problems (37) and overestimate sleep duration (38) because they may not have firsthand knowledge of sleep onset or wake-ups after sleep onset. Actigraphy device issues could further contribute to the discrepancy because although SenseWear armbands have good agreement with polysomnography at a group level (33), accelerometer devices may *underreport* sleep in adolescents at the individual level (39). Movement during sleep is typical for younger adolescents, but accelerometer algorithms may interpret this as wakefulness. Nevertheless, the average sleep duration as assessed by SenseWear is consistent with other studies using accelerometer devices. For example, average actigraph-assessed sleep duration over 7 days was 6.4 hours in adolescents from single-parent homes (24). Moreover, adolescents who are racial/ethnic minorities and of low socioeconomic status (SES) are less likely than white adolescents of middle-high SES to have greater than 7 hours of sleep per night (40).

Low actigraph-assessed sleep duration may have also contributed to null findings in nightly sleep duration variability. Sleep duration can vary as much as one hour and is linked to well-being when diary-reported sleep duration averaged about eight hours (26). It is possible that the low actigraph-assessed sleep duration in this sample on weekdays and weekends contributed to a floor effect, and thus limited variability in sleep duration.

Our findings provide additional insight into parent-youth relationships and youth sleep, but should be considered in light of study limitations. Discussions between parents and youth may benefit from additional prompts to assess nuanced monitoring of bedtime behaviors. Similarly, ecological momentary assessments (EMA) of parent and adolescent warmth of bedtime monitoring may enrich understanding of the parents' role in youth sleep and provide more insight into parent-youth relationship quality. Maternal parenting styles characterized by more warmth have been linked to more weekday sleep for young youth (5.5 – 11.5 years; (13)). Moreover, it is likely that the association between the parent-youth relationship and youth sleep is bidirectional. Longitudinal and cross-lagged analyses using an ecological momentary approach will help clarify strength and directionality of parent-youth and youth sleep associations. Additionally, strengths of our study include sleep assessments during the school year in low-income families; however, findings may not generalize to youth living in higher income and/or rural or suburban contexts or to sleep habits during the summer when children have fewer restrictions on their time.

The current study has several strengths, including a multi-method assessment of sleep, and multi-method approach to parent and adolescent monitoring of waking and bedtime behaviors, in a sample of youth who are underrepresented in sleep research. Youth-assessed parental monitoring of waking behaviors was associated with longer sleep durations in youth, which suggests that child perception of parental monitoring is relevant to sleep. Future studies may also benefit from assessment of family sleep practices to increase our understanding of how relationship and sleep behaviors (e.g., bedsharing) transmit throughout

the family. Overall, our findings highlight that parental behavior is relevant to youth sleep, which suggests that parental behavior may be an additional target for improving youth sleep.

Acknowledgements

Conflict of Interest and Source of Funding: This study was funded by National Child and Human Development (5R01HD057893, PI: Daniel S. Shaw). First author support (H.E.G.) was provided by National Institutes of Health T32 (HL082610, PI: Daniel J. Buysse) and by the Sleep Research Society Foundation's Career Development Award (013-JP-16, PI: Heather E. Gunn).

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Table 1.

Parent/Family Demographics

Parent		
Age ***Mean (SD)***		33.9 (8.25)
Race ***Percent of sample***		
	Black/African American	77.40%
	White	19.50%
	Biracial	2.50%
Marital Status ***Percent of sample***		
	Married or living with partner	25.2
	Separated, Divorced, or Widowed	15.7%
	Single, not living with partner	59.10%
Education ***Percent of sample***		
	College or Graduate degree	3.7%
	Associates degree	12.60%
	Some college	32.70%
	High school diploma	37.10%
	Partial high school	12.60%
Annual Income ***Mean (SD) and Range***		$ 19,867 (12,505) 1,752–74,000

Table 2.

Correlation matrix of variables with descriptives

		1	2	3	4	5	6	7	8	9
1	Actigraph TST 7-day	-	**.86****	**.62****	−.33**	.10	.15	**.26****	.09	.11
2	Actigraphy TST weekday		-	**49****	−.33**	.14	**.25****	.16†	.04	**.19***
3	Actigraphy TST weekend			-	−.25*	−.03	.07	**.26****	−.01	−.007
4	Actigraphy TST variability				-	.02	−.02	−.12	.08	.05
5	Parent-reported TST					-	.03	.09	**.26****	.13†
6	P-report monitoring						-	.13	**.24****	.07
7	Y-report monitoring							-	.03	.11
8	P-Bedtime expectations$^{\wedge}$								-	**.25****
9	P-Bedtime knowledge									-
	Mean	374.17	375.27	371.23	19.9	508.2	33.42	18.14	--	2.44
	Standard deviation	86.05	86.10	83.64	7.87	88.8	5.67	4.58	--	.73

Note: TST = total sleep time; P = parent; Y = youth

†= p< 10;

*= p ≤.0.5;

**= p ≤ .0.1;

$^{\wedge}$P-bedtime expectations is a dichotomous variable; approximately 66% of the parents were observed to have expectations about bedtime.

Table 3.

Linear Regression results of waking monitoring (parent and youth assessed) and bedtime monitoring and dependent sleep variables: parent-reported sleep duration and sleep variability

	Parent-Reported Usual Sleep Duration	**Sleep Variability**
Covariates	Beta (t)	
Gender	.05 (.66) p = .51	−.09 (−.92) p = .36
Age	**−.20 (−2.55) p = .01**	**.23 (2.48) p = .02**
Independent Variables		
Parental monitoring (parent report)	.04 (.51) p = .61	−.02 (−.23) p = .82
Parental monitoring (youth report)	.08 (1.52) p = .34	−.14 (−1.40) p = .16
Parental knowledge about bedtime	**.18 (2.22) p = .03**	.09 (.89) p = .38
Parental expectations about bedtime	.12 (1.50) p = .14	.12 (1.19) p =.24
	n = 149	*n = 113*

***Note*:** N = 149 for linear regression analyses. A total of 16 participants were excluded from parent - reported sleep duration analyses: n = 7 due to missing data or study withdrawal; n = 1 due to reported usual sleep duration (2.5 hours) that was 3 standard deviations below the mean; n = 1 participant due to reported usual sleep duration (16.5 hours) greater than 3 standard deviations above the mean; n = 4 participants due to data points that were multivariate outliers; and n = 3 outliers that influenced the regression coefficient. Sleep variability was calculated from actigraphy, final n includes participants who wore the actigraph 75% of the time.

Table 4.

Mixed modeling results of parental monitoring and actigraph-assessed sleep outcomes.

	7-day TST	Weekday TST	Weekend TST
	Parameter estimate (SE)		
Covariates			
Gender	**−21.90 (8.48) p = .01**	**−21.91 (9.04) p = .02**	−23.11 (12.73) p = .07
Age	**−11.02 (3.73) p = .004**	**−12.17 (3.97) p = .003**	−7.02 (5.73) p = .22
Independent Variables			
Parental monitoring (parent report)	1.29 (.83) p = .12	**2.10 (.87) p = .02**	−.79 (1.27) p = .53
Parental monitoring (youth report)	**2.73 (.91) p = .003**	**2.44 (.96) p = .01**	**3.88 (1.41) p = .01**
Parental knowledge about bedtime	5.92 (6.03) p = .33	9.19 (6.38) p = .15	−3.72 (8.87) p = .68
Parental expectations about bedtime	3.14 (9.81) p = .75	1.91 (10.42) p = .86	5.28 (14.3) p = .71
	n=113	n=113	n = 104

Note: TST = total sleep time; Each independent variable was tested in separate models; The final *n* for mixed modeling analyses includes individuals and who wore the actiwatch 75% of the day.