



Published in final edited form as:

J Sleep Res. 2018 October ; 27(5): e12676. doi:10.1111/jsr.12676.

The Link between Maternal Sleep and Permissive Parenting during Late Adolescence

Kelly M. Tu^a, Lori Elmore-Staton^b, Joseph A. Buckhalt^c, and Mona El-Sheikh^c

^aDepartment of Human Development and Family Studies, University of Illinois at Urbana-Champaign

^bSchool of Human Sciences, Mississippi State University

^cDepartment of Human Development and Family Studies, Auburn University

Summary

Utilizing a multi-method design, the present study examined the association between maternal sleep, assessed via actigraphy and self-reports, and permissive parenting (e.g., lax, inconsistent discipline) during adolescence, as well as the extent to which this association differed by mothers' race/ethnicity and socioeconomic status (SES). The sample was comprised of 234 mothers (M age = 41.76 years, SD = 6.25; 67% European American, 31% African American, 2% other race/ethnicities) and 237 adolescents (113 boys, 124 girls; M age = 15.80 years, SD = 0.80; 66% European American, 34% African American). Mothers' sleep duration (actual sleep minutes) and quality (sleep efficiency, latency, long wake episodes) were assessed using actigraphy. Mothers also reported on their sleep problems and adolescents reported on mothers' permissive parenting behaviors. Results revealed that actigraphy-based longer sleep duration and shorter sleep latency were associated with lower levels of permissive parenting. Further, mothers' race/ethnicity and SES moderated the association between actigraphy-based sleep quality (i.e., sleep efficiency, long wake episodes) and permissive parenting. Specifically, a negative association between sleep efficiency and permissive parenting was evident only for African-American mothers. In addition, a positive association between more frequent night wakings and permissive parenting was evident only for mothers from lower SES households. Findings highlight the benefits of longer and higher-quality sleep for reducing the risk of permissive parenting, especially among ethnic minority mothers and mothers from lower SES households.

Keywords

actigraphy; sleep duration; sleep quality; parenting; minority; socioeconomic status

Correspondence: Kelly M. Tu, Ph.D., Human Development and Family Studies, University of Illinois at Urbana-Champaign; 2009 Christopher Hall, MC-081, 904 W. Nevada St., Urbana, IL 61801; Tel: 1-217-244-2458; ktfrantz@illinois.edu.

DR. KELLY M. TU (Orcid ID : 0000-0002-9221-7463)

DR. MONA EL-SHEIKH (Orcid ID : 0000-0001-5784-8318)

Conflicts of interest: There are no conflicts of interest.

Author contributorship: KMT, LES, JAB, and ME conceptualized the paper, contributed to the study design, and prepared the manuscript. KMT also conducted analyses.

Introduction

Sleep is critical for health and well-being, yet the majority of adults do not get the recommended hours of sleep each night (Hirshkowitz et al., 2015). Short and fragmented sleep patterns are particularly evident in adults who are parents (Hagen et al., 2013; Hale et al., 2015; Meltzer & Montgomery-Downs, 2011). Individuals of ethnic minority status (Hale & Do, 2007; Whinnery et al., 2014; Williams et al., 2015) and lower socioeconomic status (SES; Whinnery et al., 2014) are at an even greater risk for poor sleep. Sleep is associated with daily functioning and social-emotional health (Walker, 2009) among adults and youth alike, and contributes to family functioning (e.g., Brand et al., 2009; Meltzer & Montgomery-Downs, 2011). The link between adult sleep and parenting may be especially important given the broader implications of parenting for youth development.

There is a growing literature focused on the relations between sleep and the family context (e.g., El-Sheikh & Sadeh, 2015; Meltzer & Montgomery-Downs, 2011), including the examination of sleep among youth (ranging from toddlers to adolescents), mothers, and fathers (e.g., Brand et al., 2009; Hagen et al., 2013; Kouros & El-Sheikh, 2016). However, the contributing role of adult sleep on parenting of adolescents specifically has been understudied. During adolescence, parental involvement continues to remain an important contributing factor for adolescents' adjustment, despite their increasing autonomy. For instance, a meta-analysis found that permissive parenting, characterized by lax or inconsistent discipline, predicted increases in adolescent maladjustment (e.g., externalizing problems) over time (Pinquart, 2017). Mothers who experience insufficient sleep or sleep problems may be more irritable, experience impaired attention (e.g., Groeger et al., 2004; Horne, 1985), and/or be too tired to follow through with rule enforcement, and thus more prone to parent or monitor youth in an inconsistent manner. Thus, the examination of sleep as a potential correlate of permissive parenting may be especially important.

Only one known study has examined associations between parent sleep and parenting. Specifically, among families with adolescents (10- to 17-year olds), adolescent-reported mother but not father sleep difficulties was associated with more negative and less positive parenting styles (Brand et al., 2009). Parenting styles and practices often originate in the family-of-origin (Belsky et al., 2005) and vary by ethnic (Reitman, Rhode, Hupp, & Altobello, 2002) and socioeconomic (Hoff, Laursen, & Tardif, 2002) groups. Yet, these findings demonstrate that sleep could also influence parenting.

Advancing the literature, this study examined objective and subjective maternal sleep parameters as predictors of adolescent-reported permissive parenting, and whether this association differed by mothers' ethnicity and SES. We conceptualize sleep problems as short and poor quality actigraphy-based sleep and greater mother-reported sleep problems. Using a community sample, we hypothesized that more sleep problems would be associated with higher levels of permissive parenting and vice versa. Further, consistent with health disparities frameworks (Buckhalt, 2011) and prior literature (Hale & Do, 2007; Williams et al., 2015), we anticipated that the association between sleep problems and permissive parenting would be stronger among mothers who identify as African American or those who are of lower SES. This expectation is based on the cumulative risk premise that the

combination of adversity (e.g., low SES and associated stressors) and sleep problems are more likely to culminate in disrupted parenting practices than one of these factors alone (e.g., Evans, 2003).

Method

Participants

Data for this study comes from the fourth wave of the Family Stress Study (data collected in 2012-2013); mothers' actigraphic sleep measures were only available at this wave. At the first wave (data collected in 2005), families were recruited through flyers that were distributed to elementary school systems in the Southeastern United States. Exclusion criteria included the child's diagnosis of attention deficit hyperactivity disorder, developmental delays, or a chronic illness (for more details see El-Sheikh et al., 2011).

The analytic sample included mothers and their children with data on at least one of the primary study variables and was composed of 234 mothers [95% biological; M age = 41.76 years, SD = 6.25; 67% European American (EA), 31% African American (AA), 2% other race/ethnicity] and 237 adolescents (113 boys, 124 girls; 66% EA, 34% AA; M age = 15.80 years, SD = 0.80). For three families, the mothers did not participate. Only one child per family participated. Families were from a wide range of socioeconomic backgrounds, based on their income-to-needs ratio (annual family income divided by the federal poverty threshold for a given family size; U.S. Department of Commerce). Approximately 15% of families were living in poverty (ratio = 1), 30% near the poverty line (ratio > 1 and < 2), 22% lower middle class (ratio > 2 and < 3), and 33% middle class (ratio = 3). A majority of mothers were married (77%) and 5% were cohabitating. The demographic composition of the sample is representative of the area from which they were recruited.

Procedures

The study was approved by the university's institutional review board (IRB #03-225 AR 0312); written consent and assent were obtained. Families participated during the regular school year, excluding holidays. Mothers were asked to wear actigraphs on their non-dominant wrist at bedtime for seven consecutive nights. To corroborate actigraphy data, mothers completed sleep diary logs nightly (Acebo & Carskadon, 2001). Nights during which medication use was reported (e.g., over-the-counter sleep aids; allergy medications), were excluded from actigraphy analyses. On average, families visited our research laboratory 3.98 days (SD = 12.28) following the last night of actigraphy. During the laboratory visit, mothers and adolescents completed questionnaires.

Measures

Objective sleep—Mothers' actigraphy-based sleep parameters were obtained using Motionlogger Octagonal Basic actigraphs (Ambulatory Monitoring Inc., Ardsley, NY), measuring motion in 1-minute epochs using zero crossing mode. Scores for each epoch were determined using Cole-Kripke scoring algorithm (Cole et al., 1992). On average, 5.35 nights (SD = 1.84) of valid actigraphy data were available for mothers with 34% having valid data for the entire week, 23% for six nights, 18% for five nights, 10% for four nights, and 10%

for three nights or less. Approximately 4% of mothers did not have actigraphy data. Reasons for missing data included the exclusion of nights with medication use, forgetting to wear the actigraph, and mechanical problems. For reliable estimates of regular sleep, only sleep data for mothers with five or more nights of valid actigraphy data (75%) were retained (Meltzer et al., 2012; Sadeh, 2015).

The following well-established sleep duration and sleep quality parameters were derived: (a) sleep minutes—number of actual sleep minutes from sleep onset to wake time; (b) sleep efficiency—percentage of epochs scored as sleep between sleep onset and wake time; (c) long wake episodes—number of wake episodes ≥ 5 minutes; and (d) sleep latency—amount of time (minutes) between bedtime and sleep onset. Data were averaged across all available nights for each sleep parameter. Night-to-night stability during the week ranged from .68 to .82 across the sleep parameters.

Subjective sleep—Mothers completed the 19-item Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989), which assesses several aspects of sleep including sleep duration, quality, latency, and disturbances. The global composite (range 0-21) was calculated with higher scores reflecting more sleep problems. Approximately 57% of mothers scored ≥ 5 , indicative of poor sleep and sleep difficulties in at least two domains (Buysse et al., 1989; Smith & Wegener, 2003); $\alpha = .72$.

Permissive parenting—Adolescents completed two well-established subscales of the Parent Behavior Inventory (Schaefer, 1965), which are frequently used in the literature (e.g., Pinquart, 2017): Lax Discipline (e.g., “Lets me off easy when I do something wrong”, “Can’t say no to anything I want”; four items), and Nonenforcement (e.g., “Doesn’t check up to see whether I have done what she told me”, “Doesn’t pay much attention to my misbehavior”; four items). Consistent with established guidelines, items were rated on a 3-point scale (1 = *not like* to 3 = *like*) and summed. The two scales, representing low demand and strict aspects of parenting (e.g., Steinberg et al., 1994), were correlated ($r = .50, p < .001$) and averaged to create a single score of permissive parenting; $\alpha = .75$.

Covariates—Towards a rigorous assessment of our research questions, known correlates of maternal sleep and/or parenting were included as covariates. These included mothers’ race/ethnicity (coded 0 = European American or EA, 1 = African American or ethnic minority), age (in years), SES (income-to-needs ratio), diagnosed sleep disorder (e.g., sleep apnea, coded 0 = no, 1 = yes; $n = 12$), shift work (coded 0 = no, 1 = yes; $n = 9$), and anxiety and depressive symptoms. Given that most of the mothers who identified as an ethnic minority indicated that they were African American (92%), we collectively refer to these mothers in the remainder of the paper as African American or AA. Mothers completed the 21-item Beck Anxiety Inventory (Beck & Steer, 1993) and the 20-item Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). To avoid construct overlap, one item pertaining to sleep in the CES-D was excluded. Items in both scales were rated on a 4-point scale. Internal consistency was high for anxiety and depression measures ($\alpha_s = .93$ and $.87$, respectively).

Plan of Analysis

To reduce outlier effects, values of study variables that exceeded 4 *SDs* were winsorized and recoded as the next lowest or highest observed value within 4 *SDs* (Wilcox, 2005). In total, five values were recoded, including two each for anxiety and sleep latency and one for long wake episodes. Skewness statistics were within the acceptable range (absolute value < 2; Kline, 2005). Instances of missing data were in the acceptable range, from 3% to 27%, with the latter for sleep parameters due to exclusion of actigraphy data for participants with < 5 nights of data.

A series of regression models were fitted using Amos (Arbuckle, 2012), using full information maximum likelihood estimation to handle missing data, which allows for the use of all available data in analyses (Acock, 2005). To address study aims, the independent effects of maternal sleep on permissive parenting were examined, followed by the interactions between maternal sleep and race/ethnicity and SES. Separate models were fitted for each sleep parameter. All models included the aforementioned covariates. Race/ethnicity was controlled in all models examining SES as a moderator and vice versa. Covariates and predictors were mean-centered for moderation analyses. For significant interactions, simple slopes were tested to determine whether maternal sleep was significantly associated with permissive parenting at specific levels of the moderator (ethnicity and SES; Preacher et al., 2006). Significant interactions were plotted at high (+1 *SD*) and low (−1 *SD*) levels of maternal sleep and SES, and by race/ethnicity (i.e., EA and AA; Aiken & West, 1991). The adopted significance level was $p < .05$.

Results

Preliminary Analyses

Descriptive statistics and correlations are shown in Table 1. Results of *t*-tests assessing race/ethnicity, sleep disorder, and shift work differences across study variables are provided in Supplemental Table 1.

The Link between Maternal Sleep and Permissive Parenting

Results of regression analyses are shown in Table 2. For main effects of maternal sleep, longer sleep duration (minutes) was associated with lower levels of permissive parenting, whereas longer sleep latency was associated with higher levels of permissive parenting. Each accounted for 3.0% and 4.5% of the unique variance in permissive parenting, beyond covariates.

Further, race/ethnicity and SES emerged as significant moderators in the associations linking sleep efficiency and long wake episodes with permissive parenting (Table 2), explaining 2.0% to 4.2% of the unique variance in permissive parenting beyond main effects. For moderation by race/ethnicity, tests of simple slopes revealed that maternal sleep efficiency was negatively associated with permissive parenting for AA ($B = -.07$, $SE = .03$, $p = .03$) but not EA ($B = .03$, $SE = .03$, $p = .43$) mothers (Figure 1a). Conversely, a positive association emerged between frequency of long wake episodes and permissive parenting for AA ($B = .30$, $SE = .16$, $p = .06$), although at the trend level, but not EA ($B = -.13$, $SE = .13$,

$p = .30$) mothers (Figure 1b). As shown in Figures 1a and 1b, African-American mothers who had lower sleep efficiency or more frequent night wakings had the highest levels of permissive parenting; their counterparts with better sleep had lower levels of such parenting.

For moderation by SES, tests of simple slopes revealed that higher sleep efficiency was associated with lower levels of permissive parenting for mothers from lower SES households ($B = -.06$, $SE = .03$, $p = .053$), but higher levels of permissive parenting for mothers from higher SES households ($B = .06$, $SE = .03$, $p = .053$; Figure 2a). In contrast, a positive association emerged between frequency of long wake episodes and permissive parenting for mothers from lower ($B = .26$, $SE = .13$, $p = .04$) but not higher ($B = -.22$, $SE = .15$, $p = .13$) SES households (Figure 2b). As shown in Figures 2a and 2b, mothers from lower SES backgrounds who had lower sleep efficiency or more frequent night wakings were more likely to engage in permissive parenting than their counterparts with better sleep.

Discussion

Permissive parenting during adolescence can create an environment of heightened vulnerability to problematic behaviors and risk for youth (for a meta-analysis see Pinquart, 2017). Contributing to the growing evidence linking sleep with family dynamics and parenting behaviors (El-Sheikh & Sadeh, 2015; Meltzer & Montgomery-Downs, 2011), the present study is one of the first to examine the association between maternal sleep and permissive parenting. Consistent with our hypotheses and a prior study on parenting style (Brand et al., 2009), we found that mothers who experienced longer sleep duration were less likely to engage in permissive parenting, whereas mothers who experienced difficulties falling asleep (longer sleep latency) were more likely to engage in permissive parenting. These findings highlight the direct association between sleep and parenting behaviors.

These direct associations may be explained in part by the effect that sleep has on daily functioning. Mothers who receive insufficient sleep or experience difficulties initiating sleep are likely to be more irritable, lack energy, and/or experience impairments in attention (e.g., Groeger et al., 2004; Horne, 1985). This, in turn, may affect their ability to follow through with enforcing family rules and discipline, as well as monitoring their children, resulting in more permissive parenting. Sleep disruptions have been associated with lower positive affect as well as less conflict resolution in adult interpersonal interactions (Gordon & Chen, 2013; Meltzer & Montgomery-Downs, 2011). The present findings suggest that short or poor quality sleep may also affect interactions between parents and their adolescents.

Further, as anticipated, mothers' race/ethnicity and SES moderated the association between actigraphy-based sleep quality (i.e., sleep efficiency, long wake episodes) and permissive parenting such that the association emerged only for African-American mothers and those of lower SES (with one exception); note that SES was controlled when examining interactions with race/ethnicity and vice versa. Specifically, mothers most likely to engage in permissive parenting were those who experienced poor sleep quality (low sleep efficiency, more frequent long wake episodes) in conjunction with being African American or from lower SES backgrounds. These findings are consistent with prior studies documenting sleep disparities among ethnic minority and socioeconomically disadvantaged individuals (Hale &

Do, 2007; Whinnery et al., 2014; Williams et al., 2015). Yet, for these same mothers, the link between high-quality sleep (i.e., higher sleep efficiency, fewer night wakings) and lower levels of permissive parenting were also evident, illustrating the benefits of high-quality sleep.

One unexpected finding was the positive association between sleep efficiency and permissive parenting among mothers from high SES households. Care must be taken not to over interpret one significant association that is contradictory to the more consistent pattern of effects observed for the other interactions. Tentatively, however, it is possible that mothers from higher SES households with better quality sleep may exhibit higher levels of permissive parenting because of their work or career demands outside of the home, beliefs about facilitating autonomy by allowing adolescents time alone at home after school (Luthar and Latendresse, 2005), or fewer concerns about the physical safety of their adolescents (compared with their lower SES counterparts; McLoyd, 1990).

Our findings linking mothers' sleep with their parenting behaviors are consistent with and extend prior literature documenting relations between sleep and behavior among youth (e.g., El-Sheikh, 2011; Dewald-Kaufmann et al., 2013). Furthermore, the benefits of longer and better quality sleep in contexts of adversity that have been found in research with children and adolescents (e.g., El-Sheikh, 2011; Philbrook et al., 2017) were also found in the present study with adults. Such findings highlight the utility of sleep education for interventions focused on improving sleep of individuals, including youth and adults, and also for parenting interventions focused on promoting family functioning and improving youth outcomes.

Although independent and/or interactive associations were documented for actigraphy-based sleep parameters, findings did not emerge for mother-reported sleep problems. Null findings with mother reports of sleep problems could be due in part to the nature of the subjective assessment completed. The PSQI score represents a composite of sleep problems across multiple domains, providing a more generalized assessment of sleep than actigraphy. Note however, that the subjective and objective assessments of sleep quality but not duration tended to be moderately correlated. Although mothers scored within relatively normative ranges on the actigraphy-based sleep parameters, mothers self-reported relatively high levels of sleep problems, which may be due to perceptions of individual sleep needs. Thus, these findings highlight the importance of considering multiple methods for assessing sleep as well as multiple sleep parameters (Sadeh, 2015).

There are several limitations and future directions worth noting. The community sample in this study is predominantly characterized by non-clinical levels of sleep problems and relatively low levels of permissive parenting. Further, maternal sleep (and significant interactions) explained a small percentage of the variance in permissive parenting. Additional research with samples characterized by clinical levels of sleep problems and/or at-risk families (e.g., for negative parenting, adolescent delinquency) would be informative and could potentially yield more robust findings. EA mothers, on average, were older than AA mothers, which may reduce the comparability of the two groups, although age was included as a covariate in all models. Further, given the cross-sectional design, conclusions

about directionality or causality cannot be drawn, and it is also possible that a third variable associated with ethnicity and SES could account for these associations. Additional work is needed to determine whether maternal sleep has longer-term implications for permissive parenting, as well as other parenting practices (e.g., harsh parenting, over-reactive parenting), and whether these associations are evident during different developmental periods (e.g., childhood). Further, potential mechanisms by which maternal sleep is linked with permissive parenting also warrant attention and may include factors such as employment or work stress, interpersonal relationships, time spent with adolescent, or adolescent temperament. Lastly, future studies assessing 24-hour sleep, as well as capturing weekday versus weekend sleep over multiple assessments, may provide a more comprehensive assessment of parents' sleep.

Despite these limitations, this multi-method study addresses a gap in the literature on sleep and the family, providing new evidence of the benefits of adequate and high-quality sleep for reducing the risk of permissive parenting among mothers, and particularly African-American mothers and mothers from lower SES backgrounds. Findings also demonstrate the cost of low-quality sleep for these same mothers. Results from this study suggest that improving sleep could reduce the risk of permissive parenting, which may have broader implications for overall family functioning and adolescent well-being given the negative outcomes often associated with permissive parenting.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Support: This research was supported by Grant R01-HD046795 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development awarded to Mona El-Sheikh. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. We wish to thank the staff of our research laboratory, most notably Bridget Wingo, for data collection and preparation, and the school personnel, children, and parents who participated.

References

- Acebo C, Carskadon MA. Bradley Sleep Center. Brown University; Providence, RI: 2001. Scoring actigraph data using ACTION-W 2.
- Acock AC. Working with missing values. *J Marriage Fam.* 2005; 67:1012–1028.
- Aiken LS, West SG. *Multiple Regression: Testing and Interpreting Interactions.* Sage; Newbury Park, CA: 1991.
- Arbuckle J. *Amos 21 Users Guide.* Amos Development Corporation; Chicago: 2012.
- Beck AT, Steer RA. *Manual for the Beck Anxiety Inventory.* Psychological Corporation; San Antonio, TX: 1990.
- Belsky J, Jaffee SR, Sligo J, Woodward L, Silva PA. Intergenerational transmission of warm-sensitive-stimulating parenting: A prospective study of mothers and fathers of 3-year-olds. *Child Dev.* 2005; 76:384–396. [PubMed: 15784089]
- Brand S, Gerber M, Hatzinger M, Beck J, Holsboer-Trachsler E. Evidence for similarities between adolescents and parents in sleep patterns. *Sleep Med.* 2009; 10:1124–1131. [PubMed: 19464234]
- Buckhalt JA. Insufficient sleep and the socioeconomic status achievement gap. *Child Dev Perspect.* 2011; 5:59–65.

- Buysse DJ, Reynolds CF 3rd, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: A new instrument for psychiatric practice and research. *Psychiat Res.* 1989; 28:193–213.
- Cole RJ, Kripke DF, Gruen W, Mullaney DJ, Gillin JC. Automatic sleep/wake identification from wrist activity. *Sleep.* 1992; 15:461–469. [PubMed: 1455130]
- Dewald-Kaufmann JF, Oort FJ, Meijer AM. The effects of sleep extension on sleep and cognitive performance in adolescents with chronic sleep reduction: An experimental study. *Sleep Med.* 2013; 14:510–517. [PubMed: 23523432]
- El-Sheikh M, editor *Sleep and Development: Familial and Socio-Cultural Considerations.* Oxford University Press; New York: 2011.
- El-Sheikh M, Hinnant JB, Erath S. Developmental trajectories of delinquency symptoms in childhood: The role of marital conflict and autonomic nervous system activity. *J Abnorm Psychol.* 2011; 120:16–32. [PubMed: 20919788]
- El-Sheikh M, Sadeh AI. Sleep and development: Introduction to the monograph. *Monogr Soc Res Child Dev.* 2015; 80:1–14.
- Evans GW. A multimethodological analysis of cumulative risk and allostatic load among rural children. *Dev Psychol.* 2003; 39:924–933. [PubMed: 12952404]
- Gordon AM, Chen S. The role of sleep in interpersonal conflict: do sleepless nights mean worse fights? *Soc Psychol Personal Sci.* 2014; 5:168–75.
- Groeger JA, Zijlstra FRH, Dijk DJ. Sleep quantity, sleep difficulties and their perceived consequences in a representative sample of some 2000 British adults. *J Sleep Res.* 2004; 13:359–371. [PubMed: 15560771]
- Hagen EW, Mirer AG, Palta M, Peppard PE. The sleep-time cost of parenting: Sleep duration and sleepiness among employed parents in the Wisconsin Sleep Cohort Study. *Am J Epidemiol.* 2013; 177:394–401. [PubMed: 23378502]
- Hale L, Do DP. Racial differences in self-reports of sleep duration in a population-based study. *Sleep.* 2007; 30:1096–1103. [PubMed: 17910381]
- Hale L, Emanuele E, James S. Recent updates in the social and environmental determinants of sleep health. *Curr Sleep Med Rep.* 2015; 1:212–217. [PubMed: 27540510]
- Hirshkowitz M, Whiton K, Albert SM, Alessi C, Bruni O, DonCarlos L, et al. National Sleep Foundation's sleep time duration recommendations: Methodology and results summary. *Sleep Health.* 2015; 1:40–43. [PubMed: 29073412]
- Hoff E, Laursen B, Tardif T, Bornstein M. Socioeconomic status and parenting. *Handbook of Parenting Volume 2: Biology and Ecology of Parenting.* 2002; 8(2):231–52.
- Horne JA. Sleep function, with particular reference to sleep deprivation. *Ann Clin Res.* 1985; 17:199–208. [PubMed: 3909914]
- Kline R. *Principles and Practice of Structural Equation Modeling.* Guildford; New York, NY: 2005.
- Kouros CD, El-Sheikh M. Within-family relations in objective sleep duration, quality, and schedule. *Child Dev.* 2016 Advance online publication.
- Luthar SS, Latendresse SJ. Children of the affluent: Challenges to well-being. *Curr Dir Psychol Sci.* 2005; 14:49–53. [PubMed: 17710193]
- McLoyd VC. The impact of economic hardship on Black families and children: Psychological distress, parenting, and socioemotional development. *Child Dev.* 1990; 61:311–346. [PubMed: 2188806]
- Meltzer LJ, Montgomery-Downs HE. Sleep in the family. *Pediatr Clin North Am.* 2011; 58:765–774. [PubMed: 21600354]
- Meltzer LJ, Montgomery-Downs HE, Insana SP, Walsh CM. Use of actigraphy for assessment in pediatric sleep research. *Sleep Med Rev.* 2012; 16:463–475. [PubMed: 22424706]
- Philbrook LE, Hinnant JB, Elmore-Staton L, Buckhalt JA, El-Sheikh M. Sleep and cognitive functioning in childhood: Ethnicity, socioeconomic status, and sex as moderators. *Dev Psychol.* 2017; 53:1276–1285. [PubMed: 28414509]
- Pinquart M. Associations of parenting dimensions and styles with externalizing problems of children and adolescents: An updated meta-analysis. *Dev Psychol.* 2017; 53:873–932. [PubMed: 28459276]
- Preacher KJ, Curran PJ, Bauer DJ. Computational tools for probing interactions in multiple linear regression, multilevel modeling, and latent curve analysis. *J Educ Behav Stat.* 2006; 31:437–448.

- Radloff LS. The CES-D Scale: A self-report depression scale for research in the general population. *Appl Psychol Meas.* 1977; 1:385–401.
- Reitman D, Rhode PC, Hupp SDA, Altobello C. Development and validation of the Parental Authority Questionnaire-Revised. *J Psychopathol Behav Assess.* 2002; 24:119e127. 2002.
- Sadeh A III. Sleep assessment methods. *Monogr Soc Res Child Dev.* 2015; 80:33–48. [PubMed: 25704734]
- Schaefer ES. Children's reports of parental behavior: An inventory. *Child Dev.* 1965; 36:413–434. [PubMed: 14300862]
- Smith MT, Wegener ST. Measures of sleep: the insomnia severity index, medical outcomes study (MOS) sleep scale, Pittsburgh sleep diary (PSD), and Pittsburgh sleep quality index (PSQI). *Arthritis Care Res.* 2003; 49:S184–S196.
- Steinberg L, Lamborn SD, Darling N, Mounts NS, Dornbusch SM. Over-time changes in adjustment and competence among adolescents from authoritative, authoritarian, indulgent, and neglectful families. *Child Dev.* 1994; 65:754–770. [PubMed: 8045165]
- U.S. Department of Commerce. How the Census Bureau measures poverty. 2013. Available from: <http://www.census.gov/hhes/www/poverty/about/overview/measure.html>
- Walker MP. The role of sleep in cognition and emotion. *Ann N Y Acad Sci.* 2009; 1156:168–197. [PubMed: 19338508]
- Whinnery J, Jackson N, Rattanaumpawan P, Grandner MA. Short and long sleep duration associated with race/ethnicity, sociodemographics, and socioeconomic position. *Sleep.* 2014; 37:601–611. [PubMed: 24587584]
- Wilcox RR. *Introduction to Robust Estimation and Hypothesis Testing (Statistical Modeling and Decision Science)*. second. Academic Press; San Diego: 2005.
- Williams NJ, Grandne MA, Snipes A, et al. Racial/ethnic disparities in sleep health and health care: importance of the sociocultural context. *Sleep Health.* 2015; 1:28–35. [PubMed: 26229976]

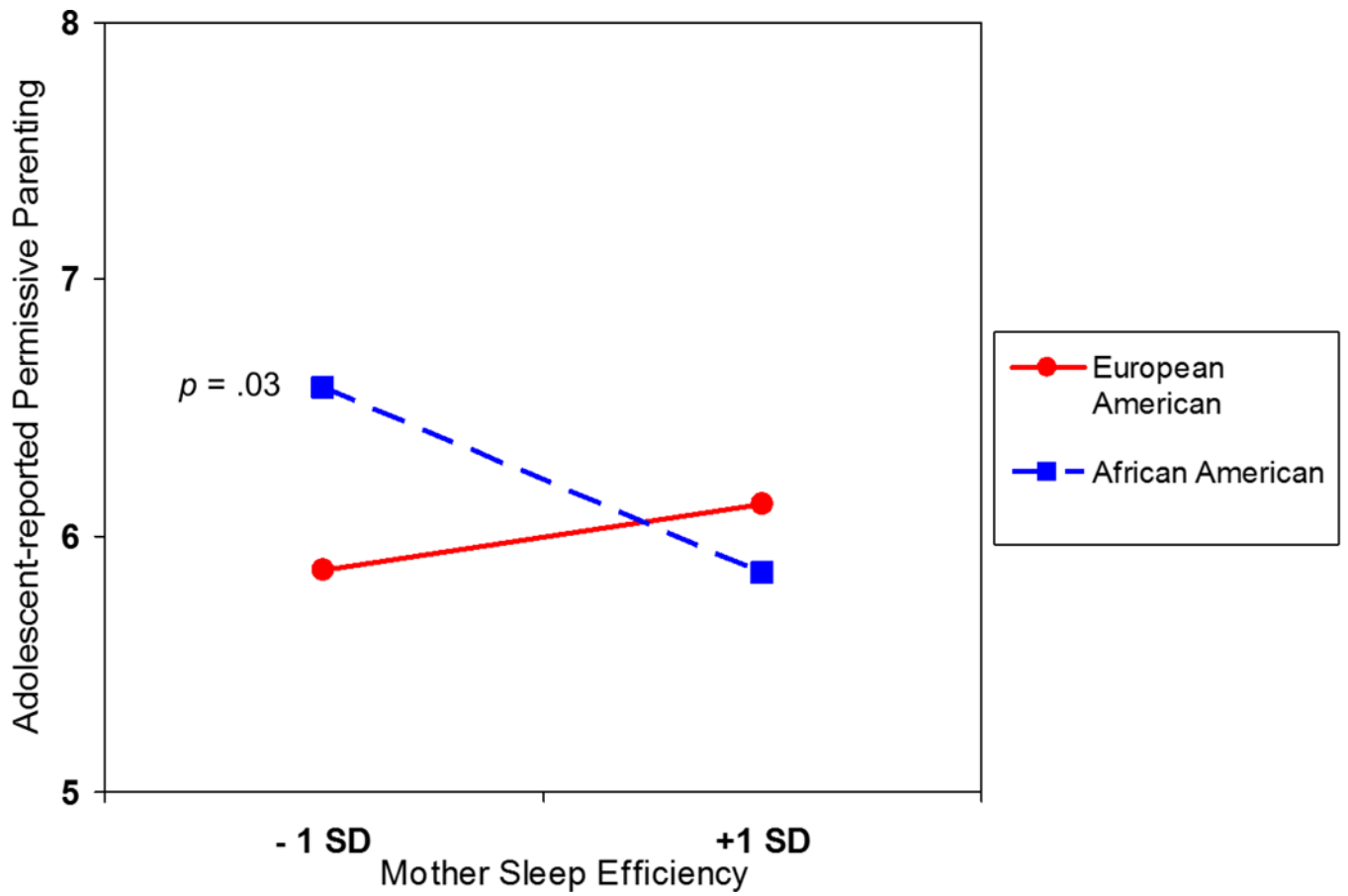


Figure 1a. The association between mothers' actigraphy-based sleep efficiency and adolescent-reported permissive parenting for European American and African-American mothers.

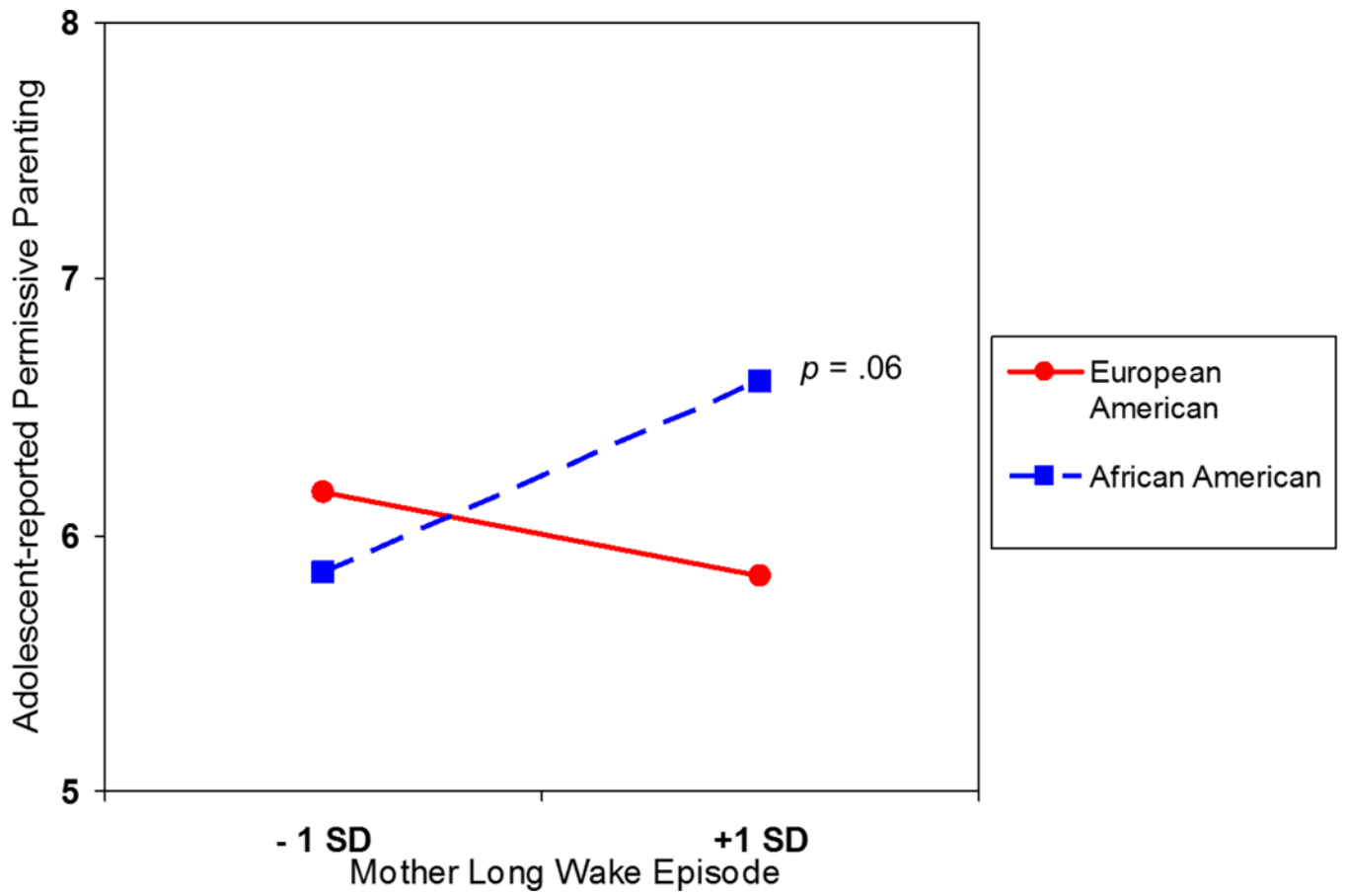


Figure 1b. The association between mothers' actigraphy-based long wake episodes and adolescent-reported permissive parenting for European American and African-American mothers.

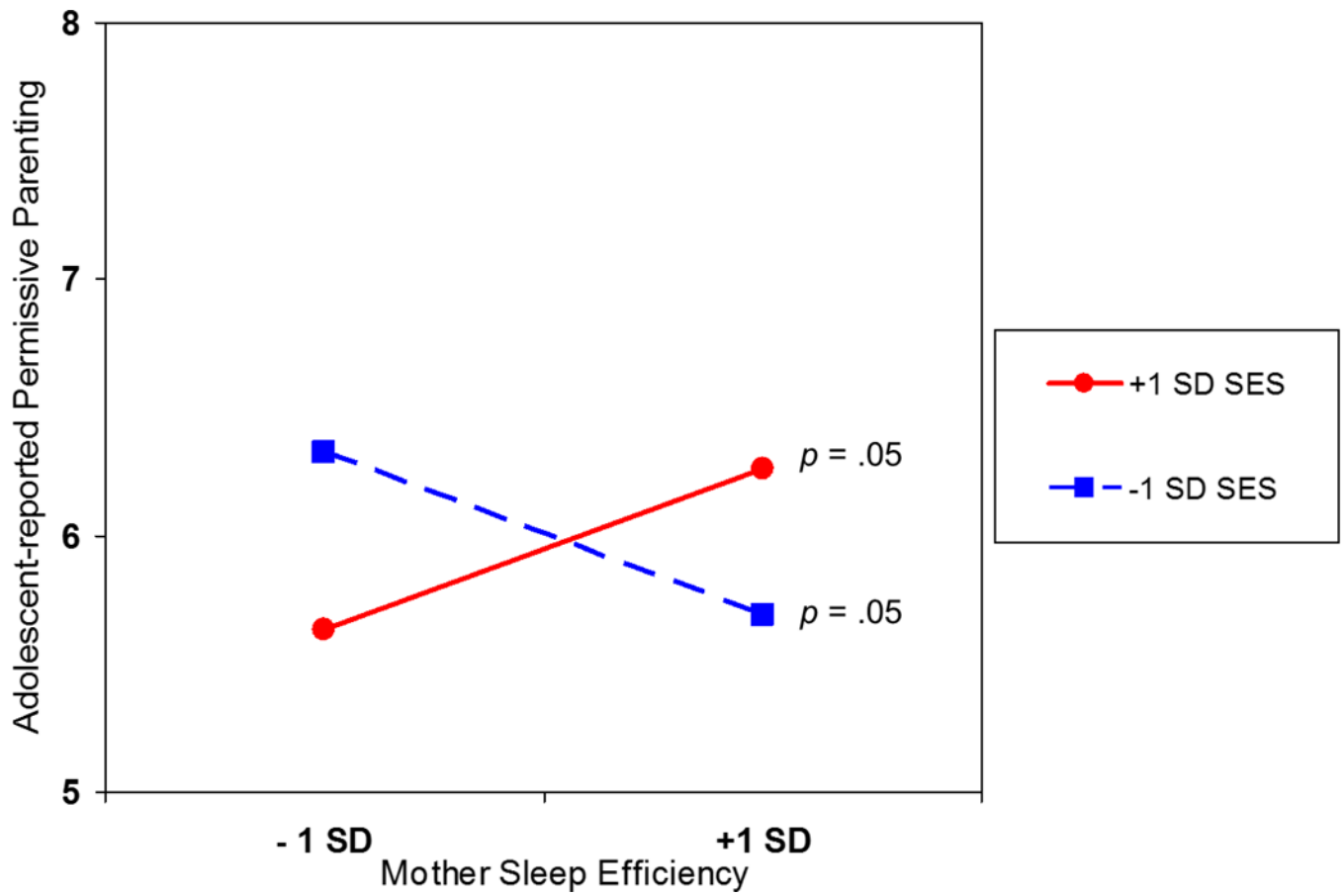


Figure 2a. The association between mothers’ actigraphy-based sleep efficiency and adolescent-reported permissive parenting at high and low levels of SES (socioeconomic status).

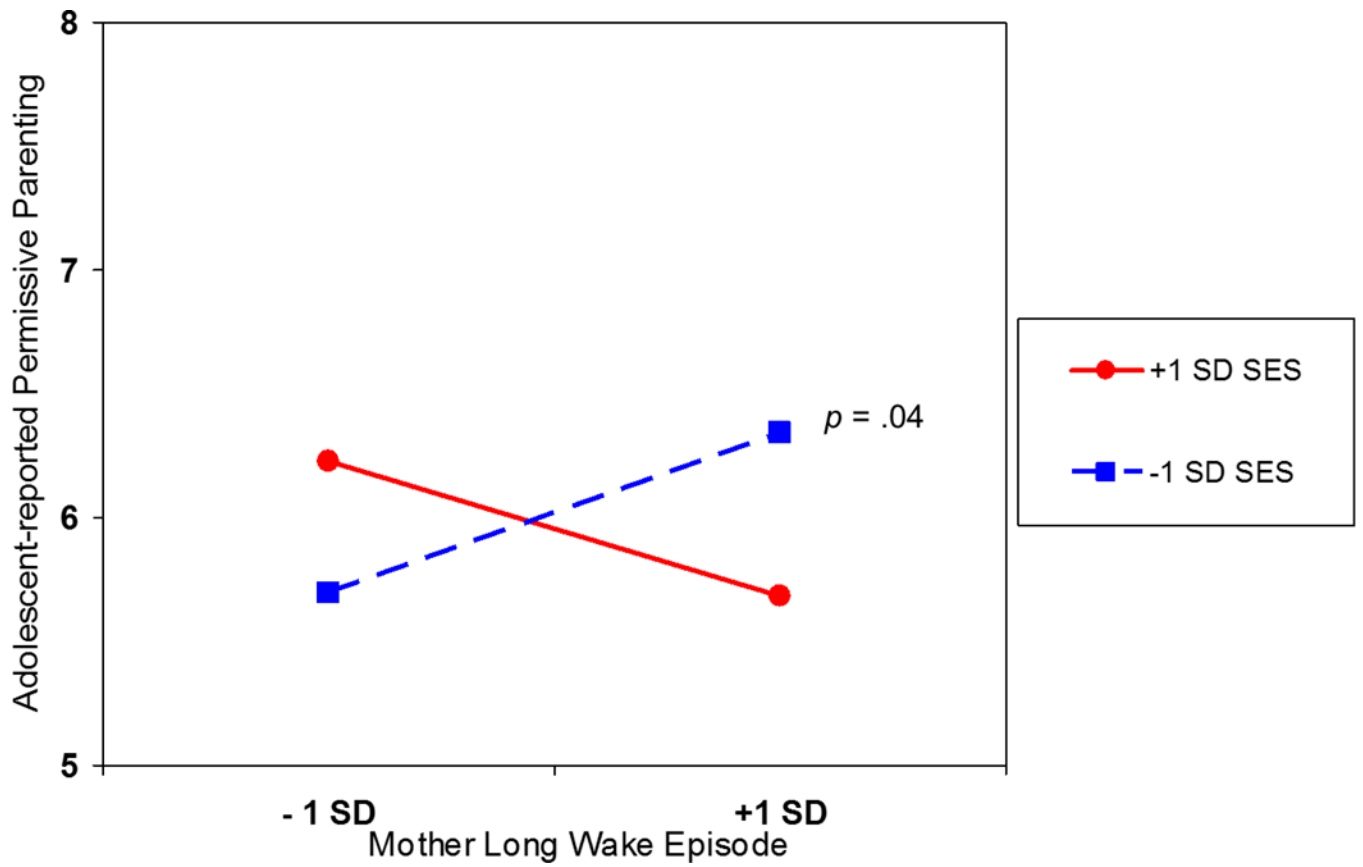


Figure 2b.
 The association between mothers’ actigraphy-based long wake episodes and adolescent-reported permissive parenting at high and low levels of SES (socioeconomic status)

Table 1
Descriptive Statistics and Correlations among Covariates, Maternal Sleep Parameters, and Permissive Parenting

	1	2	3	4	5	6	7	8	9	10
1. Mother age	-									
2. Socioeconomic status	.26***	-								
3. Mother anxiety symptoms	.03	-.11	-							
4. Mother depressive symptoms	-.01	-.14*	.61***	-						
5. Sleep minutes (actigraphy)	-.04	.28***	-.15	-.13	-					
6. Sleep efficiency (actigraphy)	.001	.30***	-.09	-.15*	.44***	-				
7. Long wake episodes (actigraphy)	-.03	-.25**	.06	.10	-.28***	-.93***	-			
8. Sleep latency (actigraphy)	-.16*	-.18*	.17*	.13	-.24**	-.35***	.32***	-		
9. Mother-reported sleep problems (PSQI)	.002	-.19**	.44***	.44***	-.14	-.25**	.23**	.31***	-	
10. Adolescent-reported permissive parenting	.08	-.07	.04	.02	-.24**	-.12	.09	.18*	.04	-
Mean (<i>SD</i>)	41.76 (6.25)	2.38 (1.30)	6.81 (8.38)	8.92 (7.91)	397.71 (64.38)	94.63 (5.17)	1.42 (1.24)	13.15 (12.08)	6.65 (3.84)	6.21 (1.55)
Range	30.33-67.00	.14-6.72	0-40	0-40	197.33-558.00	74.88-99.91	0-5	1.00-46.80	0-18	4-12

Note. PSQI = Pittsburgh Sleep Quality Index.

* $p < .05$.

** $p < .01$.

*** $p < .001$.

Table 2

Regression Coefficients for the Associations Linking Covariates, Maternal Sleep Parameters, and Ethnicity and SES as Moderators with Adolescent-reported Permissive Parenting

	<u>Adolescent-reported permissive parenting</u>		
	<i>B</i> (<i>SE</i>)	β	R ²
Covariates (maternal characteristics)			6.3%
Age	.002 (.001)	.10	
Race/ethnicity	.29 (.24)	.09	
Socioeconomic status (SES)	-.04 (.09)	-.07	
Sleep disorder	.56 (.48)	.09	
Shift work	1.31 (.53) [*]	.19 [*]	
Anxiety symptoms	.01 (.02)	.03	
Depressive symptoms	.001 (.02)	.01	
Maternal sleep parameters			
Sleep minutes (actigraphy)	-.01 (.002) ^{**}	-.21 ^{**}	9.3%
Sleep efficiency (actigraphy)	-.02 (.04)	-.08	6.8%
Long wake episodes (actigraphy)	.05 (.10)	.04	6.5%
Sleep latency (actigraphy)	.03 (.01) ^{**}	.22 ^{**}	10.8%
Mother-reported sleep problems (PSQI)	.01 (.03)	.03	6.3%
Race/ethnicity interactions			
Sleep minutes × Race	-.003 (.004)	-.08	9.0%
Sleep efficiency × Race	-.10 (.05) [*]	-.21 [*]	8.8%
Long wake episodes × Race	.43 (.20) [*]	.20 [*]	8.7%
Sleep latency × Race	.004(.02)	.19	10.2%
Mother-reported sleep problems × Race	.04 (.07)	.06	6.5%
SES interactions			
Sleep minutes × SES	.002 (.001)	.09	10.3%
Sleep efficiency × SES	.05 (.02) ^{**}	.23 ^{**}	11.0%
Long wake episodes × SES	-.18 (.07) [*]	-.20 [*]	10.4%
Sleep latency × SES	-.002 (.01)	-.02	10.8%
Mother-reported sleep problems × SES	.003 (.02)	.01	6.2%

Note. Race/ethnicity coded as 0 = European American, 1 = minority; sleep disorder coded as 0 = no sleep disorder, 1 = sleep disorder; shift work coded as 0 = no shift work, 1 = yes shift work. PSQI = Pittsburgh Sleep Quality Index. Each sleep parameter (and corresponding interactions) was examined in separate models and the corresponding R² is reported for each model.

⁺ $p < .10$.

^{*} $p < .05$.

^{**} $p < .01$.

^{***} $p < .001$.