HHS Public Access

Author manuscript

Behav Sleep Med. Author manuscript; available in PMC 2016 September 03.

Published in final edited form as:

Behav Sleep Med. 2015 September 3; 13(5): 412–423. doi:10.1080/15402002.2014.940104.

Sleep Hygiene Practices and Bedtime Resistance in Low-Income Preschoolers: Does Temperament Matter?

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Abstract

Objective—To test the association of home sleep hygiene practices with bedtime resistance among preschoolers, and to determine whether this association differs by child temperament.

Methods—Parents of Head Start preschoolers (n=374, 56% non-Hispanic white) completed questionnaires, including the 5-item Going to Bed subscale of the Children's Sleep-Wake Scale (GTB; higher score reflects less bedtime resistance), 22-item Children's Sleep Hygiene Scale (CSHS; higher score reflects better sleep hygiene practices) and Child Behavior Questionnaire-Short Form anger, activity, and impulsivity subscales (our measure of difficult temperament). Monte Carlo simulation adjusted for child age, gender, race/ethnicity, and maternal education and tested the association of CSHS with GTB in children with more difficult vs. less difficult temperaments.

Results—Children with more difficult vs. less difficult temperaments experienced worse sleep hygiene practices ($p<.0001$) and had more bedtime resistance ($p<.0001$). Among children with more difficult temperaments, better sleep hygiene was linearly associated with less bedtime resistance (GTB $\beta = 1.28$, 95% CI 0.77, 1.78). Among children with less difficult temperaments, the association followed a piecewise linear tread: sleep hygiene was not associated with bedtime resistance when CSHS scores were < 4.1 (GTB $\beta = 0.15$, 95% CI -4.87, 3.13), but for CSHS scores ≥ 4.1, an increase in CSHS was associated with lower bedtime resistance (GTB $\beta = 1.33$, 95% CI 1.00, 1.79).

Conclusions—Consistency in sleep hygiene practices are associated with less bedtime resistance and may be especially helpful in reducing bedtime resistance among children with more difficult temperaments.

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Keywords

Child behavior; Sleep; Parenting

INTRODUCTION

Sleep disturbances in early childhood can have significant consequences for children's overall quality of life[1], daytime behavior[1–5], and school performance[4–6] and have been associated with an increased risk of sleep problems later in childhood.[7,8] Bedtime resistance typically manifests as bedtime delay through behaviors such as bedtime refusal, stalling, or "curtain calls" and has been associated with sleep problems such as nocturnal arousals, sleepwalking and difficulty waking in children.[9] Bedtime resistance behaviors are part of a well described type of behavioral insomnia of childhood (limit setting type). Behavioral insomnia of childhood is commonly reported in young children, with an estimated prevalence of 13–50%.[8–11]

Good sleep hygiene practices, such as use of a regular bedtime and avoiding stimulating activities (electronic use and caffeine intake), are an important part of healthy sleep in children; poor sleep hygiene may play an important role in bedtime problems. For example, in preschool children, poor sleep hygiene practices such as falling asleep with a parent in the room, having a TV in the room, and drinking caffeine were associated with shorter sleep duration.[12] Another component of good sleep hygiene practice commonly recommended in the clinical setting is having a regular bedtime routine.[13] Yet, the association between bedtime routine and sleep duration in preschoolers is less clear. In a national sample of over 4000 predominantly low-income preschool-aged children, having a bedtime routine that includes activities, such as reading a book, praying, or playing a game, at age 3 years was associated with longer sleep duration at age 5 years.[14] In contrast, in a national sample of 385 preschool-aged children, having a regular bedtime routine was not associated with longer sleep duration.[12] Therefore, optimizing sleep hygiene practices may be helpful for parents who are struggling with bedtime problems at home.

A number of studies have evaluated specific sleep hygiene practices with regard to bedtime resistance behaviors. Television viewing before bed is a common example of a poor sleep hygiene practice that has been associated with increased bedtime resistance in children.[15] Similarly, children who share a bed with a parent or fall asleep somewhere other than their own bed are also more likely to have bedtime resistance.[9] On the other hand, the consistent use of a good sleep hygiene practice such as a regular bedtime routine has been associated with less bedtime resistance in elementary school children.[9] One randomized controlled trial examined the effect of having a bedtime routine on bedtime behaviors that could be considered problematic or resistant (e.g., "number of times child calls for parent," "number of times out of crib/bed," "how difficult was bedtime," and "number of night wakings") in 199 children, ages 18 to 36 months. Families were instructed to institute a nightly 3-step bedtime routine that included a bath, applying lotion, and doing quiet activities (e.g., cuddling, singing a lullaby), with lights out within 30 minutes of the end of the bath. It was not reported how adherent families were to the prescribed intervention, but following the 2-

week intervention period, children in the intervention arm had a number of sleep benefits including a longer sleep duration, fewer parent-reported “sleep problems”, “less difficult” parent-reported bedtimes, fewer times out of bed and fewer times calling the parent.[16]

Despite sleep hygiene being commonly recommended in clinical practice[13] and increased parent reported problematic bedtime behaviors at the preschool age, few studies have examined the association between sleep hygiene practices and bedtime resistance in preschool children. A better understanding of this association could help clinicians with recommendations for families struggling with bedtime resistance behaviors. Furthermore, identifying child characteristics that may alter the association between sleep hygiene practices and bedtime resistance may contribute to the development of more effective interventions for bedtime resistance, or the ability to target such interventions more appropriately, but to our knowledge, these characteristics have not previously been examined.

Child temperament is particularly important to examine, as sleep problems are more common among children with a more difficult temperament.[17,18] Temperament, and particularly the construct of difficult temperament, is defined differently across studies, with some measures asking parents to rate directly the difficultness of their infants across domains, and others focused on behavioral qualities of the child. In either case, difficult temperament is typically conceptualized as a constellation of traits, characterized by high reactivity, particularly negative emotionality, and a lack of behavioral control.[19] Studies of temperament and sleep in young children have shown that toddlers with lower rhythmicity, adaptability, and approach; preschoolers and school-aged children with more emotionality[20]; and school-aged children with lower task-orientation and higher reactivity[6] have all been described as having more sleep problems. Five studies have evaluated child temperamental qualities in relation to sleep problems, finding associations with varying dimensions of temperament, including child emotionality (but not shyness, sociability, or activity)[20], resistance to control[21], difficult temperament (defined as more emotionally negative, less adaptable and more persistent/unstoppable)[22], difficult temperament based on 9 different temperament dimensions in the Toddler Temperament Scale[23], and higher reactivity and less task-orientation.[6] Three of these five studies used non-US samples[6,22,23], one focused solely on school-aged children[6], none focused on lower-income families, and several may have been underpowered by limited sample sizes.[20,23] Additionally, one study looked at the association between bed sharing and child temperament in preschool children and found that bedsharers were less adaptable, less rhythmic, and more intense as compared to children who were solitary sleepers.[24] Thus, although it appears that more difficult temperament is associated with sleep difficulties, less is known about associations between sleep hygiene practices and temperament. It is also unknown whether associations between good sleep hygiene practices and bedtime resistance differ among children with more difficult versus less difficult temperaments.

In this context, the present study sought to assess the association between sleep hygiene practices and bedtime resistance in preschoolers, and to examine the relationship between sleep hygiene practices and bedtime resistance among children with more difficult versus less difficult temperaments. Our study focuses on low-income families as they have been

found to have more bedtime problems[25] and are less likely to have a regular bedtime routine.[26] We hypothesized that 1) worse sleep hygiene practices would be associated with greater bedtime resistance; 2) children with more difficult temperaments would demonstrate greater bedtime resistance; 3) children with more difficult temperaments would experience worse sleep hygiene practices; and 4) the association of sleep hygiene and bedtime resistance would differ based on child temperament.

METHODS

Participants

Participants (n = 374) were preschool children ages 3 to 5 years enrolled in Head Start (federally-funded preschool for children in poverty) and their parents, who were recruited as part of a larger study about stress and eating behaviors in children. This was a convenience sample of typically-developing preschool-age children with no known history of sleep problems who were selected on the basis of Head Start participation. Inclusion criteria were: parent and child spoke English fluently, no parent with a 4-year college degree or more, child born at 35 weeks gestation or later with no significant perinatal complications, and no history of food allergies, serious medical problems, or significant developmental delay. After written informed consent of the parent or legal guardian, study questionnaires were administered by a research assistant in the family's home. The study protocol was approved by the University of Michigan Institutional Review Board.

Measures

The Children's Sleep Wake Scale (CSWS) is a 40-item parent-report measure that assesses five behavioral dimensions of sleep quality in 2- to 8-year-old children using a 6-point scale (1 = never; 6 = always).[27] This scale has been previously used to evaluate sleep quality in children.[28,29] The Going to Bed Subscale (GTB) is the mean of 5 items on the CSWS describing behaviors that indicate bedtime resistance (e.g., repeated requests to stay up, crying/complaining about going to bed). Thus, in the current study we defined bedtime resistance, our primary outcome measure, as the GTB subscale (means and standard deviations for individual items contributing to the GTB subscale are listed in Table 1; sample Cronbach's $\alpha = 0.88$). A higher score indicated less bedtime resistance. We used the Children's Sleep Hygiene Scale[30] (CSHS) total mean score as our primary predictor. The CSHS is a 22-item parent-report measure that has been used in previous research[31,32] and assesses the frequency of use of good sleep hygiene practices (e.g., regular bedtimes and wake times; restriction of caffeine and highly arousing activities prior to bedtime; predictable and comfortable sleeping environment; sample Cronbach's $\alpha = 0.72$). Mothers responded to each item on a 6-point scale (1 = never; 6 = always); a higher score indicates that the family is engaging in better sleep hygiene practices.

To assess child temperament, parents completed 7 subscales (Activity Level, Anger, Attentional Focusing, High Intensity Pleasure, Impulsivity, Inhibitory Control, Shyness) of the Child Behavior Questionnaire-Short Form,[33–35] by rating items on a scale from 1 = extremely untrue to 7 = extremely true. Subscale scores are calculated as the means of responses to relevant items. Of these scales, we chose the aspects of child behavior that are

conceptually and theoretically implicated as “difficult” in the temperament literature to characterize difficult temperament in the current study. Thus, the anger (6 items, e.g. “Has temper tantrums when s(he) doesn’t get what s(he) wants”, sample Cronbach’s $\alpha = 0.78$), activity level (7 items, e.g. “Seems always in a big hurry to get from one place to another”, Cronbach’s $\alpha = 0.66$), and impulsivity (6 items, e.g. “Usually rushes into an activity without thinking about it”, Cronbach’s $\alpha = 0.58$) subscales were averaged to create a ‘difficult temperament’ score (Cronbach’s $\alpha = 0.78$), with potential scores ranging from 1 to 7 and a higher score indicating a more difficult temperament. As in other studies that have conceptualized difficult temperament based on parent-reported temperament scales,[34–36] these 3 subscales were chosen to reflect increased reactivity and negative affect, hallmarks of difficult temperament.[22,35,37] Although temperament is theoretically best conceptualized as a continuum, we dichotomized our temperament variable for the purposes of the current study, in order to test whether children with more difficult temperaments would have more bedtime resistance and experience worse sleep hygiene practices, and to determine whether the sleep hygiene-bedtime resistance association was similar for children who varied in their temperamental difficulty. The mean score in our sample ($M = 4.97$, $SD = 0.76$) was comparable to previously-published scales using this measure.[38] As we were interested in the role of difficult temperament in particular, we dichotomized the difficult temperament score based on an extreme-group approach and categorized children who were rated 1 standard deviation or above the sample mean as having a “more difficult” temperament, and children with scores below 1 standard deviation as having a “less difficult" temperament. We used 1 versus 2 standard deviations as the cutoff in our approach in order to have an adequate number of children in each group for analysis.

Demographic information included child age, gender, and race/ethnicity (categorized as non-Hispanic white versus not); and parent education level (categorized as high school diploma or equivalent versus more than high school education).

Statistical analysis

Statistical analysis was performed with SAS 9.3 (SAS Institute, Cary, NC). Correlations were used to assess the association of CSHS and GTB. T-tests for continuous measures and Chi- square tests for categorical measures were used to examine associations of child temperament (more difficult versus easier) with covariates as well as CSHS and GTB. Cohen’s d coefficients were calculated and effect sizes were defined as a small (≤ 0.2), moderate effect (≥ 0.5) or large effect (≥ 0.8). To examine the association between CSHS and GTB among children with more difficult versus less difficult temperaments, allowing for the possibility that the relationships were non-linear, we implemented a Bayesian change point model, adjusting for demographic covariates, age, gender, race/ethnicity and parent education level. Such a model is appropriate when there is a threshold at which the strength of the association changes. We implemented Proc MCMC in SAS to fit this model, using Markov chain Monte Carlo simulations techniques which are used to jointly estimate the threshold, if it exists, as well as the strength of the associations (slopes) above and below the threshold. Bayesian Information Criteria (BIC) were used to decide whether a non-linear change point model fit the data better than a linear model.

RESULTS

Participant characteristics are shown in Table 2, for the entire study sample and by temperament (easier versus more difficult). Children had a mean age of 4.1 (SD = 0.54) years. Half of the children were male and 56% were non-Hispanic white, 16% were Black, 17% were Biracial or another race, and 11% were Hispanic. About half (48%) of the parents had less than a high school diploma or the equivalent. GTB and CSHS were positively correlated ($r = .55$, $p<.001$). The mean GTB Score was 3.41 (SD = 1.27), with an observed range of 1.00 to 6.00. The mean CSHS score was 4.82 (SD = 0.50), with an observed range of 3.2 to 5.9. T-tests for continuous measures and Chi- square tests for categorical measures revealed that none of the demographic covariates (age, gender, race/ethnicity, parent education level) differed by child temperament. However, as seen in Table 2, children with more difficult temperaments experienced worse sleep hygiene practices and had more bedtime resistance compared to children with less difficult temperaments ($p<0.001$). Therefore, there was a moderate effect size for sleep hygiene (Cohen's $d = 0.63$) and a large effect size for bedtime resistance (Cohen's $d = 0.98$).

The Bayesian change point model showing the association between sleep hygiene and bedtime resistance among children with easier versus more difficult temperaments, controlling for child age, child gender, child race/ethnicity, and parent education is shown in Figure 1. The BIC indicated that the nature of the association between sleep hygiene consistency and bedtime resistance differed by child temperament, with a linear association between sleep hygiene and bedtime resistance present among children with a more difficult temperament, and a change point (cp) of 4.11 on the CSHS identified for the less difficult temperament group. For children with a more difficult temperament, each one-point increase in CSHS resulted in a linear increase of GTB (i.e., less bedtime resistance; $\beta = 1.28$, 95% CI 0.77, 1.78, $n = 61$). For children with less difficult temperaments, increases in CSHS up to 4.1 were not associated with statistically significant changes in GTB scores ($\beta = 0.15$, 95% CI -4.87, 3.13, $n = 16$); whereas increases above 4.1 were associated with increases in GTB scores ($\beta = 1.33$, 95% CI 1.00, 1.79, $n = 297$). Even with the highest CSHS scores, children with more difficult temperaments, on average, had a lower GTB score than the children with less difficult temperaments.

CONCLUSIONS

Five main findings emerged from this study. First, we found that sleep hygiene was positively associated with bedtime resistance in that better sleep hygiene practices correlated with less bedtime resistance. Second, children with more difficult temperaments had substantially more bedtime resistance than children with less difficult temperaments. Third, children with a more difficult temperament, on average, had worse sleep hygiene practices than children with a less difficult temperament. Fourth, better sleep hygiene practices were linearly associated with lower bedtime resistance among children with more difficult temperaments. In contrast, among children with less difficult temperaments, better sleep hygiene practices were only associated with lower bedtime resistance above the change point of 4.11 on the CSHS, and not associated below this point. Finally, even when children with more difficult temperaments had the best sleep hygiene practices their bedtime

resistance remained greater than the bedtime resistance reported in children with less difficult temperaments who had worse sleep hygiene practices.

Our finding that children with more difficult temperaments have more bedtime resistance adds to a somewhat diverse literature in this area. Prior work has identified associations of child behavioral[39] or psychiatric problems[40] with sleep problems. Much of the prior work in this area has focused broadly on sleep problems[21,40], evaluated nocturnal arousals alone[23], or combined bedtime resistance with other sleep problems[20,22] so that the association with bedtime resistance in particular cannot be clearly delineated. Further, less is known in general about the association between parents' use of sleep hygiene practices and child temperament among preschool-age children, even though this information may help guide clinical practice. Thus, our findings are novel and suggest low-income US preschool children with more difficult temperaments are more likely to have more bedtime resistance and also to have worse sleep hygiene practices.

Similarly, to our knowledge, our finding that the relationship between sleep hygiene practices and bedtime resistance differs based on child temperament has not been previously described. We found that among children with more difficult temperaments, better sleep hygiene practices were linearly associated with lower bedtime resistance. In contrast, among children with less difficult temperaments, only the best sleep hygiene practices (a score of 4.1 or more on the CSHS, reflecting a mean response approximating "quite often") were associated with lower bedtime resistance. However, children with less difficult temperaments as compared to peers with more difficult temperaments still had lower bedtime resistance, regardless of sleep hygiene practices. An additional explanation for our findings is that it may be more challenging for parents to implement good sleep hygiene practices with children who have more difficult temperaments, particularly when these children are likely to have more bedtime resistance behaviors.

This study does have several limitations. First, the same parent completed all measures, which may have resulted in reporter bias. Future work might consider using other, more objective approaches, such as ecological momentary assessments, for data collection. Second, our sample was not pre-selected on any clinical characteristics, but all participants were low-income, preschool-aged, English-speaking children who were attending Head Start. Thus, study results may not be generalizable to children who do not share these demographic characteristics. Additionally, our measures of sleep hygiene practices and bedtime resistance may not fully capture all variations in sleep hygiene practices or bedtime resistance behaviors. Therefore, it is possible that our findings describe associations between these two measures and may not reflect associations between other sleep hygiene practices and bedtime resistance behaviors not measured in this study. It is also possible that our measures of bedtime resistance and sleep hygiene practices assessed similar child behaviors to some degree. However, bedtime resistance reflects more child-driven attempts to delay bedtime, whereas sleep hygiene practices reflect more parent-driven routines and strategies, as well as general home environment conditions to promote sleep. Thus, examining the associations between these measures is valuable. It is also possible that our findings of reduced bedtime resistance only at high levels of sleep hygiene for children with less-difficult temperaments were related to there being few children in the lower (CSHS < 4.1)

group. Examining this association in a larger sample could help clarify this finding. Finally, it is important to note that this cross-sectional study cannot demonstrate causality; longitudinal and experimental work could address this issue by testing whether better sleep hygiene practices with children identified as having more difficult temperaments earlier in development could prevent bedtime resistance for these children at preschool age.

Nevertheless, our findings do have several clinical implications. First, pediatric providers now have added evidence to recommend use of good sleep hygiene practices to reduce bedtime resistance in preschool-aged children. Second, children with more difficult temperaments are prone to have bedtime resistance, but also may be likely to respond to use of good sleep hygiene practices. Parents of children with more difficult temperaments may find that intensive efforts to improve sleep hygiene practices only achieve levels of bedtime resistance that children with less difficult temperaments experience with worse sleep hygiene practices. We hope our finding that better sleep hygiene practices are associated with less bedtime resistance among children with more difficult temperaments will be encouraging to parents and providers. While more research is needed to address the needs of these children, children with more difficult temperaments for whom bedtime resistance is still problematic, despite relatively good sleep hygiene practices, may benefit from more targeted behavioral treatment if bedtime resistance continues to be problematic despite optimization of sleep hygiene practices.

Acknowledgments

Funding Source: All phases of this study were funded by an NIH grant (1RC1 DK086376-01) and salary support for Katherine Wilson was funded by an NIH grant (5T32 NS007222-30)

COI: Ronald D. Chervin has received research grants from the NIH, Fox Foundation, and University of Michigan. He has received support for an educational program from Philips Respironics and Fisher Paykel. He serves on boards of directors for the American Academy of Sleep Medicine, American Sleep Medicine Foundation, American Board of Sleep Medicine, Associated Professional Sleep Societies, and International Pediatric Sleep Association. He has consulted for Proctor and Gamble, Zansors, and MC3. He serves as a section editor for UpToDate and a book editor for Cambridge University Press. He serves as a volunteer on the advisory board of the non-profit Sweet Dreamzzz. He is named in patents, patents pending, and copyrighted material related to sleep disorder diagnosis and assessment, and owned by the University of Michigan.

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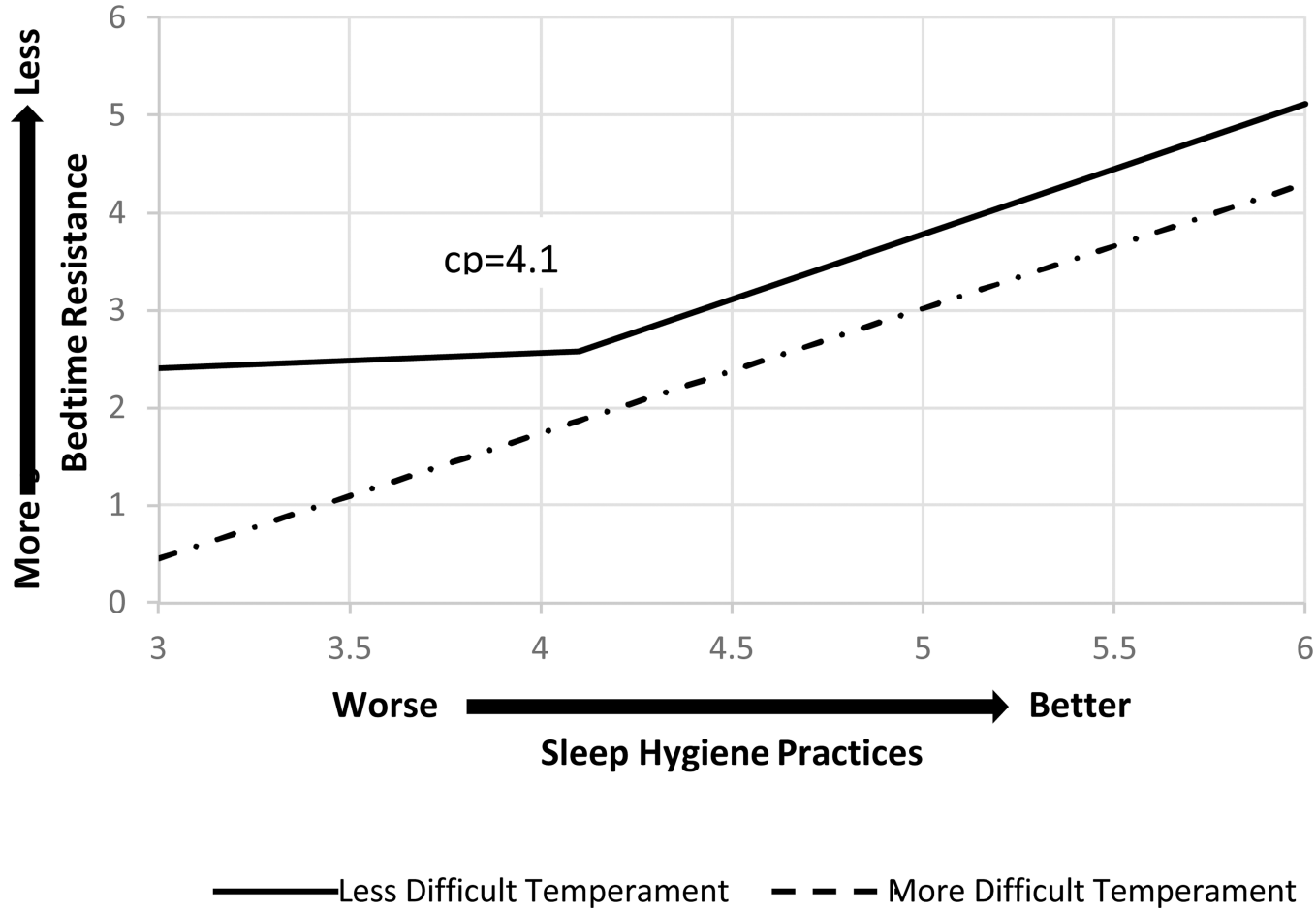

Figure 1.

Markov chain Monte Carlo simulations depicting relationship between sleep hygiene practices as measured by total score on the Children Sleep Hygiene Scale (CSHS) and Bedtime Resistance as measured by the Going to Bed subscale (GTB), based on child temperament.

TABLE 1

Question items contributing to primary outcome[1]

	Mean (SD)
Going to Bed Subscale (GTB)	
Your child makes repeated requests (asks for another drink, hug, etc.) at bedtime[2]	3.69 (1.57)
Your child wants to stay up and do other things at bedtime (read, play, watch TV)[2]	3.63 (1.52)
Your child is ready to go to bed at bedtime	2.94 (1.44)
Your child complains or cries about going to bed[2]	3.19 (1.56)
Your child puts off or delays going to bed[2]	3.36 (1.62)

[1] Individual items ranged from 1=never to 6=always.

[2] Items are presented as the raw responses in the table and were reverse coded to create scores.

TABLE 2

Sample demographics (n = 374)

	Total	Less Difficult Temperament n= 313	More Difficult Temperament n= 61	p-value[1]
Age (years), Mean (SD)	4.10 (0.54)	4.12 (0.53)	4.03 (0.60)	0.270
Gender, n (%)				
Male	186 (49.7)	153 (48.9)	33 (54.1)	0.457
Female	188 (50.3)	160 (51.1)	28 (45.9)	
Race/Ethnicity, n (%)				
Non-Hispanic white	209 (55.9)	171 (54.6)	38 (62.3)	0.271
Hispanic or not white	165 (44.1)	142 (45.4)	23 (37.7)	
Parent Education level, n (%)				
≤ High school diploma/equivalent	179 (47.9)	145 (46.3)	34 (55.7)	0.179
> high School diploma/equivalent	195 (52.1)	168 (53.7)	27 (44.3)	
CSHS, Mean (SD)	4.82 (0.50)	4.87 (0.48)	4.55 (0.53)	<.0001
GTB, Mean (SD)	3.41 (1.27)	3.59 (1.20)	2.42 (1.20)	<.0001

[1] Pearson's chi-square test was used for categorical variables, and the *t* test was used for continuous variables.

CSHS: Children's Sleep Hygiene Scale. A higher score indicates better sleep hygiene practices.
GTB: Going to Bed Subscale. A higher score indicates less bedtime resistance.