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Reading at Bedtime Associated With Longer Nighttime Sleep in Latino Preschoolers

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Abstract

Objective. To characterize bedtime routines (BR) and associations between reading at bedtime and sleep behaviors in a sample of Latino preschoolers. *Methods*: A convenience sample of Latino parents of a 4-year-old child completed standardized questionnaires assessing BRs, bedtime reading frequency and other sleep variables. Family demographics and home environment were also assessed. *Results*. Parents of 62 children completed questionnaires. A consistent BR was reported by 48%. Frequent reading at bedtime was reported in 42%. After controlling for key confounders, reading at bedtime was significantly associated with longer total nighttime sleep (*P* < .01), but not with other sleep behaviors. *Conclusion*. Reading at bedtime was significantly associated with longer total nighttime sleep duration. This, together with the relatively low frequency of reading found in this sample, suggests that interventions aimed at increasing reading at bedtime among Latino preschoolers may improve overall sleep health.

Keywords

bedtime routines, reading, sleep, sleep behaviors, Latinos

Introduction

Sleep problems are common among young children, occurring in up to 30% of healthy preschool-aged children.[1-3] The majority of sleep problems are behavioral in origin, including bedtime resistance and problematic nighttime awakenings, and result in insufficient sleep duration. These sleep disturbances have been associated with a range of adverse outcomes, including attention disorders, internalizing and externalizing behaviors, and academic difficulties.[4,5]

A bedtime routine is defined as a predictable set of presleep tasks intended to cue a child to transition from wakefulness to sleep, typically including a mix of physical preparations (eg, putting on pajamas) and calming activities (eg, reading a story). The use of a consistent bedtime routine has been associated with fewer problematic sleep behaviors in young children, including decreased bedtime resistance and night wakings[3,6-10] and has long been recommended as a means to promote healthful sleep.[11]

In addition to having a bedtime routine, there is evidence to suggest that the composition of bedtime routines is important. In particular, reading at bedtime has been associated with positive sleep behaviors. One notable study of preschool-aged children revealed a positive association between use of language-based bedtime routines (eg, reading, praying, listening to a story) at 36 months of age and both nighttime sleep duration and verbal test scores measured at 60 months of age.[12] In another study, preschoolers whose bedtime routine included reading had longer mean sleep duration.[9]

The majority of the research to date has been conducted in predominantly white, middle-class children who have a high prevalence (>90%) of having a bedtime routine.[7,13] In contrast, minority populations appear to have considerable differences in their prevalence of bedtime routines and sleep health. Two studies have reported a decreased odds of having a bedtime routine in Latino and black children, with combined prevalence ranging from 58% to 80%.[14,15] Furthermore, black and Latino preschoolers were less likely than white preschoolers to have a bedtime routine that includes reading or telling a story, even after controlling for socioeconomic factors.[14] In addition, when compared with white children, Latino

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children have been noted to have later bedtimes,[16] decreased total sleep time,[17] to be more likely to have a television in the bedroom,[18] and to share a bed/bedroom with a parent.[14] Latino children have also been found to have less slow-wave sleep and more stage 2 sleep than white children,[19] which may suggest poorer sleep quality. Given these disparities, it is important to gain a better understanding of the impact of bedtime routines on sleep behavior in this population. To our knowledge, no study has specifically examined this relationship within a predominantly Latino population.

The aim of this study was to describe the prevalence and composition of bedtime routines within a group of Latino preschool-aged children. We also wished to examine the association between these bedtime routines, specifically reading at bedtime, and nighttime sleep duration, delayed sleep onset, bedtime resistance, and night wakings. We hypothesized that more frequent reading at bedtime would be associated with longer nighttime sleep duration and more healthful sleep behaviors. With this information we hope to help guide clinical and public health interventions aimed at improving the sleep health of the young Latino population.

Methods

Participants

A convenience sample of self-identifying Latino caregivers of a 4-year-old child were recruited from the waiting room of a community pediatric clinic in northern San Diego County and asked to complete a series of questionnaires. Informed consent was obtained by a bilingual member of the research team. Materials were available in both English and Spanish, and participants were offered a choice to have the questions read aloud, if desired. All questionnaires were translated into Spanish, with independent back-translation to verify accuracy. Participants who reported diagnoses of a primary (nonbehavioral) sleep disorder (eg, obstructive sleep apnea) or developmental delay, or use of prescription medication to aid sleep were excluded from the study. A $10 gift card was offered to all participants as remuneration for their time and effort. Questionnaires were collected from 67 participants. Two participants were excluded due to incomplete questionnaires and 3 were excluded due to the child's birthdate not corresponding with the age stated by the caregiver. The number of participants included in the final analyses was 62. This study was approved by the institutional review board of the University of California San Diego.

Measures

Bedtime Routine. Nightly bedtime routines were characterized using the Bedtime Routine Questionnaire (BRQ), a parent-report measure of bedtime routine consistency and composition. The BRQ has been previously validated using a heterogeneous community sample of children between the ages of 2 and 8 years.[20] It consists of 10 items that assess the consistency of the child's bedtime routines. A total Routine Consistency subscale is calculated by summing questions regarding consistency of activity type, order, place, time, and caregiver. Consistency subscores range from 10 to 50, with higher scores suggesting greater consistency. The BRQ also measures the frequency of 16 common prebed activities (including reading), which are scored on a 5-point Likert-type scale ranging from 1 = "almost never" to 5 = "nearly always." Bedtime reading frequency was assessed by asking, "In the past month, in the hour before going to bed, how often did your child read/listen to a story?"

Sleep Behaviors. Participants also completed the Child Sleep Habits Questionnaire (CSHQ).[21] The CSHQ is a parent-report sleep-screening instrument that consists of 33 items related to common child sleep behaviors. Parents are asked to recall sleep behaviors occurring over a "typical" recent week. The CSHQ includes several subscales, including Bedtime Resistance, Sleep Onset Delay, and Nighttime Waking. Items are rated on a three-point scale: "usually" if the sleep behavior occurred 5 to 7 times/week; "sometimes" for 2 to 4 times/week; and "rarely" for 0 to 1 time/week. Higher scores are associated with more problematic sleep behaviors. The CSHQ was originally designed for children aged 4 to 10 years, and has been subsequently validated in toddlers and preschool-aged children.[22]

Sleep Environment and Demographics. Participants also reported on several other sleep variables, including usual bedtime, sleep onset time and morning wake time, daytime napping duration, sleep location, bed and room sharing, and presence of electronic devices in the bedroom. Basic demographic information including maternal age, primary language use at home and with friends (English or Spanish), education level, and marital status were also reported.

Data Analysis

Statistical analyses were performed using SPSS version 21 (IBM Corp, Armonk, NY). Bivariate analyses relating BRQ Reading score, Routine Consistency, and other

covariates to total nighttime sleep duration, CSHQ Bedtime Resistance, Sleep Onset Delay and Nighttime Waking subscales were performed using Pearson correlations (for continuous predictors) and independent-sample *t* tests (for binary predictors). An adjusted analysis including only those variables whose main unadjusted effects were significant (at $P < .2$ level) was performed using multivariable linear regression with backward selection, including examining for any potential interactions between predictor variables.

Results

The sample descriptive statistics are presented in Table 1. Mean child age was 53 months and 56% were female. Mothers comprised 95% of respondents, were predominantly married or living as married (79%) and had a high school education or less (81%). The majority (77%) reported using exclusively Spanish as their primary language. A regular daily nap was reported by 45%, and 36% coslept with a parent. Average child bedtime was 8:47 PM (SD 0:50) and average nighttime sleep duration was 10.2 hours. Only 3.2% reported that their child had a problem with sleep. However, 29% reported nighttime waking, and 42% reported taking 20 minutes or more to fall asleep. Additionally, 13.2% had a total CSHQ score above the threshold previously reported to predict problematic sleep.[21]

With regard to bedtime routines, 48% scored above the validation sample mean for Routine Consistency on the BRQ. Figure 1 presents the frequency of specific bedtime routine activities, defined as a response of "Often" or "Always." Hygiene-related bedtime routines were most common (brush teeth, 94%; use toilet, 87%; shower/bath, 77%), as well as largely nonverbal interactive activities with caregiver (hugging/kissing caregiver, 90%; putting on pajamas, 86%; saying goodnight to family, 77%). Reading at bedtime was reported frequently in only 42%. The average BRQ Reading subscore was 3.2, which corresponds with a frequency response of "Half of the time."

In unadjusted bivariate analyses (Table 2), a higher BRQ Reading score was significantly associated with a lower CSHQ Bedtime Resistance score and longer nighttime sleep duration, but was not associated with Sleep Onset Delay or Nighttime Waking scores. A higher BRQ Reading score was also significantly associated with female sex, maternal education beyond high school, and a higher BRQ Consistency score. An association between a higher BRQ Consistency score and a lower nighttime waking score approached significance, but BRQ Consistency was otherwise not significantly associated with other outcome measures. Cosleeping was

Table 1. Descriptive Statistics.

	All Participants (n = 62)
Age of child, months, mean (SD)	52.8 (5.2)
Sex of child, female, n (%)	35 (56.5)
Takes a regular daytime nap, n (%)	28 (45.2)
Bedtime, h:mm, mean (SD)	8:47 (0:50)
Nighttime sleep duration, hours, mean (SD)	10.2 (1.0)
Cosleeps with parent, n (%)	22 (35.5)
No. of people sleeping in the same bedroom, mean (SD)	3.2 (1.1)
No. of devices in bedroom, mean (SD)[a]	1.9 (1.3)
Parents married/living as married, n (%)	49 (79.0)
Maternal education, high school or less, n (%)	50 (80.6)
Primary language, Spanish, n (%)	48 (77.4)
Wakes ≥1 time per night, n (%)	18 (29.0)
Takes ≥20 minutes to fall asleep, n (%)	26 (41.9)
BRQ Consistency subscore, mean (SD)	39.5 (7.6)
BRQ Consistency subscore ≥39.5, n (%)	30 (48.4)
BRQ Reading subscore, mean (SD)	3.2 (1.3)
CHSQ Bedtime Resistance subscore, mean (SD)	10.2 (2.9)
CHSQ Sleep Onset Delay subscore, mean (SD)	1.5 (0.7)
CHSQ Nighttime Waking subscore, mean (SD)	3.9 (1.0)
CHSQ Total score, mean (SD)	46.0 (7.4)

Abbreviations: BRQ, Bedtime Routines Questionnaire (Consistency subscore ranges from 10 to 50, Reading subscore ranges from 1 to 5; higher scores associated with higher consistency); CHSQ, Child Sleep Habits Questionnaire (Bedtime Resistance range 6-18, Sleep Onset Delay range 1-3, Nighttime Waking range 3-9, Total score range 33-99; higher scores associated with more problematic sleep behaviors).
[a]Devices queried were TV, computer, videogame console, iPod/music player, smartphone, and/or "other."

strongly associated with a higher Bedtime Resistance score, and approached significance with higher sleep onset delay and nighttime waking scores. A higher number of bedroom devices was also significantly associated with a higher bedtime resistance score. There were no significant associations between key outcome variables and child age, bedtime, caregiver marital status, daily napping, or total number sharing a bedroom.

In final adjusted multivariable linear regression analyses (Table 3), a higher BRQ Reading score remained significantly associated with longer total nighttime sleep ($P < .01$) after controlling for daytime napping and cosleeping, corresponding to 16 minutes longer sleep per night. BRQ Reading score was not significantly
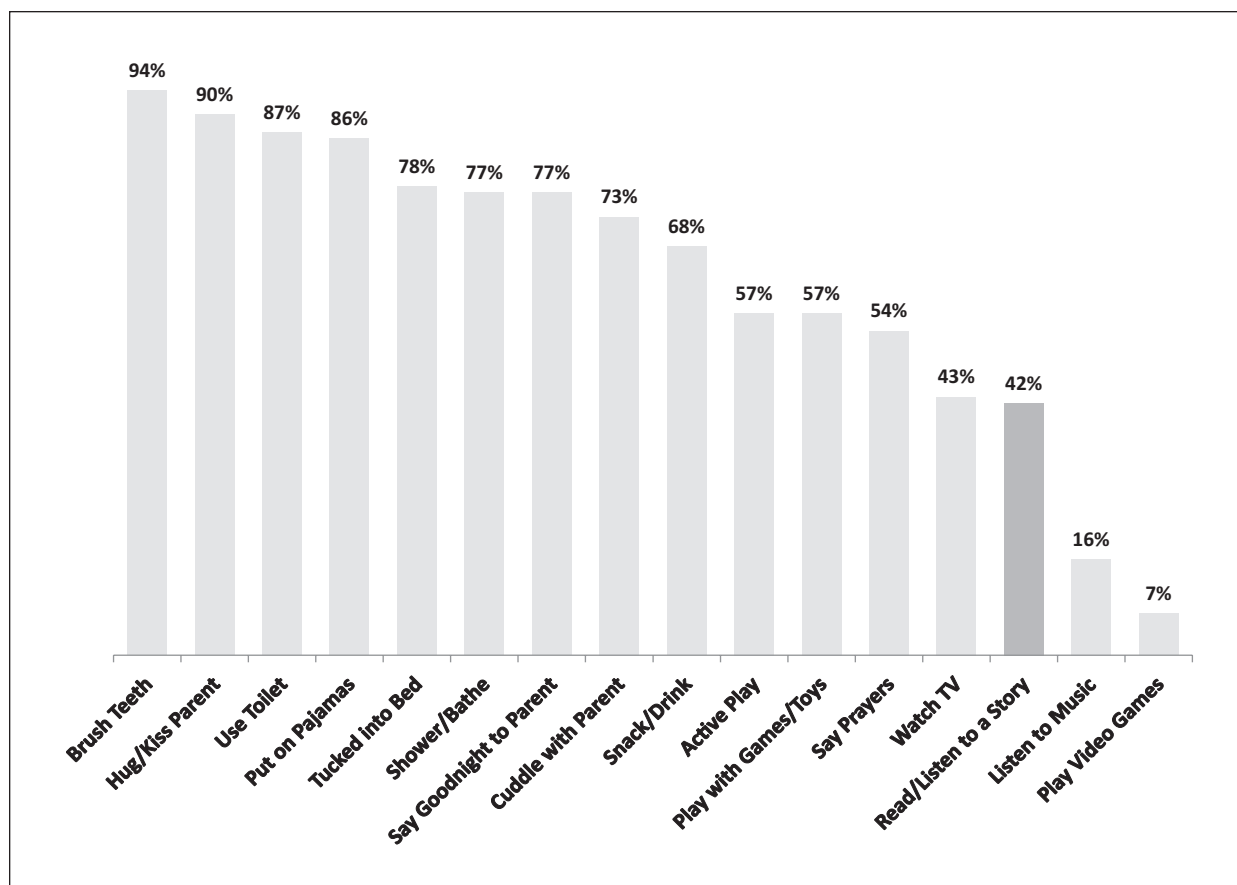
Figure 1. Prevalence of specific bedtime routine responses on the Bedtime Routines Questionnaire. Percentages represent the proportion of respondents who answered "Often" or "Always" when asked "In the past *month*, in the hour *before* going to bed, how often did your child . . ." with respect to each specific activity.

Table 2. Bivariate Analyses Relating Reading at Bedtime and Other Covariates to Total Nighttime Sleep, Bedtime Resistance, Sleep-Onset Delay, and Night Waking (n = 62).

	BRQ Reading Subscore	Total Nighttime Sleep, h	CHSQ Bedtime Resistance Subscore	CHSQ Sleep Onset Delay Subscore	CHSQ Night Waking Subscore
	Pearson correlation coefficients				
BRQ Reading subscore	—	0.28*	−0.31*	−0.14	−0.17
BRQ Consistency subscore, total	0.34**	0.17	−0.15	−0.20	−0.23[†]
Age, months	0.16	0.09	−0.08	0.12	−0.15
Bedtime	−0.18	−0.20	0.18	0.13	−0.003
Total number of people sleeping in the same bedroom	−0.22[†]	−0.05	0.25[†]	−0.01	−0.14
No. of devices in bedroom	−0.16	−0.15	0.34**	0.04	0.14
	t scores for equality of means between groups				
Sex, female	3.13**	0.93	−1.09	−0.13	−0.45
Takes a regular daytime nap	1.50	−1.73[†]	−0.93	0.96	−0.75
Cosleeps with parent	−1.20	0.58	5.10***	1.78[†]	1.37[†]
Parents married/living as married	0.69	−0.64	0.12	−0.45	0.32
Maternal education, high school or less	−2.61*	−0.29	1.24	−1.49	0.44

Abbreviations: BRQ, Bedtime Routines Questionnaire; CHSQ, Child Sleep Habits Questionnaire.
[†]$P < .1$; *$P \le .05$; **$P \le .01$; ***$P \le .001$.

Table 3. Linear Regression Models Relating Reading at Bedtime and Other Covariates to Total Nighttime Sleep, Bedtime Resistance, and Sleep Onset Delay (n = 62).[a]

	Total Nighttime Sleep, β (SE)	CHSQ Bedtime Resistance Subscore, β (SE)	CHSQ Sleep Onset Delay Subscore, β (SE)
BRQ Reading subscore	0.35 (0.10)**	–0.13 (0.24)	–0.19 (0.07)
Takes a regular daytime nap	–0.28 (0.25)*	—	—
Cosleeps with parent	0.10 (0.26)	0.51 (0.66)***	0.20 (0.18)
Bedtime	—	0.22 (0.37)*	—
No. of devices in bedroom	—	0.23 (0.23)*	—
Maternal education, high school or less	—	—	–0.25 (0.23)[†]
R^2	0.17	0.44	0.12
F	3.75*	10.64***	2.45[†]

Abbreviations: BRQ, Bedtime Routines Questionnaire (higher scores associated with higher consistency); CHSQ, Child Sleep Habits Questionnaire (higher scores associated with more problematic sleep behaviors).
[a]Empty cells indicate variables not included in final regression model following backward selection, $P > 0.2$.
[†]$P < .1$; *$P \leq .05$; **$P \leq .01$; ***$P \leq .001$.

associated with Bedtime Resistance or other outcomes after adjustment. Cosleeping remained strongly associated with a higher CSHQ Bedtime Resistance score after adjusting for other variables. Later bedtime and greater number of bedroom devices were also significantly associated with higher Bedtime Resistance scores. There were no significant associations with CSHQ Sleep Onset Delay or Nighttime Waking scores.

Discussion

We examined the prevalence and composition of bedtime routines in 62 healthy preschool-age Latino children and assessed for associations between reading at bedtime and bedtime routine consistency with sleep behaviors. We found reading at bedtime to be among the least common bedtime routine activities, with only 42% reporting reading "Often" or "Always." While this appears to be consistent with the 45% of Latinos who reported having a language-based bedtime routine by Milan et al,[14] that study did not measure reading frequency, and it may be likely that even fewer were reading "Often" or "Always" with their children. We also found that reading before bedtime was significantly associated with longer nighttime sleep duration, even after controlling for key covariates. The reasons for this association are not clear, but several intriguing possibilities exist. One is that reading is associated with higher socioeconomic status and family functioning, and that these are more directly related to better sleep. Consistent with previous studies,[12,16] the current study demonstrates a positive association between maternal education and reading at bedtime; however, an association between maternal education and sleep duration was not found. Other studies have also shown the associations between

socioeconomic factors and sleep to be less direct, and suggest that environmental and cultural differences play a larger role in sleep outcomes than socioeconomic status alone.[14,23,24]

Another possible explanation is that it is bedtime routine consistency, rather than composition, that matters. However, the negative association of several maladaptive bedtime routine activities (eg, TV watching) and poor sleep behaviors is well documented, and suggests that not all bedtime activities are equal. It is also notable that in the current study the positive association of reading and sleep duration was independent of overall bedtime routine consistency, which supports the notion that there may be an intrinsic benefit to reading over other bedtime activities. A recent study in adults documented measurable functional magnetic resonance imaging changes in brain connectivity patterns in participants given a specific reading task the night before, and that some of these connectivity changes persisted for several days.[25] Other studies have also linked reading and listening to a story to changes in brain activity at rest.[26,27] Thus, it is plausible that these or other alterations in neural connectivity brought about by reading contribute to longer, more organized sleep patterns in a way that is not yet fully understood.

While reading at bedtime was negatively associated with bedtime resistance in unadjusted analysis, it did not remain so in the multivariable model. Cosleeping with a parent is a well-known association with maladaptive sleep behaviors, and was found to be the most significant predictor of bedtime resistance in our sample, along with later bedtime and number of electronic devices in the bedroom. We found no significant association between reading at bedtime and sleep onset delay or nighttime wakening.

Examining other aspects of the bedtime routines found in this study, we found only 48% who scored above the validation mean for a consistent bedtime routine of any kind. This is notably less than what has been reported in white populations, and is consistent with what has been observed in studies of other minority groups. However, this finding is difficult to directly compare with previous reports of bedtime routine prevalence, as most other studies have only asked about bedtime routines generally, without the added dimensions of order, time, place, and caregiver consistency. In terms of composition, hygiene-related and nonverbal interactive activities with caregiver were most common, similar to what has been found in previous studies of minority populations in general.[14]

With regard to the child's sleep behaviors, there were several differences as compared with traditionally white samples. When compared with the findings of the 2004 National Sleep Foundation survey (whose respondents were 90% white), the average bedtime in the current study was nearly identical (8:47 PM vs 8:50 PM); however, the mean total nighttime sleep duration was 10.2 hours in our sample versus 9.6 hours in the national survey.[13] The percentage of those reporting a regular nap was higher in the current study (45% vs 26%), as was the percentage of cosleeping (36% vs 11%) and room sharing (95% vs 26%).

Another notable finding is that only 3.2% of our sample reported that their child had a problem with sleep while other studies of Latino children have reported a prevalence of 22%.[28] However, while the percentage of our sample directly endorsing a sleep problem in their child was quite small, a larger proportion (13.2%) had a total CSHQ score above the threshold previously reported to predict problematic sleep.[21] Additionally, 29% reported frequent nighttime waking, and 42% reported usually taking 20 minutes or more to fall asleep. Taken together, this may suggest a tendency to underreport sleep problems in this sample. Alternatively, parents may not recognize that their child's sleep is inadequate or suboptimal. This explanation is supported by a previous study of a heterogeneous primary care sample which found generally poor parental understanding of what constitutes healthy sleep.[15] Overall, this highlights the need to promote greater education and awareness of healthy childhood sleep among parents and caregivers.

This study has several limitations. As with most studies of sleep behavior, this study relied solely on parent report, and thus is subject to reporting bias. However, the use of standardized well-validated questionnaires, particularly the BRQ, allowed for more standardized and comprehensive data collection, including several variables not assessed in prior studies. While the focus of this study on low socioeconomic status Latino preschoolers may limit external validity, internal validity and applicability of results to a common demographic within the United States were maximized. Also, the small sample size may have contributed to the absence of a significant association between reading and other bedtime routine characteristics and bedtime resistance, sleep onset and nighttime waking, limiting the certainty of these as true negative findings. Larger studies of Latino samples should be conducted to further investigate these associations.

In summary, we found that the prevalence of reading at bedtime and bedtime routine use in general to be much smaller than what has been reported in white children. We also found that reading before bedtime was significantly associated with longer nighttime sleep duration, independent of other key covariates. Furthermore, longer nighttime sleep duration was not explained by bedtime routine consistency alone, suggesting a potential intrinsic benefit of reading on longer sleep duration. Further research should aim to better understand the relationships between bedtime reading and sleep through prospective and interventional trials. The use of objective sleep measures (eg, actigraphy) should also be utilized to minimize the measurement bias from parent-reported sleep time. These results add to the well-established benefits of reading on language and social development, and suggest that parents should also be encouraged to include reading as part of a consistent bedtime routine.

Author Contributions

Declaration of Conflicting Interests

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