Impact of Snack and Beverage Intake on Preschoolers' Sleep

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Abstract

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Behavioral sleep problems are common in children aged 2-5, yet little sleep research has been conducted on this population. It also remains unclear how food and beverage consumption contribute to sleep problems. The objective of this study was to understand how evening snack and beverage intake impact sleep quality in preschool-aged children. Four hundred twenty-three children (mean age = 44.5 months) participated in this study. Children wore actigraphy watches for the 7-day data collection period. Actigraphy data were used to calculate sleep onset latency (SOL) and percent wake after sleep onset (%WASO), the sleep outcomes for the study. Self-report diaries were completed by participants' parents during the same 7-day period to document what children ate and drank after dinner. Snacks were consumed on 36.2% of total nights, and 80.4% of children consumed a snack on at least one night of data collection. Sweets were consumed by 56.5% of the children who had a snack, followed by fruit (40.4%), grains (29.8%), and dairy (27.0%). Water was consumed by 94.1% of children at least once, followed by milk (43.3%) and juice (12.3%). A fixed effects regression analysis showed that consuming a beverage was significantly associated with 0.778% less waking in children during the subsequent night (95% CI: -1.320 to -0.235, $p < 0.05$), or about 4.5 minutes per night.

Consuming water was also associated with 0.679% less waking (95% CI: -1.267 to -0.092, $p < 0.05$), or about 4.0 minutes. This study adds to the research on consumption patterns of preschool-aged children and offers evidence that consuming water before bed may benefit children experiencing behavioral sleep problems.

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Sleep is considered a significant determinant of healthy child and adolescent development (Beebe, 2011; Gregory & O'Connor, 2002). Evidence-based guidelines recommend around 12-14 hours of nightly sleep for children aged 1-3, and 11-12 hours for children aged 3-5 (Galland & Mitchell, 2010). Time spent asleep, as well as sleep quality, have been associated with changes in weight and BMI (Seegers et al., 2011; Taveras et al., 2014), academic performance (Fallone, Acebo, Seifer, & Carskadon, 2005), early cognitive development, and mood regulation (Baum et al., 2014; Beebe, 2011; Sadeh, Gruber, & Raviv, 2002). Parents often report behavioral sleep problems in children under age 5, particularly as children develop circadian sleep-wake rhythms (Moore, 2012). While these problems are prevalent in up to 40% of children (Galland & Mitchell, 2010), proper sleep hygiene has been shown to mitigate dysregulated sleep behaviors. Implementing regular bedtimes, limiting nighttime media use, and avoiding caffeine throughout the day are some examples of recommended practices (Galland & Mitchell, 2010).

Sleep Duration and Food Intake

Previous research has largely focused on the impacts of dysregulated sleep behaviors on food intake and obesity. Specifically, sleep restriction in lab-controlled studies among adults has been associated with decreases in leptin, a naturally occurring hormone that regulates the body's energy and inhibits hunger (Spiegel et al., 2004). Chronic sleep deprivation is also associated with increased caloric intake and higher risk for obesity in children and adults, possibly due to changes in hormone levels (Cappuccio et al., 2008). Other research suggests that increased caloric intake is a physiological adaptation to insufficient sleep, in order to compensate for depleted energy levels (Beebe et al., 2013); decreased leptin levels may also trigger overeating because the body does not experience satiety (Chaput, 2014; Markwald et al., 2013). Alternatively, insufficient sleep may increase one's susceptibility to stimulate the brain's reward centers, driving people to eat more calorie-dense foods (Hogenkamp et al., 2013).

More recent evidence has emerged that young adults and children exhibit similar patterns to adults. Among adolescents aged 14-16, Beebe and colleagues (2013) found that chronic sleep deprivation in a randomized intervention led to food choices with a higher glycemic index, sweets in particular. Another study showed that adolescents sleeping less than 8 hours, according to actigraphy watches, consumed a higher proportion of calories from fat but fewer calories from carbohydrates (Weiss, 2010). Likewise, younger children (8-11 years) with increased sleep duration reported lower food intake and lower weight based on 24-hour dietary recalls (Hart, 2013).

Sleep Timing and Food Intake

While most studies measure the impact of sleep duration, sleep timing has also been linked to changes in dietary behaviors. An analysis of wrist-worn actigraphy data showed that adults with later bedtimes had longer sleep onset, shorter sleep duration, and consumed more calories in the evening (Baron et al., 2011). In early childhood, later bedtimes have been independently associated with shorter sleep duration and obesity rates (Miller et al., 2014; Scharf & DeBoer, 2015). Another cross-sectional study in children and adolescents found that later bedtimes correlated with higher intake of energy-dense foods with poor nutritional quality (Golley et al., 2013). However, more research is needed to understand how bedtimes and mealtimes predict one another. Snacking outside of mealtimes is increasingly more common in children and is perhaps a contribute to higher rates of childhood obesity (Larson & Story, 2013), but impacts on sleep have not been explored.

These studies have begun to explore the relationship between sleep duration and timing, food intake, and physical outcomes like BMI. However, few studies have examined how different types of food and beverage predict sleep quality. One study explored possible interactions between sugar and starch intake, sleep duration, and BMI in children aged 2-9 (Hunsberger et al., 2015). There was evidence that higher sugar intake during midday was associated with shorter sleep duration, but this was not significant after adjusting for baseline

BMI. Most existing research also focuses on young adults and older children, but there is little evidence for children under 5 years of age. Given that early childhood sleep factors may have significant impacts on adolescent and adult health outcomes, including obesity (Miller, Lumeng, & LeBourgeois, 2015) and neurological functioning (Turnbull, Reid, & Morton, 2013), early interventions to improve sleep factors should be considered. More research on sleep and consumption behaviors in young children is therefore needed to provide more robust recommendations to parents and caregivers.

The objective of this study is to better understand how evening food and beverage intake impact sleep quality in preschool-aged children. Sleep quality was measured with wrist-worn actigraphy watches, while evening food and beverage intake data came from self-report diaries completed by the child's parents. These findings could inform recommendations to parents and teachers to provide the best opportunities for children to reach their academic, socioemotional, and physical potential. See Figure 1 for a conceptual model summarizing the study components. Specific aims of this study were as follows:

1. Examine the relationship between evening snack and participants' sleep onset latency and sleep efficiency, measured as percent wake after onset (%WASO).
2. Examine the relationship between evening beverage intake and participants' sleep onset latency and sleep efficiency, measured as percent wake after onset (%WASO).

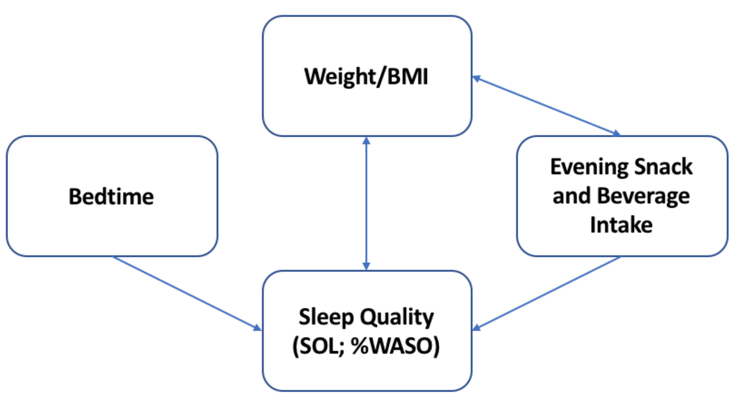

Figure 1. Model describing the relationship between child's weight/BMI, bedtime, evening snack and beverage, sleep quality.

Methods

Study Setting and Population

Children in this study were part of an ongoing, longitudinal project called the Sleep Health in Preschoolers (SHIP) study, led by the Seattle Children's Research Institute. SHIP participants were randomized to control and intervention groups to test the impact of a sleep intervention for parents with children exhibiting behavioral sleep problems. This paper uses actigraphy, survey, and diary data that were collected at baseline for both groups. Because participants had not yet received the intervention at baseline, data from both study groups were used in this study. These baseline data were collected between 2014 and 2017, while the larger SHIP study is ongoing as of 2018.

Participants were recruited from the community using flyers and advertisements in community centers, child care programs and preschools, primary care clinics, WIC program offices, churches, local free parenting magazines, as well as online postings by Seattle Children's on Facebook and Twitter, and in local parenting groups online. Researchers also used demographic data to achieve a sample that was representative of Seattle in terms of age, race, and socioeconomic status. However, parents who did not speak or read English were excluded because the validated instruments used for data collection were not available in other languages. Parents who were interested in enrolling their children in the study contacted SHIP staff to complete the Child Sleep Habits Questionnaire (CSHQ) to determine eligibility. This questionnaire, for which parents recall their child's sleep habits from a typical week, helps identify both behavioral and medical sleep problems in school-aged children (Owens, Spirito, & McGuinn, 2000). Children whose parents completed the CSHQ were included in the study if they screened positive for behavioral sleep problems. They were excluded if they screened positive for untreated sleep-disordered breathing, since the behavioral intervention would not address this condition. Children with co-occurring conditions such as diabetes, cancer, and

ADHD, or who had developmental disabilities such as autism, were also excluded from the study because of these conditions' potential impact on sleep behaviors.

Data Collection

Sleep outcomes. Sleep data were collected using wrist-worn AW-2 actigraphy watches, which record sleep activity in minute-long epochs. Watches were worn for 7 consecutive days and attached to the child's non-dominant wrist, per the instructions provided by study staff. Parents manually recorded bedtimes and wake times using event markers on the watches, and they were directed to record any period when the watch was removed.

Evening snack and beverage intake. Evening snack and beverage intake data were collected using self-report diaries completed by the child's parent or guardian over the same 7 days as actigraphy data collection. Parents were asked to check a box for each beverage the child consumed at several points throughout the day, including after dinner. Beverage options included water, milk, juice/fruit drink, non-caffeinated soda/sports drink, caffeinated soda/sports drink, diet non-caffeinated soda/sports drink, and diet caffeinated soda/sports drink; there was no option to write in other beverages. For evening snack, parents were instructed to write descriptions of any food the child consumed after dinner. One diary entry was recorded for each of the 7 days of actigraphy data collection. The diaries also included questions assessing bedtime, media use, the child's emotions, and any other external events that might affect that night's sleep.

Data Processing and Coding

Dependent variables: Sleep outcomes. Sleep variables were created from actigraphy data using 1-minute epochs. Each minute epoch was coded "S" for sleep or "W" for wake, based on watch-detected movement. Sleep onset was defined as the first minute of the first 10-minute period with consistent sleep epochs; sleep offset was defined as the first minute of the first 10-minute period with consistent wake epochs. Sleep onset latency (SOL) was calculated by finding the difference between parent-reported bedtime and sleep onset. Total time in bed was the time between the first sleep onset and permanent sleep offset in the morning. Finally, percent wake after sleep onset (%WASO) was calculated using the percentage of wake epochs, based on total time in bed.

Independent variables: Evening snack and beverage intake. Snack data were grouped into one of eight food categories (e.g. fruit, vegetable, dairy, sweets) and then assigned a code within that category to indicate different food items. These categories were based on a previous study that examined food's effects on sleep in adolescents (Beebe, 2013). Specificity of these data varied significantly because snacks were recorded in open-ended text boxes, and we could not estimate nutritional value or serving size. In cases where details were limited (e.g. "yogurt"), snacks were assigned a code that best fit the consumption patterns for participants (e.g. 4012 – "yogurt, flavored"). Entries that contained more than one food item (e.g. "peanut butter and jelly sandwich") were assigned multiple codes, one for each item (e.g. "peanut butter," "jelly," "bread"). Please see Appendix A for a list of all snack codes and descriptions.

Beverages were also classified into the seven categories listed on the diaries: water, milk, juice/fruit drink, non-caffeinated soda/sports drink, caffeinated soda/sports drink, diet non-caffeinated soda/sports drink, and diet caffeinated soda/sports drink. Each snack category and beverage category was coded as a separate dummy variable in the analysis, since children often consumed more than one snack or beverage per night. Additional dummy variables were created to indicate whether or not participants consumed any snack or beverage.

During analysis, several variables were combined or omitted depending on their characteristics. For instance, the grains and processed snacks categories were combined into one variable (*grains_or_processed*) since the snacks within each category contained similar nutritional qualities. Dairy and protein categories were also combined (*protein_or_dairy*) because of their nutritional similarities. Two snack categories (vegetable and fast food) and four beverage categories (diet non-caffeinated soda, non-caffeinated soda, diet caffeinated soda, and caffeinated soda) were omitted due to low consumption among participants; this also helped to preserve statistical power during analysis.

Time-varying covariates. To account for potential within-participant confounding, several time-varying covariate variables were defined prior to analysis. First, actigraphy-reported bedtimes were re-coded as decimals in order to ease calculation of outcome variables, especially for instances when children went to bed after midnight (e.g. 1:00 am was re-coded as 25.0). Second, whether or not each study day was a weekend was modeled as a dummy variable (i.e. 1 representing a weekend if true and 0 representing otherwise), since bedtimes may vary by day of the week. Forty-five participants had more than or fewer than 2 weekend days during the 7-day data collection period if actigraphy days were not consecutive.

Analysis

All analyses were conducted using the statistical software Stata version 14.2. We used fixed effects regression models to compare children to themselves over the 7-day study period to determine whether evening snacks and beverages were associated with 1) sleep onset latency and 2) %WASO. Specifically, we first modeled whether having a snack versus not having a snack was associated with these sleep outcomes. Second, we modeled whether distinct snack and beverage categories were associated with the same sleep outcomes. All models controlled for the time-varying covariates, bedtime and weekday/weekend, as described above.

Results

Descriptive Statistics

Demographics. Four hundred twenty-three participants were included in the analysis for this study. There were 436 participants that provided sleep data, but 13 participants were excluded from analysis because they did not submit snack diaries. With each participant reporting on 7 nights, there were 2,961 total nights of data. Our sample was 46.3% female with a mean age of 44.5 months (SD = 10.3). Participants were 88.3% White, 15.5% Asian, 9.3%

Hispanic or Latino, 3.8% Black or African American, 2.6% American Indian or Alaska Native, and 1.7% Pacific Islander or Native Hawaiian; 2.6% of participants did not provide their race or ethnicity (see Table 1).

Table 1: Characteristics of Study Participants (N=423)

Race/Ethnicity (%) -- not mutually exclusive	
American Indian or Alaska Native	2.6
Asian	15.5
Black or African American	3.8
Hispanic or Latino	9.3
Pacific Islander or Native Hawaiian	1.7
White	88.3
Prefer not to answer or Missing	2.6
Sex (% female)	46.3
Age (mean months) (SD)	44.5 (10.3)
Shares bedroom (% yes)	50.4

[1]Due to a multiple response format, totals for race categories exceed 100%.

Sleep. The average actigraphy-reported child bedtime was 8:28 p.m. (SD = 0:59), with a median bedtime of 8:21 p.m. (IQR = 19:50 - 21:00). For sleep outcomes, average sleep onset latency was 44.6 minutes (SD = 40.8), and median sleep onset latency was 35.0 minutes (IQR = 17.0 - 61.0). Average percent wake after sleep onset (%WASO) was 15.5% (SD = 7.0), and median %WASO was 14.5 (IQR = 11.0 - 18.4). See Table 2 for a summary of sleep characteristics.

Table 2. Sleep Characteristics of Study Participants (N = 423)

	Mean (SD)	**Median (IQR)**
Child Bedtime (hr:min)	20:28 (0:59)	20:21 (19:50 - 21:00)
Total Sleep Time (hrs)	9.7 (1.3)	9.8 (9.1 - 10.5)
Sleep Outcomes		
Sleep onset latency (min)	44.6 (40.8)	35.0 (17.0 - 61.0)
Wake after sleep onset (%)	15.5 (7.0)	14.5 (11.0 - 18.4)

Evening snack and beverage intake. Of the 2,961 total nights for participants, snacks were consumed on 1,072 nights (36.2%), and 80.4% of participants had a snack at least once during the data collection period. Snacks in the sweets category were most common (see Table

3); 56.5% of participants that had a snack consumed sweets at least once during the 7-day data collection period. Other frequently consumed categories included fruit (40.4%), grains (29.8%), dairy (27.0%), and processed snacks (19.4%). Water was the most commonly consumed beverage after dinner (94.1%), followed by milk (43.3%) and juice (12.3%).

Table 3: Evening Snack and Beverage Intake Characteristics

	Children (% ever consumed), N = 423 participants	**Nights (% consumed), N = 1,072 snack nights**
Snack Categories		
Fruit	40.4	28.4
Vegetable	5.4	2.9
Protein	12.1	7.1
Dairy	27.0	20.1
Grains	29.8	18.8
Sweets	56.5	45.2
Processed Snack	19.4	11.3
Fast Food	3.5	1.4
No Snack	19.6	63.8
	Children (% ever consumed), N = 423 participants	**Nights (% consumed), N = 2,961 total nights**
Beverage Categories		
Water	94.1	62.4
Milk	43.3	19.8
Juice/Fruit Drink	12.3	3.2
Non-caffeinated soda/sports drink	2.6	0.5
Caffeinated soda/sports drink	0.5	0.1
Diet non-caffeinated soda/sports drink	0.7	0.1
Diet caffeinated soda/sports drink	0	0

Is Consuming Any Snack or Beverage Associated with Sleep?

Sleep onset latency. First, we examined whether consuming any snack or beverage (versus none) was associated with sleep outcomes for that evening. There was no significant relationship between having a snack or beverage (compared to none) and sleep onset latency (see Table 4).

Wake after sleep onset (%WASO). When examining the relationship between snack and beverage intake and %WASO, we found that consuming a beverage was associated with 0.778% of less waking time during the night (95% CI: -1.320 to -0.235, *p*-value < 0.05). On average, this percentage would equate to about 4.5 minutes of less waking (95% CI: 1.368 to 7.682), based on the mean total sleep time (see Table 2). There was no significant relationship between consuming a snack and %WASO.

Is Snack or Beverage Category Associated with Sleep?

Sleep onset latency. Next, we tested whether different snack and beverage categories were associated with sleep outcomes. There was no significant relationship between snack or beverage categories for sleep onset latency (see Table 5).

Wake after sleep onset (%WASO). For %WASO, consuming water after dinner was associated with 0.679% less nighttime waking in participants (95% CI: -1.267 to -0.092, *p*-value < 0.05), or on average about 4.0 minutes (95% CI: 0.535 to 7.374) of less waking. There were no other significant associations with %WASO for other beverage or snack categories.

Table 4. Analysis by Consuming Snack or Beverage

	Coefficient (95% CI)	***p*-value**
Sleep Onset Latency		
Snack Consumption	-0.031 (-0.087 to 0.026)	0.292
Beverage Consumption	-0.018 (-0.078 to 0.041)	0.550
Percent Wake After Sleep Onset (%WASO)		
Snack Consumption	0.001 (-0.517 to 0.519)	0.997

Beverage Consumption	-0.778 (-1.320 to -0.235)	0.005

Table 5. Analysis by Snack and Beverage Category

	Coefficient (95% CI)	***p*-value**
Sleep Onset Latency		
Fruit	-0.007 (-0.088 to 0.075)	0.875
Sweets	-0.050 (-0.118 to 0.019)	0.154
Grains/Processed Snack	0.030 (-0.056 to 0.115)	0.499
Protein/Dairy	-0.053 (-0.146 to 0.040)	0.266
Water	-0.025 (-0.089 to 0.039)	0.448
Milk	-0.056 (-0.145 to 0.033)	0.217
Juice	0.086 (-0.071 to 0.242)	0.284
Percent Wake After Sleep Onset (%WASO)		
Fruit	0.082 (-0.666 to 0.829)	0.831
Sweets	-0.136 (-0.758 to 0.486)	0.669
Grains/Processed Snack	-0.510 (-1.292 to 0.272)	0.201
Protein/Dairy	0.691 (-0.159 to 1.541)	0.111
Water	-0.679 (-1.267 to -0.092)	0.023
Milk	-0.440 (-1.259 to 0.379)	0.292
Juice	0.977 (-0.453 to 2.407)	0.181

Discussion

Adequate sleep is a critical component in a child's cognitive and emotional development (Beebe, 2011; Turnbull, Reid, & Morton, 2013). While sleep problems are relatively common in young children, modifying certain pre-bedtime behaviors could alleviate dysregulated sleep. This study aimed to understand how evening snack and beverage intake affect sleep quality in preschool-aged children. In particular, we considered how the type of snack and beverage would impact length of time to fall asleep (sleep onset latency) and the amount of waking during the night (%WASO) among 423 children aged 30 to 71 months.

Evening Snack and Beverage Intake

Using coded snack diary entries, we found that the majority of children consumed an evening snack at least once during the 7-day data collection period. However, parents only reported snacks for about one third of total nights. Children most frequently consumed sweets (e.g. candy, cookies, cake) and some type of fruit after dinner. These findings are consistent with recent snacking trends suggesting that desserts are the largest source of snack calories among children aged 2-6 (Piernas & Popkins, 2010). It is possible that parents in our study may have treated the post-dinner snack as a form of dessert, or perhaps as a bedtime incentive. Other common snack foods included dairy (e.g. yogurt, milk, cheese stick), grains (e.g. bread, cereal, granola bar), and processed snacks (e.g. potato chips, Goldfish, crackers).

Water was the most commonly consumed beverage; nearly all children had water after dinner at least once, followed by milk and juice. It is likely that water was paired with evening snack, at least some of the time, given its frequent consumption. Per dietary recommendations for young children, almost no children consumed soda or sports drinks with and without caffeine. Therefore, it is unlikely that caffeine contributed to sleep problems in this study.

Sleep Outcomes

Using fixed effects regression models, we found that consuming a beverage after dinner was associated with 0.778%, or on average 4.5 minutes, of less waking in individuals. In the categorical analysis, we found that consuming water was associated with 0.679%, or on average 4.0 minutes, of less waking. Given the high frequency of water consumption in our study sample, it is likely that the consumption of water is driving the association between having any beverage and %WASO. It could be that drinking water or any beverage is part of a pre-bedtime ritual to help children fall asleep, but evidence for this is tenuous since we did not find an association between having a beverage and sleep onset latency. Rather, beverage consumption before bed may alleviate children's need to ask for beverages during the night.

Further research is needed to understand this relationship, since recommending water before bed could contribute to bedwetting behaviors.

We did not find significant associations between sleep outcomes and the snack categories. This is somewhat inconsistent with previous research indicating that snacks higher in sugars and carbohydrates may contribute to worse sleep outcomes (Golley et al., 2013; Hunsberger et al., 2015). These studies compared differences between participant groups, whereas this study used fixed effects to compare participants with themselves; this difference may account for a discrepancy in findings. However, given that previous studies also examined caloric and nutritional information, our snack categories may not have been sensitive enough to capture such effects.

Strengths and Limitations

This study was one of the first to explore the relationship between evening snack, beverage consumption, and sleep quality in young children. Few studies have used such a large sample size (N = 423) across multiple nights of data, yielding 2,961 total sleep nights. Recording sleep outcomes using actigraphy watches in children's homes, rather than a laboratory setting, also captures more authentic sleep behaviors. Our study also utilized a fixed effects model with the child held constant, which allowed us to compare within participants and better control for time-varying covariates.

There were several limitations to the study as well. Because the snack and beverage data came from self-report diary entries, it is possible that parents altered their responses due to social desirability. For instance, while it was reassuring to see that almost no children consumed caffeinated beverages, parents could have omitted certain beverages due to the stigma associated with giving children caffeine. The ambiguity of the snack data also contributed to several analysis limitations. Without serving sizes and detailed descriptions of the snack's contents, it was impossible to fully determine the nutritional qualities of the snack. We also could not ascertain whether the snack was consumed immediately after dinner or just before bedtime.

Therefore, our categorical analysis could have failed to detect impacts on sleep outcomes that would have been detectable with more sophisticated data. Lastly, we combined several snack categories during analysis in order to preserve statistical power, which could have altered our results as well.

In terms of sleep data, there were several instances where children had non-consecutive data collection days. Although we controlled for whether it was a weekend or weekday, it is possible that the actigraphy-recorded days did not match the days reported in the diaries, which could confound results. Parents were also instructed to report their child's bedtime in the diaries, which was used to calculate sleep onset latency (i.e. the time between the reported bedtime and actigraphy-recorded sleep onset). Therefore, if reported bedtimes were inaccurate, this has potential impacts on the integrity of sleep outcome data. Finally, our study may have overlooked additional confounders that contribute to better or worse sleep, such as light exposure throughout the day or media use.

Conclusion and Implications

Early childhood sleep is an important factor in healthy development. Because behavioral sleep problems are so common, understanding how consumption patterns relate to sleep could inform recommendations for parents of infants and young children. This study adds to existing literature on sleep behaviors and snack and beverage intake in preschool-aged children. Fruit and sweets were the most frequently consumed snacks, while water, milk, and juice were the most consumed beverages. Snack and beverage categories were not significantly associated with sleep outcomes in our study population. However, our results indicate that consuming water or any beverage before bedtime may contribute to less waking during the night but may not impact sleep onset latency. Future studies should conduct a more in-depth analysis of the macro- and micronutrient content of evening snacks.

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APPENDIX A: Snack Codes

ID	Snack Name
0	None
10	**Fruit**
101	Fresh fruit
1011	Apple
1012	Banana
1013	Orange/clementine
1014	Pineapple
1015	Strawberry
1016	Pomegranate
1017	Grapes
1018	Plums
1019	Tomatoes
10110	Avocado
10111	Raspberries
10112	Blueberries
10113	Blackberries
10114	Pear
10115	Nectarine/peach
10116	Kiwi
10117	Mango
10118	Watermelon
10119	Cherries
10120	Cantaloupe/honeydew
10121	Fresh coconut
102	Dried fruit
1021	Raisins
1022	Dried apricot
1023	Dried mango
1024	Dried pineapple
1025	Dried cranberries, unsweetened
1026	Dried cranberries, sweetened
1027	Dried bananas
1028	Dried oranges
1029	Dates
10210	Dried apples
10211	Dried strawberries
103	Fruit puree
1031	Applesauce
1032	Mango puree
1033	Orange juice
1034	Apple juice
1035	Coconut milk

ID	Snack Name
20	**Vegetable**
201	Fresh vegetables
2011	Carrot
2012	Zucchini
2013	Sweet potato/yam
2014	Bell pepper
2015	Broccoli
2016	Beets
2017	Cucumber
2018	Pickle
2019	Mushroom
20110	Olives
20111	Peas
20112	Radish
20113	Spinach
202	Vegetable puree
2021	Tomato juice
30	**Protein**
301	Meat
3011	Sliced turkey
3012	Turkey burger
3013	Lamb chop
3014	Smoked salmon
3015	Sliced ham
3016	Bacon
3017	Pepperoni
3018	Chicken
3019	Fish
30110	Octopus
302	Eggs
303	Nuts
3031	Peanut butter
3032	Peanuts
3033	Sun butter
3034	Cashews
3035	Sunflower seeds
3036	Almonds
3037	Almond milk
3038	Pistachios
3039	Macadamia nuts
304	Protein shake
305	Legumes
3051	Hummus
3052	Soy/substitute meat
3053	Soymilk

ID	Snack Name
3054	Black beans
40	**Dairy**
401	Yogurt
4011	Yogurt, plain
4012	Yogurt, flavored
4013	Greek yogurt, plain
4014	Greek yogurt, flavored
4015	Kefir
402	Milk
4021	1% milk
4022	Whole milk
4023	Breastmilk
4024	Chocolate milk
403	Cheese
4031	Cottage cheese
4032	String cheese
4033	Cream cheese
4034	Sliced cheese
404	Butter
405	Salad dressing, dairy
50	**Grains/starch**
501	Cereal
5011	Oatmeal
5012	Cheerios
5013	Rice Krispies
5014	Bran flakes/whole grain
5015	Kix
5016	Crispix/Chex
5017	Honey Nut Cheerios
5018	Frosted cereal
502	Granola
5021	Granola bar, Z-bar
5022	Granola bar, Luna bar
5023	Granola bar, Lara bar
5024	Granola bar, misc.
503	Bread
5031	Baguette
5032	Pizza crust
5033	Sliced bread
5034	Tortilla
5035	Cornbread
5036	Biscuit

5037 English muffin

ID	Snack Name
5041	Couscous
505	Popcorn
5051	Popcorn, buttered
506	Potatoes
5061	Mashed potatoes
507	Rice
5071	Rice cake
5072	Rice milk
508	Quinoa
<u>60</u>	**<u>Sweets/desserts</u>**
601	Candy
6011	Chocolate candy
6012	M&Ms
6013	Reese's
6014	Snickers
6015	Jell-O
6016	Swedish fish/licorice
6017	Hard candy/lollipop
6018	Marshmallow
6019	Fruit gummies/gummy bears/jelly beans
60110	Skittles
60111	Starbursts
60112	KitKat Bar
602	Cookies
6021	Oreo
6022	Graham crackers
6023	Chocolate chip cookie
6024	Animal crackers
6025	Sugar cookie

5038 Pretzel bread

ID	Snack Name
6026	Meringue cookie
6027	Sugar-free cookie
603	Cake
6031	Donut/churro
6032	Muffin
6033	Pie/crisp
6034	Cupcake
6035	Banana bread
6036	Pumpkin bread
6037	Cheesecake
6038	Brownie
6039	Pancake
60310	Angel food cake
60311	Waffle
60312	Cinnamon roll
60313	Mexican sweet bread
604	Hot cocoa
605	Syrups and gels
6051	Honey
6052	Maple syrup
6053	Nutella
6054	Jelly/jam
6055	Pudding
6056	Whipped cream
6057	Hot fudge
6058	Rice pudding
6059	BBQ sauce
60510	Ketchup
606	Frozen treats
6061	Chocolate ice cream
6062	Vanilla ice cream
6063	Sherbet
6064	Popsicle
6065	Mochi ice cream

504 Pasta

ID	Snack Name
6066	Frozen yogurt
6067	Flavored ice cream, fruit
6068	Fruit popsicle
6069	Sugar-free popsicle
60610	Coconut milk ice cream
<u>70</u>	**<u>Processed snacks</u>**
701	Chips
7011	Potato chips
7012	Vegetable chips
7013	Popchips
7014	Sunchips
702	French fries
703	Crackers
7031	Goldfish
7032	Pretzels
7033	Wheat Thins
7034	Ritz crackers
7035	Pita chips
7036	Triscuits
7037	Cheez-Its
7038	Rice crackers
704	Puffed snack
7041	Cheese puffs
7042	Pirate's Booty
<u>80</u>	**<u>Fast-food entrees</u>**
801	Pizza
802	Hamburger
803	Hot dog
804	Chicken nuggets
<u>90</u>	**<u>Soda</u>**
<u>100</u>	**<u>Unknown</u>**