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An Observational Assessment of Sleep Environments in Family Child Care Homes

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Abstract:

Background. Infants, toddlers, and preschoolers meet their sleep needs with a combination of nighttime and daytime sleep. As such, the Institute of Medicine (IOM) recommends that childcare providers adopt practices that create environments to promote age-appropriate sleep habits, but there is a paucity of research in this area especially in less formal childcare setting. The objective of this exploratory pilot study was to better understand the sleep environment of children who attend Family Child Care Homes (FCCHs), the second most utilized form of childcare in the United States.
Methods. We conducted in-person observations in 22 FCCHs located within 60 miles of Providence, RI, providing care for 205 children. Using a tool developed by our team, we assessed the following aspects of the childcare sleep environment: sleep surface and items napped with, light/brightness, noise level, use of electronics, distance between children, and provider assistance.
Results. We observed children napping on a variety of sleep surfaces (cots or mats, playpens, cribs, beds, couches, floor) with a variety of items (blankets, pillows, stuffed animals, pacifiers, books, sippy cups or bottles). Providers in over half of the observed FCCHs engaged in modifying the environment for sleep (lowering the light and/or noise level of the room). In a few FCCHs, the room was not quiet and in others we observed disruptive noises. Electronics, such as televisions and tablets were also used during naptime in a few FCCHs. We also observed variation regarding the proximity to which children slept to one another, whether or not providers assisted children in falling asleep, and flexibility with regard to when and for how long children slept.
Conclusions. Sleep environments vary widely across FCCHs. As sleep is an important health behavior for children, further research is needed to understand how the childcare sleep environment influences children's sleep and other behaviors.

Key Words: childcare; family child care homes; sleep, nap; obesity

Introduction

Childhood overweight and obesity affect approximately one in four preschool-aged children in the United States, with Hispanic and Black children at greater risk (Skinner et al., 2018). Overweight and obesity, which predispose children to a myriad of negative health outcomes, have a complex etiology and are influenced by a number of lifestyle behaviors (e.g. diet, physical activity, sedentary behavior) (Hales et al., 2017; Kumar & Kelly, 2017). More recently, insufficient sleep has been identified as an additional lifestyle behavior associated with childhood obesity (Ash & Taveras, 2017; Garfield, 2019; Miller et al., 2015). Insufficient sleep may impact obesity risk via both biological (e.g. altered levels of appetite hormones) and behavioral (e.g. increased opportunities for eating and decreased physical activity due to fatigue) mechanisms

(Ash & Taveras, 2017; Miller et al., 2015). Further, insufficient sleep has been shown to alter mood, attention, impulse control, motivation and judgment in children, all of which have implications for energy intake and ultimately weight status (Hart et al., 2011; Taveras et al., 2017). Given the impact of insufficient sleep on childhood obesity risk it is critical to understand sleep within the contexts of where children spend time.

The recommended amount of sleep per day for infants is 12-15 hours, while for toddlers it is 11-14 hours and for preschool-age children it is 10-13 hours (Hirshkowitz, 2015). A third of U.S. children do not meet their minimum age-specific recommendation at least once per week (Smaldone et al., 2007); children with a racial/ethnic minority background or from low socioeconomic households are at increased risk for insufficient sleep (Ash et al., 2019; Smith et al., 2019l Zhang et al., 2010). While sleep develops rapidly in the first few years of life, gradually decreasing in duration and becoming more consolidated during the night, most young children meet their sleep needs with a combination of nighttime and daytime sleep (Iglowstein et al., 2003; Ward et al., 2007). This is especially true for racial/ethnic minority children who tend to have later bedtimes, sleep less during the night, and nap more (Crosby et al., 2005; Nevarez et al., 2010; Smith et al., 2019). Yet, most of the literature on sleep in young children has focused on nighttime sleep or sleep within the home environment, neglecting naps and other environments in which young children spend a considerable amount of time (Agaronov et al., 2018; Yoong et al., 2016). Childcare is an important setting to consider as an estimated 75% of U.S. children spend time in childcare, for an average of 35 hours per week (Larson et al., 2011; Laughlin, 2010). Further, childcare attendance, especially in less formal care settings such as Family Child Care Homes (FCCHs), has been associated with increased risk for obesity (Benjamin et al., 2009; Corcoran & Steinley, 2019; Costa et al., 2007). Approximately a quarter of children in childcare receive care in FCCHs, which are often an appealing option for low-income and racial/ethnic minority families because they tend to provide flexible hours and be more affordable than childcare centers (Bromer, 2001; "Child Care in America," 2015).

The few studies assessing children's sleep in childcare have found that most children will nap when provided the opportunity (Ward et al., 2007). Thus, childcare environments and provider practices that do not enable or promote sleep may hinder young children's ability to obtain sufficient sleep. The Institute of Medicine (IOM) recommends that childcare providers adopt practices that create environments to promote age-appropriate sleep habits (McGuire, 2011). This includes keeping noise and light levels low during naptime and limiting the use of screens (Burns et al., 2011; McGuire, 2011). However, few states have regulations consistent with these recommendations, with fewer regulations across states for FCCHs compared to centers (Neelon et al., 2014). To our knowledge, only two studies have been published assessing sleep environments in childcare and they were observed in centers outside of the U.S. (Siren-Tiusanen & Robinson 2001; Staton et al., 2016). In addition to cultural differences, the childcare environment in FCCHs can be quite different from childcare centers because mixed age grouping is much more common, meaning that FCCH providers are often challenged with accommodating children at different developmental stages at the same time ("Child Care Options," n.d.). FCCHs also tend to have less structured schedules and operate with different logistical and space constraints than centers, which may have implications for child sleep ("Child Care Options," n.d.; Kim et al., 2012). Thus, the aim of this exploratory pilot study was to conduct in-person observations of FCCHs to better understand the sleep environment of children who attend these settings.

Participants & Methods

Study Design

We observed the sleep environment of 22 FCCHs participating in Healthy Start, a cluster randomized trial evaluating the efficacy of a multicomponent intervention to improve the food and physical activity environments in FCCHs (Risica et al., 2019). FCCH providers who had been in operation for at least six months were recruited through community organizations, flyers, brochures, events aimed at FCCH providers, direct mailings, and word of mouth referrals. As part of their involvement in Healthy Start, our team conducted a two-day observation of the home environment and provider practices in consenting FCCHs. The 22 FCCHs included in the present sub study were those for which the two-day observation had not yet been completed at the time the sleep environment observation instrument was developed. Assessment of the sleep environment was inserted into the usual measurement protocol for these remaining Healthy Start FCCHs, without anything additional required from the FCCH providers. Observations were completed by a trained research assistant for one (n=4) or two (n=18) days using a paper form generated by our team.

Measures

The FCCH sleep environment observation instrument was informed by the existing literature (Burns et al., 2011; McGuire, 2011; Staton et al., 2016), including the IOM's recommendations, as well as recommended best practices from relevant agency websites and regulations from health departments ("Child Care Center Rule," 2016; Myers, 2017). The instrument included 14 items assessing seven aspects of the childcare sleep environment: sleep surface and items napped with (2 check all that apply items), light/brightness (2 binary variables), noise level (1 three level categorical variable and 2 binary variables), use of electronics (2 binary variables), distance between children (1 binary variable with 3 dichotomous sub-variables), provider assistance (1 binary variable), and naptime structure (3 binary variables). Binary variables included "yes" and "no" response options, while the response options for the three level categorical variables assessing whether the room was relatively quiet while children slept/rested were: very (or most of the time), somewhat (or part of the time), and no. Check all that apply items included an "other" write-in option. The form underwent a process of review and revision by study investigators to maximize face validity. Characteristics of FCCHs and provider demographics were collected during the Healthy Start baseline assessment.

Data Analysis

For FCCHs with two days of observation, data collected during each day were synthesized and summed into a single entry. For example, if the children were observed napping with only blankets on day one and only pillows on day two, both blankets and pillows would be marked as items with which children were observed napping. Also, observations were assessed at the FCCH, not child,

level. If only a single child was observed napping with blankets, blankets would be marked as an item that was observed being napped with. After combining the data for FCCHs with two days of observation, we examined the frequency with which each variable was observed across FCCHs.

Results

Sample

We observed 22 FCCHs, providing care for 205 children. The number of children in care ranged from 3 to 16 (mean: 9.3, SD: 3.7). In half of the FCCHs, at least one of the children in care was either a child or grandchild of the provider; multiple children were either a child or grandchild of the provider in a third of the sample. The number of years or experience providers had working in childcare ranges from 1 to 37 (mean: 10.5, SD: 8.5). The majority (82%) of observed FCCHs received food subsidies from the Child and Adult Care Food Program. All providers were female, with 59% identifying as non-Hispanic white, 36% as Hispanic/Latina, and 5% unknown. Additional provider demographics are displayed in Table 1; sleep environment observations are displayed in Table 2.

Characteristic	n (%)
Total number of children in care[a]	9.32 (3.71)
Number of own children or grandchildren in care	
0	11 (50)
1	4 (18)
2	6 (27)
3	1 (5)
Program receives food subsidies	18 (82)
Years working in childcare'	10.50 (8.53)
Female	41 (100)
Age	
<34	4 (18)
35-44	8 (36)
45-54	5 (23)
55-64	5 (23)
Race/Ethnicity	
Non-Hispanic White	13 (59)
Hispanic/Latina	8 (36)
Unknown	1 (5)
Country of birth	
United States	13 (59)
Caribbean	5 (23)
South America	3 (14)
Africa	1 (5)
Marital status	
Single, never married	2 (9)
Married or living with partner	18 (82)
Divorced	2 (9)
Highest level of education	
High school diploma or GED	9 (41)
Associates degree or 60 semester credits	9 (41)
Bachelor's degree	3 (14)
Master's degree	1 (5)
Annual household income	
$25,000-$50,000	5 (23)
$50,001-$75,000	9 (41)
$75,001-$100,000	5 (23)
>$100,000	2 (9)
Refused/Don't know	1 (5)

[a] *mean (standard deviation) presented, as opposed to N (%) for categorical variables*

Table 1: FCCH Sample Characteristics and Provider Demographics (N=22)

Characteristic	n (%)
Sleep surface (n=19)[a]	
Cot or mat	17 (89)
Playpen or portable play yard	5 (26)
Crib	2 (11)
Bed	1 (5)
Couch	1 (5)
Floor	1 (5)
Multiple surfaces	5 (26)
Items children slept/rested with (n=17)'	12 (71)
Blanket	6 (35)
Pillow	6 (35)
Stuffed animal	4 (24)
Pacifier	2 (12)
Book	2 (12)
Sippy cup or bottle	8 (47)
Multiple items	2 (12)
No items	
Shades were drawn while children slept/rested (n=17)	11 (65)
Lights were off or dimmed while children slept/rested (n=17)	11 (65)
Noise level rating while children slept/rested (n=17)	9 (53)
Very quiet	6 (35)
Somewhat quiet	2 (12)
Not quiet	
Disruptive noises observed while children were sleeping (n=17)	6 (35)
Calming music, white noise, or nature sounds played while children slept/rested (n=17)	7 (41)
Use of electronics during sleep/rest time (n=17)	3 (18)
Television	2 (12)
Tablets (e.g. iPads)	
Distance between sleeping/resting children (n=12)'	6 (50)
Within recommended three-foot distance	3 (25)
< 18" apart, no solid barrier or not alternated in position head to feet	
Provider assisted children in falling asleep/resting (n=11)	2 (18)
Children began sleeping/resting prior to scheduled naptime (n=15)	10 (67)
Children woke on their own vs. being woken at end of naptime (n=15)	5 (33)
All children slept (n=15)	8 (53)

[a] *multiple responses allowed*

Table 2: Sleep Environment Observations in Family Child Care Homes (N=22)

Sleep Environment Observations

1. Sleep surface and items: The most common surface that children slept on was a cot or mat (89%), followed by a playpen/portable play yard (26%). Other surfaces included a crib (11%), bed (5%), couch (5%), or blanket/sheet on the floor (5%). Children slept on more than one different surface in 26% of FCCHs. Sleep surface was not observed for 3 FCCHs in which children slept in an unobserved bedroom. The most common items that children were observed napping with were a blanket (71%), pillow (35%), stuffed animal (35%), and pacifier (24%). Less frequently observed items included a book (12%) and a sippy

cup/bottle (12%). In 47% of FCCHs, children napped with multiple items, while in 12% they napped with no items. The research assistant was not present while children were sleeping to observe items napped with for 5 FCCHs.

2. Light/brightness: The shades were observed being drawn to reduce brightness in 65% of FCCHs and the lights were also observed being dimmed or turned off in 65% of FCCHs. In 53% of FCCHs, were both the shades drawn and lights dimmed or turned off. The research assistant was not present long enough during naptime to observe light/brightness for 5 FCCHs.

3. Noise level: The overall noise level of the room during naptime was rated as very quiet (or quiet most of the time) for 53% of FCCHs, somewhat quiet (or quiet part of the time) for 35%, and not quiet for 12%. Providers played calming music, white noise, or nature sounds during nap time in 41% of FCCHs, while disruptive noises during naptime were observed in 35% of FCCHs. The research assistant was not present to observe the noise level while children were sleeping for 5 FCCHs.

4. Use of electronics: We observed a television on during naptime in 18% of FCCHs. Small screens (e.g. iPads) were observed being used by children in 12% of FCCHs during naptime.

5. Distance between children: In 50% of FCCHs, children were observed napping within a three-foot distance from one another. It is recommended that children napping less than two feet apart either have a solid barrier between them or be alternated in a head to feet position ("Child Care Center Rule," 2016; Myers, 2017). In 25% of the FCCHs we observed, children napped less than 18 inches apart with no solid barrier between them nor alternated in a head to feet position. The research assistant was not present to observe the distance between sleeping/resting children for 5 FCCHs, and this information was missing for 5 FCCHs.

6. Provider assistance: A provider was observed helping children to fall asleep (e.g. rubbing their back or rocking them) in 18% of FCCHs, whereas in 81% of FCCHs providers did not assist children. The research assistant was not present to observe whether or not providers assisted children for 5 FCCHs, and this information was missing for 6 FCCHs.

7. Naptime structure: (observed in 15 FCCHs, missing in 7): In 67% of FCCHs, children fell asleep at various times, whereas in 33% of FCCHs they followed a scheduled naptime to sleep. Conversely, in 67% of FCCHs, children were woken up at the end of a scheduled naptime, while in 33% they were allowed to sleep for an unspecified amount of time. In 53% of the observed FCCHs, all of the children were observed sleeping during naptime, while in 47% of FCCHs some children were awake during naptime. The research assistant was not present to observe the naptime structure for 5 FCCHs, and this information was missing for 2 FCCHs.

Discussion

This study demonstrated the feasibility of in-person observations of the sleep environments in childcare, specifically FCCHs. However, children in a few of the FCCHs in this sample napped in spaces that were separate and not observable from the main room, such as the provider's bedroom. This study observed a variety of sleep environments in FCCHs. While the sleep environments in half of the FCCHs seemed in line with IOM recommendations (Burns et al., 2011; McGuire, 2011), potential disturbances from noise, light, and media were present in the other half of FCCHs, with multiple potential disturbances observed for most FCCHs not meeting the recommendations. Our findings demonstrate heterogeneity across FCCHs with regard to the sleep environment as well as naptime structure (e.g. flexibility regarding when children began and ended sleep). Future studies should continue to explore the sleep environments of different childcare settings.

Sleep duration and quality in early childhood is particularly sensitive to environmental influences (Touchette et al., 2013). Taken together, the results of this study suggest that there is room for improvement with regard to sleep environments in FCCHs. Our results are consistent with findings from an Australian study, which found that 36% of childcare centers offered supportive nap environments, while 19% offered unsupportive environments, and 45% were ambiguous (Staton et al., 2016). While opportunities for sleep in childcare are common, some FCCH providers can do better to engage in supportive practices to modify the environment. Having a comfortable sleep surface in a fairly dark and quiet room facilitates napping in children; on the contrary, disruptive noises, electronics, and close proximity to other children can be distracting (McHale et al., 2017).

The implications of flexibility around nap timing, or lack thereof, are less clear, and likely vary depending on age. While the need for a nap ceases as children approach age five, sleep consolidation during early childhood occurs at different rates and children have varying sleep needs (Iglowstein et al., 2003; Ward et al., 2007). Flexibility better allows for children's individual sleep needs to be met. Thus, staggered nap schedules tailored to children's ages and individual needs are a supportive practice (Siren-Tiusanen & Robinson, 2001). However, flexibility could also be indicative of a lack of protected time for napping. The implications of protected time and flexibility around napping are likely greater for children at higher risk for insufficient sleep, such racial/ethnic minorities and children from low socioeconomic households. Further, sleep consolidation itself is affected by the childcare environment, and naptime practices are associated with sleep behavior (Staton et al., 2016; Staton et al., 2015). However, more research is needed in this area.

While there were similarities between our findings and those at childcare centers (Staton et al., 2016), notable differences are worth discussing. Since FCCH providers care for children in their own homes rather than in a separate facility, they offer a more intimate setting and have fewer children enrolled. Yet they can have greater space restrictions, fewer resources available, and lower levels of training than providers in centers ("Survey of home child care," 2013). Regulations for licensed FCCHs are also different and often less stringent than regulations for centers (Costa et a., 2007). As such, FCCH providers may be less aware of children's sleep needs and practices that support them and have less latitude to make needed changes. Further, mixed age grouping, which is much more common in FCCHs, poses a challenge when children are at different developmental stages and have considerably different sleep schedules. For example, while infants tend to nap multiple times throughout the day, preschoolers typically nap only once if at all. In mixed age

childcare settings, there are likely several times throughout the day where older children are awake while others are sleeping. Awake children may not only increase the noise level and may also prevent providers from making changes to the environment that support sleep for those napping (e.g. turning off or dimming the lights) (Ward et al., 2007). Future research on sleep and other child behaviors in FCCHs, should consider the unique constraints within which FCCHs operate.

While results from this pilot study contribute to the very limited literature on sleep environments in childcare in the U.S., more studies are needed with larger and diverse samples. Studies specifically designed to assess sleep environments in childcare centers and FCCHs are needed to better identify similarities and differences across types of childcare. Studies are also needed to understand how different aspects of the childcare sleep environment actually impact children's sleep, not just during the day, but across the 24-hour period. Such studies should account for children's sleep needs based on age and other characteristics. Results could inform evidenced-based provider practice guidelines to support sleep in childcare settings, which are currently lacking.

Despite the need for larger studies to study sleep environments in FCCHs and determine their effects on children's sleep, the results of this pilot study illustrate considerable variability in sleep environments across FCCHs with many FCCHs having need for improvement to meet guidelines. Thus, efforts targeting childcare providers to make changes that support sleep may be necessary. Providers would likely benefit from similar intervention efforts as those targeted at parents, such as education and training regarding children's age-based sleep needs and caregiver behaviors that promote/support sleep, like modifying the environment for sleep (Agaronov et al., 2018; Ash & Taveras, 2017; Yoong et al., 2016). Encouraging communication between providers and parents about child sleep is also recommended (Oakes et al., 2019; Siren-Tiusanen & Robinson, 2001). Results from intervention efforts targeting safe sleep in childcare suggest that childcare providers are receptive to educational programming around child sleep (Moon & Oden, 2003). Again, consideration must be given to children's developmental stage and sleep needs, and recommendations for childcare sleep interventions should not be confused with mandatory naps, which can be frustrating and disruptive for everyone (Staton et al., 2015; Ward et al., 2007). The goal should be to provide opportunities for, as well as environments that support, sleep to enable children to meet their sleep needs, but not force children who no longer require naps to take them.

Despite being a contribution to the literature as the first study to assess sleep environments in FCCHs, the following limitations must be acknowledged. In addition to the small sample size, the major limitation of this study is that observations were not made for the entire day and the research assistant was seldom present for the entire duration of naptime. This resulted in missing data for various variables in a number of FCCHs. It is possible that the observed time periods are not representative of the overall sleep environment throughout the full day. Further, observations were only made for one or two days, which may not be representative of the usual sleep environment. Finally, other important aspects of the childcare sleep environment beyond those we assessed were not measured such as routine and emotional climate (Staton et al., 2016), and future studies giving greater consideration to developmental stage are needed. However, given the extremely limited literature on sleep environments in childcare in the U.S., the findings from this study can help inform future studies with larger, more representative samples and stronger designs.

Conclusions

The results from this exploratory pilot study show that sleep environments vary widely across FCCHs. However, studies are needed to understand how these and other aspects of the childcare sleep environment influence daytime and total sleep duration, as well as other energy balance behaviors, and ultimately obesity risk. Further research assessing sleep and other obesity-related environments and practices in FCCHs specifically is especially warranted given that FCCHs are a popular childcare option for racial/ethnic minority and low-income families, whose children are at greater risk for both insufficient sleep and obesity.

Key Messages

- Insufficient sleep is a risk factor for childhood obesity and young children meet their sleep needs with a combination of nighttime and daytime sleep.
- The Institute of Medicine recommends that childcare providers adopt practices that create environments to promote age-appropriate sleep habits.
- There is a paucity of research examining sleep environments in childcare, especially in less formal settings such as Family Child Care Homes.
- This pilot study found that sleep environments vary widely across Family Child Care Homes, with potential disturbances from noise, light, and media observed in half of the Family Child Care Homes observed.
- Further studies are needed to understand how the childcare sleep environment influences daytime and total sleep duration, as well as other energy balance behaviors, and ultimately obesity risk.

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Data availability: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Ethics statement: Study procedures and materials were approved by the Institutional Review Boards of Brown University, University of Rhode Island and University of Connecticut.

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