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Kenzie Goldsmith Lindenwood University

Melanie DuBois Lindenwood University

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The Links Between Young Children's Use of Pacifiers and Swaddling with Child Sleep Arousal

Kenzie Goldsmith and Melanie DuBois

Department of Psychology, Sociology, and Public Health, Lindenwood University

Author Note

Melanie DuBois Dhttps://orcid.org/0000-0001-9121-9902

Makenzie Goldsmith https://orcid.org/0000-0002-6624-3107

Correspondence concerning this article should be addressed to Melanie DuBois or

Makenzie Goldsmith. Email: mdubois0804@gmail.com, makenziegoldsmith9300@gmail.com

Abstract

Sleep arousal, or waking experiences during sleep, in young children was examined in relation to pacifier usage and the caregiver's use of the swaddling technique. Primary caregivers of young children from 1 to 24 months old, fluent in English, and 18 years or older completed a Qualtrics survey detailing their child's sleep routines. The survey questions considered the child's use of self-soothing devices and the caregiver's use of soothing techniques, namely pacifiers and swaddling. By utilizing the Brief Infant Sleep Questionnaire-Revised (BISQ-R; Sadeh et al., 2020), we examined the relationship between child sleep arousal and pacifier usage, along with sleep arousal and swaddle usage. By using a convenience sample of 33 participants, we found that there was no significant correlation between child sleep arousal and pacifier use. The results of an independent t-test revealed no statistical difference in sleep arousal between pacifier users and non-users, t(18.85) = .69, p = .26. Along with this, the results of an independent t-test revealed no statistical difference in sleep arousal between swaddle users and non-users, t(21) = .89, p = .19. These findings suggest that pacifier usage and/or use of the swaddling technique has no significant relationship to child sleep arousal.

Keywords: sleep arousal, self-soothing, pacifier, swaddling, infant, caregiver

The Links Between Young Children's Use of Pacifiers and Swaddling with Child Sleep Arousal

Sleep is vital to the growth and development of all children. It plays an important role in various cognitive, psychological, and somatic processes. Infants range greatly in terms of hours of sleep, varying anywhere from 10 to 18 hours in early infancy, which decreases to a range of 8.5 to 11 hr as they reach toddlerhood (Bruni et al., 2014). Infants who have the ability to self-soothe throughout the night develop healthy sleep-wake patterns (Burnham et al., 2002). As such, decreasing sleep arousal in children is pertinent to promoting better sleep.

Research suggests that various self-soothing devices and soothing items may aid this pursuit, including pacifiers and sleep swaddles (Moon et al., 2011; Öztürk Dönmez & Bayik Temel, 2019). The Brief Infant Sleep Questionnaire (BISQ-R; Sadeh et al., 2020) is a scoring system that analyzes child sleep patterns, which ties into utilizing pacifiers and sleep swaddles (Mendell et al., 2019). This questionnaire asks how the child typically falls asleep at bedtime (with a pacifier, being rocked, nursing, etc.).

Using a pacifier during sleep is encouraged by the American Academy of Pediatrics, and it is noted that the protective effects of a pacifier continue when the child loses it during sleep (Moon et al., 2016). The benefits of this self-soothing device are seen not only in sleep but in protective measures as well. Pacifier use also decreases infant arousal during sleep and offers increased protection against SIDS for infants in adverse sleeping environments (Moon et al., 2011).

Soothing items employed by caregivers may promote better sleep within children (Öztürk Dönmez & Bayik Temel, 2019). One commonly used soothing item for younger children is a swaddle, which involves a technique that encourages wrapping a child's body comfortably in a

blanket with their head out. The swaddling technique promotes better sleep within children by decreasing the likelihood of waking, reducing the startle reflex, and providing comfort (Kelly et al., 2016). Research suggests various caregiver soothing behaviors beyond swaddling can reduce child sleep arousal as well. Using the 4S soothing techniques with infants (swaddling, holding at side or stomach position, shushing-white noise, and swinging) in one study showed that the children experienced a decrease in waking at night on average in comparison to the control group (Öztürk Dönmez & Bayik Temel, 2019). Another study found sleep time from swaddling, in addition to arousal and autonomic control, is affected by previous swaddling experience (Richardson et al., 2010).

We hoped to gain general insight into young children's sleep practices in exploring the possible relationship between children's use of pacifiers and caregivers' use of swaddling as they pertain to child sleep arousal. We hypothesized that young children and infants who utilize pacifiers would experience less arousal during sleep. In addition, we hypothesized that caregivers utilizing swaddles and the swaddling technique would promote better sleep within children. Our online survey examined young child and infant sleep practices. We hoped to provide knowledge to parents and caregivers with children of these ages about the use of pacifiers and swaddles as they relate to sleep.

Method

Participants

The study's participants were included if they met the criteria of being at least 18 years of age, fluent in the English language, and having a child between the ages of 1 month to 24 months to which they were considered a primary caregiver. We defined a primary caregiver as being involved with the child for the majority of a week, or four days. The intended sample size for this

study was 50 to 100 participants, and the achieved sample size was 33. We were able to utilize data from 24 of the 33 participants, with unusable data attributed to uncompleted surveys or participants not meeting the study's criteria. All 24 participants specified they were at least 18 years old and fluent in the English language. All participants had a child between 1 month to 24 months of age, with the average age of the participants' children being 12.5 months. The participants were asked how many children they had, with the average number of children per participant being 2.26, SD = 1.36. Each participant specified they were involved seven nights a week in their child's nighttime routine. There were 23 participants who described themselves as mothers and 1 participant described themselves as a father.

The study's sampling procedure was a convenience sample of participants through two recruitment sources. The participants for this study were recruited through physical flyers posted at three different locations, as well as digital flyers with social media scripts posted on three different social media sites. We obtained permission to post flyers at the Lindenwood University buildings known as Evans Commons and the Spellmann Center, along with the Goddard School of St. Charles, Missouri.

Social media recruitments were conducted through the sites Facebook, Reddit, and Snapchat. Facebook is a social networking and media service that allows users to engage with one another through posts involving pictures, videos, and words. Reddit is a social website that permits users to post to various subreddits consisting of a variety of topics to engage with one another through comments. The subreddit r/SampleSize was used for this study. Snapchat is a social media service that allows users to send messages, pictures, and videos that can expire or be deleted within a set amount of time. Each post to the three sites included the flyer along with a social media script. The participants completed this study of their own will, with no

compensation provided. This study met the ethical standards evaluated by the Lindenwood University Institutional Review Board and the Psychology Program Scientific Review Committee.

Materials and Procedure

We used our personal phones, laptops, and iPads to create our flyer, survey, and to conduct data analyses. To recruit participants for the study we created a flyer through Adobe's Creative Cloud program, as seen in Appendix A. This flyer was created to reach individuals beyond Lindenwood University as we felt that a large majority of the students would not meet the inclusion criteria of this study. We provided a Quick Response (QR) code to direct potential participants to the Qualtrics survey on the bottom left corner of the flyer. Facebook, Reddit, and Snapchat allowed us to recruit more participants who fit within our study's criteria. We used a digital version of our flyer for our posts on these sites. Facebook and Snapchat did not require approval for posts since we used our personal accounts and followed the Terms of Service for each site. Any person we had listed as a "friend" on these two platforms was able to share and interact with this post of their own will. Moderators from the subreddit, /r/SampleSize, approved our post on Reddit. We used the same social media script in each post to maintain consistency.

The survey took participants an estimated 30 min and involved questions about the caregiver and child along with their nighttime sleep routines. It began with five basic demographic and personal questions, three of which were used to determine participant qualification. The demographic questions for the participants considered the number of children a participant currently had and were expecting, their age, relationship to the child, nights involved in the child's nighttime routine, and if they currently had a child between the ages of 1 month to 24 months. The three questions that were used to determine qualification for the survey

concerned the participant's age, the child's age, and the involvement in the child's nighttime routine.

We used the following section of questions to determine which self-soothing devices the child currently used, with a specific focus on pacifiers. Of the 24 participants, 8 reported that their child fell asleep with a pacifier. The participants described other self-soothing items used or engaged in by young children including thumb-sucking, nursing through breastfeeding or with a bottle, stuffed animals, sound machines, blankets, and light machines. We also asked what caregiver soothing behaviors were used with young children, with another focus on swaddles and the swaddling technique. Of the 24 participants, 6 reported that they used a swaddle at bedtime with their child. Other caregiver soothing behaviors engaged in included verbal comforts (singing, hushing sounds), bottom or back pats (both in a crib or while the child was lying in a crib), rocking the child while holding, and breastfeeding. Participants were asked to specify if their child typically needed caregiver intervention when aroused from sleep, with 11 participants reporting the need to intervene when their child was aroused and 13 participants reporting that they did not need to intervene.

We implemented the BISQ-R into our survey among other questions created by us in the subsequent section. The participants were asked to describe the time their child went to sleep and when they woke up, with the average hours slept by young children being 11.14 hours (SD = 1.43). The participants reported various responses as to how often their child had the same bedtime each night, which was clarified as the child falling asleep within 15 min of the same time each night. The most common response for this question was seven nights a week, followed by six and five nights a week equally. We asked our participants to describe how difficult bedtime was on a scale ranging from very easy to very difficult, with 7 participants reporting

bedtime to be very easy, 10 as somewhat easy, 4 as neither easy nor difficult, and 3 as somewhat difficult. It was reported that children took anywhere from 5 to 45 min to fall asleep, with the average time to fall asleep being 20 min.

Nearly all the participants reported that their child awoke at least once in the night, with 87.5% experiencing at least one arousal from sleep. Children ranged greatly in the number of hours slept consistently from 3 hr to 12 hr, with the modes of sleep being 10.5 and 11 hr per night. The participants described their children's sleep on a scale ranging from very poor to very well, with the majority of participants describing their child's sleep as very well or well. They were also asked to describe their child's mood when they awoke in the morning on a scale of very happy to very fussy, with the majority of participants reporting their child's mood as very happy. We presented a debriefing statement explaining the true purpose of the study and the hypotheses we predicted to the participants once the study was completed.

Scoring for much of this survey was done through the BISQ-R Scoring System as many questions were taken from the BISQ-R survey itself (Sadeh et al., 2020). The BISQ-R is a young child sleep scoring system, which we used to examine arousal responses of the child with the engagement in caregiver soothing behaviors (Sadeh et al., 2020). Infant sleep is a subscale scored by the BISQ-R survey, and this is what we used to examine the correlation between children's sleep and pacifier usage. We also used the infant sleep subscale to examine the correlation between caregivers' use of swaddles or the swaddling technique with their children. The parent perception subscale and parent behavior subscale are two other subscales used in the BISQ-R Scoring System but were not used in our survey as they did not pertain to our hypotheses. We compiled our data into an Excel sheet to send off to the BISQ-R scoring team,

who provided child sleep scores based on the infant sleep subscale and our data from the 24 participants.

We utilized IBM SPSS Statistics (Version 28) to conduct two independent samples t-test analyses to examine the relationship between pacifiers and sleep arousals, and swaddles and sleep arousals. To look further into these relationships, we used a chi-square analysis calculator to conduct a 2x2 chi-square examining sleep arousal with swaddle use. A Fisher's Exact Test was used to further examine pacifier usage in relation to sleep arousals in young children. We conducted an independent samples t-test to determine whether the number of times children experience sleep arousals differed based on whether they were pacifier users or not. The results indicated no statistical difference between pacifier users (M = 1.67, SD = 1.54) and non-users (M = 1.38, SD = .52), t(18.85) = .69, p = .26. The degrees of freedom for this test were adjusted because the two samples' variances were unequal.

We calculated the difference between sleep arousal and swaddling with a second independent t-test and found that the participants who reported their child used a swaddle (M = 1.71, SD = 1.04) compared to the participants who reported their child did not use a swaddle (M = 1.17, SD = .75) showed equal variances were assumed for this group, t(21) = .89, p = .19. These analyses suggest that a child's use of a pacifier or a caregiver's use of a swaddle with their child does not have any significant relationship to the arousals from sleep that a child experiences. These results contradict our proposed hypotheses that pacifier usage and swaddle usage would lead to a decrease in sleep arousals experienced by a child.

In addition to the independent *t*-tests conducted to examine the relationship between pacifier use and sleep arousal, a Fisher's exact test was conducted to further examine these variables. The number of children who aroused during sleep was compared between pacifier

users and non-users. Our data revealed that 33.3% of pacifier users and 37.5% of non-pacifier users experienced sleep arousals whereas 0% of pacifier users and 12.5% of non-pacifier users experienced no sleep arousals. These differences were analyzed using the Fisher's exact test and revealed statistically non-significant differences between groups p = .24.

To look further into swaddle usage and sleep arousal in young children, the number of children who were aroused during sleep was compared for swaddle users and non-users. A chi-square test of independence was performed and revealed that 20.8% of swaddle users and 37.5% of non-swaddle users experienced sleep arousals whereas 4.17% of swaddle users and 12.5% of non-swaddle users experienced no sleep arousals. The relation between these variables was nonsignificant, $X^2(2, N = 18) = .16$, p = .69. There is no significant difference in sleep arousals between swaddle users and non-swaddle users.

Discussion

We hypothesized that pacifier and swaddle usage would lead to a decrease in sleep arousals experienced by children were not supported by our data collection and statistical analyses. Our hypotheses were developed based on personal observations and experiences with caring for young children, along with research into other studies examining self-soothing devices and caregiver soothing behaviors in relation to young children's sleep arousals. Despite our findings, studies suggest that there are many self-soothing devices and soothing techniques that may be helpful in reducing infant sleep arousal (Moon et al., 2011; Öztürk Dönmez & Bayik Temel, 2019). Though we were unable to find support for pacifiers decreasing sleep arousal in our study, there are benefits beyond this that they provide as well. The American Academy of Pediatrics supports pacifier usage, noting that benefits for pacifier usage extend beyond reducing sleep arousal, and offers security against SIDS for children in unfavorable sleep environments

(Moon et al., 2011). Swaddling is also a useful technique for various reasons beyond the possibility of decreasing sleep arousals. This technique also reduces the startle reflex experienced by younger children and infants, and provides soothing feelings overall (Kelly et al., 2016).

A major study limitation was our accomplished participant sample size. The intended sample size for this study was 50 to 100 participants, and we achieved a sample size of 24 after forgoing unusable data from 9 participants. We set out to examine 50 to 100 participants as we felt this would be feasible and provide a sufficient amount of data to examine. We sought to reach this number of participants by posting our flyer at numerous physical locations and on various digital platforms. We were unable to reach our participant goal.

We also found that participants experienced confusion on what we recognized as a self-soothing behavior for a child versus a soothing technique or behavior employed by a caregiver. One example of this was breastfeeding, which participants specified as both a self-soothing behavior engaged in by their child and a soothing technique engaged in by the caregiver. We inquired which self-soothing item a participant's child used beyond a pacifier in our survey. Additionally, we asked what soothing behaviors they engaged in aside from swaddling. These were separate questions within which a pacifier was specified as a self-soothing item, and swaddling as a behavior used by caregivers. We suggest that breastfeeding be labeled as a soothing behavior that caregivers provide to their children for future studies examining this topic.

It is important to consider that we relied on participants self-reporting their child's experiences with sleep arousals as well. Much of the data provided by the participants were estimates of the child's experiences in sleep, including the arousals reported during sleep on average. As these were only estimates, it was difficult to control for significant accuracy in these

measures. Improvements could be made here by altering the format of the study, such as examining sleeping children in person as opposed to using a self-report survey.

Another difficulty experienced in this study was the time limit. We initially believed we had sufficient time to send out our survey and collect data within two months, February and March. We were compelled to gather our data sooner than the end of March so we could have time to conduct our analyses. It also took longer than anticipated to receive study and material approval from outside sources. Our informational flyer was approved and posted in the middle of February, which was slightly later than expected. In conjunction with this issue, Lindenwood's Institutional Review Board approved our study at the end of February, so we could not start collecting data until very late in February, or almost the beginning of March. With this in mind, we had an active study for roughly a month rather than closer to two months.

Future studies should consider examining sleep arousals in children as they relate to self-soothing devices and soothing behaviors in a physical setting if possible. This could include studying sleeping children in daycare or preschool environments, though this would likely alter the time of focus of sleep from night to daytime. This should not be considered a limit though, as examining different times of sleep beyond night could provide more crucial information to this area of research. It is important for future studies to aim for a higher participant sample size as well within the range of 50 to 100 participants at least. This could be achieved utilizing the methods we took with posting flyers and using social media sites but increasing the flyer and social media postings. Numerous forums and websites that cater to and focus on our distinct participant group are available on the internet and may be helpful in increasing participant size as well.

The implications of our findings suggest the need for further research in these areas, along with research into other self-soothing devices and soothing behaviors or techniques. It is crucial to gather information on sleeping habits not only in younger children, but in older children and adolescents as well. The application of this information is crucial for further insight into young children's sleep and how we can promote more healthful, effective sleep within children.

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Appendix A

"Infant Sleep Arousal" Flyer

WE WANT TO HEAR FROM YOU!

PRIMARY CAREGIVERS 18+ WITH INFANTS AGES 1 TO 24 MONTHS

This study seeks to understand the relationship between infant use of self-soothing items and caregiver engagement in self-soothing behaviors on infant sleep arousal.

We want 30 minutes of your time (at most) to examine:
- Infant sleep arousal behaviors and self-soothing devices used
- Caregiver use of soothing behaviors



INTERESTED?

Survey open February through March



Scan the QR code for the survey and contact Makenzie Goldsmith at mrg144@lindenwood.edu or

Melanie DuBois at md358@lindenwood.edu with any questions We are looking for primary caregivers with infants between the ages of 1 and 24 months. Primary caregivers are those who take care of the infant for at least the majority of the week (4 days).

Participants will complete an online survey consisting of questions pertaining to infant sleep arousal, self-soothing devices, and caregiver soothing

Appendix B

"Young Child Sleep Arousal" Survey

Start of Block:
Q1 How many children do you currently have (including child(ren) currently pregnant with if applicable)? Please specify below:
\bigcirc 1 (1)
O 2 (2)
O 3 (3)
O 4 (4)
O 5 (5)
Other, please specify: (6)
Q2 Are you at least 18 years old?
○ Yes (1)
O No (2)
Q3 What is your age? Please specify below in years:

Q4 What is your relationship with your child? Please specify below:
O Mother (1)
O Father (2)
Other, please specify: (3)
Q5 Do you have an infant currently within the age range of 1-24 months?
O Yes (1)
O No (2)
Q6 How many nights per week are you involved with your infant at bedtime and/or overnight?
\bigcirc 1 (1)
O 2 (2)
O 3 (3)
O 4 (4)
O 5 (5)
O 6 (6)
O 7 (7)
End of Block: Default Question Block
Start of Block: Block 1
Q7 If you have more than one infant between the age of 1-24 months, please only specify information pertaining to one infant for the following questions for the entirety of the survey.

Q8 Please specify the age of your infant in terms of weeks and/or months, written as " months, weeks" (for example 4 months, 2 weeks) below:
Q9 Does your infant usually fall asleep at bedtime with a pacifier?
○ Yes (1)
O No (2)
Q10 If your infant uses any other self-soothing devices at bedtime, including but not limited to stuffed animals, blankets, and sound machines, please list them below:
Q11 Is your infant usually swaddled at bedtime?
○ Yes (1)
O No (2)
Q12 If you use any other soothing behaviors with your infant at bedtime, including but not limited to singing, facial rubs, rocking, and back/bottom pats, please list them below:

O Return to sleep immediately or within a few minutes on their own (1) O Does not return to sleep on their own, needs caregiver intervention (2) Q14 Please think about your infant's sleep during the past two weeks in answering the following questions. Q15 What time do you usually start your infant's bedtime routine (start getting your infant ready for bed)? Please fill in your response below: Q16 What time do you usually put your infant to bed at night (lights out)? Please specify below: Q17 In a typical week, how often does your infant have the same bedtime (within 15 minutes)? ☐ 1 (1) ☐ 2 (2) ☐ 3 (3) ☐ 4 (4) ☐ 5 (5) ☐ 6 (6) ☐ 7 (7)	Q13 When your infant wakes up, they often:
Q15 What time do you usually start your infant's bedtime routine (start getting your infant ready for bed)? Please fill in your response below: Q16 What time do you usually put your infant to bed at night (lights out)? Please specify below: Q17 In a typical week, how often does your infant have the same bedtime (within 15 minutes)? Q1 (1) Q2 (2) 3 (3) 4 (4) 5 (5) 6 (6)	Return to sleep immediately or within a few minutes on their own (1)
Q15 What time do you usually start your infant's bedtime routine (start getting your infant ready for bed)? Please fill in your response below: Q16 What time do you usually put your infant to bed at night (lights out)? Please specify below: Q17 In a typical week, how often does your infant have the same bedtime (within 15 minutes)? O1 (1) O2 (2) O3 (3) O4 (4) O5 (5) O6 (6)	O Does not return to sleep on their own, needs caregiver intervention (2)
Q16 What time do you usually put your infant to bed at night (lights out)? Please specify below: Q17 In a typical week, how often does your infant have the same bedtime (within 15 minutes)? 1 (1) 2 (2) 3 (3) 4 (4) 5 (5) 6 (6)	
Q17 In a typical week, how often does your infant have the same bedtime (within 15 minutes)? 1 (1) 2 (2) 3 (3) 4 (4) 5 (5) 6 (6)	
 1 (1) 2 (2) 3 (3) 4 (4) 5 (5) 6 (6) 	Q16 What time do you usually put your infant to bed at night (lights out)? Please specify below:
 2 (2) 3 (3) 4 (4) 5 (5) 6 (6) 	Q17 In a typical week, how often does your infant have the same bedtime (within 15 minutes)?
 3 (3) 4 (4) 5 (5) 6 (6) 	O ₁ (1)
4 (4)5 (5)6 (6)	O 2 (2)
5 (5)6 (6)	O ₃ (3)
O 6 (6)	O 4 (4)
	O 5 (5)
O 7 (7)	O 6 (6)
	O 7 (7)

Q18 Typically, how difficult is bedtime?
O Very easy (1)
O Somewhat easy (2)
O Neither easy nor difficult (3)
O Somewhat difficult (4)
O Very difficult (5)
Q19 How long does it usually take your infant to fall asleep? Example: If you put your infant to bed at 6:30 p.m. and your infant falls asleep at 8:00 p.m., it takes 90 minutes for your infant to fall asleep. Please specify with the average number of minutes below:
Q20 How many times does your infant usually wake during the night? Please specify below numerically:
Q21 How much total time during the NIGHT is your infant usually awake (between when your infant goes to bed and wakes for the day)? Example: If your infant wakes up 2 times and is awake for about 15 minutes each time, your infant's total time spent awake is 30 minutes. Please specify with the average number of minutes below:
Q22 What is the longest stretch of time that your infant is usually asleep during the NIGHT without waking up? Please specify below:

Q23 What time does your infant usually wake up in the morning? Please specify below:
Q24 How well does your infant usually sleep at night?
O Very well (1)
○ Well (2)
○ Fairly well (3)
O Poorly (4)
O Very poorly (5)
Q25 How would you rate your infant's mood when he/she wakes up in the morning?
O Very happy (1)
O Somewhat happy (2)
O Neutral (3)
O Somewhat fussy (4)
O Very fussy (5)
End of Block: Block 1