



Jornal de Pediatria

www.jpmed.com.br



LETTERS TO THE EDITOR

Association between sleep behavior and motor development in preterm infants



Dear Editor,

The World Health Organization (WHO) estimates 15 million infants are born preterm every year, equal to more than 1 in 10 live births. Prematurity is the cause of 35% of infants' deaths, as well as a risk factor for complications such as neurocognitive impairment, auditive and visual deficit.¹

In light of the seriousness of the situation, research plays a key role in improving and reducing prematurity complications. Manacero and Nunes² assessed the relation between sleep disturbances and motor development in preterm infants and its repercussion at 4–5 years, furthering our knowledge in the field. The authors observed a possible relation at 6 months, which was not apparent at 12 months; yet they did present delayed or atypical motor development, which disappeared at 4–5 years.

Firstly, it is worth noting that there is a prominent time gap between 12 months and 4–5 years. Due to the lack of assessment during 3 or 4 years, the interpretation of the results is complex. A more exhaustive and enlarged evaluation throughout time would have provided more information on the premature neonates' evolution and, thus, allow for a more solid conclusion.

At 6 months, more awakenings, longer awake periods, and lateral position were associated with atypical motor development. Furthermore, with the Alberts Infant Motor Scale (AIMS) the supine position was significantly associated with suspected motor development delay, as was observed for the lateral position. Out of the 40 preterm infants studied, 21 were recorded sleeping in a supine position. These results agree with another study,³ which concluded that supine position was associated with delayed gross motor development at 4 and 6 months and correlated prone position with proper gross motor development at 4 to 10 months. However, at 12–36 months and at 11 to 17 months, there was no association established for the supine and prone positions, respectively.

At 12 months and at 4–5 years, no association was found. This could be a result of the sleep quality improvement when compared to 6 months. Sleep differences between infants born at term and premature infants have been described. Premature infants sleep longer and present a

higher number of awakenings yet, when they are corrected to the term gestational age, the sleep-wake cycles are similar to those born at term.⁴ Regardless of the fact that sleep patterns vary after 6 months, it is unknown why at 12 months the infants present delayed motor development.

The following limitations were acknowledged by the authors. Because of the longitudinal nature of this study, some families dropped out of the study before its conclusion. The final sample ($n = 36$) for comparison at 4–5 years was not enough to be statistically significant. For the study to be statistically significant with a 90% power, a sample of $n = 38$ would have been needed. Moreover, the tests and scales used for assessing infants at 6 and 12 months differed from those used at 4–5 years. A standard methodology for the correct evaluation of the same characteristics at each determined age would have allowed us to properly compare and observe the evolution.

Another issue to consider is gestational age (GA). The WHO¹ has classified children born preterm as extremely preterm (< 28 weeks of GA), very preterm (28 to < 32 weeks), and moderate to late preterm (32 to < 37 weeks). Sleeping position, gestational age, and low birth weight have been described as factors associated with gross motor development.³ Manacero and Nunes² included very preterm and moderate preterm infants in their study. Therefore, results may differ depending on the GA.

Additionally, time spent at Neonatal Intensive Care Units (NICUs) was not examined. NICUs environment has been described to alter sleep patterns in preterm infants.⁵ Preterm infants with an immature brain, are exposed to several stimuli such as light, noise, and procedures, which can lead to alterations in brain function and structure.⁶

The authors acknowledge that mother-child interaction was a factor that was not taken into account. It has been described that mother-child interaction can have a good effect on sleep patterns. According to literature, maternal voice exposure has a crucial impact on sleep⁵ and the lack of mother-child attachment is prejudicial for brain structure and function.⁶ Skin-to-Skin contact or kangaroo care is a helpful method for establishing parents' attachment, decreasing infant stress, and organizing sleep patterns which, consequently, helps brain maturation.⁷

In conclusion, this field should continue to be investigated. Evidence suggests that sleep behavior produces complications in neurodevelopment. Although no association between sleep behavior and motor development was identified, further

research will be needed to understand the effects of poor sleeping in motor development and compare them with Manacero and Nunes.² A wide range of factors has to be kept in mind to obtain reliable and comparable results in further studies. Increasing knowledge in this area could promote risk prevention and minimize long-term outcomes through the implementation of strategies such as maternal voice, parents' attachment, and Skin-to-Skin contact sleep.

Conflicts of interest

The authors declare no conflict of interest.

References

1. World Health Organization. Born too soon: the global action report on preterm birth. Geneva, [cited 2021 Mar 10]. Available from <https://apps.who.int/iris/handle/10665/44864>.
2. Manacero S, Nunes ML. Longitudinal study of sleep behavior and motor development in low-birth-weight preterm children from infancy to preschool years: sleep behavior and motor development. *J Pediatr (Rio J)*. 2021;97:44–51.
3. Boonzaaijer M, Suir I, Mollema J, Nuysink J, Volman M, Jongmans M. Factors associated with gross motor development from birth to independent walking: a systematic review of longitudinal research. *Child Care Health Dev*. 2020(Nov). <https://doi.org/10.1111/cch.12830>. Online ahead of print.

4. De Beritto T. Newborn Sleep: patterns, Interventions, and Outcomes. *Pediatr Ann*. 2020;40:82–7.
5. Shellhaas RA, Burns JW, Barks JDE, Hassan F, Chervin RD. Maternal voice and infant sleep in the neonatal intensive care unit. *Pediatrics*. 2019;144:e20190288.
6. Deng Q, Li Q, Wang H, Sun H, Xu X. Early father-infant skin-to-skin contact and its effect on the neurodevelopmental outcomes of moderately preterm infants in China: study protocol for a randomized controlled trial. *Trials*. 2018;19:1–11.

Laia Álvarez Bota ^{a,*}, Eric Alcaide ^a,
Carlota Guerrero García ^b

^a *University of Barcelona, Medicine Department, Barcelona, Spain*

^b *Hospital Universitario Sagrat Cor Grupo - Quirón-Salut, Internal Medicine Service, Barcelona, Spain*

* Corresponding author.

E-mail: lalvarbo@hotmail.com (L. Álvarez Bota).

<https://doi.org/10.1016/j.jpmed.2021.04.006>
0021-7557/

© 2021 Sociedade Brasileira de Pediatria. Published by Elsevier Editora Ltda. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Reply to Letter to the Editor - Association between sleep behavior and motor development in preterm infants



Dear Editor,

We appreciate the interest in our article “Longitudinal study of sleep behavior and motor development in low-birth-weight preterm children from infancy to preschool years”¹ and your comments.² Our primary goal was to assess longitudinally whether sleep characteristics of low-birth-weight preterm infants would affect motor development during infancy and preschool years. However, Bota and collaborators have raised an important point: that there is a prominent time gap between 12 months and 4-5 years. We agree that a more exhaustive assessment throughout time would have provided more information on the preterm infants' evolution and, thus, allowed for a more solid conclusion, but, unfortunately, we lacked the resources to investigate these outcomes beyond the three-time points described in the study (at 6 months of corrected age, at 12 months of corrected age, and at 4-5 years of chronological age).

Previous authors³ have advanced our understanding of the relationship between sleep position and motor development delay by reporting that supine position was associated with delayed gross motor development at 4 and 6 months and prone position was correlated with proper gross motor

development at 4 to 10 months, but no association was established for the supine and prone positions at 12-36 months and at 11-17 months, respectively. We originally intended, as a secondary objective, to compare the findings of preterm infants with those of an age-matched control group of children born at term. However, our controls (born at term) were recruited only at 4-5 years of age, and we did not have access to their birth records to compare their data at birth with those of preterm infants—for this reason, such a comparison was not included in the study. Nevertheless, at 4-5 years of chronological age, in analyses adjusted for age, parents' level of education, and family income, sleep characteristics, and motor development were similar in preterm (n = 36) and full-term (n = 31) children. Future studies should recruit controls at birth to allow proper comparison between case and control groups over time.

Indeed, the mean gestational age in our study was 30.7 (SD, 2.4) weeks, corresponding to very preterm (28 to < 32 weeks) and moderate preterm (32 to < 37 weeks) infants according to the WHO classification,⁴ but data was analyzed using corrected age at the 12 months evaluation.

Finally, we agree that more studies are necessary to evaluate the impact of the NICU environment and early mother-child interaction across life on infants' sleep patterns. We have recently published data in a larger cohort (2.222 mothers and infants) where we observed that mothers in the depressed group were more likely to report disturbed sleep in their children, however, objective data from actigraphy did not replicate this finding. Probably maternal depression may affect the mother's impression of her infant's sleep.⁵ We acknowledge that our study has limitations as expressed in the discussion, as we have not accessed mothers' behavior.