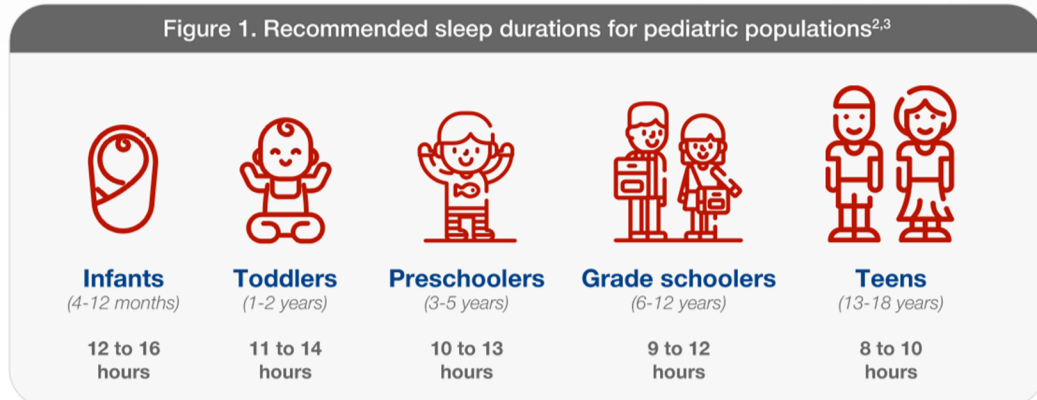


Exploring the Connection Between Infant Sleep and Cognitive Development

Sleep plays a vital role for early childhood development, supporting cognitive growth, memory, emotional regulation, and brain structure formation. Establishing healthy sleep patterns early builds a strong foundation for a child's long-term mental and emotional well-being.¹

How much sleep do children need?

Figure 1. Recommended sleep durations for pediatric populations^{2,3}



*Adapted from the American Academy of Pediatrics

The American Academy of Pediatrics (AAP) supports the American Academy of Sleep Medicine's (AASM) guidelines on recommended sleep durations for children and adolescents, highlighting the vital role of age-appropriate sleep in cognitive, physical and emotional development (Figure 1).^{2,3}



Sleep patterns develop rapidly in early childhood, especially during the first two years, as sleep duration, structure and consolidation evolve alongside brain maturation.¹

Newborns lack a circadian rhythm and sleep in short intervals. By 10–12 weeks, a circadian rhythm emerges, consolidating sleep at night. Total sleep decreases from 16–17 hours at birth to 13–14 hours by six months.¹



Sleep is associated with better memory consolidation



Infants who took more than 30 minutes of naps showed better recall of new behaviors after 4- and 24-hour delays.⁴



Infants who napped after learning showed enhanced memory retention of recently learned words and experiences.⁵



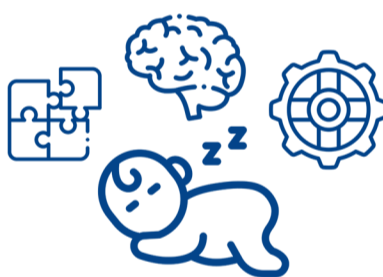
Infants who took a nap after learning two novel object-word pairs showed enhanced recognition of the words.⁶

Sleep quality is linked to general cognitive abilities

Longer nighttime sleep recorded by actigraphy showed better cognitive problem-solving abilities in 11- 13- month-old infants.^{7,8}

Greater motor activity during sleep and more fragmented sleep pattern were moderately linked to lower BSID-II MDI scores.^{7,10}

Infants with two nighttime awakenings had significantly higher Mental Development Index (MDI) scores than those with more frequent awakenings.^{7,9}



Sleep pattern is connected with emotional regulation



Sleep-deprived toddlers show a 34% reduction in positive emotional reactions to solvable puzzles and a 31% increase in negative responses to unsolvable puzzles.¹¹

Toddlers who lack sleep exhibited diminished effectiveness in tackling challenging tasks and rely on less mature coping strategies.¹²

Sleep duration is associated with physical growth



Infants sleeping <12 hours daily had higher BMI z-scores, increased skinfold thickness, and a higher risk of being overweight by age 3.¹³



Nighttime sleep under 10 hours was linked to higher daily caloric intake compared to 11–12 hours.¹⁴



Lower sleep scores were found to be associated with higher BMI z-scores, fat mass index, waist and hip circumferences and risk of obesity.¹⁵

Key Takeaways

- ✓ Sleep is crucial for early brain development, supporting cognitive growth, emotional regulation, and learning, while promoting healthy memory and overall brain function.
- ✓ Extended naps after learning significantly improved memory retention in 6- to 12-month-old infants.
- ✓ Sleep is essential for emotional regulation and problem-solving in early childhood. Sleep-deprived toddlers show less positive emotion and more frustration when solving puzzles.
- ✓ Inadequate sleep (<12 hours/day) during infancy is associated with higher BMI, increased fat mass, and a greater risk of being overweight.

References

1. Tham EK, et al. Nat Sci Sleep. 2017;9:135–149.
2. American Academy of Pediatrics. Available at: <https://www.healthchildren.org/English/healthy-living/sleep/Pages/healthy-sleep-habits-how-many-hours-does-your-child-need.aspx>.
3. Paruthi S, et al. Recommended amount of sleep for pediatric populations: A consensus statement of the American Academy of Sleep Medicine. J Clin Sleep Med. 2016;12(6):785–786.
4. Seehagen S, et al. Timely sleep facilitates declarative memory consolidation in infants. Proc Natl Acad Sci U S A. 2015 Feb 3;112(5):1625–9.
5. Friedrich M, et al. Generalization of word meanings during infant sleep. Nat Commun 6, 6004 (2015). Doi: <https://doi.org/10.1038/ncomms7004>.
6. Horváth K, et al. Napping facilitates word learning in early lexical development. J Sleep Res. 2015;24(5):503–509.
7. Jiang F. Sleep and early brain development. Annales Nestle. 2019;77(2):44–53.
8. Gibson R, et al. Actigraphic sleep and developmental progress of one-year-old infants. Sleep Biol Rhythms. 2012;10(2): 77–83.
9. Sun W, et al. A community-based study of sleep and cognitive development in infants and toddlers. J Clin Sleep Med. 2018 Jun;14(6):977–84.
10. Scher A. Infant sleep at 10 months of age as a window to cognitive development. Early Hum Dev. 2005 Mar;81(3):289–92.
11. Berger RH, et al. Acute sleep restriction effects on emotion responses in 30- to 36-month-old children. J Sleep Res. 2012 Jun;21(3):235–46.
12. Miller AL, et al. Toddler's self-regulation strategies in a challenge context are nap-dependent. J Sleep Res. 2015 Jun;24(3):279–87.
13. Taveras EM, et al. Short sleep duration in infancy and risk of childhood overweight. Arch Pediatr Adolesc Med. 2008;162(4):305–311.
14. Fisher A, et al. Sleep and energy intake in early childhood. Int J Obes (Lond). 2014;38(7):926–929.
15. Taveras EM, et al. Chronic sleep curtailment and adiposity. Pediatrics. 2014;133(6):1013–1022.