

All about... sleep

Getting enough sleep – and the right sort of sleep – is a crucial component for development. *Natasha Kirkham* explains why, and considers what advice practitioners can give to parents

PHOTOGRAPHS AT CHILDFIRST, NORTHAMPTON, BY TONY HARDACRE



With the possible exception of food, it is hard to imagine a topic that takes up more of a caregiver's mind than sleep. Does my child sleep enough? Do they sleep at the right times? Does your child sleep more than mine, or better than mine? Why is this child always tired? What about the great should they/shouldn't they nap debate? And let us not even tip-toe over to sleep training and the various regimens that parents are encouraged to adopt.

Yet there is very good reason to think and talk about sleep so much. Although we already know that a rested child is a happy child, it turns out that sleep does much more than just affect mood. In fact, sleep plays an essential role in a child's brain function and cognitive development. As caregivers and practitioners, what could be more important to us than that?

WHAT IS SLEEP?

How can we define sleep? Is it really (as defined on Wikipedia) 'a condition of body and mind, which typically

Sleep helps us to organise the information of the day, allowing for better memory retrieval later

A child's brain actually changes during sleep

recurs for several hours every night, in which the nervous system is inactive, the eyes closed, the postural muscles relaxed, and consciousness practically suspended?' No. It is not. Sleep is not the passive state many people once considered it to be.

During sleep, some parts of the brain quieten – like the pre-frontal cortex, which underlies attention, working memory and planning (all we as humans need to navigate our complex world). However, other parts of the brain wake up – like the mid-brain, which acts as a relay station for visual and auditory information. ➤

Other than this being a neat fact, why is it so important? Well, it means that sleep helps us to organise the information of the day, allowing for better memory retrieval later. And that means sleep actively moderates learning and development. So, telling someone to get a good night's sleep before a big test is not just about being alert during the test; it actually will support better memory of the studied subjects.

WHAT HAPPENS DURING SLEEP?

Throughout a night's sleep, our brains move through a series of stages during which brain waves slow down. This period of slow wave sleep is accompanied by relaxation of the entire body. Heart rate, blood pressure and body temperature all fall. It is this stage that most people think about when they think about sleep – the relaxation, the unconscious state. After these stages, however, brain activity changes radically, from that deep slow wave sleep to rapid eye movement (REM) sleep, which is when active dreaming occurs.

This stage is characterised by brain waves that are startlingly similar to those observed during waking. The younger you are, the more time you spend in REM sleep. Given that infancy and childhood is a critical time in learning, there is a strong suggestion that the brain activity occurring during REM sleep may be important for actual physical brain development. In other words, a child's brain actually changes during sleep.

HOW DO YOUNG CHILDREN SLEEP?

Throughout early and middle childhood, sleep patterns become more consistent and stable, similar to those of adults. Yet, in early childhood (from one to five years) children continue to need a sleep cycle that is comprised of multiple naps during the day and an extended period of sleep at night.

According to the NHS, young children need on average ten to 12 hours of sleep, including an hour nap. The United States National Sleep Foundation states that three- to five-year-olds should sleep 11 to 13 hours.

It is worth pointing out that though sleep requirements do vary across individuals, these guidelines are based on many scientific research programmes across the domains of paediatrics and child psychology.

They can, therefore, definitely help us figure out whether children are getting the sleep they need in order to function at their best in both school and social situations.

HOW ARE CHILDREN AFFECTED BY LACK OF SLEEP?

Dr Ronald E Dahl, professor of psychiatry and paediatrics at the University of Pittsburgh, is a paediatrician with many years of research behind him on the effects of sleep on emotion and behaviour. He states that '[m]any toddlers and [primary] school children respond to insufficient sleep with irritability, crankiness, low frustration tolerance, and short attention span.'

It is certainly not difficult to recall times from our own lives when we did not get enough sleep. And here's what we, as parents and practitioners know: we know that when our sleep has been interrupted, and we are tired, we don't function well. We feel grumpier and our tempers are shorter. Our decisions are poorer and attention spans dwindle. Emotions are closer to the surface. And life does not go as smoothly as it would if we were rested.

Research on sleep apnoea (a condition in which sleep is interrupted due to breathing difficulties) has shown memory deficiencies in sufferers. There is even a fun study that shows that our cognitive function during extreme tiredness is similar to that of being legally drunk. So, why would we think that interrupted sleep would be any less catastrophic for a child? Indeed, given the fact that childhood is a time of constant brain development and growth, perhaps we should even hypothesise that sleep disturbance could be worse for a child.



Children need a sleep cycle comprising naps during the day and an extended period at night

ADVICE TO PARENTS

Sleep issues in children are very common. Approximately one in five parents show concern about their child's sleep habits, and many teachers and practitioners notice children yawning in classrooms. In fact, in an American survey of teachers from Reception to Year 4, the teachers reported that on average 10 per cent of their students were actually falling asleep during class.

But let's take a step back from the research for a moment and consider what advice you can give to parents. If a parent asks you about their child's sleeping habits, it is easy to quote the guidelines outlined above. However, there are considerable individual differences in sleep duration (and presumably sleep needs) across all ages, so you will have to consider the science-based averages alongside the sleep needs of the individual child.

When assessing a child's need, there are two important things to remember.

- All children, no matter what, need more sleep than adults. This is an incontrovertible fact. So if the parent requires seven hours of sleep to feel at their best, then their





Light from screens may actually turn off the sleep hormone, melatonin

the child's sleeping environment and activities in the lead-up to bedtime.

In fact, something as simple as environmental noise (for example, traffic, siblings, televisions) can be enough to interrupt a light sleeper. Additionally, stress can mess up sleep to the same extent in children as in adults.

Although it is a complicated multi-faceted relationship, with stress both causing and being the cause of sleep disturbances, there is plenty of research showing that stress hormones give rise to lighter sleep with more night wakings. Reviews of 'mindfulness-based' meditations show some success with helping to reduce stress and thus alleviate sleep disturbances.

If the child is a light sleeper, reducing noise and light can be the perfect solution. As well, activities involving screens (for example, iPads, TVs, computers) should not be used right before sleep – the light from the screens actually promotes alertness.

Furthermore, some new research has suggested that the light emanating from screens can actually turn off the sleep hormone (melatonin). This is clearly not a good thing for a child with sleep issues.

And, as will come as no surprise to anyone who has read even just one parenting article, routine continues to be the gold standard of all caregiving. Sleep is no exception.

A regular bedtime, with regular soothing events (baths, stories) really does work. Add that to what we term 'bedtime expectations' ('we expect you to sleep in your bed, throughout the night', with perhaps a little treat if it is done) and most childhood sleep issues can be conquered.

And they should be, because, after all, it is not just the child who suffers as a result of inadequate sleep. A child not sleeping well will have an impact not just on the child but on the rest of the family, as well as on the teachers and children that they interact with.

However, identifying the cause of some persistent sleep problems may require the help of doctors and/or child psychologists. Some chronic health issues, such as asthma or sleep apnoea, can lead to sleep disturbances. Certain psychiatric disorders such as autism spectrum disorder and attention deficit hyperactivity disorder also include sleep issues in their symptoms (although sleep issues are in no way diagnostic of either of those conditions). ➤



child needs to be sleeping more than that.

- The quality of sleep is important. If a young child sleeps only eight hours but those eight hours are uninterrupted, and the child seems socially and cognitively capable during the day, without disintegrating into tears and tantrums, then there is nothing to worry about. However, if a child is waking up consistently throughout the night and having trouble

falling back to sleep, then their quality of sleep is at risk. In other words, if a child can go to bed, fall asleep easily, wake up easily, and not be tired during the day, then they're probably getting enough sleep.

Where there does seem to be a problem with the child's sleep routines, then you need to work with the parent to establish a possible cause. Common causes – but ones that are overlooked surprisingly often – are

SLEEPING AND LEARNING

Let's now return to the science. Decades of research show that the effects of sleep deprivation and sleep disorders on human functioning and well-being are negative. And yet, even though all caregivers and practitioners know that tired children are harder to teach (or manage) than rested children, no one has looked into the real, true effects of sleep deprivation on learning and cognitive development – until very recently. And, in news that comes as a shock to no one, least of all people who live with and care for children, it turns out that sleep is quite important for thinking.

Unfortunately, this information has not been clearly integrated with the (equally true) understanding that childhood is a time of rapid learning and that children are little sponges, ready and willing to soak up all information available.

So, there has been a tug of war between people who believe that if children stay awake longer they are maximising this time of enhanced learning and those who believe that learning can be hindered by tiredness.

This tug of war was recently played out in the nap debate in the United States, with primary schools stopping kindergarten (Reception) children from napping. The theory behind this decision was that learning happens so quickly and so efficiently at this age that napping would interrupt this learning. However, in my field of developmental psychology, a very different viewpoint is being espoused.

Rebecca Gomez, PhD (University of Arizona), a developmental scientist who is an expert in sleep and its relationship with learning, published a ground-breaking article in 2006 showing that even a little nap could change babies' learning abilities.



She tested two groups of 15-month-olds on an artificial language learning task (using a made-up simple grammar of two- or three-syllable fake words). Both groups of babies were exposed to the same artificial language, but one of the groups got to nap before being tested on it. The babies who were tested after a nap performed significantly better than

Research suggests babies learn better if they have had a nap

those who did not nap. This suggests that sleeping helps promote learning even in babies. And it doesn't stop there: research with adults shows that naps are as beneficial for visual perceptual learning as a night of sleep is.

Another recent finding, from a large longitudinal study (in which 1,492 children were followed from two to six years of life), demonstrates that short sleep duration in the first three years of life might be associated with hyperactivity/impulsivity and lower cognitive performance on neurodevelopmental tests at age six. This is a very impressive and potentially inflammatory finding and clearly needs some clarification (reasons for the short sleep duration, for example), but the study is well controlled and potentially very important.

According to the main author of this study, Évelyne Touchette (Sleep Disorders Centre, Sacré-Coeur Hospital, Montreal, Canada), 'a modest but chronic reduction of just one hour of sleep nightly in early childhood can be associated with the child's

The results are consistent: better learning occurs after better sleep





cognitive performance at school entry? It is time to stop thinking that sleep is not that important.

Another very exciting study done in 2003 by Avi Sadeh, a clinical psychologist at Tel Aviv University, Israel, backs up Dr Touchette's findings. Dr Sadeh monitored 77 ten-year-olds' sleep behaviours for two nights and measured how much, on average, each child slept at night. He then asked half of the children to go to bed one hour earlier, and half the children to go to bed one hour later for the next three nights.

Children were tested on a series of computer-based tasks that reflect skills needed in a classroom (reaction time, visual memory, attention) both before and after the one-hour change in sleep duration.

The results were surprising in their sheer magnitude, with statistically significant improvements in the extended sleep condition. Although this research does not help us understand individual sleep needs, it certainly does underline the need to



monitor and address children's sleep.

Increasingly in my field of study (how children learn), we have been adding sleep as a main variable in our research programmes. Many studies investigating cognitive development, from the developing understanding of literacy to maths to science, have started including data on the infant or child's sleep habits, and/or manipulating whether testing occurs before or after naps/full night of sleep.

And the results are consistent: better learning occurs after better sleep. And with each new study that gets published, we are becoming more and more aware of just how important and wide reaching the effects of sleep are on children's development.

So tonight, turn off the TV, put the iPads down and enjoy a beautiful night of active, constructive sleep. ■

Dr Natasha Kirkham is a senior lecturer in psychology at the Centre for Brain and Cognitive Development, Birkbeck, University of London

REFERENCES AND READING

- 'Associations between sleep duration patterns and behavioral/cognitive functioning at school entry' by E Touchette, D Petit, JR Seguin et al (2007) in *Sleep*
- 'Extended wakefulness: Compromised metabolites in and degeneration of locus ceruleus neurons' by J Zhang, Y Zhu, G Zhan, P Fenik, L Panosian, MM Wang et al (2014) in *The Journal of Neuroscience*
- 'Light level and duration of exposure determine the impact of self-luminous tablets on melatonin suppression' by B Wood, MS Rea, B Plitnick and MG Figueiro (2013) in *Applied Ergonomics*

MORE INFORMATION

- For 'sleep' resources, look out for our next *Nursery Equipment* supplement, due out on 19 May
- For sleep routines in the nursery, see 'Rest assured' by Liz Dolan, or for more information on brain research see 'Sleep tight' by Annette Karmiloff-Smith, both at www.nurseryworld.co.uk

- MENDS sleep study, www.guysandstthomas.nhs.uk/our-services/childrens/services/childrens-neurosciences/childrens-sleep-centre/specialties.aspx
- 'Moderate sleep deprivation produces impairments in cognitive and motor performance equivalent to legally prescribed levels of alcohol toxin' by AM Williamson and A-M Feyer (2000) in *Occupational Environmental Medicine*
- 'Naps Promote Abstraction in Language-Learning Infants' by RL Gomez, RR Bootzin and L Nadel (2006) in *Psychological Science*
- 'Sleep habits and sleep disturbance in elementary school-aged children' by JA Owens, A Spirito, M McGuinn and C Nobile (2000) in *Journal of Developmental Behavioral Pediatrics*
- 'The effects of mindfulness-based stress reduction on sleep disturbance: a systematic review' by NY Winbush, CR Gross and MJ Kreitzer (2007) in *Explore: The Journal of Science and Healing*
- 'The effects of sleep restriction and extension on school-age children: what a difference an hour makes' by A Sadeh, R Gruber, and A Raviv (2003) in *Child Development*
- 'The impact of inadequate sleep on children's daytime cognitive function' by RE Dahl (1996) in *Seminars in Pediatric Neurology*

