

What the Research Says

Peer-reviewed evidence behind our circadian-care approach.

Children's bodies run on a 24-hour clock. It's set by light, movement, and routine. When it's well-aligned, children sleep deeper, behave better, and learn more easily. When it's disrupted, almost everything gets harder. The good news: the levers that align it are simple, free, and well-evidenced.

What follows is a plain-English summary of the strongest peer-reviewed evidence behind our approach. All citations are publications indexed on PubMed. DOIs are listed at the end and link to the original article.

1. Young children are far more sensitive to evening light than adults

This is the finding that should change how every nursery and every family thinks about evening lighting.

In a study of preschoolers (3–4 years old), one hour of bright light in the evening **suppressed melatonin by 88%**. For 7 out of 10 of the children, melatonin was still below half of normal levels 50 minutes after the light was turned off. Their bodies don't bounce back as quickly as adults' do. ¹

A larger follow-up study tested 36 preschoolers across light intensities from very dim (5 lux — lower than most lamps) all the way up to bright office light (5,000 lux). Across the whole range, **melatonin was suppressed by 70–99%** (average 85%). Even the dimmest light tested suppressed melatonin by 78%. The takeaway: **your child's body responds to evening light at intensities that adults barely register.** ²

Why this happens: young children's eyes have clearer lenses and larger pupils than adults. More light reaches the retina. The signals sent to the body clock are stronger. The same lamp that doesn't bother an adult can shut down a child's sleep hormone.

2. Why blue light specifically — and why it tricks the brain

Light isn't all the same. The body clock is most sensitive to **blue wavelengths** (around 460 nanometres). When blue light hits the eye, the brain reads it as "the sun is up." Melatonin is held back. The body stays in day mode.

A systematic review of 128 studies confirmed evening blue light suppresses melatonin in a dose-dependent way, with stronger effects at shorter (bluer) wavelengths. Even very low (5–10 lux) night-time light can shift the circadian clock. ³

Modern problem: most LED lighting and almost all screens are heavily weighted toward blue. The light we live under in the evening looks nothing like the firelight humans evolved with. A small

experiment in 9-year-olds found that **even one evening of pre-bed smartphone use shortened sleep, increased night waking, and worsened next-day attention and reaction times.** Five nights in a row also dented working memory and physical performance.⁴

In teenagers, blue-blocking glasses worn while using LED screens partially restored evening melatonin and reduced alertness before bedtime — a clean demonstration that **it's the blue wavelengths, not the screen itself**, that does the damage.⁵

3. What screen time does to preschool brains specifically

A study using EEG (which measures brain activity) on typically-developing preschoolers found that **regular screen exposure was linked to brain activity patterns that resemble those seen in children with attention difficulties** — more slow theta waves, fewer fast beta waves. A comparison group exposed to stories instead of screens showed gains in visual attention. The screen group did not.⁶

A large analysis of **over 100,000 children** in the US National Survey of Children's Health found that excessive screen time was linked to higher odds of behavioural and conduct problems, developmental delay, speech disorder, learning disability, autism spectrum disorders, and ADHD. The relationship was dose-response: more screen time, higher odds. **The effect was strongest in preschoolers** (0–5 years) — stronger than in older children and teenagers.⁷

These studies show a strong **correlation** between screen time and developmental and behavioural problems — they don't prove direct cause, and other factors (family context, stress, pre-existing differences) almost certainly play a role. But the size and consistency of the evidence, particularly in the youngest age group when the brain is developing fastest, is what most major paediatric guidelines lean on when recommending screen-time limits for under-5s.

4. Sleep is when the brain develops — losing it has costs

Sleep isn't "off." It's when the brain consolidates memory, builds new connections, and clears metabolic waste. A neuroscience review showed that even short periods of sleep loss **change which genes are switched on and how proteins are built in memory-related brain regions**. The conclusion: adequate sleep is essential for healthy brain function in children, teens and adults alike.⁸

A meta-analysis of 1.1 million people across the Netherlands, the UK and the US found **roughly 1 in 4 sleeps less than the age-appropriate recommendation**. Over half of teenagers fall short of the recommended 8–10 hours, and significant numbers of children are also under-sleeping.⁹

5. Outdoor time is the single biggest lever you can pull

A meta-analysis of 25 studies (mostly children) found more time outdoors significantly **reduced the risk of becoming short-sighted** and slowed the myopic shift over three years.¹⁰ The international IML consensus on myopia prevention concluded that the safest, most aligned-with-general-health strategy to slow childhood myopia is encouraging children to spend more time outdoors.¹¹

And outdoor time helps sleep too: in **nearly 47,000 children**, those getting at least two hours of outdoor activity a day had about a third lower odds of insufficient sleep than children outside less than an hour.¹²

6. Consistency tracks with health

A systematic review of 41 studies in over 92,000 adults found **later bedtimes and inconsistent sleep timing were tied to worse health outcomes**; regular bedtimes tracked with better health.¹³ The strongest evidence is in adults, but the underlying biology is the same in children — and consistency is almost always cited as the single most actionable sleep intervention for parents.

What this all means in one sentence

Children are more biologically sensitive to evening light than adults, more affected by screen time than older children, and more dependent on outdoor daylight to set their body clock. Circadian care is a 24-hour partnership — the nursery anchors the day with outdoor time, real daylight, and red-spectrum lighting during nap and rest; families anchor the evening and night with the routines in our companion guide. Both halves matter.

References

All citations are peer-reviewed publications indexed on PubMed. DOIs link to the original article.

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This summary accompanies our practical guide, **Circadian-Friendly Home Routines**, available at circadiannest.co.uk. Citations from PubMed.

This summary is general educational information based on peer-reviewed research, not medical advice. For specific concerns about your child's sleep, behaviour or development, please speak to your GP, health visitor or paediatrician.