



The Children's Best Bedroom Environment for Sleep (CBBES) Parents' Manual



FACULTY OF
REHABILITATION
MEDICINE
UNIVERSITY OF ALBERTA

Pursuing **your best**

Department of
Occupational
Therapy

Dear Parents:

Welcome to the **Children’s Best Bedroom Environment for Sleep (CBBES)** manual. If you are concerned about your child’s sleep- you are not alone. Every day we hear more and more about how much sleep matters for children. But it can be quite a challenge to find out how sleep works and what you can do to help your child get a quality sleep. That’s what the **CBBES manual** is for- helping you understand sleep so you can make good decisions based on the best research available.

The **CBBES manual** was developed by researchers in the Department of Occupational Therapy, Faculty of Rehabilitation Medicine at the University of Alberta. We designed it for busy parents like you, who are concerned about their child’s ability to get the best quality of sleep possible.

The amount of information available can be overwhelming, and it is difficult to know what is reliable and based on facts, not fads. We understand that this makes it hard for you and other parents to find information to guide you in making your decisions. Our role as researchers is to make information, based on the best scientific evidence possible, available so you can make informed choices about your child’s sleep.

This manual has two goals:

1. To help you understand the science of children’s sleep, and
2. To provide you with research-tested ways to change your child’s bedroom environment so he or she gets the best sleep possible.

How to use the CBBES manual

It is best to start at the beginning and read through the whole CBBES manual. That way you will understand the sleep science supporting the recommendations in this manual. Once you understand the sleep science you will be able to select recommendations that best fit your child and family. Not all of the recommendations will work for every child so don’t feel discouraged if you need to be creative- after all, being creative is what parents do best!

This manual has used the best scientific evidence available regarding the sleep environment. Key references are included on page 25. For more information about behavioural interventions and other aspects of sleep you can visit the SleepRight website at <http://www/Sleepright.ulberta.ca>.

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Disclaimer:

This manual was developed as a guide only for parents and healthcare providers and does not constitute nor replace healthcare professional advice.

This manual should not be used as a substitute for information/advice provided by a healthcare provider. If you or a person you are caring for has a health-related concern please consult a qualified healthcare provider.

Neither the University of Alberta nor any of the contributors/authors of this manual are providing diagnostic or treatment services through the information provided in the manual. Moreover, while every effort has been made to ensure the accuracy of the content of the toolkit at the time of publication, there is no guarantee as to the completeness nor accuracy of the information contained herein: and no liability or responsibility is accepted for the use or misuse of this manual.

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Introduction

To better understand ‘what’ you can do to help your child sleep, you need to first understand ‘how’ sleep works and ‘why’ your child might be having problems. All of the following information is from recent research. The numbers at the end of a sentence tell you what specific scientific publication the information in the **CBBES manual** is based on. A list of all these references is on page 25.

Children’s sleep problems

As many as three of every ten young children experience sleep problems ^{1,2}.

• Sleep problems can include: not getting enough sleep, poor sleep quality, restlessness and frequent waking up during the night. Some children resist going to bed. Some children have other health conditions that interfere with their sleep. Examples of these include asthma, pain, and sensory problems such as being hypersensitive to certain textures or sounds. Sometimes medications can interfere with sleep ².

If your child has a health condition you should discuss sleep with a healthcare provider. The **CBBES manual** is only intended to help you understand the environmental factors that can interfere with sleep and is not intended to substitute for healthcare provider assessment and treatment

Do sleep problem last?

It may be encouraging to know that many children’s sleep problems are temporary. Often they get better over time, as your child ages and matures. However, for children with chronic health conditions, like cerebral palsy or developmental delay, poor sleep can remain an ongoing problem.

Fortunately, scientific research has shown that there are many practical steps parents can take to help improve their child’s sleep.

The **CBBES manual** focuses on the important role of the bedroom environment in helping children sleep. The manual also shows you how to assess the bedroom environment and offers a number of research-tested ways to improve the environment to help your child sleep.

This manual will tell you about the four key bedroom environment factors that influence children’s sleep:

- Light
- Temperature
- Sound
- Bedding

The second half of the **CBBES manual** will explain how to assess and improve your child’s bedroom environment to help him or her sleep.

Part 1

Sleep Science Basics

Why is sleep important?

When children and adults don't sleep their mood is often affected. Children without enough sleep have difficulty thinking, concentrating, staying alert and doing daily activities. Not having enough sleep interferes with a child being able to learn, play, manage daily activities and make friends. Not having enough sleep also affects children's ability to heal, digest food and produce body chemicals and hormones that are important to physical function, emotions, thinking activities, and overall health³. Hyperactivity and irritability can sometimes be signs of insufficient sleep.

Language development and success at school can all be affected if a child suffers from sleep problems. Also, children with sleep deficiency are at higher risk of developing health problems (such as obesity, diabetes and depression) later on in life.

In summary, sleep deficiency in childhood can interfere with health throughout a person's whole life.

There are many factors that are important for quality sleep. Sleep science can help us to understand the importance of the environment.

The Science of Sleep

Sleep occurs in cycles throughout the whole sleep period. Each cycle lasts about 90 minutes. Each cycle also consists of four stages⁴: This means a night's sleep is composed of a series of 90 minutes cycles. It is normal for your child to return to light Stage 1 sleep each cycle so you should not be overly concerned about light sleep at times during the night.

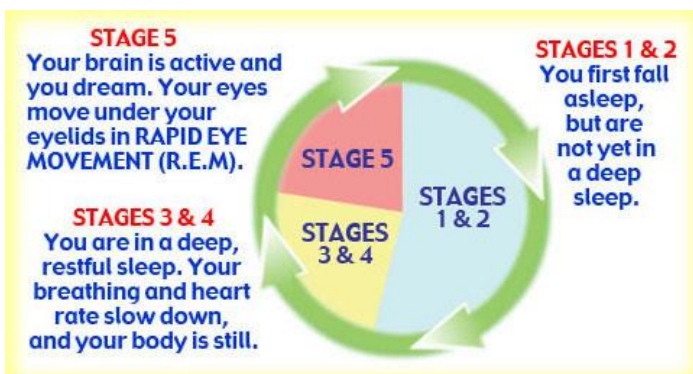
- Stage 1- light sleep
- Stage 2- moderately deep sleep
- Stage 3- very deep sleep
- Stage 4- REM (Rapid Eye Movement) sleep.

Stages 1 through 3 do not involve REM. During these stages your child's body carries out functions that are important to healing, digestion and hormone production.

Stage 4 (REM sleep) is also referred to as 'dream sleep' because this is when dreams are remembered. REM sleep is very important for memory, learning, concentration and emotions. Children often have more REM sleep than adults. It is possible for a child to achieve only Stage 1 and 2 sleep because of factors (such as light or noise) in the environment that prevent them from moving into deep Stage 3 sleep and REM. Each stage of the sleep cycle occurs in order and it is not possible to skip Stages 1 and 2 to go directly to deep sleep and into REM sleep.

Sleep requirements⁴:

- **Infants** < 6 months: up to 16 hours of sleep a day
- **6 months** 12 hours plus two naps.
- **Preschoolers** 12 hours plus one nap



Sleep is controlled by two body mechanisms:

1. **Sleep-wake homeostasis:** This is also called "Sleep Drive". Basically, sleep drive means that the need for sleep increases the longer someone has been awake.
2. **Circadian rhythm:** This is also known as our "body clock". Circadian rhythm in your body regulates feelings of sleepiness and wakefulness.

The changing amount of light we are exposed to between day and night regulates our circadian rhythm to influence sleeping and waking⁶. Light and dark are the most important influence on circadian rhythm. Circadian rhythm regulates the timing of sleep, and also influences change in our body temperature, thirst and appetite.

The hypothalamus (see picture) is an area of the brain that controls circadian rhythm⁴. The amount of blue spectrum light taken in by the eyes determines whether your child's brain is signaled to produce chemicals and hormones to keep him awake or help him fall asleep and stay asleep.

Basically, the greater the amount of blue spectrum light at night – the more alert your child will be and less likely to get enough sleep. The less blue spectrum light before bed and at night - the easier it is for your child to fall asleep. Blue spectrum light is produced by natural daylight, electronic devices and artificial lighting.

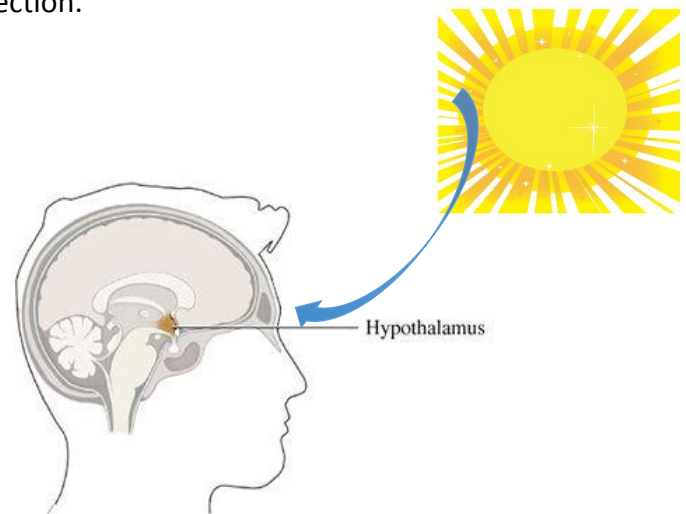
Core body temperature also changes with the circadian rhythm. Core body temperature is highest during the day to keep your child alert. At night core body temperature needs to drop slightly to help your child sleep. This temperature cycle appears to affect REM sleep. The amount of time spent in REM sleep is longest when body temperature is at its lowest⁶.

The hypothalamus contains an area called the pineal gland. The pineal gland is important in circadian rhythm because as it gets darker this is

the area that controls production of the hormone melatonin⁶. Melatonin is an important hormone because it promotes sleep. The following section on **Light** (page 8) will give you more detail about melatonin⁴.

Circadian rhythm also regulates the amount of the stress hormone cortisol that your body produces. Cortisol also follows a daily cycle. Cortisol is lowest between 12-4am and then starts to build to help us wake up⁶.

In summary: Circadian rhythm is influenced by light and temperature. We need bright light to stay alert, and dark, cool environments to sleep better. Sound and bedding are two more important influences on sleep. All four environmental influences will be discussed in detail in the next section.



Important points:

- Sleep is important for developing emotional, cognitive and social skills.
- Reduced sleep in children is associated with behavioral problems.
- Your child needs all 4 stages of sleep.
- Circadian rhythm is important for regulating the sleep-wake cycle.
- A hormone (melatonin) is produced in response to darkness. It helps promote sleep.
- The stress hormone cortisol is low during sleep.



How Light Affects Sleep

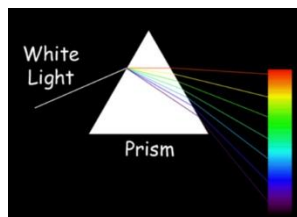
Light is perhaps the most important environmental influences on your child's sleep. Specifically, **light at the blue end of the light spectrum** is a key influence on circadian rhythm. Children need lots of blue spectrum light in the daytime and as little blue spectrum light as possible in the 2 hours before bed.

Blue spectrum light is produced by:

- Natural sunlight
- Televisions
- Electronic games, tablets, computers and lap tops
- Artificial light from light bulbs and florescent tubes

Blue spectrum light sends a message to the hypothalamus (see page 7) in the brain to stop producing melatonin. That's a good thing in the daytime when we need to be awake, but at night your child needs to produce melatonin to go to sleep and stay asleep.^{7,8,9}

Light is measured in **lux**. Research shows that blue spectrum light of more than **30-40 lux can prevent your child from producing melatonin**. Also, once melatonin production is slowed down by blue spectrum light it can take 60-90 minutes in the dark for it to become active again. Laptops and electronic tables produce high amounts of lux and are held close to the eyes- that's why they should not be used close to bedtime.¹⁰



The amount of blue spectrum light in a child's bedroom can add up if there are a number of light sources. For example sitting in a bright room, texting on a smart phone, having the television on, can add up to a high amount of light exposure and lux.

Average lux levels

- | | |
|------------------------------|--------------|
| • Sunny day at noon | 5,000-10,000 |
| • Average office | 400-500 lux |
| • Living room in the evening | 300-400 lux |
| • Laptop | 25-80 lux |
| • Smart phone | 10-45 lux |

Note: Lux emission from electronic devices is quite varied depending on the brand.

What does this mean for your child?

Bright blue spectrum light exposure within the 90-120 minutes before bed can suppress melatonin production and so interfere with sleep. Also, sources of light during the night can interfere with melatonin production and deep sleep. For example if there is light coming through the curtains, under the door from the hallway, or from a night light, the light level may exceed 30 lux and interfere with your child's sleep.

Light and electronics are an important part of our lives. We use these devices for entertainment and for learning so we can't, and don't want to, just turn everything off. The good news is there are ways to reduce the amount of blue spectrum light exposure your child receives in their bedroom environment. See page 20 for practical, research tested options to find the ones that are right for your child and family.

Key points

- Blue spectrum light suppresses production of the melatonin need for sleep.
- Blue spectrum light sources include electronic devices, lap tops, tablets, smart phones and televisions.
- Blue spectrum light exposure above 30-40 lux can suppress melatonin production by 90-120 minutes.
- **You can measure lux** with a smartphone light meter app (see the Resource section for more information).



How Temperature Affects Sleep

Temperature is an important influence on your child's circadian rhythm. High or low temperatures in the bedroom environment can disrupt sleep. This is an even greater problem for children who cannot easily move around in bed. The ideal temperature for sleep is recommended to be between **20-22 degrees Celsius**.²⁰

Why is temperature important?

Each person's circadian rhythm causes his or her core body temperature to vary over the 24 hour period each day. Your child's core body temperature will usually be highest around 3pm in the mid-afternoon and lowest around 4 am in the morning.^{6,3}

- For sleep to occur your child's core body temperature needs to drop slightly. This drop of a few degrees helps your child fall asleep and stay asleep.
- Core body temperature decreases until about 3am and then starts to increase gradually which helps your child prepare to wake up.
- Blood flow to the skin is also affected and changes over the sleep period.

The temperature in the bedroom combines with the temperature created by trapped body heat when your child is under the covers. If the combined temperature is greater than 22 degrees Celsius or cooler than 18 degrees Celsius it can interfere with your child's ability to sleep. Most people can find the right balance by adjusting bedding and/or room temperature. For example, if your child is very fond of warm flannelette sheets and pajamas, the bedroom temperature might need to be decreased slightly more.

During the REM stage of sleep we are not as able to shiver or move around – this means we are less able to regulate our own body temperature.¹⁵ Children usually have longer periods of REM sleep later in the night. This means that they need to be

cool to go to sleep but by around 3 or 4 am they need to have a warmer temperature or more bedding to stay comfortable and asleep. The best solution is using timers on fans and heaters and programmable thermostats.

Important considerations:

- Exercise and **vigorous play** close to bedtime raise your child's core temperature and making it difficult for them to sleep.
- It can take up to two hours for elevated core body temperature to drop.
- Showers and baths before bed can raise core temperature and then, when the core temperature drops, the child becomes sleepy. For more about this see "passive body warming" on page 24.
- **Sleeping position** can also raise core temperature- when a child lies on his or her side there is less contact with the mattress and less warm air gets trapped between the bedding and body.¹³ This means that side lying is often a cooler position. However, for medical reasons, some children need to sleep on their back (for example, children with high muscle tone, contracture, and muscle tightness). For these children adjustable bedding that allows for core temperature fluctuation is important.
- **Bedding that is in layers** and easily pulled up or thrown off can also help with regulating core body temperature as it changes during the sleep period.

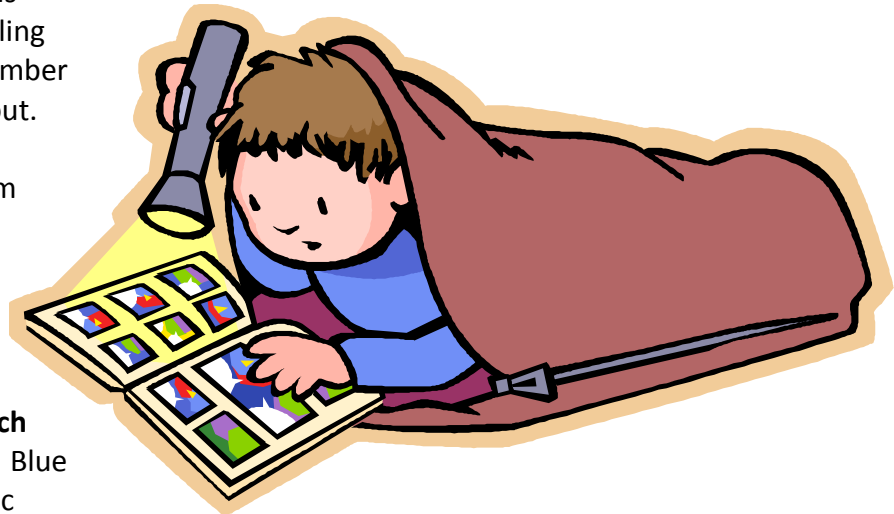
Key points:

- A slight drop in core body temperature helps your child fall asleep.
- A further slight drop of core body temperature as sleep continues is necessary to stay asleep.
- Temperatures that are lower than 18 degrees Celsius, or higher than 22 degrees Celsius can disturb sleep.

An example of how light can interfere with sleep: “Dustin can’t sleep”

Dustin is a 3 year-old boy. He lives with his parents and cat in a home just outside of Edmonton. Dustin loves trains, he enjoys playing with trains, watching train movies and making train noises. He also loves playing with a train game on his electronic tablet. His mother lets him play with it for 2 hours before he goes to bed while she and his father are tidying up after dinner. After Dustin gets ready for bed his dad reads him an interactive Thomas the Tank Engine story, also on his electronic tablet. Dustin has difficulty falling asleep and often gets up out of bed a number of times once his parents turn the light out. Sometimes, when he is having difficulty sleeping, his parents let him sit with them while they watch TV. Dustin goes to preschool in the afternoons, because he often needs to sleep in late, sometimes until 11am.

In this example **Dustin is getting too much blue spectrum light during the evening.** Blue spectrum light coming from his electronic tablet and the television suppress his body’s ability to produce the melatonin he needs to fall asleep and stay asleep.



There are a number of environmental changes Dustin’s parents can make to help decrease his exposure to blue spectrum light before bed and once he is in bed for the night.

See page 20 for a list of **research tested suggestions** to reduce blue spectrum light exposure at night.

An example of how bedtime activity can interfere with sleep: “Isabel is very busy”.

Isabel is 3 ½ years old. She has lots of energy and is very active! Her parents try to keep her as busy as possible. She goes to preschool in the morning and takes a nap in the afternoon. Her regular bedtime is 7pm but on the evenings she has skating lessons and gymnastics club Isabel does not get home until at least 630 and so seldom gets to bed by 7pm.

Her mother says she tries to keep her active in the evenings because that way Isabel will be tired out and fall asleep more quickly. However, Isabel has a hard timing getting to sleep after a very busy evening, and she gets upset and cries. Isabel’s mother says that often she seems to pick a fight with her parents and her older sister at bedtime. Isabel’s mother also keeps the bedroom warm (about 25 degrees Celsius) because Isabel kicks off her covers at night and her mother is worried she will get cold.

Isabel’s **core body temperature** becomes raised when she has vigorous activity (like gymnastics) before bedtime. A raised core body temperature takes about two hours to drop enough so that Isabel can sleep more easily. Also, because **the bedroom is kept above the recommended** temperature (between 18 and 22 degrees Celsius), she is less able to stay asleep. Being unable to stay asleep means she is unlikely to get the **REM sleep** she needs for emotional development and learning. Instead she ends up unrested, cranky, and easily upset.

Page 21 has **research tested recommendations** to help create a good temperature for sleep in the bedroom environment.





How Sound Affects Sleep

Sound in the bedroom

A quiet environment is important for quality sleep. Certain types of sounds, and sound over a certain level of loudness, can cause physical reactions in your child's body that will interfere with him or her going to sleep and staying asleep.

Sound is measured in decibels (also written as dB). Sounds that are between 30 and 40 decibels can cause your child to wake up. Sounds that are 60 decibels or greater can cause a stress response in your child's body and his heart rate will increase, breathing becomes more rapid and stress hormones are released. All of this interferes with sleep.

Ideally noise levels in the bedroom should not be above 30 decibels (see the box for more information about decibels). Noises that are sudden and infrequent (like a door opening and closing, or a burst of laughter on the television) are the most alerting. If the noise is constant and with a steady, unchanging sound (like an air conditioner or a fan) it will be less alerting. That is why running a fan at night is often a good strategy to block out other infrequent noises.

Noise affects sleep and often causes awakenings.

- Noises outside the bedroom and outside the home are also a problem.^{17,18}
- Noise disturbances at night have also been shown to affect mood and level of fatigue during the day.

During sleep we are especially sensitive to noise:

- Noise can disturb sleep even when it does not wake your child up. This is because noise influences the body's essential functions including release of hormones (like the stress hormone cortisol), and changes in heart rate, blood pressure, breathing rate and muscle tone.¹⁸

Environmental noise will impair sleep and prevent your child from going through all four stages of the sleep cycle (see page 6). For example your child may stay

lightly asleep for the whole night but loud traffic noise will prevent him from getting into Stage 3 (Deep sleep) and Stage 4 (REM sleep). Your child will be cranky and feel unrested in the morning when that happens. Other sources of noise that commonly interfere with a child's sleep include sharing a room with someone on a different bedtime schedule or who snores; being able to hear the TV from other areas of the house; conversations near the bedroom; and the noise from household appliances like dishwashers.

In summary- the negative effects of noise on sleep include:

- increased time to fall asleep
- interruptions in the sleep cycles,
- increased restlessness and broken sleep,
- increased heart rate and alerting, and
- Decreased total sleep time.

Research shows that a constant background hum (also known as 'white noise') can help to block out other sounds that interfere with your child's sleep. Sources of white noise include fans, special white noise machines and smart phone apps (for example - <http://www.simplynoise.com/appstore/>) or on the internet (for example - <http://mynoise.net/NoiseMachines/whiteNoiseGenerator.php>)

Decibel levels of common noises¹⁶

- 140 dB**= airplane taking off, firearms
- 110 dB**= car horn, rock concert, baby crying
- 90 dB** = subway, passing motorcycle, truck
- 80–90 dB** = blow-dryer, kitchen blender, food processor
- 70 dB** = busy traffic, vacuum cleaner, alarm clock
- 60 dB** = typical conversation, dishwasher, clothes dryer
- 50 dB** = moderate rainfall, refrigerator
- 40 dB** = quiet room, quiet residential area
- 30 dB** = whisper, quiet library

An example of how sound can interfere with sleep: “Aiden is tired in the morning”.

Aiden is a 4 year-old who lives in an apartment with his mother Paula and his 28 month-old sister Ava.

Aiden and his sister share a bedroom across from the living room. Paula works during the day, and the children go to daycare. When Paula gets home she gets the children’s dinner ready and lets them watch TV while they are eating. Then she gets them ready for bed. Ava and Aidan go to bed at the same time and Paula leaves the TV in their room on to help them fall asleep. Sometimes when she comes in to turn it off around 10 pm Aiden is still awake. She often finds him sitting quietly looking out of the window which looks down onto a **busy street with lots of traffic noise** and bright electric lights.

Paula likes to make her own dinner and prepare the lunches for the next day when her children are in bed. She then talks to friends on the phone and watches TV in the living room.

Aiden often seems tired in the mornings. His preschool teacher expressed concern that he is easily distracted and irritable and sometimes falls asleep at school.

Aiden is exposed to a great deal of noise at night. Paula’s occupational therapist friend suggested she **test the decibel level** in

Aiden’s room at night with a smart phone app (for example

<https://itunes.apple.com/ca/app/decibel-10th/id448155923?mt=8>).

Paula was surprised to learn there were more than 60 decibels of sound created by her work in the kitchen, the TV, and the street noises. Sixty decibels is likely to increase Aiden’s heart rate and



stress response in his body. When this happens he is not able to move out of light sleep and into the Stage 3 deep sleep and the REM sleep stage he needs to be rested and ready to learn and play during the day (see page 6 to review the reason he need REM sleep).

Page 21 has **research tested suggestions** to help reduce disruptive noise in the bedroom.



How Bedding and other Fabrics Affect Sleep

The fact that **fabric** can be something in the environment that interferes with sleep seem less obvious to most people. This means bedding and other soft furnishings (like toys and carpets) are often overlooked as a something that might affect getting a good night's sleep.

Many of the **synthetic materials** that are often used in pillows, quilts, mattresses and other fabrics in the bed and soft toys can collect **dust, dust mites, and other allergens**. An allergen is a tiny, sometime almost impossible to see, bit of material that can cause an allergic reaction and problems breathing. For example dust floating in the air or pollen from flowers can be allergens for some people.

It is more difficult to remove dust and allergens from many synthetic fabrics than it is to remove them from natural fabrics.

Common man-made or synthetic fabrics in the bedroom include:

- polyester fleece blankets and pajamas
- stuffed toys
- shag pile rugs
- foam mattresses or pillows.

Tightly woven fabrics are a much better barrier to dust mites and allergens than loosely woven or stretchy fabrics. For example cotton sheets with a **high thread count** are tightly woven and don't keep as much dust and allergens close to your child's face. You can also purchase dust mite barrier mattress and pillow covers that go between the mattress and pillow and the bedding.

Research tells us that:

If children sleep on their back they may be more susceptible to the allergic effects of synthetic bedding.¹⁹ This is likely because the bedding is closer to their nose and mouth. However, **some children must sleep on their backs for medical reasons** – for these

children frequently washing bedding and anti-allergenic fabrics are important.

Synthetic bedding can contain **8 times the allergens** and other fungi (for example dust mites) compared to feather bedding with tightly woven cotton covers. Tightly woven fabrics are needed to keep the feathers inside and so this tight weave also prevent dust and other allergens from coming through the fabric.

Of course some children are allergic to feathers so then parents would not use feather duvets and pillows – rather they should make sure all other bedding fabric is as tightly woven as possible.¹⁹ Most department stores sell dust mite barrier mattress and pillow covers because it is a common problem.

Pets in the bed can also affect sleep:

- Pets can make it difficult for your child to sleep in a comfortable position.
- They may also shed fur and dander that interfere with breathing.

Children who usually snore or breathe through their mouth may have a sleep disorder that should be checked by a doctor. There are many effective treatments to help your child breath easily at night.

If you believe that your child may benefit from changes in bedding see page 22 for research-tested suggestions.

Comfortable bedding that can be easily removed or pulled up is important as well. And if your child has a significant amount of **pain** they may also be unable to move freely in bed. If your child has bed mobility problems, is unable to adjust his own bedding, and/or gets very hot and sweaty during sleep, an occupational therapist can give you suggestions about special bedding materials that will help reduce the problem.



An example of changing the environment to help a child with cerebral palsy have a better sleep: “Lydia gets her own bedroom”.

Lydia is a 4 year-old girl with cerebral palsy. She lives in a one storey house with her mother, her father, and her 10-year old sister Stephanie. Lydia shares

bunk beds with Stephanie. Stephanie sleeps on the top bunk and Lydia sleeps on the bottom. There is lots of light (from a nearby streetlamp) that reaches the room through the window. Stephanie usually goes to bed about two hours after Lydia.

Lydia often has a hard time falling asleep and staying asleep. Lydia’s parents say that she normally wakes up several times throughout the night. They have also noticed that Stephanie snores and that Lydia often complains of a stuffy nose.

Lydia often needs two naps during the day. Lydia’s occupational therapist is concerned because Lydia often seems to not have enough energy to fully participate in her weekly therapy sessions. Lydia gets easily frustrated and often has to leave therapy early. Lydia’s occupational therapist suggests that the family look at Lydia’s sleep routine and her sleep environment.

The **light from the streetlamp** may be preventing Lydia from falling asleep. The occupational therapist explains how bright blue spectrum light inhibits production of the melatonin that Lydia needs to fall asleep and stay asleep (page 7). Lydia also has many **disruptions** at night because of Stephanie’s routine when going to bed. Because Lydia is not able to stay asleep she spends less time in **REM sleep**. She needs REM sleep to be motivated, to control her emotions and to function during the day. As a child with cerebral palsy, lack of sleep may also cause Lydia to experience more pain. **Pain** will also make it harder for her to sleep.

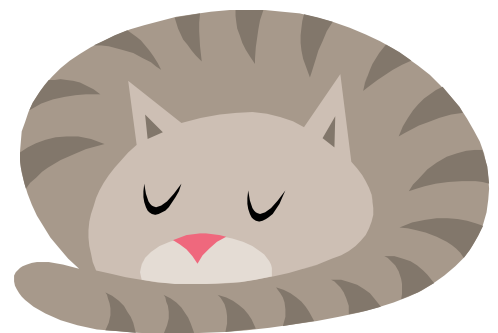
Lydia’s parents decide to change the sleeping arrangements. They decide that they will give up having a guest bedroom so that Lydia and Stephanie will each have their own bedroom. This means that

Lydia will no longer be interrupted when Stephanie goes to bed.

Lydia’s parents put very good curtains in her new bedroom to block outside light. Lydia is nervous about being alone so her parents install a special night-light that has a bulb that filters out **blue spectrum light** (page 24 for more information). The family also decides to change their polyester comforters to a brand with more tightly woven covers, run all the comforters and pillows through the dryer every two weeks, and make sure the family cat does not stay in Lydia’s bed all night (see page 14 for the reasons why).

Stephanie downloaded a sound monitor app to her smart phone and found out that, because Lydia’s new room is close to the living-room, the noise level when Lydia is trying to sleep can be **over 30 decibels** (see page 12). Lydia’s parents also checked the temperature in her new bedroom- they were surprised to find out that it is often **over 25 degrees** Celsius. The therapist explains that temperature greater than 22 degrees or lower than 18 degrees Celsius may interfere with sleep (page 9). Lydia’s parents decide to run a fan in Lydia’s room to block out background noise and help cool the air. They also used layers of bedding that **she can easily** remove, so that she is warm enough but does not overheat.

Soon after making these modifications the family notice changes in Lydia’s mood, her motivation to participate in therapy and to play with her sister. They also notice a decrease in the amount of pain that Lydia seems to be experiencing. Lydia has an easier time falling asleep and does not wake up and call out during the night as often. Everyone seems much happier (except of course the cat, who now sleeps on a chair in the living-room instead of with his best friend- Lydia)!



Creating a sleep-friendly bedroom environment

The Bedroom Checklist

Now that you know the science explaining how the environment influences sleep you are better able to make changes in your child's bedroom that best match your own situation.

Start by going through this list of questions to identify potential problem areas in your child's bedroom. Check the boxes 'yes' or 'no'. Once you identify where the problems are you can go to pages 20-23 to find a list of research tested options for making changes to improve your child's sleep.

| A. Questions about Light: | Yes | No |
|---|-----|----|
| 1. Once your child is in bed for the night is the light intensity of the bedroom greater than 30 lux? (See the Resource section on page 24 for information of how to assess lux). | | |
| 2. Is there bright light from outside coming into the bedroom through your child's window? (For example from street lights or a patio light). | | |
| 3. Are there any windows without curtains? | | |
| 4. Does light get through the existing curtains? | | |
| 5. Does your child like to sleep with the door open? | | |
| 6. If your child sleeps with the door closed, is there light that gets through the space between the door and the floor? | | |
| 7. Does your child sleep with a nightlight or lamp? If so, does this emit blue or white spectrum light? | | |
| 8. Are any electronic devices (such as a TV, laptop, or electronic tablet) left on in the bedroom once your child is in bed for the night? | | |
| 9. Does your child use any of these electronic devices within one hour of bedtime or once he or she is in bed for the night? | | |
| <p>Did you answer "Yes" to any of these questions? If so, see the suggestions on page 20 in Lighting changes.</p> <p><i>Jot down any notes about these light sources here or on the back of this page.</i></p> | | |

| B. Questions about Noise: | Yes | No |
|--|------------|-----------|
| 1. Is the noise level in your child’s bedroom at night higher than 30 decibels? (See the Resource section on page 24 for suggested smart phone apps to test decibel levels). | | |
| 2. Do you live on a busy street or in a neighborhood where there is lots of noise outside? (For example noise from cars and traffic). | | |
| 3. Does your child share a bedroom? | | |
| 4. Does your child’s roommate snore? | | |
| 5. Does your child’s roommate go to bed later than your child? | | |
| 6. Are there conversations or sounds in the house that occur close to the bedroom while your child is sleeping? | | |
| 7. Is there a TV, radio or other appliance (washing machine, dishwasher, blender etc.) that makes noise close to the bedroom while your child is sleeping? | | |
| 8. Does your child listen to music or watch TV while trying to fall asleep? | | |
| 9. If your child watches TV or listens to the radio when he or she is in bed, are these devices left on all night or until someone turns them off manually? | | |
| 10. Does your child bed frame make a squeaky noise? | | |
| 11. Do your child’s sheets make a noise when he moves in bed? (This is common with plastic undersheets for example). | | |
| Did you answer “Yes” to any of the questions? If so, see the suggestions on page 21 in Noise-related changes . | | |

| C. Questions about temperature | Yes | No |
|---|------------|-----------|
| 1. Is the temperature of the bedroom when your child is sleeping between 18 to 22 degrees Celsius? | | |
| 2. Is the temperature in the bedroom adjustable? (For example a separate control/thermostat to adjust heat in the room, or a window you can open). | | |
| 3. Can your child easily adjust layers of bedding depending on feeling too hot or cold? | | |
| 4. Is your child's nightwear made of different fabric depending on the season? (For example light cotton in the summer and flannelette in the winter). | | |
| 5. Does your child participate in only calming activities 1 hour before bed so that his or her core body temperature does not get too raised? (For example- reading a book is calming, running around playing tag is not calming). | | |
| <p>Did you answer "No" to any of the questions?</p> <p>If so, see the suggestions on page 22 in temperature-related changes.</p> <p><i>Jot down any comments about these temperature items in this space or on the back of the page.</i></p> | | |

| D. Questions about Bedding (sheets, blankets & other fabrics): | Yes | No |
|--|------------|-----------|
| 1. Is there carpet in the bedroom? | | |
| 2. Is the bedding synthetic? | | |
| 3. Are the sheets changed less than once a week? | | |
| 4. Are the pillows, blankets, duvet and any soft toys on the bed washed less than once a month? | | |
| 5. Does your child suffer from asthma or allergies? | | |
| 6. Does your child complain or appear to experience a recurrent stuffy nose? | | |
| 7. Does your child sleep with a pet on the bed? | | |
| 8. Are sheets and pillow cases directly on top of the mattress and pillow? | | |
| 9. Is the mattress more than 2 years old? | | |
| <p>Did you answer "Yes" to any of the questions?</p> <p>If so, see the suggestions on page 23 in bedding-related changes.</p> <p><i>Jot down any comments about bedding in this space or on the back of the page.</i></p> | | |

Part 3

Creating a Sleep-Friendly Bedroom

In Part 1 of the **CBEES manual** you learned about the science of sleep. Then in Part 2 you checked your child's bedroom to see where there might be some problems. This section will now help you pick changes you can make to the bedroom to improve your child's sleep.

Please check off all of the changes you think would be realistic to try. Then, for any changes you actually make, put in the date. Remember- **it takes time to see results** from most changes so it is best to give all changes a trial period of at least 2-3 weeks before you decide if they are useful.

If you have comments about the changes you made please write them in the box at the end of the section

| A. Lighting changes | This is something I could try | I tried this on- (insert date): | I did this for (fill in number of days) |
|--|-------------------------------|---------------------------------|---|
| 1. Purchase dark curtains/black out blinds that filter out all light | | | |
| 2. Place cardboard sheets over the window at night that can be easily removed to let in daylight in the morning. | | | |
| 3. Make sure the bedroom door is closed at night or light from the hallway is blocked out by a curtain over the door. | | | |
| 4. Turn off all the lights in surrounding rooms/hallways or minimize the light coming from them - Test the lux level using a simple app (see Resources on page 24) | | | |
| 5. Cover the crack under the door to the hallway with a towel. | | | |
| 6. See if your child would be willing to wear an eye mask to block out light. | | | |
| 7. Use a motion activated night light (this will only come on when your child is awake and moving). (see page 24) | | | |
| 8. Use a blue spectrum light filtering nightlight (see page 24) | | | |
| 9. Make sure your child is not exposed to TV, lap tops or other electronic devices within 1 ½ hours before bed time. | | | |
| 10. Use blue light filtering software on the laptop (see Resource section on page 24 for a link to the free F.Lux program). | | | |
| 11. Use a blue light filter film over top of the screen on electronic devices- this will decrease the blue spectrum light exposure (see Resource section on page 24) | | | |
| 12. Provide blue light filtering goggles for your child to wear to watch TV or use electronic devices in the evening (see Resource section on page 24). | | | |
| | | | |

| B. Noise related changes | This is something I could try | I tried this on- (insert date): | I did this for (fill in number of days) |
|--|-------------------------------|---------------------------------|---|
| 1. Try soft classical or non-classical music with a tempo of 60-80 beats per minute for 20-45 min. See Resource section on page 24 for information about how to check the appropriateness of your music online). | | | |
| 2. Put any music, taped books or television on a timer so it shuts off after 15 minutes. | | | |
| 3. Try playing white noise in your child's bedroom. White noise machines can be purchased at most major electronic retailers or downloaded as an App.. An electric fan or air conditioner can also be used to block out noise. | | | |
| 4. Try having your child sleep with earplugs. | | | |
| 5. Try to have anyone sharing your child's room go to bed as close to the same time as possible to avoid disruptions. | | | |
| 6. Minimize the use of dishwashers and other household appliances while your child is sleeping. | | | |
| 7. Keep TV on low or use headphones when you are watching it so no sound reaches the bedroom. | | | |
| | | | |

| C. Bedding related changes | This is something I could try | I tried this on- (insert date): | I did this for (fill in number of days) |
|--|-------------------------------|---------------------------------|---|
| 1. Wash sheets weekly. | | | |
| 2. Run pillows, blankets and stuffed toys in the dryer weekly on medium heat. | | | |
| 3. Wash pillows and other duvets/bedspreads and soft toys monthly. | | | |
| 4. Use natural fabric bedding with high thread count sheet (300 and greater). | | | |
| 5. Vacuum weekly. | | | |
| 6. Replace synthetic bedding with natural fabrics. | | | |
| 7. Remove pets from the bed OR at change the bedding the pet sleeps on every two days. | | | |
| 8. Use dust mite barrier mattress and pillow covers underneath the bottom sheet and the pillow case. | | | |
| 9. Consider purchasing a new mattress at least every two years. | | | |
| | | | |

| D. Temperature related changes | This is something I could try | I tried this on- (insert date): | I did this for (fill in number of days) |
|---|-------------------------------|---------------------------------|---|
| 1. Keep your child's bedroom less than 22 degrees Celsius until approximately 2 to 3am and then gradually warm the room up to a comfortable temperature for getting out of bed. A fan and a heater on timers can help with this if you do not have a programmable thermostat. | | | |
| 2. Layer the bedding so children can adjust the amount themselves or so you can do it without waking the child at night. | | | |
| 3. Avoid physical activities and sports at least 90 minutes before bed. | | | |
| | | | |

RESOURCES

General Resources for children's sleep:

- Canadian Sleep Society Brochures: www.canadiansleepsociety.ca/publisher/articleview/fmArticleID/341
- SleepRight website for children with chronic health condition <http://www/SleepRight.ualberta.ca>
- Sleep for Kids: www.sleepforkids.org
- Your child's sleep: www.kidshealth.org/parents/general/
- Sleep for toddlers and preschool children: www.bbc.co.uk/parenting/your_kids/toddlers_sleeping2.shtml
- Sleep- Child and Family Webguide: <http://www.cfw.tufts.edu/?/category/young-children/17/topic/sleep/79/>
- Sleep behaviour – the Encyclopedia of Early Childhood Development <http://www.child-encyclopedia.com/en-ca/child-sleeping-behaviour/how-important-is-it.html>

Light:

- Visit www.justgetflux.com to download free f.lux software to filter out bright white and blue light in the evening on your computer or tablet.
- Blue light filtering goggles, electronic device filters, bulbs and nightlights- <https://www.lowbluelights.com/>
- Apps that measure amount of light intensity in Lux:
 - For android devices: <https://play.google.com/store/apps/details?id=com.notquitethem.android.luxmeter>
 - For Apple devices: <https://itunes.apple.com/ca/app/luxmeter-pro/id408369821?mt=8>

Sound:

- For helpful tool to determine the beats per minute of your child's music visit www.songbpm.com or www.bpmdatabase.com
- Examples of white noise apps and software <http://mynoise.net/NoiseMachines/whiteNoiseGenerator.php>
- Apps that measure decibel level (dB):
 - For android devices: <https://play.google.com/store/apps/details?id=kr.sira.sound>
 - For Apple devices: <https://itunes.apple.com/ca/app/decibel-10th/id448155923?mt=8>

Bedding:

- For information about allergens visit http://www.worldallergy.org/professional/allergic_diseases_center/allergen_avoidance/ scroll to the end of the document for strategies to reduce dust mites and other allergens.

Temperature:

- For information about passive body warming (using baths, electric blankets or wheat sacks) see <http://www/SleepRight.ualberta.ca>

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