

Community Brain Injury Program for Children & Youth in British Columbia

Sleep

Why is sleep important to brain health?

Sleep plays a very important role in good brain and mind health. Sleep is vital for brain development and for making the solid memories that result in learning. While we sleep our brains are pruning weak connections between axons and neurons and strengthening solid connections. Although the process is not yet fully understood, it is thought that while asleep our brain's configuration changes slightly to allow more space for cerebral spinal fluid to wash away a toxic protein called beta-amyloid that forms while we are awake.

How does the brain affect sleep?

Moving from sleep to wakefulness is a complex process which involves coordination among several different centers in the brain, including the hypothalamus, thalamus, pineal glands, amygdala and the brainstem. Chemicals known as neurotransmitters switch on and off in the brain to signal time to sleep and time to wake. This pattern is known as circadian rhythms. These same chemicals also signal to the brain the transition between rapid eye movement sleep (or REM), and non-REM sleep. The latter is important for the regulation of emotions and for the relaxation that promotes whole body healing. Healthy babies spend fifty percent of their sleep time in REM sleep while healthy adults spend about twenty percent in REM. Any damage to these critical brain structures or to the production of neurotransmitters such as serotonin, melatonin, dopamine, histamine, and noradrenaline can affect the quality of sleep or the ability to go to sleep and stay asleep.

What are some results of sleep problems?

People who have difficulty sleeping can experience changes in mood, including irritability, worry and depression. These people may have challenges thinking, learning, making judgements and tolerating pain. The body's metabolism as well as the immune and cardiovascular systems, can also be affected by lack of sleep.

Individuals with post-traumatic stress disorder (PTSD), often suffer from lack of sleep which results in worsening symptoms and makes it more difficult to recover from the disorder.

How can a brain injury affect sleep?

The processes of growing, cleaning, and healing that the brain undertakes during sleep become even more important when brains have been injured. Unfortunately, brain injuries can lead to various problems with sleep. These problems can begin right after the injury or develop later during recovery. They often last until they are effectively treated. Children and teens with mild to severe brain injuries can all be affected.

What are some common sleep problems that occur after a brain injury?

- Insomnia – trouble falling asleep or staying asleep or feeling tired after sleeping
- Extreme daytime drowsiness
- Hypersomnia – sleeping too much or for too long
- Delayed sleep phase – confusion of day and night. Suddenly your child is a night owl who has trouble getting up in the morning
- Narcolepsy – sudden and uncontrollable sleep onset during the day
- Snoring or pauses in breathing
- Clenching or grinding teeth
- Involuntary movement of arms and legs while asleep
- Sleep walking

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What are some obstacles to sleep?

- Spending time in busy, bright, noisy environments such as hospitals, can lead to interrupted sleep
- Anxiety or stress can interfere with sleep or lead to early waking
- Being overtired can lead to difficulty falling asleep
- Pain, including headache pain, can disturb sleep
- Daytime napping can lead to night wakefulness
- Lack of normal physical activity can make it harder to sleep
- Changes in breathing control regulated by the brainstem can affect sleep
- Some medications can lead to daylong sleepiness or can interfere with getting to sleep

How should I address sleep problems with my child's doctor?

If your child has sleep problems following a brain injury, be sure to discuss any changes in medications, including health food supplements, with your child's doctor or neurologist. Because there may be interactions with other medications or with the child's brain chemistry, the doctor may decide to change, adjust or alter the timing or dosage of medications to meet your child's needs.

Doctors don't typically prescribe sleep medications or advise using over-the-counter sleep products for people with a brain injury because they contain antihistamines which can interfere with memory and learning. Instead, doctors may prescribe small doses of antidepressant medications that modify the amount of serotonin and other neurotransmitters available in the brain.

Depending on the sleep problem, the doctor may decide to do a more thorough investigation through a sleep lab or polysomnographic testing. Your child's doctor may attempt better pain control and may recommend counselling or suggest changes to the environment, like a morning light box.

What are some ways parents can support good quality sleep in their children or teens?

Children and teens typically need 9.5 hours of sleep per night. During the day encourage your child or teen to:

- Stick as much as possible to the same wake up time and bedtime every day
- Include meaningful activities and physical exercise every day
- Limit all screen time, especially several hours before bedtime
- Go outdoors for at least 20 minutes every day. This can reset your internal clock, especially if you go outside in the morning (even on grey, wet days)
- Eat breakfast close to a bright window
- Take frequent rest and hydration breaks but try to limit napping to 20 minutes per day
- At bedtime encourage your child or teen to:
 - › Spend time winding down before bed. This means avoiding active exercise or arousing activities within 2 hours of bedtime
 - › Stay away from screens for an hour or two before bed. Screen light inhibits the release of melatonin making sleep difficult. In addition tension caused by emotional texting or watching some programs produces the stress hormone cortisol which wakes the brain
 - › Follow a bedtime routine that includes the same steps in the same order. This relaxes children because they do not have to think about what to do
- Take a warm bath and maintain a predictable time for reading before bed

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- Mentally lock worries in a box. Teens sometimes find it helpful to write down their concerns and anxieties in order to limit night time worrying
- Avoid large meals, sugary snacks, and caffeinated beverages just before sleep but do not go to bed hungry
- How can the bedroom be made as restful and relaxing as possible?
- Do not use the bedroom as a place for punishment or “time out”
- Remove distractions in the bedroom, including any electronic devices (tv, phones, games, etc)
- Do not permit your child or teen to do homework in the bedroom
- Provide black-out curtains especially in the summer or if street lights shine into the room
- Prevent extreme temperatures and loud noises
- Provide a weighted blanket or give a deep pressure massage
- Play soft music
- Teach relaxing breathing exercises

Resources

“Sleep, Sleep Disorders, and Mild Traumatic Brain Injury. What We Know and What We Need to Know: Findings from a National Working Group”, by Emerson M. Wickwire et al, *Neurotherapeutics* (2016) 13:403-417 Free article at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4824019/>

“Brain Basics: Understanding Sleep”, National Institute of Neurological Disorders and Stroke
<https://www.ninds.nih.gov/Disorders/Patient-Caregiver-Education/Understanding-Sleep>

“Getting a Good Night’s Sleep” Anxiety BC
<https://www.anxietybc.com/adults/getting-good-nights-sleep>

“Traumatic Brain Injury and Sleep” (Comic format for older teens)
http://www.msktc.org/lib/docs/Info_Comics/MSKTC_SleepComic_508.pdf

Relaxation strategies:

“Relaxation Strategies”, The Children’s Trust, Brain Injury Hub
<https://www.braininjuryhub.co.uk/information-library/relaxation-strategies>

“How to Chill”, Anxiety BC
<http://youth.anxietybc.com/relaxation>