## ADOLESCENT BRAINS AND SLEEP: <br> THE <br> 'SLEEPI <br> DEMIC'


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## LOOK FAMILIAR?



## OUR STUDENTS ARE NOT GETTING ENOUGH SLEEP.

The first "evidence-informed" Canadian sleep guidelines, released in 2016, highlighted that the quality and consistency of sleep has been deteriorating for children and youth (McGinn, 2016).

Canada is the third most sleep-deprived country, with nearly a third of Canadians feeling like they don't get enough sleep. The United Kingdom and Ireland are the only two countries that finished ahead of Canada, with the United States matching Canada (Joseph, 2016).

Experts also agree that teenagers are more likely to fall short on sleep than anyone else (Brody, 2014).

Currently, 31\% of schoolaged children and 26\% of adolescents in Canada are sleep deprived (McGinn, 2016).


## HOW MUCH SLEEP DO ADOLESCENTS NEED?

According to the Canadian 24hour movement guidelines:

- children between 5 and 13 should get nine to 11 hours a sleep a night
- teens between 14 and 17 should get eight to 10 hours of sleep with consistent bed and wakeup times


Actually, my species is not nocturnal:
I'm just a teenager...

## THE SCIENCE OF SLEEP

Our bodies naturally release chemicals in a 24-hour cycle, telling us to do certain activities at certain times.

Each of these cycles is called a circadian rhythm. One of the chemicals involved in this process is melatonin, a hormone that makes us feel drowsy.

The amount of melatonin in our bodies starts increasing in the evening and peaks in the middle of the night, letting us know it is time to sleep. It then decreases by morning ('The Science of Sleep', 2014).

This process starts in the eye's retina. Exposure to light prevents melatonin release, which keeps us awake, and lack of exposure to light induces melatonin release.


Figure 1. When a part of the brain called the suprachiasmatic nucleus does not detect light, the pineal gland is free to produce melatonin, which makes us feel drowsy.

## THE SCIENCE OF SLEEP

Figure 2. The synthesis of melatonin occurs in four steps. First, tryptophan is converted into 5 -
hydroxytryptophan, which is converted to serotonin. Then, serotonin is converted into N -acetylserotonin, which is converted into melatonin. Activity of serotonin-Nacetyltransferase (SNAT), an enzyme that adds an acetyl group to serotonin to produce N -acetylserotonin, peaks when it is dark outside.

Anthony Fernandez; http://www.vivo.colostate.edu/ hbooks/pathphys/endocrine/otherendo/pineal.html
('The Science of Sleep', 2014)


## TEENS AND MELATONIN

In teens, melatonin is naturally produced about three hours later in the 24 -hour sleep cycle than in children or adults.

This keeps them awake longer, and when they wake up early (for school), SNAT is still active and they are still producing melatonin, which leaves them feeling sleepy in the morning.
('The Science of Sleep', 2014)

## Phase Delay:

Researchers have found that the biological clock opposes the sleep-wakefulness cycle at certain points of the day and at certain ages. It keeps people awake when they are actually very tired.

Just before puberty, this internal clock helps teens stay alert at night when they should be falling asleep. Until the age of 10, many children wake up fresh and energetic to start the day. In contrast, the biological clock of preteens (continuing into the twenties) shifts forward, creating a "forbidden" zone for sleep around 9 or 10 p.m. It is propping them up just as they should be feeling sleepy.
(Spinks, 2014)

## OTHER FACTORS:

- increasing screen time
- social and cultural forces
(ex. studying, part-time jobs, over scheduled lives, parental pressures)
- lack of physical activity
- mental health (ex. stress and anxiety)

Children and youth aged five to 17 should get at least 60 minutes of moderate to vigorous physical activity each day, several hours of "light physical activities," ... and have no more than two hours a day of "recreational screen time." (McGinn, 2016)


## SIDE EFFECTS OF SLEEP DEPRIVATION:

Insufficient sleep in adolescence increases the risk of:

- high blood pressure
- heart disease
- Type 2 diabetes
- obesity
- weakened immune system

(Brody, 2014)


## WHAT DOES SLEEP DEPRIVATION LOOK LIKE IN OUR CLASSROOMS?

 Insufficient sleep in adolescence has large effects on mood, cognitive and motor skills. Students may suffer:- an inability to concentrate
- decreased academic achievement
- an increase in anxiety and irritability
- depression (even increase the risk of suicidal thoughts)
- poor concentration and short attention
- hyperactivity
- impaired judgement / decision-making skills
(Brody, 2014; ParticipACTION, 2016; Primeau, 2013; Richter, 2015)



## BENEFITS OF GETTING ENOUGH SLEEP:



- improved emotion regulation - increased concentration and alertness
- stronger immune system
- improved academic achievement
- more efficient at work

- less accident prone
- more energetic and active


## SLEEP, LEARNING, AND MEMORY

In experiments done at Harvard Medical School and Trent University, students go through a number of tests and then sleep various lengths of time to determine how sleep affects learning.

## Findings:

- the brain consolidates and practices what is learned during the day after the students (or adults, for that matter) go to sleep
- the brain seems to need lots of slow-wave sleep and Rapid Eye Movement (REM) sleep
- learning a new task, whether it is sports or music, will be greatly helped by getting a good night's sleep
- students' ability to remember things is mediated by sleep



## IT'S TIME FOR A WAKE-UP CALL.

Current statistics amongst teens should sound the alarm for parents, schools, students, and teachers.

Recent sleep research shows "some 28\% of high school students said they fell asleep in class at least once a week. In addition, 22\% dozed off while doing homework, and 14\% arrived late or missed school because they oversleep." (CTV Ottawa News, 2016)

It is clear, that sleep deprivation among teens is indeed an epidemic - in Canada and around the globe.

## WHAT CAN WE DO?

The challenge of balancing the biological sleep schedule of teenagers with the demands of society is difficult and complex.

The first step is to begin the conversation. This is a complex problem that involves a number of factors and involves a number of key stakeholders from parents, to kids themselves, to policy makers, to schools.

First, sleep is believed to reinforce learning and memory, with studies showing that people perform better on mental tasks when they are well-rested. (Richter, 2015)


## OUTSIDE OF SCHOOL:

- parents should consider instituting an electronic curfew
- reduce pressure for academic / extracurricular demands
- develop and implement consistent sleep and wake routines
- avoid eating 4 hours before sleep
- reserve the bed for sleep only
- limited sitting for extended periods of time
- increase physical activity during the day or after school
- parents should set a good example



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