The Darkside of Sleep Debt

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Sleep. It's as essential for a healthy functioning body as drinking water or eating healthy food, yet nearly 1 in 3 North Americans are not getting enough of it. We are so busy chasing deadlines, trying to accomplish a multitude of tasks and squeeze as many hours out of our day as possible that we end up sacrificing our sleep to do so. What may start out as a short time of sleep deprivation to finish a project or study for an exam, may turn into a pattern of continuous sleepless nights for years on end. This leads to an insurmountable sleep debt that may have huge consequences down the road. What are those consequences? Over time, constant lack of sleep can affect the very structure of the brain and the way it functions. This has an impact on mental health, impaired memory and cognition and increases the risk of developing Alzheimer's disease.

What happens within the brain when we sleep? Does the brain just simply go offline and rest? The answer*, Not at all!* While sleeping, the brain is busy filing away memories and clearing away cellular waste. So how does lack of sleep increase your risk of developing Alzheimer's disease? Sleep deprivation may allow for the build up of amyloid beta in between cells. This build up happens when the glymphatic system of the brain, which is most active when we sleep, does not have time to perform its usual functions due to the disruption of sleep. When we are sleeping, the spaces between neurons widen by about 60%, allowing cerebrospinal fluid to wash through and escort cellular waste like amyloid beta out of the brain and into the lymphatic system to be disposed of. When amyloid beta starts to pile up, it forms into clumps of sticky plaque. These sticky plaques can cause inflammation in the brain and damage the membrane around the neurons, and with prolonged exposure, causes death to those cells. As neurons die, overall cognitive function declines as well. Sleep quality diminishes even further with disruption of circadian rhythm and decreased melatonin production. A vicious cycle is created and can be challenging to break.

So how much sleep do we need to restore the brain and maintain the health of the body?

The guidelines vary depending on age.

- **Older adults (65+):** 7–8 hours
- **Adults (18–64 years):** 7–9 hours
- **Teenagers (14–17 years):** 8–10 hours
- **School children (6–13 years):** 9–11 hours
- **Preschoolers (3–5 years):** 10–13 hours
- **Toddlers (1–2 years):** 11–14 hours
- **Infants (4–11 months):** 12–15 hours
- **Newborns (0–3 months):** 14–17 hours

Genetics can also determine how many hours you may need for sleep each night. Certain genetic mutations can affect how long you need to sleep, the time of day you prefer to sleep and how your body may respond to sleep deprivation. People who have a rare genetic mutation can sleep 4-6 hours each night and wake feeling fully refreshed after. Most adults require around 7-8 hours, even if they have trained themselves to get by on far less.

Sleep quality is just as important as length of sleep, so if you find that you still feel tired after getting what should be considered enough sleep, poor quality sleep may be to blame. There are

also certain sleep disorders that can affect sleep quality such as sleep apnea, so if you find that you are extremely tired and cannot function throughout your day, go see your family physician to rule out any medical conditions that may be contributing to your lack of sleep.

Tips for improving sleep quality:

1. **Create a sleep friendly environment**
   Sleeping in a cool, quiet and darkened room can help you sleep better. Try not to exercise or be too active before bed and refrain from consuming large meals or any stimulants before sleeping. Using a white noise device may be necessary if your sleep environment is noisy (living near a highway).

2. **Follow a consistent sleep schedule**
   Set aside 7-8 hours for sleep and be consistent. Go to bed at the same time each night and get up at the same time each morning, including on the weekends. This will help to reinforce your body's sleep-wake cycle. Readjust slowly if you're aiming to go to bed earlier. Adjusting your bedtime in small increments of 15-20 min earlier every second or third night will lead to lasting change.

3. **Create a calming bedtime routine**
   Create a routine that is unique to your needs and preferences. You can try diffusing certain essential oils that can help you to feel calm and relaxed for bedtime. Lavender and Cedarwood help to soothe and calm the nerves, whereas Vetiver helps to calm racing thoughts that are preventing you from relaxing. Herbal teas can also be helpful for relaxing. Popular herbal mixed teas include Chamomile, Lavender, Valerian root and Lemon Balm. Relaxing music or a warm bath can become part of a calming bedtime routine.

4. **Try meditation**
   Meditation and relaxation training may help improve sleep quality, brain function and memory retention. There have been some studies done that has shown improvement in quality of sleep in the elderly when practicing relaxation and meditation techniques.

5. **Exercise daily**
   Studies have shown that exercise can improve sleep quality. Exercise has also been shown to reduce stress levels, improve mood and increases feelings of well being. Studies also have shown that people who are physically active are less likely to experience a decline in their mental function and have a lowered risk of developing Alzheimer's disease.

6. **Minimize caffeine intake**
   Caffeine has the biggest impact on sleep quality and reduces the quantity of slow wave sleep and REM sleep. If you are finding it difficult to fall and stay asleep, cut back on your caffeine consumption and don't have any caffeine in the afternoon or evening. If you have sleep apnea, also reduce nicotine and alcohol intake as both worsen sleep apnea symptoms.

7. **Reduce electronic usage before bedtime**
   Exposure to short wave, artificial blue light from electronic devices before bed can disrupt your circadian rhythm and delay the release of the sleep-inducing hormone called Melatonin. The more electronics used right before bed, the more challenging it is

to fall asleep and stay asleep. Try to turn off or put aside electronic devices at lest 30 minutes or one hour before bed.

In summary, the importance of sleep cannot be overstated. The impact sleep deprivation can have on mental health, overall cognitive function and future Alzheimer's disease risk is significant. Create a bedtime routine that will help you to be consistent with getting a proper sleep and you will reap the health benefits for years down the road.

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