#### **A PRIMER ON SLEEP AND PARKINSON'S**



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For many years, the benefits and causes of sleep remained a mystery. However, in the past few years, sleep science has grown significantly. We now have a deeper understanding of the importance of sleep, why it is so essential to sleep consistently and properly, the effects of sleep medicine and how people with Parkinson's are specifically affected.



Matthew Walker, PhD is one of the foremost experts on sleep science. He is a professor of psychology and neuroscience at

the University of California, Berkeley, and in 2017, he published the New York Times bestselling book Why We Sleep: Unlocking the Power of Sleep and Dreams. While his research is not Parkinson's-specific, his coverage of the function and importance of sleep is applicable across the board.

In this article, we help you navigate to the right information so you can understand the function and importance of sleep and get started on your path to better sleep with Parkinson's.

To understand the faulty sleep mechanisms associated with Parkinson's, we first need to delve into why we sleep. Sleep enriches our learning capacities and helps us make logical choices. It improves our psychological function and balances our emotions so that we can make level-headed decisions the next day. Sleep also strengthens our immune systems, prevents infection, balances metabolism, regulates appetite, encourages gut microbiomes and lowers blood pressure, among other benefits. The bottom line is that sleep is the ultimate system reset, and every part of you benefits from it.

> Every major system, tissue, and organ of your body suffers when sleep becomes short. No aspect of your health can retreat at the sign of sleep loss and escape unharmed. Like water from a burst pipe in your home, the effects of



sleep deprivation will seep into every nook and cranny of biology, down into your cells, even altering your most fundamental self – your DNA." -Matthew Walker, 164



#### **SLEEP AND WAKE CYCLES**

Humans have a two-factor, built-in sleep/wake cycle. Your **circadian rhythm** is an internal clock that regularly makes you feel awake or tired, while **adenosine** is a chemical compound that builds up in your brain while you are awake and makes you feel a pressure to sleep. The carefully controlled balance between these two factors – your circadian rhythm and adenosine levels – determines your sleep/wake cycle. Another important component of regulating this cycle is melatonin, a hormone that makes you feel less awake. Melatonin is closely tied to light, so when it gets darker out, your brain produces more of it. However, melatonin doesn't actually cause sleep, it just prompts your body that it's time to go to bed.

As many of us know, caffeine can be a very effective sleep deterrent. Walker explains that "caffeine works by successfully battling with adenosine for the privilege of latching on to adenosine welcome

sites – or receptors – in the brain. Once caffeine occupies these receptors, it blocks and effectively inactivates them, tricking you into feeling alert and awake, despite the high levels of adenosine that would otherwise seduce you into sleep." (32) However, overusing caffeine or consuming it at the wrong time can severely impact your sleep and make you more tired the next day.

# **ARE YOU GETTING ENOUGH SLEEP?**

It can often be difficult to tell whether you're getting enough sleep. However, Walker offers a few simple questions and their corresponding answers about your sleep habits.

1. After waking up in the morning, could you fall back asleep at ten or eleven a.m.?

If the answer is "yes," you are likely not getting sufficient sleep quantity and/or quality.

2. Can you function optimally without caffeine before noon?

*If the answer is "no," then you are likely self-medicating your state of chronic sleep deprivation.* 

3. If you didn't set an alarm clock, would you sleep past that time?

If so, you need more sleep than you are giving yourself.

4. Do you find yourself at your computer screen reading and then rereading (and perhaps rereading again) the same sentence?

This is often a sign of a fatigued, under-slept brain.

5. Do you sometimes forget what color the last few traffic lights were while driving?

#### Simple distraction is often the cause, but a lack of sleep is very much another culprit.

It's also possible that you're only getting enough of one kind of sleep. In 1952, researchers discovered that humans cycle through two different kinds of sleep. The first is called **REM** (rapid eye movement) sleep, during which we dream, and the second is called NREM (non-rapid eye movement) sleep. You go through cycles of different lengths every night. Depending on whether you're staying awake too late, getting up in the middle of the night or waking up too early, you might be missing out on mostly REM or mostly NREM sleep, each of which has different consequences. For example, in an experiment from the 1960s, researchers found that depriving people of REM sleep made them moody, paranoid, anxious and psychotic, demonstrating the importance of plentiful REM sleep.

Even with all this research on the importance and function of sleep, many people still are unaware of the myriad effects that poor sleep has. Especially for seniors, Walker notes that "elderly individuals" fail to connect their deterioration in health with their deterioration in sleep, despite causal links between the two having been known to scientists for many decades. Far more of our age-related physical and mental health ailments are related to sleep impairment than either we, or many doctors, truly realize or treat seriously." (96)

While improved sleep is not a cure-all, it can certainly help with many different ailments, especially those that affect us as we age. Another important change that occurs as we get older is that our sleep becomes more **fragmented**, meaning that we wake up during the night more often. We'll address this further as it relates to Parkinson's later on.

Amazing breakthrough! Scientists have discovered a revolutionary new treatment that makes you live longer. It enhances your memory and makes you more creative. It makes you look more attractive. It keeps you slim and lowers food cravings. It protects you from cancer and dementia. It wards off colds and the flu. It lowers your risk of heart attacks and stroke, not to mention diabetes. You'll even feel happier, less depressed, and less anxious. Are you interested?"



Now that you are armed with more information about *how* sleep works, let's take some time to delve into why sleep is so important. We've already touched on the fact that a good night's sleep has beneficial effects on the entire mind and body, but the effects are far more multifaceted than just making you feel better-rested. For example, while it may be surprising that sleep could provide the widespread effects described in the "ad" above from Walker's book, over 17,000 studies have proven these findings.

In addition, the effects of a poor night's sleep can be very detrimental. Without good sleep habits, people put themselves at higher risks of **depression** and **chronic pain**, among other issues. Since these are often already symptoms of Parkinson's, poor sleep can exacerbate them. Additionally, poor sleep habits combined with the already deteriorated sleep of older adults causes a lower learning capacity the next day. To put it simply, the more you sleep, the better you retain information, while the longer you stay awake, the faster you forget things.

#### **EMOTIONAL IMPACTS**

As mentioned earlier, sleep is also important for emotional regulation. Without a good night's sleep, your capacity to make level-headed decisions is diminished. In his research, Walker compared emotional responses for people who were awake vs. asleep all night. He found that in the **amygdala**, a part of the brain involved in strong emotional reactions and the fight-or-flight effect, there was a 60% increase in emotional response for the sleep-deprived people. He also found that people who were sleep-deprived had overactive striatum, which are associated with emotion, impulsivity and reward. Therefore, when you don't get enough sleep, you are more prone to both extreme positive and negative emotional swings.

### THE EFFECT OF EXERCISE

Exercise has been shown to have a variety of beneficial impacts, and sleep is no exception. In fact, a study found that after four months of physical activity, adult insomniacs got an average of one extra hour of sleep per night. Exercise improves sleep quality, quantity, number of nighttime waking incidents and the time it takes to fall asleep. Sleep also gives you more energy and therefore contributes to a **positive feedback loop** of more exercise and more sleep.

From preventing against cancer to improving your learning capabilities to making cool-headed decisions, consistent and proper sleep habits can offer a wide range of positive effects. But even if you know how important sleep is, when you're having trouble sleeping, what can you do to fix it?

The number of reported cases of sleep issues has increased dramatically in recent years. There are a variety of underlying causes, as Walker describes:

To date, we have discovered numerous triggers that cause sleep difficulties, including psychological, physical, medical, and environmental factors (with aging being another, as we have previously discussed). External factors that cause poor sleep, such as too much bright light at night, the wrong ambient room temperature, caffeine, tobacco, and alcohol consumption can masquerade as insomnia." -Matthew Walker, 243



True insomnia requires that the difficulty sleeping is caused by your own body, rather than by an outside force. Addressing external causes of sleep troubles can often be done using **sleep hygiene** techniques (as we will discuss later), while dealing with true insomnia often causes people to turn to medications. However, Walker cautions strongly against using sleeping pills as the first form of defense.

# WHAT DOES THE RESEARCH SHOW?

Dr. Daniel Kripke of the University of California, San Diego researched connections between sleeping pills and disease/mortality risk. He found that people who took sleeping pills were 4.6 times more likely to die than those not taking sleeping pills in a 2.5-year period. In the same time period, he found that people taking more than 132 pills per year were 5.3 times more likely to die, and people taking just 18 pills per year were still 3.6 times more likely to die. Further, sleeping pills cause higher rates of infection, increased risk of car accidents (caused by the groggy feeling the next morning), high fall rates and higher heart disease and stroke rates. These statistics are not meant to tell you to stop taking your prescribed medication. Rather, they should encourage you to consider whether a pharmacological solution is best for you. If you are interested in alternative ways to improve your sleep, keep reading for tips on better sleep hygiene and speak to your health care professional to make the changes you see fit.

Parkinson's can manifest in many different non-motor symptoms, and sleep issues are very common. Poor sleep is a hallmark of Parkinson's and is a pre-motor symptom. Sleep disturbances are also the most commonly reported non-motor symptom. Quality of sleep is a keystone of Parkinson's, since if you don't sleep well enough, you can't manage your other symptoms effectively.

#### **REM SLEEP BEHAVIOR DISORDER**

One very common sleep disturbance is REM Sleep Behavior Disorder, otherwise known as RBD. RBD is characterized by people acting out vivid dreams, including talking, jumping out of bed, kicking, biting, etc., even though the person is often unaware of it. About 50% of people with Parkinson's report RBD as one of their symptoms, but even more strikingly, 80% of people with RBD will develop a neurodegenerative disorder within 10 years, making it a highly effective predictor. Several studies of prodromal Parkinson's indicate that sleep issues, especially RBD, are strong measures of conversion to movement disorders. There are a variety of ways to deal with RBD, including taking medication. However, environmental treatments like adjusting your sleeping space, getting separate beds or introducing a sleep barrier can also be helpful for both for the

person with RBD and the bed partner.

## **OTHER COMMON SLEEP ISSUES**

RBD is not the only sleep issue that people with Parkinson's can face. Other common symptoms include:

- Insomnia
- Sleep fragmentation
- Excessive Daytime Sleepiness (EDS)
- Nighttime sweating
- Trouble moving in bed
- Sleep apnea
- Fatigue
- Restless Leg Syndrome (RLS)

# WHAT CAUSES THESE ISSUES?

Several studies have investigated the causes of these sleep disturbances and have found that a combination of motor symptoms, iatrogenic issues, dysfunction of the autonomic nervous system and neurodegeneration come together to disrupt normal sleep patterns. In addition, certain medications can cause vivid dreams and nightmares, which become worse in conjunction with RBD. Some of these issues can also be caused by pain, muscle cramping, nocturia or **non**-Parkinson's causes like exercising too late in the day, drinking caffeine and alcohol or too much light in the bedroom. These symptoms can be addressed through certain lifestyle changes or in some cases by medications. However, before trying any of these methods, it's important to talk to your doctor.

Unfortunately, while sleep disturbances are common symptoms of Parkinson's and can have severe impacts on quality of life, insufficient studies exist about treatments. Though many medications are in existence, they are not applicable across the board and often can have unfortunate side effects. More research is necessary to find better solutions, and your participation in clinical trials can be instrumental in working to find these solutions.

With all this information about why sleep is so important, it can feel daunting to find ways to improve your sleep when you're experiencing sleep disturbances. It may be tempting to turn to pharmaceuticals to manage your sleep difficulties; however, this option has the potential for adverse side effects and is often less effective than lifestyle changes in the long run. Always discuss changes that you're considering with your healthcare professional, but don't be afraid to try different techniques to find what works for you. Sleep is an essential part of living well, so make sure to prioritize it as much as possible.

"Sleep hygiene" is the set of habits and behaviors that help you sleep well on a regular basis. Below, we offer some general and Parkinson's-specific sleep hygiene tips to hopefully help improve your sleep.

#### HOW TO TAKE ACTION AND IMPROVE YOUR SLEEP

- 1. Protect your bedroom. Avoid blue light (including screen technology), preserve your circadian rhythm and don't interfere with natural melatonin production. If you get anxious about not being able to sleep and you find yourself watching the clock, remove any visible clockfaces from view in the bedroom.
- 2. Prepare your sleeping area. Reduce light and noise, cool the temperature of your room (around 65 degrees Fahrenheit is considered ideal) and consider using a white noise machine or app to lull you to sleep.
- 3. Set a sleep schedule and develop a routine based on what's optimal for you. Make sure to follow a regular bedtime and wake-up time, even on the weekends, because consistent sleep patterns will help you in the long run.
- 4. Limit your daytime naps. If you do find yourself needing to nap, try to schedule it for 7-9 hours after you've woken up in the morning and limit it to 20-30 minutes so that you don't impede your sleep the next night.
- 5. Watch when and what you eat. Many people with Parkinson's have constipation and/or acid reflux (GERD), so tailoring your diet to avoid exacerbating those problems can also help you sleep. Avoid spicy or acidic foods, avoid too much protein (high protein levels can make it harder to absorb your medicine) and avoid sugary snacks or caffeine (which stimulate the nervous system).
- 6. Limit your liquids. Be extra careful about consuming caffeine and alcohol, especially close to your bedtime. Caffeine competes with adenosine and therefore keeps you awake rather than letting you fall asleep. Alcohol, though it may put you to bed faster initially, actually ends up causing lower sleep quality and can make you wake up more often.
- 7. Exercise regularly and at the right time. Get some aerobic exercise earlier in the day and be sure to wear sunglasses to avoid throwing off your circadian rhythm. Get some more sunlight in the afternoon, but don't wear the sunglasses, because the light will help you balance your sleep cycle rhythm. Avoid aerobic exercise too late in the day and engage in gentler activities like yoga, tai chi, Pilates or meditation before bed instead.
- 8. Clear a path to the bathroom. Be careful to avoid trip hazards, and if you are particularly concerned about this, you can consider including a low brightness lighting system from your bedroom to the bathroom to help you make your way without falling. Be careful not to make the system too bright, though, or you will have difficulty going back to sleep.