



ENHANCED

Learning

SLEEP IS CRITICAL

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Questions Answered

- Why is sleep important to a student?
- What is the process or stages of sleep?
- What are problems students can have with sleep?
- What are the consequences of problems with sleep?
- How can we help a student get better sleep?
- What are resources for learning about sleep problems?

Sleep is a natural part of everyone's life, but many people know very little about how important it is, and some even try to get by with little sleep. Sleep is something our bodies need to do; it is not an option. Even though the exact reasons for sleep remain a mystery, we do know that during sleep many of the body's major organs and regulatory systems continue to work actively. Some parts of the brain actually increase their activity dramatically, and the body produces more of certain hormones.

Sleep, like diet and exercise, is important for our minds and bodies to function normally. In fact, sleep appears to be required for survival. Rats deprived of sleep die within two to three weeks, a time frame similar to death due to starvation.



As educators we see the effects of sleep on students every day in the classroom. One day a student may seem attentive and lively, but on another day that same student seems lethargic and sleepy. The amount of sleep may be one of the things responsible for the student's change of behavior. Other things, such as illness or emotional problems, may certainly affect sleep in the classroom. However, in this article, we will look at the mechanics of sleep and how sleep can influence how a child learns.

The purpose of this article is to briefly describe the nature of the sleep process, to look at the problems that sleep deprivation can cause, and to offer suggestions for families on resources for students with sleep issues.

PROCESS OF SLEEP

An internal biological clock regulates the timing for sleep. It programs each person to feel sleepy during the nighttime hours and to be active during the daylight hours. Light is

the cue that synchronizes the biological clock to the 24-hour cycle of day and night.

Figure one, below, summarizes the stages of sleep, and what happens when we sleep through the night.

Types of Sleep

	Non-Rapid Eye Movement Sleep	Rapid Eye Movement Sleep
Stage 1	Transition/light sleep; easily awakened; muscle activity in sleep starts or nap jerks; eye movements slow down.	Usually first occurs about 90 minutes after you fall asleep; cycles along with the non-REM stages throughout the night.
Stage 2	True sleep; eye movements stop; slower brain waves, with occasional bursts of rapid brain waves.	Eyes move rapidly, with eyelids closed; breathing is more rapid, irregular, and shallow.
Stage 3	Considered deep sleep; difficult to awaken; brain waves slow down more, but still have occasional rapid waves.	Heart rate and blood pressure increase.
Stage 4	Considered deep sleep; difficult to awaken; extremely slow brain waves; restorative sleep.	Dreaming occurs; arm and leg muscles are temporarily paralyzed

Non-REM and REM sleep alternate about every 90-100 minutes in adults. In infants, the cycle is about 50 minutes and increases to adult lengths. Brief arousals followed by rapid return to sleep, often occur at the end of each sleep cycle, 4 to 6 times per night.

Figure 1: Stages of Sleep

WHAT IS SLEEP?

Sleep was long considered just a uniform block of time when you were not awake. Thanks to sleep studies done over the past several decades, it is now known that sleep has distinct stages that cycle throughout the night in predictable patterns. How well rested you are and how well you function depend, not just on your total sleep time, but on how much of the various stages of sleep you get each night.

Your brain stays active throughout sleep, and each stage of sleep is linked to a distinctive pattern of electrical activity, known as brain waves. Sleep is divided into two basic

types: rapid eye movement (REM) sleep and non-rapid eye movement (Non-REM) sleep, with four different stages. People usually cycle through five phases of sleep:

- ✓ Stage 1--Drowsiness
- ✓ Stage 2--Light Sleep
- ✓ Stage 3--Deep Sleep
- ✓ Stage 4--Slow-Wave Deep Sleep
- ✓ Stage 5--Rapid Eye Movement, or REM

During the deep stages of Non-REM or quiet sleep, blood supply to the muscles is increased, energy is restored, tissue growth and repair occur, and important hormones are released for growth and development.

During REM or active sleep, our brains are active and dreaming occurs. The body becomes immobile, and breathing and heart rates are irregular.

We spend almost 50 percent of our total sleep time in stage 2 sleep, and about 20 percent in REM sleep, while the remaining 30 percent is in the other stages. During stage 1, or light sleep, we drift in and out of sleep and can be awakened easily. Our eyes move very slowly and muscle activity slows. In stage 2 sleep, eye movement stops and brain waves slow. In stage 3 and 4, extremely slow brain waves appear. It is very difficult to wake someone during 3 and 4, which together are called deep sleep. There is no eye movement or muscle activity.

Children who wet the bed or sleep walk tend to do so during stages 3 or 4 of non-REM sleep. Deep sleep is considered the restorative part of sleep that is necessary for feeling well rested and energetic during the day.

During REM sleep, your eyes move rapidly in various directions, even though your eyelids remain closed. Your breathing also becomes more rapid, irregular, and shallow; and your heart rate and blood pressure increase. Dreaming typically occurs during REM sleep. During this type of sleep, your arm and leg muscles are temporarily paralyzed, so that you cannot act out any dreams that you may be having.

Behaviors such as sleepwalking are more likely to happen in the early part of the night, while things that happen during REM sleep, such as nightmares, will more often occur in the early morning hours.

One important aspect of these sleep cycles is that most of them will end in a short period

of awakening, or partial awakening, from sleep. This is called an arousal, and takes place before the person goes on to the next sleep cycle. In young children, these short arousals happen about every sixty to ninety minutes. Most of the time, they go right back to sleep. However, if the child has not learned to fall back to sleep by themselves (that is without out some type of parental contact), these brief arousals can turn into a major middle-of-the-night distress call. It's not the arousal or waking that is the problem for the child; it the inability to go back to sleep by themselves that needs to be addressed. Why people dream and why REM sleep is so important are not well understood. It is known that REM sleep stimulates the brain regions used in learning and the laying down of memories. Animal studies suggest that dreams may reflect the brain's sorting and selectively



storing important new information acquired during wake time. While this information is processed, the brain might revisit scenes from the day, while pulling up older memories. This process may explain why childhood memories can be interspersed with more recent events during dreams. Studies show, however, that other stages of sleep besides REM are also needed to form the pathways in the brain that enable us to learn and remember.

PROBLEMS WITH SLEEP

Sleep problems are very common among children and adults with ADHD. In fact, about

80 percent of them struggle with sleep in some way, and are among the 70 million Americans

who are chronically sleep-deprived. Although we still do not know exactly why the brain needs to sleep, all species need certain regular amounts of sleep. Surveys have shown that our grandparents generally got enough sleep; whereas, in our fast-paced lives today, most of us are sleep-deprived. Teens, especially, tend to run a sleep-deficit—naturally falling asleep later and awaking later than at other ages. This circadian pattern does not fit well with classes starting at 7:00 or 7:30 a.m. in many schools. Consequently, many teens' schoolwork and relationships suffer, due to fatigue. At any age, sleep deprivation causes many problems, including headaches, irritability, ADHD-like symptoms, hypertension and even heart problems.

Problem Sleepiness Has Serious Consequences

Sleep is, in essence, food for the brain; and insufficient sleep can be harmful, even life-threatening. When hungry for sleep, the brain becomes relentless in its quest to satisfy its need, and will cause feelings of sleepiness, decreased levels of alertness or concentration, and, in many cases, unanticipated sleep. Excessive sleepiness is also associated with reduced short-term memory and learning ability, negative mood, inconsistent performance, poor productivity and loss of some forms of behavioral control. Problems with sleep are common in both children and adults, although each age group has their own unique challenges to healthy sleep. Difficulties settling down or sleeping through the night are common in infants and preschoolers. School-aged children have more problems with sleepwalking, nightmares, teeth grinding, and bed-wetting. Adolescents and adults can have more problems with insomnia and daytime sleepiness.

While there is quite a bit of research on disturbed sleep in adults, much less is known about sleep problems in school-aged children. Adults will complain and seek treatment for their problems with sleep, but children seldom

are able to articulate their sleep challenges, or ask for help. One recent study found that about 11 percent of parents of children between ages 4 and 12 years of age reported sleep problems; but less than one half of those parents had ever discussed their concerns with their child's doctor. Sleep problems, such as snoring, tiredness during the day, and taking excessive time to fall asleep, were very common.

Other studies of sleep in children report that about 25 percent of all children experience some type of sleep problem during their growing up years. These problems range from short-term difficulties, such as falling asleep or waking during the night, to more serious problems, like obstructive sleep apnea and narcolepsy.

Although we still do not know exactly why the brain needs to sleep, all of us need certain regular amounts of sleep. Babies need 18-20 hours of sleep each day, children need 9 – 11 hours, teens need 8 – 10 hours, and adults need 7- 9 hours of sleep.

As many as 70 million Americans may be affected by chronic sleep loss or sleep disorders, at an annual cost of \$16 billion in health care expenses and \$50 billion in lost productivity.

Additional health outcomes of inadequate sleep can include an increase in accidental injuries, as well as negative effects on a child's cardiovascular, immune and metabolic systems. For example, chronic sleep deprivation may play a significant role in the development of obesity in children. In short, inadequate sleep is a major public health issue that is very common and often overlooked.

Sleep problems can make medical, emotional or developmental problems even more severe. A child with ADHD who doesn't get an adequate amount of sleep will have even more difficulty with attention and self-control. A depressed teenager who doesn't sleep well will have even more problems with moods. There will be more conflicts between an oppositional defiant young person and their parents when they don't have enough sleep. Medical conditions, such as juvenile

rheumatoid arthritis, will be made more painful by the presence of a sleep disorder. On the positive side, improving the sleep for these same individuals will help improve their medical or emotional condition. One area of research looked at the consequences of middle-school-aged students who were allowed to sleep only six and a half hours every night for a week. They found that this lowered amount of sleep led to significant learning problems, such as poor attention span, difficulty with problem solving, and decreased speed and efficiency in completing tasks.

Sleep problems in adolescents have been linked to increased risk of learning and behavioral problems. Many parents of ADHD children report frequent sleep disturbances. Studies have also shown that youngsters who frequently snore or have sleep disorders are almost twice as likely to suffer from ADHD than those who sleep well.

Experts are finding that children are going to bed later, getting up earlier and getting less sleep than they were ten or twenty years ago. Busy schedules, computers, video games, cell phones and televisions may all contribute to the problem.

Polls conducted by the National Sleep Foundation found that our younger children are sleeping less than experts recommend, and that more than two-thirds experience frequent sleep problems. This same study found that three out of four parents would like to change something about their children's sleep habits. This same study found that, in every age group, children did not meet the low end of the range recommended by sleep experts for daily hours of sleep.

Many people view sleep as merely a down time, when their brain shuts off and their body rests. In a rush to meet work, school, family, or household responsibilities, people cut back on their sleep, thinking it won't be a problem, because all of these other activities seem much more important. But research reveals that a number of vital tasks carried out during sleep help to maintain good health and enable people to function at their best. While you sleep, your brain is hard at work forming the

pathways necessary for learning and creating memories and new insights. Without enough sleep, you can't focus and pay attention or respond quickly. A lack of sleep may even cause mood problems. Growing evidence shows that a chronic lack of sleep increases the risk for developing obesity, diabetes, cardiovascular disease, and infections.

Sleepiness due to chronic lack of adequate sleep is a big problem in the United States and affects many children, as well as adults. When we get less sleep (even one hour less) than we need each night, we develop a *sleep debt*. If the sleep debt becomes too great, it can lead to problem sleepiness – sleepiness that occurs when you should be awake and alert, that interferes with daily routine and activities, and that reduces your ability to function. Even if you do not feel sleepy, the sleep debt can have a powerful negative effect on your daytime performance, thinking, and mood; and it can cause you to fall asleep at inappropriate and even dangerous times.

Consequences of Problems With Sleep

Problem sleepiness has serious consequences – it puts adolescents and adults at risk for drowsy driving or workplace accidents. In children, it increases the risk of accidents and injuries. In addition, lack of sleep can have a negative effect on children's performance in school, on the playground, in extracurricular activities, and in social relationships.

Inadequate sleep can cause decreases in:

- School and academic performance
- Concentration
- Reaction times
- Ability to put ideas together

Inadequate sleep can cause increases in:

- Memory lapses
- Accidents and injuries
- Behavior problems
- Mood problems
- Signs of sleep disorders

A child who has not obtained adequate nighttime sleep is at high risk for symptoms of physical and/or mental impairment. The child may fall asleep in school, have difficulty concentrating in school and other activities, and/or exhibit behavioral problems. Some children who are sleepy become agitated, rather than lethargic, and may be misdiagnosed as hyperactive. Not getting enough sleep is one cause of problem sleepiness. Undiagnosed/untreated sleep disorders can also cause problem sleepiness. Children, as well as adults, can suffer from sleep disorders. If you see any of the following behaviors in the classroom, you should inform the child's parents.

Parents should talk to their pediatrician about a possible sleep disorder if their child has any of the following:

- Snoring
- Breathing pauses during sleep
- Problems with sleeping at night
- Difficulty staying awake during the day
- Unexplained decrease in daytime performance

Difficulty falling asleep, or *sleep-onset insomnia*, is the most common sleep problem associated with ADHD. Many students describe not being able to settle down and stop thinking at bedtime. Distracted thinking after stimulants have worn off may make them unable to focus enough to relax and fall asleep. For these youngsters, moderate afternoon exercise, maintenance of consistent bedtime routine and relaxation strategies in bed may be sufficient. However, when that doesn't work, a mild sleep aid like clonidine or melatonin (a hormone/ antioxidant) could be helpful. Ironically, a small dose of stimulant medication in the late evening can sometimes help, when distracted thinking is the problem. A physician can help with these decisions.

Melatonin May Help

Melatonin is a naturally occurring hormone, which plays an important role in regulating sleep. Secreted by the pineal gland, a small

endocrine gland located in the brain, Melatonin controls the circadian rhythm, the body's internal clock that controls when a person falls asleep and wakes up.

Since Melatonin is the master hormone that controls sleep patterns, many parents find that it will induce sleep in their ADHD children, and help to alleviate the insomnia and sleep disturbances that go along with ADHD. Melatonin has been shown to reduce the amount of time it takes to fall asleep, lengthen the time one stays asleep, and increase daytime alertness. Talk to your physician about this alternative for your child.



For an ADHD child, Melatonin will help him to have more normal sleep patterns and to sleep longer, which, in turn, helps the child to be more alert and function better during the day. Best of all, since Melatonin is the natural chemical your brain uses to regulate sleep, it enhances normal sleeping patterns. Many drugs that induce sleep do not cause the body to reproduce natural sleep patterns and, as a result, the child often does not feel rested, even though he slept.

Other Interventions

There are also a variety of other barriers at bedtime, including uncompleted homework (the midnight scholar), gripping television shows and video games (the "just a few more minutes" sleeper), bedtime fears or loneliness (the "please stay with me sleeper"), and oppositional behavior (the bedtime warrior). Each of these problems presents a unique challenge; but each can be successfully managed with consistent maintenance of schedule, rules and good parental example. Brief professional counseling may be needed if the problem is entrenched.

You might suggest the following interventions to the parents of the child who seems to be having sleeping difficulties.

- Set a regular time for bed each night and stick to it.
- Turn off televisions, computers, iPad's, cell phones and any access to the Internet.
- Avoid naps or sleeping in on weekends to catch up on sleep.
- Maintain a healthy diet and exercise regularly.
- Lose or gain weight, if needed.
- Seek treatment for allergies, pains, snoring or other problems that disrupt sleep.
- Establish a relaxing bedtime routine, such as giving your child a warm bath or reading her a story.
- Make after dinner playtime a relaxing time; too much activity close to bedtime can keep children awake. No wrestling or active video games.
- Avoid family arguments in the evening.
- Avoid feeding children big meals close to bedtime. A snack is okay;but a large meal is not appropriate.
- Avoid giving children anything with caffeine less than six hours before bedtime.
- Set the bedroom temperature so that it's comfortable – not too warm and not too cold.
- Make sure the bedroom is dark. If a night-light is necessary, make it a small one.
- Keep the noise level low.
- Help them learn deep breathing and relaxation techniques to help calm down and get to sleep.

Seek a Specialist

If you or your staff think a student may have a sleep disorder, have the parents talk to their family doctor or seek out certified sleep centers and professionals certified in behavioral sleep medicine. Also, keep in mind that there's no one-size-fits-all approach when treating sleep disorders. Often a combination of physicians, specialists, psychologists or counselors may be needed to work with a child with sleeping problems. ■

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