

Attention deficit hyperactivity disorder and sleep

Insomnia and other sleep problems may worsen symptoms of ADHD; treatment options exist.

Parents and clinicians report that sleep problems affect 25% to 50% of children and adolescents with attention deficit hyperactivity disorder (ADHD). The most typical problems include bedtime resistance and difficulty falling asleep.

Studies using objective measures of sleep quality have produced inconsistent results, however. For example, studies using an actigraph, a lightweight monitor that people can use at home, have found that sleep in youths with ADHD is similar to that of other youths when it comes to parameters such as sleep onset, duration, and quality. At the same time, actigraph studies suggest that youths with ADHD are more active during the night (assessed by frequency and duration of movements), and they show greater variability in sleep patterns from one night to the next—suggesting unstable regulation of sleep and arousal.

The symptoms of ADHD and sleeping problems often overlap, making it difficult to differentiate the two. For this reason, it's important to rule out sleep problems before confirming a diagnosis of ADHD. At the same time, sleep disorders can exacerbate symptoms of ADHD—and vice versa—presenting a challenge to both parents and clinicians.

A bidirectional relationship

The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) describes four ADHD subtypes: predominantly inattentive, predominantly hyperactive-impulsive, combined, and not otherwise specified. Although severity varies, symptoms typically include inability to focus, sustain attention, plan or execute tasks, or remember things.

Clinicians and parents have long noticed an association between symptoms of sleep disorders and ADHD in

children. (It is less clear whether sleep problems occur in adults with ADHD, partly because sleep problems are common in adults in general.) The cause of sleep problems in ADHD—and how the two conditions are related—remains unknown, but current thought is that multiple factors may be involved and that they probably interact.

Biology. Although the research is preliminary and sometimes speculative, it suggests that both ADHD and certain sleep disorders share common biological abnormalities. Disruptions in neurotransmitter systems, especially those involving dopamine and norepinephrine, are found both in people with ADHD and those with sleep disorders.

Other research suggests that abnormal circadian rhythms may contribute both to ADHD and sleep problems in some people. For example, one study reported that medication-free children with ADHD who have trouble falling asleep have a delayed nighttime increase of melatonin (a chemical that induces sleepiness) when compared with unmedicated children with ADHD who do not have insomnia.

Behavior. Symptoms such as hyperactivity and inability to settle down may contribute to bedtime resistance. Likewise, poor sleep at night can worsen behavior during the day, leading to a counterproductive cycle that affects both sleep quality and ADHD symptoms.

Two preliminary studies that used objective measurements of sleep and daytime alertness in youths with ADHD reached the counterintuitive conclusion that—at least in some children—hyperactive behavior may result from underarousal in the brain. In both studies, investigators found that sleep in children with ADHD was similar to that in controls, but that children with ADHD were less alert and more likely to be sleepy during the day.

Other conditions. Anxiety, depression, learning disorders, conduct disorder, and oppositional defiant disorder also commonly occur in conjunction with ADHD, and may contribute independently to sleep problems. Children with ADHD and anxiety or depression, for example, may ruminate about the day's events or worry about the next day, and these distressing thoughts may keep them awake.

Children may also develop primary sleep disorders in conjunction with ADHD. Two of the most common are sleep-disordered breathing (affecting up to 25% of children with ADHD) and restless legs syndrome or periodic limb movement disorder (affecting as many as 36%). In different ways, these disorders contribute to multiple awakenings and disrupted sleep patterns.

Stimulants. About one-third of children with ADHD who are not on medication experience chronic insomnia, suggesting that difficulty falling asleep may be intrinsic to the disorder. Nevertheless, research also suggests that stimulants used to treat children and adolescents with ADHD probably cause or exacerbate insomnia in some youngsters.

One option is for youths to take stimulants only early in the day. However, some may experience a “rebound” phenomenon, in which they become more hyperactive as the stimulant drug wears off. For these children, lowering the stimulant dose, using a time-release formula, or switching to a nonstimulant drug may be worth considering.

Treatment options

Treatment options for sleep problems in people with ADHD are generally the same as recommended for other people. The first step consists of lifestyle changes and behaviors that promote sleep. Psychotherapy or medications

provide additional options when necessary.

Sleep hygiene. A prevailing view is that people can learn how to sleep better. “Sleep hygiene” is the term used to describe behaviors that promote good sleep. These include maintaining a regular sleep-and-wake schedule, using the bedroom only for sleeping, and keeping the bedroom free of distractions like the computer or television.

Avoid caffeine. Coffee and tea aren’t the only beverages that contain this stimulant. Some soft drinks, such as cola, orange, and citrus sodas, contain a lot of caffeine. Chocolate drinks or candy also contain this stimulant. It’s important to avoid caffeine after mid-to late afternoon, as this substance can remain in the system for hours.

Physical activity. Regular exercise during the day, especially aerobic activity, helps people fall asleep faster,

spend more time in deep sleep, and awoken less often during the night. As an added bonus, physical activity also helps expend some of the energy that may contribute to hyperactivity and restlessness. It may be hard to sleep right after exercising, however, so physical activity may be worth avoiding in the hours just before bedtime.

Light therapy. If a disruption in circadian rhythm is contributing to sleep problems and other symptoms in someone with ADHD, a preliminary study in adults suggests that morning light therapy (similar to that prescribed for seasonal affective disorder) may help improve daytime alertness and focus. A case report found similar benefits for younger patients.

Cognitive behavioral therapy. Because people who don’t sleep well can become preoccupied with the problem while lying in bed, cognitive behavioral

techniques can help them build more confidence that they can enjoy a good night’s sleep.

Medications. Preliminary research in children with ADHD and insomnia suggests that melatonin at night may help children fall asleep. Antidepressants and other medications to treat co-occurring disorders such as depression or anxiety may help if rumination is the problem. A variety of sleep aids also exist, but these have generally not been studied in children. ♥

Gruber R. “Sleep Characteristics of Children and Adolescents with Attention Deficit-Hyperactivity Disorder,” *Child and Adolescent Psychiatry Clinics of North America* (Oct. 2009): Vol. 18, No. 4, pp. 863–76.

Tsai MH, et al. “Attention-Deficit/Hyperactivity Disorder and Sleep Disorders in Children,” *Medical Clinics of North America* (May 2010): Vol. 94, No. 3, pp. 615–32.

For more references, please see www.health.harvard.edu/mentalextra.

In brief

Theories about what causes chemobrain

A type of cognitive impairment known as “chemobrain” or “chemofog” is a common side effect of chemotherapy and other cancer treatments. A review of outcomes for adults treated with chemotherapy for solid tumors (such as those in the breast and prostate) found that 15% to 45% developed cognitive impairment, although impairment was usually subtle and short-lived.

The research suggests that many types of thinking ability are affected, including memory, processing speed, attention, concentration, and executive function (ability to plan and make decisions). For most people, these deficits subside with time, but in a minority they persist.

It is likely that multiple factors contribute to the development of chemobrain. The most obvious is cancer drug treatment itself. Although most chemotherapy agents do not cross the blood-brain barrier, some agents do—and may damage neurons and other brain cells.

Other research suggests that some people are genetically vulnerable to cognitive damage following chemotherapy. For example, people born with a version of the apolipoprotein E gene known as ApoE4 are not only more

likely than others to develop Alzheimer’s disease, but also to experience cognitive decline after chemotherapy.

Hormonal changes caused by cancer treatment may also contribute. Both estrogen and testosterone have neuroprotective effects. Both chemotherapy and hormone treatments can reduce levels of these hormones, contributing to problems thinking. Other possible causes of chemobrain include cancer-related fatigue and immune system impairment.

Unfortunately, we do not yet know how to prevent chemobrain or treat it when it occurs. Researchers are currently testing medications, dietary supplements, and cognitive remediation strategies. Some cancer survivors have learned to cope with the symptoms by compensating for any deficits—such as scheduling business meetings in the morning if they feel foggy by afternoon or making lists rather than relying on memory. Until we know more about chemobrain, such self-help strategies may need to suffice.

Argyriou AA, et al. “Either Called ‘Chemobrain’ or ‘Chemofog,’ the Long-Term Chemotherapy-Induced Cognitive Decline in Cancer Survivors Is Real,” *Journal of Pain Symptom Management* (Sept. 9, 2010): Electronic publication ahead of print.



THE QUIRKY BRAIN

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