

The Connection Between Sleep Cycles and ADHD in Adolescents

Introduction

Gaining adequate sleep is extremely valuable, especially among adolescents, as it supports their brain development, memory, emotional regulation, and hormone balance. Without enough rest, adolescents can struggle with keeping focus, regulating their mood, performing well academically, and can even suffer from negative mental and physical health effects including depression, anxiety, fatigue, and hand tremors (Cleveland Clinic, 2025). For teenagers with Attention-Deficit /Hyperactive Disorder (ADHD), sleep challenges are even more pronounced, not just in their sleep duration, but also in their brain activity between each sleep cycle. Recent studies have shown that teenagers with ADHD experience altered brain wave activity within each stage of their sleep, potentially contributing to the difficulties those affected face during the day with attention, working-memory, and behavior. Research suggests that these differences may be attributed to a maturational lag in their brain development. Considering how crucial it is that teenagers obtain proper rest, the idiosyncrasies in the sleep cycles of adolescents with ADHD are vital to explore in order to ensure healthy development of adolescents struggling with this disorder.

Understanding the Structure and Brain Waves of Sleep Cycles

Sleep cycles consist of multiple stages, each characterized by distinct brain wave patterns. A full sleep cycle is divided into two main categories: Non-Rapid Eye Movement (NREM) and Rapid Eye Movement (REM). NREM sleep is divided into three stages: Stage 1 consists of theta waves and is when an individual starts falling asleep; Stage 2 involves continued theta wave activity, sigma wave activity, and sleep spindles and K-complexes which both play important roles in memory consolidation; and Stage 3 is also known as slow-wave sleep or deep sleep and consists of delta waves. After the NREM stages, the individual enters REM sleep, where brain activity is actually quite similar to wakefulness, as it consists of beta and alpha waves. The stage is associated with vivid dreaming (Biswas-Diener & Teeny, 2025). This cycle repeats every 90-120 minutes about 4-6 times a night (Patel et al., 2024).

ADHD and Abnormal Brain Wave Activity During Sleep

Recent research conducted by Lunsford-Avery and colleagues suggested abnormalities in the brain wave activity of adolescents with ADHD during these sleep cycles based on polysomnography (PSG) data. When the researchers compared the electroencephalogram (EEG) results of their experimental group (adolescents with ADHD) to their control group (adolescents without ADHD), they found that the participants with ADHD spent more time in N2 sleep and less time in N3 sleep. Furthermore, the participants with ADHD had “lower NREM EEG delta power and higher NREM EEG sigma power” (Becker, 2025). These findings reflect similar patterns found in other longitudinal sleep studies, suggesting that adolescents with ADHD

experience abnormal sleep cycles and delayed brain maturation. Further analysis using brain imaging techniques during sleep would be very beneficial for deepening our understanding of the differences in brain development of those with ADHD and can guide future interventions to mitigate its impact.

Conclusion

It is important for health professionals and educators to understand how ADHD affects the quality of sleep in adolescents. The altered brain wave activity experienced by affected teenagers points to significant neurodevelopmental differences. It is important to address these differences in order to prevent them from continuing to impair memory, focus, and academic performance. Further research using advanced neuroimaging techniques can provide valuable insight into the abnormalities in the sleep patterns of adolescents with ADHD and will be critical in shaping interventions for improving sleep hygiene and cognitive development. Ultimately, prioritizing a broader understanding of sleep in adolescents with ADHD has the potential to lead to meaningful improvements in their daily life and long-term development.

References:

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