Evaluating & Managing Sleep Problems: The Sleep/ADHD Conundrum

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The brain starts to work the moment you are born. It never stops until you stand up to speak in public.
Objectives

- Recognize implications for sleep from having ADHD
- Recognize implications for ADHD of getting good sleep
- Recognize related conditions that may influence sleep and ADHD symptoms
- Learn to better manage ADHD through improved Sleep
Sleep and the Brain

- Extensive neuroscience research shows that sleep changes brain functioning.

- Both learning and memory are improved (consolidated) when followed by good sleep -
  - Information processing
  - Long term memory
Effects of Too Little Sleep

- Too little sleep undermines mental functioning in both adults and children
- Children restricted to 5 hours of sleep have shown
  - Daytime sleepiness
  - Diminished verbal processing
  - Reduced creativity
  - Impaired abstract reasoning

(Randazzo, et al., 1998)
Effects of Fragmented Sleep

- Fragmented sleep, sleep deprivation, and poor sleep quality lead to
  - Inattention and poor executive functioning (Sadeh et al., 2002)
  - Irritability; Behavior problems
  - Emotional Instability
  - Low frustration tolerance (Dahl, 1996)
Health Effects: Too Little Sleep

- Obesity
- Diabetes
- Hypertension
- Metabolic Syndrome
- Cardiovascular Problems
- Accidental injuries in children
- Increased risk of motor vehicle accidents
How Sleep Is Regulated

Sleep Influences
Physiologic (hunger, exercise, disease, medication, etc.)
Behavioral (sleep/wake schedule, etc.)
Environmental (temperature, noise, light, etc.)
Circadian Cycle in the Brain

- Melatonin into blood
- Pineal gland
- Melatonin into cerebrospinal fluid
- Third ventricle
- Suprachiasmatic nucleus
- Optic chiasm
- Brain stem and spinal cord
- Hypothalamus
- Hypophysis
- Certain ganglion cells in retina
- Postganglionic sympathetic neuron in superior cervical ganglion of sympathetic cord
- Preganglionic sympathetic neuron in thoracic cord
New Research Link: ADHD/Sleep

- Children with ADHD have elevated polymorphisms of CLOCK genes
  - T3111C was higher when parents reported sleep disturbances
- Circadian rhythm is known to be influenced by CLOCK genes that affect sleep-wake cycle through release of melatonin and cortisol
Both sleep problems and ADHD represent brain arousal disorders.

Brain systems for Attention-Arousal and Sleep Regulation are essentially the same:

- Structural Description - lower brain reticular activation, thalamus, projection paths to pre-frontal areas of the cortex – executive functioning
- Neurochemical Description - primary noradrenergic and dopaminergic neurotransmission
What’s the Conundrum?

- Sleep problems worsen ADHD symptoms
- ADHD worsens sleep problems, with or without medication
- Medication for ADHD may further interfere with sleep
- Medication for ADHD may mask serious sleep problems that then go untreated
  - For example, obstructive sleep apnea
ADHD / Sleepiness Present Alike

- Subjectively tired, drowsy, fatigued (poor self-awareness)
- Yawning, rubbing eyes, resting head
- Impulsivity, hyperactivity, aggression
- Mood lability
- Neurocognitive deficits
  - Decreased cognitive flexibility
  - Decreased verbal creativity
  - Diminished abstract reasoning
  - Memory impairments
  - Poor motor skills
  - Decreased attention and vigilance
ADHD adds to sleep instability

- ADHD is a form of arousal dysregulation
- ADHD is partly characterized by unstable sleep
- ADHD children are consistently sleepier than children without ADHD, as measured by mean sleep latency tests
Sleep and Development

- Sleep = 40% of childhood
- Prevalence of disturbed sleep and daytime sleepiness (Barkley, 2015):
  - 23% in neurotypical children
  - 56% among those with ADHD
    - 53-64% unaffected by medication (Ball, et al., 1997)
    - 52% vs. 21% evident from infancy (Trommer et al., 1988)
- Sleep Disorders are very prevalent among neurodevelopmental disorders generally – 86%?
Sleep problems more common with ADHD than with other referral reasons

Ball, Tiernan, Janusz & Furr (1997)
Parent Report: ADHD Sleep Problems?

- More daytime sleepiness
- Reduced total sleep time
- More difficulty falling asleep
- More frequent awakenings
- More bedwetting
- More habitual snoring
- More sleepwalking
- More restlessness
- More nightmares and anxiety
- More sleep resistance
- More teeth grinding (bruxism)
- More difficulty with AM awakening
Polysomnogram and ADHD

- Polysomnogram studies have often not shown differences in sleep architecture of children with ADHD, but
  - Children with ADHD are more likely than controls to suffer from periodic limb movements (PLMS)
  - They are more active during sleep
  - They have more daytime sleepiness and show sleepiness on mean sleep latency tests
  - Age appears to be a significant moderator in that young children with ADHD may have greater problems with total sleep time and stage 1 sleep

12 studies; 11 journals; 331 ADHD vs. 231 controls]
Parent Report vs. Polysomnogram?

- Some bedtime problems may be part of ADHD presentation.
- Sleep difficulties may stem from comorbid other conditions (e.g., ODD, OCD, anxiety, depression, ASD).
ADHD May Influence Circadian Rhythm

- Persons with ADHD show higher daytime activity especially in the afternoon, which can affect circadian rhythm

- Children with ADHD show higher heart rate, especially during afternoon and at night, which can affect circadian rhythm

- Thus, ADHD (and/or stimulants for it) can alter circadian rhythm, contributing to sleep problems
Sleep Disorders May Present Like ADHD

- Obstructive Sleep Apnea/Hypopnea Syndrome (OSAS)
- Primary Snoring
- Restless Legs Syndrome
- Periodic Limb Movement Disorder
- Narcolepsy
Obstructive Sleep Apnea Syndrome (OSAS)

- Peak age 2 - 7 years
- 2nd peak in adolescence (obesity is then a major risk factor)
- Prepubertal: female = male
Sleep Apnea: Nocturnal symptoms

- Loud snoring
  Respiratory pauses, snorts, gasps
  Increased respiratory effort / paradoxical breathing

Restless sleep
Sweating
Unusual sleeping positions

Parental anxiety level
Sleep Apnea: Day Symptoms

- Difficulty with AM waking
  Early AM headaches
- Complaints of daytime sleepiness
- Hyperactivity, poor impulse control
- Aggressiveness
- Attention span problems
- Shyness / social withdrawal
- Learning problems
- School failure
N = 297 children < 10th percentile in class rank

Grouped by (1) SBD using pulse oximeter and partial pressure CO₂, (2) primary snoring, or (3) controls

Treating SBD kids significantly improved their GPA

Adolescents /ADHD / Sleep: The Perfect Storm

- Stay up later but don’t get up later
- Due to circadian rhythm differences, older adolescents are biologically suited for later AM awakening
- High school teens average 1 hour less sleep than middle school teens
- But sleep need is not reduced
- EVMS sleep lab research found that local teens in schools with earlier start times had more car crashes (Vorona et al., 2011)
- This research has been replicated elsewhere
Evaluation Implications

- Assess for sleep duration and quality with every ADHD evaluation
- Assess for ADHD when doing sleep evaluations
- Determine whether there may be
  - Only ADHD
  - Only a Sleep Problem
  - Both ADHD and a Sleep Problem
Patient/Parent Role: Evaluation

- Notice and report
  - Sleep Duration and Quality Problems
  - Sleep Related Breathing Problems
  - Daytime Sleepiness
Treatment Implications: Rx

- Evaluate sleep effects of ADHD Rx
- Melatonin before bed?
  - ½ hour improvement in sleep onset in children compared to placebo
  - No improvement in bedtime behavior, cognition, or quality of life
- Clonidine and L-thenanine also helped
- Zopidem ineffective; neg side effects
Treatment Implications

- Education about ADHD and sleep
- Education about sleep hygiene
- Structure children’s sleep toward better sleep hygiene
  - Later school start times for adolescents
  - Shift sleep phase gradually over time
- Employ behavioral interventions to assist sleep
Fact Check

- Children who do not get enough sleep are more likely to be underweight than overweight.
- False
- 23% of parents answered correctly in research by Judy Owens (2011)
Fact Check

- Being overweight can increase a child’s risk of sleep problems.

- True

- 59% of parents answered correctly
Fact Check

- Snoring indicates a child is sleeping well.
  - False; 49% correct
Fact Check

- Being under- or overactive can be warning signs that a child is not getting enough sleep.

- True; 53% correct
Fact Check

- Watching TV in the bedroom makes it more difficult for children to fall asleep.

- True; 64%
Fact Check

- Children should have the same bedtime and wake time on weekdays and weekends.
- True; 55%
Fact Check

- Well-rested children do not need an alarm clock to wake up in the morning.

- True; 46%
Fact Check

- The average preschooler needs 10 hours of sleep per 24 hours.
  - False; 7%
Fact Check

- The average school-aged child needs 8 hours of sleep per 24 hours.

- False; 11% correct
Parent Research:
Problem Practices Are Common (age 1 – 7)

- 70%: Adult present in room at sleep onset at least a few nights/week
- 79%: At least one electronic device in the bedroom (TV, DVD, computer)
- 76%: Parents underestimated sleep needs of their own child
- 60%: Watching TV is part of bedtime routine
- 43%: Bedtime after 9 PM
- 42%: No regular bedtime for all 7 nights/wk
“Never miss a good chance to shut up.”

Will Rogers