



Effective Treatment of Sleep Problems for Children with ASD

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Normal Sleep

- What is Sleep?
 - Sleep is a brain process
 - Yet effected by environmental factors
 - operant contingencies
 - Sleep is an active process
 - Not just a response to fatigue
 - Sleep is not a single process
 - Multiple systems work together to create sleep/wake



3 Systems of Sleep Regulation

- Nervous system activation
 - Sympathetic vs. parasympathetic
 - Example: conditioned anxiety
- Sleep debt
 - Drive state (hunger, thirst)
 - Purpose is not to relieve sleepiness
- Circadian Rhythm
 - Internal biological clock to regulate systems
 - 24-26 hour cycle
 - Core body temperature
 - Max alertness near peak temperature (2pm)
 - Cycle is reset daily by bright light



Basics of Biological Rhythms

- Timing is everything
 - Zeitgebers
 - Day/night
 - Ambient temperature
 - Food availability
 - Physical activity
 - Social cues
 - Entrainment by Light



Sleep and Age

- Sleep patterns change over the lifespan
 - Babies sleep twice as much, but at irregular intervals
 - Intervals begin to consolidate
 - Total sleep time begins to decrease

Age	Total Hours of Sleep	Suggested Nap Hours
2 years	13	1-3 hours (1 Nap)
3 years	12	1-3 hours (1 Nap)
4 years	11.5	0-2.5 hours (0-1 Nap)
5 years	11	0-2.5 hours (0-1 Nap)
6 years	10.75	None
7 years	10.5	None
8 years	10.25	None
9 years	10	None
10 years	9.75	None
11 years	9.5	None
12 years	9.25	None
13 years	9.25	None
14 years	9	None
15 years	8.75	None
16 years	8.5	None
17 years	8.25	None
18 years	8.25	None



Why Does Sleep Matter?

- Sleep has a broad effect across many of the day-to-day aspects of an individual's life
 - Poor sleep is associated with irritability, mood, concentration, memory, and learning problems
- Sleep problems may be the result of a medical condition, side effect of medication, poor sleep hygiene, or a psychological disorder
 - Benca, 2000; Gillin & Drummond, 2000; Smith, Smith, Nowakowski, & Perlis, 2003; Uhde, 2000



Medications and Sleep Problems

- Many medications will impact sleep
 - Blood pressure medications
 - Clonidine, propranolol, atenolol, methyldopa
 - Hormonal
 - Thyroid, cortisone, progesterone
 - Long-term use of antihistamines
 - Asthma
 - Theophylline, albuterol, salmeterol
 - SSRI antidepressants
 - Fluoxetine, paroxetine
 - Steroids
 - Prednisone
 - Stimulants
 - Methylphenidate, amphetamines



Why Does Sleep Matter?

- Sleep problems are common
- Often associated with emotional disorders or stressful life events
 - Ford & Kamerow, 1989
- Patients with chronic sleep disorders have been found to be at an increased risk for depression, anxiety disorders, substance abuse disorders, and nicotine dependence
 - Breslau, et al. 1996; Ford & Kamerow, 1989
- Improvements in mood may often be found when treating the underlying sleep problem
 - Jacobs, et al. 1993; Jacobs, et al. 2004



Why Does Sleep Matter?

- Sleep problems occur frequently among children with ASD
 - 40-80%
 - Parents rank sleep problems among the most common and important problem.
- Risk of accidents



Why Does Sleep Matter?

- Other issues reported:
 - Hyperactivity
 - Disruptive behavior
 - Communication difficulties
 - Social difficulties
 - Difficulties breaking routines
- All of these problems may impact learning during the day



Why Does Sleep Matter?

- When your child doesn't sleep well, nobody sleeps well!



Sleep in Children with ASD

- Sleep problems predict overall autism scores and social skills deficits (Schreck et al 2004)
 - Hours of sleep per night predict:
 - autism severity
 - social skills deficits
 - stereotypic behavior
 - Sensitivity to environmental stimuli and screaming predict communication problems



- Sleep Disorders vs. Sleep Problems



Types of Sleep Disorders

- **Dysomnias**
 - Dysomnias consist of problems related directly to the sleep process
 - amount, quality, and timing of sleep
- **Parasomnias**
 - Consist of problems that occur during sleep or sleep-wake transitions



Dysomnias: Primary Insomnia

- Prevalence rates of insomnia follow a developmental course in which persons in early childhood and older adulthood are more likely to experience this problem
- Persons with primary insomnia appear to be hyperaroused (Hauri, 2000)
- It is not particularly the inability to fall asleep that is found distressing, but rather it is the consequences of getting too little sleep that are seen as the problem
- Lack of sleep can increase irritability, lead to excessive daytime sleepiness, or impair functioning (Zorick & Walsh, 2000)



Insomnia in ASD

- Most common type of sleep problem among children with ASD
- Types of insomnia problems:
 - Sleep onset
 - Length of sleep
 - Early morning wakening
 - Irregular sleep-wake cycle
 - Poor sleep routines



Insomnia in ASD

- Behavioral Causes
 - Sleep-Onset
 - Using sleep aids to help a child fall asleep may actually make things worse
 - Develop dependency upon the conditioned state
 - Unable to fall back to sleep without it
 - Limit-Setting
 - Behavioral routines and enforcing bedtimes



Insomnia in ASD

- Non-Behavioral Causes
 - Gastrointestinal Problems
 - GI problems can be painful - May lead to night awakenings and fragmented sleep (Ming, 2008)
 - Seizures
 - Malow, 2004
 - Sleep deprivation may promote seizure activity
 - Anxiety & Depression



Insomnia in ASD

- Circadian Rhythm Dysfunction
 - Melatonin
 - Naturally occurring hormone
 - Regulates circadian rhythm
 - Seasons
 - 10% of children with ASD show some sign of seasonal sleep problems (Giannotti, 2008)
 - Hayashi (2000)
 - sleep journal from a child with autism showed moderate problems in Jan-June, none in July-August, major increase Oct-Dec
 - daylight savings time



Dysomnias: Primary Hypersomnia

- Sleepiness will wax and wane throughout the day (Mitler & Miller, 1996)
 - Decreased alertness during the mid-afternoon (2:00 pm)
 - Severe decrease during early morning (2:00 am)
 - corresponds to a peak in body temperature and a significant drop in body temperature, respectively
- Severe cases of excessive daytime sleepiness are frequently associated with obstructive and central sleep apnea, restless leg syndrome, and neurodegenerative diseases (El-Ad & Korczyn, 1998)
- Typically not reported as a significant problem in ASD



Dysomnias: Breathing-Related Sleep Disorder

- Breathing-Related Sleep Disorder
 - Apneas (breathing cessation)
 - Hypopneas (slow or shallow breathing)
 - Hypoventilation (low oxygen blood levels)
- Types:
 - obstructive, central, and central alveolar hypoventilation



Sleep Apnea in ASD

- ASD not a particular risk for BRSD
- Relatively easy to treat in some cases
 - Malow (2006)
 - Adenotonsillectomy resulted in improvement across multiple domains
 - Social functioning, concentration, repetitive behaviors, auditory sensitivity



Dysomnias: Circadian Rhythm Sleep Disorder

- Circadian Rhythm Sleep Disorder
 - Desynchronization of sleep cycle with environmental cues
 - Unable to sleep when it is desired or socially expected



Parasomnias

- Sleep Terror Disorder
 - Showing signs of acute terror: screaming, crying, shouting
 - Not related to psychopathology
 - Unknown cause
 - May be genetic



Other Disorders in ASD

- Non-REM Arousal Disorders
 - Aberrant Arousals from NREM
 - Confusional arousals, sleepwalking
 - Risks: sleep deprivation, illness, stress, apnea
 - REM Sleep Behavior Disorder
 - Acting out dreams
 - Risks: medications
 - Rhythmic Movement Disorder
 - Primarily seen during sleep transitions
 - Repetitive movements: head, trunk, limbs



Treatment

- Two treatment approaches
 - Pharmacological
 - Behavioral



Pharmacological Treatments

- Should be used as second-line treatment for sleep problems in ASD
 - Avoid over the counter medications like antihistamines
 - Benadryl is not a medication for sleep!
 - Medications should target the underlying cause of the sleep problem, not just sedate the child



Pharmacological Treatments

- Melatonin
 - Naturally occurring hormone
 - Considered a nutritional supplement by FDA
 - Available over the counter
 - Regulates circadian rhythm
 - May only be working as a hypnotic and not entraining sleep cycle
 - Van den Heuvel, et al. 2005



Pharmacological Treatments

- Melatonin
 - May be deficient in children with ASD
 - Ritvo et al. 1993; Nir et al. 1995; Kulman et al. 2000; Tordjman et al. 2005
 - Initial results support the use of melatonin
 - Few controlled studies
 - Not rigorously tested for safety



Pharmacological Treatments

- Little data to support use of other medications (Johnson, Giannotti, & Cortesi, 2009)
 - If child is already taking a medication for another condition, consider the timing of the sedative effects



Behavioral Treatments

- Behavioral Treatment tools
 - Bedtime Scheduling
 - Bedtime Routine
 - Sleep Hygiene
 - Light Therapy
 - Faded Bedtime
 - Chronotherapy
 - Extinction
 - Morning Positive Reinforcement
 - Bedtime Pass



Behavioral Assessment

- Functional Analysis is the gold standard
- Brown & Piazza (1999)
 - Suggest the use of FA in the treatment of sleep disorders
- Failure of treatment may be due to lack of matching treatment to function of the sleep problem

Time	In bed	Sleeping	Crying	Parent's Behavior
7:00 PM				
7:30 PM	✓			
8:00 PM	✓	✓		
8:30 PM	✓	✓		
9:00 PM	✓	✓		
9:30 PM	✓	✓		
10:00 PM	✓			
10:30 PM	✓	✓		
11:00 PM	✓	✓		
11:30 PM			✓	
12:00 AM			✓	
12:30 AM	✓			
1:00 AM	✓	✓		
1:30 AM	✓	✓		
2:00 AM	✓	✓		
2:30 AM	✓	✓		
3:00 AM	✓	✓		
3:30 AM			✓	
4:00 AM	✓	✓		
4:30 AM	✓	✓		
5:00 AM	✓	✓		
5:30 AM	✓	✓		
6:00 AM	✓	✓		
6:30 AM	✓	✓		
7:00 AM				
7:30 AM				



Bedtime Scheduling

- Consistency matters
 - Same bedtime everyday
 - Same naptime everyday
 - Same wake time everyday
- Giving in on these will make the problem worse
- Why it works:
 - Sleep debt
 - Entrainment of circadian rhythms



Bedtime Routines

- Like consistent scheduling, forming a routine can be very effective and should be a foundation to any treatment
 - Children with ASD typically respond well to routines
 - Low cost to implement
 - Typically a component of treatment but not implemented alone
 - Adams & Rickert, 1989; Allison et al, 1993



Bedtime Routines

- The activities are less important than the actual routine itself
 - Quiet and calming activities
 - Read a book instead of power rangers videos
 - Fixation on the routine may become a problem (Kodak & Piazza, 2008)
 - Insert subtle variety into the routine
 - Example: Switching pajamas



Sleep Hygiene

- Get up at the same time everyday
- Bedroom is free of noise
- Bedroom is at a comfortable temperature
- Eat regular meals - don't go to bed hungry
- Avoid excessive liquids in evenings
- Cut down on all caffeine products
- Your child's bed is only for sleep, not playing in
- Avoid long naps
- Exercise regularly



Light Therapy

- Light therapy is a promising intervention for treating various sleep problems
 - Primarily for insomnia or circadian rhythm disorder
 - Relatively easy and inexpensive
- Exposure to bright natural or artificial light
 - Takes advantage of the strong role that light plays as a zeitgeber
 - Daily exposure to light for approx 2 hours for two weeks
- Shown to be effective for treating fragmented sleep
 - Following unsuccessful treatment attempts with sleep hygiene as well as hypnotic medication
 - Short & Carpenter 1998; Altabet, et al. 2002



Faded Bedtime

- Set bedtime during period in which the child is likely to fall asleep quickly (within 15 minutes)
 - If the child falls asleep within 15 minutes, move the bedtime earlier by 30 minutes for the next day
 - If not, move bedtime back 30 minutes



Faded Bedtime

- Piazza et al. (1991)
 - 4 y.o. girl with autism
 - Bedtime disruptions, night waking, excessive daytime sleepiness
 - Faded bedtime for 10 nights
 - Significantly improved night sleep time
 - Significantly decreased daytime sleep



Faded Bedtime

- Piazza et al. (1997)
 - 14 children (3 with ASD)
 - Target Behaviors:
 - Early waking, night waking, delay to sleep onset
 - 2 of 3 with ASD sleep problems totally eradicated



Faded Bedtime

- Recommended for:
 - Delayed sleep onset
 - Fragmented sleep
- Considerations:
 - Easy to implement with guidance
 - Data tracking can be tricky
 - Must be willing to keep child awake throughout the day
 - No matter how tired they are!



Chronotherapy

- Developed as a treatment for delayed sleep phase syndrome
 - Each day the individual's bedtime is pushed back by one to two hours
 - This is continued until the appropriate bedtime is reached
- Piazza, et al. (1998)
 - Used of chronotherapy to effectively reduce sleep problems in an 8 year-old girl with autism
- Considering the overall burden of this approach, other less disruptive methods may be preferred



Extinction

- Caregiver must ignore all challenging behavior
 - Let the child "cry it out"
 - Place back into bed without giving attention
 - Ignore complaints or other verbal behavior



Extinction

- Effective but hard to implement correctly
- Implementing incorrectly will make the problem much worse
 - Giving in simply teaches the child to cry longer/louder
 - Caregiver fatigue
- Safety concerns
- Noise concerns



Morning Positive Reinforcement

- Goal:
 - reinforce the behavior of waking-up in own bed
- Primarily for co-sleeping
- Child receives positive reinforcement for sleeping in his/her bed through the night
- Requires Extinction
 - if child attempts to sleep in another location they are redirected back to their bed



Bedtime Pass

- Goal:
 - Increase compliance with going to bed (and staying)
- For bedtime refusal
- Child is given a “pass” to leave bedroom
 - Set number of passes per night
 - Gives up one pass for each time leaving
 - Reduce the number of passes given per night as bedtime refusal is reduced

Out of Bed

