Effective Treatment of Sleep Problems for Children with ASD

Dennis R Dixon, Ph.D.
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
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<tr>
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<th>Total Hours of Sleep</th>
<th>Suggested Nap Hours</th>
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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
- Improvements in mood may often be found when treating the underlying sleep problem
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 in 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
• 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
## Behavioral Assessment

- Tracking sleep problems

<table>
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<tr>
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<th>In bed</th>
<th>Sleeping</th>
<th>Crying</th>
<th>Parent’s Behavior</th>
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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 every day
- 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 reach
- 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
Bedtime Pass

Baseline
Bedtime Routine & Pass
Routine = Bedtime ADL's
ADL's = 2 minutes Story
Bedtime Pass = 1 Free Bed Exit

Out of Bed

Frequency of Inappropriately Exiting Bed

Date

7/18/2009
7/25/2009
8/1/2009
8/8/2009
8/15/2009
8/22/2009
8/29/2009
9/5/2009
9/12/2009
9/19/2009

Inapp Exits of Bed
Use of BP

[Graph showing frequency of inappropriate bed exits over dates]