Delayed sleep phase syndrome in adolescents

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2. I have the following relationships with entities **producing, marketing, re-selling, or distributing** health care goods or services consumed by, or used on, patients:

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<th>Type of Potential Conflict</th>
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<td>Grant/Research Support</td>
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3. The material presented in this lecture has no relationship with any of these potential conflicts, **OR**

4. This talk presents material that is related to one or more of these potential conflicts, and the following objective references are provided as support for this lecture:

1. 
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Objectives

Gain improved understanding of

• the continuum from normal developmental changes in circadian phase to delayed sleep phase disorder in adolescents

• recommended sleep duration in adolescents and the relationship between sleep duration and health

• the relationship between delayed sleep phase disorder, insomnia, and behavioral independence in adolescents

• treatment strategies for management of delayed sleep phase disorder in adolescents
Is a phase delay normal for adolescents?

• A shift of up to 2 hours relative to pre-pubertal sleep-wake cycles is normal\(^1\). The cause of the phase delay is likely due to
  1) Changes in melatonin secretion that parallel shift from “morning” type to “evening” type\(^2\)
  2) Homeostatic sleep pressure accumulates more slowly\(^3\)
• DSPS is a likely cause of insomnia in adolescents\(^4\).
• While a phase delay is statistically normal in adolescents, the current prevalence of delayed sleep phase disorder is much less common (1.1%-4.5% depending on the criteria used).

Inter-individual variability in sleep timing for adolescents

- There are individual differences in blue light responsiveness\textsuperscript{1} which likely contribute to the magnitude of the phase shift.
- A variant of the RNA-binding protein for the RBFOX3 gene may combine with the normal phase delay to produce DSPS\textsuperscript{2}

How much sleep do adolescents need?

• A joint task force from the AASM, AAP, and CDC performed a thorough review of the literature and recommended that teens age 13-18 should sleep 8-10 hours per 24 hours on a regular basis to promote optimal health\(^1\).

• Topic areas covered in the systematic review included cardiovascular health, developmental health, human performance, immunology, longevity, mental health, metabolic health, cancer, and pain\(^2\).


Is it normal for adolescents to be sleepy?

• Clinical vs. statistical “normal” sleep propensity
• Older (Tanner stage 3-5) adolescents are sleepier than younger adolescents
• 48% of adolescents have at least one SOREMP
• Very little normative data on MSLTs in adolescents but more than one SOREMP is abnormal

Is there any harm in being a sleep-deprived adolescent?

• When sleep-deprived (6.5 hours in bed) for 5 consecutive nights, normal adolescents demonstrated symptoms similar to ADHD\(^1\):
  • Lower academic performance
  • Inattentive behavior
  • Lower arousal

• Inconsistent sleep patterns between weekdays and weekends are associated with increased truancy, substance use, and mood disorders\(^2\)

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Irregular sleep-wake patterns and academic performance


SRI=sleep regulatory index=%probability of an individual being in the same state (awake or asleep) at any two points in time 24 hours apart.
Treatment of DSPS in adolescents

• Evaluation and treatment of comorbid sleep disorders
• Evaluation and interventions for mood disorders, substance use disorders, and environmental/social stress
• Sleep hygiene/sleep education
• Fixed sleep schedule
• CBT
  • Adolescents often pretend to understand when they really don’t
  • Adolescents often understand when you think they really don’t
  • Consider both self-administered and parent-administered rewards for regularization of sleep patterns and adherence to treatment
  • Appeal to appearance (you look better when you sleep better)
• Light therapy
• Melatonin
Delayed school start times

• A start time of 10am for high school greatly reduced illness and improved academic performance\(^1\).

• Earlier start times are associated with increased risk of car crashes, and later start times reduced car crashes\(^2\).

• AASM position statement is that middle school and high school start times should be 8:30am or later\(^3\).

Melatonin

• Treatment of children with melatonin has been controversial because high nocturnal levels of melatonin from exogenous melatonin may delay puberty\(^1\).
• No evidence that low dose melatonin (average dose 2.69 mg) is unsafe or disturbs puberty onset\(^2\).
• Individual response is variable.
• Best use for melatonin in DSPD is probably as an adjunct to phototherapy with fixed sleep-wake schedule.

CBT plus light therapy

• In an RCT, CBT plus light therapy is effective and resulted in an increase in total sleep time during the school week of 1 hour\(^1\).
• Shifts toward morningness are associated with improvement in both mood and sleep quality\(^2\).
• Adolescents with DSPD may be less sensitive to morning light than those without DSPD\(^3\).

2. Hasler B, Buysse D, Bermain A. Shifts towards morningness during behavioral sleep interventions are associated with improvements in depression, positive affect, and sleep quality. Behav Sleep Med 2016;14:624-635.
Is it the light, the dark, the fixed schedule, or the interaction between these factors that works?

- Morning blue light and morning dim light both shifted DLMO in young adults with delayed sleep phase, when combined with a fixed early sleep schedule\(^1\).
- Light timed after the minimum core body temperature in the morning leads to a phase advance\(^4\).
- In adults, when sleep is truncated by waking early, the circadian clock will phase advance\(^2\) but this may not happen in adolescents.
- Even brief (240 ms) flashes of bright light over a 1 hour period in a sleeping person shifts salivary melatonin\(^3\).

Sleep environment in the home

• Children and adolescents have better age-appropriate sleep in the presence of household rules for
  • Limited caffeine
  • Regular bedtime
  • No devices on in the bedroom after bedtime

• Exposure to blue-enriched light common on LED screens, even at low intensity, suppresses melatonin.

• Media also tends to
  • Replace time sleeping
  • Produce cognitive and emotional stimulation

Case examples

• Implementation of a fixed sleep schedule with gradual phase advance
• Light therapy applications
• RLS and comorbid DSPD
• Family stress initially presenting as DSPD
• PTSD with nightmares and sleep avoidance
• Anxiety disorder with OCPD
Questions?