



Assessment and Treatment of Sleep Problems in Young Children

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Special Thanks to **Gregory Hanley Ph.D. BCBA-D**

Western New England University

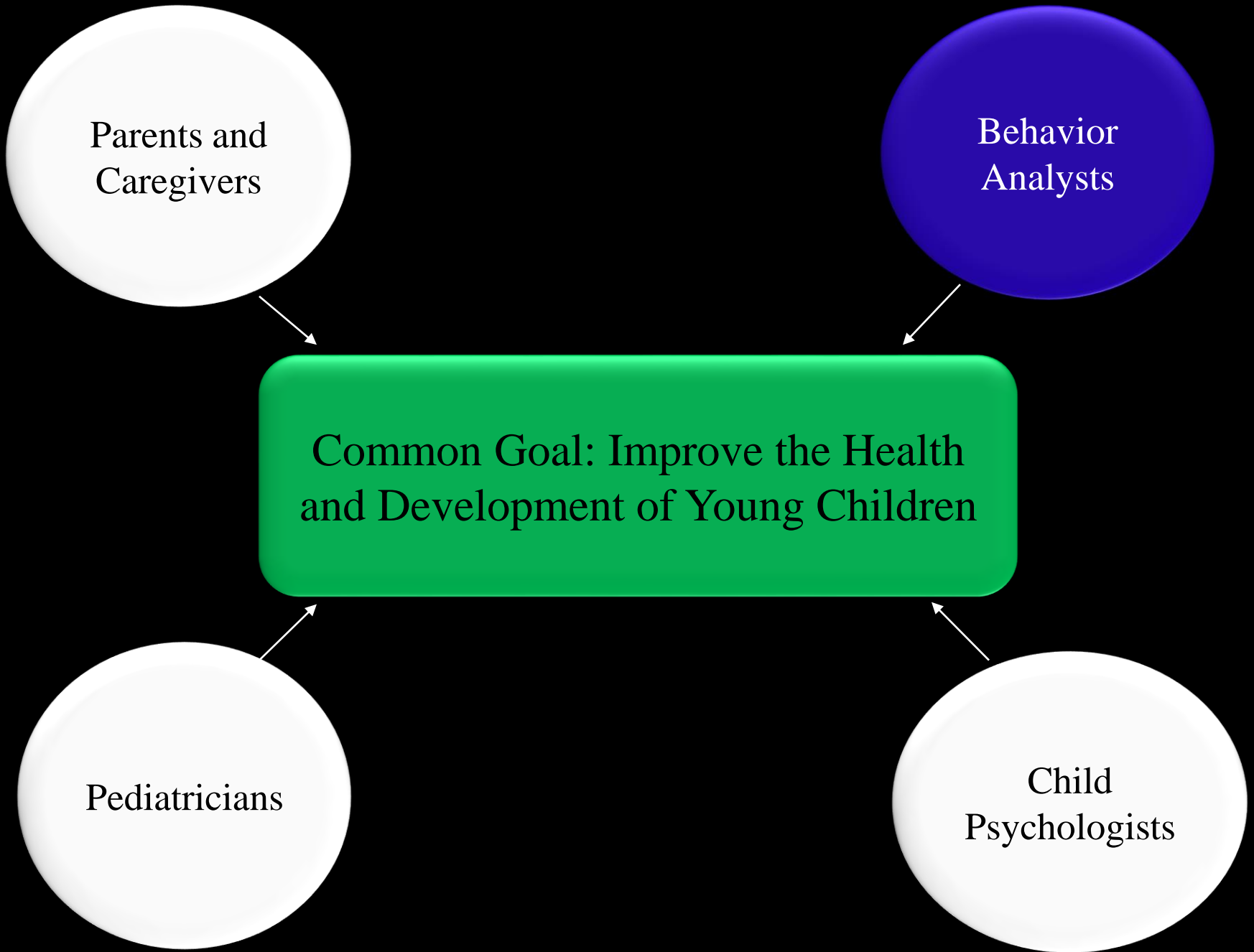
Parents and
Caregivers

Behavior
Analysts

Common Goal: Improve the Health
and Development of Young Children

Pediatricians

Child
Psychologists



Behavior Analysis



Assumptions of Behavior Analysis Regarding Sleep

- Sleep problems are **skill deficits**
- Can be addressed by **understanding** the controlling variables and **teaching** the relevant skills

Assumptions of Behavior Analysis Regarding Sleep

- Falling asleep is a **BEHAVIOR**
(Bootzin, 1972)
- Influenced by
 - Evolutionary history (**phylogenetic selection**)
 - Past and present experiences in one's sleeping environment (**ontogenic selection**)
 - Cultural practice (**cultural selection**)

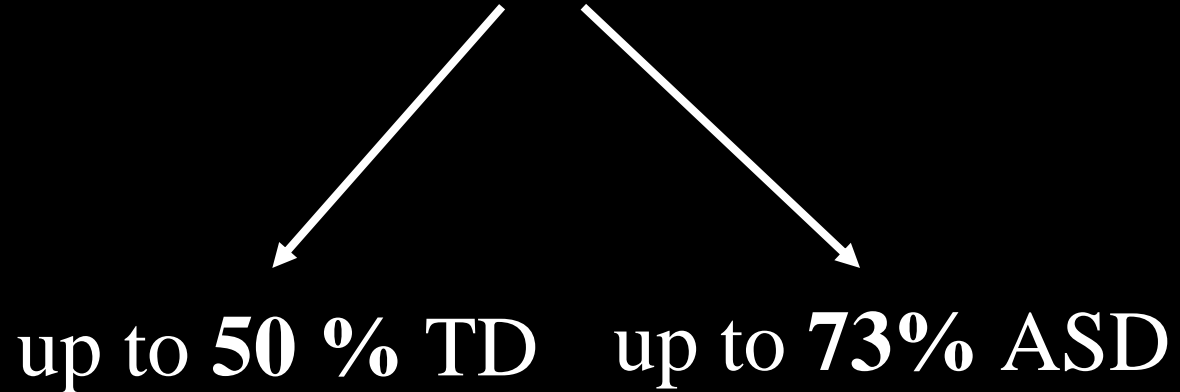
Why Assess and Treat Sleep Problems?

Sleep Problems in Children

- Commonly reported child-rearing difficulty
- Frequently complained to pediatricians
- One of the primary reasons for prescribing psychotropic medications to children

(Minde, 1998; Mindell et al., 1994)

Prevalent



Polimeni et al. (2005)

Impact on Children

Associated with increased risk of:

- Unintentional injuries (Koulouglioti et al., 2008)
- Difficult temperament (Richman, 1981)
- Obesity (Bell & Zimmerman, 2010; Magee & Hale, 2012)
- Poor academic performance (Dewald et al., 2010)
- Problem behaviors: noncompliance, aggression, & self-injury (Wiggs & Stores; 1996)

Impact on Family

- Poor sleep quality (Meltzer & Mindell, 2007)
- Poor daytime functioning (Meltzer & Mindell, 2007)
- Maternal depression (Richman, 1981)
- Marital discord (Chavin & Tinson, 1980)

When Seeking Treatment Options...



→ On their own

→ Pediatricians

- ~5 hours training on sleep
- May say children outgrow these problems
(Mindell et al. 1994)
- 25% rated themselves as confident in treating sleep problems
(Owens, 2001)

Sleep Problems Stay Persistent

(Kataria et al. , 1987; Zuckerman et al., 1987)

Pharmacological Interventions

- ~81 % of children's visits result in medication (Stojanovski, et al. 2007)
 - No prescribing guidelines
 - No drug approved by FDA
 - Limited research on efficacy, tolerability and acceptability
- ~75% of primary care pediatricians reported recommending nonprescription medication
- ~50% reported prescribing sleep medication



(Owens et al. 2013)

What is being recommended?

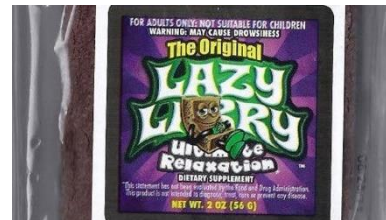
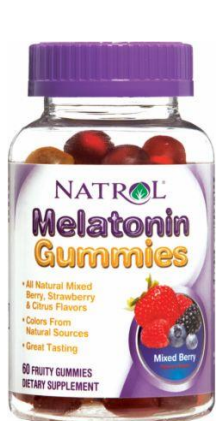
Big Three

- Antihistamine (83% pediatricians reported use)
- Clonidine (46%)
- Melatonin (42%)

(Schnoes et al., 2006)

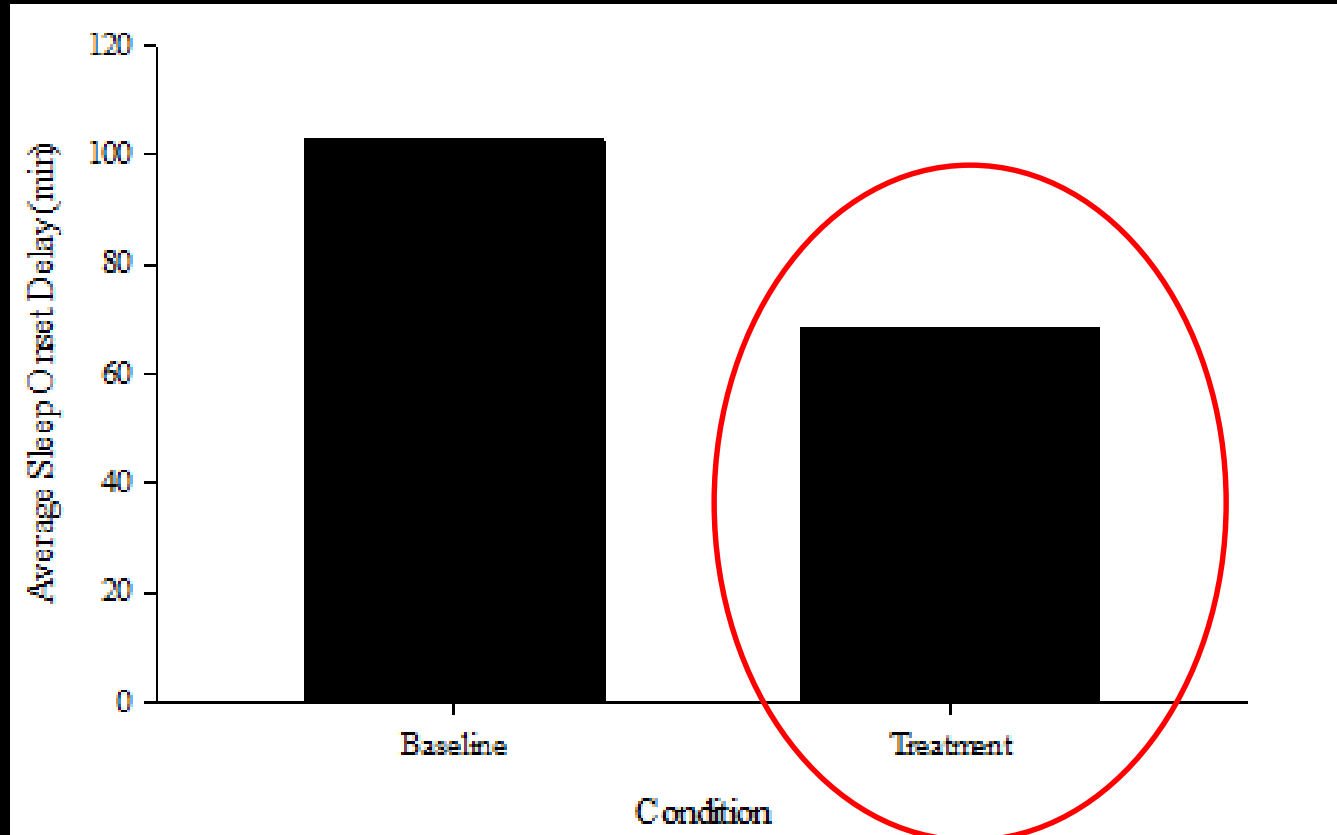
Melatonin

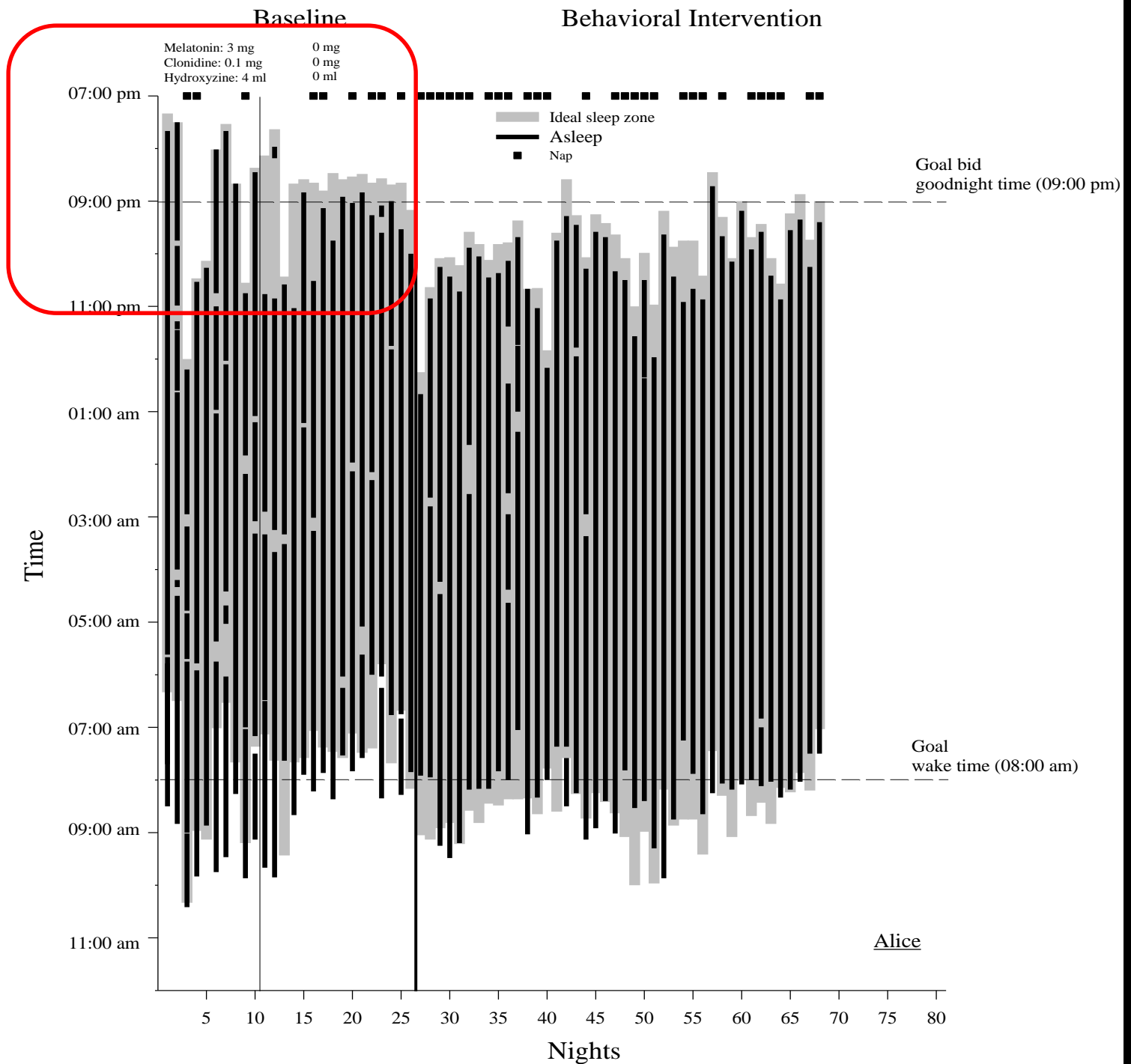
- Endogenous hormone secreted by the pineal gland (release suppressed by light)
- Nocturnal peak makes it a synchronizer of circadian rhythm
- Some evidence suggesting that it yields statistically significant improvement in sleep onset delay with minimal side effect



But...

- Studies that reported average sleep onset delay:





Take-home Point

Chronic medication use is NOT the solution to sleep problems in young children

Behavioral Intervention

Recommended 22% of time (Stojanovski et al., 2007)

More modification than analysis

Some are no behavioral or evidence-based

- Commercially available products
(e.g., candles and lotions, sleep fairy storybook)
- Positive routines
- Regular sleep schedule
- Changes to bedroom environment
- “letting the child cry it out”
- “Ferber” method

Limitations of Existing Behavioral Sleep Intervention

#1. Problems with measurement

- Emphasis on survey instruments
- Rely exclusively on subjective measurement (i.e., parental sleep diary)
- Intrusive and expensive objective measurement that yields little information regarding problem behavior (i.e., polysomnography at Sleep Lab)

Many other options available (e.g., nighttime video, actigraphy, edentrace system)



Limitations of Existing Behavioral Sleep Intervention

#2. Insensitive to social acceptability (measurement, context of treatment delivery, or treatment itself)

For example:

- Measurement or treatment within in-patient facilities (not home-based)
- Ignoring the child's problem behavior (cry-out or severe problem behavior)

May result in poor treatment compliance and loss of confidence

Limitations of Existing Behavioral Sleep Intervention

#3. Not predicated on functional assessment

- Not based on an understanding of the contingency
- Neither personalized nor comprehensive
 - Focus on only one aspect of the problem, or
 - One-intervention-works-for-all-problems approach

Is Assessment-based Approach Effective?

Initial intake interview

- rule out medical conditions (e.g., sleep apnea, narcolepsy etc...)

Baseline measurement

- socially acceptable and objective measurement system

Functional assessment (SATT, Hanley 2009)

- identify sleep problems and controlling variables

Design personalized and comprehensive intervention

- encourage parents to develop goals and interventions with clinicians

Parent training

- behavior skills training: instruction, modeling, role-play, and feedback

Treatment implementation with measurement

- support, frequent feedback, reinforce treatment compliance

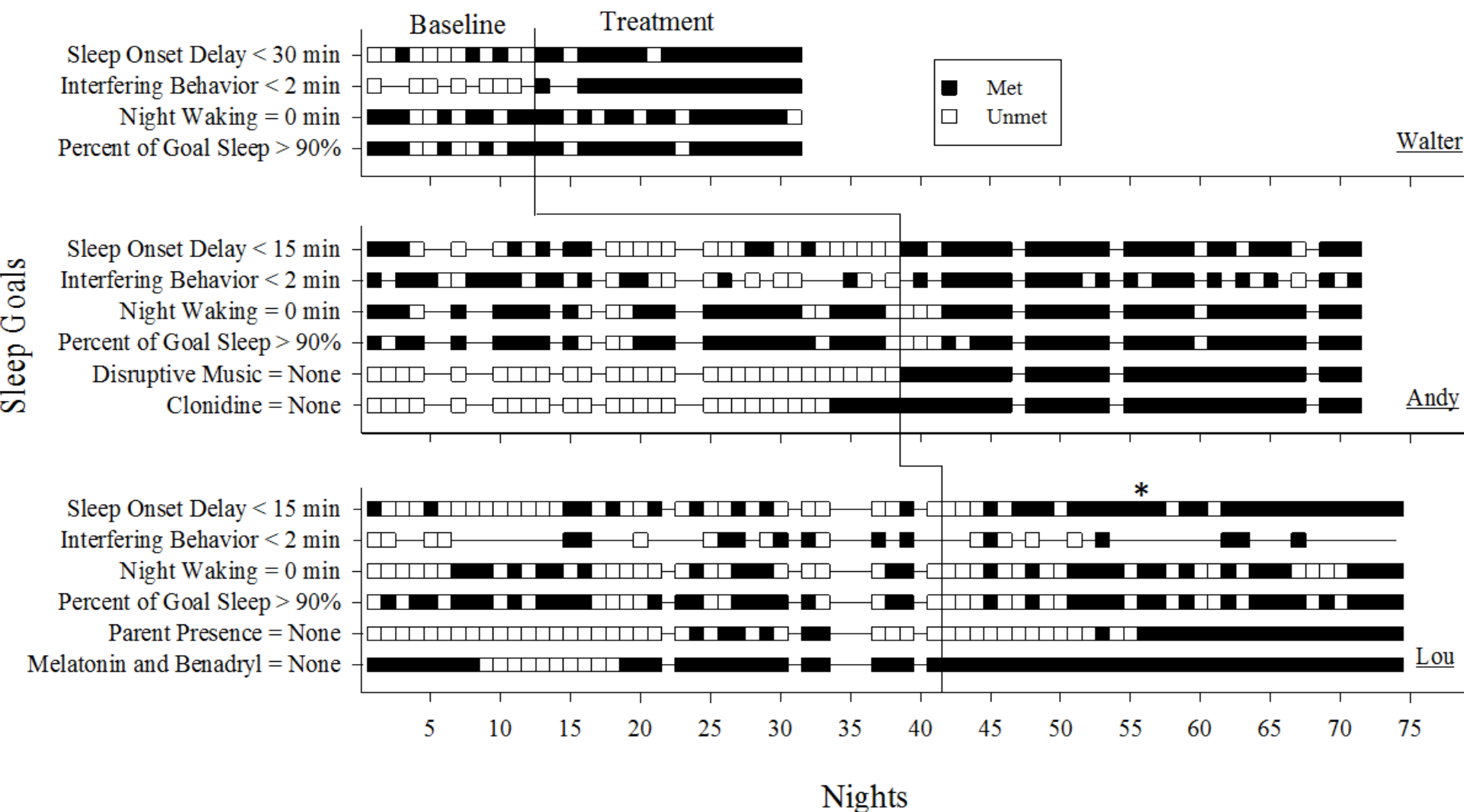
Social validity

Follow-up

*AN INDIVIDUALIZED AND COMPREHENSIVE APPROACH TO
TREATING SLEEP PROBLEMS IN YOUNG CHILDREN*

C. SANDY JIN, GREGORY P. HANLEY, AND LAUREN BEAULIEU

WESTERN NEW ENGLAND UNIVERSITY



Social Validity Questionnaire

Table 1

| Questions | Walter | Andy | Lou | Average (Range) |
|--|--------|------|-----|--------------------|
| 1. Acceptability of assessment procedures | 7 | 6 | 7 | 6.7 (6-7) |
| 2. Acceptability of treatment | 7 | 6 | 7 | 6.7 (6-7) |
| 3. Improvement in sleep | 7 | 7 | 7 | 7 |
| 4. Consultation was helpful | 7 | 6 | 7 | 6.7 (6-7) |

Note: Likert scale: 1 to 7. 1 (not acceptable, not satisfied, not helpful), 7 (highly acceptable, highly satisfied, highly helpful)

Today

- What are the common sleep problems?
- What are the common factors that influence good sleep and sleep problems?
- How do we design personalized and comprehensive intervention based on this understanding of the factors that influence sleep?
- What are some strategies to include in our consideration?

Your Turn: What is Good Sleep?

Develop Reasonable Sleep Goals

- Falling asleep within minutes (e.g., 5-15 min)
- Staying asleep throughout the night or fall back asleep within minutes
- “Independent” sleep
 - Not relying on your presence
 - Not relying on medication
- Developmentally-appropriate amount of sleep
- Waking without much trouble and not feeling excessive drowsy during the day

Commonly Reported Sleep Problems

- Bedtime routine noncompliance
- Sleep interfering behavior (e.g., crying, calling out, getting out of bed, aggression, playing etc...)
- Delayed sleep onset
- Night awakenings
- Early awakenings
- Phase shift
- Insufficient sleep

Through the Lens of a Contingency



Consideration #1



- What occasions falling asleep by momentarily increasing value of sleep as a reinforcer?

Develop Optimal Schedule By:

A. Recognize age-appropriate sleep amounts

B. Importance of current sleep phase and
“forbidden zone”

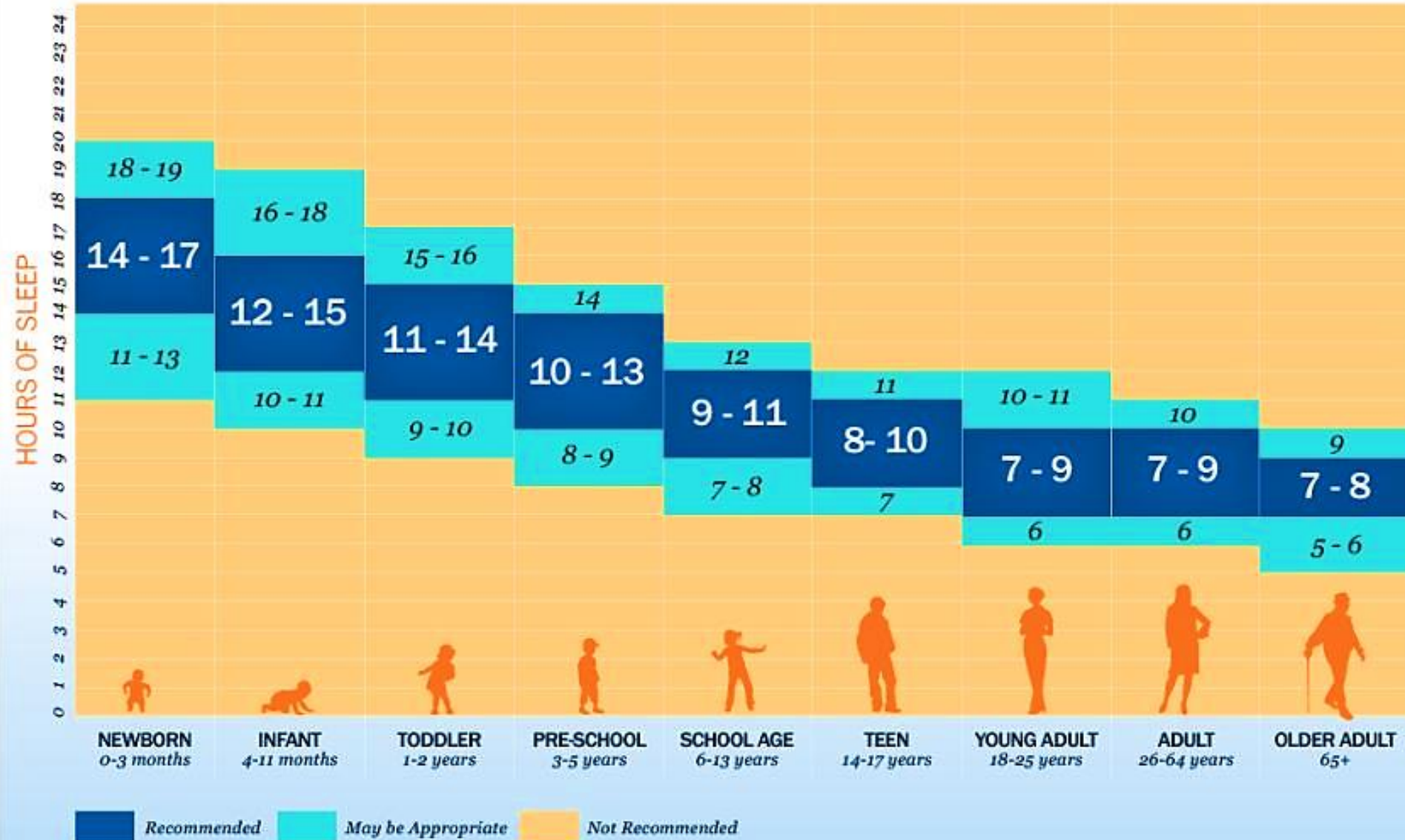
C. Universal tendency of to go bed later and wake
up later

Age-Based Sleep Averages:

| Age | Total Sleep | Night Sleep | # Naps |
|-----|---------------|--------------|--------------|
| 2 | 11 hrs 30 min | 9.5 hours | 1 (2 hrs) |
| 3 | 11 hrs 15 min | 10 hours | 1 (1hr15min) |
| 4 | 11 hrs | 10 -11 hours | 0-1 |
| 5 | 10 hrs 45 min | | |
| 6 | 10 hrs 30 min | | |
| 9 | 10 hrs | | |
| 12 | 9 hrs 45 min | | |
| 15 | 9 hrs 15 min | | |
| 18 | 9 hrs | | |

Adapted from: *Solve Your Child's Sleep Problems*, Richard Ferber, Simon & Schuster, 2006

New NSF Recommendation



Caution:

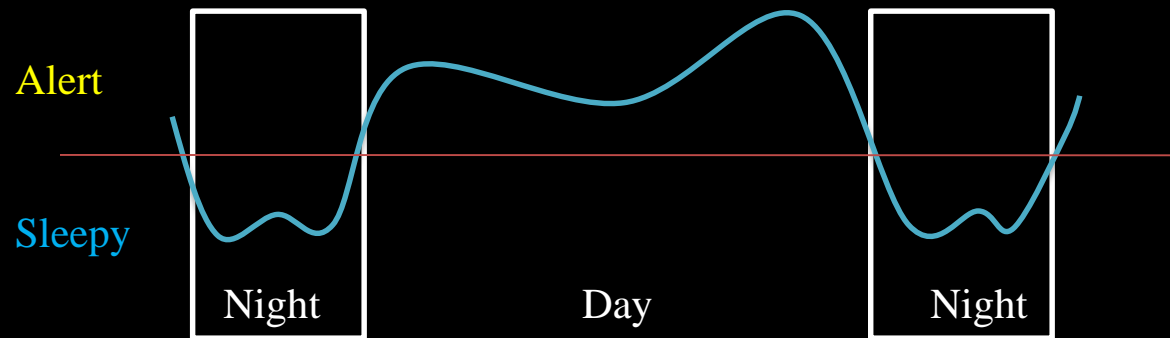
Difficulty falling asleep, staying asleep, or complying with nighttime routines may occur if child is expected to be in bed too long

Difficulty waking up or day time tiredness may be related to child being in bed for too short of a time

Solution:

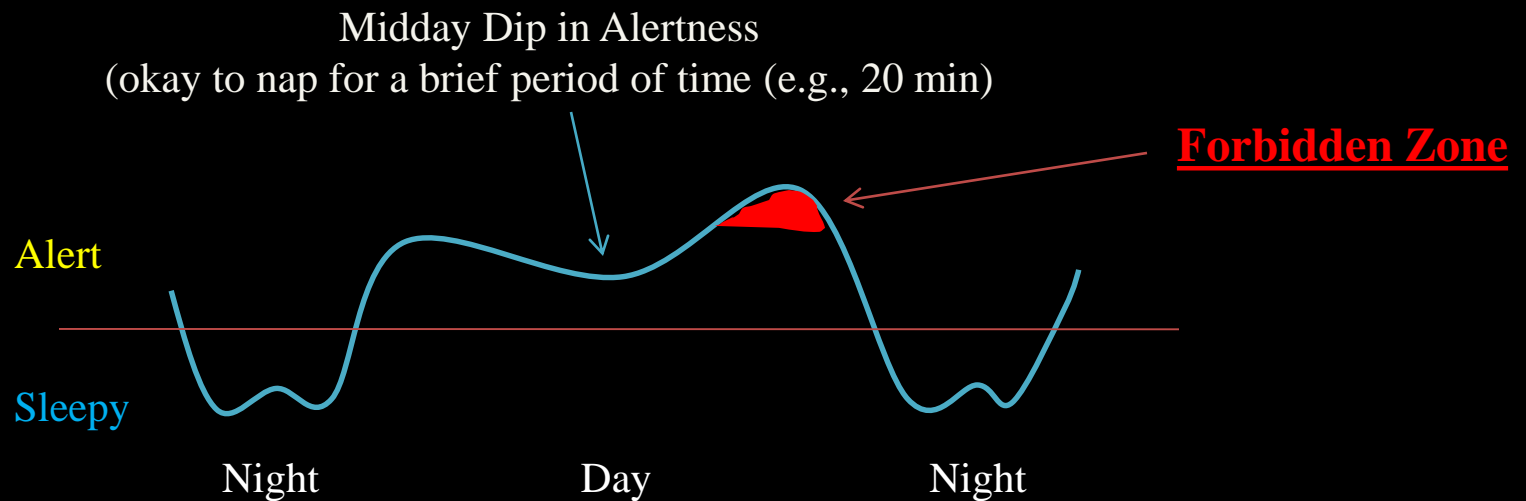
Schedule a developmentally-appropriate amount of sleep

Sleep Phase



Adapted from: *Solve Your Child's Sleep Problems*, Richard Ferber, Simon & Schuster, 2006

Forbidden Zone of Sleep

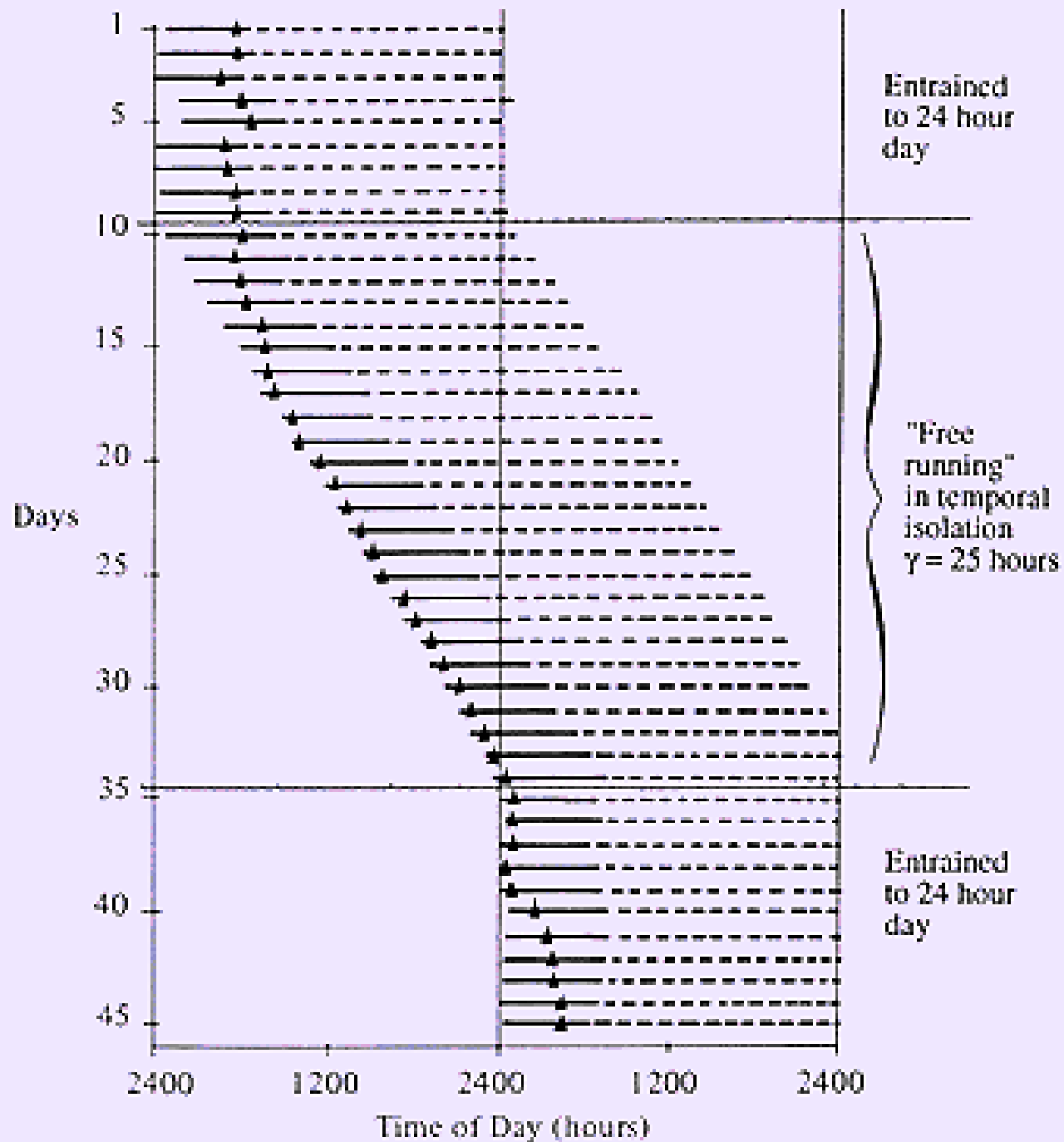


Adapted from: *Solve Your Child's Sleep Problems*, Richard Ferber, Simon & Schuster, 2006

Circadian Rhythm

We have a tendency to go to bed later and wake up later because of our 24.2 hr clock

Artificial light and nighttime activity availability leads to a 25-hour clock



Caution:

Putting children to bed during the Forbidden Zone will increase the likelihood of delayed sleep onset, sleep interfering behavior, and routine noncompliance

Solution:

Faded bedtime (response cost may not be necessary)

At the beginning of sleep treatment:

set the start of the sleep routine slightly later than when the child fell asleep the previous night

Then gradually transition sleep phase earlier

if child falls asleep within 15 min, move bedtime 15-30 min earlier next night until desired bedtime is achieved (Piazza et al., 1991)

Extreme Sleep Phase Shift?

Try **chronotherapy** if sleep phase is more than 4 hours past desirable sleep time:

Move sleep and awake times forward by 1 to 2 hours each night (larger leaps can be made with older children)

Your Turn

Consideration #2



- What occasions falling asleep by signaling the availability of sleep as a reinforcer?
- Are those signals consistently available throughout the night?

A. Routinize Nighttime Routine

- Develop a nighttime routine that occasions “behavioral quietude”
- Routine consistently across nights
- Activities progress from active to passive
 - Consider providing choices (e.g., on a picture schedule)
 - Gradual transition from rich to barren environment
- Exercise and baths earlier in the routine
- Progressively dimming ambient light
- Light snacks without caffeine given earlier in the routine and before brushing teeth

Nighttime Routine Noncompliance

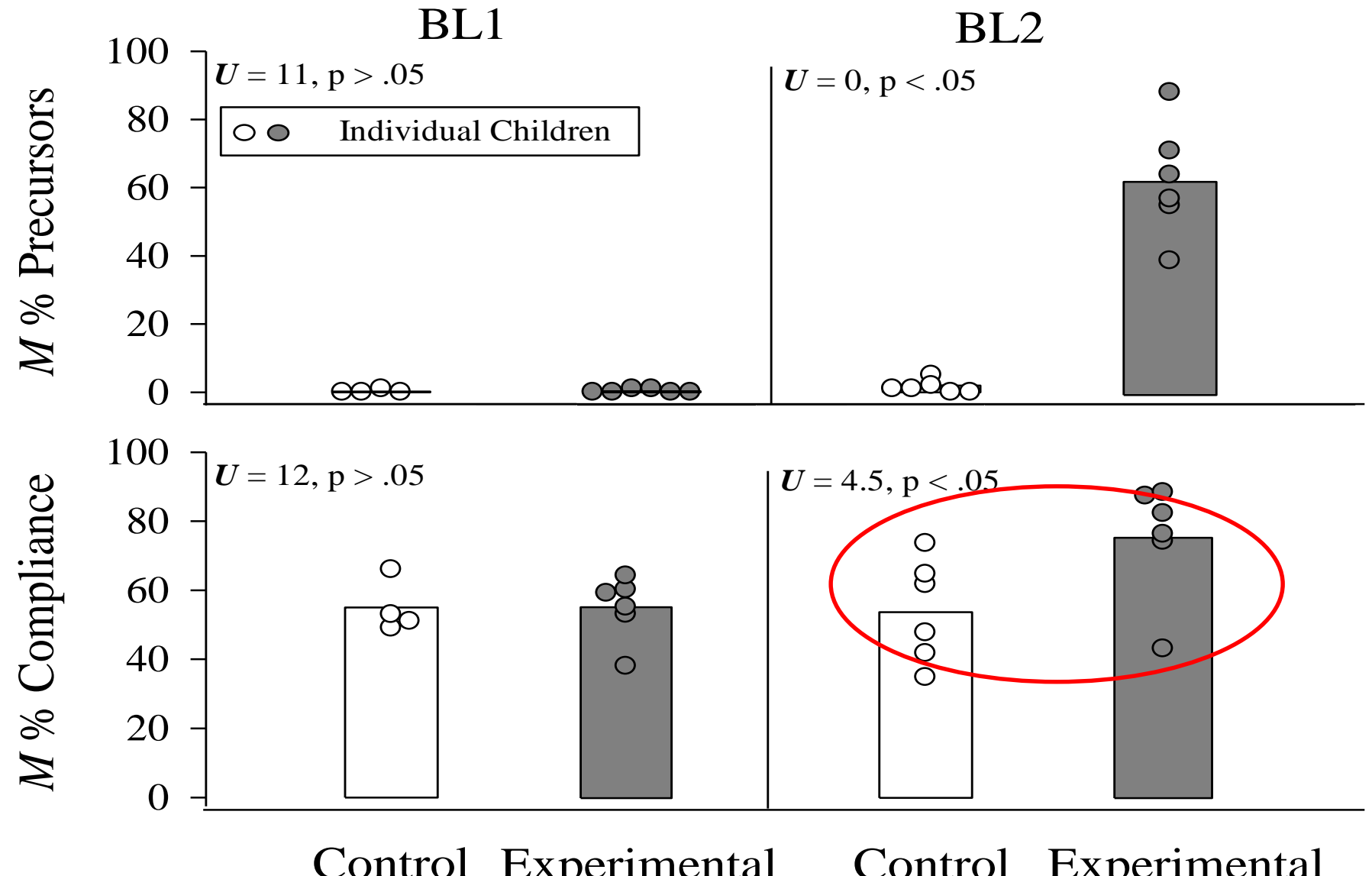
Tendency to not follow instructions during bedtime (e.g., brush teeth, put on PJs etc...)

Solution:

- Promote instruction following during the day (different workshop)
 - First consider proactive strategies (form of instruction, reinforce responding to name etc..), then consider reactive strategies (three-step etc...)
- Make sure sleep is valuable (e.g., child is sleepy) when starting routine. Start just prior to “natural” sleep phase
- Discrepancy in consequences for compliance vs noncompliance
 - Avoid TEACHING instruction-following at bedtime
 - Avoid reactive strategies at bedtime (extinction or punishment)
 - Differentially reinforce

Teaching Responding to Name

Beaulieu et al. (2013 *JABA*)



B. Optimize Bedroom Environment

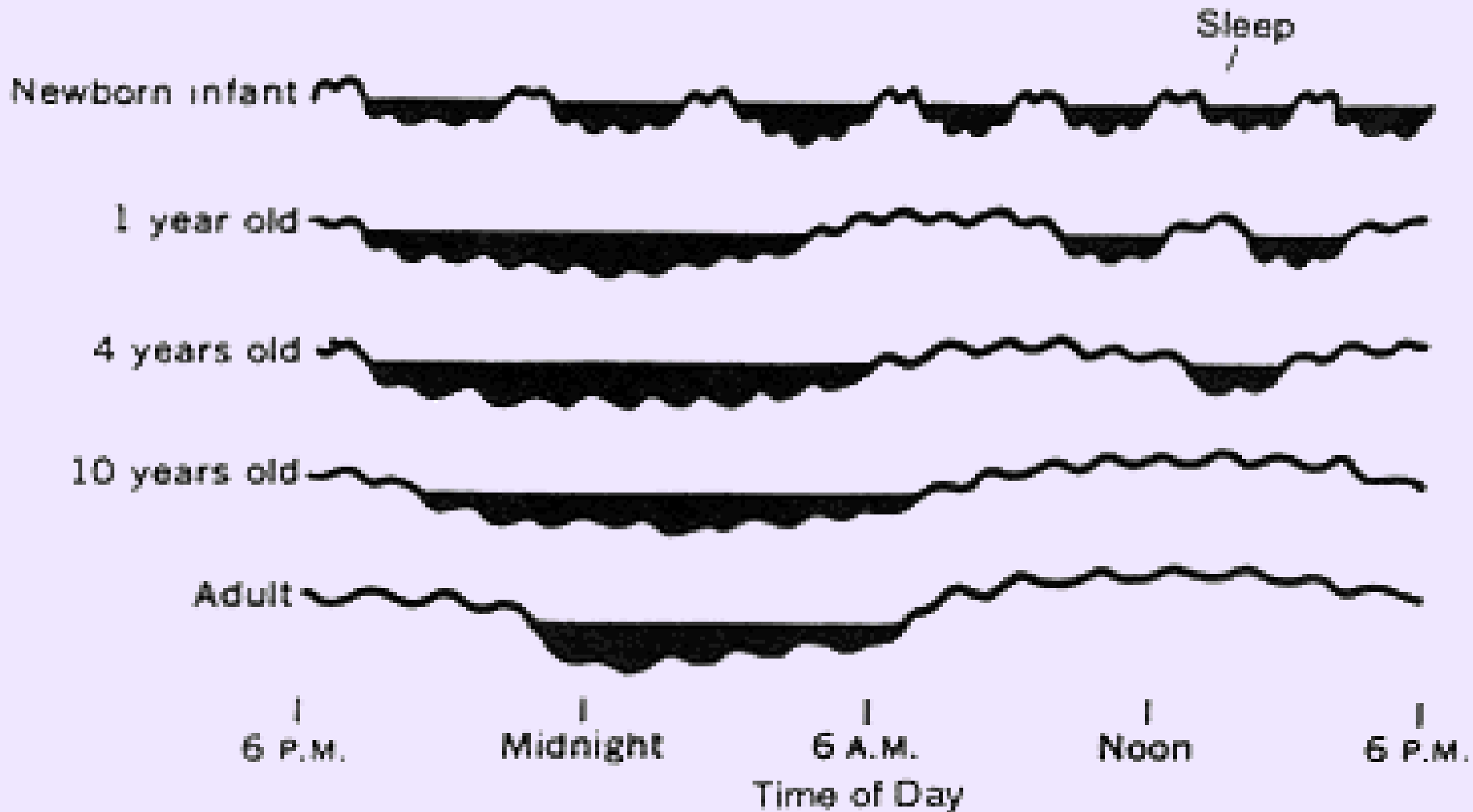
- Bed with comfortable mattress
- Cool temperature
 - Can the child control the temperature?
- Indirect nightlight, curtains closed
- Non-undulating noise

(note these conditions increase the likelihood of healthy sleep dependencies)

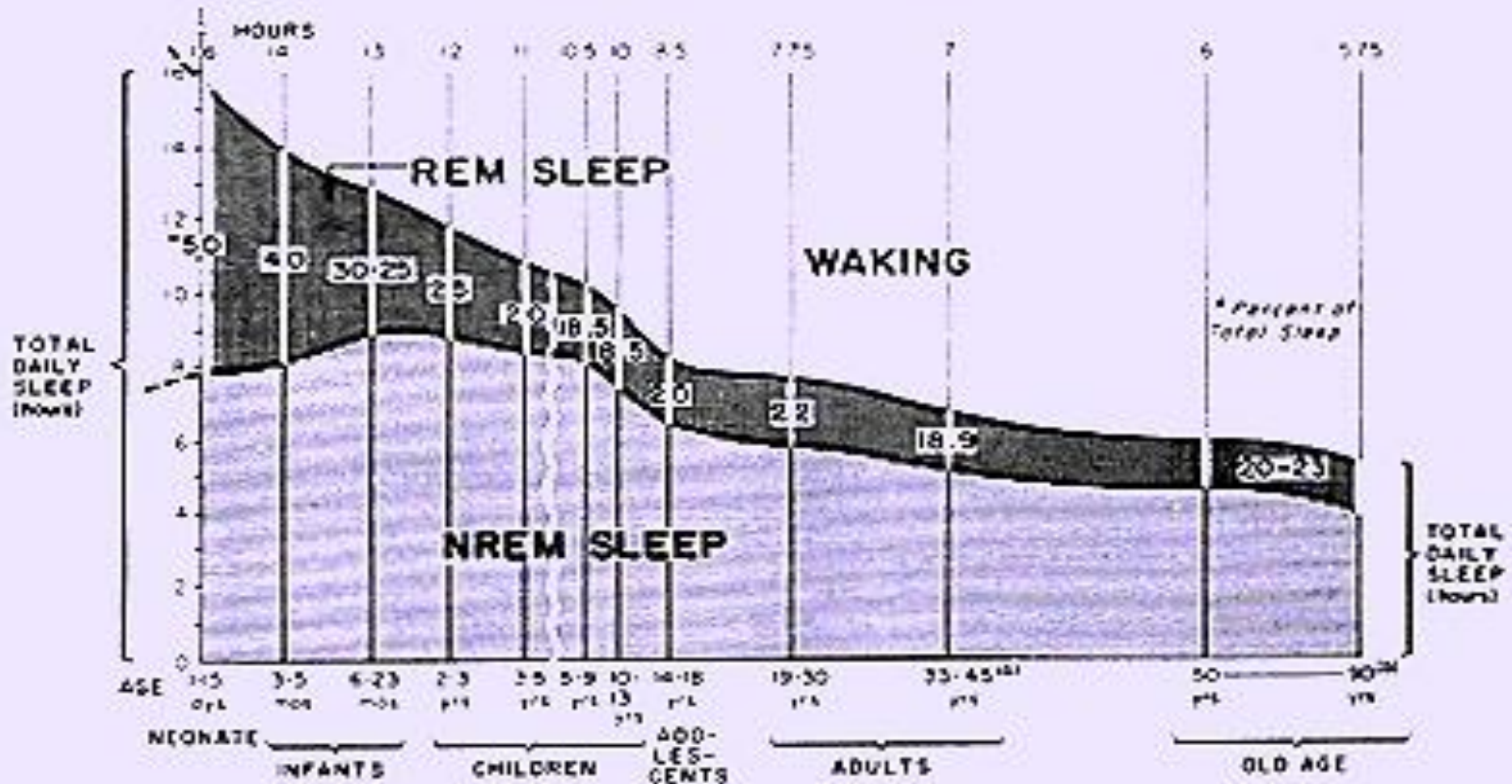
C. Sleep Dependencies

Transition to sleep depends on stimuli associated with falling asleep

Sleep from Infancy to Adulthood

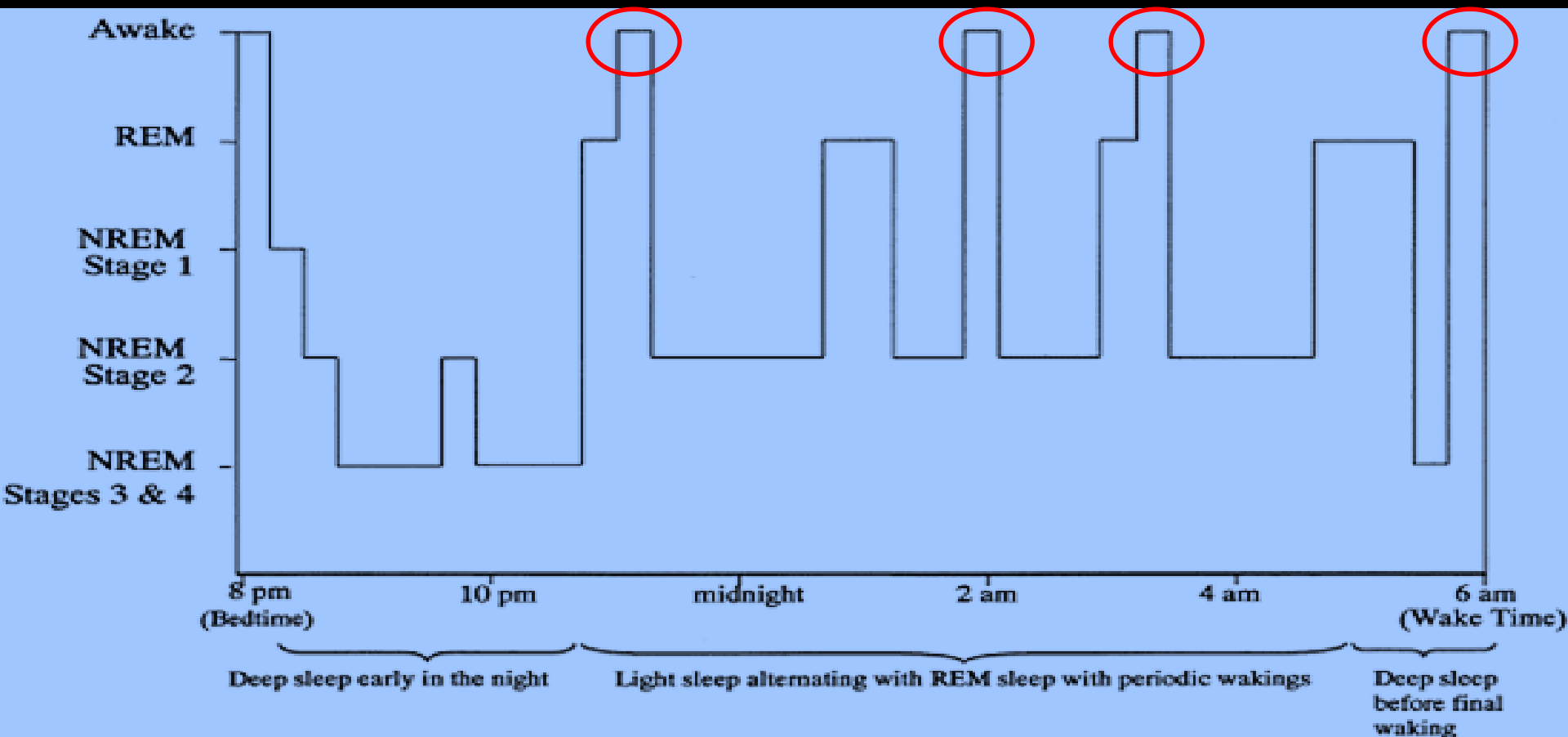


Sleep from Infancy to Adulthood



Transition to sleep depends on stimuli associated with falling asleep (i.e., sleep dependencies)

These stimuli must be present throughout the night because children wake up multiple times



Caution:

Things that occasion sleep are suddenly removed, inconsistently available, or not present when the child wakes up during the night = Sleep Onset Delay, Night Awakenings, and possibly Sleep Interfering Behavior

Examples: TV, electronics, radio, books, bottles, “full belly,” presence of another person, being rocked or patted, lights, fallen stuffed animal or blanket

Solution:

Eliminate or fade “bad” sleep dependencies and occasion sleep with things that don’t require your presence, can be there in the middle of the night, and are transportable (e.g., for vacations or nights at Grandparent’s home)

Examples: preferred blanket, stuffed animal, **white-noise** sound machine on continuously

Your Turn

Consideration #3



- Examples:
 - Leaving bed (curtain calls)
 - Crying/calling out/excessive requests
 - Talking to oneself
 - Playing in bed with toys, iPads, etc...
 - Motor or vocal stereotypy
 - Severe problem behavior (SIB, property destruction)

Possible Reinforcers

- Attention/interaction
- Food/drink
- Access to toys, TV, electronics etc...
- Escape/avoidance of the dark
- Automatic reinforcers directly produced by the behavior
- Combination

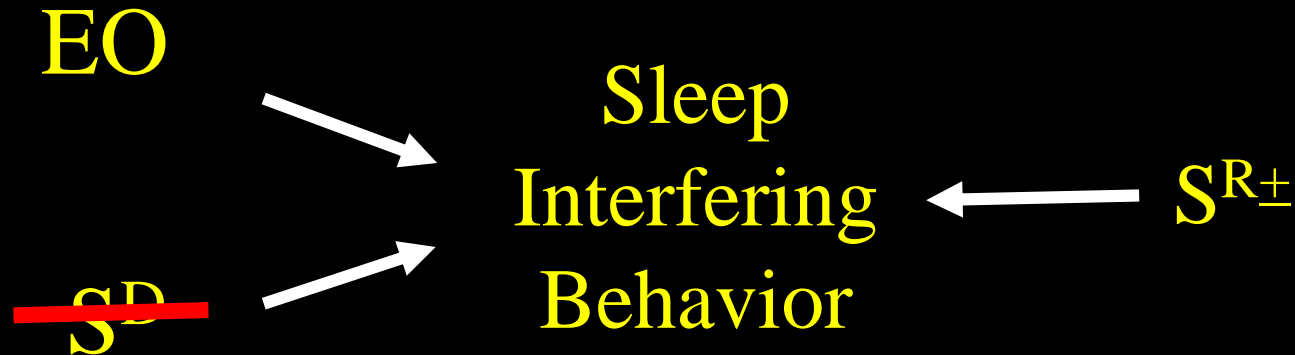
Remember to Assess, Assess, Assess

- SATT (Hanley, 2009)



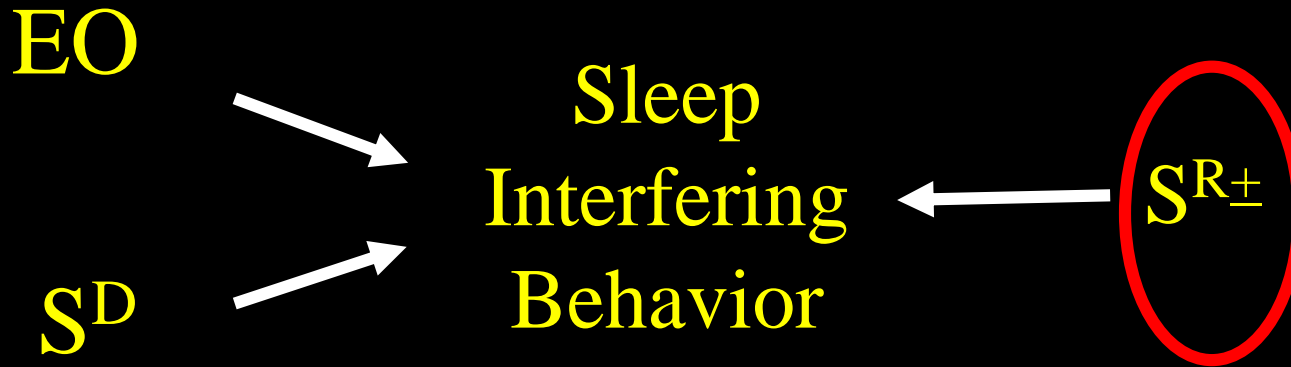
- Abolish the value of the reinforcer for SLIB
- Consider provide the presumed reinforcer prior to bidding goodnight
 - Access to stereotypy
 - Access to interaction/attention

Consideration #4



- Eliminate stimuli that occasion SLIB
- Consider bidding the “toys, iPads, books” goodnight routine
- Eliminate the presence of preferred activities
- Eliminate the sight of food/drinks/snacks
- Eliminate the signals of interaction/attention

Consideration #5



- Withhold access to the presumed reinforcer following SLIB (Disrupt the contingency)
 - “complete” withholding from the start (extinction)
 - Gradual elimination (thinning the reinforcer)
 - Deliver reinforcer independent of SLIB (NCR)
 - Reinforce alternatives, incompatibles, or the absence of SLIB (DRA, DRI, DRO)

EXTINCTION: withholding reinforcer following EACH occurrence of SLIB

- Extinction is procedurally different for attention-, escape-, automatic-maintained SLIB (letting the child cry it out is extinction for only attention-maintained SLIB)
- Rapid reduction of SLIB when consistently implemented

CAUTION:

- Poor treatment compliance may exacerbate the problem
- Extinction procedure does not match the function

Solution:

- Adequate training before implementation
- Frequent support and feedback
- Functional assessment before implementation
- Consider alternatives

Gradual elimination

- reducing the magnitude/intensity of the reinforcer

e.g., **QUALITY FADING**: gradually reduce the quality of interaction for att-SLIB

- Progressively increase the time from SLIB to the reinforcer

e.g., **PROGRESSIVE WAITING** (Ferber method)
(risk of exacerbating SLIB)

Deliver the reinforcer independent of SLIB (NCR)

TIME-BASED VISITING for att-SLIB (also consider time-based exiting)

Visit your child at increasingly larger intervals after the bid good night and across nights (hopefully before IB occurs); during visit re-tuck them, bid good night, and leave

| Day | First visit | Second visit | Third visit | Fourth visit | Fifth visit | Sixth visit | Seventh visit |
|-----|-------------|--------------|-------------|--------------|-------------|-------------|---------------|
| 1 | 10 s | 30 s | 1 min | 3 min | 5 min | 10 min | 30 min |
| 2 | 30 s | 1 min | 3 min | 5 min | 10 min | 30 min | |
| 3 | 30 s | 3 min | 5 min | 10 min | 30 min | | |
| 4 | 1 min | 3 min | 5 min | 10 min | 30 min | | |
| 5 | 1 min | 5 min | 10 min | 30 min | | | |
| 6 | 5 min | 10 min | 30 min | | | | |
| 7 | 5 min | 30 min | | | | | |

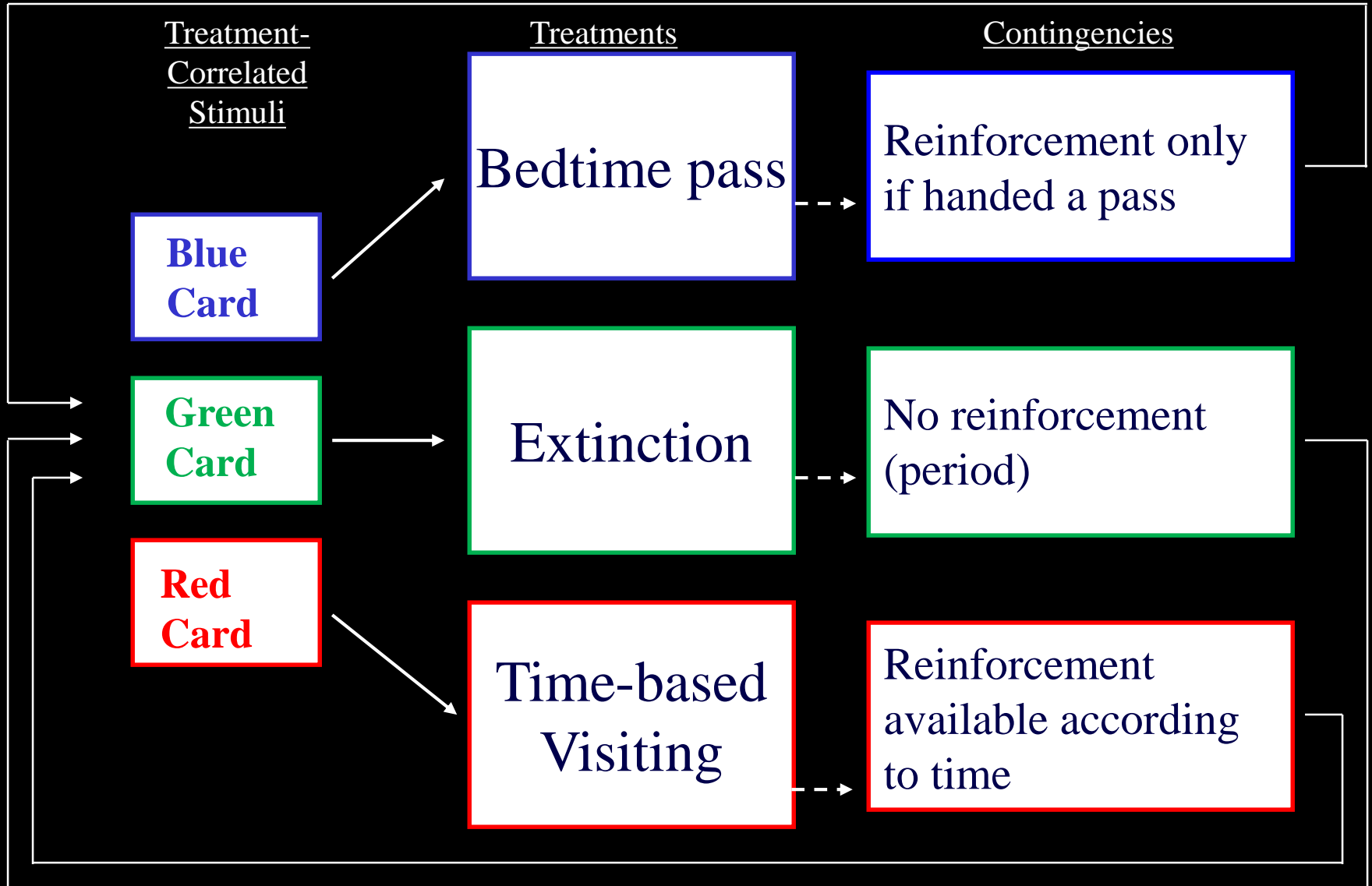
Differential Reinforcement

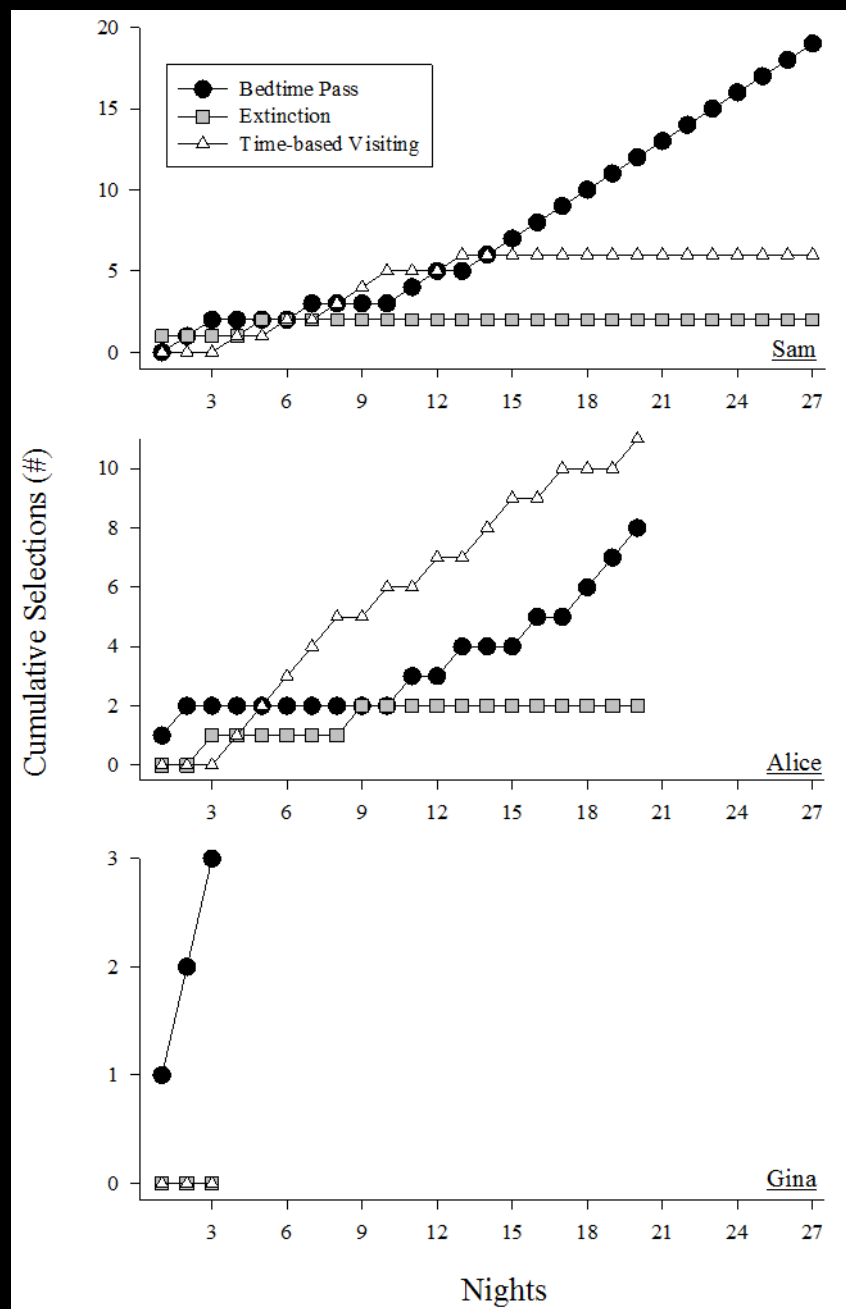
QUIET-BASED VISITING

Visit after increasingly larger intervals of quiet

BEDTIME PASS

Give your child one or more bedtime pass(es) to be used as needed after the bidding good night to exchange for reinforcers (e.g., grant request).





Parent Preference Idiosyncratic

Table 1

Results of Social Acceptability Questionnaire Administered to Parents

| Ranking | Sam | | Alice | Gina |
|---------|---------------------|---------------------|---------------------|---------------------|
| | Mom | Dad | Mom | Mom |
| 1 | Time-based Visiting | Bedtime Pass | Extinction | Bedtime Pass |
| 2 | Bedtime Pass | Extinction | Bedtime Pass | Extinction |
| 3 | Extinction | Time-based Visiting | Time-based Visiting | Time-based Visiting |

Note. 1 = most preferred strategy.

Your Turn

Summary

Establish the value of sleep
around the time a child is
bid goodnight
(e.g., bedtime fading,
chronotherapy)

Falling Asleep

Occasion behavioral quietude
with reliable and salient
stimuli at bedtime
(e.g., white-noise sound
machine on through the night,
preferred blanket)

Summary

Abolish the value of the reinforcer for SLIB prior to and following the bid goodnight (e.g., story time with parents, provide access to stereotypy)

Sleep Interfering Behavior (SLIB)

Disrupt the contingency between SLIB and its reinforcer (e.g., extinction, bedtime pass, time-based visiting, quiet-based visiting)

Eliminate discriminative stimuli for SLIB at bedtime (e.g., setting clear barriers to toys,)

Summary

- Assess, Understand, Design, and Treat

Thank you!

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