


## Sleep Habits and Cognitive Development

Victoria J. Molfese  
Dennis L. Molfese  
University of Nebraska - Lincoln



## Sleep and School Readiness

- Kindergarten
  - An important developmental transition
  - The point when many children are first evaluated for school readiness.
- School Readiness
  - Many different definitions
  - Usually refers to the social-emotional, physical, behavioral, and cognitive skills children need to learn and function successfully in school
  - School readiness requires emergent content knowledge and more.....  
Learning-Related behaviors

## Self-Regulation

- Self-regulation is a critical component of learning-related behaviors
- Also called "temperamental self-regulation" or "effortful control"
- Behaviors:
  - Pay attention on purpose
  - Remember information
  - Function socially by getting along with others
  - Delaying gratification
- Boyd, Barnett, Bodrova, Leong and Gombay (2005)

## Self-Regulation

- Cognitive side of self-regulation is called "Executive Function Skills"
- Refers to skills needed for learning and problem solving
- Behaviors:
  - Persisting on difficult tasks
  - Working in the face of distractions
  - Remembering rules
  - Inhibiting inappropriate behaviors
  - Flexibility in approaching tasks
- Skills of working memory, focusing, planning, inhibiting, shifting

## School Readiness & Self Regulation



School readiness is a combination of cognitive skills



and skills needed for controlled and focused behaviors

## Sleep and School Readiness


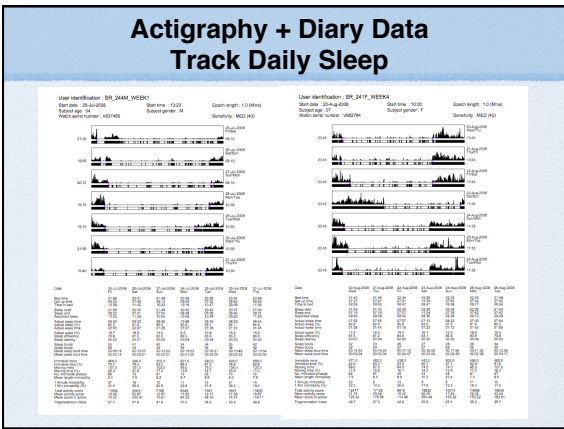
- Sleep plays an important role in learning and behavior development
- Less research on sleep in children compared research with adults
- What we know
  - Regular bedtimes and sufficient sleep time are important
  - Children need more sleep time than adult
  - 3- to 6- year-olds are **estimated** to sleep 10 to 12 hours at night (National Sleep Foundation, 2004).
  - Estimates of sleep using parent reports may not be accurate

## How Is Sleep Time Measured?

- Parent reports
  - Record information about the child's sleep in "logs" or "diaries"
  - Record day by day information across a specific period of time (1 week)
  - Note bedtime and rise time (sleep duration)
  - hourly information between 6 pm to 6 am in which the parents try to report on whether the child is "out of bed", "in bed" and "asleep".

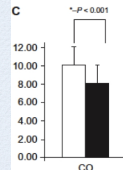
## Actigraphs

- Small, portable devices (Astronaut watches)
- Sense physical motion
- Record information on
  - Sleep onset time and offset time (sleep duration)
  - True sleep time (sleep duration with night wakefulness subtracted)
  - Longest sleep interval
  - Activity level (level of activity during sleep)
  - Number of arousals during the night.

## D. Molfese, Gozal et al. Research

- Sample included 110 typically developing children 3 to 9.5 years old (M = 6.6 years)
- Sleep duration data were obtained using parent sleep logs and actigraphs.
- Sleep duration was recorded across a 1 week baseline period
- Parent reports *overestimated* sleep duration
- by 111 minutes when compared to actigraph data!



C  
\*P < 0.001

## Sleep Insufficiency

- Sleep insufficiency affects behaviors, day time sleepiness, health, weight
- Sources of sleep insufficiency
  - Resistance to going to bed/sleep
  - Night time awakenings requiring parental interactions
  - Difficulty initiating or maintaining sleep
  - Fears
  - Lack of sufficient sleep time due to the child's sleep schedule
  - Sleep disordered breathing - sleep apnea
    - hallmark is snoring

## Impact of 1 Hour of Sleep Loss On The Brain

- 32 Children participated for a 2 Week period
- Week 1 - All maintained their regular sleep schedule.
- Week 2 - Half went to bed 1 hour later at night.



## Sample

- N = 32 (14 females)
- Age = 7.46 years (s.d. = 0.68, range = 6.33 to 8.83 years)
- Sleep Duration:
  - M = 9.42 hours (s.d. = 0.43, range = 8.42 - 10.18)
- PPVT = 108.44 (s.d. = 10.88, range = 91 - 130)
- No Differences in Age by Sleep time,  $F(1,30)=1.19$ , PPVT scores by Sleep time,  $F(1,30)=.183$

## Procedures

Polysomnography Screening



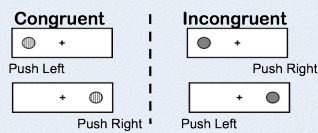
16 Assigned Randomly to Control  
16 Assigned Randomly to Sleep Restriction

ERP and Behavior testing occurred at end of each week

## Directional Stroop Task

(Diamond, et al, 1998, 1999)

**Procedure:** Congruent block (30 trials)  
Incongruent block (30 trials)  
Mixed block (60 trials) - Mix of Congruent & Incongruent Trials



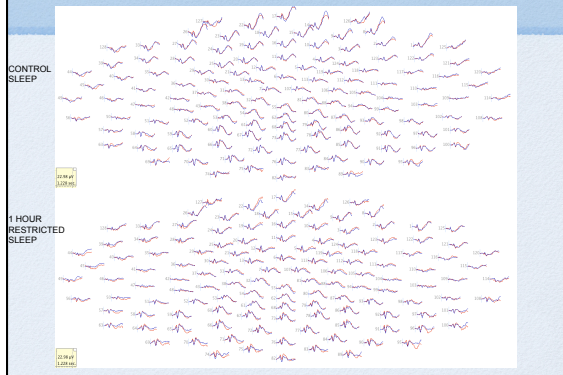
Test Advantage: No age related effects from 4 to 11 years of age.

## Have Electrode. Will Travel.

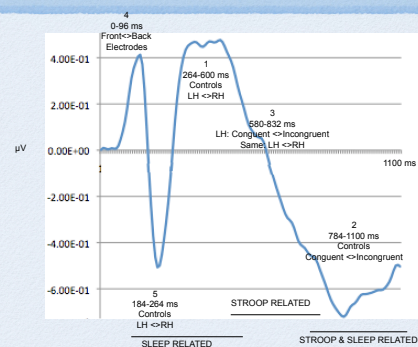


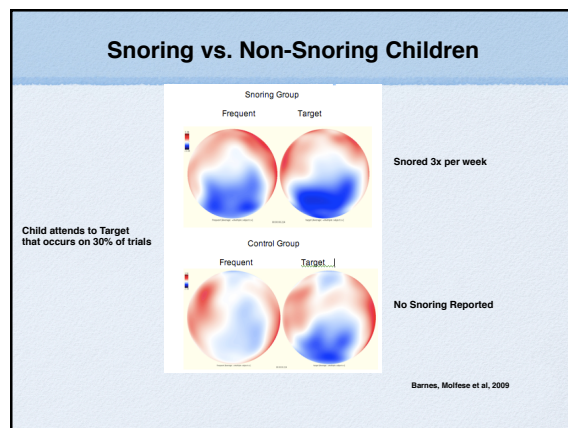
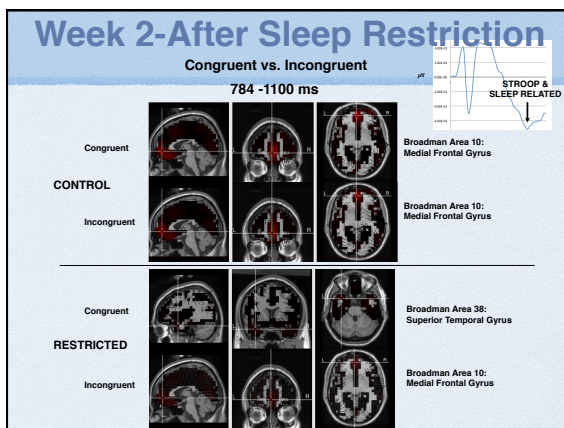
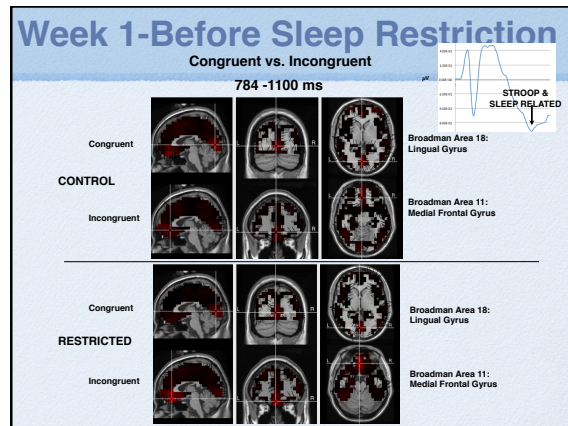
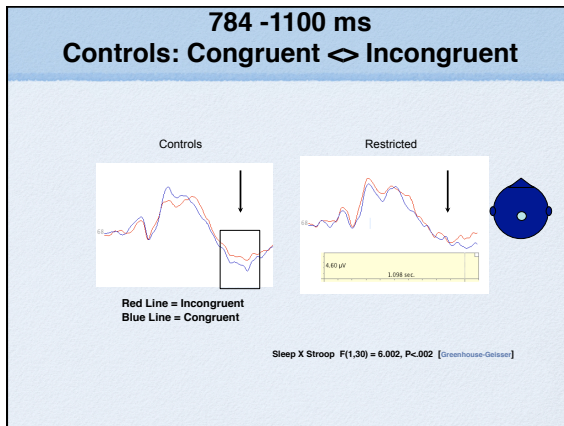
ERP Testing In Schools & Hospitals

## WEEK 2



## Summary of Effects Across 1100 ms Period





## Why Focus on Sleep?

- Parents very receptive to information about
  - Children's sleep
  - The development of good sleep habits
  - Ways to address sleep problems
  - Parent sometime do not realize the importance of sleep

## Take Away Points

1. Good sleep habits (regular bedtimes and sufficient sleep time) are related to children's learning and behavior.
2. The brains of people (adults and children) who get insufficient sleep Engage More Brain Areas Less efficiently, are Slower To Start Processing information AND take Longer To Process information.
3. All of these Factors Impair Learning & problem solving abilities.
3. Sleep problems related to sleep disordered breathing in children and adults should be taken seriously.



# QUESTIONS ???

- [Vmolfese2@unl.com](mailto:Vmolfese2@unl.com)
- [dlmolfese@mac.com](mailto:dlmolfese@mac.com)

<p><b>Collaborators:</b>                  Steven Barnett, Ph.D.                  E. Todd Brown, Ph.D.                  Roxana Oskamen, Ph.D.                  Peter Forney, M.D.                  David Goff, M.D.                  Lalit Gupta, Ph.D.                  Kyle Hanson, Ph.D.                  Jena Hasbani, M.D.                  Jeanne Johnson, C.C.C., Ph.D.                  Heiki Lyytinen, Ph.D.                  Linda Mares, M.D.                  David Molfese, Ph.D.                  Peter Molfese, Ph.D.                  Louise O'Brien, M.D.                  Paula Rasmussen, Ph.D.                  MaryAnn Romani, Ph.D.                  Kathleen Rutland, Ph.D.                  Ariane Tai, Ph.D.                  Don Tucker, Ph.D.                  David Washburn, Ph.D.                  Paul Yoder, Ph.D.                  Merle Barnes, M.D., Ph.D.                  Melissa Ferguson, Ph.D.</p> <p><b>Postdoctoral Fellows:</b>                  Spencer Kelly, Ph.D.                  Matthew Kelly, Ph.D.                  S. Fomayrosa Key, Ph.D.                  Guy Jones, Ph.D.                  Mervyn McGuinn, Ph.D.                  H. Koss, Ph.D.                  Siddhes Kate, Ph.D.</p> <p><b>Sabbatical Fellows:</b>                  Teri Bonebrigt, Ph.D.                  Jeanne Johnson, Ph.D.                  Mary Jane Mowley, Ph.D.                  Henry Whitaker, Ph.D.</p>	<p><b>Biomedical Engineering</b>                  Child &amp; Family Psychology                  Developmental Pediatrics                  Elec. Engineering                  Neuropsychology                  Radiology                  Communicative Disorders                  Psychology                  Molecular Neuroscience                  Neuropsychology                  Neonatology                  Neurobiology                  Language Disorders                  Counsel &amp; Ed. Psy                  Psychology                  Primatology/Psychology                  Special Education                  Pediatrics                  Clinical Child Psychology</p> <p><b>Psychology</b>                  Psychology                  Psychology                  Philosophy                  Child Language                  Elec. Engineering                  Elec. Engineering</p> <p><b>Psychology</b>                  Communicative Disorders                  Communicative Disorders                  Linguistics/Psych</p>	<p><b>Researchers</b>                  Natalie Armstrong, B.A.                  Jennifer Benwick, B.A.                  Allison Dooly, B.A.                  Krista Garrod, M.S.                  Brittany Haines, B.S.                  Adrienne Roman, B.A.                  Alyssa Roe, B.A.                  Gillian Starkes, B.A.                  Lauren Tucker, M.A.                  Rachel Walters, M.A.                  Jamie White, B.A.</p> <p><b>Graduate Students</b>                  Kathleen Kelley                  Callynn Lutese                  Carlin Hulse</p> <p><b>Undergraduate students (current)</b>                  Roxanna Haslam                  Megan Anderson                  Nate Petro                  Kacie Medinger                  Shweta Roderiger                  Sarah Halverson                  Sean Olson                  Matt Smith                  Cody Nordhus                  Sara Mason                  Anna Davidson                  Matt Shuman                  Samantha Palamair</p>
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## Intervention

Right Medial View

Left Lateral View

■ No Prisms  
 ■ With Prisms

Hudac et al, 2011

