



# Implications of habitual snoring and sleep habits in children.

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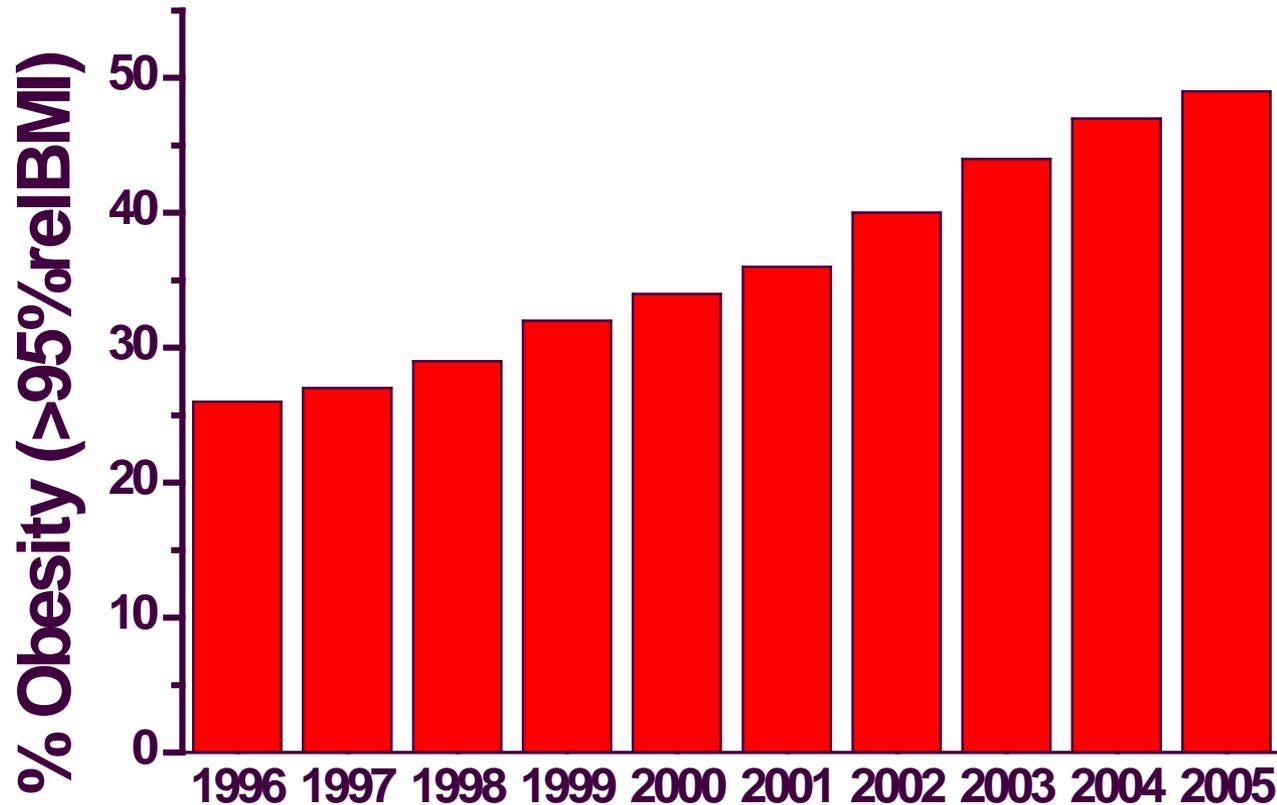
# My tasks today:

- Morbidity of OSA and snoring in children
- Sleep in pediatric populations – assumption vs. reality

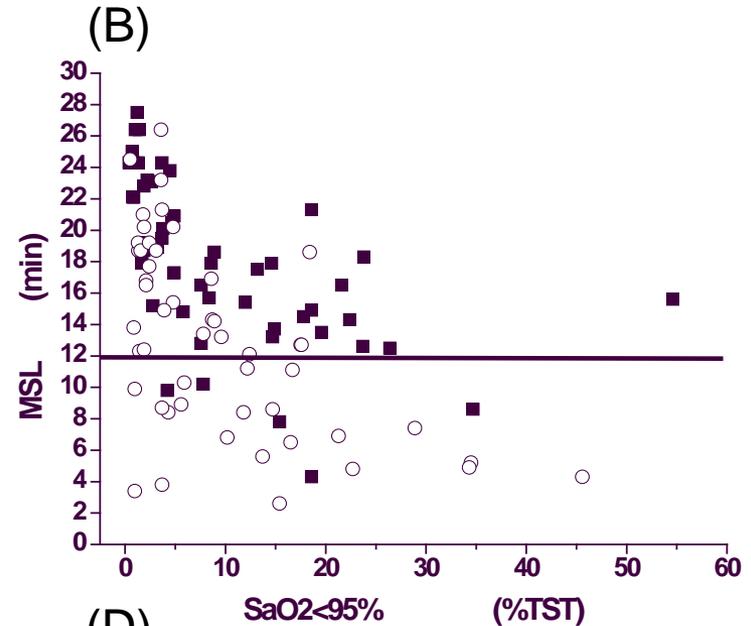
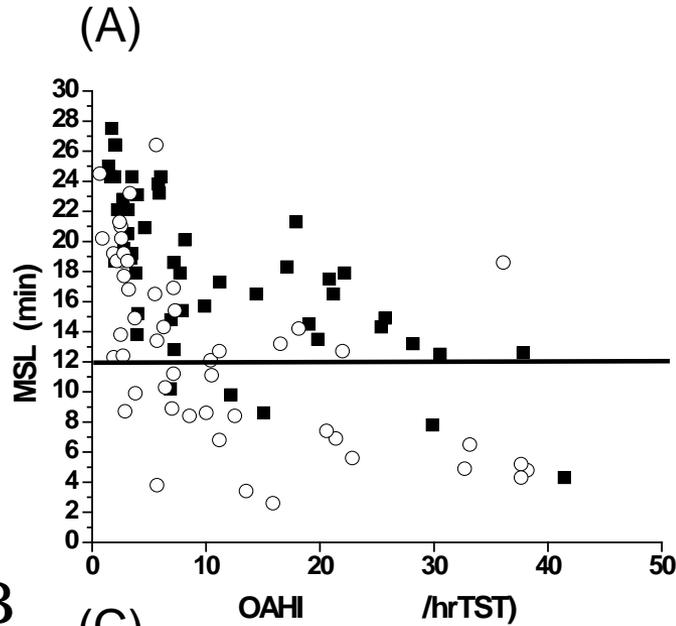
# OSA in Childhood:

- **Habitual snoring occurs in 7-13% of pre-school and school-aged children.**
- **OSA (as currently defined) is present in 2-3% of all 2-8 year old children.**
- **Association with obesity, asthma, allergic rhinitis, passive smoking exposure, air pollution, RSV bronchiolitis, prematurity, and African American ethnicity.**

# Secular Trends in Obesity Among Snoring Children Referred to a Pediatric Sleep Clinic

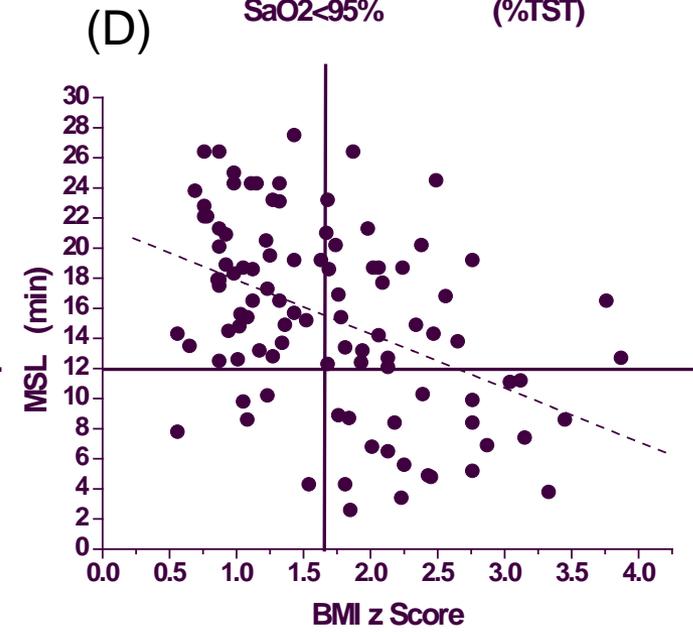
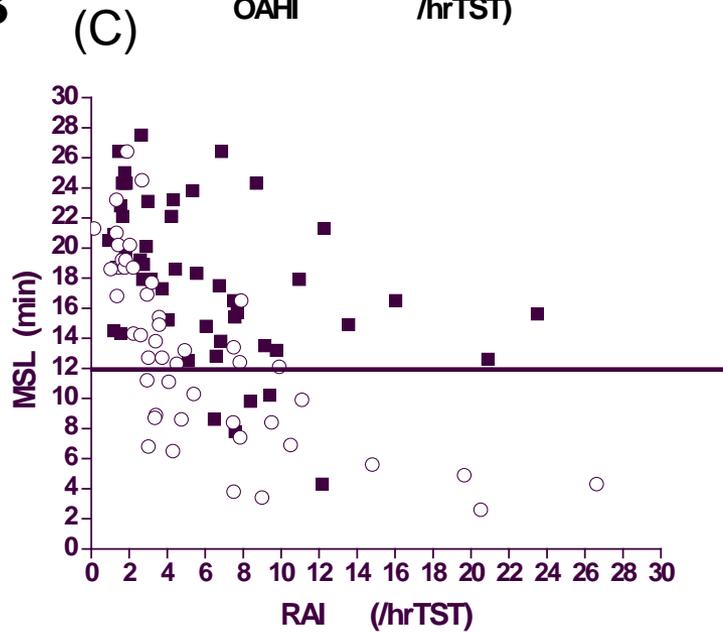


# Sleepiness in Non-obese and Obese Snoring Children



■ NOB

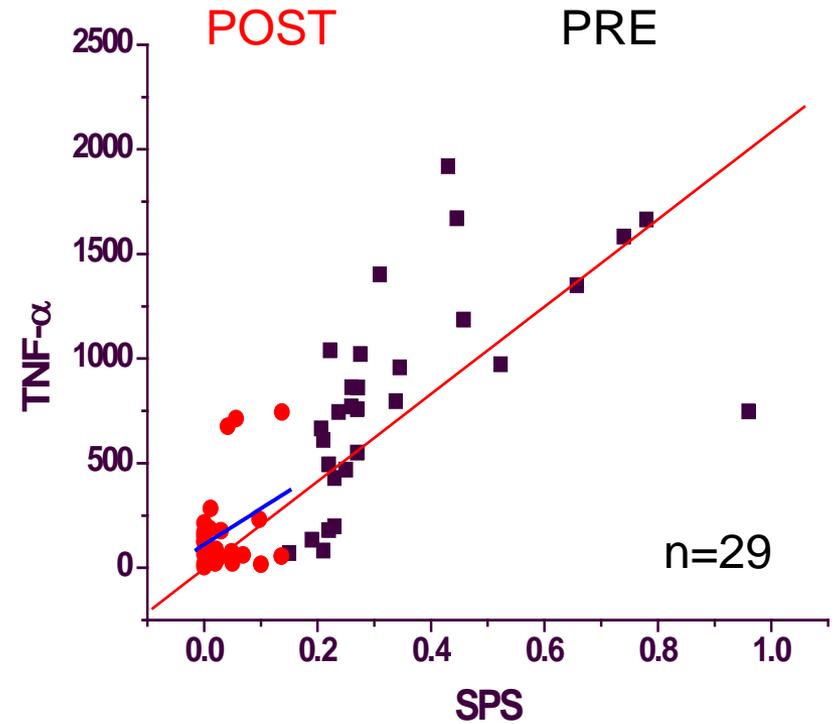
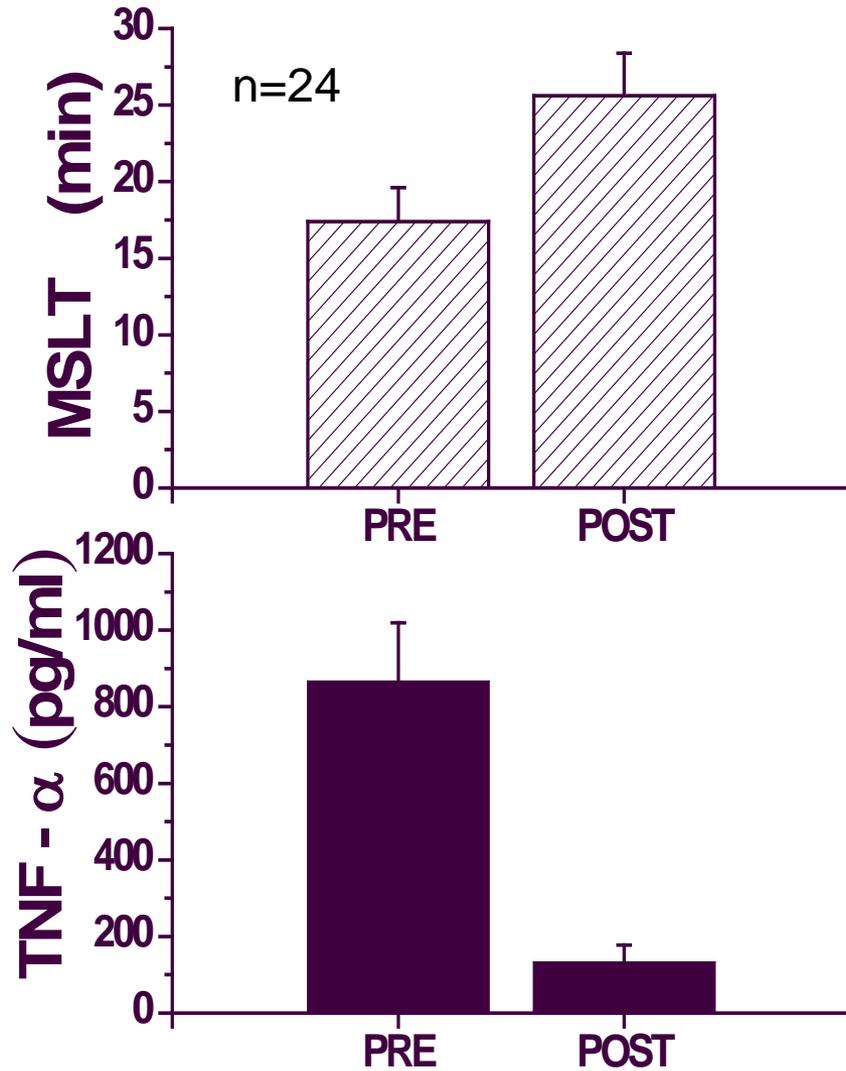
○ OB



**Morning plasma TNF- $\alpha$  levels in normal children and children with OSA with (Epworth score >11) or without (Epworth score <5) excessive daytime sleepiness.**

	<b>Controls N=80</b>	<b>OSA &amp; EDS(-) N=28</b>	<b>OSA&amp;EDS(+) N=39</b>	<b>P value OSA+EDS vs 2 other groups</b>
<b>TNF-<math>\alpha</math></b>	<b>295.6 <math>\pm</math> 37.0</b>	<b>317.7 <math>\pm</math> 42.0</b>	<b>799.8 <math>\pm</math> 77.0*</b>	<b>&lt;0.001</b>

# Effect of OSA Treatment on SPS, MSLT, and TNF- $\alpha$



# Quality of Life

- **OSA , even mild, reduces the quality of life** (Franco et al., 2000; Rosen et al, Sleep 2002)

# Quality of Life

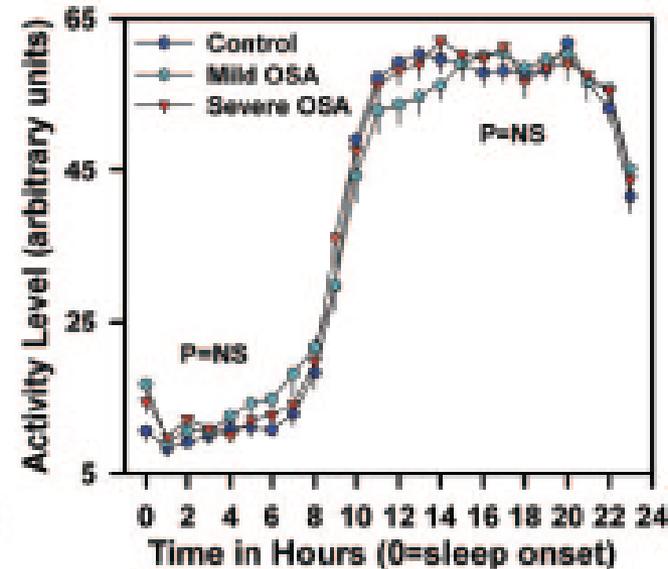
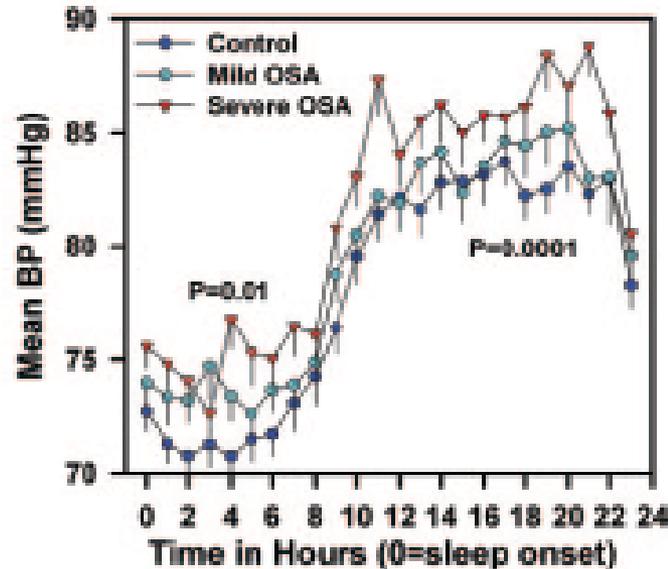
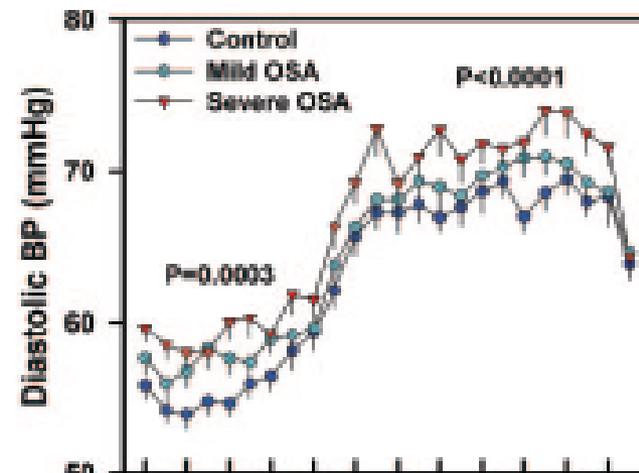
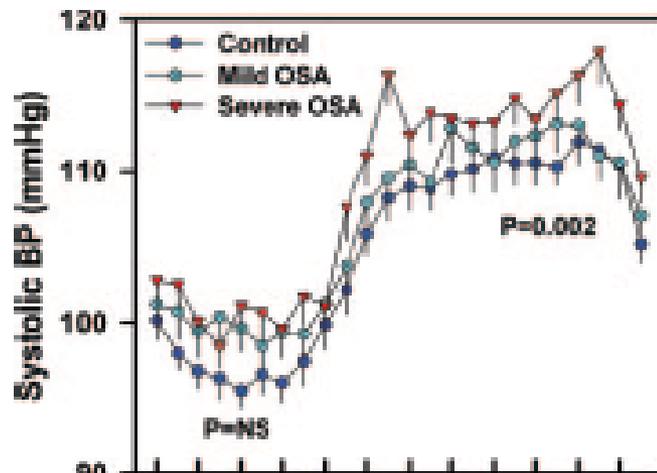
- **Obesity and OSA adversely impact on QOL.**
- **Depression scales** are increased in snoring children.
- **39% obese children with SDB and 27% of normal weight children with SDB report clinically significant levels of ANHEDONIA.**

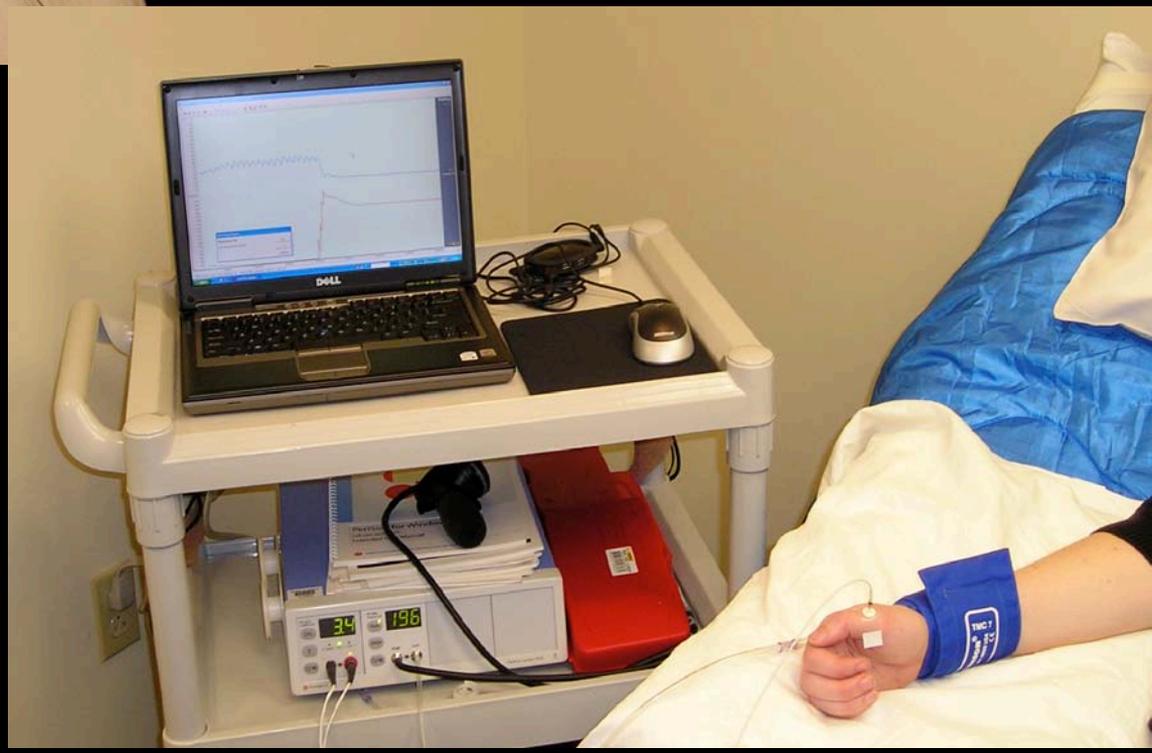
(Crabtree et al., Sleep 2004)

# Activity-Adjusted 24-Hour Ambulatory Blood Pressure and Cardiac Remodeling in Children with Sleep Disordered Breathing

Raouf Amin, Virend K. Somers, Keith McConnell, Paul Willging, Charles Myer, Marc Sherman, Gary McPhail, Ashley Morgenthal, Matthew Fenchel, Judy Bean, Thomas Kimball, Stephen Daniels

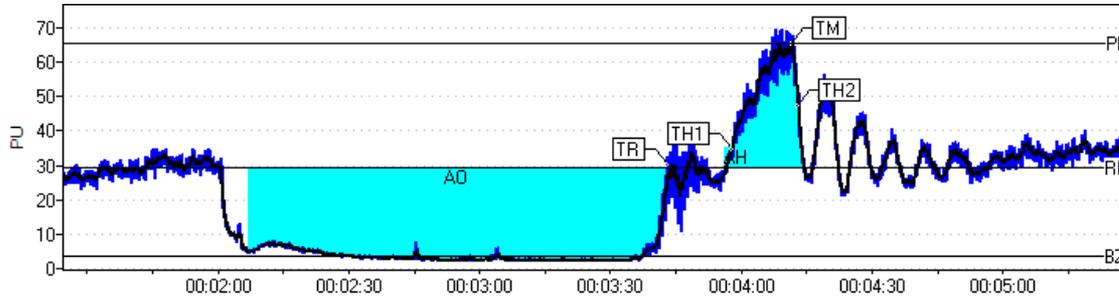
*Hypertension*. 2008;51:84-91.



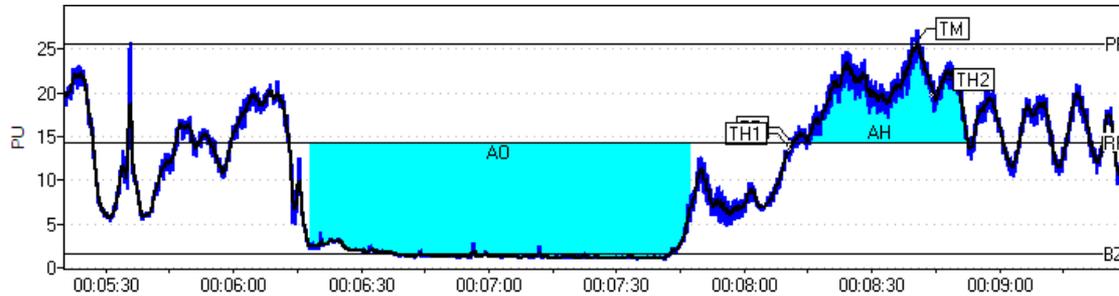


# Endothelial Function: Post-Occlusive Hyperemia

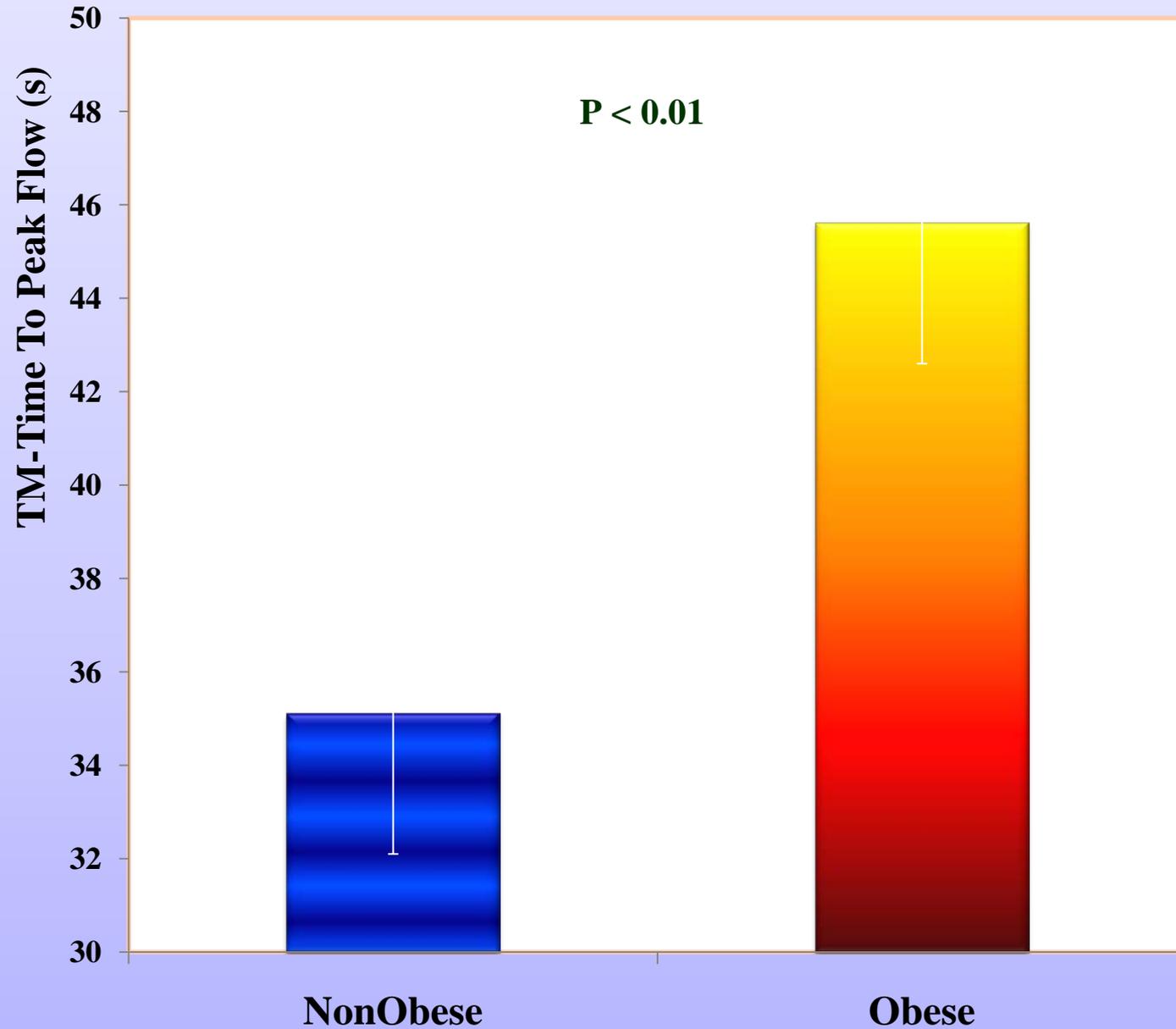
**NOB  
Control**



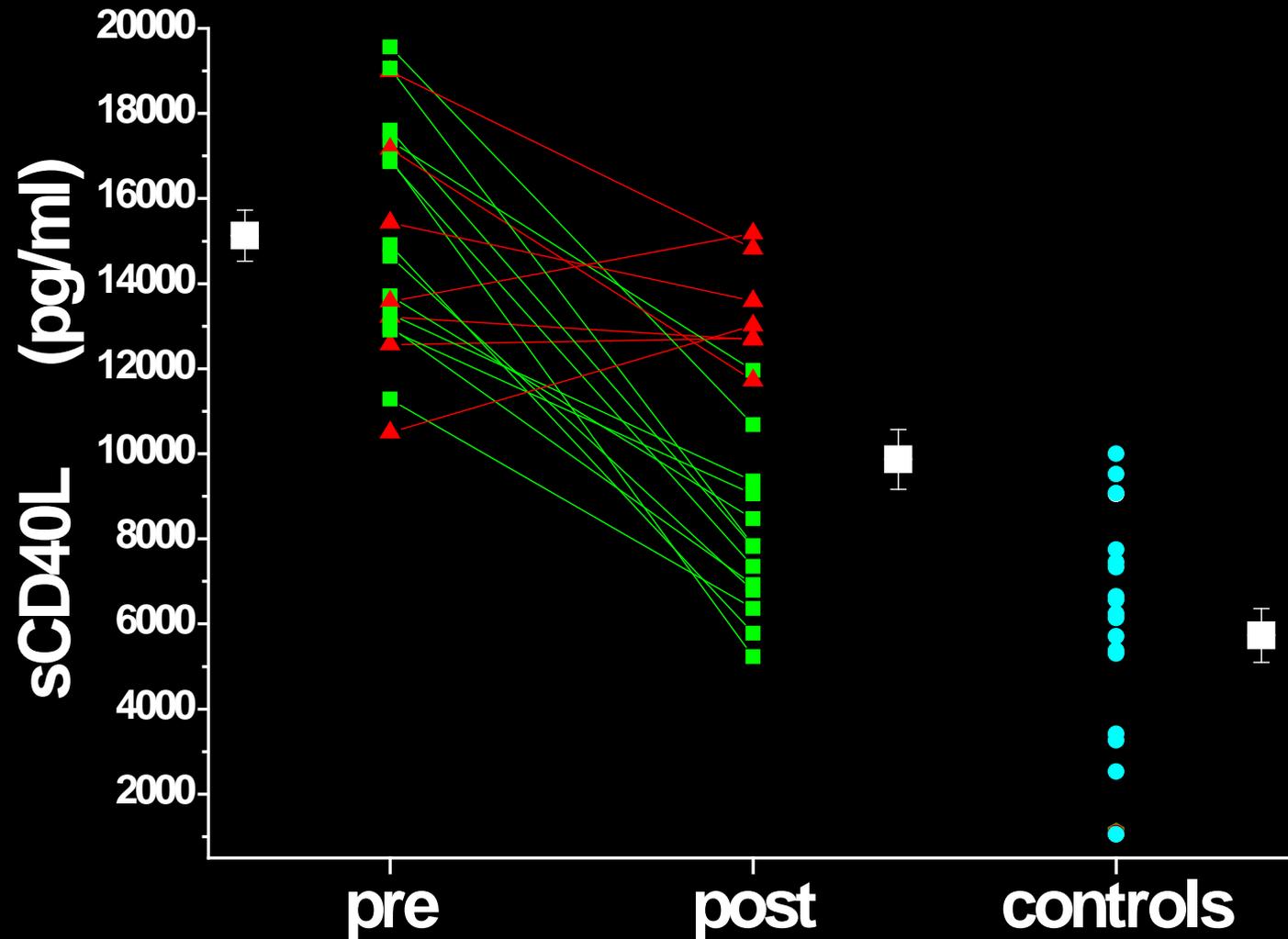
**NOB  
OSA**



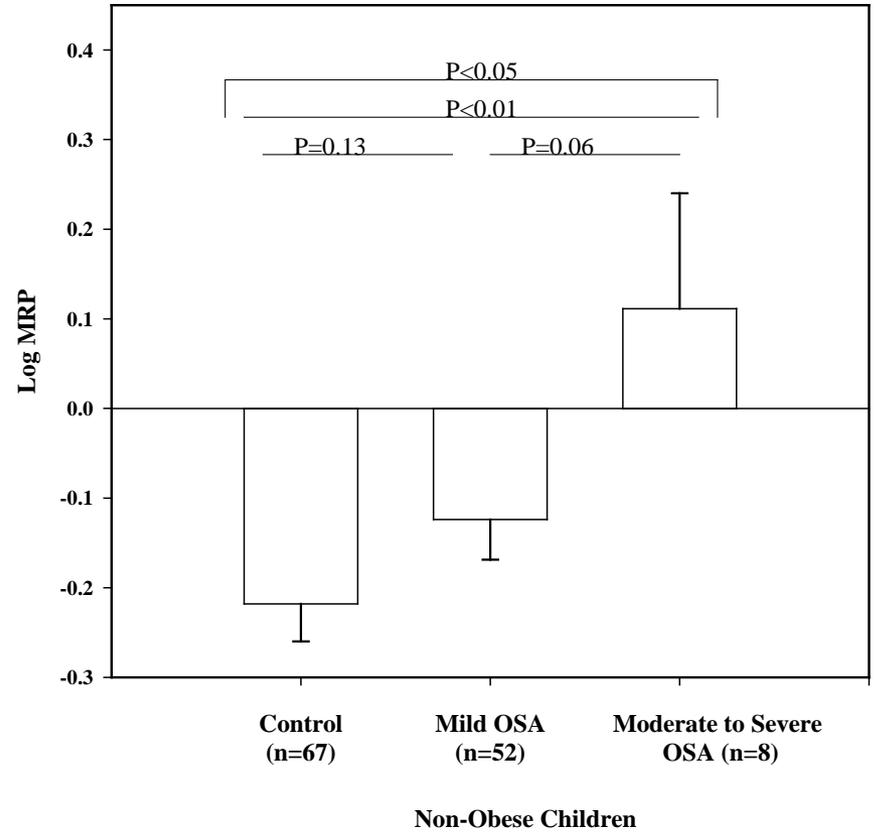
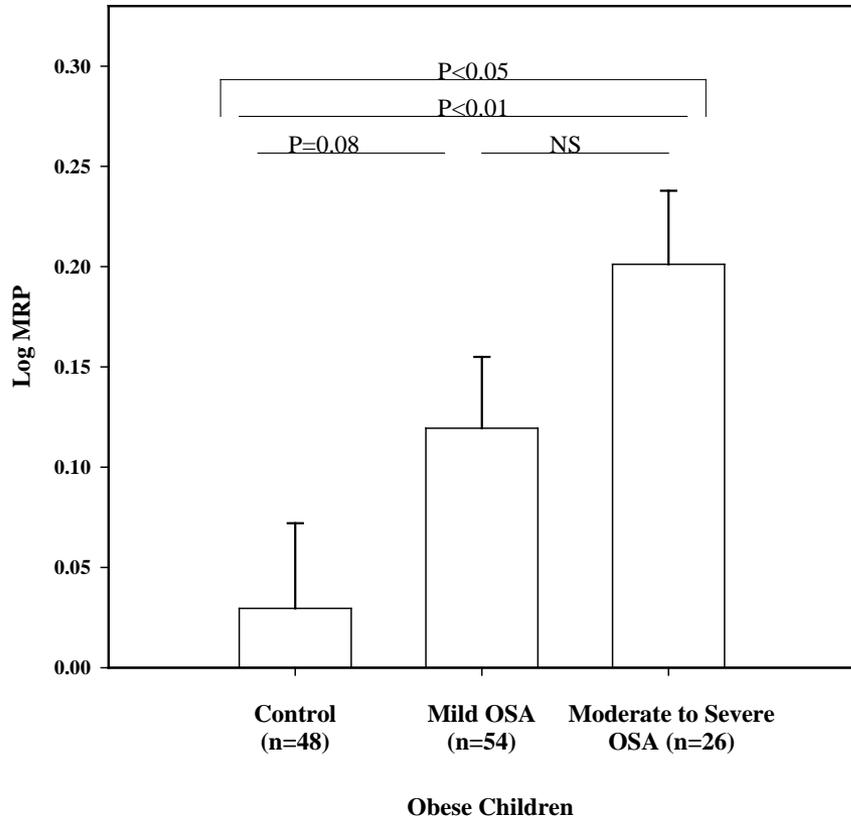
# The Effect of Obesity on Endothelial Function in Children



# Soluble CD40 Ligand

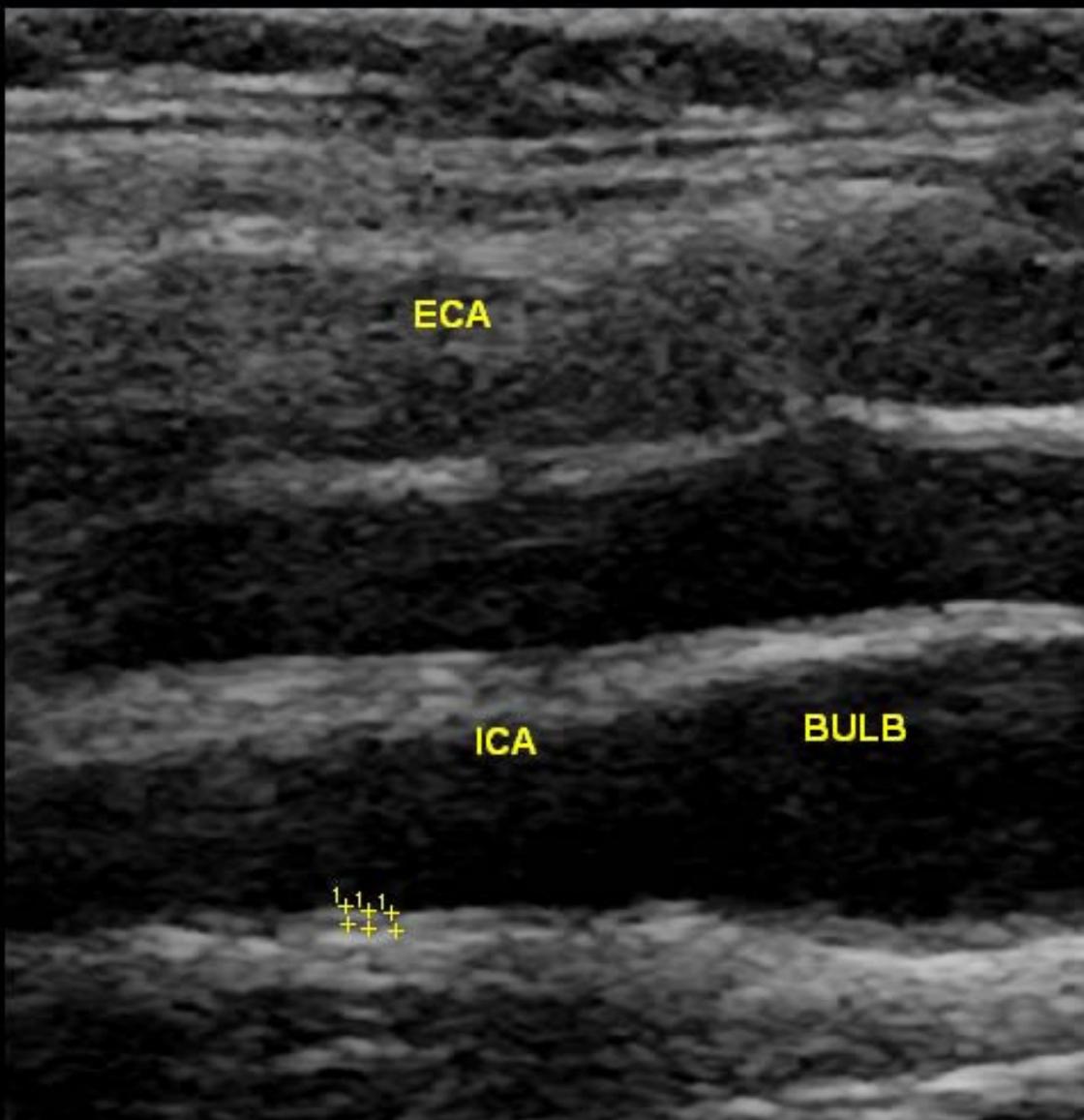


# MRP 8/14





GE  
Le

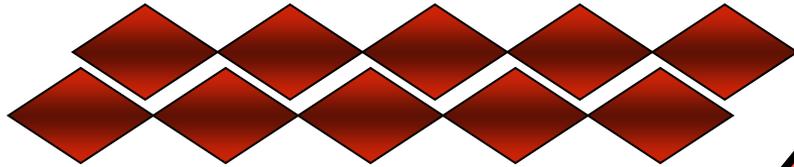
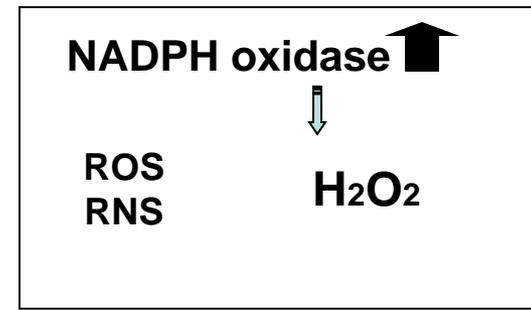


B  
 - Frq 10.0 MHz  
 Gn 52  
 - E/A 3/4  
 Map K/0/0  
 D 4.0 cm  
 - DR 78  
 FR 22 Hz  
 AO 100 %  
 1- XBeam Off

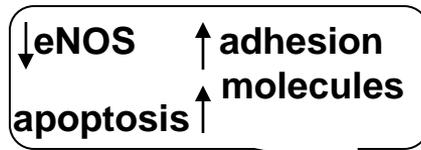
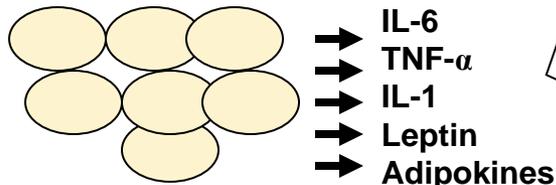
2-

●	■	
1	Rt D1	0.423 mm
	Rt D2	0.420 mm
	Rt D3	0.433 mm
	Rt ICA-IMT	0.425 mm

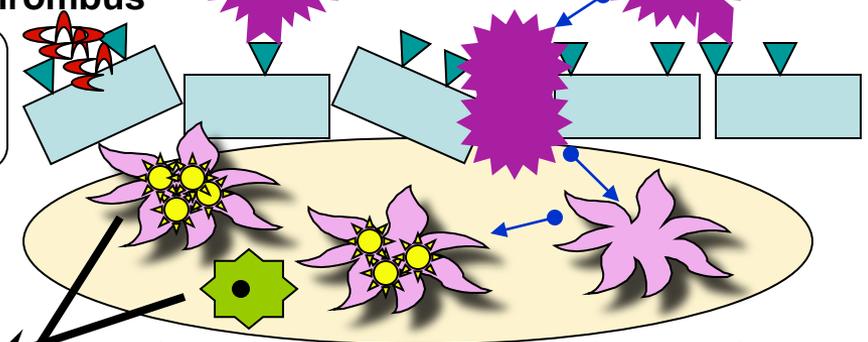
# Normal Vessel Wall



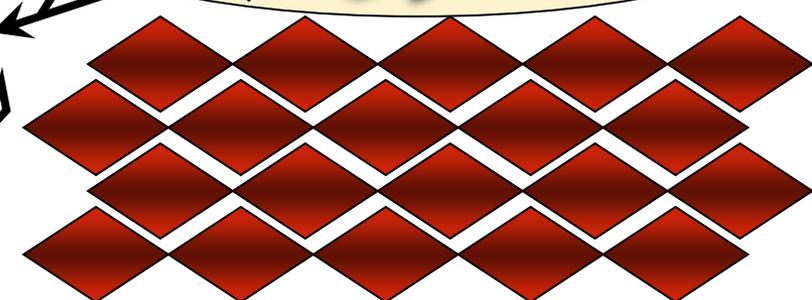
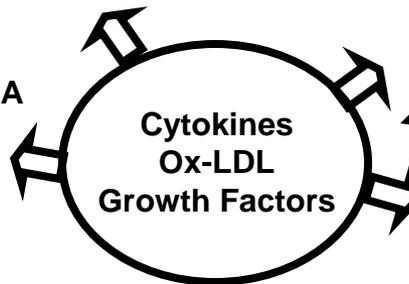
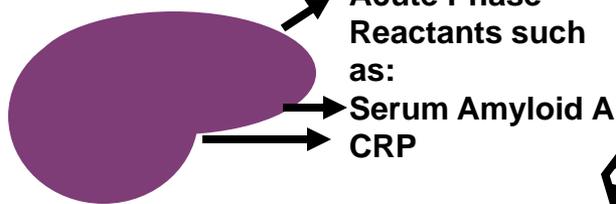
## Adipose Tissue



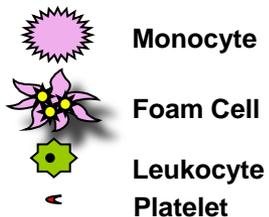
## Thrombus



## Liver

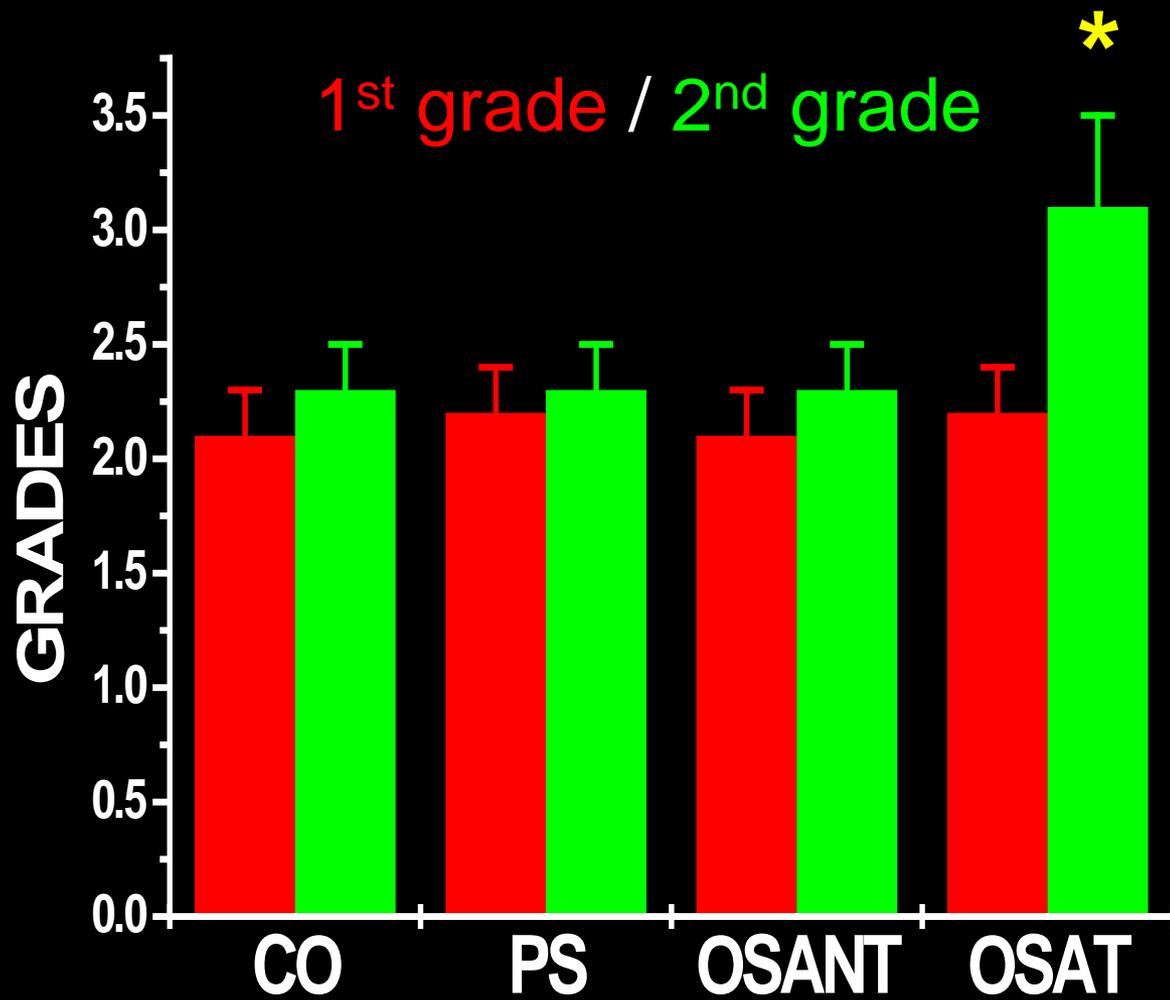


# Smooth Muscle Vessel Wall in OSA



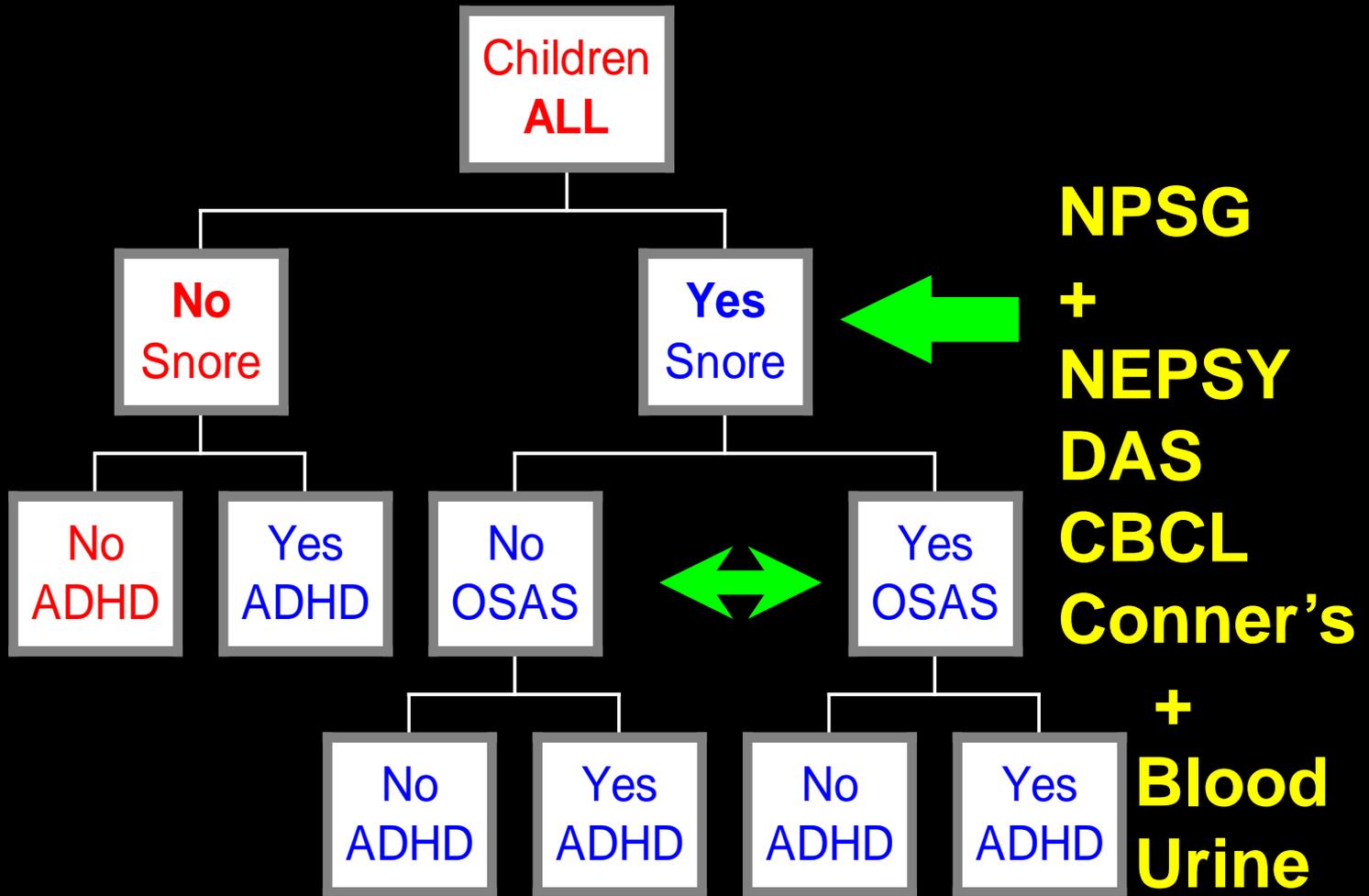
# Cognitive and Behavioral Consequences:

- Snoring and OSA in children is associated with behavioral problems such as hyperactivity, aggressiveness, reduced freedom from distractability, and learning problems. **(Ali et al., 1993, 1994, 1996; Leach et al., 1992; Ferreira et al., 2000; Chervin et al., 2002)**
- In 297 poorly performing first-graders, the incidence of OSA was 6-9 fold increased. **(Gozal, 1998)**



(Gozal, 1998)

# Louisville Study





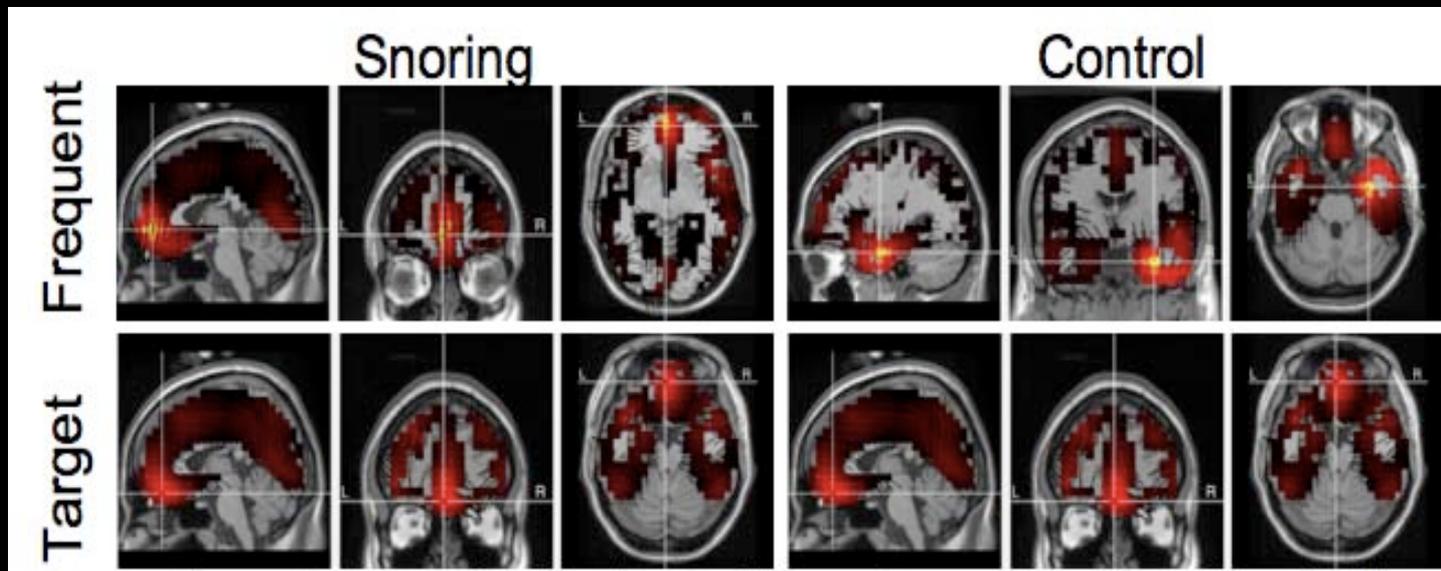
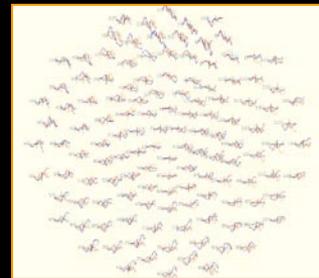
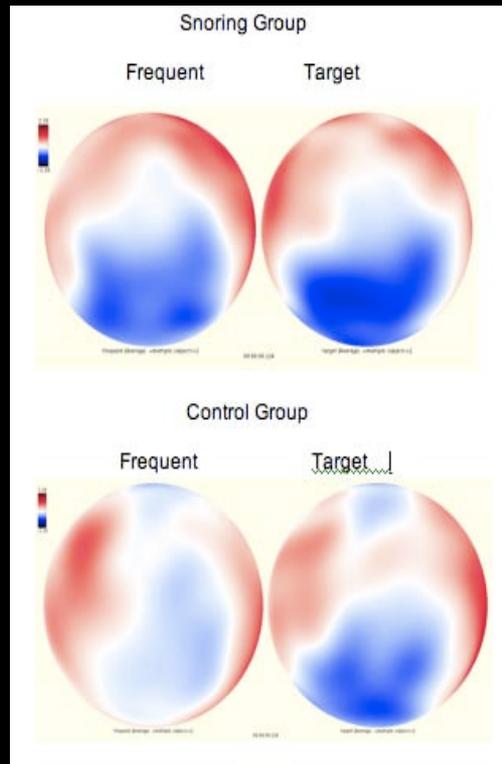
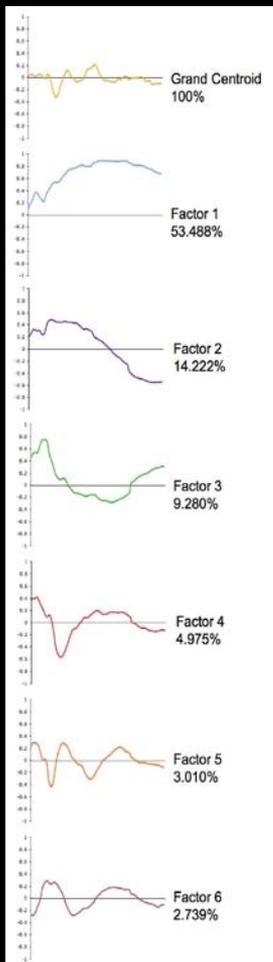
However.....

## Behavioral Measures (1)

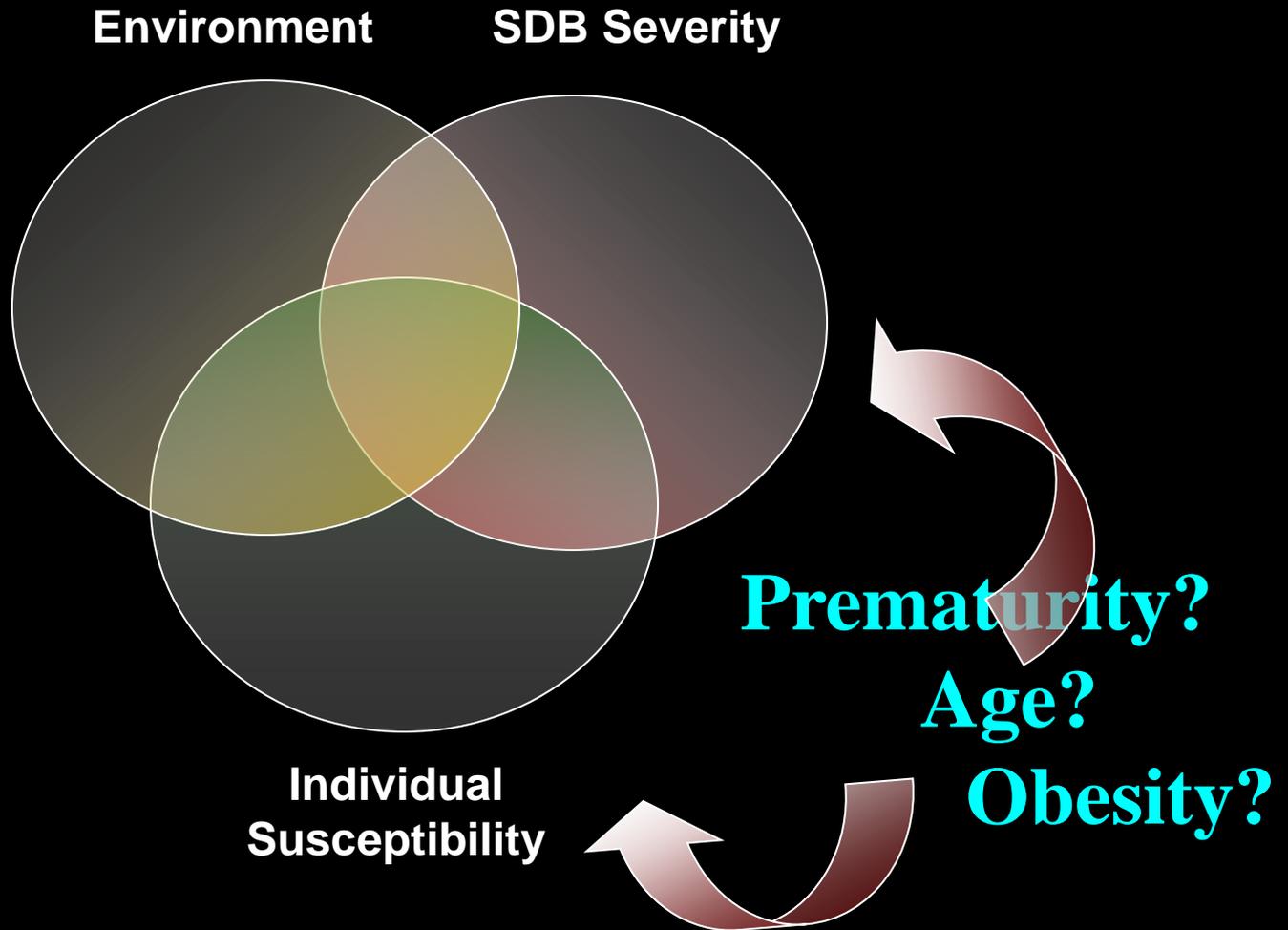
	PS	OSA	Control
<b>CBCL</b>			
Withdrawn	56.0 ± 8.1	55.1 ± 6.8	54.3 ± 6.8
Somatic Complaints	<b>59.0 ± 8.2*</b>	<b>61.2 ± 9.5**</b>	55.7 ± 6.3
Anxious / Depressed	57.5 ± 8.0	57.2 ± 9.8	55.2 ± 6.2
Social Problems	<b>57.8 ± 8.8*</b>	<b>58.9 ± 9.5</b>	54.4 ± 6.7
Thought	57.9 ± 8.3	56.9 ± 8.4	55.8 ± 6.4
Attention	<b>61.1 ± 10.6*‡</b>	59.7 ± 9.4	57.3 ± 7.7
Delinquency	<b>57.5 ± 7.9**</b>	<b>59.2 ± 8.6*</b>	54.2 ± 5.8
Aggression	<b>58.5 ± 10.3*</b>	59.2 ± 9.6	55.5 ± 6.1
Internalizing	<b>56.3 ± 10.9**</b>	<b>56.4 ± 11.6*</b>	51.0 ± 11.3
Externalizing	55.7 ± 11.9	56.7 ± 13.0	52.3 ± 9.5
Total	<b>59.0 ± 11.6**</b>	<b>59.1 ± 11.7</b>	53.7 ± 11.1

# Neurocognitive Measures

	<b>PS</b>	<b>OSA</b>	<b>Control</b>
<b>DAS</b>			
Verbal	<b>96.5 ± 13.0**</b>	92.9 ± 11.3**	105.4 ± 13.2
Non-Verbal	99.1 ± 13.0	<b>96.1 ± 12.6*</b>	103.3 ± 13.7
Overall	<b>97.9 ± 12.9**</b>	94.2 ± 10.6**	105.2 ± 12.4
<b>NEPSY</b>			
Attention / Executive	<b>105.2 ± 16.1*</b>	103.7 ± 16.4	110.9 ± 14.8
Language	<b>98.2 ± 17.3*</b>	95.7 ± 16.2*	105.6 ± 17.6
Visuospatial	<b>102.6 ± 15.2*</b>	100.2 ± 14.2*	108.6 ± 13.3
Memory	108.2 ± 16.0	108.6 ± 16.7	110.8 ± 13.9



# Triple Risk SDB Morbidity Model



# How much sleep do our children get?

- Community based healthy children (4-8 years of age)
- NPSG to rule out sleep pathology
- Actigraphy and sleep diary

# Results

# Implications

- Young school-aged children are sleeping substantially less than what is recommended
- Is less sleep need in children than previously believed? or
- Are healthy, non sleep-disordered children chronically sleep deprived?

# Summary

- **Sleep logs are inaccurate** tools for assessment of sleep onset in children when compared to actigraphy. While parents may be aware of their children's bedtimes, they appear to be unaware of their sleep onset latency. Sleep logs are, however, reliable means of judging sleep offset in children when compared to actigraphy, as parents are clearly aware of their children's rise times.
- The underestimates of sleep onset latency resulted in parental reports of markedly longer sleep duration compared to actual sleep duration. Actigraphy and daily logs are complementary and should always be used concomitantly

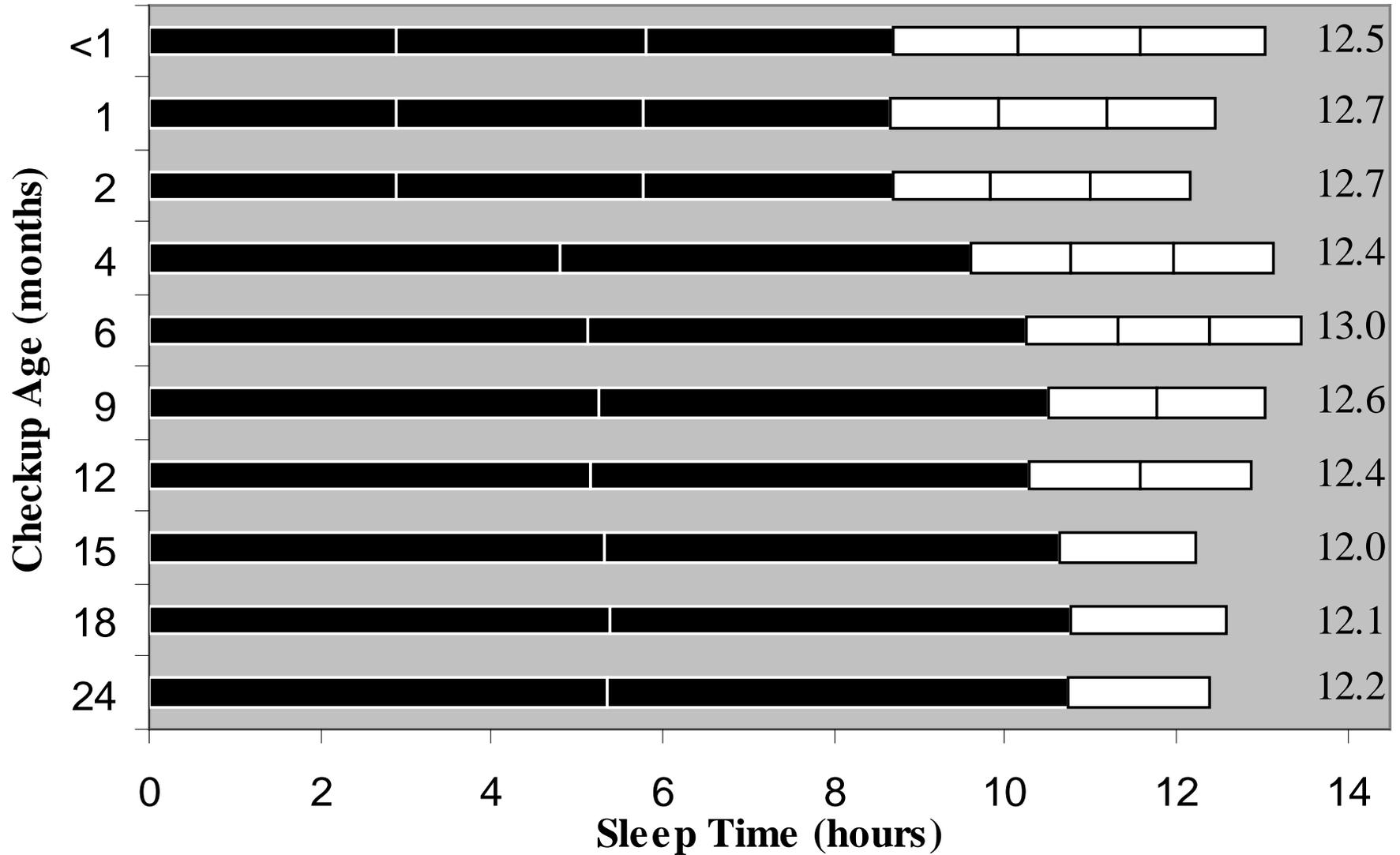
# Infant-Toddler Study

**N= 1,038**

<b>Female</b>	<b>47.1%</b>
<b>White</b>	<b>79.5%</b>
<b>Birth Weight (SD) lbs</b>	<b>7.5 (1.3)</b>
<b>Gestational Age (SD) wks</b>	<b>38.6 (2.4)</b>
<b>Primipara</b>	<b>48.9%</b>
<b>Vaginal Delivery</b>	<b>72.5%</b>
<b>Maternal Age (SD) yrs</b>	<b>29.0 (6.0)</b>
<b>Maternal Ed (SD) yrs</b>	<b>14.8 (2.6)</b>

**Actigraphy and sleep diary**

*Sleep Duration and Distribution over Age  
During 1<sup>st</sup> 24 Months of Life*



# Summary

- Current sleep duration is shorter than commonly recommended by healthcare professionals.
- For this age range, there is no conclusive evidence indicating that sleep duration below a certain threshold is suboptimal
- Justification of current recommendations for 16 hours/day sleep appears arbitrary.
- Such *a priori* excessive expectations may lead to inappropriate parental management of children's sleep routines and potentially to the erroneous belief that the child suffers from a sleep disorder.

# Acknowledgements:

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