

The Potential Role of Sleep in Cognitive Aging

Sean P.A. Drummond, PhD

Laboratory for Sleep & Behavioral Neuroscience
University of California San Diego
V.A. San Diego Healthcare System

Stages of Sleep

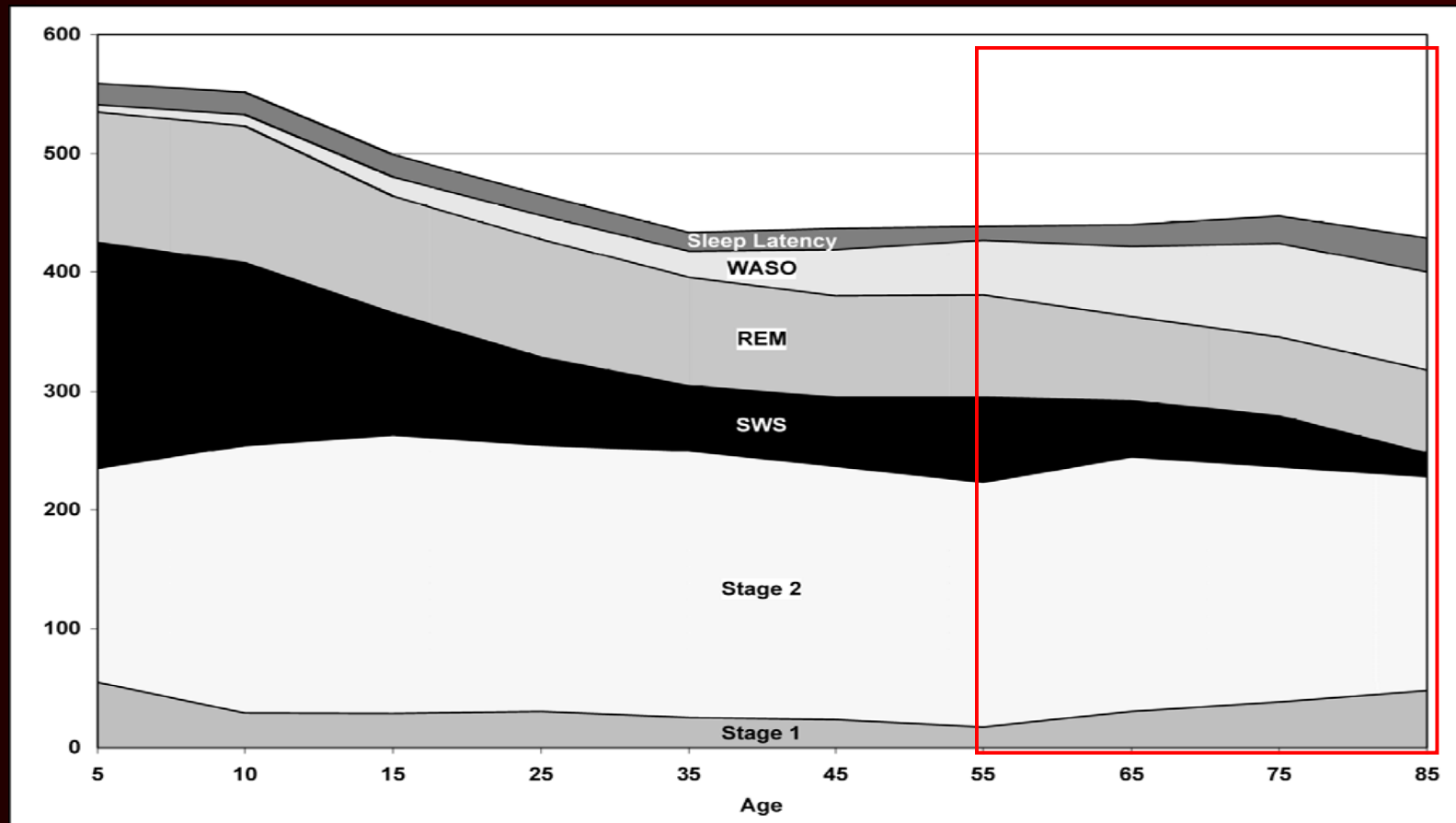
☯ Non-REM Sleep

- Stage 1
- Stage 2
- Stage 3 } Slow Wave Sleep (SWS)
- Stage 4 }

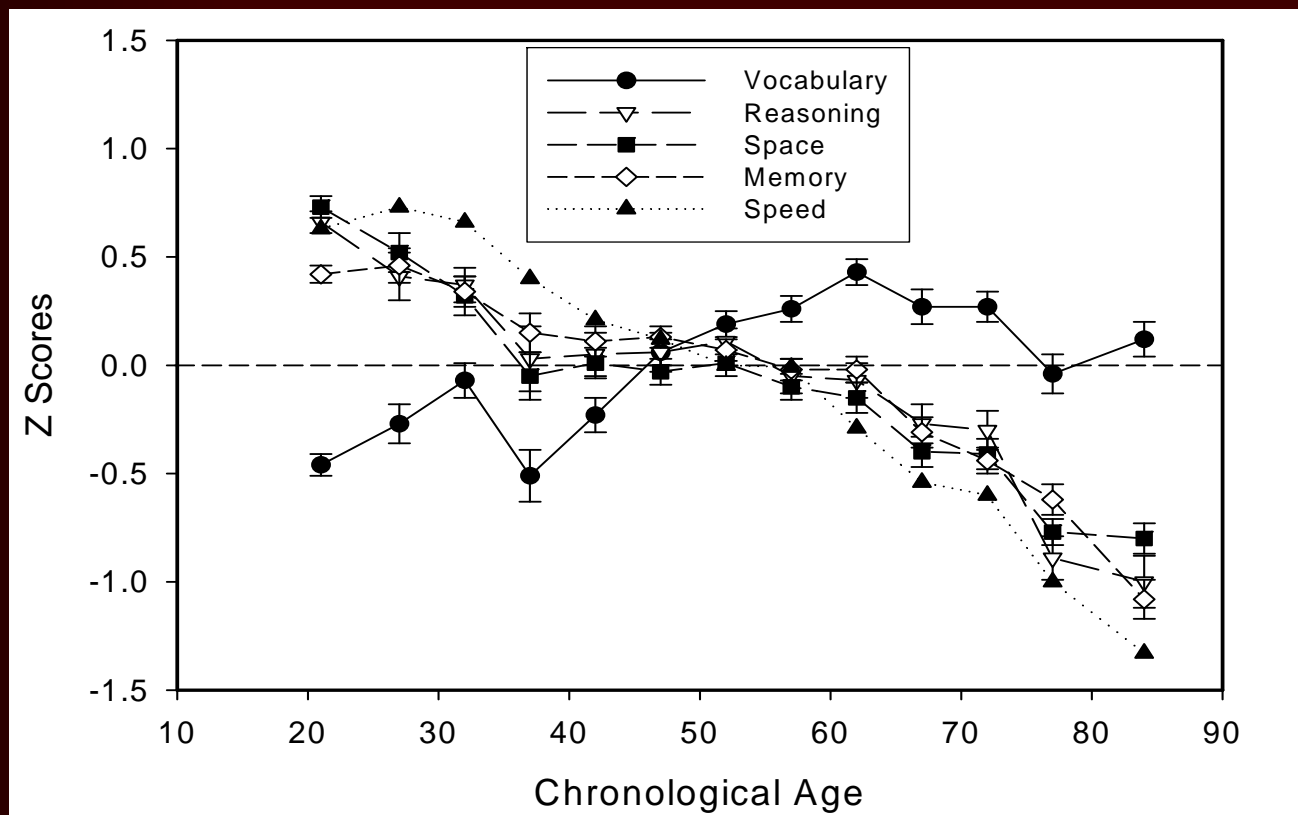
☯ REM Sleep

- Rapid Eye Movement Sleep
- Dreaming

Meta-Analysis of Sleep across the Lifespan

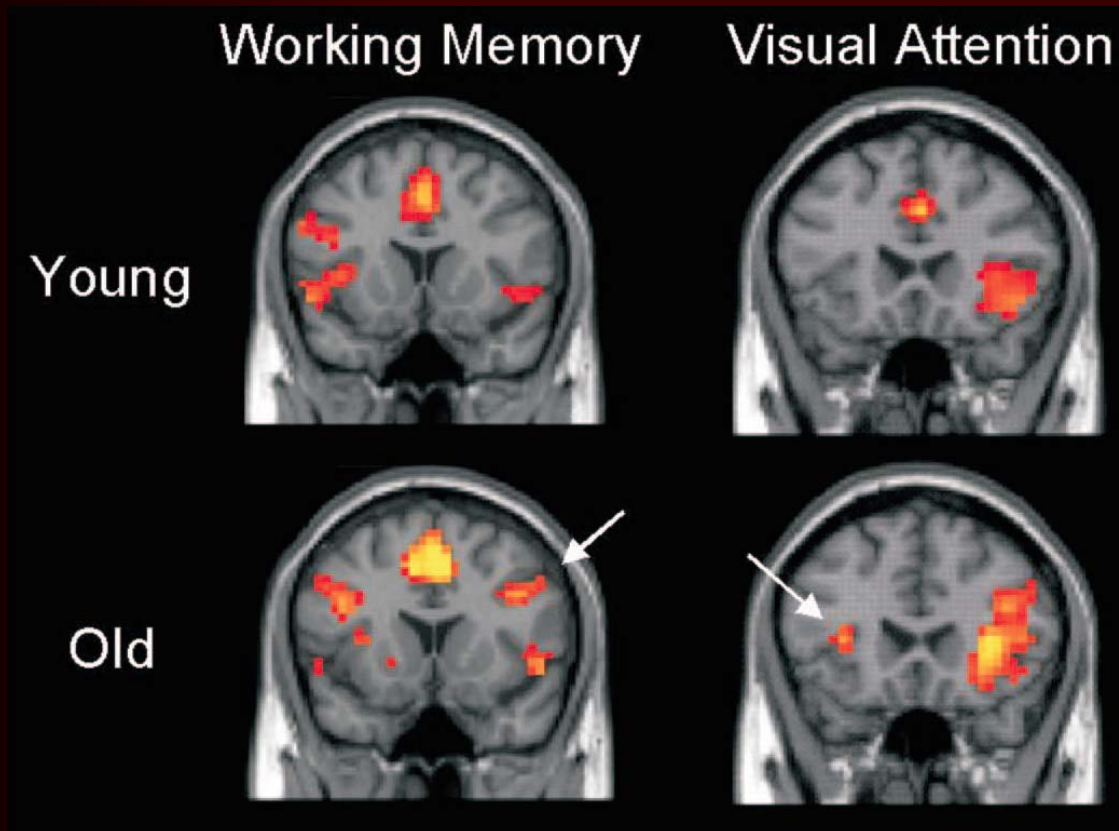


Age & Cognitive Performance

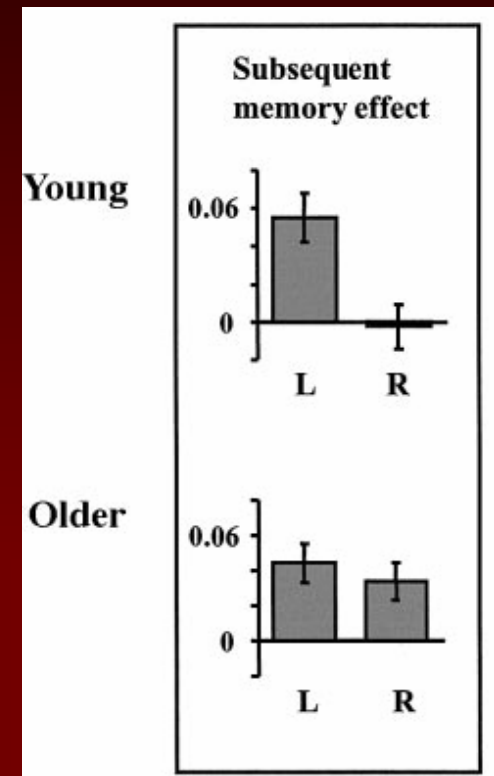


adapted from T.A. Salthouse, Psychology & Aging, 2003

Older Adults: Brain Compensation



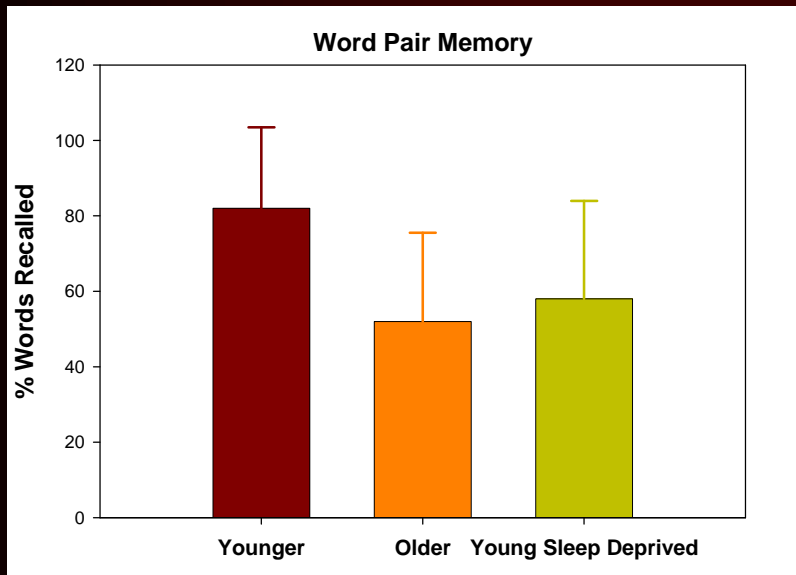
Cabeza et al., Cerebral Cortex, 2004



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Morcom et al., Brain, 2003

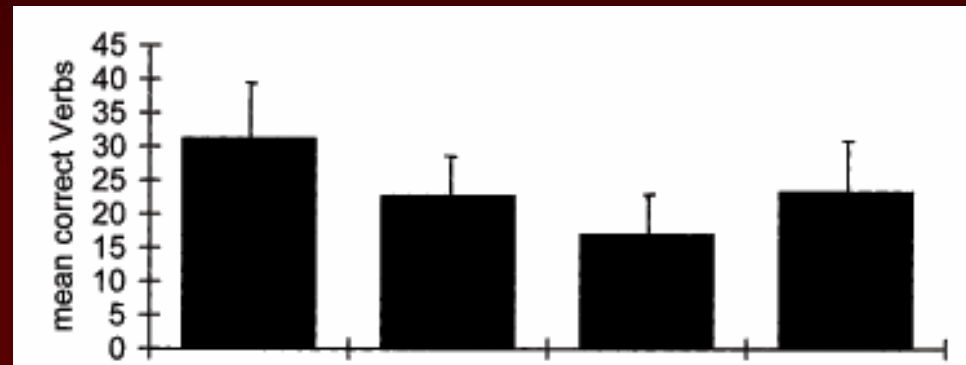
Aging & Sleep Deprivation: Similar Effects?



Younger = 20-30
years-old

Older = 61-85
years-old

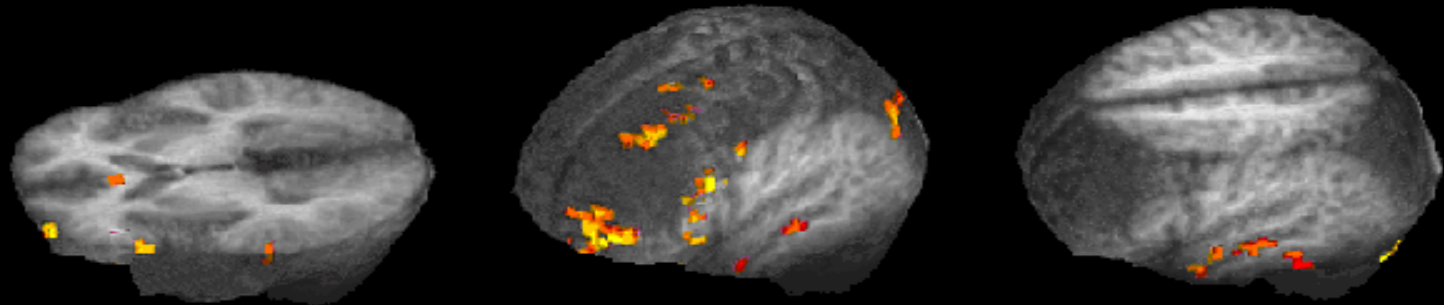
Verb Generation



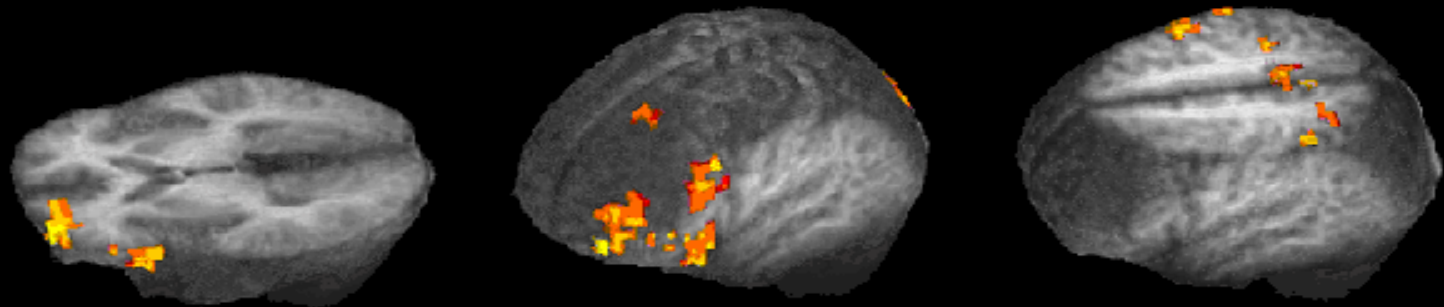
Age: 19-27 55-64 66-85 Young
Sleep
Deprived

Aging & Sleep Deprivation: Similar Effects?

Normal
Sleep



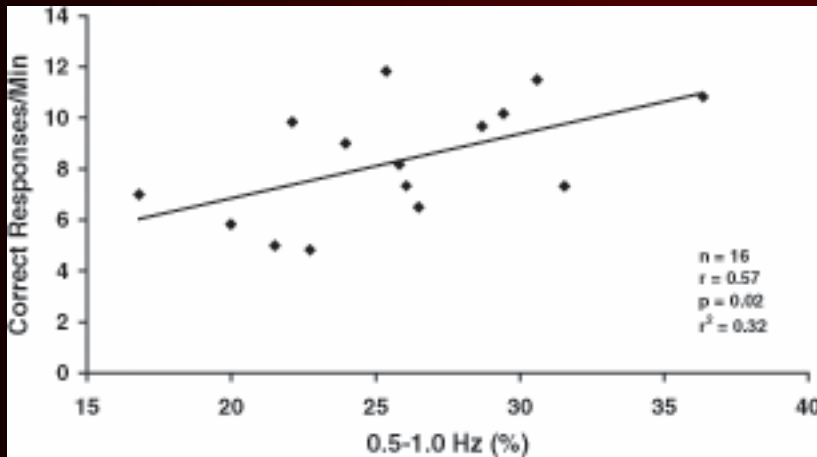
Sleep
Deprivation



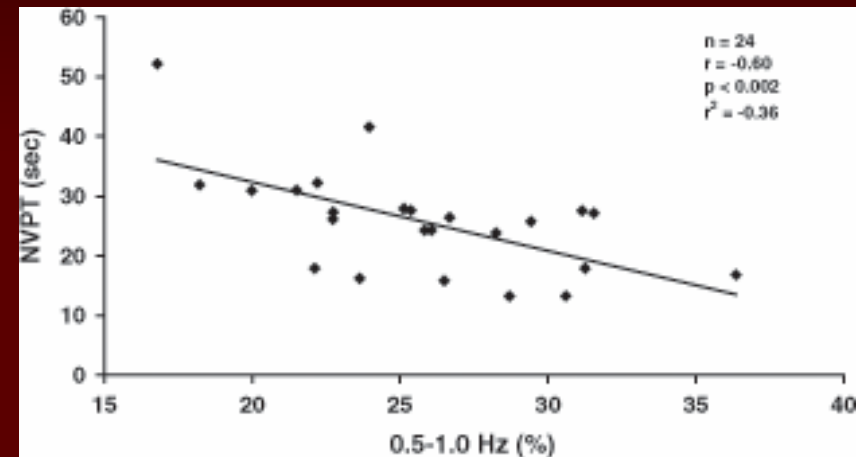
Drummond et al., Nature 2000; Neuropsychopharmacology, 2001

Deep Sleep & Performance in Aging

Word Generation

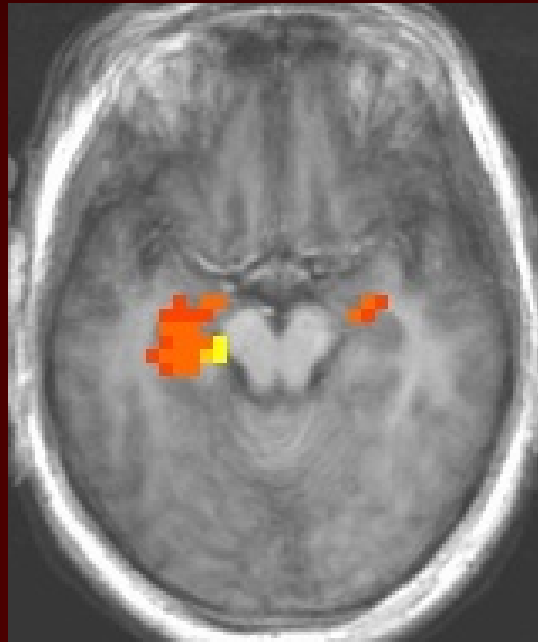
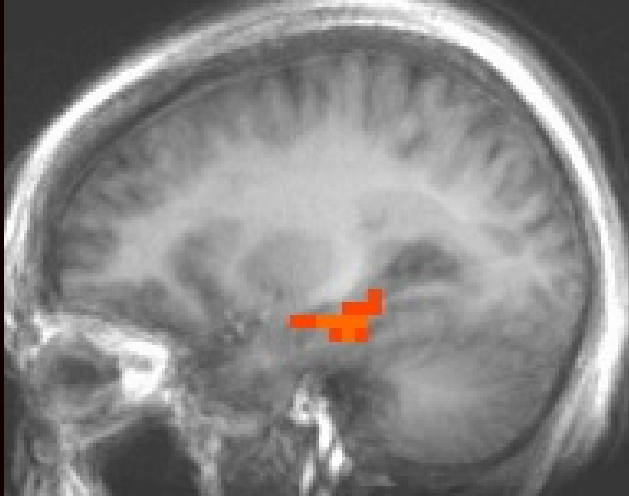


Non-verbal Planning Time



Older adults 61 – 75 years-old

Sleep & Cerebral Responses: Verbal Learning

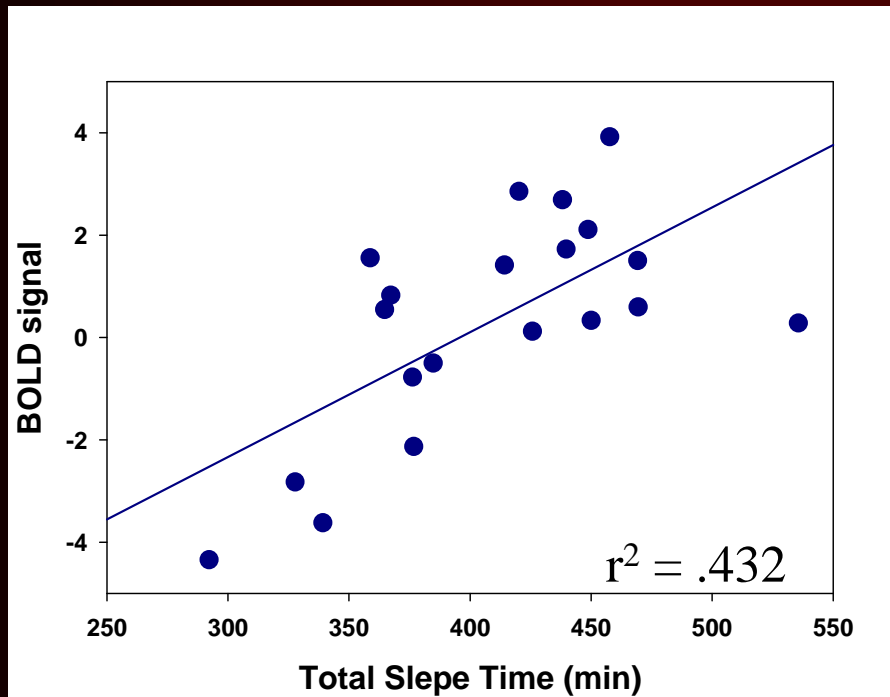


↑ Total Sleep Time = ↑ responses in bilateral parahippocampal regions

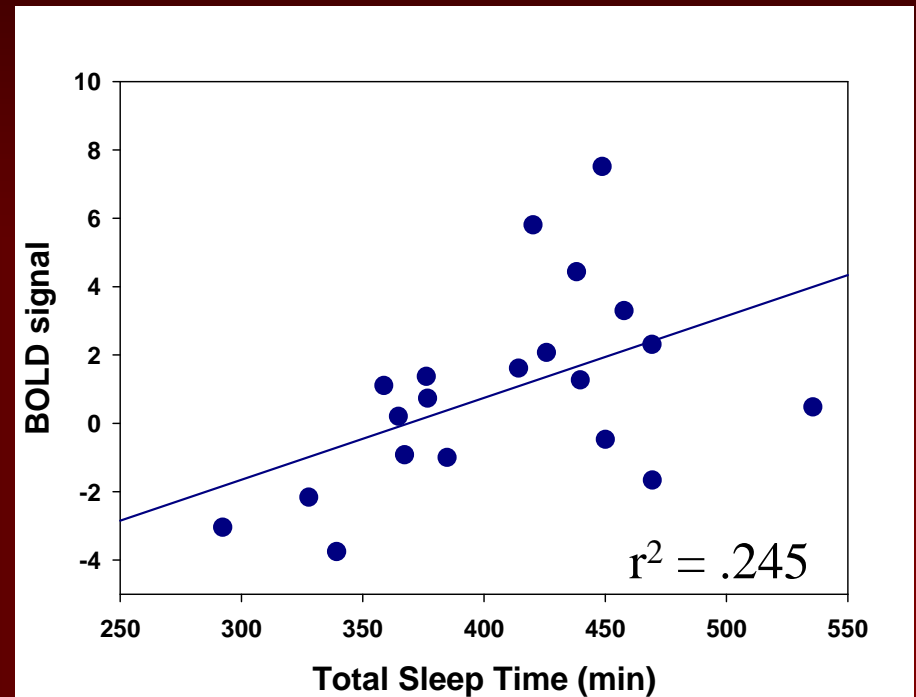
Drummond, NIA R01 AG024506

Sleep & Cerebral Responses: Verbal Learning

Left parahippocampal region



Right parahippocampal region



How Might Sleep Impact Cognition In Aging?

- ☯ Sleep allows for optimal performance
 - Reaction time and response speed
 - Working memory capacity
- ☯ When sleep deteriorates with age, our brains
 - May be at a lower baseline of readiness
 - Or, may be less able to deal with more challenging tasks
 - Or, may need more time to perform.

How Might Sleep Impact Cognition In Aging?

- ☯ Memory Consolidation enhanced during sleep
 - Motor learning, declarative episodic memory, perceptual learning, spatial learning
 - Sleep stage specific effects
- ☯ When sleep changes with age
 - Less facilitative of memory consolidation
 - Particularly related to loss of Slow Wave Sleep

Future Directions

- ☯ Better understand sleep-cognition connection
 - Studies to date all use very healthy older adults with relatively intact sleep
 - What happens when shows significant deterioration?
- ☯ Improving sleep may help
 - Improve cognitive function in healthy aging
 - Slow down cognitive decline in aging