

Effects of Sleep Deprivation on Learning and Memory

Dr Chloe Newbury
@ChloeRNewbury



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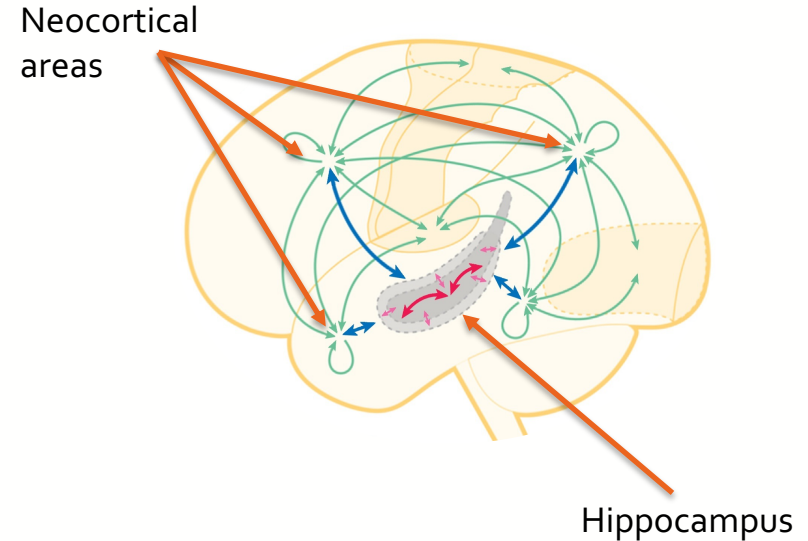
- Does sleep boost learning and memory?
- What causes sleep deprivation in adolescents?
- What is the impact of sleep deprivation on learning and memory?
- What's next? Future directions in understanding effects of sleep deprivation and ways to tackle the problem.



Does Sleep Boost Learning and Memory?



- When we learn something new, the information is initially stored in the hippocampus.
- Over time, these memories are integrated into a long term store in neocortical areas.

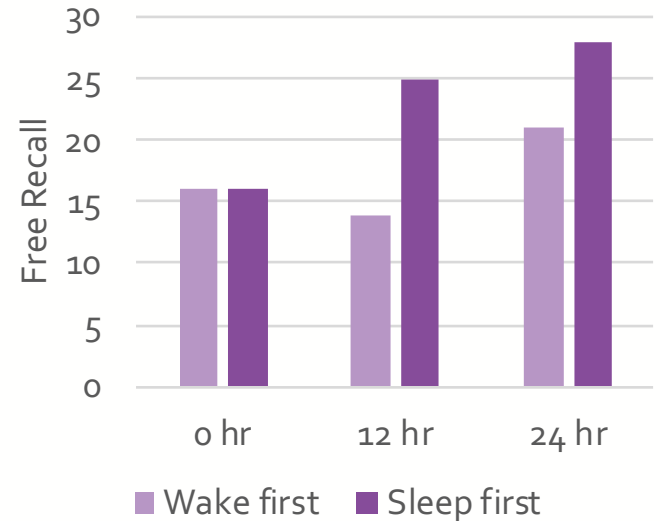
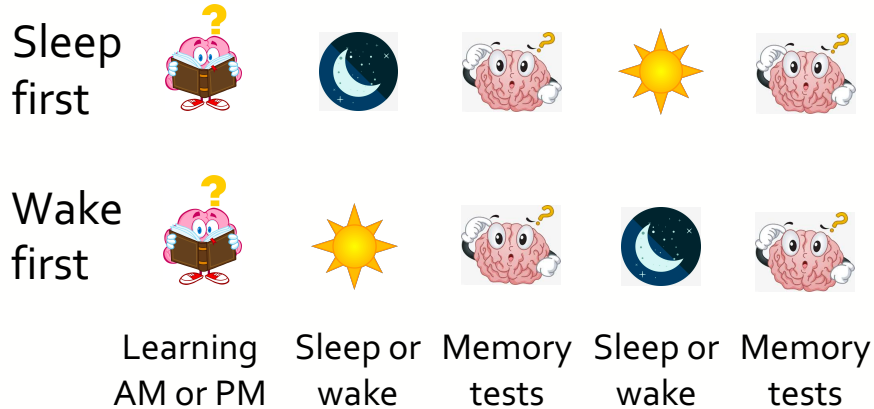


Does Sleep Boost Learning and Memory?

Adult Research



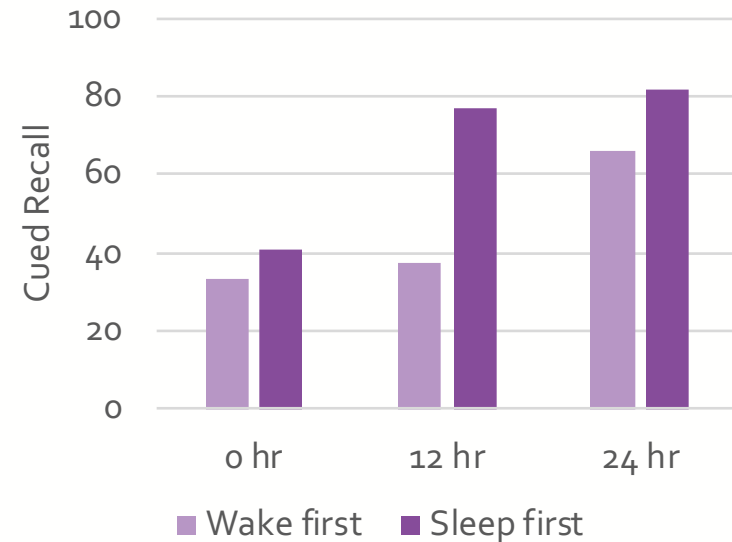
- This integration of memories has been found to be enhanced after a period of sleep compared to daytime wake.



Does Sleep Boost Learning and Memory? Child Research



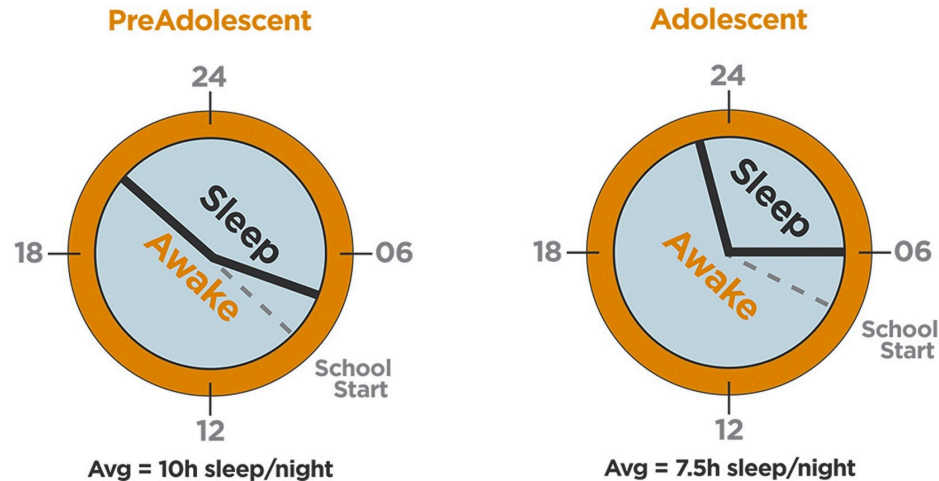
- In children aged 7-12, a period of overnight sleep was required to strengthen memory of newly learned words.



Sleep Deprivation in Adolescents



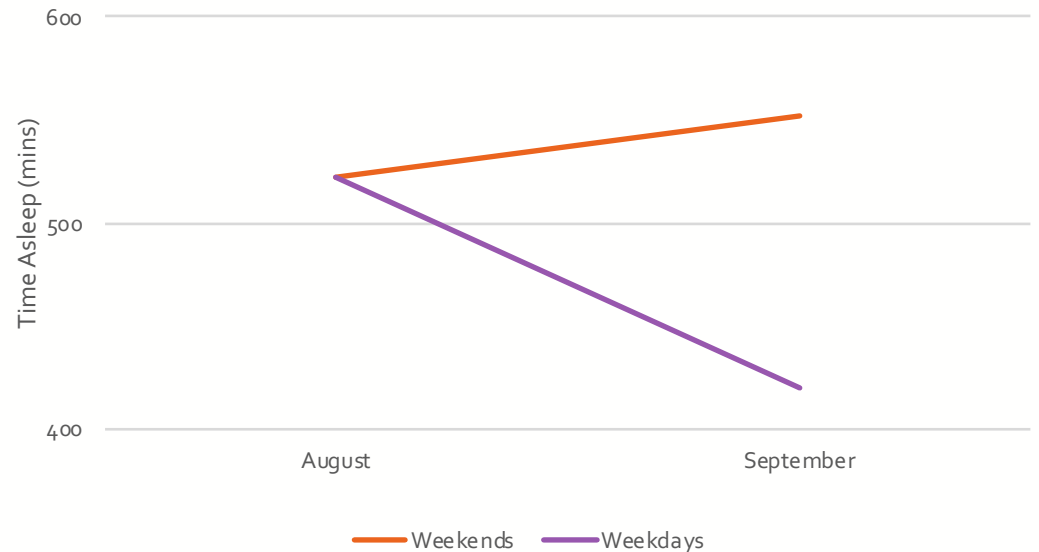
- Adolescents biological clock shifts forward by around 2 hours.
- Later sleep time and earlier wake up time means that many adolescents get less than the recommended 9 hours of sleep each night.



Sleep Deprivation in Adolescents



- Sleep duration decreases when adolescents go back to school, compared to summer holidays and weekends.



Impact of Sleep Deprivation in Adults



- In adults, sleep deprivation caused forgetting of newly learned words.
- Sleep deprivation in adults has been associated with a negative impact on learning, attention, & health.

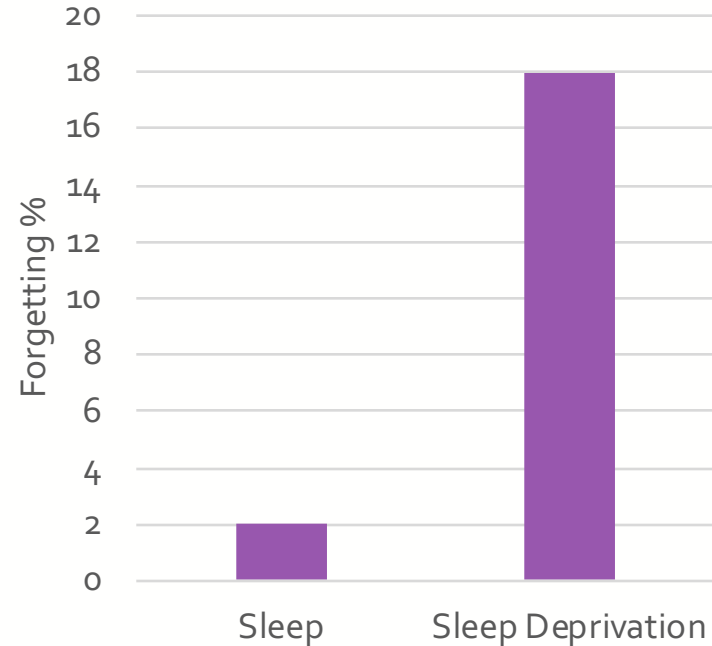


Figure recreated from Gais, Lucas & Born (2006)

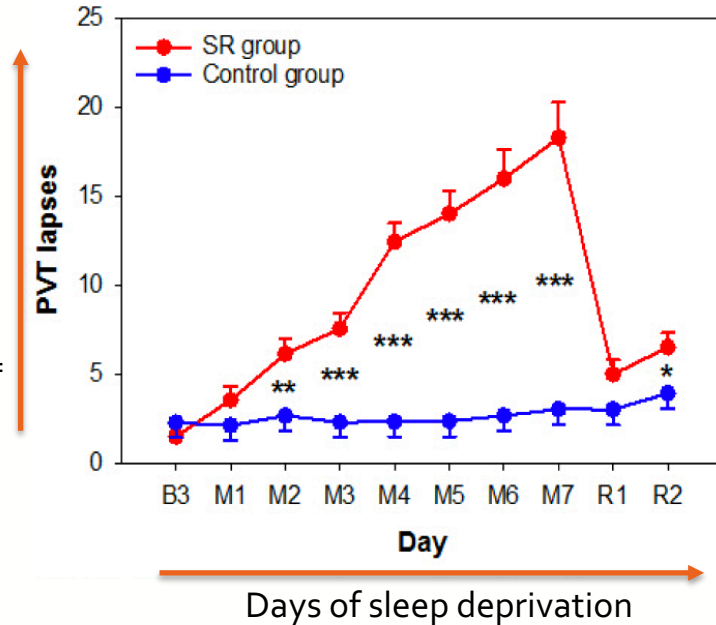
Impact of Sleep Deprivation in Adolescents



- 15-19 year old students slept for either 5 hours (red) or 9 hours (blue) for 1 week.
- Sleep deprived students suffered from deteriorating attention and working memory.

Higher score =
poorer
performance

(A) Sustained attention



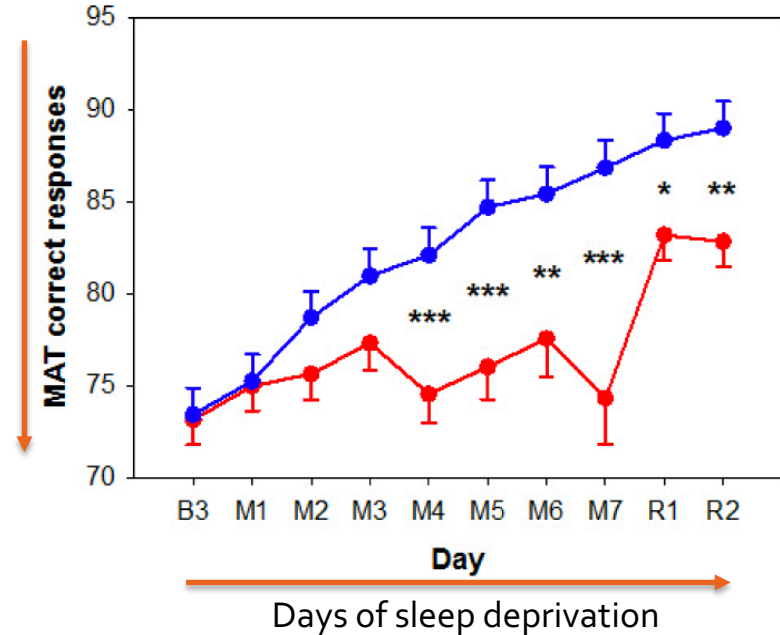
Impact of Sleep Deprivation in Adolescents



- Performance on tasks measuring speed of processing were also affected by sleep deprivation.

Lower score = poorer performance

(C) Speed of processing

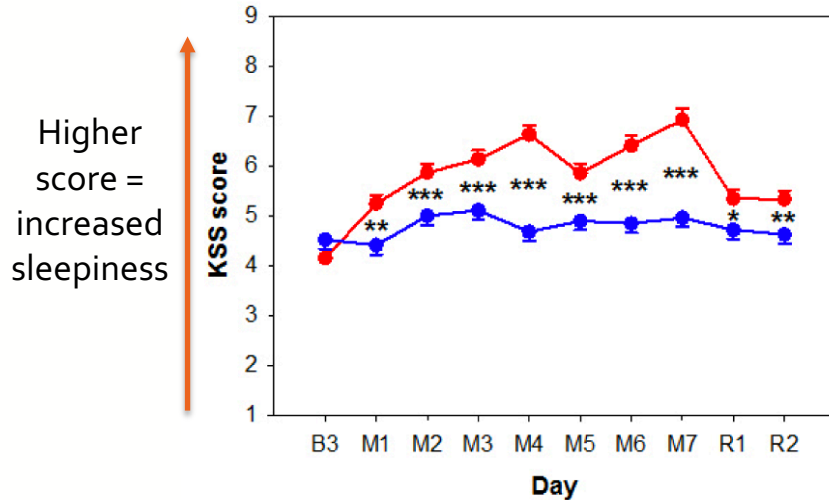


Impact of Sleep Deprivation in Adolescents

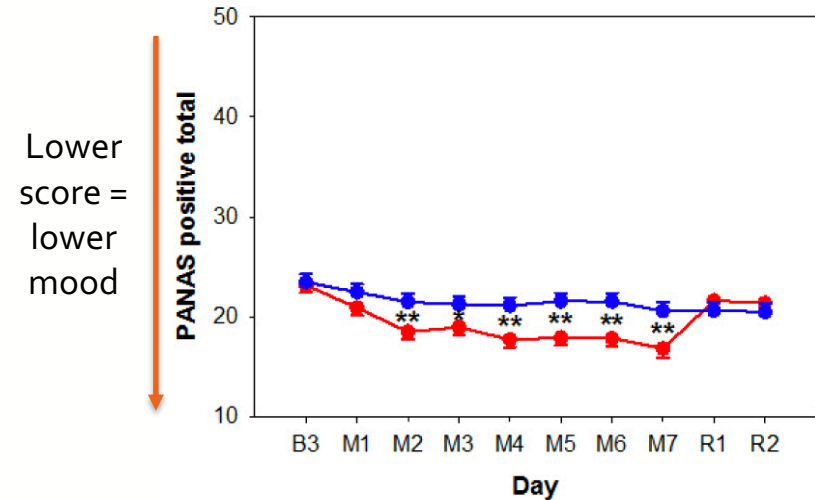


- Ratings of sleepiness were higher for the sleep deprived group, and their ratings of positive mood were lower.

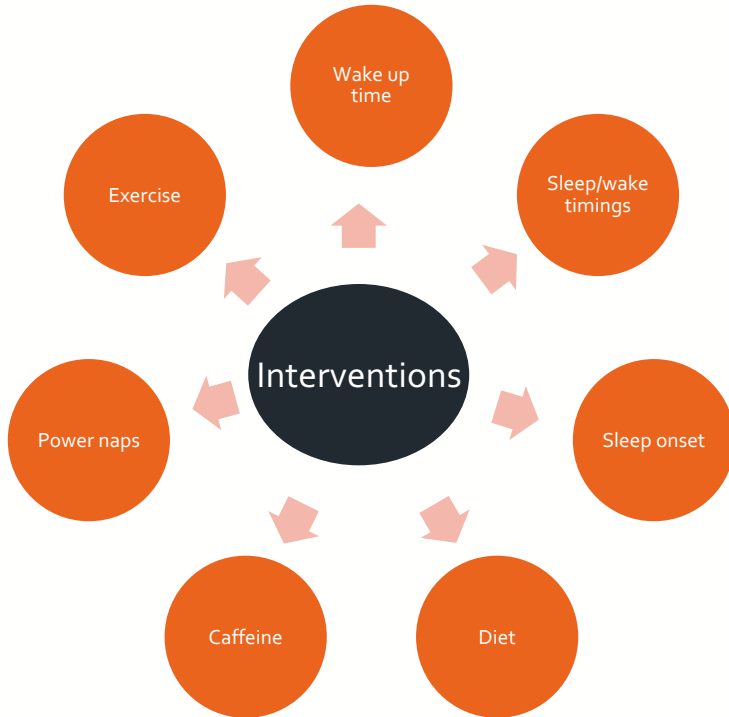
(D) Subjective sleepiness



(E) Mood



Future Directions – Can we 'reset' adolescents' late timing?



Sleep Medicine

Available online 10 May 2019

In Press, Corrected Proof



Original Article

Resetting the late timing of 'night owls' has a positive impact on mental health and performance

Elise R. Facer-Childs ^{a, b, d} , Benita Middleton ^c, Debra J. Skene ^c, Andrew P. Bagshaw ^{b, d}

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<https://doi.org/10.1016/j.sleep.2019.05.001>

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Future Directions – Understanding sleep in adolescents



- How does lack of sleep in adolescence affect learning and memory?
- Characteristics of sleep change through the life course. Are there specific characteristics of adolescent sleep that help cope with lack of sleep?
- Is there an optimal time for learning in adolescents?
- What are the effects of sleep on developmental disorders and mental health?



WE ARE LOOKING FOR

Schools to take part in a Sleep Project!

Researching the link between sleep
variability and educational outcomes

Project stages



Design

We would like the school to help design the study – what research is important for schools and how can the study run well in a school?



T1 data collection

Collect actigraph data from at least one class per year group, and ask some questions – ideally in Autumn/Winter term 2019



T2 data collection

Repeat data collection at T1, a year later – also look at other relevant data e.g. GCSEs if available



Data analysis and presentation

We can present group level data to the school to help everyone learn about sleep during adolescence

If you are interested or have some ideas please e-mail

Jessica.Dyson.2015@rhul.ac.uk

Thank you! Questions?

Dr Chloe Newbury
@ChloeRNewbury



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