Relationships Between Sleep Quality and Neural Pattern Similarity of Associative Memory in Young and Older Adults

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INTRODUCTION

Sleep quality is reduced in older adults and racial/ethnic minorities.

- Older and middle-aged adults tend to have poor sleep quality (Ohayon, Carskadon, Guilleminault, & Vitello, 2004) and poor associative memory, compared to young adults (Bender, Naveh-Benjamin, & Raz, 2010; Koen & Yonelinas, 2014).
- Both young and old racial/ethnic minorities have poorer objectively and subjectively-measured sleep quality than non-racial/ethnic minorities (Bei et al., 2016).

Relationships between sleep quality and episodic memory performance are underexplored in older adults and racial/ethnic minorities.

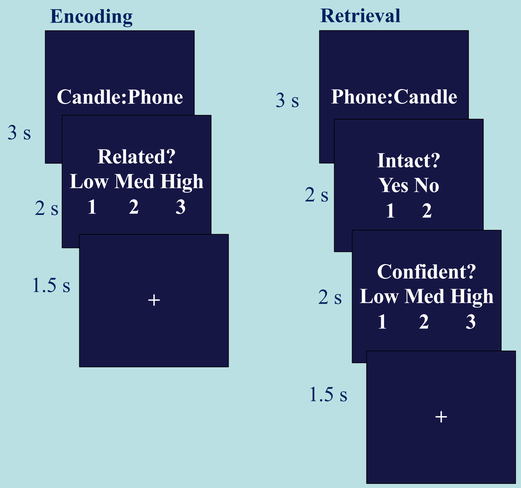
- Sleep is important for memory consolidation, but research on the importance of sleep quality for episodic memory performance is limited, particularly in healthy older adults (Wilckens, Woo, Kirk, Erickson, & Wheeler, 2014) and racial/ethnic minorities (Hokett & Duarte, 2019).

We hypothesized that poor sleep quality would be associated with reduced episodic memory performance at the behavioral and neural level in older adults and Black adults.

- The present study objectively measured habitual sleep quality to better assess the relationship among sleep, aging, race, and associative memory. We expected habitual sleep quality to demonstrate a positive correlation with associative memory performance, especially in older adults. We also predicted that Black participants would sleep more poorly than White participants and possibly show differences in the association between sleep quality and associative memory.

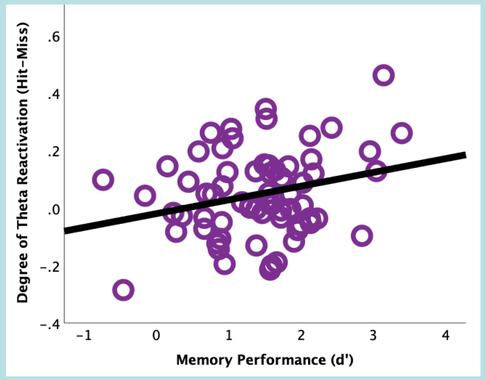
METHOD

- **Participants**: 66 adults (35 White, 20 Black, 3 Latino, 5 Asian, 3 Other)
- **Sleep**: One week of wrist-worn actigraphy data was collected from each participant.
  - Principal component analysis was used to extract composite measures of sleep quality.
- **Memory**: An associative memory task was administered after 7 nights of sleep measurement
- **Neural Reactivation**: EEG (32-channel) was collected during encoding and retrieval.
  - Pattern similarity was calculated as the correlation in centroparietal theta power for high confidence hits subtracted from misses at encoding and retrieval.

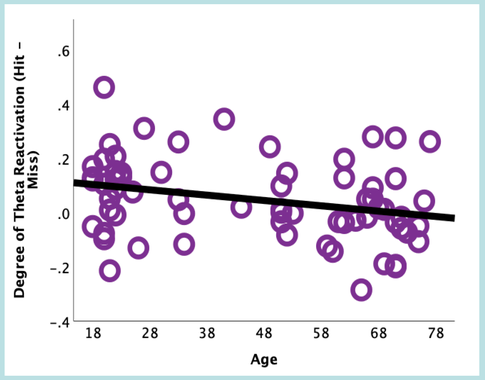


RESULTS

Neural reactivation correlates with memory performance and chronological age.

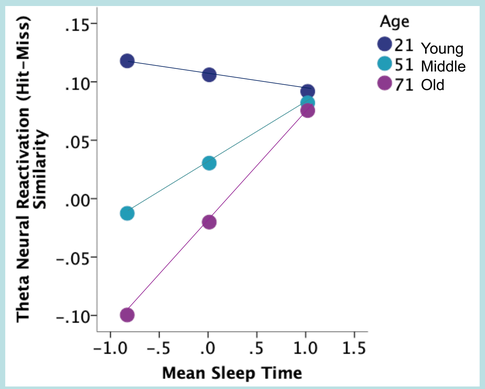


$r(64) = .263$, $\boldsymbol{p = .033}$ *

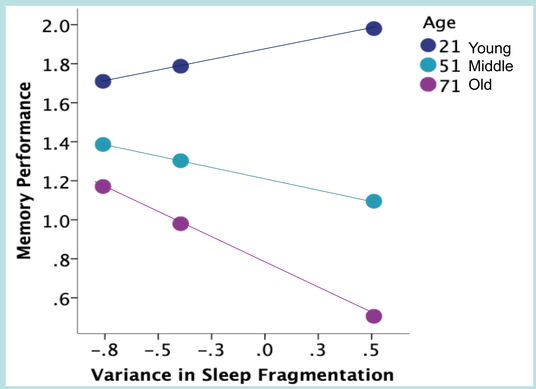


$r(64) = -.283$, $\boldsymbol{p = .021}$ *

Chronological age moderates the relationship between sleep quality and associative memory.



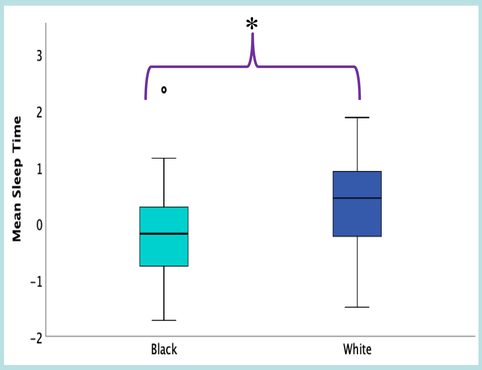
$\Delta R2 = .07$,
$F(1, 62) = 5.37$
$\boldsymbol{p = .024}$ *



$\Delta R2 = .07$,
$F(1, 62) = 6.04$
$\boldsymbol{p = .017}$ *

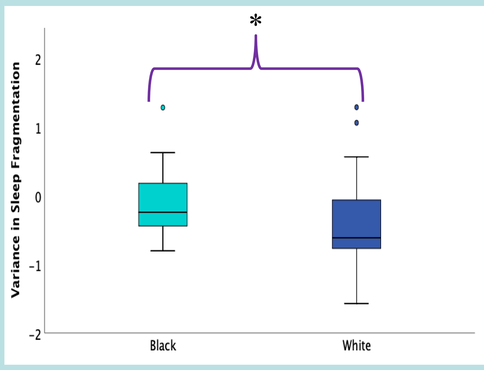
Preliminary results show that Black adults, across age, sleep more poorly than White adults.

Black adults maintained reduced total sleep time compared to White adults.



$t(53) = -2.05$
$\boldsymbol{p = .046}$ *

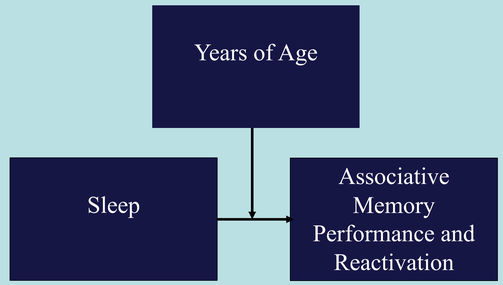
Black adults had more varied night-to-night sleep fragmentation than White adults.



$t(53) = 1.72$
$p = .091$

CONCLUSION

Age moderates the relationship between sleep quality and associative memory performance and its underlying neural reactivation.



- Maintaining good night-to-night sleep quality may be differentially supportive of associative memory performance by age group.
- Sleep quality may facilitate cognitive reserve in older adults such that those who maintain better sleep demonstrate greater ability to successfully retrieve episodic memories compared to older adults who maintain poor sleep.
- Sleep quality positively correlated with greater neural reactivation in the theta band, and this measure of neural reactivation correlated with associative memory performance (Hanslmayr et al., 2016).
- Black adults across age slept more poorly than White adults, but more research is needed to determine how this discrepancy relates to episodic memory performance and reactivation.
- The future aims of this study are to examine the role of sleep cofactors, including psychosocial stressors and sleep habits, to determine if individual differences in these cofactors explain age and racial group interactions between sleep quality and associative memory.

ACKNOWLEDGEMENTS

I am thankful for support from my advisor Dr. Audrey Duarte, the Memory and Aging Lab, the Master's committee for this project (Dr. Verhaegen and Dr. Wheeler), our participants, and the NSF GRFP (DGE-1650044) and NIH (5T32AG000175) for funding.

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