

Multivariate associations of sleep quality, depressive symptoms, and grey matter volume with motor performance across the lifespan in large population cohorts

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Background

- **Sleep disturbances** are associated with **motor performance** (e.g., grip strength)
- Low motor performance is linked with development of **depressive symptoms**
- Age-related changes in sleep patterns, depressive symptoms and motor performance
- Pathophysiological changes in late-life depression between adults and elderly
- Impairments in all 3 domains co-occur in many neuropsychiatric diseases (e.g., PD)

Research question

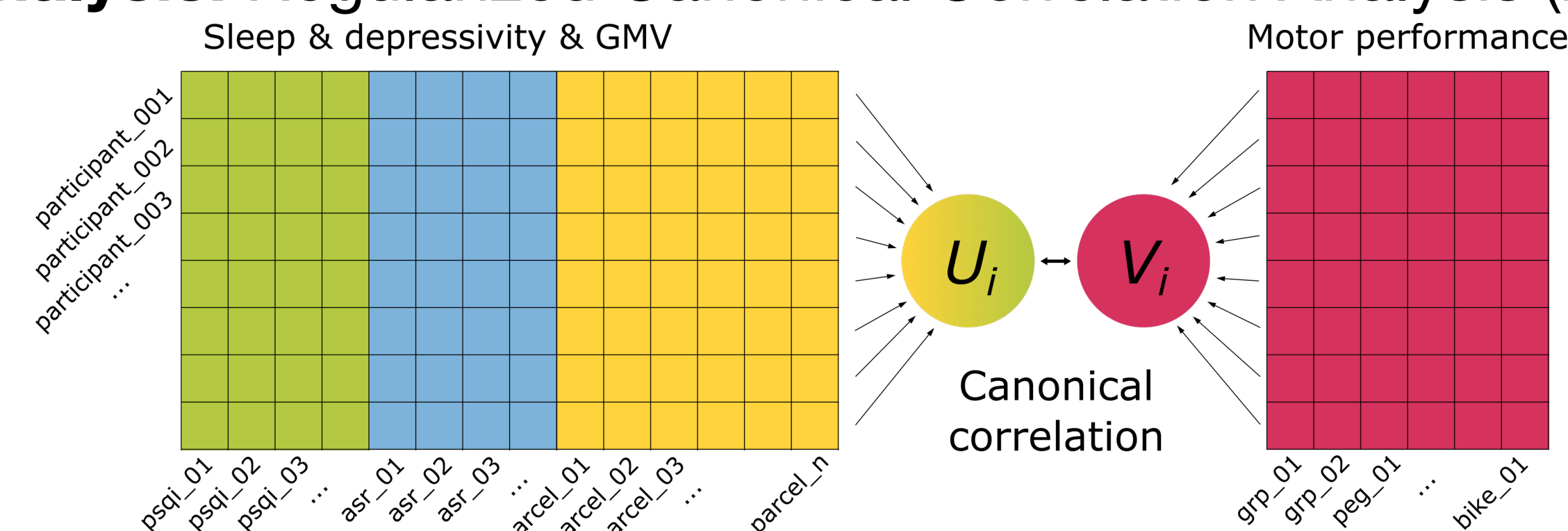
- What is the combined association of sleep quality, depressive symptoms, and grey matter volume, with motor performance at different ages across the lifespan in the general population?

Methods

3 datasets^{1,2,3}

- 1) HCP young adults: N = 1055 (578 f.)
- 2) HCP aging: N = 521 (300 f.)
- 3) eNKI: N = 495 (335 f.)

Analysis: Regularized Canonical Correlation Analysis (rCCA)⁴



Sleep disturbances, depressive symptoms, grey matter volume (X)

- Pittsburgh Sleep Quality Index (PSQI)
- Adult Self Report (ASR)
- Brain structure: 262 regions (Schaefer 200, Tian S2, SUIT atlases)

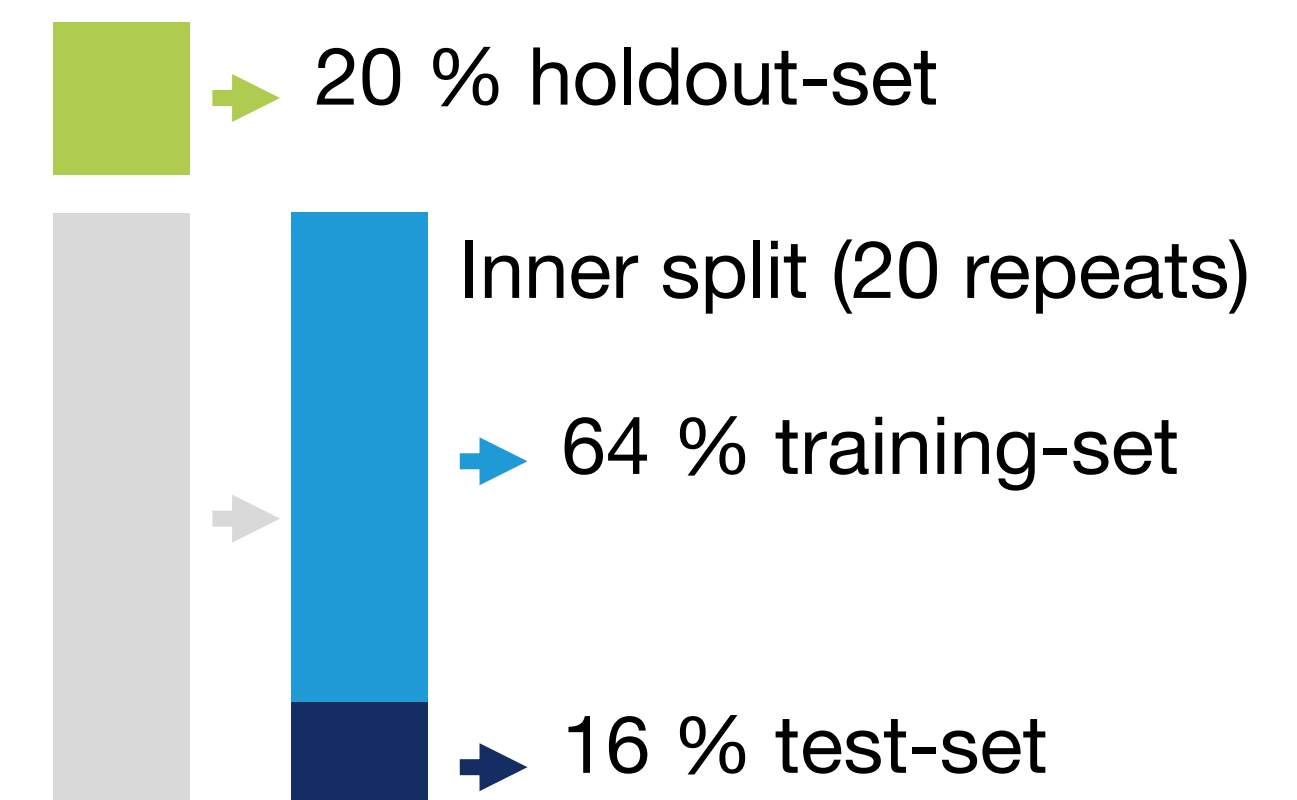
Motor performance (Y)

- Grip strength, Endurance (2-Minute Walk test/ Bike test), Pegboard, Processing Speed Test, Trail Making Test

Confounds: Age, Age squared, Gender, TIV

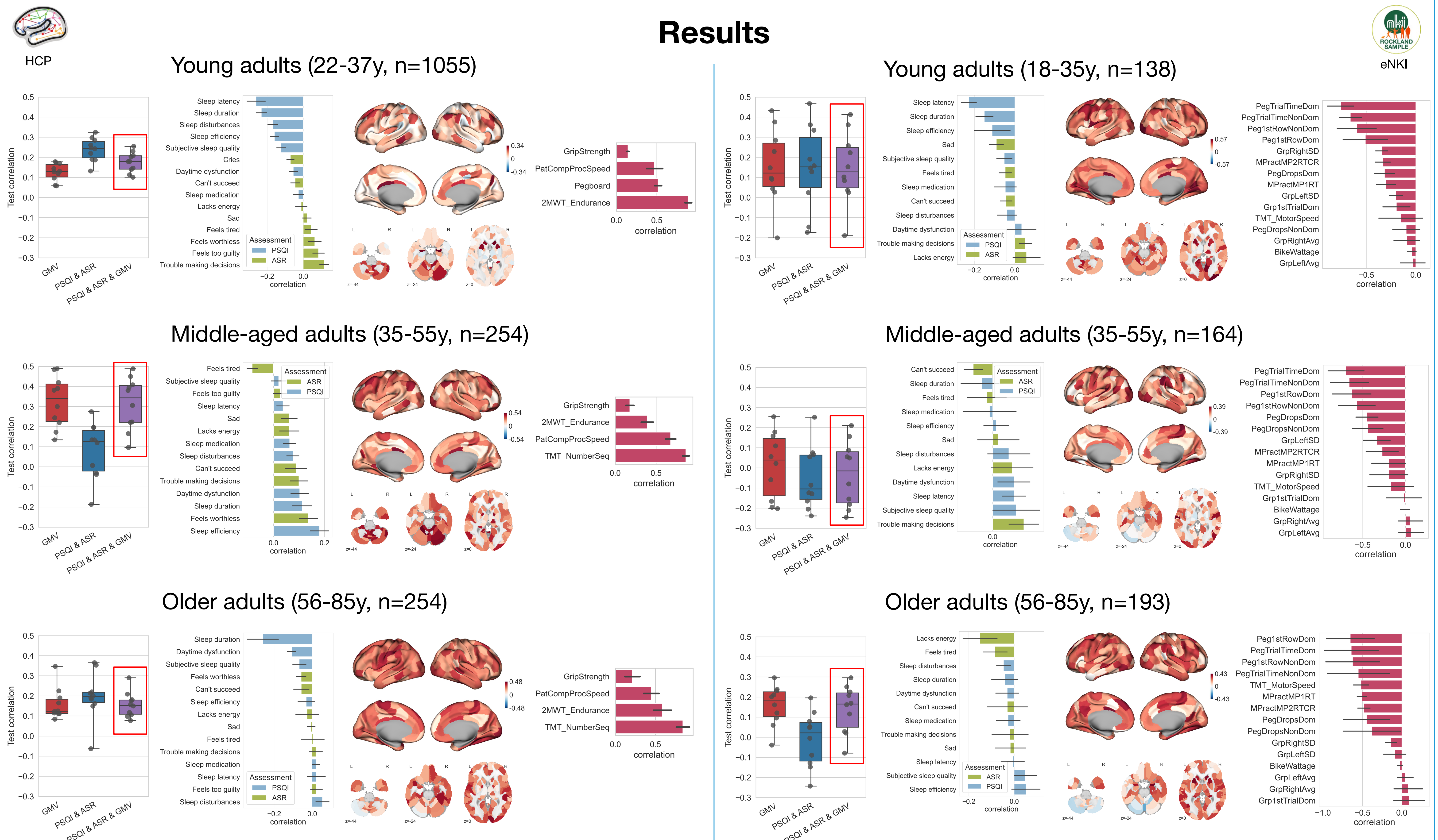
Machine learning framework: holdout

Outer split (10 repeats)



rCCA loadings are the *pearson* correlation of input variables with the latent dimensions (U, V) averaged across all 10 outer repeats

Results



Conclusions

- In **young adults**, better sleep quality and mild depressive symptoms are linked to higher motor performance
- In **middle-aged adults**, higher grey matter volume loadings are associated with higher motor speed, while higher sleep problems and depressive symptoms are linked to higher motor performance
- In **older adults** better sleep quality, less depressive symptoms and higher grey matter volume loadings are linked to higher motor performance (motor speed, endurance, dexterity)
- The relationship between sleep, mood, brain structure, and motor performance is complex and changes across different age groups.

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References. [1] Nooner et al., Frontiers in neuroscience, 2012. [2] Van Essen et al., Neuroimage, 2013 [3] Bookheimer et al., Neuroimage, 2019, [4] Mihalik et al., Biological Psychiatry: Cognitive Neuroscience and Neuroimaging, 2022.