

Inter- and intra-individual variation in brain structural-cognition relationships in aging

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Abstract

Background

The sources of inter- and intra-individual variability in age-related cognitive decline remain poorly understood. We examined the association between 20-year trajectories of cognitive decline and multimodal brain structure and morphology in older age.

Method

We used the Whitehall II Study, an extensively characterised cohort with 3T brain magnetic resonance images acquired at older age (mean age = 69.52 ± 4.9) and 5 repeated cognitive performance assessments between mid-life (mean age = 53.2 ± 4.9 years) and late-life (mean age = 67.7 ± 4.9). Using non-negative matrix factorisation, we identified 10 brain components integrating cortical thickness, surface area, fractional anisotropy, and mean and radial diffusivities (Figure 1).

Result

We observed two latent variables describing distinct brain-cognition associations. The first describes variations in 5 structural components associated with low mid-life performance across multiple cognitive domains, decline in reasoning, but maintenance of fluency abilities. The second describes variations in 6 structural components associated with low mid-life performance in fluency and memory, but retention of multiple abilities (Figure 2). Expression of latent variables predicts future cognition 3.2 years later (mean age = 70.87 ± 4.9) (Figure 3).

Conclusion

Longitudinal cognitive decline and maintenance across diverse cognitive functions are both positively and negatively associated with distinct markers of cortical structure. Latent brain-behaviour relationships predict future cognitive performance.





