

Structural correlates of visuospatial and verbal working memory

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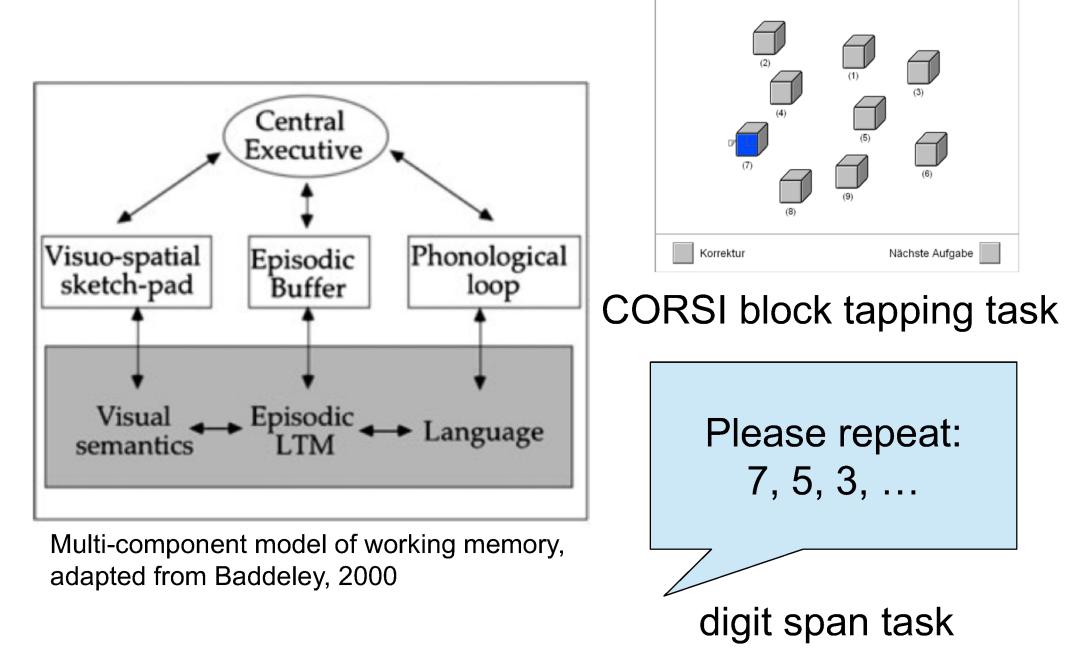




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Introduction

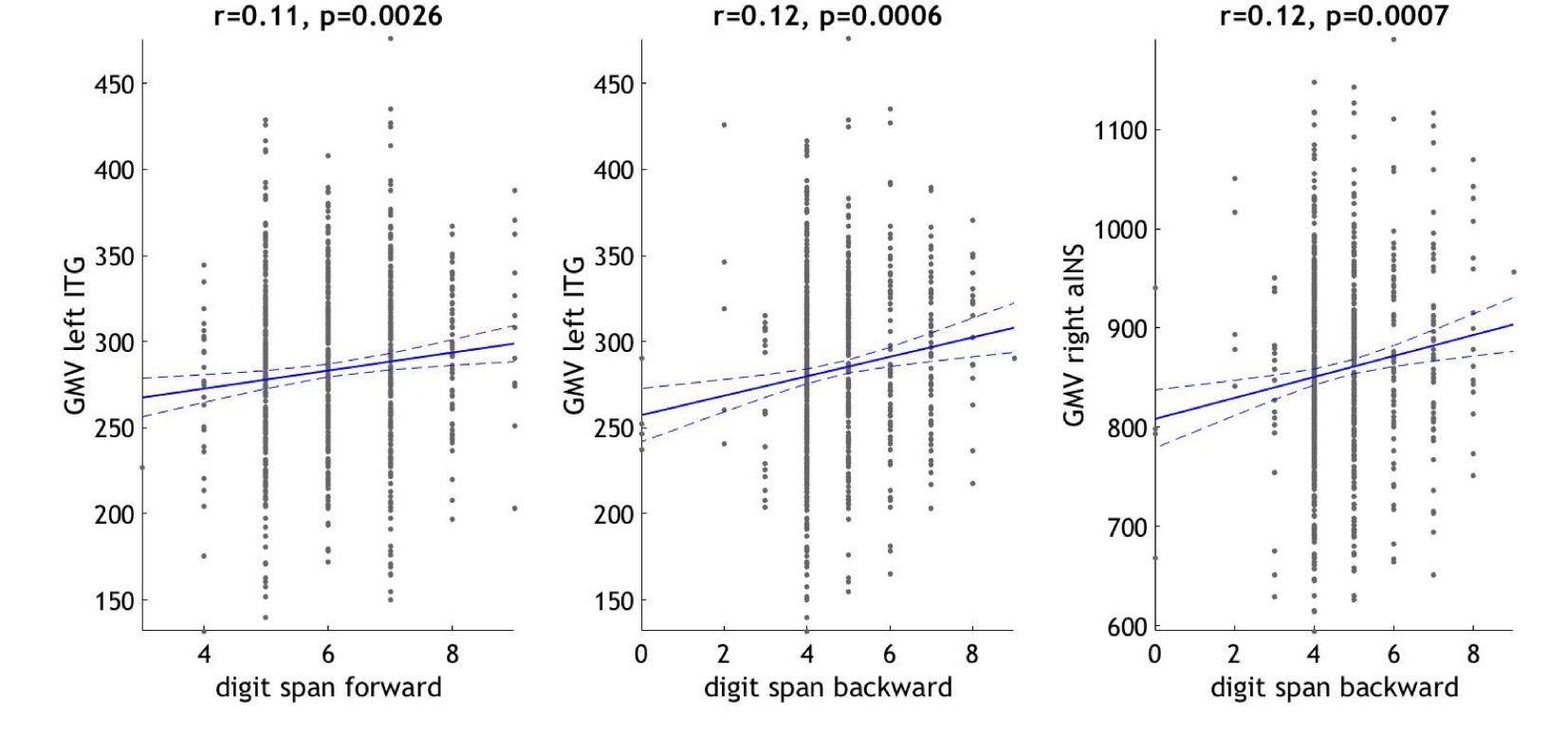
- Working memory (WM): ability to store and manipulate information for a short period of time
- Measured by span tasks
 - increasingly longer sequences of stimuli have to be recalled in same or reversed order as presented
- CORSI block tapping task and digit span task to assess visuospatial and verbal subcomponents
- Structural underpinnings of WM remain unclear



Methods morphometry (VBM) Voxel-based investigating for **VBM** association of grey matter volume (GMV) and performance on both recall versions of both tasks Normalisation Whole-brain and regional analyses Regional analyses used extended multiple demand Segmentation network (eMDN) subsumes regions functionally connected regions GM activated across multiple demands Covariates of no interest: age and gender Modulation T1-weighted imaging data of 765 subjects from the "1000BRAINS" study was analysed Age range: 55 to 76 years (mean: 65.9 years, SD: 5,6 years) Smoothing **GM** Analysis

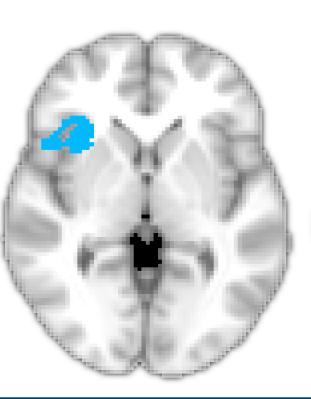
Results

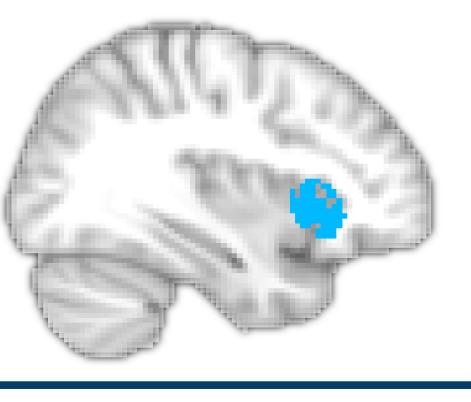
- Whole brain results.
- No significant correlations between GMV and performance in either recall version of either test
- Regional results.
- CORSI block tapping task
 - No significant correlations between GMV in either region of the eMDN with performance on forward or backward recall
- Digit span task
 - Forward recall was positively correlated with GMV in the left inferior temporal gyrus (ITG) (r(764)=0.11, p=0.0026)
 - Backward recall was positively correlated with GMV in the right anterior insula (aINS) (r(764)=0.12, p=0.0007) and left ITG (r(764)=0.12, p=0.0006)

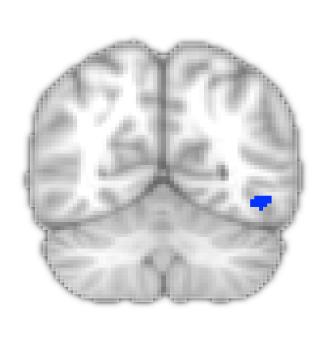


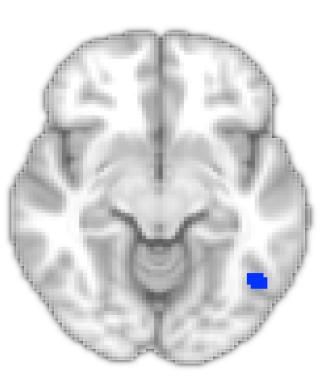
Regions of the eMDN, adapted from Camilleri et al., 2018

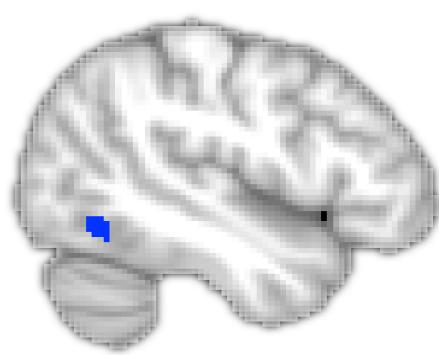












Left (light blue):
right anterior insula
Right (darker blue):
left inferior temporal
gyrus

Discussion

- Findings of structural correlates of WM are inconsistent
- Insula involved in executive processes
 - Significant correlation for right aINS only for the backward digit span: more executive control involved in backward compared to forward recall
- Left ITG is linked to semantic processes, may play a role in verbal WM
- Significant correlations showed only small effect sizes
 - Similar to recent large sample studies using VBM
- Lack of significant results on whole-brain level:
 - GM might not be relevant neural substrate when investigating WM performance or differences between the visuospatial and verbal component
 - Other factors might have stronger contribution

References: Baddeley, A. (2012). Working Memory: Theories, Models, and Controversies. In S. T. Fiske, D. L. Schacter, & S. E. Taylor (Eds.), *Annual Review of Psychology, Vol 63* (Vol. 63, pp. 1-29). Palo Alto: Annual Reviews.; Camilleri, J. A., Muller, V. I., Fox, P., Laird, A. R., Hoffstaedter, F., Kalenscher, T., & Eickhoff, S. B. (2018). Definition and characterization of an extended multiple-demand network. *Neuroimage, 165*, 138-147. doi:10.1016/j.neuroimage.2017.10.020; Caspers, S., Moebus, S., Lux, S., Pundt, N., Schutz, H., Muhleisen, T. W., . . . Amunts, K. (2014). Studying variability in human brain aging in a population-based German cohort-rationale and design of 1000 BRAINS. *Frontiers in Aging Neuroscience, 6*, 14. doi:10.3389/fnagi.2014.00149