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IMAGE

Brain-wide white matter tract integrity is associated with information processing speed and general intelligence

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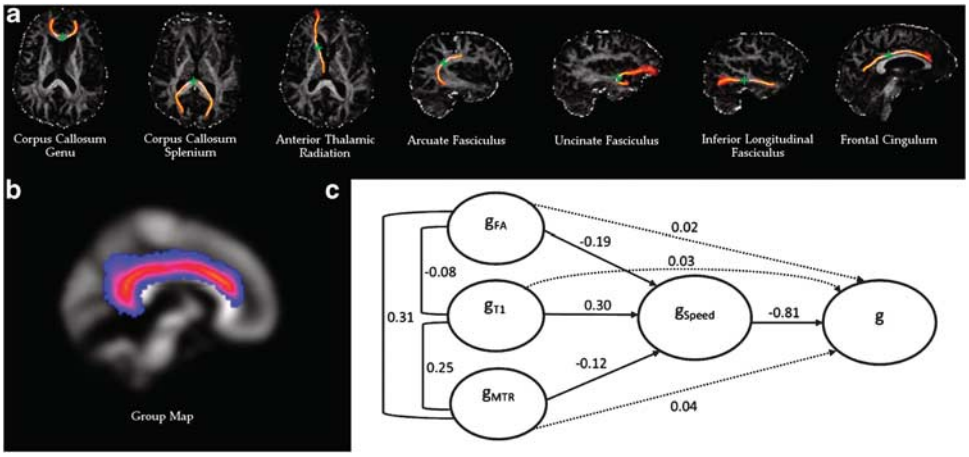

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As yet there are no firm associations between general intelligence differences and basic structural brain imaging parameters that have a clear functional meaning. Brain magnetic resonance imaging scans of 420 healthy older adults from the Lothian Birth Cohort of 1936 were analysed. Fractional anisotropy (FA), T1 longitudinal relaxation time and magnetisation transfer ratio (MTR) were measured in 12 major white matter tracts using probabilistic neighbourhood tractography (**a**). Panel **b** shows an exemplary standard space group map for the rostral cingulum. For all three indicators, people who had good white matter integrity in any one tract tended to have good integrity in all others. Therefore, data reduction yielded three latent biomarkers of brain-wide white matter tract integrity (g_{FA}, g_{T1} and g_{MTR} in panel **c**). These three biomarkers independently predicted general intelligence (*g*), a latent trait formed from six psychometric tests. The effect was fully mediated by information processing speed (g_{speed}), which was a latent trait formed from two experimental reaction time tests and a psychophysical test (**c**). The numbers in panel **c** were obtained from structural equation modelling and may be treated like standardised partial beta weights from a regression model. The results suggest a mechanistically plausible neurostructural model of human intelligence differences. For more information on this topic, please refer to the article by Penke *et al.* on pages 1026–1030.