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The Neural Architecture of General Knowledge

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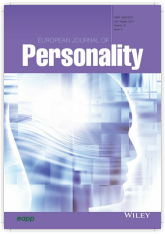
Abstract

Cognitive performance varies widely between individuals and is highly influenced by structural and functional properties of the brain. In the past, neuroscientific research was principally concerned with fluid intelligence, while neglecting its equally important counterpart crystallized intelligence. Crystallized intelligence is defined as the depth and breadth of knowledge and skills that are valued by one's culture. The accumulation of crystallized intelligence is guided by information storage capacities and is likely to be reflected in an individual's level of general knowledge. In spite of the significant role general knowledge plays for everyday life, its neural foundation largely remains unknown. In a large sample of 324 healthy individuals, we used standard magnetic resonance imaging along with functional magnetic resonance imaging and diffusion tensor imaging to examine different estimates of brain volume and brain network connectivity and assessed their predictive power with regard to both general knowledge and fluid intelligence. Our results demonstrate that an individual's level of general knowledge is associated with structural brain network connectivity beyond any confounding effects exerted by age or sex. Moreover, we found fluid intelligence to be best predicted by cortex volume in male subjects and functional network connectivity in female subjects. Combined, these findings potentially indicate different neural architectures for information storage and information processing. © 2019 European Association of Personality Psychology

Supporting Information



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