

Genetic and environmental influences on brain structure and the association with intelligence

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Evidence is accumulating that genetic factors are involved in (the risk to develop) psychiatric diseases, such as schizophrenia. Schizophrenia is accompanied by decreases in global and focal gray and white matter volumes and densities (1,2). Global brain volume is largely genetically determined (3), as is its association with general intelligence (4). Twin studies can provide reliable estimates of heritabilities in brain volume measures and these can be generalised to the singleton population (5). Morphological brain measures may thus serve as intermediate phenotypes for study in behavioral genetic research. Indeed, we found that increased genetic risk for schizophrenia is associated with decreases in global white matter volume, whereas decreases in global gray matter volume are probably related to environmental risk factors for the disease (6). Focally, in healthy twin pairs, the dorsolateral frontal cortices and Wernicke's area were found to be more genetically determined than other cortical gray matter regions and associated to intelligence (7). However, it remains unclear whether the connecting focal white matter and (medial) gray matter densities contribute to the genetic variation in brain convolution, and are associated with (abnormalities in) cognitive functioning. Results on magnetic resonance brain imaging studies in twins will be presented.

1. Hulshoff Pol et al. (2002) Am J Psychiatry
2. Hulshoff Pol et al. (2001) Arch Gen Psychiatry
3. Baaré et al (2001) Cerebral Cortex
4. Posthuma et al (2002) Nat Neurosci
5. Hulshoff Pol et al (2002) Brain
6. Hulshoff Pol et al (2004) Biol Psychiatry
7. Thompson et al (2001) Nat Neurosci

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