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Early dynamics of white matter deficits in children developing dyslexia

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Abstract

Neural anomalies have been demonstrated in dyslexia. Recent studies in pre-readers at risk for dyslexia and in pre-readers developing poor reading suggest that these anomalies might be a cause of their reading impairment. Our study goes one step further by exploring the neurodevelopmental trajectory of white matter anomalies in pre-readers with and without a familial risk for dyslexia ($n = 61$) of whom a strictly selected sample develops dyslexia later on ($n = 15$). We collected longitudinal diffusion MRI and behavioural data until grade 3. The results provide evidence that children with dyslexia exhibit pre-reading white matter anomalies in left and right long segment of the arcuate fasciculus (AF), with predictive power of the left segment above traditional cognitive measures and familial risk. Whereas white matter differences in the left AF seems most strongly related to the development of dyslexia, differences in the left IFOF and in the right AF seem driven by both familial risk and later reading ability. Moreover, differences in the left AF appeared to be dynamic. This study supports and expands recent insights into the neural basis of dyslexia, pointing towards pre-reading anomalies related to dyslexia, as well as underpinning the dynamic character of white matter.

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