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Cerebral blood flow increases across early childhood

Dmitrii Paniukov, R. Marc Lebel, Gerald Giesbrecht, Catherine Lebel

Abstract

Adequate cerebral blood flow (CBF) is essential to proper brain development and function. Detailed characterization of CBF developmental trajectories will lead to better understanding of the development of cognitive, motor, and sensory functions, as well as behaviour in children. Previous studies have shown CBF increases during infancy and decreases during adolescence; however, the trajectories during childhood, and in particular the timing of peak CBF, remain unclear. Here, we used arterial spin labeling to map age-related changes of CBF across a large longitudinal sample that included 279 scans on 96 participants (46 girls and 50 boys) aged 2–7 years. CBF maps were analyzed using hierarchical linear regression for every voxel inside the grey matter mask, controlling for multiple comparisons. The results revealed a significant positive linear association between CBF and age in distributed brain regions including prefrontal, temporal, parietal, and occipital cortex, and in the cerebellum. There were no differences in developmental trajectories between males and females. Our findings show that CBF continues to increase until the age of 7 years, likely supporting ongoing improvements in behaviour, cognition, motor, and sensory functions in early childhood.

Keywords: Cerebral blood flow, Arterial spin labelling, Brain perfusion, Brain development, Early childhood development, Magnetic resonance imaging