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Converging neural evidence for number-specific mechanisms supporting number line estimation

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Abstract

Children's spatial and numerical skills are highly related, and predictive of concurrent and future mathematical ability (Lourenco et al., 2018). The number line estimation (NLE) task, in which children indicate the spatial positions of numbers on a line, is a commonly used index of spatial-numerical ability. Critically, training studies have demonstrated a causal link between NLE and math ability (Ramani & Siegler, 2008). Nonetheless, there is extensive debate about the role of numerical and domain-general abilities in the NLE task. Here, we used fMRI with young children to assess the neural mechanisms supporting NLE performance. Whole-brain and ROI analyses yielded significant activation in bilateral intraparietal sulcus (IPS) during the NLE task, relative to matched control conditions. Moreover, we found a positive association between neural maturity in bilateral IPS during the NLE task and behavioral measures of math ability (Cantlon & Li, 2013), controlling for analogical reasoning and spatial working memory.