Neural lateralization during number line estimation differentially predicts numerical and spatial capacity

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Abstract

Numerical and spatial skills are highly interrelated, and both contribute to mathematical cognition. Spatial-numerical associations are frequently examined using number line estimation (NLE); however, there is considerable debate about the relative contributions of number-specific and domain-general (i.e., working memory) processing involved in this task. Here, we used functional neuroimaging to examine the processes supporting NLE in adults (n = 47). Participants completed an in-scanner NLE task and number localizer. We found that within left and right parietal number regions, neural activity during the in-scanner NLE task differentially predicted out-of-scanner behavioral measures. Specifically, activity in the left (but not right) posterior intraparietal sulcus (IPS) predicted visuo-spatial working memory, and activity in the left (but not right) anterior IPS predicted performance on an out-of-scanner NLE task. These findings suggest that NLE relies on both spatial-numerical and domain-general capacities supported by left-hemisphere parietal regions, challenging hypotheses about right-lateralized visuo-spatial contributions to number processing.

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