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# Expanding Understandings of Embodied Mathematical Cognition in Students' Fraction Knowledge

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## Abstract

This exploratory study provides evidence that middle-grade students' symbolic fraction knowledge relates to grounded and embodied cognitive learning processes such as spatial ability and anxiety. These findings ( $N = 89$ ) are consistent with several previous findings on fraction knowledge and mathematics learning more generally while highlighting several novel associations. Three key findings include: 1) mental rotation and spatial visualization are specifically predictive of fraction knowledge scores; 2) spatial anxiety may moderate the relationship between spatial ability and fraction knowledge scores; and 3) fraction knowledge is not only grounded in processes operating at biological and cognitive timescales individually, but components of these processes are interconnected. Though exploratory, these findings may provide the foundations for future work exploring the mechanisms behind these associations.