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Spatial Representations of Symbolic Fractions and Nonsymbolic Ratios: SNARC Effect and Number Line Estimation

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Abstract

Recent research on numerical cognition has begun to systematically detail the ability to perceive the magnitudes of symbolic fractions and non-symbolic ratios. The current study extended this line of research by investigating spatial representations of symbolic fractions and nonsymbolic ratios with two behavioral measures: the Spatial-Numerical Association of Response Codes (SNARC) effect and number line estimation. The two research questions were: 1) what are the similarities and differences of spatial representations between symbolic fractions and nonsymbolic ratios? 2) do mechanisms driving the SNARC effect and performance on number line estimation rely on a shared cognitive mechanism? Participants completed four tasks: magnitude comparison with symbolic fractions, magnitude comparison with nonsymbolic ratios, number line estimation with symbolic fractions, and number line estimation with nonsymbolic ratios. Results suggested the existence of both shared and specific spatial representations of symbolic fractions and nonsymbolic ratios. Moreover, individual participants SNARC effects and number line estimation performances were not correlated with each other. Findings further elucidate the relations between different spatial representations for symbolic fractions and nonsymbolic ratios and cast doubt on the prospect of their sharing common cognitive mechanisms.