

Going through the Motions: Skill Differences in the Representation of Arithmetic Operations

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Abstract: How do adults represent arithmetic operations? One proposal is that addition is represented as rightward movement along a left-right mental number-line, whereas subtraction is represented as leftward movement (Hubbard et al., 2005). To test this proposal, 24 college students solved single-digit arithmetic problems displayed on a computer screen along with rightward- or leftward-moving dots. We hypothesized that that for addition, rightward motion would facilitate problem solution (as it is congruent with the mental representation of movement along a mental number-line) and that leftward movement would interfere with problem solution (as it is incongruent). For subtraction, the expectations of facilitation and interference were reversed. We found that the response times of students with lower levels of mathematical skill, though not with higher levels, showed the hypothesized operational momentum effect. This research has implications for the development of math pedagogy, especially for how operations are conceptually introduced.