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# Linear Estimation and Mental Rotation Predict Children's Early Math Abilities

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**Abstract:** A linear representation of number predicts children's arithmetic abilities and mathematical achievement scores (Booth and Siegler, 2008), and this connection is mediated by children's spatial skills (Gunderson et al. 2012). To evaluate the relation of early spatial and numerical skills to mathematical abilities we administered a battery of mathematical and spatial tasks to kindergarten and 3rd graders. We found that a significant amount of variance in math ability is predicted by knowledge of place value and calculation ability as well as the ability to estimate magnitudes along a number line and to mentally rotate symbols, even controlling for verbal ability. We also show that number line linearity is predicted by children's knowledge of digits and how to order numbers left to right. This work has important implications for developing children's early spatial transformation abilities and providing children with a linear representation of magnitude.