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On the Role of Nonsymbolic and Symbolic Numeracy Skills in Number-Line Estimation Processes

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Abstract

Number-line estimation tasks (NLETs) have been used to assess symbolic numerical skills (SNS; Booth & Siegler, 2008; Lyons & Ansari, 2015) and have also been associated with the approximate number system (ANS; Khanum et al., 2016; Wong et al., 2016). A recent study with 6–7-year-old children in Sweden (Morell-Ruiz et al., 2025) provided evidence that training NLE abilities can help bridge these two numerical systems, suggesting that the ANS may actively scaffold the development of the SNS. Building on this, we designed a novel two-choice NLET compatible with Drift Diffusion Model (DDM) fitting, allowing us to decompose children's estimation processes into interpretable parameters. Our results show that DDM parameters significantly correlate with performance in both symbolic and nonsymbolic tasks, and that performance on the two-choice and standard NLETs is strongly correlated. These findings validate our paradigm, offering new insights into the cognitive mechanisms linking numerical representations via number-line estimation.