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The relation between approximate number system and early arithmetic: the mediation role of numerical knowledge.

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Summary: We investigated whether the approximate number system (ANS) was related to arithmetic among kindergartners and the mechanism underlying this possible relation. Specifically, we examined whether numerical knowledge mediated the possible relation between the ANS and arithmetic after controlling for potential confounding cognitive variables. Results showed that the ANS was moderately related with early arithmetic ($r = .36-.37$). After controlling for age, IQ, visual attention, working memory, visuospatial processing, and inhibition, numerical knowledge demonstrated a medium mediation effect ($k^2 = .09$) on the relation between the ANS and arithmetic. Our findings suggest the importance of the ANS in early arithmetic and support the numerical knowledge mediation hypothesis. That is, numerical knowledge plays a more important role than visuospatial processing and inhibition in explaining the relation between the ANS and early arithmetic. Implications of these findings for early arithmetic instructions are discussed.

Classification: F21 F31

Keywords: ANS; arithmetic; numerical knowledge; visuospatial processing; inhibition; mediation

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