You can count on your fingers: The role of fingers in early mathematical development

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Abstract

Even though mathematics is considered one of the most abstract domains of human cognition, recent work on embodiment of mathematics has shown that we make sense of mathematical concepts by using insights and skills acquired through bodily activity. Fingers play a significant role in many of these bodily interactions. Finger-based interactions provide the preliminary access to foundational mathematical constructs, such as one-to-one correspondence and whole-part relations in early development. In addition, children across cultures use their fingers to count and do simple arithmetic. There is also some evidence for an association between children’s ability to individuate fingers (finger gnosis) and mathematics ability. Parallel to these behavioral findings, there is accumulating evidence for overlapping neural correlates and functional associations between fingers and number processing. In this paper, we synthesize mathematics education and neurocognitive research on the relevance of fingers for early mathematics development. We delve into issues such as how the early multimodal (tactile, motor, visuospatial) experiences with fingers might be the gateway for later numerical skills, how finger gnosis, finger counting habits, and numerical abilities are associated at the behavioral and neural levels, and implications for mathematics education. We argue that, taken together, the two bodies of research can better inform how different finger skills support the development of numerical competencies, and we provide a road map for future interdisciplinary research that can yield to development of diagnostic tools and interventions for preschool and primary grade classrooms.

Keywords

cognitive development; numerical cognition; finger counting; finger gnosis; embodied cognition; neuroscience; mathematics education

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