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The effects of physical manipulatives on children's numerical strategies.

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Summary: This article focuses on how the representational properties of manipulatives affect the strategies children employ in problem solving. Two studies examined the effect of physical materials on 4–7-year-old children's problem solving strategies in a numerical (i.e., additive composition) task. The first study showed how children not only identified more solutions using physical materials compared with no materials, but that using manipulatives fostered conceptually more developed strategies: relating consecutive solutions to each other systematically in exploring the space of permutations. The second study demonstrated the unique benefits of physical manipulation by comparing children's solutions and strategies using materials they could or could not spatially manipulate (i.e., physical versus pictorial). As with the first study, children using the physical materials had more solutions and showed more conceptually developed strategies compared with the children in the pictorial condition. There was no advantage in providing children with a record of all their solutions.

Classification: U61 U62 F32 F31 F21 F22

Keywords: numerical strategies; physical manipulatives; learning

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