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Symbol grounding boosts transfer in addition learning

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Abstract

Early math instruction often prioritizes rapid retrieval of mathematical facts, (e.g. $4 + 6 = \_\_$; 10), an approach that promotes quick recall of sums but with limited transfer to unstudied problems. We consider how this pattern changes when the learning scenario highlights the quantities that underlie symbols. Adult participants learned a novel base 8 addition task using alphabetic symbols to indicate quantities (e.g. $AG + AF = \_\_$). They practiced with symbols only or with symbols grounded in quantitative representations. When tested in the same format as participants were trained, studied problems were learned equally well but symbol-only learners transferred only to identical-elements problems (e.g. $AG + AF$ transferred to $AF + AG$). Grounded learners showed better transfer to problems involving novel quantities. The results suggest, in contradiction to some other recent findings, that arithmetic transfer is boosted when the learning scenario highlights quantitative meaning denoted by number symbols.