

Connecting Nature and Nurture: How Non-Symbolic Numerical Representations Inform Early Math Intervention

Early childhood is a critical period for laying the foundations of later academic achievement, particularly in mathematics. Preschoolers are active, capable learners, but their success often depends on whether tasks fall within their proximal zone of development and on how adults structure learning experiences. Understanding these boundaries is essential for designing effective parental practices and early interventions. In this talk, I present an experimental study using arithmetic problem solving to illustrate how object-based, non-symbolic representations of number can scaffold early math learning. Across four experiments ($N = 217$ preschoolers; $M_{age} = 6.13$ years, 99 girls), we found that the implementation of contrastive can supports children solve non-symbolic unknown-addend problems (e.g., $1+X=3$, $2+Y=3$) that they typically fail. These findings suggest that relatively simple changes in how problems are presented (e.g., highlighting “what is different”) can substantially support preschoolers’ non-symbolic arithmetic reasoning. These contrastive, object-based scaffolds can be translated into everyday parental practices and classroom activities to better align instruction with children’s developing capacities.