Longitudinal Studies of Cognitive and Mathematical Processing in Preschoolers with and without Neurodevelopmental Disorders Who Are at High Risk for Learning Difficulties in Mathematics
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Findings are presented from two longitudinal studies that investigated risk for mathematical difficulties at school-age based on mathematical and cognitive indicators in the preschool years. Study 1 followed socially and economically disadvantaged children from the beginning of pre-kindergarten to the end of kindergarten and first grade. Study 2 followed children with spina bifida myelomeningocele (SBM), a neurodevelopmental disorder associated with a high rate of math disabilities, and their typically developing controls, from 36 months to 7.5 years of age.

In Study 1, with 843 participants, language-based and visual-spatial skills differentially predicted performance on different informal mathematical tasks. A subsample of these children (443) who were followed into kindergarten revealed that over 80% of cases could be correctly classified as falling into groups at high or low risk for mathematical learning difficulties by the end of kindergarten (falling below the 12th percentile or above the 60th percentile on the TEMA-3, respectively) based on a combination of mathematical and cognitive indicators at the beginning of pre-kindergarten.

In Study 2, the combination of mathematics-specific and more domain general cognitive abilities (i.e., visual-spatial, language-based, and fine motor abilities) from 36 months best predicted performance on different informal mathematical tasks at 60 months in both typically developing children and in children with SBM. Visual working memory at 36 months of age partially mediated the effect of group on mathematical fluency and math calculation scores at 7.5 years of age.

Findings from both studies are discussed with reference to their implications for: 1) cognitive models of mathematical disability; and 2) assessment of and interventions for children with mathematical difficulties.

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