

How the fine motor skills can influence the arithmetical abilities development: a multilevel growth curve analysis.

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Children's ability to use their fingers in numerical contexts is assumed to contribute to the development of the first arithmetical skills (Geary, 2004). It has been shown that young children's ability to use their fingers for solving arithmetical problems is linked to the development of their finger gnosis (Noël, 2005; Reeve & Humberstone, 2011) and their manual dexterity (Asakawa & Sugimura, 2014). Interestingly, it has been shown that developmental coordination disorder (DCD) is often associated with mathematical learning disability (MLD) (Pieters, Desoete, Roeyers, Vanderswalmen, & Van Waelvelde, 2012). One hypothesis for this common comorbidity is that it could result from a weaker ability to use fingers in arithmetical activities. Very few studies explored how fine motor skills influence arithmetical development, especially finger dissociation and finger coordination, two components of fine motor skills known to be involved in finger-based numerical activities.

In this study, a two-year longitudinal follow-up of fine motor skills will be conducted to examine how it influences arithmetical skills development. A sample of 80 kindergartens attending mainstream schools in Belgium will be tested once every six months using finger skills tasks (i.e. imitating fingers configurations) as well as tasks assessing early arithmetic development (i.e. calculation with time constraints).

With multiple time-point data, multilevel growth curve models will be carried out to examine whether changes in finger skills predict changes in arithmetical development taking into account age, IQ and global motor skills. Finally, the growth of children with typical fine motor skills will be compared to the one of children with DCD in order to understand the impact of this disability on their arithmetical development.