Emphasizing the Numbers in Patterns During Training, Effects on Patterning and Math Skills

Math knowledge develops rapidly in the preschool years, varies substantially, and is strongly predictive of later math achievement (Duncan et al., 2007; Starkey & Klein, 2004). While theory, research, and education standards on math development have concentrated primarily on the contributions of numeracy skills (Sarama & Clements, 2004, Common Core Standards, 2010), emerging research suggests that children's patterning skills also predict concurrent and later math and numeracy knowledge (Nguyen et al., 2016; Rittle-Johnson, Fyfe, Hofer, & Farran, 2017; Rittle-Johnson, Zippert, & Boice, 2019). This might suggest that training patterning skills would lead to improvements in mathematics and numeracy knowledge. The goals of the current study were to:

1. Determine if patterning skills in preschool can be successfully improved through targeted training
2. Evaluate if training patterning skills improves general math and numeracy knowledge and one specific aspect of numeracy

Preschool children (N = 212, M_{age} = 4.7 years, SD = .37; 44% female) were recruited from 7 private and 5 public preschools and randomly assigned to one of 3 conditions (patterning and numeracy training, literacy and numeracy training, and a business-as-usual control condition). Their general math and numeracy knowledge, a measure of repeating patterning, and a measure of a specific aspect of numeracy were assessed at both timepoints. An additional patterning measure was assessed at post-test.

To address both aims, 5 separate ANCOVA's were run with post-test performance as the dependent variable, (General math, general numeracy, teacher- and researcher-based patterning, and successor function), condition as between-subject factors (Patterning, literacy, control), controlling for age and performance at pretest (see Figure 1.1). Results suggested that children improved on one of the patterning measures more so in the patterning condition than the literacy or control conditions, however, no significant improvements were found for general math and numeracy, or successor function.

These findings suggest that patterning can be improved with targeted training, but the effects of this training do not generalize to a transfer patterning task, nor to general math and numeracy, or a specific aspect of numeracy knowledge, the successor principle. Numerous studies have revealed a correlational and predictive link between early patterning and concurrent and later math and numeracy knowledge. Further, extensive patterning training in preschool and primary school can improve numeracy knowledge (Kidd, et al., 2014; Papic, Mulligan & Mitchelmore, 2011). However, we were not able to replicate the generalizing effects of previous, more intensive, training studies with preschool-aged children. Results will be discussed in terms of patterning skills at different points in development and future directions for this research.