

## Visual artificial grammar learning in children with and without Specific Language Impairment (SLI): Is variability the key?

**Background.** According to Ullman and Pierpont (2005), children with SLI suffer from a procedural learning (PL) deficit. This system subserves sequencing, learning and use of rule-governed aspects of grammar, across morphosyntax and phonology. Since the PL hypothesis was proposed, a growing empirical research has shown difficulties in PL, especially sequential learning, in individuals with SLI (Lum et al., 2014). Importantly, some studies revealed that a PL deficit can be reduced or eliminated under optimized learning conditions. Indeed, it appears that adults with SLI can learn a linguistic artificial grammar structure with same performance levels as control adults but only when a large variety of unique grammatical exemplars was presented (Torkildsen et al., 2013). Therefore, variability seems to be an interesting approach to assist individuals with poor language skills to acquire grammatical structures, but this has to be confirmed by additional research.

**Objective.** This study aims to explore PL abilities in children with and without SLI by using a visual artificial grammar task. Moreover, we explored the role of variability on the acquisition and retention of the new grammatical structure. It has been suggested that variability enhances the quality of learning and plays a major role in generalization.

**Research questions.** Can SLI children learn and maintain in memory a new grammatical rule as well as children with typical language skills (TL)? Does the presentation of numerous token exemplars facilitate the generalization of this grammatical rule?

**Method.** Thirty school-aged children with SLI matched to 30 TL children participated in the experiment. Children with SLI were selected if they scored below -1.25 SD of the expected normative performance in at least two language areas. Children were assigned to one of two learning conditions (high variability or low variability). Half (15 SLI and 15 TD children) were familiarized with 24 unique exemplars of the grammatical rule. The other half (15 SLI and 15 TD) were familiarized with 12 unique exemplars of the grammatical rule.

We used Knowlton and Squire (1996) experimental grammar by replacing letters by visual stimuli (i.e., monsters). The study consisted of a familiarization phase during which exemplars

of the artificial grammar were presented, followed by two test phases immediately and 24h after, during which children were asked to accept test strings that belonged to the grammar and reject those that did not belong.

**Results.** Statistical analyses revealed that TL children were able to acquire the grammatical rule only in the high variability condition ( $p=.027$ ) whereas performance in children with SLI did not reach significance in both low ( $p=.44$ ) and high ( $p=1.00$ ) variability conditions. Notwithstanding, there was no statistical difference between performance obtained in the immediate phase test (day 1) and the differed one (24h after), suggesting no change of grammar knowledge between the two test phases.

**Conclusion.** Although TL children were able to use variability learning to maintain and generalize the grammatical structure, the SLI group was unable to do so. Thus, children with SLI may face problems with implicit rule learning, which is in line with the PL hypothesis.

#### **References:**

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