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Executive Functions and their Effect on Phonology and Morphology Abilities: a Comparison between Specific Language Impairment and Typically Developed Kindergartners.

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ABSTRACT

The primary goal of the present study is to examine the effect of executive functions on the phonological and morphological abilities among Hebrew speaking kindergarten children with specific language impairment (SLI) in comparison to their typically developing peers. The basic assumption of the study is that a greater difficulty in executive function abilities will correlate with a substantial decrease in language abilities among SLI children. The study focuses on three main executive function components: working memory, inhibition and cognitive flexibility and examines their effect on the phonological and morphological abilities. In addition, a second goal of this study is to examine the underlying nature of difficulty among SLI Hebrew speaking children and to determine whether this difficulty is specific to the language area or is it a part of a broader cognitive difficulty, manifesting in non-verbal domains as well.

Research participants were a total of 53 preschool children; out of which 19 were SLI children (mean age 67.08 months) and 34 were typically developing children (mean age 67.42 months). All participants were Hebrew-speaking, had intact non-verbal intelligence, had no visual or auditory impairments and had typically developed motor skills, as reported by their parents and was seen at the preliminary selection test (Raven's Matrices Test). All children with SLI met the following criteria: (a) diagnosed officially as SLI by a speech/language pathologist (b) had an average performances on the non-verbal intelligence test and had low scores on the preliminary Wechsler Intelligence Scale for Children (WISC-R).

Research tools included three types of tasks: (a) Three phonology tasks: analysis, synthesis and omission tasks, each one addressing different aspects of phonological awareness. (b) Morphological tasks: one inflection task and two derivation tasks. (c)

Ten computerized executive function tasks that were constructed especially for the purposes of the current study, addressing verbal and non-verbal aspects of working memory, inhibition and cognitive flexibility. Two working memory tasks were designed based on the Odd One Out paradigm and two were based on the N-Back paradigm. Four inhibition tasks were designed based on the Classic Simon Task paradigm and two cognitive flexibility tasks were designed based on the Dimensional Change Card Sort paradigm.

Analysis of the results indicated significant differences between SLI children and typically developing children on all three executive function components, with SLI children scoring significantly lower than their typically developing peers. Additionally, the results show no difference in the type of function tested, indicating that the SLI children's abilities were significantly lower in the verbal domain as well as in the non-verbal domain. These finding suggest a deficit that is not constrained to language and reinforce the hypothesis regarding a domain general processing limitation rather than a domain specific language defined deficit.

Significant differences were also found in the tasks regarding the language abilities, with SLI children preforming significantly lower than their peers. Findings based on the phonological awareness tasks indicate lower ability in both the general measure and in each of the phonological tasks. Likewise, findings in the morphological awareness area indicate a low ability in both the general measure and in each of the inflection and derivational tasks.

The most meaningful finding of this research relates to the primary goal: examining the effect of executive functions on the phonological and morphological abilities. First, results show a significant positive correlation between executive functions and

language abilities, meaning that the greater executive function abilities a child possesses, the better he will perform on measures of his language abilities. Additionally, findings show a significant effect on each of the executive function components in the prediction of phonology and morphology abilities among all children. A closer look at the findings indicate that working memory and cognitive flexibility are the most meaningful predictors of phonology abilities and that cognitive flexibility is the most meaningful predictor of morphology abilities. Also, results show an even greater effect of cognitive flexibility on phonology and morphology abilities among SLI children.

Conclusions from the present study emphasize the impact that executive functions have on the development of language abilities among all kindergarten children and SLI kindergartners in particular. Additionally, they present a cognitive deficit that is not constrained to language domain but is a more domain general processing limitation.