

The contribution of working memory to early literacy and numeracy in kindergarten and to language and mathematical abilities in first grade

Marina Shvartsman, PhD student. Supervisor: Dr. Shaul Shelley

Research topic: The purpose of this study is to examine the links between verbal and non-verbal (visuo-spatial) working memory (WM), early language, literacy, and early numeracy in kindergarten, as well as the contribution of working memory to later academic abilities (literacy and numeracy) in 1st and 2nd graders.

Why is my study unique? This study examines whether children with different memory capabilities (verbal versus non-verbal) are linked to early literacy and numeracy in kindergarten, whether these profiles remain stable or change from preschool to school, and how they affect the development of early academic skills in 1st and 2nd grade.

Analyses and findings: Eight latent variable (LV) measurement models were created, corresponding to working memory, early literacy, and early numeracy variables. The strength of the relationships between the WM and language LVs and the relationships between the WM and math LVs was the subject of investigation. The fit of the data to the model was tested by structural equation modelling (SEM), and the relationships between WM and early literacy and numeracy are presented in the figures below.

In the literacy domain, medium to strong correlations were observed between verbal auditory WM and all language and literacy skills. Only a weak correlation was found between visual spatial WM and orthography. This suggests that the key component in the WM-literacy link is not the central executive (common to both verbal and non-verbal WM) but the phonological loop subsystem specific to the verbal-auditory WM.

In the numeracy domain, medium to strong correlations were again found between verbal auditory WM (but not visuo-spatial WM) and all math skills, confirming the highly “verbal” nature of early arithmetical skills. Nonetheless, a significant (moderate) correlation between visual spatial WM and non-symbolic math knowledge was also found.

Relevance for educational practice: The findings of this study are important both theoretically and practically. They enable a better understanding of the nature of the working memory’s contribution to individual differences in the early literacy and numeracy academic fields. The study’s practical value lies in pinpointing which techniques can assist children diagnosed with one

or more memory disabilities, as early as preschool prior to the development of learning disabilities in school.

Figure 1: The connection between early literacy skills and working memory

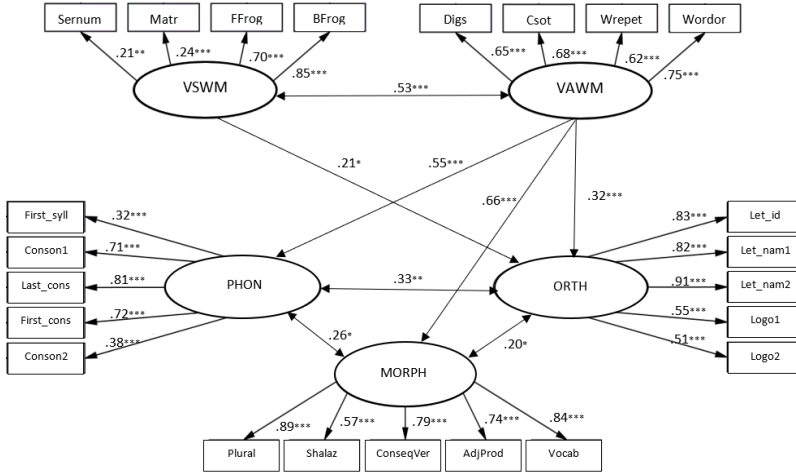


Figure 2: The connection between early numeracy and working memory

