

Changes induced by reading acquisition in print and speech brain networks

Literacy acquisition is a demanding process that induces significant changes in the brain, especially in the spoken and written language networks. Nevertheless, large-scale paediatric fMRI studies are still limited. Longitudinal study conducted in 2013-2016 in the Nencki Institute by our team makes a contribution to the field. During my talk, I will discuss theoretical background and present the design of our study. Next, I will present analyses and results from the first stage of the study, published lately in the *Journal of Child Psychology and Psychiatry*.

In this stage of the study, we analyzed the fMRI data of 111 kindergarteners and first graders to show how individual differences in reading performance correlate with brain activation for speech and print in young readers. We also examined group differences between a matched subset of emergent-readers and prereaders. We revealed that reading skill was positively correlated with the magnitude of activation difference between words and symbol strings in left STG, IFG and FG. Group comparisons of the matched subset of pre- and emergent-readers showed higher activity for emergent-readers in left IFG, PreCG, and PostCG. Individual differences in activation for natural versus vocoded speech were also positively correlated with reading skill, primarily in the left temporal cortex. However, in contrast to studies on adult illiterates, group comparisons revealed higher activity in prereaders compared to readers in the frontal lobes. Print-speech coactivation was observed only in readers and individual differences analyses revealed a positive correlation between convergence and reading skill in the left superior temporal sulcus. These results emphasize that a child's brain undergoes several modifications to both visual and oral language systems in the process of learning to read. They also suggest that print-speech convergence is a hallmark of acquiring literacy.

At the end of my talk I will introduce preliminary longitudinal results of the study. Participants (among them 25 dyslexic children) were examined two years after the first fMRI data acquisition, and data from two time points will be presented.