

Brain structural and functional differences associated to language learning abilities

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Language-related areas within frontal, parietal and temporal cortices are organized in dorsal and ventral segregated but highly interactive streams. Studying individual differences in functional and structural connectivity between those brain regions and how they change during language learning can clarify the function of each of these specific connections in learning dysfunction and inter-individual variability. While the dorsal stream has been related to articulation and production, the ventral stream has been associated to comprehension and semantic processing (Hickok and Poeppel 2007; Rauschecker and Scott 2009; Saur et al 2008). To understand their role in the earliest stages of language learning we have used artificial languages to study the acquisition of word forms from fluent speech with no influence of semantic information. I will present evidence showing that the direct functional and structural connectivity between left frontal and temporal structures is relevant for audio-motor integration and critical for the acquisition of new word forms. Indeed, interference with this audio-motor component required for working memory maintenance of the phonological form disrupts language learning. Other studies highlight the importance of attention orienting associated to the left fronto-parietal network in the extraction of the embedded rules of words. In addition, the data indicate the relevance of the ventral connection between left frontal and temporal areas as a supporting pathway in the early acquisition process even when no semantic information is available.