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A reappraisal of echolalia in aphasia: A case-series study with multimodal neuroimaging

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Introduction: Verbal echoes are commonplace in patients with aphasia, yet information on their cognitive and neural mechanisms remains unexplored (Berthier et al., in press). This study aims to instantiate the concept of echolalia (Berthier et al., 2016) by reappraising its relevance in the frame of modern neuroscience in three different types: (1) automatic echolalia (AE) (parrot-like repetition of all verbal stimuli); (2) mitigated echolalia (ME) (changes in echoes for communicative purposes), and (3) effortful echolalia (EE) (echolalia with articulatory struggling, distorted prosody, and increased effort).

Methods: Case-series study of three variants of echolalia in three patients with chronic post-stroke aphasia using cognitive testing and multimodal imaging including structural magnetic resonance imaging (MRI), diffusion tensor imaging (DTI), functional MRI (fMRI) during repetition of words and non-words, and resting state fMRI (rsfMRI). Patient 1 had mixed transcortical aphasia (mutism and nil auditory comprehension with intact repetition). Patient 2 had residual Wernicke's aphasia with mildly impaired auditory comprehension; and patient 3 had Broca's aphasia with impaired syntactic comprehension.

Results: Patient 1 had severe AE associated with two large lesions in the left dorsolateral and mesial frontal lobe and the left temporo-parietal cortex (isolation of speech area). DTI revealed absent left dorsal and ventral streams and full development of right white matter tracts. Using fMRI and rsfMRI a compensatory activity in both cerebral hemispheres (right greater than left) was found. Patient 2 had ME associated with DTI-proven incomplete damage to the left dorsal stream and complete damaged to the left ventral stream. fMRI and rsfMRI revealed compensatory activity via right hemisphere structures. Patient 3 had EE associated to a large lesion in the left perisylvian language core.

Discussion: Our study revealed heterogeneous aphasic profiles and cognitive deficits in the different types of echolalia amongst patients with chronic aphasia. In addition, multimodal imaging showed a complex pattern of network rearrangement in both cerebral hemispheres which depended upon the localization of the structural lesion. Our preliminary findings set out a starting point to advance research on echolalia eventually providing hints for neurorehabilitation.

References: Berthier ML et al., P. Coppens and J. Patterson (Eds.). Jones & Bartlett Learning, Burlington, MA (2016)

Berthier ML et al. *Aphasiology* (in press)

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