

Anatomical Physiology of Semantic Associations in Primary Progressive Aphasia

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Research Abstract

DESCRIPTION (provided by applicant): Language disorders caused by neurodegenerative diseases are known as Primary Progressive Aphasia (PPA). Atrophy in PPA can affect any region within the temporosylvian language network, affording unique opportunities for examination of brain-language relationships. Anomia, the inability to name objects, is a common symptom in PPA. Naming requires the integrity of object knowledge, word knowledge, and the interactive linkage of these two domains, phonological encoding, and articulation. The goal of

this study is to better understand the mechanisms of naming impairments in PPA, as a preliminary step [that could potentially lead to neuroplasticity-inducing treatments such as transcranial magnetic stimulation.] In prior studies we used electroencephalographic responses, known as event-related potentials (ERPs), to probe for subtle processing abnormalities often unobservable based on behavior alone. N400 ERPs in response to object picture-visual word pairs revealed the extent to which words had been anticipated and predictively coded. ERPs from patients did not differentiate the name of the object from related words (dog-cat), suggesting a failure to proceed from generic to specific levels of word identification. Reductions in N400 responses to related words correlated with atrophy in the left anterior temporal lobe (ATL). Responses to object picture pairs were normal, suggesting impairment in word rather than object processing. Processing demands were not balanced in this preliminary study, as the object-word test required mapping between stimulus types while the object-object test did not. In this proposal we address this potential confound by examining crossmodal visual-auditory interactions (Specific Aim #1). In one test visual objects will be paired with auditory words. We predict that even within this crossmodal design, PPA patients will demonstrate a generic-to-specific processing impairment in ERPs and behavior. In the second test, visual objects will be followed by auditory object sounds (dog-barking). We predict that PPA patients will show normal differentiation of visual object-auditory object relationships, demonstrating that anomia occurs even when crossmodal object-object associations can still be evoked. We will also examine whether an ERP index of word specificity correlates with left ATL atrophy (Specific Aim #2), demonstrating a role of this region in the associative linkage of auditory as well as visual words. Finally, in this proposal we incorporate a convergent method to investigate the physiology of PPA: MRI resting state functional connectivity analysis (Specific Aim #3). [We will examine whether connectivity between ATL and other epicenters in the language network is abnormal in PPA, and whether such abnormalities relate to performance in the ERP test.]

Further information available at:

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