

"Mechanisms of dissociation between single-word and sentence comprehension impairment in primary progressive aphasia: Evidence from eye tracking"

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Language can be disrupted as a result of damage to the language network in the brain. In previous models of aphasia based on stroke studies, language comprehension and production have been theorized to be carried out by two circumscribed areas in the brain. The cortical area located in posterior portions of the left superior temporal gyrus (Wernicke's area) was described as a language node responsible for comprehending words and sentences. The left inferior frontal gyrus (Broca's area) was shown to be involved in language production and comprehension of complex grammatical sentences. However, atypical correlations between lesion sites and language deficits in stroke patients have been shown by lesion studies. Some patients with damage to these traditional language nodes did not show typical features of Wernicke's or Broca's aphasia. Furthermore, due to the variability in blood supply, some regions in language network (i.e. anterior temporal lobe) can be more resistant to cerebrovascular accidents. Thus, these regions can be spared in stroke aphasia. However, neurodegenerative aphasia, namely, primary progressive aphasia (PPA) may disrupt any region in the language network.

In PPA patients, neurodegeneration of anterior temporal lobe disrupts the linkage between words and objects, in particular in the semantic subtype. Moreover, patients with single-word comprehension impairment may have preserved comprehension for complex sentences. On the other hand, agrammatic PPA patients may have no difficulty understanding single words but cannot extract the meaning from a sentence. Therefore, studying different subtypes of PPA provides a unique opportunity to understand mechanisms of language impairment, in particular the dissociation between single-word comprehension and sentence comprehension.

Comprehension of words and sentences can be assessed with high sensitivity using novel techniques such as eye movement tracking. Word-object matching paradigms in eye tracking experiments have successfully revealed that blurring of intra-category borders (taxonomic blurring) may be the main mechanism of word comprehension deficits in neurodegenerative aphasias. Patients with semantic PPA may not differentiate words from the same category (i.e. cat and dog). Finally, in agrammatic PPA, assignment of grammatical relations between the verb and its arguments is impaired. Using a novel sentence-completion eye tracking paradigm this impairment has been successfully detected even at the early stages of agrammatism.