

## Introduction

### Background:

Aphasia is a speech-language disorder resulting from post-stroke damage to the left-hemisphere brain areas. Individuals with aphasia exhibit communication disabilities including impairments in speech fluency, auditory comprehension, word-finding, and repetition

Previous studies have suggested that certain aspects of behavioral symptoms in aphasia are accounted for by damage to the sensorimotor network that supports auditory feedback processing during speech<sup>[1-5]</sup>

### Objective:

The present work used left-hemisphere stroke as a model to study the impaired efference copy mechanisms of speech in individuals with aphasia

## Methods

### Subjects:

34 Aphasia:

22 males; age range: 42-80 yrs; mean age: 61.2 yrs  
7 Anomic; 18 Broca's; 8 Conduction; 1 Global

46 Control:

23 males; age range: 44-82 yrs; mean age: 63.6 yrs

### Experimental task:

Subjects were tested under altered auditory feedback (AAF) during speech vowel production and listening tasks (Fig. 1)

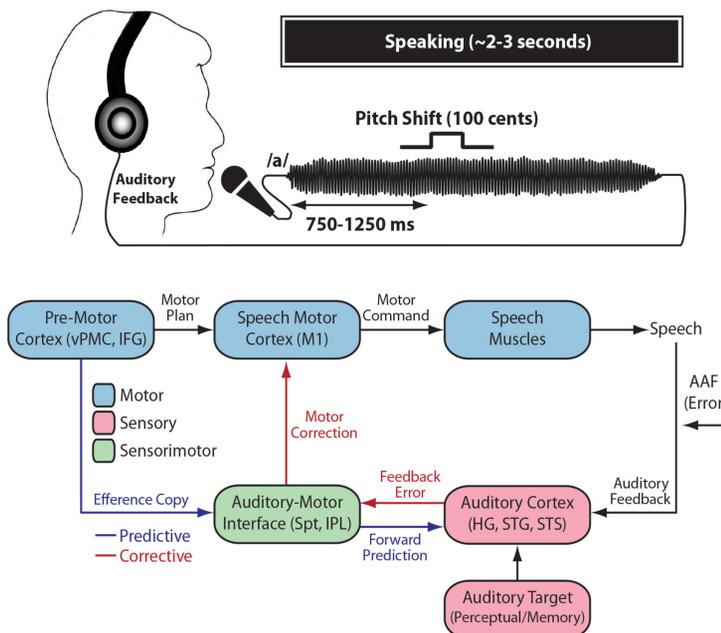


Fig. 1 AAF paradigm (top) and the auditory-motor model of speech (bottom)

## Results

### Speech compensation:

Aphasia subjects showed diminished speech compensation compared with control group (Fig. 2) ( $F(1,78)=11.04, p<0.01$ )

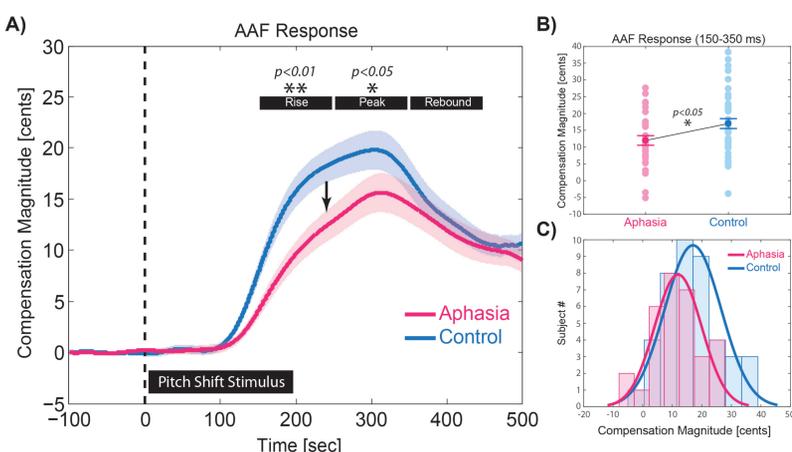


Fig. 2 Speech compensation in aphasia vs. control group

## ERP Neural Activity:

Aphasia subjects showed diminished speaking-induced modulation of the P1 ( $p<0.05$ ) and N1 ( $p<0.01$ ) ERP neural components compared with control group (Fig. 3)

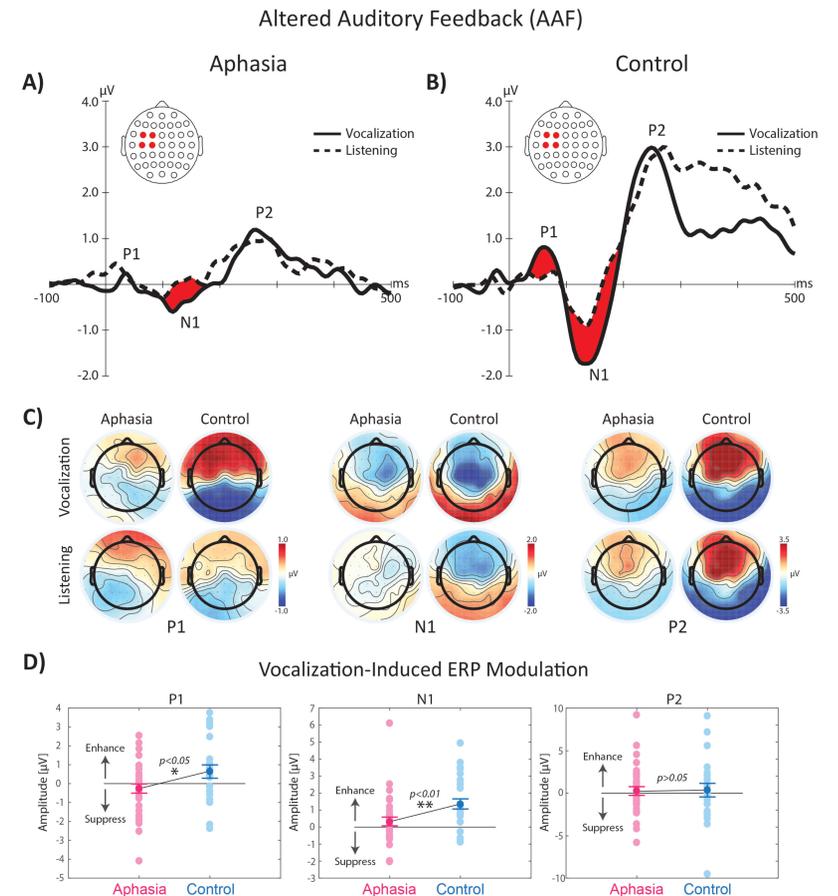


Fig. 3 ERP neural responses in aphasia vs. control group

## Lesion Mapping:

Damage to auditory-motor regions within the dorsal stream network predicted diminished ERP activity in aphasia (Fig. 4)

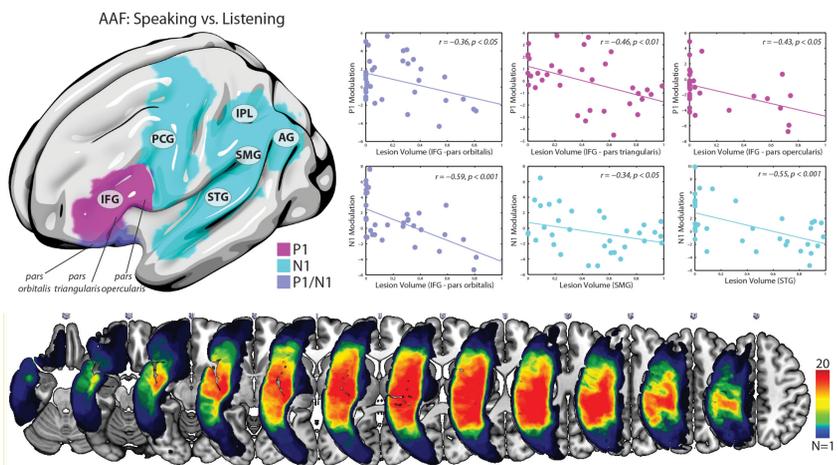


Fig. 4 Lesion mapping analysis of neural responses in aphasia

## Discussion

Findings provide evidence for behavioral and neural deficits in efference copy mechanisms of speech in aphasia

Damage to different auditory-motor cortical areas within the dorsal stream networks predicts the temporal dynamics of impaired efference copy mechanisms during speech

- Anterior damage predicts early phases of processing
- Posterior damage predicts late phases of processing

Data offers clinical implications for developing targeted interventions for speech rehabilitation in post-stroke aphasia

## References

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- [2] Buchsbaum BR, Baldo J, Okada K, Berman KF, Dronkers N, D'Esposito M, Hickok G. Conduction aphasia, sensory-motor integration, and phonological short-term memory - An aggregate analysis of lesion and fMRI data. *Brain & Language* (2011)
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