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UCL

A network analysis of speech perception in normals and aphasic stroke patients using Dynamic Causal Modeling

(poster #)

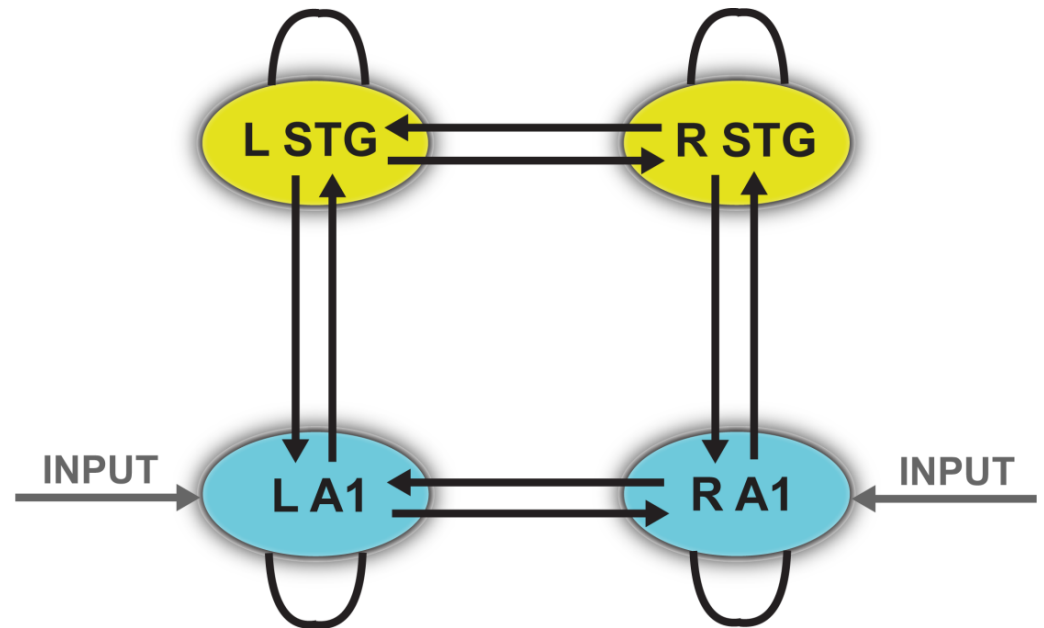
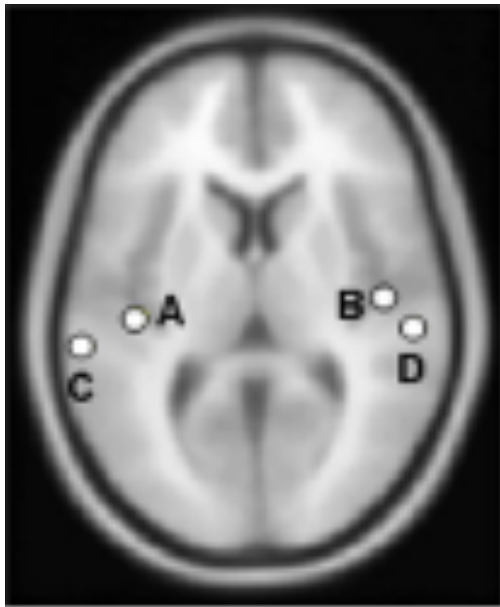
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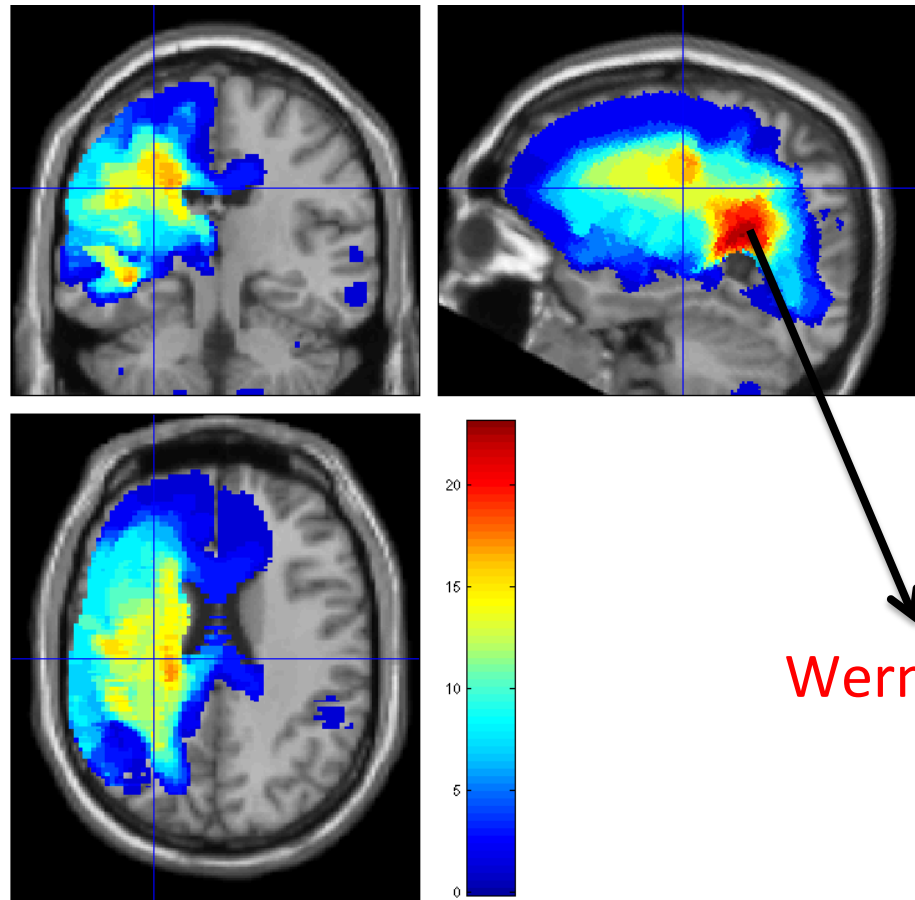
Speech perception

- Speech perception is mediated by a bilateral network of interacting sources in **primary auditory cortex (A1)** and secondary auditory cortex in **posterior superior temporal gyrus (STG)**.





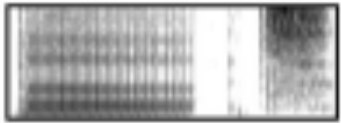


Aphasics

- 25 aphasics with chronic auditory comprehension deficits caused by left hemisphere stroke.
- Patients' lesion overlap map:



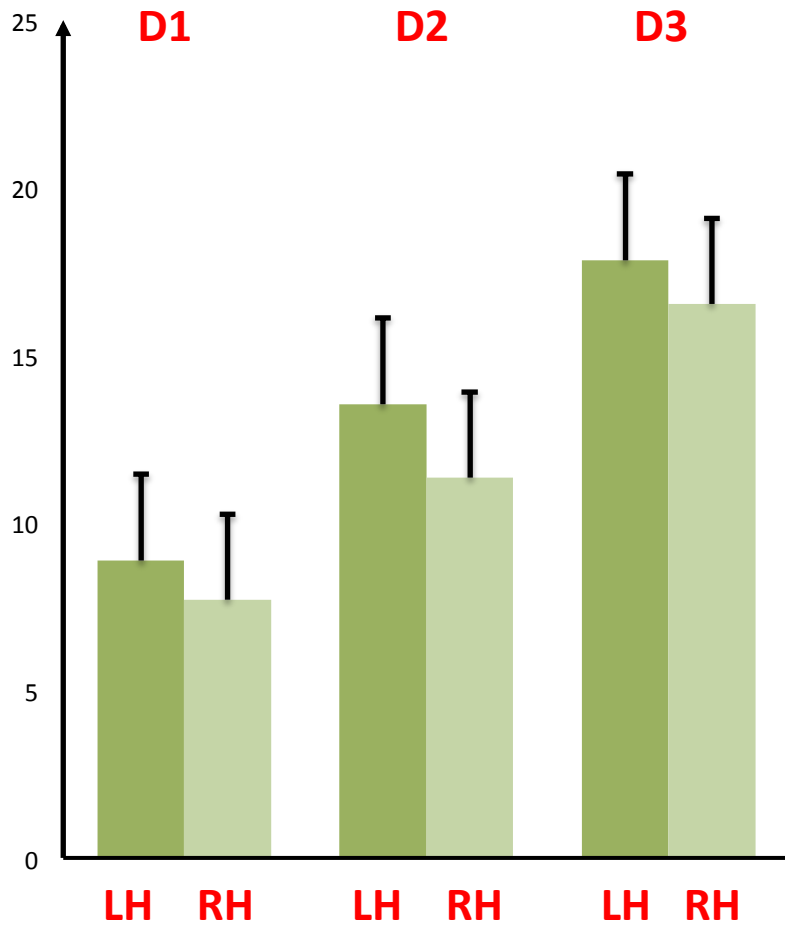
Wernicke's area

Vowel Mismatch Paradigm

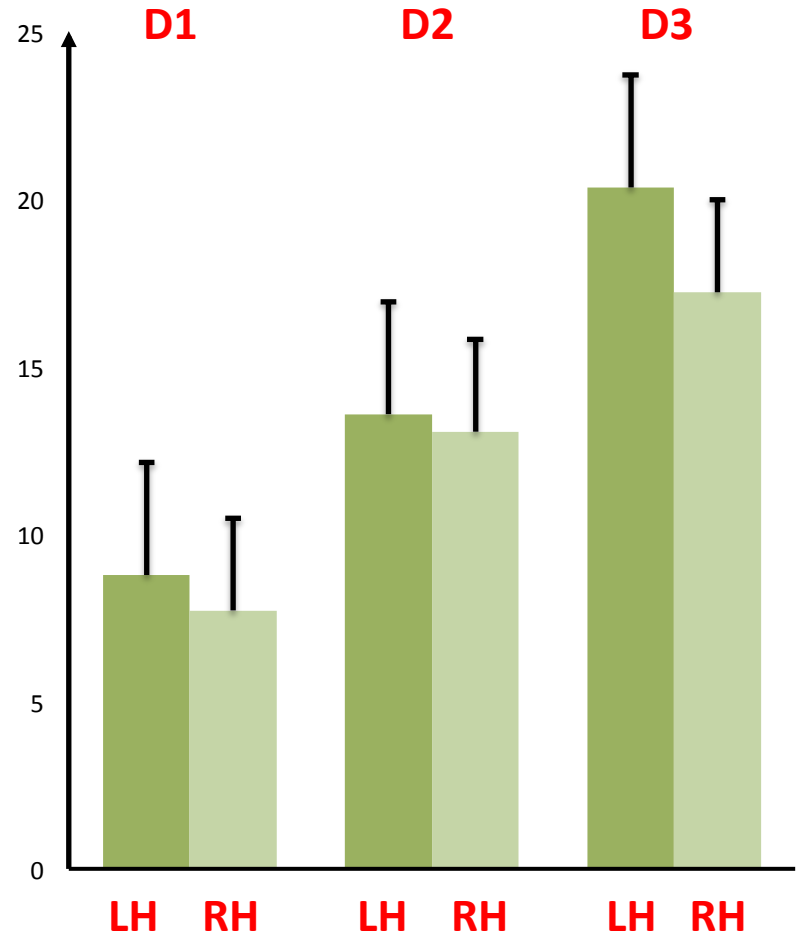
Vowel Stimulus	Percept	Vowels 	Formant F1 (Hz)	Frequencies F2 (Hz)	Distance from Standard (ERB)
STD	“Bart”		628	1014	0
D1	“Bart”		565	1144	1.16
D2	“Burt”		507	1287	2.32
D3	“Beat”		237	2522	9.30

- Stimuli:** CVC words with different frequencies of F1 and F2 formants
- D1:** **acoustic deviant** (within same vowel category)
- D2 and D3:** **phonemic deviants** (perceived as different vowel type)

Source-space MMF amplitudes (nA)



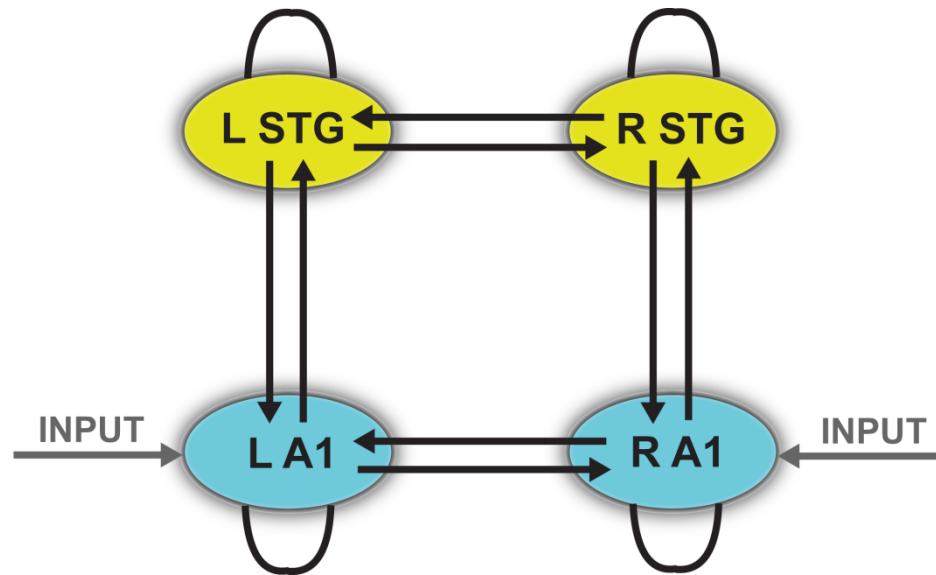
CONTROLS
(n=16)



APHASICS
(n=23)

DCM of deviant responses

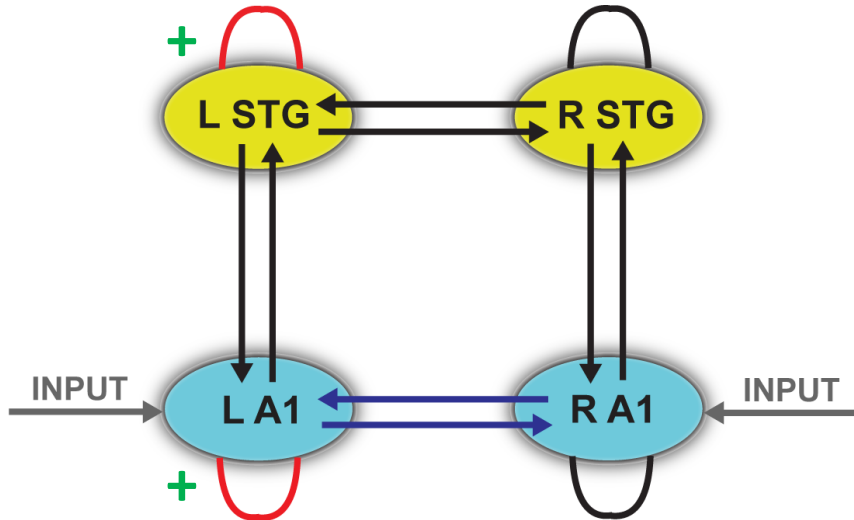
- **Models:** 12 connections between A1 and STG were modelled, yielding 255 models for each participant.



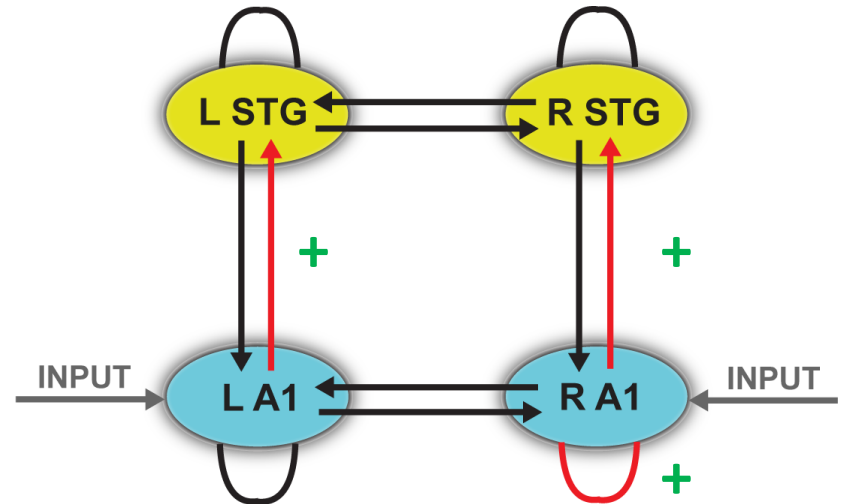
- **Aim:** To investigate modulation of these connections for the **phonemic contrast: (D3 and D2) vs. D1**

DCM Results

CONTROLS



APHASICS with LH Stroke



- Aphasics lack modulated self-connections in left A1 and STG
- Aphasics show increased modulation of forward connections from A1 to STG, i.e., from lower to higher level of the hierarchy.
- **Predictive coding theory**: Greater prediction error is passed from lower level to higher levels of the speech network in aphasics.