

Language & The Brain

Primary motor cortex
Broca's Area
Primary somatic sensory cortex
Primary visual cortex
Primary auditory area
Posterior Speech Areas Including Wernicke's Area

Broca's Aphasia

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Dr. Gardner: "Were you in the Coast Guard?"
Mr. Ford (patient):
"No, er, yes, yes ... ship ... Massachu ... chusetts ... Coastguard...years". He held up his hand twice indicating 19.

Gardner H. The Shattered Mind. New York: Vintage Books, 1974, pp 60-61.

1. Language Comprehension (good)
2. Speech Production (impaired):
 - Nonfluent
 - Words improperly formed
 - Slow and slurred
 - Paraphasic errors: "purnpike" (for turnpike)

Wernicke's Aphasia

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Dr. Gardner: "What brings you to the hospital?" I asked the 72-year-old retired butcher four weeks after his admission to the hospital.

Mr. Gorgan (patient):
"Boy, I'm sweating, I'm awful nervous, you know, once in a while I get caught up, I can't mention the tarripoi, a month agok, quite a little, I've done a lot well, I impose a lot, while on the other hand, you know what I mean, I have to run around, look it over, trebbin and all that sort of stuff.

Gardner H. The Shattered Mind. New York: Vintage Books, 1974, pp 67-68.

1. Language Comprehension (poor)
2. Speech fluent but nonsensical
3. Long sentences without meaning

THE ARCUATE FASCICULUS

White Matter Tract that connects Broca's Area and Wernicke's Area

Damage: Conduction Aphasia

1. Language Comprehension: intact
2. Fluent speech with some paraphasic errors
3. **Inability to repeat words**

Vernooij, et al. Neuroimage, Vol 35(3) 15 April 2007, pp 1064-1076.

The "Arcuate Fasciculus" (lime green) in different primates using tractography.

HUMAN
CHIMPANZEE
MACAQUE

Nature Neuroscience 11, 426 - 428 (2008)

Bilinguals: A Neural Signature?

Activation in bilinguals (English-Spanish) > monolinguals

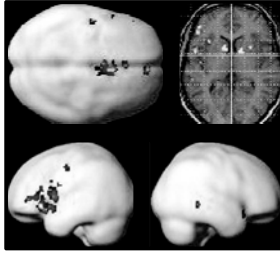
Contrast for English language (BA 45, Lateral Inferior Parietal Cortex, including Broca's Area)

Hot/red: Activation unique to bilinguals

Spring/green: Shared activation between bilinguals and monolinguals on a syntactic task in English.

Adapted from Kovelman, et al. Journal of Cognitive Neuroscience January 2008, Vol. 20, No. 1, Pages 153-169

Bilinguals



SUBJECTS

10 bilingual undergrads from the Translation Department at University of Geneva

■ German : First language (L1)
 ■ French: Second Language (L2)

TASK

Name a picture in L1 or in L2, depending on a cue

The image shows those brain regions with greater activation for L2 as compared to L1.

Figure adapted from Abutalebi, J. et al. Cereb. Cortex 2008 18:1496-1505

Videos about Language Processing

Genie, the language-deprived child:

<http://www.youtube.com/watch?v=ipt0pjz0mww>
http://www.youtube.com/watch?v=nha-lGE_wjo
http://www.youtube.com/watch?v=lxUBkKNOz_k
<http://www.youtube.com/watch?v=lcEEvNFNETM>
<http://www.youtube.com/watch?v=rsRr9COItp0>
http://www.youtube.com/watch?v=3NGUP_JSRic

Broca's aphasia:

<http://www.youtube.com/watch?v=f2IIMEbMnPM>

Wernicke's aphasia:

<http://www.youtube.com/watch?v=aVhYN7NTIKU>

Split-brain patient:

<http://www.youtube.com/watch?v=ZMLzP1VCANo>