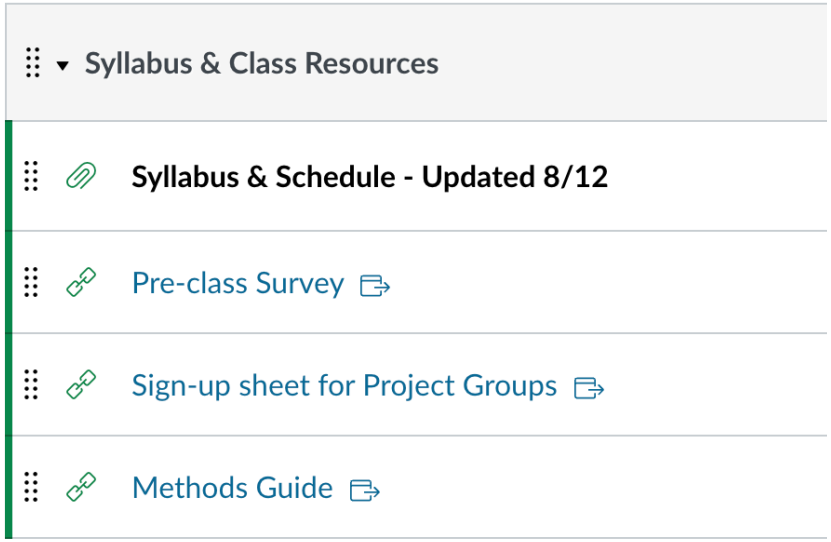
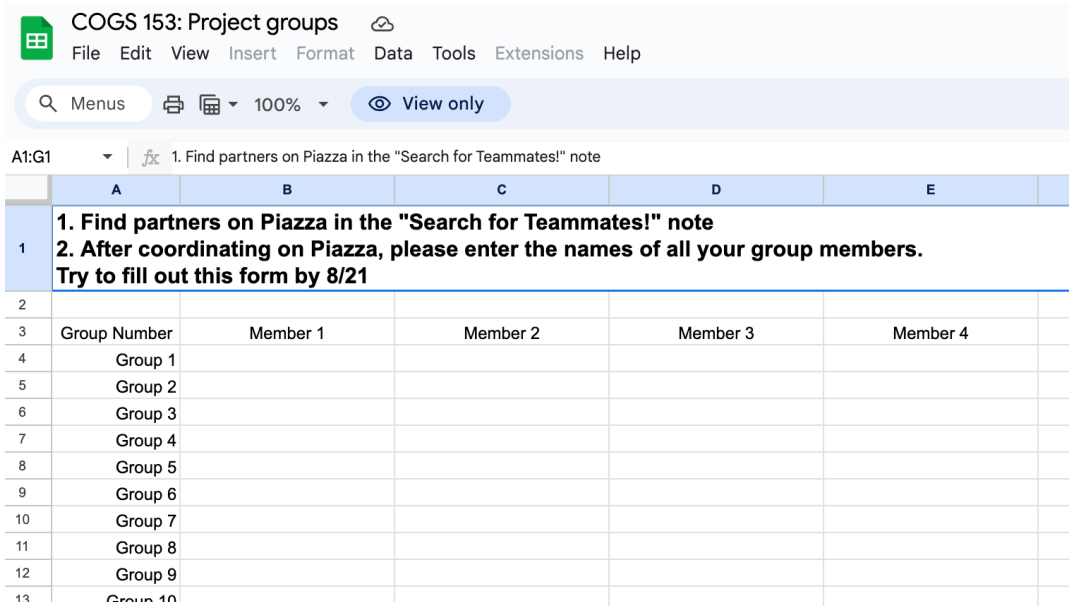
Lecture 12:
Communication Disorders, Pt. 1

COGS 153

Reminders

- HW1 due tonight
- Quiz 2 due tonight
- Enter your group info
- Methods Guide is available




COGS 153: Project groups

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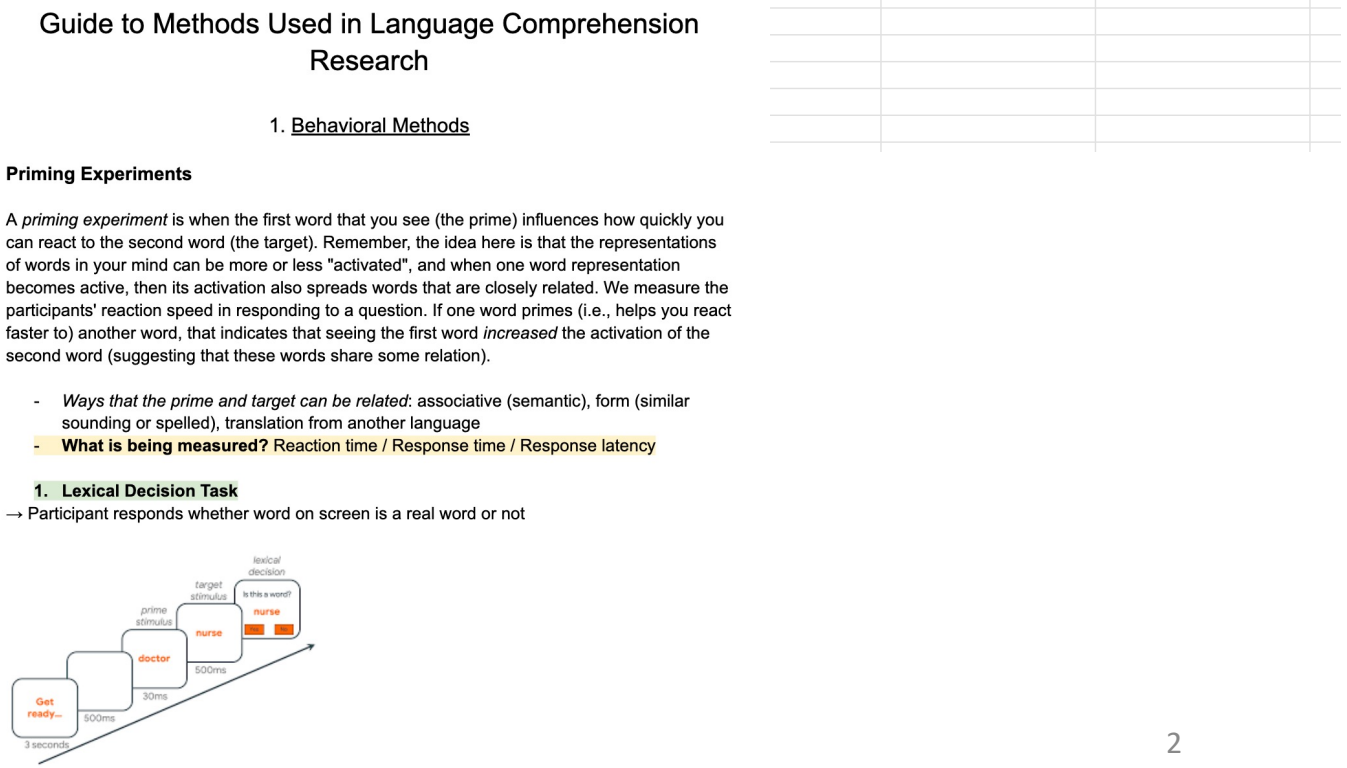
Menus 100% View only

A1:G1 | 1. Find partners on Piazza in the "Search for Teammates!" note

	A	B	C	D	E
1	**1. Find partners on Piazza in the "Search for Teammates!" note 2. After coordinating on Piazza, please enter the names of all your group members. Try to fill out this form by 8/21**				
2					
3	Group Number	Member 1	Member 2	Member 3	Member 4
4	Group 1				
5	Group 2				
6	Group 3				
7	Group 4				
8	Group 5				
9	Group 6				
10	Group 7				
11	Group 8				
12	Group 9				
13	Group 10				


Guide to Methods Used in Language Comprehension Research

1. Behavioral Methods

Priming Experiments

A *priming experiment* is when the first word that you see (the prime) influences how quickly you can react to the second word (the target). Remember, the idea here is that the representations of words in your mind can be more or less "activated", and when one word representation becomes active, then its activation also spreads words that are closely related. We measure the participants' reaction speed in responding to a question. If one word primes (i.e., helps you react faster to) another word, that indicates that seeing the first word *increased* the activation of the second word (suggesting that these words share some relation).

- *Ways that the prime and target can be related*: associative (semantic), form (similar sounding or spelled), translation from another language
- **What is being measured?** Reaction time / Response time / Response latency

1. Lexical Decision Task

→ Participant responds whether word on screen is a real word or not

What are communication disorders?

Communication disorders is a broad term encompassing both *speech/sign* and *language*

Speech –

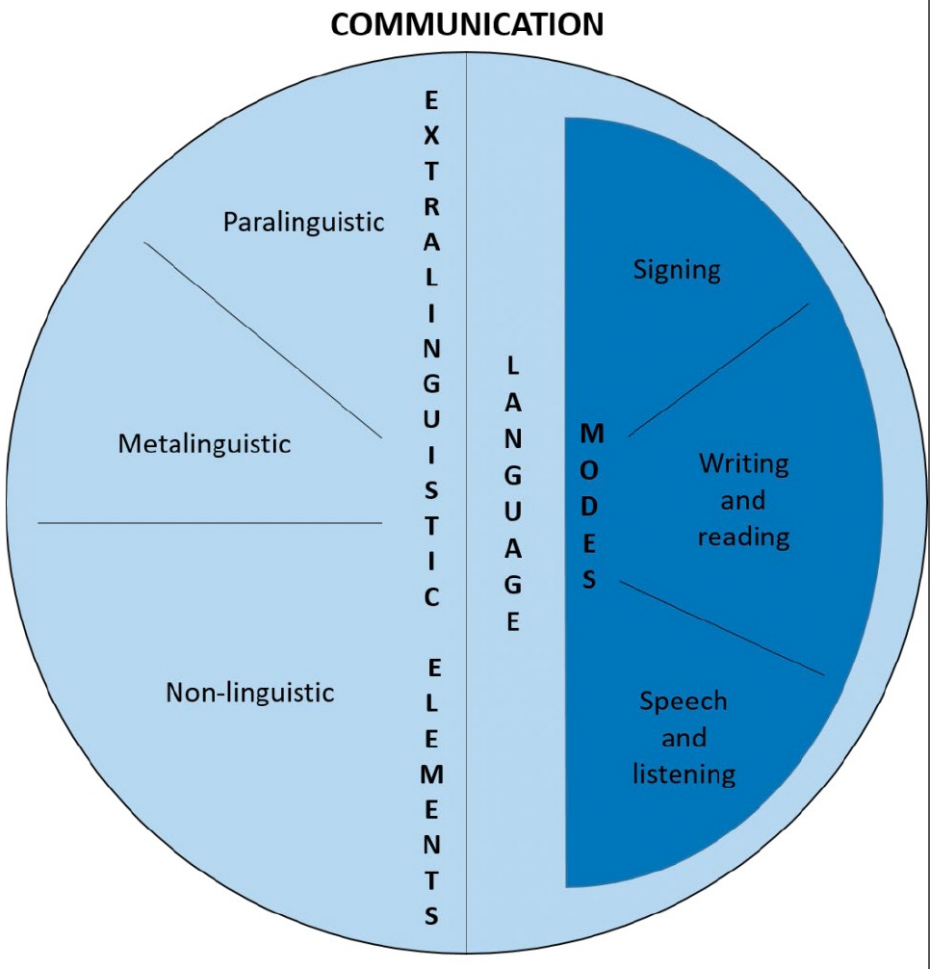
- Articulatory & Phonological – Childhood Apraxia of Speech
- Fluency – e.g., Stuttering
- Voice – e.g., Dysphonia

Language –

- Developmental – **Developmental Language Disorder (DLD)/Specific Language Impairment (SLI)**
- Acquired – **Aphasia**

Communication –

- Acquired – **Traumatic Brain Injury (TBI)**
  - Neurodegenerative – **Dementia**, Multiple Sclerosis
- Developmental – Down Syndrome



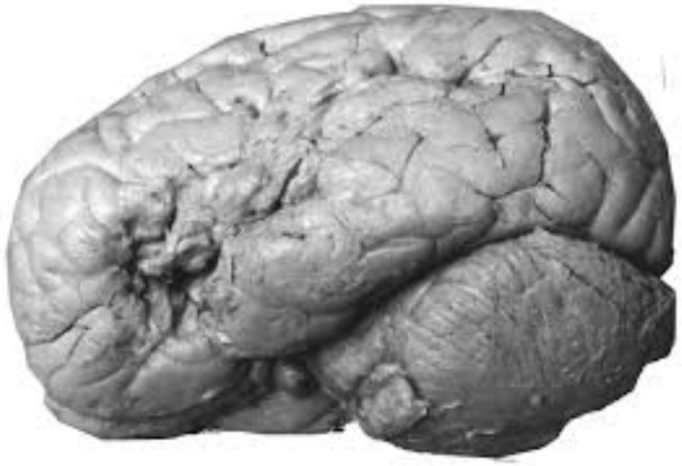
What is aphasia?

- **Aphasia** is an impairment of the ability to produce or understand language
- Aphasia is typically acquired after a stroke (blockage or rupture of a blood vessel in the brain)
  - About 750,000 strokes occur each year in the USA
  - About one third of these result in some form of aphasia
  - There are at least 2 million people in the US who have a form of aphasia
- Aphasia may also result from head injury, tumor, or other neurological causes

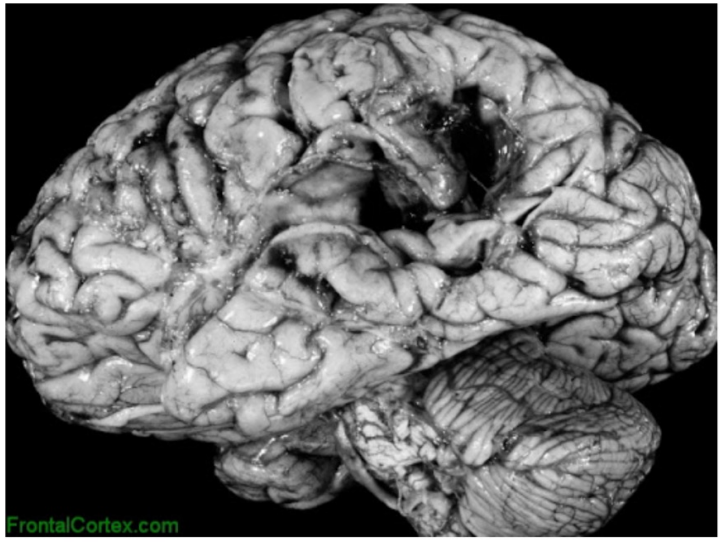
Case Studies:

first attempts at localization of language-related areas of the brain

- **Paul Broca** (1824-1880)
  - Characterized this damage + symptoms:
    - Left frontal lobe lesion
    - Impaired speech production
    - Intact speech comprehension



- **Carl Wernicke** (1848-1905)
  - Characterized this damage + symptoms:
    - Left temporal gyrus lesion
    - Impaired speech comprehension
    - Intact speech production



Expressive Aphasia / Broca's Aphasia

Also called "non-fluent aphasia" and "agrammatic aphasia"

- Partial loss of the ability to produce speech
- Slow, effortful speech
- Misarticulations of consonants and vowels
- Prosody, intonation and stress are impaired or absent
- *Anomia*: Impaired recall of words with no impairment of comprehension or the capacity to repeat the words
- **Agrammatism**
  - Difficult, effortful speech production
  - Some difficulty comprehending syntactically complex sentences
  - *Telegraphic speech*: Produce mostly content words and few or no function words
- Comprehension is generally intact

Expressive Aphasia, example 1

https://youtu.be/JWC-cVQmEmY

Expressive Aphasia, example 2

https://youtu.be/6CJWo5TDHLE

Melodic Intonation Therapy

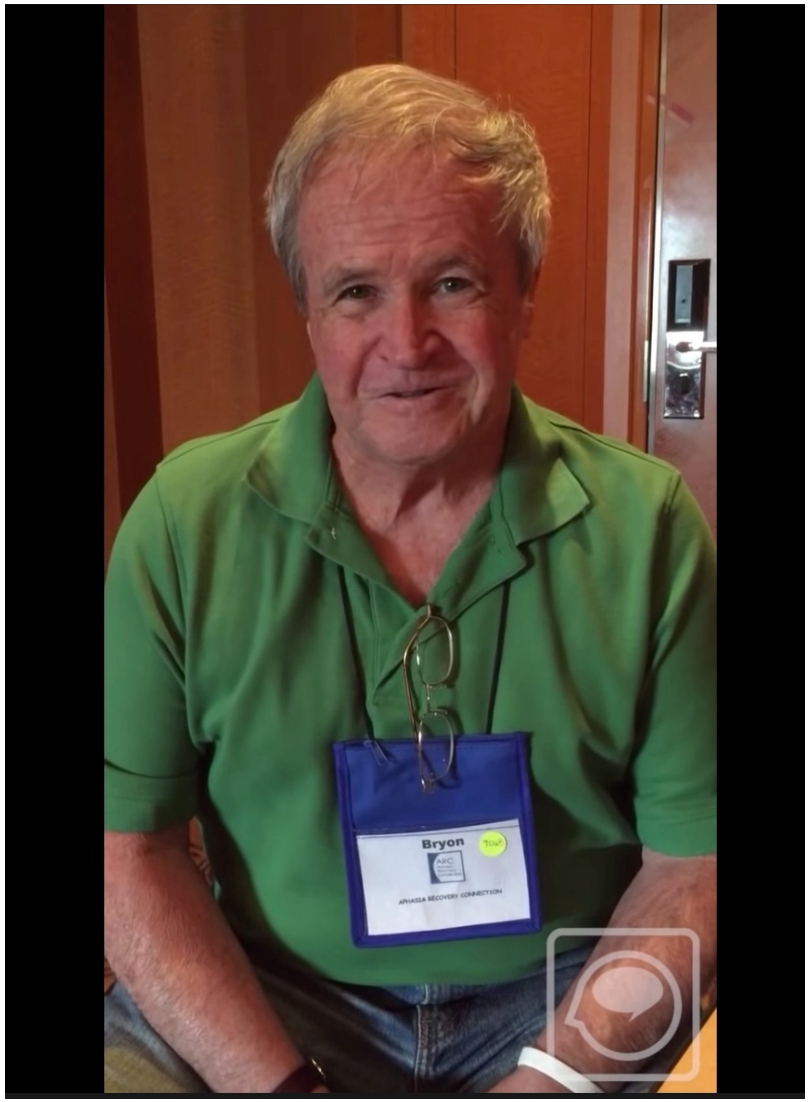
https://youtu.be/QzLqNQ4PYik?si=IgB1eIyK12p1_nV5

Receptive Aphasia / Wernicke's Aphasia

Also called "fluent aphasia"

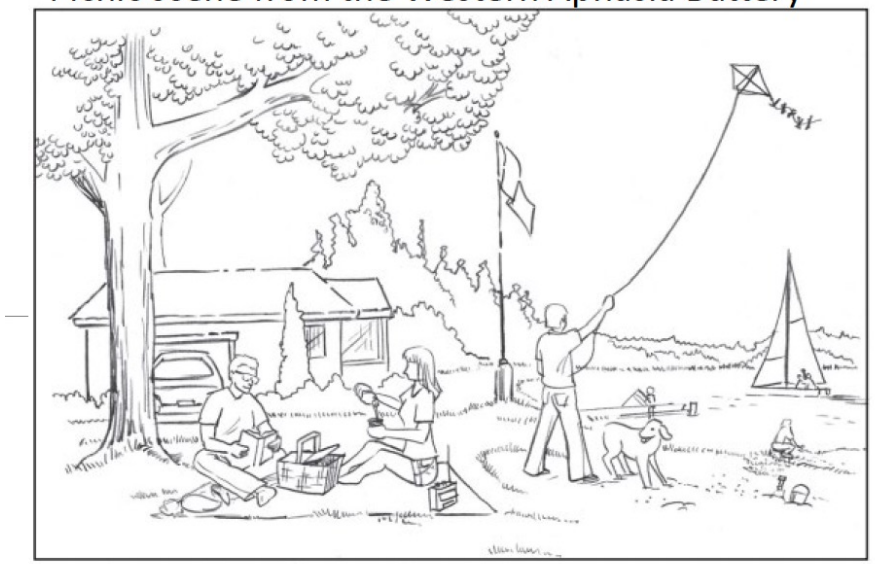
- Partial loss of the ability to comprehend speech
- Difficulty understanding written or spoken speech
- Relatively fluent production of speech (grammatical, rapid, not effortful), but it often doesn't make much sense
- Word salad
- *Logorrhea*: excessive wordiness and repetitiveness, incoherency
- More difficulty with content than function words
- People with this type of aphasia typically don't recognize that they don't make sense

Receptive Aphasia, example 1

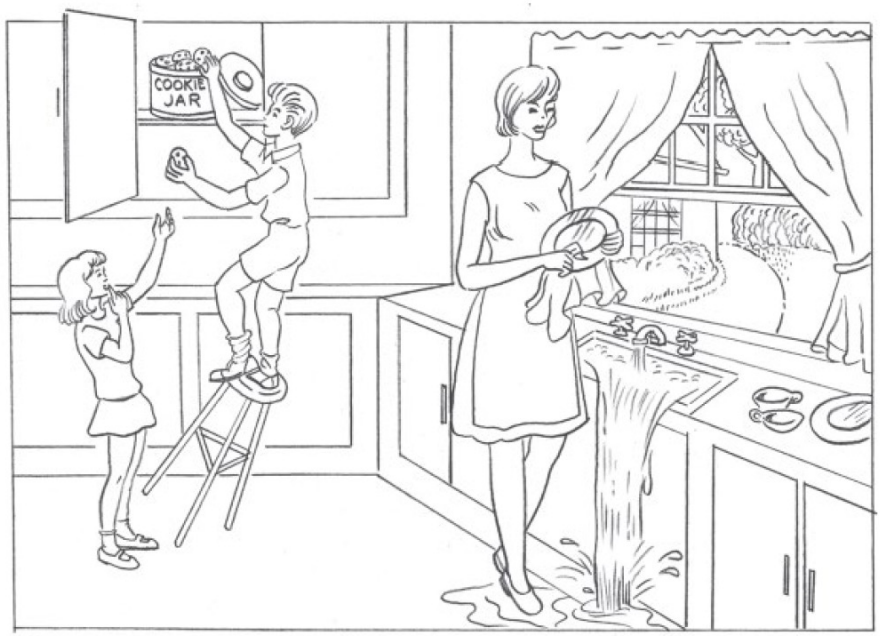


https://youtu.be/3oef68YabD0

Picnic scene from the Western Aphasia Battery



She a girl.
Man a boat.
Chidren a sand.
Dog
Radio off.
Sande - feel.
a girl dride.



Cookies are ~~tef~~ four looking for the boy and little girl. The will ~~tet~~ ~~luvd~~ hit the button of the ~~to~~ boy. Mother is not finding much to help the ~~fo~~ ~~ear~~ ~~dzg~~ dzy of the sink and dishes. Water in the floor is a ~~mistd~~ ~~we~~ water on the floor and miking all over the shoes. Miss ~~mUG~~ is a muss.

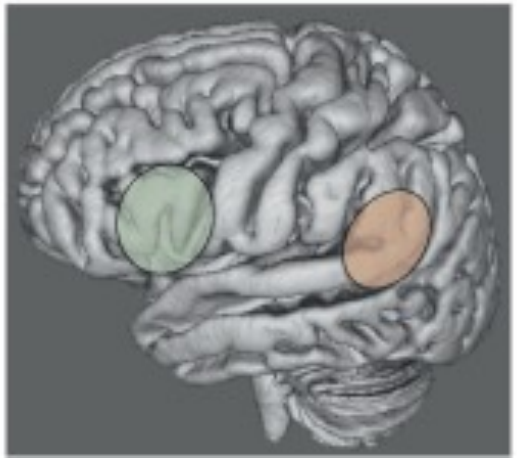
How can **impairment** inform our understanding of language processing?

- When studying the effects of lesions/damage, we can ask "What is the neural substrate responsible for a behavior / cognitive process?"

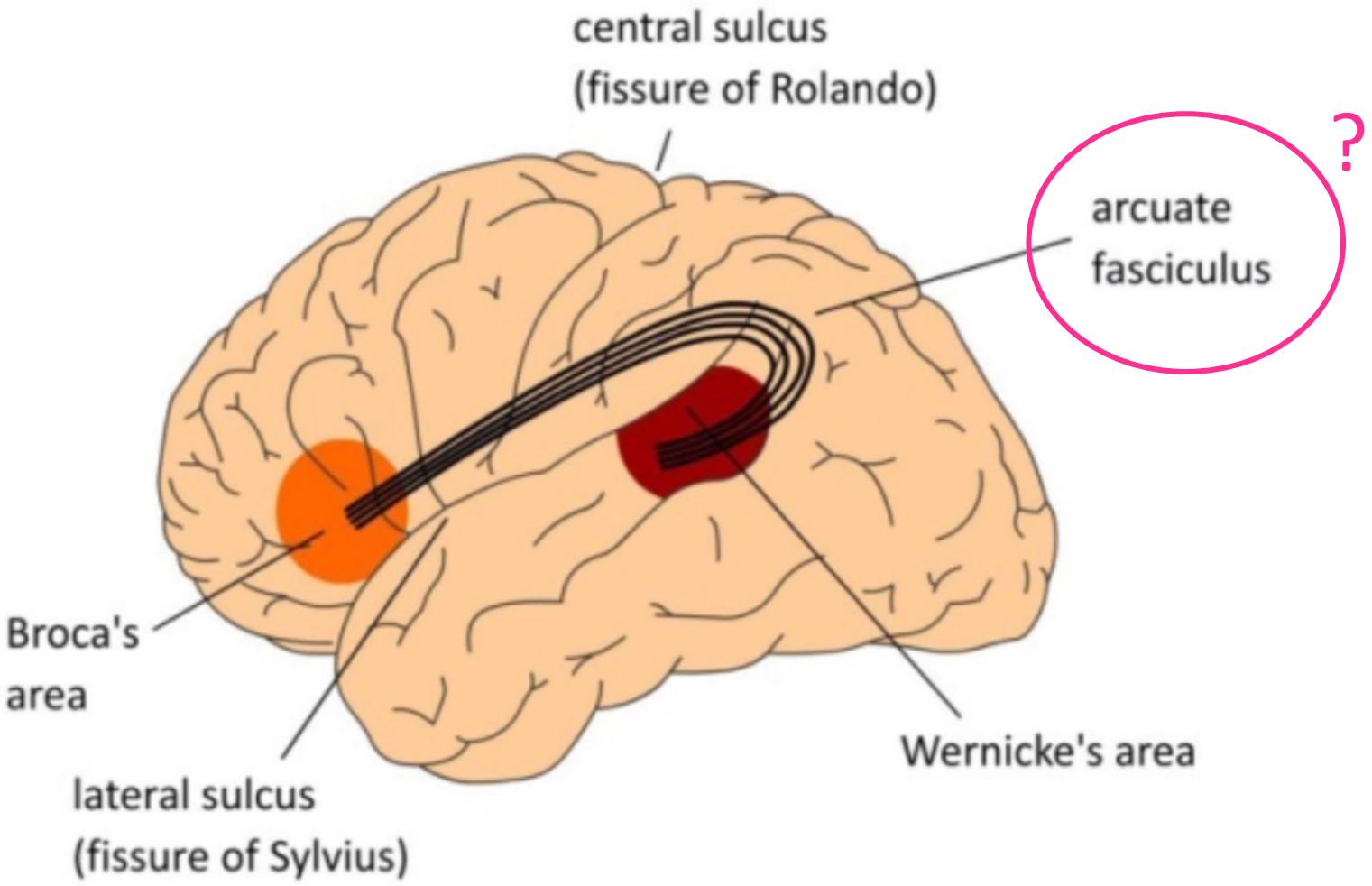
Double Dissociation: "identifying the neural substrate of a particular brain function through identification of case studies, neuroimaging, or neuropsych testing"

- It's a technique used to figure out what the underlying structure responsible for some function is
- A double dissociation is when a lesion in "*brain structure A*" impairs "*function X*" but not "*function* Y" AND a lesion to "*brain structure B*" impairs "f*unction Y*" but not "*function X*"
- e.g., Broca's vs Wernicke's aphasias

	Speech production	Speech comprehension
Left frontal lesion	+	—
Left temporoparietal lesion	—	+

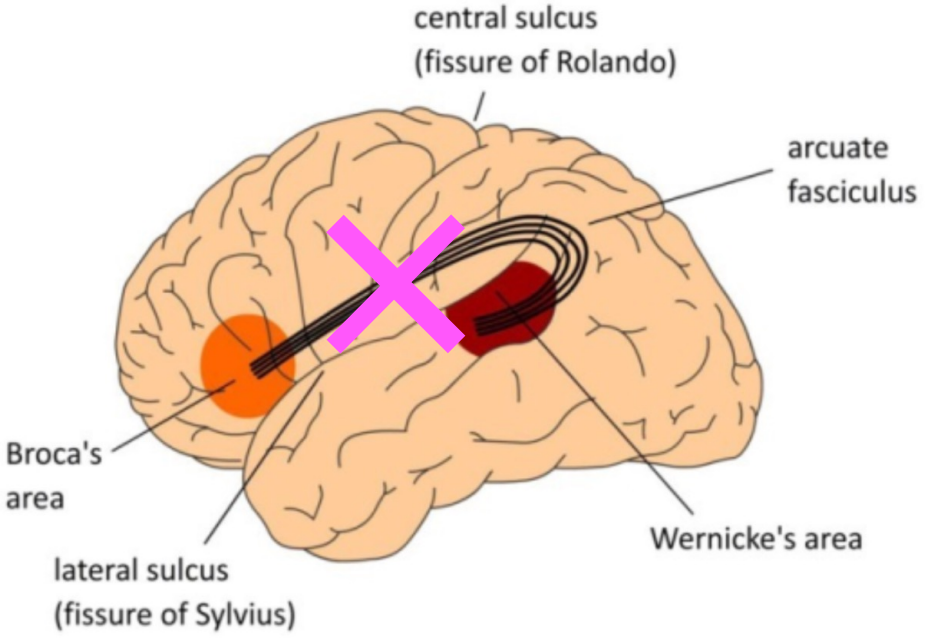


The Wernicke-Geschwind model



Conduction Aphasia

- A third syndrome: “disconnection” syndrome, or conduction aphasia, due to damage to the **arcuate fasciculus**
  - Ability to comprehend speech
  - Intact articulation
  - Difficulty repeating sounds
  - Difficulty repeating simple phrases
- However, more research suggests it may also be caused by damage to areas other than the arcuate fasciculus (e.g., Quigg, Geldmacher & Elias, 2006)
  - Lesions in the temporal parietal junction that knock out underlying white matter can produce conduction aphasia



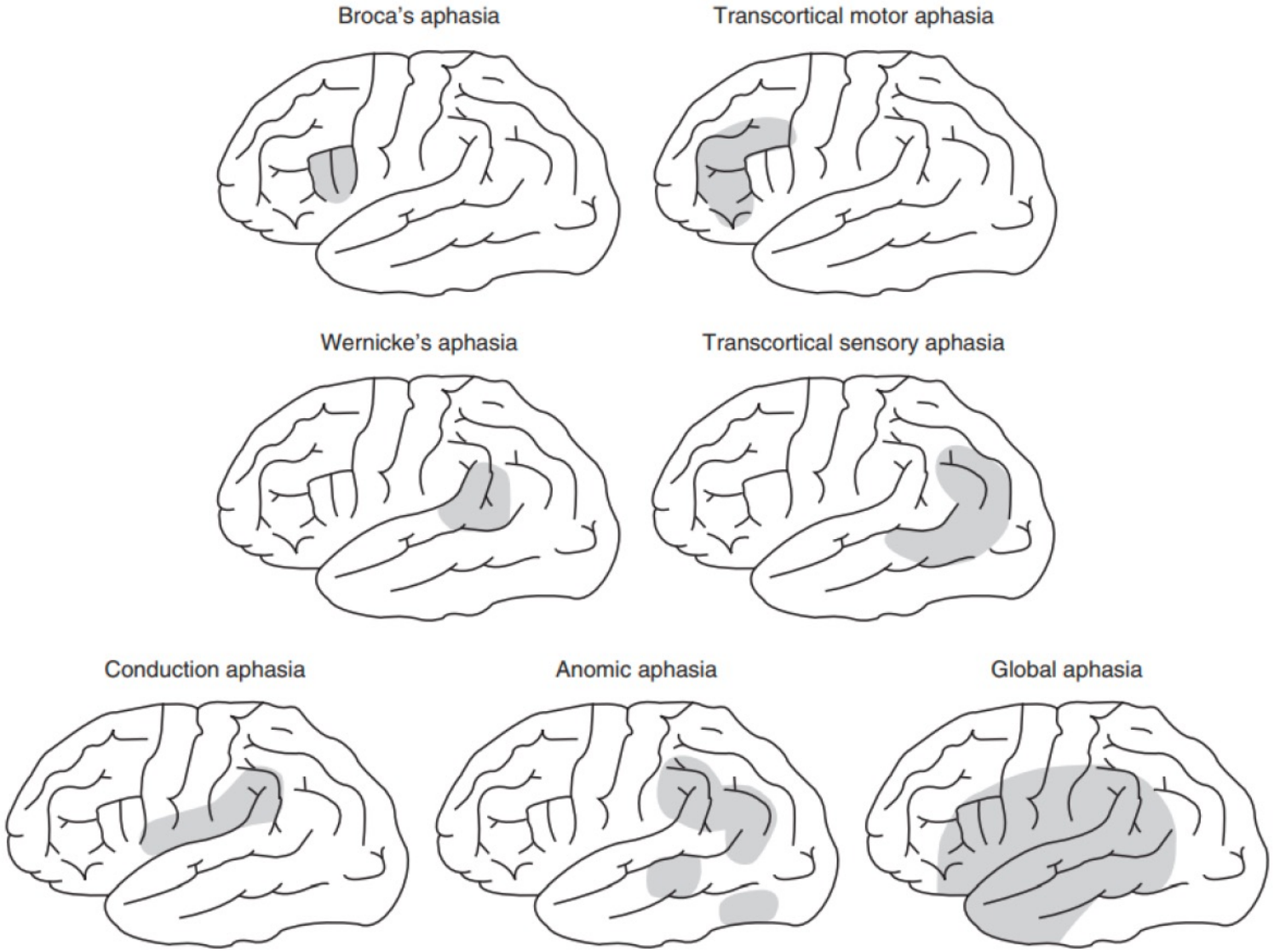
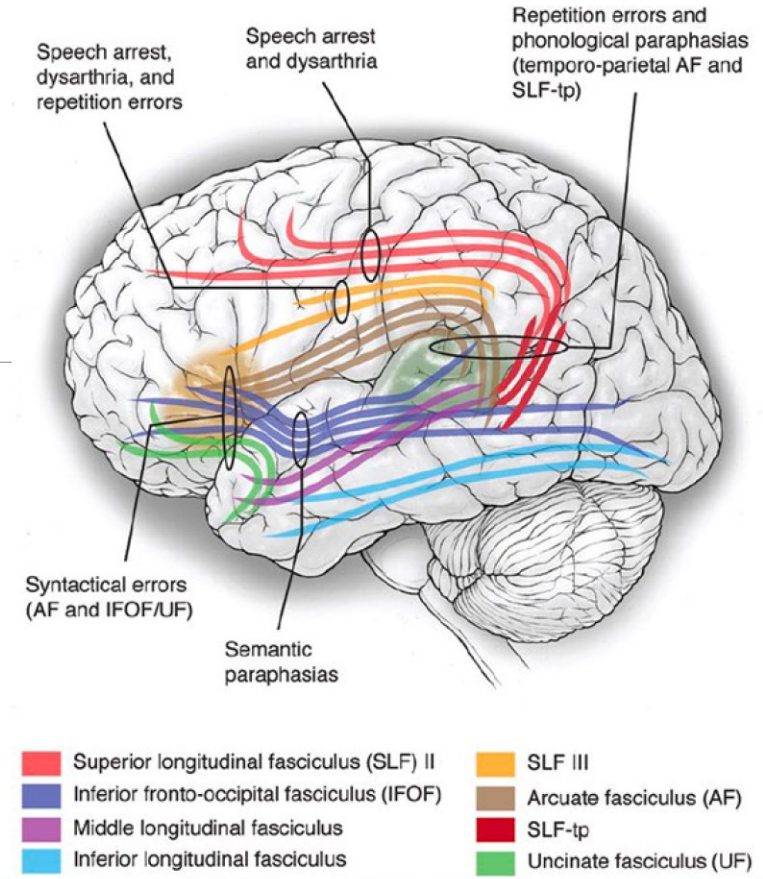
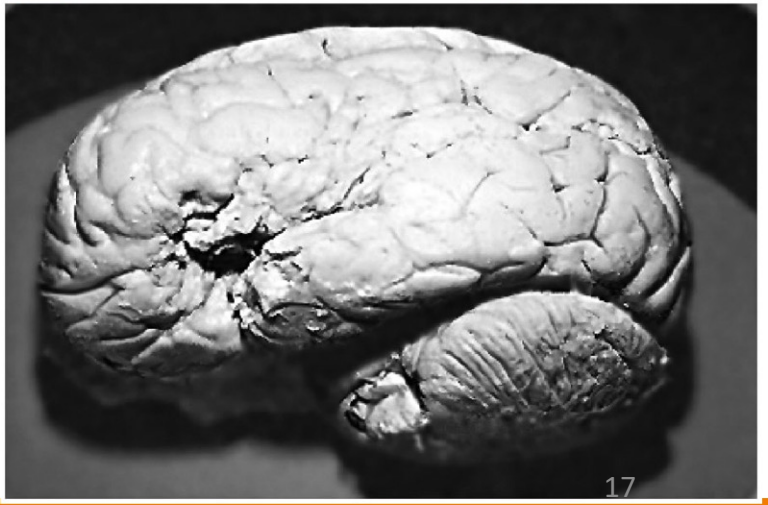


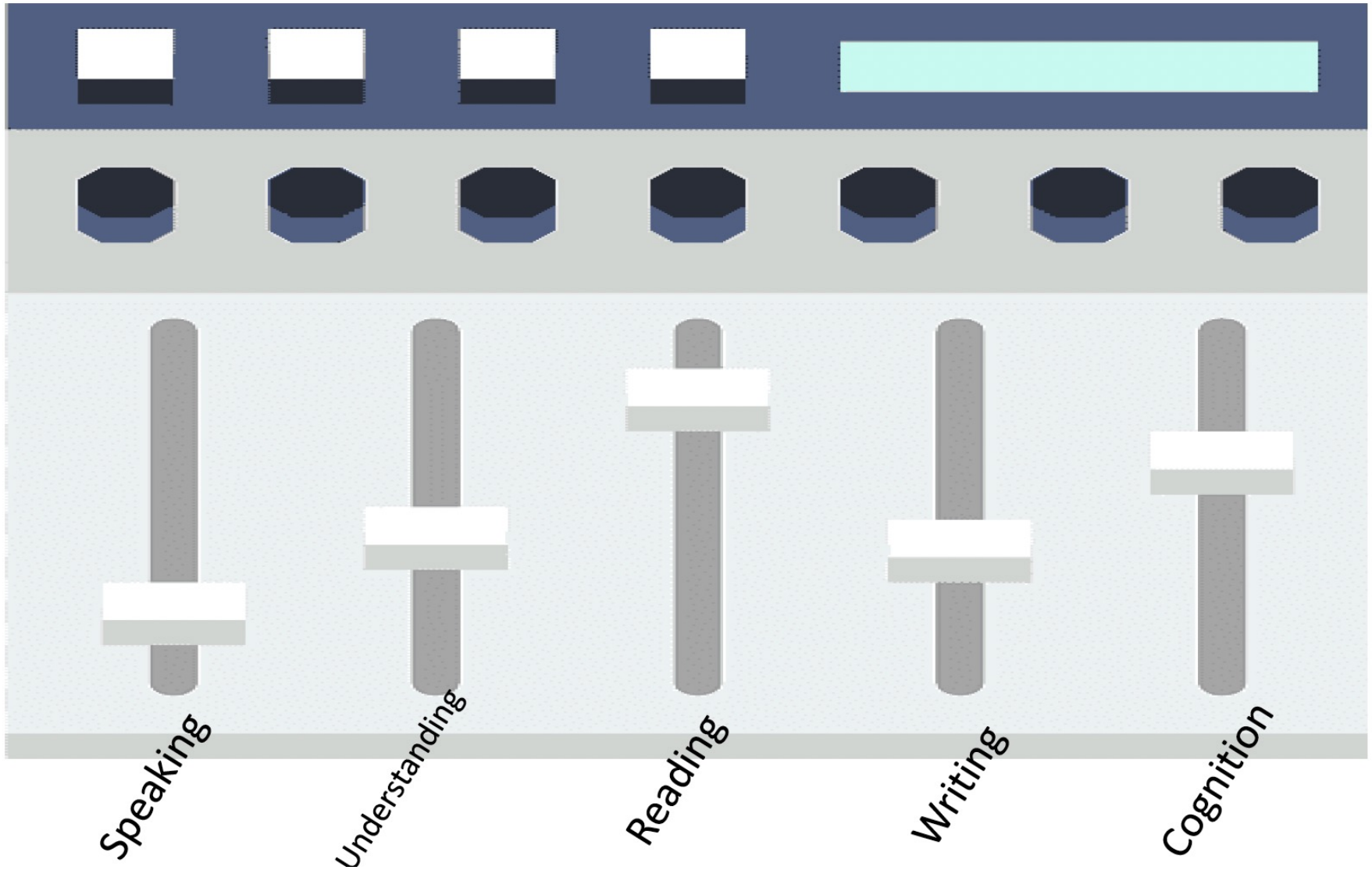
Figure 10-3 An illustration of typical sites of neural injury resulting in aphasia. This illustration demonstrates the typical 1:1 lesions associated with these syndromes. It is important to not confuse the correlation of structure with that of function. There is considerable variability in lesion sites with respect to damage to cortical and subcortical tissue.





Brain of Patient "Tan", preserved in a museum in Paris

Individual variability in aphasia



In-class activity

Discuss: Patients with lesions in Broca's area experience severe difficulty producing speech, yet their ability to sing lyrics is unaffected. What does this suggest?