Moodle

**WHAT DID WE DISCOVER about language networks, and their functional organization/distribution in relation to cognitive tasks thanks to fMRI?**

*watch Ellman, min. 44 – 50 mins*

**How to find out where language is in the brain?**

genetic glitches

SLI and dyslexia

types of aphasia

brain injuries – physical, stroke, seizures

**SCANs show**

interconnection and overlap of the areas;

correlation of thinking and speaking w hemodynamic images reflecting blood oxygenation in response to diverse stimuli

connection btw a stimulus and the blood flow/ brain activity that shows language areas engaged by tasks

identification of functions performed while using language

**brain areas are multifunctional and overlap**

are interconnected thru neural pathways > FUNCTIONAL NEURAL ANATOMY

are active while doing language, e.g. deciding, seeing, etc. are “activities”

**… tasks involved in using language are complex by definition**

representative SCANS/images of listening, hearing, etc. are composites of images gained from patients undergoing identical task-targeted screening

* **A new sort of MAP = web of threads**

Typical patterns / language functions of reading words

of hearing words

of thinking abt words

of saying words

of processing ir/regular verbs or common vs. abstract nouns

the functions are performed simultaneously

the process is SCATTERED/ distributed but COORDINATED

e.g., to produce a word/sentence – unfinished products are shuttled in-btw regions until they become final products

gradual build-up of a map based in functional neural anatomy: Box 3.5

STG and STS areas: Accessing and integrating syntactic structures and semantic information

MTG, ITG, STS – mapping sound to meaning

MTG – accessing meaning of written words

STG and SMG – integrating what’s heard with sequencing sounds

Spt – integrating motor and auditory aspects of sounds

vocal tract-produced sounds, linguistic and non-linguistic

production and image of sounds

region for learning new words

region for short-term verbal memory

word meaning regions in relation to diverse tasks: mapping sound to meaning, accessing meaning of what’s written, etc.

speech perception distributed over both hemispheres vs. speech production - left-lateralized

Language is networked together with non-linguistic cognition;

Language interconnects **cortex** areas with subcortical regions through **connective tissues** > the old parts of the brain that get recruited in humans for l. such as basal ganglia;

most language centers are in the **left hemisphere – seeing language, hearing L, comprehending, articulating, et al. and networked in with other areas:**

**to articulate** implies to move lips, to imagine the words/hear them internally and link them to meanings

**to share or comprehend meaning** happens in diverse centers

**to remember** happens in diverse centers depending on what it is to be remembered – shopping list, sequence of #s, an event, a story…

showing and saying what’s *a spiral* activates regions of articulation and comprehension but also the visual cortex imagining spiraling

saying *cow* activates auditory cortex but also the area where the sound cows make is imagined

saying *he kicked me* activates not only speaking centers but also the leg motion center

externalizing thoughts linguistically is divided >

tracks for complex (**dorsal track**) vs. simple sentences (**ventral track**)

hearing sounds is divided >

tracts for affective tones/sounds vs. language sounds

tones, long sounds, clicks get tracked depending on whether linguistic or paralinguistic

hearing *sin* and *thin*, *sit* and *seat* activates also an area of phonology analysis

articulating activates also an area for analyzing syllables and phonology

gesturing causes a different cortical activation than signing for language

2 additional analogous language tracts in the left hemisphere: WEB 3.4

**how** is an object used vs. **what** is it/ what is seen?

LEFT HEM WEB 3.2-3

analyzes through right visual cortex

deals w lexicon and syntax, w writing and speaking

includes 2 hotspots coordinating linguistic activity in neural tracks

* BROCA’s motor/ expressive region, if injured >problems w word retrieval, matching word to meaning, speech fluidity, sentential breaks and inton

the connection of mechanical and cognitive functions is impaired

inability to articulate doesn’t impede the movement of lips or tongue

comprehension is unaffected

why couldn’t the Broca’s injury patient get the meaning of *the boy was chased by the girl* but could get *the mouse was chased by the cat*?

near BROCA’s region – a region of lip and mouth control for language

a bit further - a region of hand, fingers and arms control (that colonize the next-door region in deaf-mute speakers)

* WERNICKE region injury > problems w comprehension but fluid speech

functional disconnect of articulation and meaning

able to say routine phrases but no thoughtful revelation of ideas

RIGHT HEM

analyzes through left visual cortex

deals with linguistically expressed emotion

with understanding space relations

with basic routine speech

To SUM:

moving lips doesn’t imply…

moving hands doesn’t imply…

speaking in good rhythm, sequencing and intonation doesn’t imply…

understanding instructions doesn’t imply… ability to repeat them