**Language, Speech**

Last updated: May 8, 2019

**PEDIATRIC DEVELOPMENT STAGES**

6 months – beginning of distinct **babbling**.

1 year – **1-word speaker** (language understanding, 1 or more poorly pronounced words).

2 years – **2-word (telegraphic) speaker** (žodynas > 50 žodžių, kalba dvižodėmis frazėmis).

3 years – **3 word sentences** (žodynas ≈ 1000 žodžių).

4 years – close to **adult** speech competence.

**ANATOMICAL BASIS**

- **localized to** **NEOCORTEX**! (vs. **memory** and **learning** are functions of large parts of brain).

- **human neocortical mantle is highly developed** → speech and other intellectual functions.

- **primary language areas are in** **PARASylvIAN AREA of dominant (categorical) hemisphere**:

  **Wernicke center** – **auditory association cortex** - memory of images that represent word as heard / seen (receptive speech), i.e. comprehension of auditory / visual information (visual information prieš tai turi būti apdorota in angular gyrus).

  *Planum temporale* (superior surface of temporal lobe posterior to Heschl's gyrus and extending to posterior end of sylvian fissure), is slightly larger on left (Wernicke center).

  **Arcuate fasciculus** – projection from Wernicke to Broca.

  **Broca center** – **motor association cortex** - memory for word articulation (expressive speech); processes information received from Wernicke area into detailed coordinated pattern for vocalization → projects pattern (via speech articulation area in insula) to motor cortex → appropriate movements of lips, tongue, larynx → speech.

  **Angular gyrus** (behind Wernicke area and connected to it) processes information from **read words** in such a way that they can be converted into **auditory forms** of words in Wernicke area.

  - Ž angular gyrus patenka informacija iš **unimodal association cortices** (tiek iš visual, tiek iš auditory); jei išgirstą / pamatytą žodį tereikia pakartoti, informacija iš Wernicke / visual association cortex ž Broca eina apleńkdama angular gyrus.
- Angular gyrus is **heteromodal association cortex** - semantic interpretation (meaning) and integration with other sensory modalities and passed experiences.

Second language & Broca area
- If individual learns second language in **adulthood**, portion of Broca area associated with it is **adjacent to but separate** from area associated with native language.
- In **children** who learn two languages **early in life**, there is only **single** area involved with both (children acquire fluency in second language more easily than adults!).

**WERNICKE-GESCHWIND model** for language & gestures

**Person names visual object:**

Person is asked to **raise right hand**; 
Person is asked to **raise left hand**.
N.B. norint pagal komandą pakelti kairę ranką, reikalingas CORPUS CALLOSUM (jei jis pažeistas → kairės rankos ideomotorinė apraksija).

PET of left cerebral hemisphere:
A: **Looking at words** activates *primary visual cortex* and part of *visual association cortex*.
B: **Listening to words** activates area at *junction of temporal and parietal cortex*.
C: **Speaking words** activated *Broca's area* and adjacent frontal lobe.
D: **Thinking about words** activates *large areas* (including much of frontal lobe).

**DISORDERS**

If patient cannot talk properly consider **five Ds**:
1. Deafness
2. Dementia
3. Dysphasia
1. **Language disorders** – kalbos, kaip *bendravimo priemonės*, sutrikimas. see S2 p.

2. **Speech disorders** – mechanical disorders of oral communication: see S3 p.
   - **Dysphonia** – disturbance in *phonation-vocalization* (voice production).
   - **Dysarthria** – disturbance in *articulation* of individual sounds.

**BIBLIOGRAPHY**

NMS Neuroanatomy 1998
Ganong “Review of Medical Physiology”, 2002
McPhee, Lingappa, Ganong “LANGE Pathophysiology of Disease”, 2002
Weiner “Neurology (House Officer Series)”, 5th ed., 1994 (P9-P15 p.)