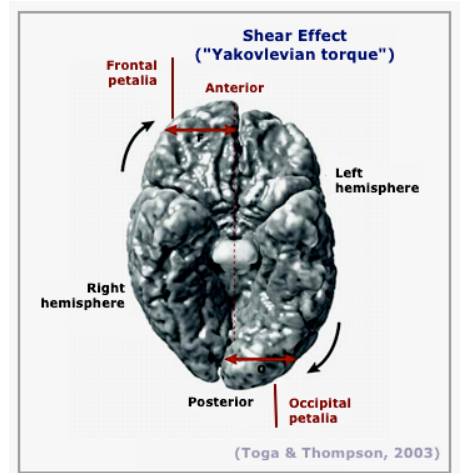


## Cerebral Asymmetry • Hemispheric Lateralization

**Asymmetry** = Difference between each hemisphere (“A” = not + “sym” = the same + “metry” = measurement)

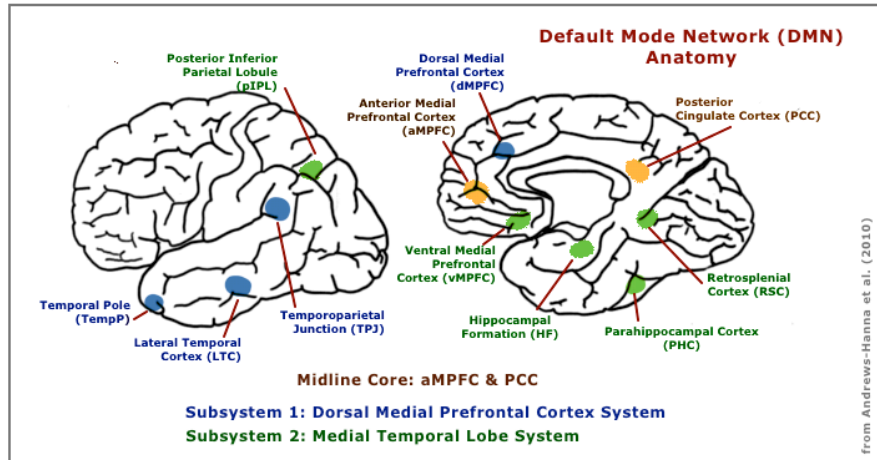
Anatomical (differences in structure; Watkins et al. 2001)

- “Shear” effect (“Yakovlevian torque”): frontal lobe (R > L) and occipital lobe (L > R) in most individuals (see figure)
- L > R: planum temporale, angular gyrus
- R > L: cingulate sulcus, caudate nucleus, anterior insula



Recent Insights (Nielsen et al, 2013)

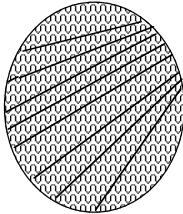
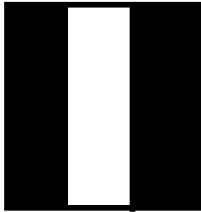
- Left-dominant networks include “regions from the default mode network (medial prefrontal cortex, posterior cingulate cortex, and temporoparietal junction) and language regions (e.g., Broca Area and Wernicke Area)”
  - Default mode network (DMN): Greater activity during resting state rather than when performing a task. May be involved in attending to internal stimuli, internal narrative, or self-reflection.
    - Considering one’s own present mental state (Subsys 1/dMPFC)
    - Episodic decision making about the future (recalling past & thinking ahead) (Subsys 2/MTL)
    - Both subsystems are active when spontaneously thinking (daydreaming, etc.)



- Right-dominant networks include “dorsal and ventral attention networks and the cingulo-insular or salience network...This network is more active during tasks requiring attention to external stimuli or assessment of stimulus salience or novelty...Right lateralization of external stimulus attention is consistent with lesion studies reporting much greater incidence of hemispatial neglect following right-hemispheric injury, particularly associated with lesions to regions of the ventral attention network.” (Nielsen et al., 2013, p. 7)

What is **NOT** true

- “Preferred Cognitive Styles” arising from using or favoring one hemisphere more than the other. There is **no empirical evidence** for this. People are not “left brained” or “right brained”.

Focus/Function	Left Hemisphere	Right Hemisphere
Older Theory	Verbal materials only	Nonverbal materials only
<b>Mode or Style of Processing</b> (How data are processed)	Details, parts, pieces	Gestalt, overall configuration; global form
<b>Spatial Frequency Hypothesis</b> (What data are processed)	High spatial frequency: many and frequent visual changes 	Low spatial frequencies: few visual changes 
<b>Visual system</b>	<ul style="list-style-type: none"> <li>Letters, words</li> <li>Face: Subtle differences</li> </ul>	<ul style="list-style-type: none"> <li>Complex geometric patterns</li> <li>Face: Overall configuration</li> </ul>
<b>Auditory system</b>	<ul style="list-style-type: none"> <li>Language-related sounds</li> </ul>	<ul style="list-style-type: none"> <li>Nonlanguage environmental sounds</li> <li>Music</li> </ul>
<b>Somatosensory system</b>	<ul style="list-style-type: none"> <li>(None identified)</li> </ul>	<ul style="list-style-type: none"> <li>Tactile recognition of complex patterns</li> <li>Braille</li> </ul>
<b>Movement</b>	<ul style="list-style-type: none"> <li>Complex voluntary movement</li> </ul>	<ul style="list-style-type: none"> <li>Movement in spatial patterns</li> </ul>
<b>Memory</b>	<ul style="list-style-type: none"> <li>Verbal memory</li> </ul>	<ul style="list-style-type: none"> <li>Nonverbal memory</li> </ul>
<b>Language</b>	<ul style="list-style-type: none"> <li>Speech</li> <li>Reading</li> <li>Writing</li> <li>Arithmetic</li> </ul>	<ul style="list-style-type: none"> <li>Prosody (rhythm, stress, intonation, emotional state of speaker, emphasis, etc.)</li> </ul>
<b>Spatial processes</b>		<ul style="list-style-type: none"> <li>Geometry</li> <li>Sense of direction</li> <li>Mental rotation of shapes</li> </ul>

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