



# Brain Damage and Impairment A Brief Overview of Brain-Behavior Relationships

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	Function	Region/lobe	Structures
Normal Language Processing	Production: <ul style="list-style-type: none"> <li>• Articulation</li> <li>• Motor processes for production</li> </ul>	Dorsal Region	<ul style="list-style-type: none"> <li>• Middle frontal gyrus</li> <li>• Inferior frontal gyrus (IFG) Pars opercularis</li> <li>• Inferior frontal gyrus (IFG) pars triangularis</li> <li>• Precentral gyrus</li> <li>• Postcentral gyrus</li> <li>• Supramarginal Gyrus</li> <li>• Anterior insula</li> <li>• Posterior insula</li> <li>• Putamen</li> <li>• Globus pallidus</li> </ul>
	Perception/ Comprehension: <ul style="list-style-type: none"> <li>• Word recognition</li> <li>• Semantic processing</li> </ul>	Bilateral Ventral Regions	<ul style="list-style-type: none"> <li>• Inferior frontal gyrus (IFG) orbitalis</li> <li>• Angular gyrus</li> <li>• Superior temporal gyrus (STG)</li> <li>• Pole of the superior temporal gyrus (STG)</li> <li>• Middle temporal gyrus (MTG)</li> <li>• Pole of the middle temporal gyrus (MTG)</li> <li>• Inferior temporal gyrus</li> <li>• Posterior superior temporal gyrus (STG)</li> <li>• Posterior middle temporal gyrus (MTG)</li> <li>• Middle occipital gyrus</li> </ul>

	Behavior/ Diagnosis	Associated Lesion Sites
Lesion Sites & Associated Behaviors	Apraxia of Speech	<ul style="list-style-type: none"> <li>• Precentral gyrus</li> <li>• Postcentral gyrus</li> <li>• Supramarginal gyrus</li> <li>• Supplementary motor area</li> </ul>
	Allocentric (Object-Centered) Neglect	<ul style="list-style-type: none"> <li>• Parietal cortex (right hemisphere)</li> <li>• Middle occipital gyrus (right hemisphere)</li> <li>• Middle temporal gyrus (MTG) (right hemisphere)</li> <li>• Superior temporal gyrus (STG) (right hemisphere)</li> </ul>
	Egocentric (Person-Centered) Neglect	<ul style="list-style-type: none"> <li>• Precentral gyrus (right hemisphere)</li> <li>• Middle frontal gyrus (right hemisphere)</li> <li>• Insula (right hemisphere)</li> </ul>
	Spastic Dysarthria	<ul style="list-style-type: none"> <li>• Upper motor neurons in motor cortex</li> </ul>
	Flaccid Dysarthria	<ul style="list-style-type: none"> <li>• Cranial nerves in pons (CN V, VII)</li> <li>• Cranial nerves in medulla (CN IX-XII)</li> </ul>
	Ataxic Dysarthria	<ul style="list-style-type: none"> <li>• Cerebellum</li> </ul>
	Hyperkinetic & Hypokinetic Dysarthria	<ul style="list-style-type: none"> <li>• Basal ganglia control circuits:               <ul style="list-style-type: none"> <li>○ Caudate</li> <li>○ Putamen</li> <li>○ Globus pallidus</li> </ul> </li> </ul>

	Structural Connectivity	Functional Connectivity
Brain Connectivity	White matter connections that directly connect different grey matter regions <ul style="list-style-type: none"> <li>• Ex: Broca's and Wernicke's areas are connected by the arcuate fasciculus, a large white matter pathway.</li> </ul>	Brain regions that may not be structurally connected but demonstrate coherent activity during rest or a task <ul style="list-style-type: none"> <li>• Ex: The "executive control network" has been studied by many researchers to explain goal-directed behavior. This network is comprised of dorsolateral frontal and parietal cortical regions, and research has shown that these areas demonstrate similar patterns of activity in resting conditions which predicts performance on executive function tasks</li> </ul>