The left posterior inferior frontal gyrus (pIFG) is a part of the articulatory network I involved in motor syllable programs. The articulatory network itself contains three cortical areas; the posterior inferior frontal gyrus, the premotor cortex, and the anterior insula. These systems are interrelated but each has specific independent functions in speech comprehension and production. This system acts mostly when the vocal tract opens and closes during syllable production. Considered a “controller” of the motor aspect of speech production, the pIFG does not directly interact with the vocal tract; instead, it acts indirectly through the motor cortex. The posterior inferior frontal gyrus, connected to Brodmann Area 44, codes motor programs for this system while the auditory cortex (via the Spt) houses a series of sensory targets. Together, these areas function as a sensory-motor loop for syllable information coding.

In a study conducted comparing phonological and arithmetic processing and the involvement of different sections of the interior frontal gyrus and angular gyrus, cortical activation for phonology, subtraction, and multiplication tasks was compared. The predetermined language-calculation network was limited to the left inferior frontal gyrus, angular gyrus, superior parietal lobule, and the horizontal portion of the intraparietal sulcus. The results were significant to support that there was a pattern of left lateralization for each of these tasks all activating the Perisylvian fissure network, with some general localized areas for phonology and arithmetic. It was supported that phonology activated the pIFG and anterior angular gyrus, multiplication mainly implicated the anterior inferior frontal gyrus and the posterior angular gyrus. These systems are activated through similar neuronal processes but independently placed along the network.

The left inferior frontal gyrus (IFG) is also extremely important for language comprehension and production due to the fact that most language processing takes place in the left hemisphere. Commonly known as “Broca's area”,persons with damage in this region often have a type of non-fluent aphasia known as Broca's aphasia. Broca's area is located on the left hemisphere of the brain and encompasses Brodmann's area 44 and 45. Both overall have contributions to verbal fluency, but each has its own specific contribution. Area 44 is involved in the language production and phonological processing due to its connections with motor areas like the mouth and tongue. Area 45 is a part of the anterior inferior frontal gyrus and is involved in semantic processing. Characteristics of Broca's aphasia include agrammatic speech, relatively good language comprehension, poor repetition, and difficulty speaking. Persons with Broca's aphasia do not have deficits in language comprehension; however, they speak mostly in short utterances of a few words at a time, mostly nouns. Their speech is limited to short sentences, and producing sound is a very difficult task for those affected. The left IFG has also been suggested to play a role in inhibitory processes, including the tendency to inhibit learning from undesirable information. For example, TMS to the left IFG has been shown to release such inhibition, increasing the ability to learn from undesirable information.

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