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What Are Executive Functions?

As one advances hierarchically through the animal chain, a larger portion of the brain's cortex is devoted to the frontal structures. This region of the brain is the most modern in evolutionary development, and it is the last to develop and mature in an individual.

The frontal lobes of the brain are marked by their neuroanatomic diversity. The frontal lobes have numerous connections to other sections of the brain, and the functions they carry out are the product of information collected from many locations in the central nervous system.

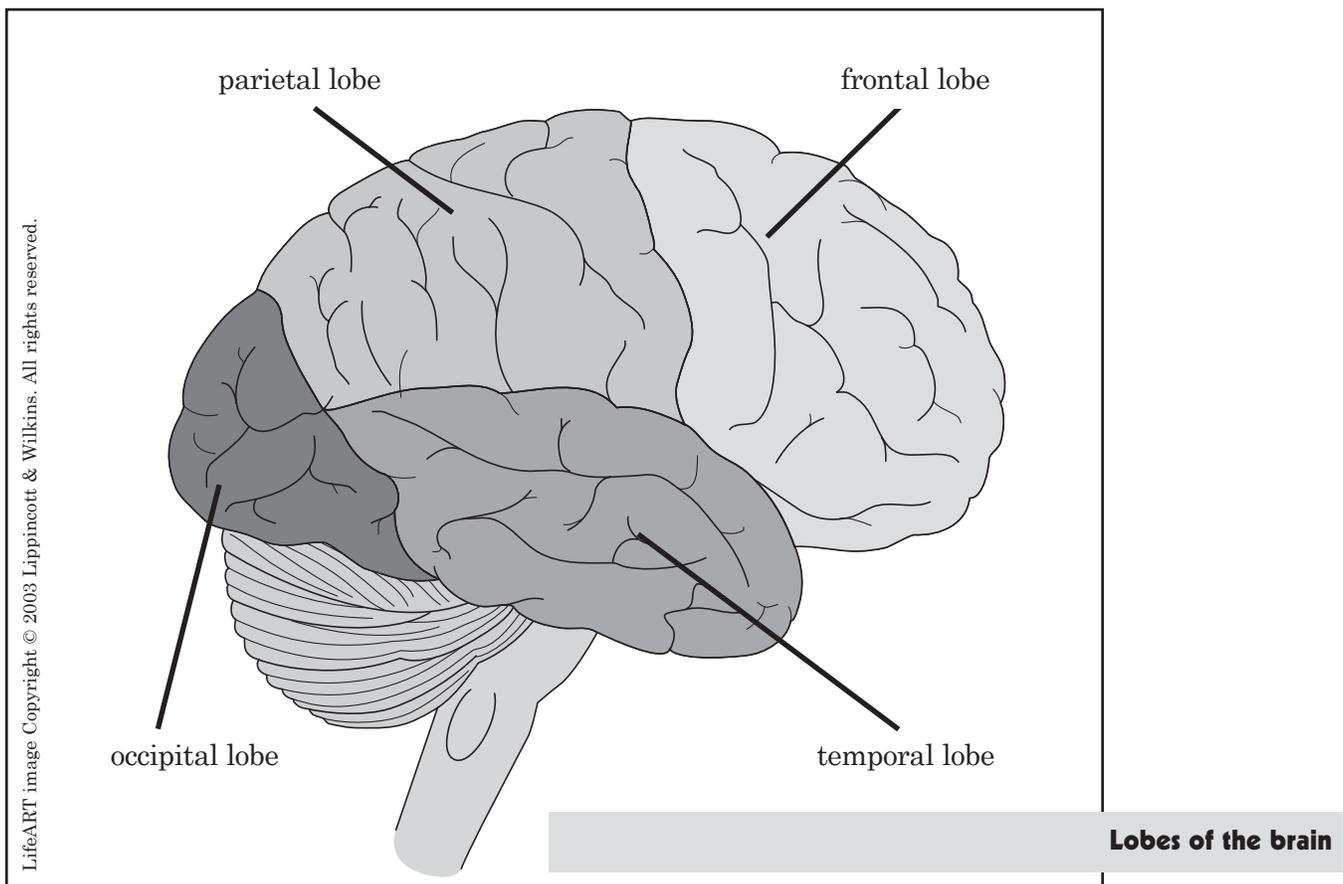
The frontal lobes are not only accountable for primary cognitive functions but also for coordinating and actualizing the activities involved in cognitive processing. The frontal lobes coordinate input from other sections of the brain, and they function to organize and regulate behavior necessary to reach accomplishment of certain tasks. The frontal lobes are fundamental to the executive functions of anticipation, goal selection, planning, self-monitoring, use of feedback, and completion of purposeful activities.

The anatomical positioning of the frontal lobes leaves them sensitive to injury. They rest against rough, bony protuberances of the inner, anterior skull and, as the result of head injury, are easily scratched or bruised. Damage to the frontal lobes results in a combination of behavioral and emotional deficits and cognitive problems—specifically, decreased executive functions.

What are Executive Functions?

Executive functions do not portray a single, distinct process. Instead, executive functions perform as a collective service that comes into play with all facets of cognitive processing. Executive functions are a collage of cognitive activities that encompass the ability to design actions toward a goal, to handle information flexibly, to realize the ramifications of behavior, and to make reasonable inferences based upon limited information. Additionally, executive functions can be thought of as encompassing such activities as anticipation, goal selection, planning, initiation of activity, self-regulation or self-monitoring, and use of feedback. The executive functions are detailed functions of logic, strategy, planning, problem solving, and reasoning.

Impairment of any or all of these executive functions may be present in spite of strong intellectual skills and unaffected language capacity. When executive functions are impaired, all other cognitive systems have the potential to be affected, even though those same systems may remain undiminished in isolation. Individuals with executive function impairments have difficulty with planning and organization. They are unable to identify what needs to be done and/or are unsure of how to accomplish the



steps to completion in an orderly way. Individuals often appear inattentive and disorganized. Frequently, they miss deadlines, are late for appointments, or overschedule themselves. People with executive function impairments demonstrate difficulties with initiation as well as experience pitfalls in beginning tasks. This may be evident by the person sitting idle when directly asked to do something, or in a more subtle form, by someone appearing less spontaneous or less energetic than might otherwise be expected. Once the person begins a task, he or she may have problems maintaining attention to the task or in persisting to the end. With executive function impairments, self-monitoring and self-regulation become arduous. People with executive function disorders are inconsistent in their performance and have problems integrating feedback or suggestions.

Executive function disorders are characterized by the following:

- difficulty with planning and organization
- trouble identifying what needs to be done
- problems determining the sequence of accomplishment
- difficulty carrying out the steps in an orderly way
- difficulty beginning tasks
- problems maintaining attention
- trouble evaluating how they are doing on a task
- difficulty taking feedback or suggestions

Case Studies

1. KB is a 35-year-old male who was injured when a ceiling fell on him.

He reportedly lost consciousness for a short period of time (5-10 minutes) and was taken to the emergency room. He was treated and released. Since that time, he reported being unable to work and experienced a variety of physical, cognitive, and emotional difficulties. He reported difficulties with attention, organization of thought in both speaking and writing information, and poor time management. KB earned a B.A. degree from a large university and, at the time of his accident, owned a special events planning business. At the time of his injury, he had several events mid-project, which he completed, but per his and his clients' reports, at a substandard level. Since completing these projects, he has been unable to accept new projects or solicit new clients stating, "I know I should, but I just can't seem to do it."

2. LE is a 33-year-old female who was in a car accident. She reported loss of consciousness for a "few minutes." She noticed a decline in her memory since the accident, but she attributed this to medication she was taking for the back

pain she developed from the accident. The changes in memory persisted even after she discontinued use of the medication. At the time of the accident, LE was enrolled in the last quarter of an M.B.A. program in finance and international business, earning A grades. She completed her last quarter, earning C grades and feeling she “learned very little.” LE has been unable to look for a job since completing her degree. She says that she “reads the paper and doesn’t see any jobs” appropriate for her. She has not developed a resumé nor enlisted the help of her college placement department. She has moved back home with her parents.

- 3. JW is a 48-year-old male diagnosed with a left frontal lobe brain tumor.** The tumor was resected and found to be benign. No chemotherapy or radiation was indicated. JW described struggling to keep up the responsibilities of his job as a director at an advertising agency. He reported daydreaming during meetings, missing important meetings even though he had thought about them earlier in the day, and being unable to do more than one thing at a time.
- 4. PS is a 42-year-old male who was in his usual state of good health when he fell off his bike and lost consciousness.** A CT scan identified a skull fracture on the left with blood present in the right frontal area. Since the accident, he noted decreased concentration, short-term memory difficulties, and organizational problems. He is a self-employed manufacturer’s representative and a single father of four children ages 7-18 who live with him. PS’s major complaints revolved around home activities as opposed to work. He reported frequently failing to finish the laundry and finding wet clothes days later in the machine. He was often late for scheduled pick-ups of his children and reported feeling very irritable when helping with homework, a task he previously enjoyed doing.