

The Brain's "CEO"

The role of executive function in human behavior is to coordinate the many brain activities needed to set goals, make plans to attain those goals, organize steps to carry out those plans, and ensure that the desired outcomes are achieved. This capacity can be likened to that of a company's chief executive officer. Psychologists are not in full agreement, but most acknowledge that multiple executive functions are mediated by the frontal lobes. The ones described below are engaged often.

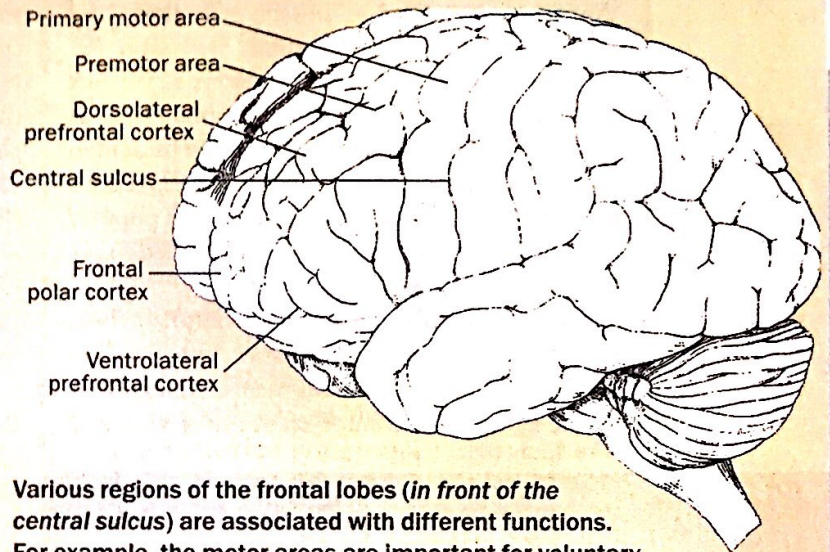
Abstract thinking. Discerning relations among stimuli—seeing the forest for the trees—depends on abstract thinking. Imagine being asked to group into two sets of objects a pair of scissors, a water glass, an ax and a wheelbarrow. You might decide that the scissors and the water glass go together because they are used indoors, whereas the ax and wheelbarrow are used outdoors.

Attention shifting. Can you find another grouping? Scissors and axes cut, glasses and wheelbarrows contain. Many people with executive deficits find it hard to shift attention and inflexibly hold on to their original perceptions and behaviors, even when the usefulness of these associations has long expired.

Information manipulation. Nearly all higher-order cognitive operations require the real-time manipulation of information held in short-term memory. To prepare for a dinner party, a host has to juggle multiple timetables of when different foods will be cooked as well as consider the likes and dislikes of guests.

Planning and foresight. Preparing for a vacation requires foresight and analysis of the conditions and needs at the destination, which may be very different from the conditions and needs at home. A patient with executive dysfunction is often unable to escape the present to form a mental model of a future that is different.

Monitoring and error correction. These processes are engaged when results do not correspond with intentions.



Various regions of the frontal lobes (in front of the central sulcus) are associated with different functions. For example, the motor areas are important for voluntary movement. The prefrontal cortex mediates executive functions.

This effect could be seen, for example, in a woman who drives to a special bakery to buy a pie for a dinner party she is throwing that evening and finds it is closed. She might go to another bakery on the other side of town without considering that the trip would not allow her to get back home until long after the guests had arrived.

Decision making. Consider a man who is having trouble making ends meet. He could cut expenses or increase income, either path requiring him to weigh options, arrive at a decision and see it through. Patients with executive difficulties cannot settle on a choice, particularly in situations where the correct response is not obvious or previously learned. They may blindly follow other people's suggestions, which is why they can be easily exploited.

Inhibition. Automatic responses can be unhelpful or even harmful. Imagine you have just won a major award; your reaction would be to tell everyone your news. But waiting until other finalists are properly informed of their loss requires inhibition.

Social functioning. Failure to appropriately process or output social cues can have devastating consequences. The main concern of one frontal lobe dementia patient, on seeing that his wife was cut and bleeding badly from an accident involving a power tool, was that the tool be cleaned as soon as possible. —B.L.

Recording multiple instrumental and vocal tracks and fitting them into a coherent whole relies on manipulating many streams of information held in short-term memory, a key executive function. Whereas other producers at the time

recorded relatively simple songs in a single "take" performed by the entire group, Wilson held in his mind intricate symphonic arrangements and harmonies, recorded parts separately, then later put together the pieces of the puzzle. The song "Good