

Frontal lobe and its function psychology



**ASSIGN
BUSTER**

The human brain is a very complex structure; it is the center of our nervous system. One of the most important parts is the frontal lobe. The frontal lobes are responsible for what is known as the executive functions which include things like motor function, problem solving, spontaneity, memory, language, initiation, judgment, impulse control, and social and sexual behavior (“frontal lobes,” 2010). The focus of this paper will be the physiology of the frontal lobes, explain how the frontal lobes relate to the rest of the brain, and its functions. We will also look at some of the early lobotomy procedures performed in the past, what happens when the frontal lobes are damaged, and characteristics of the patients in whom they were performed.

The frontal lobe, which is made up of the primary motor cortex and the prefrontal cortex, “extends from the central sulcus to the anterior limit of the brain” (Kalat, 2004). The posterior part of the frontal lobe specializes in the control of fine movements. Separate parts are responsible for separate parts of the body “mostly on the contralateral side but also with slight control of the ipsilateral side (Kalat, 2004). Then there is the anterior part of the frontal lobe which is formed by the prefrontal cortex. Neurons in the prefrontal cortex tend to have large dendrites that are covered with “more dendritic spines than dendrites in other cortical areas” resulting in the prefrontal cortex integrating large amounts of information (Kalat, 2004). Other research has found that the prefrontal cortex is important for working memory and especially for the delayed-response tasks. People with prefrontal cortex damage usually have problems modifying their behavior “in relation to the context” so they have trouble reacting socially appropriate and tend to have impulsive reactions (Kalat, 2004).

There are some asymmetrical differences between the left and right frontal lobe. The left frontal lobe is involved in language control that is related to movement while the right frontal lobe is more involved in “ non-verbal abilities” (“ frontal lobes,” 2010). Although not all researchers agree, with some stating that both lobes are involved in all behaviors. The frontal lobes are also thought to play a part in our spatial orientation, including our body’s orientation in space” (“ frontal lobes,” 2010). Other functions of the frontal lobe include understanding humor, according to a study conducted by Dr. Stuss at the University of Toronto “ people with right anterior frontal damage had the most disrupted ability to appreciate written and verbal jokes” when compared to people in the control group and people with lesions in other brain regions (“ frontal lobes,” 2010).

LOBOTOMIES

Lobotomies became extremely popular after laboratories reported changes in primates that had suffered damage to the prefrontal cortex. The primates seemed to act tamer and were not otherwise impaired by the damaged they had suffered to their frontal lobes. In the late 1940’s and early 1950’s “ about 40, 000 prefrontal lobotomies were performed in the United States, many of them performed by Walter Freeman, a medical doctor untrained in surgery” (Kalat, 2004). Said lobotomies were performed in the frontal lobe, where the prefrontal cortex was disconnected from the rest of the brain. Some of the known consequences of prefrontal lobotomies include apathy, loss of ability to plan or take initiative, distractibility, and loss of emotional expressions. Some people even “ lose their social inhibitions, ignoring the rules or polite, civilized conduct” (Kalat, 2004).

DAMAGE TO FRONTAL LOBES

The frontal lobes are extremely vulnerable to injury given their location at the front of the brain “ proximity to the sphenoid wing and their large size” (“ frontal lobes,” 2010). It is well known that people with frontal lobe lesions can be impaired when it comes to verbal and visual memory tests, according to McDonald et al. (2006) this would indicate that the frontal lobes are involved in learning and recalling information. The frontal lobes seem to be in control of complex motor movements. Damage to the frontal lobes are often characterized by “ loss of fine movements and strength of the arms, hands and fingers” (“ frontal lobes,” 2010). Kolb and Milner (1981) found that patients with frontal lobe damage often show little spontaneous facial expressions and have trouble recognizing said facial expressions. In the study participants with frontal lobe damage were asked to perform various tasks. Findings show that participants with frontal lobe damage “ made significantly higher numbers of intrusion, omission, and sequential errors than any of the others patient groups in both, exercising consisting of facial expressions and arm movements (Kolbs & Milner, 1981). One of the most common characteristics of patients after suffering from frontal lobe damage is a “ difficulty in interpreting feedback from the environment, risk taking and non-compliance with rules.” Some other changes can be seen in personality and even sexual behavior, with dramatic changes in social behavior (“ frontal lobes,” 2010). According to Owens et al. (1990), patients with frontal lobe damage lack initiative and organizational skills for everyday life. They describe the case of young woman with a frontal lobe tumor, who was unable to plan a full meal for her family, but could easily prepare the

each dish separately. Their findings show that people with frontal lobe damage are “ significantly impaired in a computerized version of the Tower of London test, a series of problems requiring higher level planning ability.” These findings are consistent with previous literature that has reported slow, apathetic responses in people with frontal lobe damage. Frontal lobe impairment on the Tower of London test “ can also be interpreted in terms of the observed strategy deficits in the spatial working memory test” (Owens et al, 1990).

Frontal lobe epilepsy is the second most common type of partial epilepsy, it accounts for 20-30% of all partial epilepsies (Patrikelis et al. 2009). Symptoms of frontal seizures might include “ bizarre movements and vocalizations, contralateral clonic movements, unilateral or bilateral tonic motor activity, and complex behavioral automatisms.” Also, disturbance of consciousness is likely to occur in frontal lobe epilepsy. Patrikelis et al. (2009) also state that overall patients with frontal lobe epilepsy show deficits in tests of social cognition, and humor appreciation and detecting emotional expressions are impaired.

A study conducted by McDonald et al. (2006) looked at memory impairments in patients with frontal lobe damage. The main focus of the study was to examine directed forgetting in people with left or right frontal lobe lesions compared to a control group. Participants were exposed to 3 different variables, “ directed instructions to remember or forget a word list, encoding instructions to learn or judge each individual word, or the test format (free recall and recognition).” Their findings suggest that both control and frontal lobe damage patients show inhibition when tested using free recall methods,

“ poor encoding processes may lead to deficits in recall performances in patients with left frontal lobe damage, and to a lesser degree in patients with right frontal lobe damage” (McDonald et al., 2006).

Farrant et al. (2005) found that there was some impairment on an advance test of Theory of Mind or social understanding. Participants also showed impairment on a humor appreciation task, and like previous research, they also found impairment in facial emotional recognition and on tests that required inferring mental states from gaze expressions. These results show that frontal lobe epilepsy patients are not only impaired in executive functioning, but also on social cognition.