Physiology of Volition

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Summary. The idea of free will is a conscious awareness of the brain concerning the nature of the movement that it produces. There is no evidence for it to be a driving force in movement generation. This review considers the physiology of movement generation and how the concepts of willing and agency might arise. Both the anatomical substrates and the timing of events are considered. Movement initiation and volition are not necessarily linked, and one line of evidence comes from consideration of patients with disorders of volition. Movement is generated subconsciously, and the conscious sense of willing the movement comes later, but the exact time of this event is difficult to assess because of the potentially illusory nature of introspection. The evidence suggests that movement is initiated in frontal lobe, particularly the mesial areas, and the sense of volition arises as the result of a corollary discharge from premotor and motor areas likely involving the parietal lobe. Agency probably involves a similar region in the parietal lobe and requires both the sense of volition and movement feedback.

Keywords: free will, volition, agency, corollary discharge, frontal lobe, parietal lobe, premotor cortex, motor cortex.

1 Definition of Terms

What is volition? The common view is that it is the human process of choosing which movement to make and when to make it; it is often referred to as “free will.” I will review what is known about how the brain makes movement, and it is not clear that such a process has been identified. Indeed, to some extent it is not even clear how to recognize it. However, there is another aspect of volition which is certain, and that is that humans have the perception that their movements are freely chosen. This perception is an element of consciousness, a so-called quale, and even
though consciousness itself is not understood, we are able to investigate the perception of volition. Considerable work is being done in this area. There are two aspects of volition. One is the sense of willing a movement to occur. The second is agency, the sense that the person caused the movement that just occurred. In this situation, the person is the agent. Willing can occur without a movement happening, but to have a sense of agency there needs to be both willing and the movement.

2 Disorders of Volition

While the perception of volition is common, it is not universal. There are many neurological disorders in which movements occur without volition or with a distorted sense of volition. These disorders are of great interest in themselves, but also indicate that movement genesis is not obligatorily linked to the perception of volition. Such movements could theoretically arise in two different ways. The process of movement genesis could be aberrant. Alternatively, the process of movement genesis might involve normal mechanisms, but the linkage to the perception is faulty. Thus, if there is an aspect of volition that does indeed choose movement, it can be separated from the aspect of volition which is perceived. A brief review of some of these disorders of volition will illustrate this point.

There is the problem of involuntary movements. Patients with Huntington disease have chorea, but often do not recognize their involuntary movements early in the course of their illness. When asked about a movement, patients will say that it was voluntary. Patients with tics often cannot say whether their movements are voluntary or involuntary. They find it easier to say that they can suppress their movements or that they just let them happen.

The symptom of the loss of ability to make, or initiate, voluntary movement is often called abulia or, in the extreme, akinetic mutism. The bradykinesia and akinnesia of patients with Parkinson disease is a symptom complex of the same type, but milder. The alien hand phenomenon is the feeling that the hand does not belong to the person and is often characterized by unwanted movements that arise without any sense of their being willed. In one extreme form, called diagonistic dyspraxia, there is intermanual conflict, with the left hand performing actions contrary to actions performed by the right hand (Aboitiz et al. 2003; Scepkowski & Cronin-Golomb 2003).

Although psychogenic movements look voluntary, patients say that they are involuntary (Hallett et al. 2006). Their etiology is unknown, but they are thought to have a “psychiatric” origin, perhaps via a “conversion” mechanism. Similarly, in schizophrenia, their movements can look normal, but there is often the subjective impression of the patient that their movements are being externally (or alien) controlled.