

1. Introduction & aim

My project is situated in the domain of bioethics, also referred to as ‘the ethics of the new biosciences’, and is specifically part of the recently developed domain of *neuroethics*. Neuroethics can be broadly defined as the discipline that investigates the ethical, legal and social implications of neurological findings and neurological applications (Illes & Bird, 2006). Recent progress in (cognitive) neuroscience raises numerous ethical questions, both with regard to more practical issues (e.g. recent technological advances), as well as with regard to ancient philosophical concepts such as free will (versus determinism), personal identity through time (‘the idea of a constant self’), Cartesian dualism (versus monism) and (moral) responsibility. Although some questions are comparable to those accompanying the rise of modern genetics, there are important differences. Most importantly, brains are more directly related to selves than are genomes. Moreover, brain interventions are more easily accomplished than genetic interventions (Farah, 2005; Roskies, 2007). The question rises how neurological findings (will) influence our philosophical concepts. Moreover, because intervention at the level of our brain states implies intervention at the level of our mental states (‘our self’), we find ourselves in an ethically pregnant position (Glannon, 2007). In this project I investigate the ethics of neuromodulation. I specifically focus on current and hypothetical cases of cortical and subcortical electrical brain stimulation (by means of electrode implants) in case of psychiatric disorders (both in non-delinquents and delinquents) (e.g. paraphelia, psychopathy).

2. Objectives

The central aim of my project is to investigate the ethical and philosophical questions that accompany neuromodulation techniques, electrical brain stimulation with electrode implants in particular. This technique involves the placement of electrodes in the brain (cortically or subcortically), which are connected to a kind of ‘pacemaker’ near the collarbone, the abdomen or thigh, which can then be set on/of with a remote control (the intensity of the stimulation can also be adjusted by means of the remote control). Deep brain stimulation (DBS) as it is now being practised goes back to the work of Benabid et al. (1987) who were the first to report successful stimulation for tremor in Parkinson’s disease. The technique is now the standard surgical procedure for Parkinson related movement disorders that are refractory to pharmacological therapy. It has been experimentally applied, among others, in case of major depression, Tourette syndrome and obsessive compulsive disorder (Chou et al., 2007; Hardesty & Sackeim, 2007). Experimental applications for paraphelia are currently under consideration.

In this project, I investigate **on the one hand**:

(1) How current findings in neuroscience (may) influence philosophical concepts such as free will, personal identity through time and (moral) responsibility, and **on the other hand**

(2) How my findings regarding this first question relate to the ethics of certain neurological applications; in particular: electrical brain stimulation with electrode implants for psychiatric disorders (in non-delinquents and delinquents).

While researching part (2), I will systematically implement any findings/insights related to part (1). Both parts pertain to the possible interplay between bioethical questions on the one hand and current scientific findings on the other hand (Borry et al., 2005).

The first part of my project deals with the following questions:

(1a) what is the relationship between brain states and mental states?

(1b) to what extent can we talk about ‘free will’ from a neurological perspective?

(1c) to what extent is reductionism versus non-reductionism applicable?

(1d) to what extent does intervention in our brain infringe upon the idea of a ‘constant self’?

(1e) how do these findings (1a-d) relate to the notions moral and legal responsibility and moral and legal guilt?

The second part of my project deals with the following questions:

(2a) is electrical brain stimulation practically possible and/or ethically desirable as a treatment for psychiatric disorders (in non-delinquents and delinquents)?

- (2b) if possible/desirable, should this treatment be considered as an alternative to chemical and/or physical castration in case of sexual delinquency (and hence, should it be one of the possibilities)?
- (2c) if possible/desirable, to what extent should such treatments be related to sentencing?
- (2d) is court-ordered CNS intervention ethically sustainable? (Farah, 2007).

Design and methodology

Part 1: (a) I will classify the major philosophical positions on free will, personal identity through time and responsibility. For my licentiate thesis, I critically investigated the philosophical debate on personal identity through time and provided a systematic analysis of the main philosophical positions (e.g. Noonan, 2003; Glover, 1988; Parfit, 1984).

(b) I will research the relevant scientific findings regarding such notions as free will, personal identity through time (the idea of a ‘constant self’) and responsibility (e.g. research on brain activity related to decision making, see Bechara et al. 1994). Based upon current findings in neuroscience, I will investigate Benjamin Libet’s research in the 80’s up till now (e.g. Libet et al. 1983), which indicates that our brains make decisions before we are consciously aware of them (which questions the notion ‘free will’). I will also investigate current neuroscientific findings on brain abnormalities and how these are related to inhibitory skills and (moral) decision making (e.g. Green, 2003; Moll et al., 2005; Yang et al., 2005).

Part 2: (a) I will identify the ethical questions that accompany neuromodulation applications in general, and electrical brain stimulation with electrode implants in particular (e.g. do such techniques infringe upon the idea of a ‘constant self’). Because of the many practical and especially long-term uncertainties, ethical deliberation should always carefully weigh the short-term, middle-term and long-term pro’s and con’s that are associated with these techniques (Hardesty & Sackeim, 2007) (e.g. unforeseen side effects such as suicidal thoughts; issues related to informed consent: how does the possibility of refraining from treatment apply, considering that one’s mental states might be changed). Electrical brain stimulation with electrode implants for psychiatric conditions is still in the experimental phase, and should therefore be treated extremely cautiously. Because of the many uncertainties related to the technique, some ethicists argue that it should be restricted to these disorders that are refractory to any other treatment (Glannon, 2007).

(b) I will research the questions that I identified in 2(a) by means of standard bioethical approaches (e.g. distributive justice: should such techniques be available for criminals?; informed consent: how do mood changes reflect upon the possibility to refrain from therapy, what does it mean that ‘our self’ might change during stimulation?) (Beauchamp & Childress, 2001). Because of my collaboration with neurosurgeon Dr. Dirk De Ridder, who performs electrical brain stimulation by means of electrode implants, I will be informed with regard to the latest information and applications. Moreover, my research fellowship at the Center for Cognitive Neuroscience (Dartmouth College) enables me to fully capture the neuroscientific aspects related to this research. Thanks to the collaboration with Dr. De Ridder, as well as with forensic psychiatrist Prof. Dr. Paul Cosyns (Director of Psychiatry, University Hospital of Antwerp), I will be able to perform an ethical follow-up of specific ongoing and future case studies (e.g. neurostimulation for paraphelia).

Expected results: Based upon my findings in Part 1 and Part 2, my project will contribute to the development of an ethical decision-making framework regarding neuromodulation techniques in general and electrical brain stimulation with electrode implants in particular (both in non-delinquents and delinquents). The results of my research will be presented and discussed at international conferences and workshops, as well as in international (peer-reviewed) journals.