

Ethical Challenges Posed by Neurotechnology in Treating Disability

Zihao Huang *

Suzhou Experimental High School, Jiangsu, China

* Corresponding Author Email: 2020050492@stu.cdut.edu.cn

Abstract. As the applications of neurotechnology like DBS are increasingly accepted by the public, many people are concerned about the risk of such treatment. This paper is focused on the potential ethical issues posed by the treatment of neurotechnology. Two ethical issues, informed consent, and patient selection would be expressed in detail by analyzing case studies and other related papers. In many cases related to children, parents and doctors did not make the appropriate assessment of the risk and benefits of the treatment. Therefore, it caused needless problems on the effect of the operation and postoperative care. Furthermore, sometimes patients and doctors focus on the different risks of benefits of an operation. Firstly, parents and doctors should be responsible for children who cannot make decisions about important and risky treatment. Secondly, patients need to have a good chance of benefiting from surgery and at the same time, doctors should inform patients benefits and risks of the treatment.

Keywords: Neurotechnology, Informed Consent, Patient Selection, Deep Brain Stimulation

1. Introduction

A disability is any physical or mental condition that makes it difficult for the person to perform certain activities and engage with the world around them. Although disabled people are sometimes called one a single group, but it is actually a diverse group with different needs. Two people with the same disability can be influenced in very different ways [1, 2].

Brain-computer interfaces (BCI) allow the brain to communicate with different machines. BCI work in three main steps: collecting brain signals, interpreting the signals, and then outputting commands based on the received brain signals to machines that are linked together. A variety of tasks can apply BCI, including neurofeedback, restoring motor function in paralyzed patients, restoring communication function in patients, and improving sensory processing [5].

According to the method of collecting brain signals, the BCI can be divided into three categories. Non-invasive: EEG signals are collected by placing electrodes on the scalp, which is the outermost part. Semi-invasive: The ECoG signal is obtained from electrodes on the dura or arachnoid membrane. Invasive: Electrodes are implanted into the cortex to obtain signals directly from the brain parenchyma.

Existing ethical issues include the issue of informed consent and patient selection. This essay would detail the two issues with various specific case studies to describe the appropriate solutions.

2. The analysis of the two ethical issues

2.1. Case 1

A specific case study can effectively and accurately embody the potential ethical issues behind the application of BCI. By analyzing different cases, the measures that are used to deal with the ethical issues would be perfected.

Cochlear implants are the best option available today to rehabilitate deaf children (Lester et al., 2011). However, listening is not a passive endeavor for children newly implanted with electrodes, and keeping up with the hearing world can be tiring [3].

2.1.1 Characteristics of Pediatric Patients

There are two common characteristics of pediatric patients: Vulnerability and Alienation. Firstly, from the aspect of vulnerability, it leads to a reduction or complete loss of freedom and autonomy. Children generally have insufficient capacity to make decisions for themselves and deafness further reduces cognitive skills. Secondly, from the aspect of alienation, pediatric patients would prefer to communicate with other deaf populations, instead of the general public.

In this case study, researchers found that a majority of deaf children isolate from mainstream society and tend to join deaf communities which rely on an “other” form of communication (sign language). Community members develop shared values and attitudes toward deafness.

2.1.2 Analysis of the problems

The CRPD adopts a model of autonomy in Article 12:

- We make decisions with some support from others, but the decision is still ours
- If a person with a disability cannot communicate his/her will and preference, the best interpretation of the person’s will and preference should be used for decision making.

Therefore, parents need to be in good psychological standing to make decisions (whether or not to implant) for children. Parents in question need to be transparent to children about the consequences of implants and hear about the children’s opinions. However, the situation is more problematic because young children in their golden age for language acquisition have trouble understanding the concept of deafness & communicating their thoughts. Also, deaf parents and non-deaf parents might have drastically different preferences on this issue.

2.1.3 Suggestions

Firstly, physicians and parents must play their part. Physicians should present the viability of deaf life to parents, not just the disadvantages or “medical perspective”. Parents should communicate with children when possible and consider the issue holistically. Secondly, the institution of post-implantation rehabilitation programs is required. The institution aims to assist in children’s social and psychological adjustment to the hearing world and encourage children’s adoption of a bilingual system (spoken & sign language).

2.2. Case 2

Deep brain stimulation (DBS) has become a valuable tool for treating patients with neurological disabilities since the Food and Drug Administration approved DBS for essential tremor and Parkinson's tremor in 1997 [6].

2.2.1 Analysis of the problems

DBS is a fairly straightforward option for essential tremor because there is currently no other reliable treatment for essential tremor. Although ages would make people consider the risk of treatment, DBS is always the best choice for treating tremor. The situation at dystonia is similar. Patients seem to do well, no matter what kind of deep brain stimulation, when the structural abnormalities of the brain are not known. Secondary dystonia patients have a poor response to DBS because of structural abnormalities. PD patients may feel that DBS is an automatic next step, as the FDA has stated that DBS is not required until four years after the disease has been present. But the FDA's directive does not mean that every Parkinson's patient should receive DBS after 4 years [7].

2.2.2 Suggestions

A movement disorder specialist determines if the drug is getting the most benefit. However, a key consideration for specialists is what are the concerns patients think about. They may not match the experts. For instance, tremor is the most important symptom in PD patients. But patients may actually be more concerned about other risks with DBS, like speech difficulties. Therefore, the cooperation between specialists and patients critical. Mixing patient priorities with careful patient selection can help identify cases that are most likely to benefit from DBS.

3. Discussion

3.1. Autonomy and Consent

Voluntary and fully informed consent must be given to patients who undergoing the treatment of implantable medical devices (IMDS) during this procedure [8, 9]. In fact, some patients may feel they have no other choice but to take proposed treatment. However, this is not the last option and probably this would be the most effective treatment. Also, some media have raised the actual effect of IMDS, but some patients have unrealistic ideas about it. Therefore, patients must be informed with the realistic information, not only about the benefits of the surgery but also about the risks and side effects of this treatment.

3.2. Patient Selection

Careful patient selection is necessary to maximize the benefit for individual patients [10]. Patients need to have a good chance of benefiting from surgery. Patients with significant dysfunction, and are not responsive to other less non-invasive or invasive treatments are not suitable to take further treatments. In addition, patients should be physically, cognitively, and emotionally able to tolerate operation and participate in postoperative care [4].

4. Conclusions

The first case indicates that children usually do not have the ability to assess the risks and benefits of the treatment, for example, most deaf children who plan to accept cochlear implant treatment do not understand the potential risks or benefits of it. Therefore, physicians and parents must play their roles. Physicians should show parents the possibility of deaf life and parents should communicate with pediatric patients and inform them of the real effects of the treatment. The second case indicates that some tremor patients would feel DBS is the automatic next step for treatment, but whether using DBS for treatment needs to be assessed by experts and family members of patients. Furthermore, sometimes patients have different concerns with doctors like some tremor patients are concerned about the postoperative problems instead of the tremor. Therefore, cooperations between doctors and patients are important.

References

- [1] Geneva World Health Organization, International Classification of Functioning, Disability, and Health (ICF)external icon. 2001, WHO.
- [2] Alexa Josphine Social Impacts of Disability. Social Impacts of Disability (theclassroom.com)
- [3] Miziara ID, Miziara CS, Tsuji RK, Bento RF. Bioethics and medical/legal considerations on cochlear implants in children. *Braz J Otorhinolaryngol*. 2012 Jun.
- [4] Schermer, Maartje Ethical Issues in Deep Brain Stimulation. *Frontiers in integrative neuroscience*. (2011). 5. 17.
- [5] The Introductory Guide to BCI (Brain-Computer Interface) - EMOTIV (BCI definition) The Introductory Guide to BCI (Brain-Computer Interface) - EMOTIV
- [6] Schuepbach WM, Rau J, Knudsen K, et al. Neurostimulation for Parkinson's disease with early motor complications. *N Engl J Med*. 2013 Feb 14
- [7] Neurology insights- Patient Selection for Deep Brain Stimulation Patient Selection for Deep Brain Stimulation - Neurology Insights
- [8] Khan W, Muntimadugu E, Jaffe M, et al. Implantable medical devices[M], Focal controlled drug delivery. Springer, Boston, MA, 2014: 33-59.
- [9] Joung Y H. Development of implantable medical devices: from an engineering perspective[J]. *International neurology journal*, 2013, 17(3): 98.

- [10] Pearce C B, Lawrance I C. Careful patient selection may improve response rates to infliximab in inflammatory bowel disease[J]. Journal of Gastroenterology and Hepatology, 2007, 22(10): 1671-1677.