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Case: Deep Brain Stimulation Studies

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Description

In this fictional case, a young neuroscientist decides whether to take a post-doctoral fellowship in a lab where her assignment would be explore whether deep brain stimulation can be used to modulate soldiers' emotions to make them more effective in high-stress environments.

Body

Shakima Gregory was recently awarded a post-doctoral fellowship to work in one of the most prestigious neuroscience labs in the country after finishing a doctoral thesis on the use of deep brain stimulation (DBS) techniques to treat patients with Parkinson's disease.

Deep brain stimulation is an invasive neurosurgical intervention that involves the implantation of an electrode in the brain. The electrode is connected and stimulated by a device called an *implanted pulse generator* (IPG), which is inserted in the patient's chest (Bell *et al.* 2009). DBS was approved by the FDA in 1997 and is now an established therapy for many neurodegenerative disorders. It can be turned off in cases where the patient experiences adverse effects or no effects, and the effects are thought to be reversible. DBS has recently been extended to treat psychiatric

disorders, such as major depression and obsessive-compulsive disorder, as well as obesity (Dunn *et al*. 2011, Halpern *et al*. 2008).

During her doctoral studies, Shakima became aware of some of the risks and concerns about DBS therapy. As a neurosurgical procedure, DBS carries risks of haemorrhage, infection, and even death (Schermer 2011). It can also have other deleterious side effects, such as cognitive impairment, memory impairment, aggression, and depression (Schermer 2011). However, Shakima was proud to work on research that could contribute to the betterment of the quality of lives of individuals who suffered from Parkinson's disease.

Shakima now has the opportunity to be a post-doc in a lab that uses DBS in an entire new context. The Defense Advanced Research Projects Agency (DARPA) is funding the principal investigator, Dr. Daniels, to examine whether DBS can be used to treat posttraumatic stress disorder in veterans. Dr. Daniels has offered Shakima a position where she would lead a new, related research project in the lab. Her task will be to investigate whether DBS can be used on soldiers to modulate emotions, such as reducing or blocking the sensation of fear, in order to make them more effective in high-stress environments. [1]

Shakima has some hesitation about her research assignment. After discussing her research assignment with a more experienced colleague, Shakima realizes that there are many social and ethical concerns about the use of DBS technology: What if the research is successful and soldiers are forced or coerced into undergoing this kind of invasive neurosurgery? What if DBS interventions develop to the point of creating super soldiers that kill indiscriminately? What if the technology interferes with a soldier's sense of morality? [2] As a pacifist, Shakima is deeply troubled by these possibilities and wonders whether she, as a research scientist, has a social and moral responsibility to raise and/or address these issues.

Discussion Questions:

- Should Shakima take this post-doctoral fellowship?
- What are the social and ethical responsibilities of engineers and scientists in conducting defense-related work?

- Some would argue that defense work often results in "spin-offs" for the civilian economy. Should this factor into Shakima's decision on accepting the offer? [3]

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- [1]This hypothetical scenario is based off Liao (2014).
- [2]These concerns are also raised by Liao (2014).
- [3]Thanks to Joe Herkert for these discussion questions.

Notes

The author wishes to acknowledge the contributions of Karin Ellison, OEC - Life and Environmental Sciences Editor, and Joseph Herkert, OEC Engineering co-Editor. They provided valuable input in selecting topics and crafting the resources.

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Rights

Resource Type

Case Study / Scenario

Parent Collection

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