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Neuro-Ethics and Biotechnology: An Emerging Community Challenge

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Abstract

Background: Our new knowledge has begun to spill into the community as neuroscience raises new ethical, legal, and social concerns. The brains of "normal" people in some imaging studies yield clinically significant findings disconcertingly. What kind of information and follow-up do we owe those people? Some studies may have military implications; such as that, brain stimulation created an indefinitely awake and alert soldier or pilot. A new fascinating research area studying "Ethics of neuroscience" as neuroscientists explore how brains make decisions when confronted with moral dilemmas. The implications are unclear. Researchers point to three categories of existing consumer technology brain–computer interfaces for device control or self-monitoring, devices for noninvasive neuro-stimulation, and neuro-marketing applications of imaging technology and argue that the brain data collected pose significant privacy and information security risks. Although the topic of Direct to Consumer (DTC) neuro-technology certainly warrants attention, the commentary contains factual and conceptual errors that not only distort the reality of current DTC neuro-technology and its regulatory oversight but also misrepresent the state of the science. These misrepresentations, combined with unbridled speculation about the inevitability of widespread, highly accurate, DTC neuro-monitoring devices that can collect revealing personal information, prompt the authors to suggest impractical solutions to privacy and security concerns.

Conclusion: Researchers have a responsibility to prevent misuse of neuroscience new technology, they need to point out when unproven new technologies are being used recklessly and to explore the social consequences of effective new technologies. There is urgent need to maximize the benefits of the applications of neuroscience and minimize their risks with implementation of Nero-ethics guidelines.

Keywords: Brain leaks; Consumer; Neuro-technology

Introduction

Ethical concerns reflect the values of society, neuro-ethics is a recently field concerned with ethical, legal and social policy implications of neuroscience [1]. In 1995, the United Nations Educational, Scientific and Cultural Organization (UNESCO's) International Bioethics Committee highlighted the challenges of behavioral research involving deception and manipulation, and of research involving patients, children and captive populations who had limited capacity to make informed and voluntary decisions about participation in the researches. Neuroscience refers to ethical issues associated with child-rearing, technological advances, and associated with mind and behavior [2].

Advances in neuroscience increasingly challenge long-held views of the individual's relationship to society, neuroscience has led to innovations in clinical medicine that have therapeutic and non-therapeutic dimensions. These procedures dramatically changed the personalities of patients and raised significant concerns about efficacy and the personal cost of therapy [3]. Professional societies were to advance neuroscience research; little attention was paid to its social implications. An argue is that the brain data collected pose significant privacy and information security risks. Brain leaks and consumer neuro-technology, pay attention to a worthy topic: Direct to-consumer (DTC) neuro-technology [4]. DTC neuro-monitoring devices can collect revealing personal information, prompt the researchers to

suggest impractical solutions to privacy and security concerns, it is important to know whether current digital infrastructure, as well as ethical and legal safeguards, provide sufficient protection for consumer brain data [3].

Capacity for memory and attention can be augmented by using drugs, it functions by modulate AMPA receptors to facilitate depolarization, so increasing levels of cAMP-Response-Element Binding protein (CREB), this in turn activates genes to produce proteins that strengthen the synapse, or memories are suppressed using β blockers, the goal is roughly the same: pharmacological control over neurocognitive function [5]. Consumer technology including three categories which are: Brain–computer interfaces for device control or self-monitoring, devices for noninvasive neuro-stimulation, and neuro-marketing applications of imaging technology [3]. Cognitive enhancer devices include; Transcranial Magnetic Stimulation (TMS) which has more complications, Transcranial Direct Current Stimulation (tDCS), it can be widespread due to low costs and ease of production and use, it enhances cognitive and physical performance, tDCS is considered as a promising alternative to conventional pharmacological treatment of many diseases, including mild cognitive impairment, depression, Alzheimer's disease, and attention deficit hyperactivity disorder [4]. tDCS is a device that can be easily built at home and used repeatedly on different cortical locations and in various stimulation modalities, during stimulation one of the electrodes used (anodal electrode) has the effect of enhancing cortical excitability whereas the other (cathodal electrode) actually diminishes it, the current is distributed along the electrode surface: it enters through the anode, passes through brain tissue and exits through the cathode [5].

Mechanisms of action involve different synaptic and non-synaptic effects on neurons and on non-neuronal (glial) cells and tissues within the brain, the long-lasting effects appear to depend on protein synthesis. Synaptic microenvironment is also modified which affects excitatory and inhibitory neurotransmitters, it might induce additional prolonged neurochemical changes. The risks are to be poorly understood by the general public [6]. The dangerous of long-term and unexpected side effects of tDCS use, leading to some safety concerns, actual benefits come into play since they are balanced with possible harms. Harms of tDCS include side-effects associated with potential misuse, overuse, or abuse [4]. Using tDCS may also challenge fairness, especially in competitive settings. Concerns related to distributive justice are based on the assumption that tDCS will not be equally distributed. Justice issues related to tDCS are relevant only in the case of effective technology, leading to proven benefits and real improvements of cognitive performance or memory functions [7]. If tDCS devices actually modify memories (assumption about efficacy), this could be seen as a possible threat to self-identity and the meaning of our lives. There are many questions about authenticity may concern the modification of ''human nature'' related to identity and personality, (changing personality) and (changing the nature of the human species) [8].

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