

Neuroethics and neuroscience

Neuroética e neurociência

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Abstract. The debate about the ethical aspects surrounding the brain is growing these days and consequently the sciences directly related to it covered by neurosciences. Neuroethics is a recent field linked to the intersection of bioethics and neuroscience, and its advances raise ethical questions. The aim of this article is to verify and to comment important aspects of neuroethics. It was accomplished to critically review the literature. Ethics applied to areas related to neurosciences needs criteria that will serve as reference to consider variables and judge circumstances; the recent advances in neuroscience raise important ethical questions that need to be discussed and observed by Neuroethics; there is a need to define the boundaries between the use of technologies and therapies to treat an ill patient and usages only to improve the performance of normal healthy individuals. Recent progress on cognitive neuroscience brings important ethical, practical, technological, philosophical, spiritual and moral questions to society.

Key words: bioethics, neuroscience, health, neuropsychology.

Resumo. Cresce, atualmente, o debate acerca dos aspectos éticos que envolvem o cérebro, e, consequentemente, as ciências a ele diretamente relacionadas, abarcadas pelas neurociências. A neuroética é um campo recente, ligado à interseção da bioética e da neurociência e seus avanços suscitam questionamentos éticos. O objetivo deste artigo é verificar e comentar aspectos relevantes da neuroética. Foi realizada revisão crítica de literatura. A ética aplicada às áreas envolvidas pelas neurociências precisa de critérios que sirvam de referência para considerar variáveis e julgar circunstâncias; os avanços recentes das neurociências suscitam questionamentos éticos importantes que necessitam ser discutidos e observados pela neuroética; há necessidade de definição de fronteiras entre o uso de tecnologias e terapêuticas para tratar um paciente doente e sua utilização apenas para melhorar o desempenho do indivíduo normal saudável. O progresso recente na neurociência cognitiva traz questionamentos éticos importantes, de natureza prática, tecnológica, filosófica, espiritual e moral para a sociedade.

Palavras-chave: bioética, neurociência, saúde, neuropsicologia.

The debate about ethical issues surrounding the brain and the sciences directly related to it, such science as psychology, medicine, physiotherapy and biology, points to different issues. Such science directs the study of brain specialties such as neuropsychology, neurology, biomedical engineering, and neuroscience in research and intervention of mental and neurological diseases, diagnostic methods (including neuroimaging) and prognostics of the evolution of thought and brain function.

Slachevsky (2007) admits that neuroethics is a necessary subject and suggests that, nowadays, there is no consensus about its definition, but in a broad sense, it states about social, legal and ethical implications for neurosciences and its ethical issues on research. Kipper (2011) acknowledges that, until recently, there was little awareness about the ethical aspects arising from neuroscience and that the most recent tendency is to consider bioethics in terms of new lines of scientific or technological research as genetics, nanoscience and neuroscience. The author considers that neuroscience's special ethical-related questions are everywhere and concludes that there is an urgent need for the neuroethics' development in a way to suggest standards and guidelines for the ethical practice of the neurosciences advances.

Canli *et al.* (2011) emphasize the importance of the subjects and take the discussion into the field of national security, stressing that neuroscience may be worthwhile, but they alert about the risks of the premature implementation of its achievements and the little attention given to the development of ethical, legal and social aspects and their consequences.

It is clear that in this new era, scientific development is taking along new technologies and results, such as biotechnology, for example, which leads to a real revolution on people's way of life, even reaching other important sectors, such as the social and economic ones.

This is a very promising field of knowledge and, at the same time, very dangerous, considering the consequences of its results. Nonetheless, neurosciences might bring significant contributions as long as it is well applied (Lombera and Illes, 2009). Technological innovations in neurosciences show a geometric evolution and nothing is as innovative as this field.

Pessini and Hossne (2011) point out the existence of six scientific revolutions in the 20th

century each one demanding their own ethical approaches and refer that in the case of neuroscience and its accelerated improvement neuroethics would be required. The authors conclude that this neologism and others that are associated to different fields of knowledge, demonstrates the need of specified ethical perspectives on each of those. Therefore, one can note the necessity to strengthen and introduce this neologism before the scientists and professionals who act on the development of this important field.

But there is one issue that permeates these practices: how far one can intervene in the brain of an individual? This question is addressed by inquiries of neuroethics.

Roskies (2002) defends the idea that "Neuroethics" is the appropriate word and lists the following reasons for this thought: First, it is concise, captivating and evocative. Second, it is a sad mistake to think that *ethics* is only an academic exercise for philosophers. On the contrary, our capacity of thinking and acting ethically is, without doubt, something that defines what a human being is. In its turn, neuroethics growth in the world is unquestionable, as observed in the periods between 1989 (the first time that the word "neuroethics" appeared in a scientific journal) and 2005, cited on review of the literature conducted in 39 countries, both in developed and developing ones, showing not only an increasing number of published scientific articles in addition to a greater involvement of periodicals and countries (Lombera and Illes, 2009). These authors believe that neuroethics is an international reality and it can contribute to the neurotechnologies, in the same way as that the bioethics and the ethics did to other projects and programs of major impact, for example, the Human Genome Project and its consequences for society.

The decisions applied by different areas of neurosciences need criteria to consider variables and judge circumstances. These are permeated by the modernity of new technologies and intertwined treatment to the duty to respect and help humans. By the way, for example, Nassar Junior *et al.*, (2005) say that patients want to know their diagnosis and doctors should inform them about it in the most adequate moment and give more information and a debate about palliative care is also necessary, specially about multiple sclerosis. An issue of principle, which refers to moral and ethical connotations, may occur according Danziato (2010).

The progress of brain examinations by functional MRI machine images contributed to the rise of neuroethics. The neuroscientist Roberto Lent (2005), Federal University of Rio de Janeiro, defined neuroethics as "the interface between ethics, neuroscience and neurotechnologies". The new discipline made its debut in the United States in 2002 (Araia, 2008). The growing importance of the area led a group of American psychologists, lawyers and philosophers to found the Neuroethics Society. Today it is the International Neuroethics Society (2011).

According to Kagawa (2009), there were conflicts about neuroethics placement since its emergence, highlighting that advances in neuroscience have created a new field of moral and conventional bioethics investigations, which had not been noticed before?. Considering the existence of controversies between neuroethics and bioethics, establishing a discussion about the investigations of relevant scientific and technological developments is crucial. So far, it seemed to foster the proliferation of bioethics subdisciplines, converging into a complex that requires the new integration of bioethical questions about the related technologies to nano, biology, information and cognition.

Although known as a recently modernized field, from the intersection of bioethics and neuroscience, for centuries, neuroethics has associated mind and behavior.

Defined broadly, neuroethics concerns the ethical implications of neuroscience policy, legal and social of neuroscience and the aspects of its research that led to therapeutic innovations (and beyond) in clinical medicine. The exponential increase in interdisciplinary research, commercialization of cognitive neuroscience, the impetus to develop training courses focused on ethics and the increased attention being paid to public understanding of science illuminates the role of neuroethics in neuroscience (Illes and Bird, 2006).

Recent advances in neuroscience raise important ethical questions that are being inappropriately discussed. It is necessary to draw attention to neglected neuroethics. Thus, some studies of contemporary neuroscience show that it is getting closer to artificially recreate some functions of the human mind (Esteves, 2006).

Esteves (2006) cites that knowledge of the molecular mechanisms of memory opens doors for the production of drugs that can enhance this power and he? questions the manner in which these drugs could be prescribed. It is reasonable to imagine that the "memory pills" are given to patients with Alzheimer's and elderly people in a preventive manner. But could they be taken by students on the eve of trial? And by workers who rely on memory to perform their functions, or by anyone who wants to improve his/her performance in this regard? Esteves further explains that in Lent's evaluation, there is the fundamental ethical dilemma to be discussed in the application of new technologies derived from neuroscience: it is difficult to define the boundary between the use of these technologies to treat a sick person, is ethically justifiable procedure to use only wishes to enhance the capabilities of a normal individual, a situation more debatable.

The process related to neuromaturation, neurophysiology and neuropsychology in neurodevelopmental and ecological contexts is important, and frequently are neglected on the child's development, either normal or delayed maturation of cognitive functioning, educational context (Pontius, 1993). In this sense, the basic intent of neuropsychology assessment would clarify the higher cortical functions, like perception, memory, language and attention (Schlindwein-Zanini, 2010).

What concerns Lent, according to Esteves, is the fact that neuroscience is moving faster than the ethical discussions about the new doors that it begins to open. Farah (2005) believes that there was little public awareness of the ethical implications of neuroscience. However, recent progress in cognitive neuroscience brings ethical questions of comparable importance. Some are practical, about the applications of neurotechnology and the likely implications arising for individuals and society. The other question that imposes itself is of greater philosophical view and challenges science and society to see people as moral and spiritual agents and beings.

Conclusion

This paper concludes that there is the need to stimulate and improve the studies in neuroethics as a field to be consolidated, given the importance and speed of development of new technologies linked with neurosciences; the neuroethical debate must be part of public health policies in the contemporary agenda; ethics applied to areas involved by neurosciences needs criteria to consider variables and

judge circumstances. Recent advances in neuroscience raise important ethical questions that need to be discussed and observed, thus, it is essential to define the boundary between the use of technologies and therapies to treat a sick patient, and use only to improve the performance of a normal healthy individual. Recent progress in cognitive neuroscience brings ethical questions of practical, technological, philosophical, spiritual and moral value for society.

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