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Neuroethics Supplement: Neuroscience and the Treatment of Mentally Ill Criminal Offenders: Some Ethical Issues

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ABSTRACT

Neuroscience has recently come to play an important role in criminal settings, influencing all stages of criminal procedures, most importantly the sentencing. Finding a suitable sentence for mentally ill offenders has long been a problem for jurists and psychiatrists. Neuroscientific research promises to address this question using the neurobiology of mental illness with the purpose of imposing on the offender treatment instead of punishment. We briefly survey the historical background of the relation between brain sciences and criminal law and examine some modern uses of neurosciences for the treatment of mentally ill offenders in the light of this historical survey, as well as provide an overview of some potential dangers. Some analogies between past movements in brain sciences and some current tendencies of neuroscientific research, especially the tendency to explain violent behavior on neurobiological grounds, suggest that the use of neuroscience for treating mentally ill offenders can be a double edged sword, potentially impacting on criminal rights.

Key words: *Neuroscience, law, ethics, mental illness, offenders, sentence, treatment*

INTRODUCTION

Neuroscientific knowledge, research and techniques have already begun to find their way into criminal settings and to influence all stages of the criminal procedure, from investigation to sentencing.

Finding a suitable sentence for mentally ill offenders has long been a problem for jurists as well as psychiatrists. The latest neuroscientific discoveries promise to address this question using the neurobiology of mental illness with the purpose of imposing on the offender a more adapted treatment, instead of punishment (Greely, 2008). In this paper we propose to explore some ways in which neuroscientific discoveries could influence the treatment/sentencing of mentally ill offenders, but also to consider the potential dangers of the improper use of these discoveries in the context of a prison setting.

I. Brain Sciences and the Treatment of Criminals: An Old Story

The relationship between neuroscience and criminal law is not entirely new. It is worth examining this relationship throughout the years in order to illuminate the current debate about how neuroscientific findings could be used for the treatment of mentally ill offenders.

There are three major movements in the history of brain sciences and criminal law (Pustilnik, 2008):

1. Phrenological Studies of Criminal Behavior: late 18th - early 19th centuries

In the late 18th century, Austrian physician Franz Joseph Gall came to develop a cerebral localization hypothesis, according to which, certain parts of the brain were responsible for particular mental faculties.

According to Gall's theory, the external form of the cranium reflects the internal form of the brain, thus, the study of the shape of the skull could offer an indication of particular mental faculties and character traits of the individual. To seek support for his ideas, he started examining the indentations and the bumps on the heads of people in hospitals, asylums and prisons (Schlag, 1997).

This practice of phrenology intersected with criminal law, since Gall had a special interest in examining criminals and people confined with insanity (Weiss, 2006; Pustilnik, 2008). Phrenologists claimed that insanity was a somatic disease of the brain and should be treated as a disease, rather than a behavior requiring punishment (Cooter, 1976).

Phrenology theories had serious impact on various aspects of the European and American judicial systems. The ability of phrenology to "read" the inner mind of a person was used for jurists to identify and distinguish the criminals from the insane, and to determine the mental state of the defendant in a criminal trial (Tovino, 2007), and it informed legal theories on criminal responsibility. Moreover, phrenologists engaged in the movement for criminal law reform and tried to introduce expert testimony in courts (Weiss, 2006).

Eventually, the new inductive methods of pure science and Freud's new ideas contributed to the decline of phrenology, which, by the mid-19th century, had acquired the status of a "pseudoscience" (Tovino, 2007).

Although phrenology lost credibility as a science, it left an important legacy. It provided scientific explanations for insanity and criminality, previously interpreted as signs of sins. Phrenologists also stressed the need for the reexamination of the goal of punishment, many of them rejecting the principles of retribution and deterrence (Rafter, 2005). As Rafter points out, phrenology offers the first manifestation of a neuropsychological theory in that it set out certain assumptions fundamental to present-day neuropsychology.

2. Lombroso and the "The Criminal Man": mid-19th - early 20th centuries

Phrenology influenced Italian psychiatrist Cesare Lombroso, the founder of criminal anthropology. In his book, "The Criminal Man", Lombroso developed his theory of atavistic criminality. He believed there is a distinct, hereditary class of criminals who are

biological throwbacks to a primitive stage of human evolution. Such criminals exhibit some physical and mental anomalies, called "physical stigmata"¹.

Lombroso placed criminals into two categories, each of which had three subcategories. The first category includes the Born Criminal, the Insane Criminal and the Epileptic Criminal. These criminals were "atavistic, physically, emotionally and behaviorally very homologous to primitive race" (Fleming, 2000). Although "Insane criminals" bore some stigmata, they were not "born criminals", but became criminals as a result "of an alteration of the brain, which completely upsets their moral nature" (Fleming, 2000). Lombroso's second category included the Occasional, the Criminaloids and the Habituals, who had none of the physical peculiarities of the previous category (Fleming, 2000).

Lombroso suggested that the first category of criminals should not be held accountable for their actions, as they were prevented from exercising their free will. Accordingly, punishment should be imposed only on those who committed crime by choice and therefore could be deterred by punishment. Lombroso tried to reform the Italian penal system, and he encouraged more humane treatment of criminals, arguing for rehabilitation and against capital punishment (Horn, 2003).

However, with regards to born criminals, Lombroso considered them, "a group of criminals, born for evil, against whom all social cures break as a rock – a fact which compels us to eliminate them completely, even by death" (Fleming, 2000) and argued for their removal from society for their own and society's protection: "...if the author is a born criminal, he must be confined for life, though the crime itself is not great" (Cesare Lombroso in his article for *The Forum*, as quoted by Horn, 2003).

Later experimental studies contradicted Lombroso's theory which soon fell, like phrenology, into the category of "pseudoscience". But Lombrosian criminal anthropology also left an important legacy, linked to what we might call a new culture of risk assessment (Horn, 2003). Lombroso introduced a theory of social control whose central principle was the protection of the society (Rafter and Ystehede, 2010).

3. Psychointervention: mid - 20th century

During the 20th century, major advances on brain research facilitated direct intervention in the brain, which led to the development of "Psychointervention". What is meant by this term is any surgical procedure on the brain to relieve mental disorders, especially lobotomy and electrode implantation². By the late 50's, lobotomy (the surgery involving the destruction of a portion of the frontal lobes, thought to be involved in controlling extreme forms of pathological behavior) was practiced massively and was used to "cure" everything from mental retardation to homosexuality and criminal insanity.

In 1970, physicians Mark and Ervin published a sensational book entitled "Violence and the Brain". The authors claimed that violent behavior was caused by the offender's disordered neurobiology

and that brain function is an important determinant for abnormal and violent behavior (Mark, 1985). Thus, a “treatment” of uncontrollably violent neuropsychiatric patients was possible, with the use of amygdalotomy³. Mark and Ervin claimed that violence had become a public health problem and made proposals for rehabilitation programs for “young but violent” prisoners. They published articles in medical journals presenting their theories about urban disorder and its connection with brain disease, offering psychosurgery as a possible solution to crime (Mark, Sweet and Ervin, 1967).

In 1968, psychosurgery operations were performed on three violent prisoners, at the California Medical Faculty at Vacaville, with a technique known as stereotaxic surgery (Aarons, 1972). This technique involved surgical implantation of electrodes for the purposes of destroying the amygdalar tissue of the subjects’ brains. The goal was to eradicate their desire and ability to engage in violent behavior⁴.

The U.S. government extensively funded research into brain intervention techniques. In 1972, it supported the development of the “Center of Study and Reduction of Violence”, as well as research projects in various California prisons (Pustilnik, 2008).

But soon, with the rise of the anti-psychiatrist movement, these theories received a lot of criticism (Breggin, 1975) and became unpopular. Significant stigma marks psychosurgery to this day.

All three movements briefly outlined above fell into epistemic traps and are now considered unfortunate historical curiosities (Pustilnik, 2008).

Some Uses of Modern Neuroscience for the Treatment of Mentally Ill Criminal Offenders

Our increasing understanding of the brain is producing new ways of intervening in human behavior. Here are some modern brain interventions which have been suggested for the treatment of mentally ill offenders.

1. Neurofeedback in correctional settings

Use of neurofeedback in correctional settings has been suggested as an innovative approach that may ultimately lessen criminal behavior, prevent violence, and lower recidivism (Evans, 2006).

Neurofeedback or neurotherapy is a relatively new, non-invasive method which is based on the possibility of training and adjusting the speed of brainwaves, which normally occur at various frequencies (Hammond, 2011). An overabundance, or deficiency in one of these frequencies, often correlates with conditions such as depression, and emotional disturbances and learning disabilities, such as Attention Deficit Hyperactivity Disorder (ADHD) (Greteman, 2009).

Therapists attach electrodes to the patients’ head and a device records electrical impulses in the brain. These impulses are sorted into different types of brain waves. Using a program similar to a computer game, patients learn to control the video display by achieving the mental state that produces increases in the desired brain wave activity. Neurofeedback has gained recognition for its potential benefits for children with ADHD, alcoholics and drug addicts. It can also enhance athlete and musician performance as well as improve elderly people’s cognitive function (Greteman, 2009).

Could neurofeedback be effective for the treatment of mentally ill criminals? In 1995, Canadian researcher Douglas Quirk tested the effects of a neurofeedback treatment program on 77 dangerous offenders who suffered from deep-brain epileptic activity, in an Ontario Correctional Institute. The results demonstrated reduction in the subjects’ criminal recidivism and suggested that, “*a subgroup of dangerous offenders can be identified, understood and successfully treated using this kind of biofeedback conditioning program*” (Quirk, 1995).

These encouraging results raised hope for the use of neurotherapy in juvenile offenders, who are very often compromised neurologically. ADHD, post-traumatic stress disorder, depression and impaired neuropsychological functioning are known to be widespread in the juvenile offender population (Smith and Sams, 2005), whose rehabilitation is generally considered to be a major purpose of the criminal justice system.

A study was designed to further evaluate the results of neurotherapy on youth offenders. Smith and Sams (2005) used neurotherapy on 13 juvenile offenders with significant psychopathology and electroencephalographic abnormalities. Results of the study suggested that neurotherapy as an adjunctive treatment seemed to hold promise for improvement in cognitive performance as well as recidivism.

Another similar study was conducted by Martin and Johnson (2005). Seven incarcerated male adolescents diagnosed with ADHD had their residential detention treatment program enhanced with EEG biofeedback training. Six out of seven participants displayed fewer aggressive behaviors and all of them demonstrated improved regulation of emotional reactions and behavior and inhibition of inappropriate responses.

The benefits of neurofeedback for treating juvenile offenders are becoming known to private practitioners as well. Beth Black, director of a private counseling clinic, used neurofeedback with the juvenile offenders sent to her clinic regularly for court-assigned behavioral therapy. According to Black, the seven juvenile offenders who entered the program of intensive neurofeedback therapy showed significant improvement despite their learning disabilities (Greteman, 2009).

2. Deep Brain Stimulation (DBS)

There has been discussion lately as to whether an invasive technique, such as DBS, could be used in prison populations for the rehabilitation and treatment of mentally ill inmates. DBS uses one

or two surgically implanted medical devices to deliver electrical stimulation to precisely targeted areas, deep within the brain. Although DBS has been effective in the treatment of movement disorders and is rapidly being explored for the treatment of other neurologic disorders, the scientific understanding of its mechanisms of action remains unclear and continues to be debated in the scientific community (McIntyre et al, 2004).

In 2005, Franzini et al. published a study describing the therapeutic effect of DBS for the treatment of patients suffering from mental retardation, with aggressive and disruptive behavior and resistant to any pharmacological treatment. Results demonstrated consistent improvement of disruptive behavior and of the quality of life of these otherwise untreatable patients, at the follow-up evaluation, one year later.

However, Franzini's study did not take place in a prison setting and the subjects who participated were not convicted inmates. In June 2011, in the annual meeting of the Michigan Association of Neurological Surgeons, Dr Mark Hoeprich presented his proposal on the use of DBS for the rehabilitation of criminal psychopaths. Dr Hoeprich suggested that treating criminal psychopaths with DBS is a solution which could provide significant economic, ethical and social benefit to society.

Psychopathy is a specific neurocognitive dysfunction which leaves patients with a complete lack of remorse, making them capable of performing callous acts of violence. Since psychopathic criminals are incapable of reformation, the only means society has to protect itself from them are either life imprisonment, or execution. According to Dr. Hoeprich, the use of DBS could provide a better alternative, because it is medically feasible, it is 'proven' safe and effective, and from an ethical point of view, use of DBS is justified as a better social option. Opposing its use, according to him, would mean choosing retribution over rehabilitation (Hoeprich, 2011). It is simply too soon, however, to predict how his proposal will play out.

3. Pharmacological interventions for drug addicts in the criminal justice system

Drug addiction is a significant problem that most societies face, associated with increased violence, crime and mental illness (Carter, 2009). Untreated substance abusing offenders are more likely to relapse to drug abuse and return to criminal behavior (National Institute on Drug Abuse, US Department, 2006). Until recently, policymakers have seemed to be indifferent to the high cost and the failure of criminal punishment to reduce drug use (Bonnie et al, 2008).

Some see a major opportunity for the criminal justice system to take advantage of recent neuroscience advances for an improved understanding of the biological correlates of addiction and for more effective treatment through associated pharmacological developments (Volkow and Li, 2005). Expected benefits include reduction of health risks associated with drug use, decarceration, avoidance of recidivism and recognition of addiction by social policies as a neuropsychiatric condition that should be treated therapeutically.

With regards to addiction to heroin and other opioids, it is widely suggested that treatment should include opioid substitution therapy (OST) (Stover and Michels, 2010), which is nevertheless a frequently neglected intervention in many prison systems.

Some of the newest drugs used for opioid addiction include buprenorphine and naltrexone. Buprenorphine is a long-acting medication that activates the opioid receptor and has been shown to reduce heroin craving. Buprenorphine treatment has been shown to be able to reduce drug-related disease and recidivism for inmates (Kinlock et al, 2010). Initial examinations of buprenorphine in correctional settings in France (Levasseur et al, 2002) and in Puerto Rico (Garcia et al, 2007) found that it is feasible and that it facilitated post-release addictions treatment entry.

A recent study evaluating the efficacy of Naltrexone demonstrated reductions in frequency of drug use among heroin-dependent inmates, as well as criminality, suggesting that Naltrexone may be a valuable treatment option in prison settings (Lobmaier et al., 2011).

Finally, researchers are developing a range of vaccines against such highly addictive substances as cocaine, nicotine, heroin and methamphetamine. Some researchers underline the urgent need for new treatments especially for cocaine addiction, since no effective pharmacological interventions are available for cocaine, in contrast to heroin addiction (Kinsey et al, 2010). Clinical trials with a cocaine vaccine, the so called TA-CD vaccine, showed that cocaine users who were vaccinated were much more likely to reduce their cocaine use than those not vaccinated (Hylton, 2008; Greely, 2008).

II. Some Ethical Issues

There is no doubt that research should continue to be encouraged for the treatment of psychiatric diseases and for the rehabilitation of mentally ill offenders. However, some ethical issues have to be addressed, before adopting these new interventions too prematurely.

We will not analyze the scientific efficacy of the methods described above. We will only underline the fact that despite some positive results already demonstrated, there is still a lot of scientific uncertainty about these methods, whose efficacy and safety is not yet fully tested. DBS is a striking example. Although still highly experimental, with many reported negative side-effects for patients, it was nevertheless suggested as an alternative treatment for psychopathic criminal offenders. Neurofeedback is generally admitted to be a quite safe procedure, since it is non-invasive and there are few significant side effects. However, in order for the safety of the procedure to be guaranteed, training is required and the practice should only be undertaken by, or under the supervision of, a professional therapist (Hammond, 2011).

With regards to psychopharmacology, there is still much controversy about its use. Buprenorphine's efficacy in treating opiate dependence has been proven through numerous clinical trials, however, studies have shown that implementing such treatment within a correctional setting is far from an easy task. There are a number of practical difficulties, including the need

for collaboration between treatment, correction and research personnel, as well as the fact that attempted diversion by prisoners (i.e. the use of prescription drugs for recreational purposes), appears to be more frequent with buprenorphine. (Gowing, Ali and White, 2002).

Therapists working with people with addictions in Russia (the only country in the world that has approved the use of naltrexone implants in routine clinical practice) have reported that naltrexone implants are problematic as they are too expensive for most addicts, do not reduce cravings, and do not help addicts psychologically to stop abuse. In addition, they may increase suicide rates during treatment and fatal overdose post treatment (Holt, 2010).

Finally, none of the anti-drug vaccines has yet been approved for clinical use and it remains unclear how effective they will be across large populations. It is too early to consider their use in a prison setting.

But even if these interventions prove to be effective and safe in the near or the long future, there are still some difficulties concerning their use in correctional settings for the treatment of mentally ill offenders. Successful rehabilitation benefits both the society and the offender. But do addicted and mentally ill persons have the capacity to make autonomous decisions regarding their treatment? And if not, would it be legitimate for society to coerce mentally ill offenders into treatment (Carter, 2009; Farah, 2002)? Some authors have tried to overcome this problem suggesting that the offender should agree to undertake the treatment in return for a more favorable disposition of the case (Bonnie et al, 2008). But, offering treatment as an alternative to punishment for some crimes does not eliminate the problem; incorporation of treatment into sentencing is a highly controversial issue and treatment should aim to treat a medical condition and not be a form of extrajudicial punishment (Carter, 2009).

In most justice systems punishment and rehabilitation are often combined; there is an alarming need to carefully define the mental disease that has to be treated each time, in order to avoid manipulation and control of an incarcerated population under the pretext of treatment and rehabilitation. With regards to this issue, we cannot help but noticing some striking similarities between past movements in brain sciences and some tendencies of current neuroscientific research.

The three movements described in the first chapter are based on the theory of cerebral localization. In all three of them, we come across the idea that abnormal, asocial, or criminal behavior can be tracked down to a specific part of the brain and thus be eliminated when spotted.

It is interesting to note that while these movements started in asylums, as theories of neurology and psychiatry, they soon made inroads into criminal law (Pustilnik, 2008) and were largely used in prisons and penitentiary facilities in order to “treat” violence and abnormal behavior: Phrenology inaugurated the idea that the cause of crime may lie in brain defects. Lombroso explained criminality in terms of a defective brain, and some psychosurgery advocates clearly suggested that violence was a public health problem.

In recent years, the development of computer-based techniques and

image-guided surgery has led to a revival of cerebral localization theories by many neuroscientists. In addition, the idea that the cause of crime and violence may lie in brain defects seems today to be making a comeback (if it ever declined).

Numerous studies on the question of the neurobiology of violence have been published recently and the discussion about the “treatment” of the violent offenders is vivid. In these studies, violence is presented either as highly correlated with mental illness, or considered as a disease itself. For example, neuroscientist J. Volavka, in 1999, repeats in almost exactly the same terms what Mark and Ervin had suggested back in 1972, that “violent crime and violent behavior in general cause a major public health problem”, due to high percentages of violent crimes which occur annually, citing major mental disorders and head injuries as contributing factors to the level of increasing community violence. The author suggests that violence can be prevented and treated with pharmacological treatment in patients with mental disorders.

Adrian Raine has published numerous studies on the psychopathology of violence (Raine and Sanmartin, 2001; Raine, 1993, Raine and Young, 2006 etc). He considers criminal behavior to be the result of some flaw in the biological makeup of the individual, which could be due to heredity, neurotransmitter dysfunction, or brain abnormalities. Kent Kiehl is another researcher who focuses on criminal psychopathy (Kiehl, 2006) and conducts research in New Mexico state prisons, where he collects life histories and brain scans of inmates.

There are numerous other researches looking at the neurobiology of violence (Siever, 2008; Tateno et al, 2003; Baier et al, 2002). Scientists, but also some legal scholars, tend to view violence and crime as mental diseases which can be cured. But under a purely therapeutic approach to crime, neuroscientific treatment interventions can potentially become tools for political coercion, leading to a “therapeutic tyranny” (Moran, 1985). Crime and violence are complex phenomena, normative, social and legal constructions, which cannot be explained exclusively on the neurobiological level (Pustilnik, 2008). It seems the interaction between physical and social factors contributing to crime and violence is largely disregarded.

Evaluating the role of neuroscience for treating mentally ill criminal offenders, we have to keep in mind that the notion of the “mental disease” is, in itself, to an important extent, a normative issue. The problem of how to distinguish “normal” people from mentally ill people on treatment remains unsolved because it is conceptual, not just epistemic, issue and, to an important extent, a normative question upon which we will have to decide rather than discover (Vincent, 2010).

Last but not least, applying neuroscience in legal settings as a therapeutic measure can be a double edged sword for mentally ill offenders. Neuroimaging results showing a malfunctioning brain could secure a finding of innocence. However, they could also be used as evidence of dangerousness of an offender, (Farahany and Coleman, 2006), an aggravating factor that can increase punishment in many legal systems. Even if the accused person is found innocent by reason of insanity, the idea that some damaged brains are incapable of being treated might have huge implications for the nature and the length of the therapeutic measure to be

imposed and could lead to highly experimental interventions, justified by the idea that the owner of a damaged brain will surely recidivate.

Conclusion:

Undeniably, current neuroscientific research offers great potential for the treatment of psychiatric diseases in the future. However, mistakes and epistemic traps of the past in the use of brain sciences for treating criminal and aggressive behavior, suggest that we should be vigilant over the use of modern neuroscientific methods in correctional settings for this purpose. Such uses, especially when they subjugate an individual's interest to those of society, are violations of an individual's freedom and human dignity. Violence and criminality are indeed a significant problem of modern societies. Medicalization of crime and explanation of violence on neurobiological grounds seem to be a convenient solution that satisfies the accentuated societal need for security, as it suggests that crime can indeed be "treated" by modern methods of brain intervention. But apart from being overly simplistic, this approach is also dangerous for the rights of such a highly vulnerable population as mentally ill offenders. Not only does it stigmatize them, as it strongly associates violence with mental disorder, but it threatens their human rights and facilitates their manipulation.

As punishment and treatment are combined in most justice systems, the challenge for the future is to use neuroscience to the real benefit of mentally ill offenders, as a therapeutic tool, which would replace punishment. To do that, efficient, safe and tested neuroscientific interventions should be employed with the purpose of treating a well-defined, existing psychiatric disorder and not as a means of experimentation or further punishment, under the pretext of treatment and rehabilitation

Notes:

1. Physical stigmata included various unusual skull sizes, asymmetry of the head and of the cranium, prognathism, a sloping forehead, ears of unusual size and excessive length of arms.
2. As Pustilnik (2008) points out, this idea was not new. Since 1891, Swiss psychiatrist Gottlieb Burckhard, the founder of Psychosurgery, had performed neurosurgery on six of his patients, removing their cerebral cortex, based on his theory that one could eliminate unwanted behaviors by removing specific portions of the brain.
3. By the term amygdalotomy is meant the kind of psychosurgery in which amygdaloid fibers that mediate limbic system activity are severed (in cases of extreme uncontrollable violence).
4. Aaron reports that this method had poor results: the only inmate who showed marked improvement after the surgery was released with parole, only to be re-arrested for robbery in 1969.

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13.1 In this chapter the committee considers issues that arise when people with mental illnesses come into contact with the criminal justice system. The publicity given to critical incidents involving mentally disturbed people might lead the public to believe that a high proportion of people with mental illness commit crimes, but this is not the case. Nevertheless, people with mental illness comprise a disproportionate number of the people who are arrested, who come before the courts and who are imprisoned. The reasons for this, the legislation governing the treatment of people with mental illness and the handling of mentally ill offenders by a criminal justice system is an indicator of the ability of a society to balance public safety interests with the achievements of modern psychiatry and of its ability to incorporate basic human rights principles into penal and mental health practice. In some, but not all western industrialised countries, forensic psychiatry today has been established as a professional specialty within psychiatry. As a consequence of these new opportunities for treating the mentally ill, community-based mental health care developed and the number of psychiatric hospital beds declined substantially. Summary Advances in neuroscience raise ethical, social and legal issues in relation to the human person and the brain. Potential benefits of applying neuroimaging, psychopharmacology and neurotechnology to mentally ill and healthy persons have to be carefully weighed against their potential harm. Questions concerning underlying concepts of humans should be actively dealt with by interdisciplinary and public debate. Keywords brain enhancement, ethics, free will, mind-body problem, neuroscience, self. In view of these questions, an intensive dialogue between neuroscience and the humanities becomes more than ever necessary. ARTICLE. Neuroethics Supplement: Neuroscience and the Treatment of Mentally Ill. Criminal Offenders: Some Ethical Issues. Georgia-Martha Gkotsi JD PhD (candidate). Faculty of Biology and Medicine, Faculty of Law and Criminal Sciences. Ethos – The Interdisciplinary Ethics Platform, University of Lausanne, Switzerland. mentally ill offenders in the light of this historical survey, as well as provide an overview of some potential dangers. Some analogies between past movements in brain sciences. and some current tendencies of neuroscience research, especially the tendency to explain violent behavior. on neurobiological grounds, suggest that the use of neuroscience for treating mentally ill offenders can be a double edged sword, potentially impacting on criminal rights.