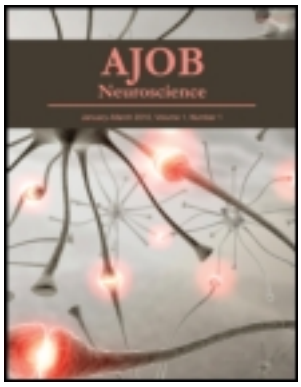

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Abstracts

Top 25 Abstracts from 2012 Annual International Neuroethics Society Meeting in New Orleans

1. Revisiting the Brian Dugan Trial: Is Evidence from Brain-Imaging Technology Ethically Relevant to Criminal Justice?

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Background

Neuroethics is an emergent subfield in bioethics that investigates the ethical implications of advances in neuroscience and brain-imaging technology, as well as their impact on the understanding of how the human brain functions, and how we view ourselves as moral agents. Given the connection between brain and behavior, advances in neuro-imaging technology do offer key breakthroughs in understanding the neurological basis of human behavior. These advances could potentially revolutionize the criminal justice system offering deeper insights into the neural and causal foundations of criminal or antisocial behavior. Critical ethical questions, nonetheless, come to bear, regarding the use of brain-scan evidence in criminal trial.

Problem Statement

Is the admissibility of neuro-imaging evidence in criminal justice proceedings ethically relevant to adjudicating culpability and gauging moral responsibility? The case of Brian Dugan, an Illinois resident, who was convicted for the rape and murder of 10-year-old Jeanine Nicarico, was a premier in the admittance of fMRI [functional magnetic resonance imaging] evidence in criminal court. Using the Dugan case as a departure point, we investigate the relevance of neuro-imaging evidence to criminal justice. In the light of key ethical principles—of justice, of autonomy and moral responsibility, and of respect for persons—we explore the law of evidence, and the federal rule of evidence undergirding the use of scientific evidence, particularly brain-imaging evidence, in criminal prosecution. From the perspective of neuro-experts, we also examine the science of brain imaging and the question of objectivity in measuring cognitive functions and determining mental capacity.

Method

Several relevant literatures, both legal and neuro-scientific, as well as court proceedings/legislations, were critically examined and analyzed. Together with the Dugan case, three other similar proceedings in which neuro-imaging evidence was admitted in criminal court were examined. Likewise, several legal documents, including the Federal Rule of Evidence and *Daubert v. Merrell Dow Pharmaceuticals*, were critically reviewed. In addition, several neuro-imaging research studies were examined to understand causative and correlative relationships between neural correlates and specific human behavior.

Results

All of the cases involved a capital crime. There was divergence among the neuro-experts regarding the relevance of neural correlates to particular kinds of behavior outside a standard behavioral assessment. Within legal circles, an fMRI could be equally used as a mitigating and aggravating factor, thus posing questions of relevance and ethical dilemma. Ideally, with a preponderance of published peer-reviewed and unchallenged research results that demonstrate a precise "causal relationship between a particular brain anomaly and a specific criminal behavior" (Nugent 2009, 1), and brain-imaging evidence that was taken within proximity to the time a crime occurs, it would be unjust and certainly unethical to impose severe penalties on a defendant not even for reason of deterrence, since the causal factor of the criminal behavior was an anatomical and physiological force that surpassed the defendant's control (Nugent 2009). In reality, however, establishing such a direct causal relationship still remains inconclusive for many reasons. While there have been significant advances in understanding the neural foundations of criminal behavior in the fields of cognitive neuroscience and forensic psychiatry, there has been a marked reluctance within certain scholarly circles in justifying behavior on biological and brain-related determinations.

Conclusion

While we observe that the import of neuro-imaging evidence could offer potential benefits to the adjudication of

only in 25.7% of the cases. (3) The main fear of patients refers to surgery complications (42.5%), whereas "personality change" is less frequently mentioned as a frightening outcome (9.7%). But the respondents consider apathy and personality changes as relatively common side effects (17.7%/11.5% of the respondents believe that more than 10% of the patients may suffer from these side effects), whereas surgical problems are considered to occur very rarely (2.7%). (4) Of the respondents 38.1% confirm the existence of a "satisfaction gap," that is, report that in more than 10% of the cases the patients' expectations are not fulfilled. (5) A large majority of the respondents consider DBS to be a safe and successful intervention in movement disorders, superior to medication-based interventions. They claim that more patients should be able to profit from this intervention. (6) A large majority evaluates the growth in further DBS indications as unproblematic and considers obsessive-compulsive disorders, Tourette syndrome, major depression, and epilepsy to be the most promising applications, whereas schizophrenia, Alzheimer's disease, and autism are considered to be least promising.

Conclusion: Our survey expresses evaluations of a generally very experienced sample of DBS experts who are optimistic with respect to the current use and potential of DBS. Mismatch with respect to patient fears and risks and the issue of a satisfaction gap require closer investigation. In particular, the process of patient information and selection may have to rely on a broader set of experts.

Outlook: In order to expand and validate the results of our survey, we have created an address database of ~500 DBS centers that are currently addressed in a second survey, including also a shortened version of the questionnaire for analyzing health service research issues along the lines done for a pilot study for Switzerland.

10. Has Neuroscience Really Demonstrated Gender Dimorphism? Ethical and Philosophical Reflections and Implications for Communication and Education

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Are men from Mars, active, rational, aggressive, and women from Venus, passive, emotional, nurturing? And has this alleged diversity been demonstrated by modern neuroscience? Once discourses about the difference between the sexes began, brain weight was its measure, while nowadays the measure is functional neuroimaging. Actually, science has not been able to produce convincing evidence of a "female brain" and a "male brain." In order to clarify this controversial issue, we have reviewed the recent neuroscience literature and found that, according to the "gender similarities hypothesis" (Hyde 2005), the likeness in the brain of both sexes is by far more compelling than its supposed difference. Moreover, it is now universally accepted that the brain is an organ with plasticity and adaptability found also in adulthood, far from being immutable. The neuroscientific literature seems also to confirm that different upbringings play an important role in modulating the nervous systems of boys and girls. From childhood men and women are constantly bombarded by the axioms, prejudices, and platitudes about the differences between the sexes, and that incessant hammering that passes through the family, the school, the entire society, and, last but not least, science and its narrative journalism eventually impresses on their minds the image and identity of women or men. Philosophically it is necessary, in neuroscience and particularly so in gender studies, to rediscover the concept of human person, a category that represents a novelty introduced by Christianity. From an ethical perspective it is of utmost importance, giving that education and stereotypes heavily contribute by assigning roles and promoting gender differences in our societies, to consider the neuroscience study design before going to the conclusions, often based on biased premises. With respect to education and communication, we argue that neuroscientific data can be used to make the case for gender differences. Contrary to common belief, neuroscientists may not completely understand, for example, how significant the activation of the right prefrontal cortex in a specific task might be, although they always try to provide an explanation for experimental data. Unfortunately, the limitations of some neuroscience research do not prevent popular writers from extrapolating the results to demonstrate that males and females are hard-wired to feel and think differently, and that for the same reason they should be taught mathematics and literature otherwise. Therefore, far from supporting the existence of significantly different male and female brains, much of the research on the topic is not only deeply flawed, but dangerously misleading. If we look around in our societies to try and explain gender inequality, the attribution to some brain differences between men and women seems to appeal more than the claim of discrimination based on gender.

12. Neuroethics and the Globalisation of Neuroscientific Research

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Neuroscientific and neurotechnological research is becoming an ever more prominent domain of a number of nations' (e.g., China, Russia) overall scientific and technological agenda. Clearly, such neuroscientific advances in medicine, public life, and national security can be leveraged on the world stage to affect economic, sociocultural,

and geopolitical credibility and capability, and thereby influence global ethico-legal and social dynamics. In light of this, we posit the necessity of a globally applicable neuroethics that is sufficiently cosmopolitan to enable differing cultural frameworks within the conduct and application(s) of neuroscientific and neurotechnological research. To be sure, conducting neurotechnological research on the global stage incurs a number of potential ethico-legal issues, inclusive of, but not limited to, forms of biopower evoked by implicit and explicit macro-level control over groups of people through the use and access to emerging neurotechnologies (Anderson, Fitz, and Howlader 2012). Herein we address (1) those kinds of core constructs that would enable a globally relevant and applicable neuroethics; (2) if and how various ethical systems might be integrated into this paradigm to address and mediate the issues, questions, and problems of international neuroscientific developments and use; and (3) the potential for realistic articulation of such a global neuroethics through informing and formulating international policies. We opine that a globally relevant and applicable neuroethics is possible, and can serve as a foundation upon which cultural norms can be meaningfully framed in contexts of ethical ideals and practical guidelines for the conduct and use of neuroscientific and neurotechnological research upon the world stage.

13. Ethical Issues in Neuroscience Communication

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A huge gap often exists between neurobiological observations and misleading conclusions stated by the media. Some opinion articles and two quantitative studies have already suggested that scientists themselves contribute to distort media reporting of neurobiological findings. Here, based on the literature and on our ongoing studies we describe four levels of data distortion. First, ambiguous scientific wordings contribute to misleading translation of correlated observations into scientifically proven causes in the media. Second, data misrepresentation within a scientific article occurs when the conclusions stated in the summary or in the discussion are not fully supported by the results (Gonon 2011). Third, citation distortion creates unfounded authority (Greenberg 2009). Fourth, publication biases explain why most neuroscience finding echoed by the media are invalidated by subsequent studies. We systematically studied this bias by focusing on attention deficit hyperactivity disorder (ADHD). Using databases, we identified 47 scientific publications on ADHD that were published in the 1990s and echoed by 347 newspapers articles. We selected the 10 most echoed publications and collected all their relevant subsequent studies until 2011. We checked whether findings reported in each "top 10" publication were consistent with previous and subsequent observations. Seven of the "top 10" publications were initial studies and their conclusions were either refuted or strongly attenuated subsequently. Among the three "top 10" that were not initial studies, two were confirmed subsequently and the third was attenuated. The newspaper coverage of the "top 10" publications (223 articles) was much larger than that of the 67 related studies (57 articles). Moreover, only one of the latter newspaper articles reported that the corresponding "top 10" finding had been attenuated. Because newspapers preferentially echo initial ADHD findings appearing in prominent journals, they report on uncertain findings that are often refuted or attenuated by subsequent studies.

In the long run, inaccurate media reporting of neuroscience findings might lead to inappropriate decisions regarding mental disorders. Moreover, distortions of neuroscience findings open the door to suspicious public attitudes toward neuroscience. It is therefore the ethical responsibility of neuroscientists, and in the interest of their community, to avoid distortions in scientific articles and to actively collaborate with journalists to improve media reporting. Because distortions are partly motivated by the institutional process of research financing, we lobby in favor of research grants that do not present links to therapeutic applications. A lobby should also be engaged to explain to politicians that excessive support of therapeutically oriented research programs may be counterproductive because it encourages misinformation of the lay public.

15. New Practices Lead to New Issues: Ethical Implications in Neuroscience Education. The Case of iPSCS Inside (and Outside) Medical Schools

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An emerging and crucial field of study for both medical and neuroscience programs concerns neural stem cell (SC) research. Cognitive and emotional deficits and/or sensorymotor impairments characterize neurodegenerative disorders (e.g., Alzheimer disease, Parkinson disease, multiple sclerosis). Recent data have hypothesized that SC transplantation could effectively oppose degeneration through an induced neuronal regeneration. Historically, ethical and neuroscientific research mainly focused on the transplantation of embryonic SCs (ESCs) derived from mouse and human donors. Conversely, recent works by Takahashi and Yamanaka (2006), Thompson (2007), and Vierbuchen (2010) have provided evidence on the possibility of both murine and human fibroblasts reprograming (e.g., skin cells) into a new kind of stem cell (e.g., induced pluripotent stem cells or iPSCs) or directly into new neurons to be transplanted. Moreover, IPS cell-derived neurons from patients hold great promise in filling an important niche between studies in humans and animal models, trying to model neurologic and psychiatric diseases in vitro (Dolmetsch and Geschwind 2011). Such development overcomes the ethical