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Governing sporting brains: concussion, neuroscience, and the biopolitical regulation of sport

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ABSTRACT

Drawing on the recent concussion litigation from the United States' National Football League (NFL), the paper examines the emergence of neuroscience knowledge as part of a defining rationale for the justification and rationalization of the lawsuit. The paper argues that neuroscience knowledge is best understood as a regulatory discourse that is attached to larger social, political, and economic realities that bring it into being as a legitimate type of knowledge. This larger socio-political governance logic is one that scholars call 'biopolitical' which emphasizes the protection of individual life over and above other ways of being. Risk discourses that frame risk-taking practices as immoral thus emerge within this biopolitical regime of governance that frame morality in terms of public health that individual citizens ought to pursue. With this in mind neuroscience knowledge plays an important role in concussion litigation. It emerges as a technology of biopolitical governance in that it is used to justify legal decisions on concussion. This is despite the fact that neuroscience knowledge remains nascent and even scientifically uncertain. Because of this, the paper argues that scholars ought to not only consider neuroscience research skeptically, but also ought to be aware of the dangers of neuroscience's emergence as an 'anticipatory discourse' that has the potential to reduce human behavior to matters of the brain that thus transforms our very ontology of ourselves and the practices we perceive as 'good'.

KEYWORDS

Neuroscience; concussion; sport law; biopolitics; risk

Introduction

In July 2011 the Superior Court of California, Los Angeles County heard a suit filed by 75 former professional National Football League (NFL) players against the NFL and helmet company, Riddell Inc. (*Maxwell et al. v National Football League et al.*, (Superior Court of California, County of Los Angeles, BC, 19 July 2011)). The retired players claimed that NFL Parties had not only put players at risk from concussive and sub-concussive injuries but that the NFL had fraudulently concealed these risks. Three successive lawsuits were filed that were then consolidated and joined by approximately a further 5000 former players who have since filed over 300 lawsuits against the NFL. Former players claimed that the NFL not only deceitfully concealed risks from repetitive traumatic brain injury but that the NFL also cultivated and 'glorified a culture of violence and a gladiator mentality, encouraging NFL players

to play despite head injuries' (re: *National Football Player's Concussion Injury Litigation* [2015], MDL 2323, p. 6). These series of lawsuits were eventually turned into a class action lawsuit in 2014–2015 that was concluded in 2016 when NFL players Keith Turner and Shawn Wooden, on behalf of themselves and other similarly situated plaintiffs, filed to hold the NFL responsible for alleged injuries based on liability and breached duty of care. Resisting these claims, the NFL responded that 'there was no scientifically proven link between repetitive traumatic head impacts and later-in-life cognitive/brain injury' (2015, Id. 308). Yet, silently acknowledged at the centre of this case as that which was encumbered with speculation and scientific uncertainty, but that would be used to tenaciously support the weight of the case, was a pivotal type of knowledge: neuroscience.

It is this focus on neuroscience and its role in the construction of knowledge claims about concussion injuries in sport law that is central to this paper. In particular, the paper is concerned with the knowledge claims that neuroscience makes to 'truth' and how this truth gets used as a regulatory mechanism in reorienting the 'goods' of sport toward what I describe as biopolitical governance agendas preoccupied with 'life itself' at the expense of other value orientations. With this in mind, the paper opens with a brief overview of the rise of neuroscience knowledge and its claims to normativity before next explaining the knowledge claims central to the concussion litigation and the role of neuroscience knowledge in legitimating these claims. Next, the paper moves onto considering how the legitimization of concussion litigation through neuroscience knowledge can be understood within a larger understanding of neuroscience as a regulatory discourse that is part of a broader biopolitical mode of governance. Finally, the paper considers how such a regulatory discourse shifts, and indeed puts into question, the very 'goods' of sport itself.

We are our synapses

Since it emerged as a professional field of inquiry in the 1960s, neuroscience knowledge has become increasingly dominant in our mainstream understanding of the human being and, particularly, the mind. The 1990s, hailed as the 'decade of the brain', revealed the weight of neuroscience as a field and discipline of knowledge (Satel and Lilienfeld 2013). Questions about human consciousness that have baffled psychologists, physiologists, and philosophers for decades appeared to be concluded through the one organ in the human body that was suddenly being revealed to us, not only by neuroscientists themselves, but by their host of sophisticated imaging technologies that could precipitously provide a window to our souls and reach the depths of human consciousness. Approximately 100 billion neurons in the brain that interact through the trillion synaptic connections have come to be regarded as the key to unlocking humanity and providing the answer to every element of human behavior (Herculano-Houzel 2009; Mahfoud 2014).

Scholars like Stephen Morse and Nikolas Rose describe this incursion of neuroscience knowledge as 'neuroexuberance' (Morse 2011) and 'neuromania' (Rose and Abi-Rached 2013). While they do not deny the importance of neuroscience knowledge per se, they are concerned with the rapid shift toward attempting to understand and reduce the human subject to the brain that has exploded both in science, in fields beyond neuroscience itself, and in popular media. As neuroscience knowledge has become accepted as a mode of enhancement and diagnosis, concerns emerge that neuroscience claims to challenge and open up new conceptualizations of society, of subjects, and of the human brain that reshape our

fundamental ontologies of ourselves (Rose 2007). Speculation emerges from these scholars not least because the ‘explanatory gap’ that has kept philosophers, psychologists and physiologists speculating for centuries appears to have been filled with a new ‘materialist ontology of thought’ that has not, as Rose (2016) claims, been discerned by philosophers, but rather by technology, and human interpretation of this technology. A new ability to ‘see the mind’—or see the mind simply as the brain—causes unease for those who seek to conceive of the human in less reductionist fashions and to also critically appraise and caution the normative force of such neuroscience discourses that take root in our understanding of humanity.

Scholars dealing with this question of the normative force of neuroscience knowledge have also been increasingly concerned with its role in the regulation and governance of life. Speculations arise about where such new conceptualizations of the human subject framed around the brain may take us in our understanding of the very function of what it means to be human, how we relate to one another, and to what extent we are able to function as free willing subjects. These concerns are coupled with ‘harder’ concerns regarding the regulation of neuroscience knowledge through the legal realm (Morse 2015a, 2015b; Schleim 2012). There is a concern that the law—and indeed sport law—may take on neuroscience knowledge in such a way that it changes the very foundations of law itself and the fundamental principles that underscore it (Green and Cohen 2004).

We have already seen evidence of the permutations of neuroscience knowledge as they make their way into sport. Where the majority of studies are performance enhancing, neuroscience knowledge is also used for diagnostic and rehabilitative, as well as regulatory, purposes, as evident in the opening examples from this paper of the NFL cases. Thus, in sport, in law, and in daily life, the rise of neuroscience knowledge as a legitimate mode of enhancement and as a diagnostic rationale reveals itself as an increasingly dominant way to understand and explain human behavior.

Concussion, neuroscience knowledge, and scientific uncertainty

Whilst concussion was identified in the tenth century it continues to be a relatively unknown injury or illness in modern medicine, primarily because of its ‘invisibility’ (Stone, Patel, and Bailes 2014). Generally, concussion is regarded as a head injury that results in a temporary loss of normal brain function, differentiated from other head injuries by its effects on consciousness. Early on, concussion symptoms were analogized to alcohol affliction, termed ‘punch drunk’. At the turn of the twentieth-century X-ray technology, that had only recently become available, made possible concussion diagnosis as the presence of a skull fracture or cerebral contusion (Stone, Patel, and Bailes 2014). Punch drunk syndrome was also linked to ‘dementia pugilistica’, regarded as long-term effects of repeated, low-grade concussive brain injuries. In 1954, medical researchers identified these chronic symptoms in a neuropathological report on a retired boxer who had post-traumatic dementia and Alzheimer’s Disease symptoms (Stone, Patel, and Bailes 2014). Studies on boxing continued in the 1970s but it was only in 2005 that a study by neuropathologist Bennet Omalu and colleagues emerged on the case of NFL player, Mike Webster, that sought to identify a relation between concussion and dementia pugilistica, coined at that time Chronic Traumatic Encephalopathy (CTE).

Omalu's study helped the diagnosis of concussion, previously made possible through visual markers and cognitive tests, become more scientifically determinable through the association between concussion and CTE that could be revealed through postmortem and neuropathological examinations of the athlete's brain. Postmortem examination procedures involve the examination of the brain under a microscope, revealing that repeated trauma leads to a build-up of an abnormal tau protein. Tau protein is said to be responsible for stabilizing nerve cell structure; when abnormal it forms twisted fibers in the nerve cells, destroying them which can cause neurological diseases. Brain imaging technologies have promised to provide a deeper scientific insight into concussion and concussion-related illnesses through the rise of PET scans in the late 1950s and fMRIs in the 1990s (e.g. Barrio et al. 2016), though at present these scans have yet to identify CTE in living athletes and only postmortem examinations are claimed to be conclusive (Saulle and Greenwald 2012).

Despite imaging technologies having not managed to diagnose CTE in living athletes, the NFL litigation was hinged on the development of neuroscience knowledge that could make this link conclusive. Players in the NFL class action lawsuit alleged that their engagement in football, through which they experienced concussive and sub-concussive injuries, was the cause of various medical conditions linked to CTE such as Alzheimer's Disease, Dementia, depression, cognitive functioning deficits, processing speed reduction, memory loss, inattention and reasoning, sleeplessness, mood swings, and personality changes. Players filing the lawsuit claimed that the NFL was aware of these 'scientifically proven links' between concussive and sub-concussive injuries and CTE markers of tau protein but did not educate NFL players of the dangers; such dangers, plaintiffs argued, were clearly evident given that in 1994 the NFL Parties formed a Mild Traumatic Brain Injury Committee (MTBI Committee). Players, therefore, accused the NFL of negligence and fraud, claiming that the NFL had knowledge of concussion related injuries in these earlier cases (pre action lawsuit).

In response, objectors claimed that links between concussion and CTE were not scientifically credible and remained uncertain. Since Omalu's research only 200 brains had been examined for CTE. A link between concussion and CTE could therefore not be conclusively stated. This scientific uncertainty of CTE was not concealed by the judge: the case fully acknowledged the 'nascent' state of CTE knowledge and that '... the symptoms of the disease, if any, are unknown' (*Re: NFL 2015*, p. 79). As the case clearly stated, '[I]t should be emphasized that an association is not equivalent to causation' (82). Despite the clear scientific uncertainty, neuroscience knowledge prevailed as a legitimate rationale for the decision held against the NFL.

Scientific uncertainty, risk and the biopolitics of sport

Scientific uncertainty in law is a common point of contention. In cases of public controversy, such as the issue of concussion, scientific uncertainty becomes inexplicitly linked and '... intertwined with differences in policy and philosophy' (Weiss 2003, 28). Karl Popper had claimed that science could only ever approximate to truth, but as Weiss (2003) acknowledges, this approximation is also not politically or philosophically neutral.

One of the major concerns, if not the main organizing principle, of the concussion litigation case was with regard to public health and the risk that players, future players, and society more broadly faced, from cultivating a sporting culture that valued the 'gladiatorial' discourse of pain and injury. It was this point raised forcefully by players who believed they had been

inculcated into a culture of risk-taking practices that had normalized pain and injury and therefore normalized concussion as part of the sport itself. Players felt this normalization of concussion was made possible through a concealment of research that indicated the contrary: that indeed concussion was a serious long-term health problem.

Litigation from players is particularly interesting given that, as scholars like Parissa Safai (2003) have claimed, sporting practices generally do indeed ‘... normalize pain and injury in sport’ (127) in a ‘culture of risk’ that pushes players ‘... to accept risk-taking ... and to make light of the consequences of injuries’ (128). One could argue that players have adopted this culture of risk somewhat freely. While one could argue that sports like football do breed risk taking and violence and, therefore, NFL Parties are responsible for inculcating this environment, particularly with regard to younger players, it is equally fair to say that athletes have agency to resist these norms; to think otherwise would be to accuse athletes of being cultural dupes.

Where Safai has noted a culture of risk, she also notes a ‘culture of precaution’ with regard to the rise of the public health agenda concerning health and safety more broadly speaking. In this culture of precaution risk-taking is regarded as an immoral value (Beck 1992; Giddens 1999). Such a shift to a politico-philosophy that decouples risk, pain, and injury from the ‘goods’ of sport seems evident in the NFL concussion litigation, in contrast to the existence of sport as an exceptional realm that validated character traits of valiance, courage and risk taking; risky practices associated with hegemonic masculine norms and celebrations of ‘gladiatorial’ brutality are being othered. Far from being role models, players are instead medicalized and their engagement questioned; their injuries suffered and illnesses diagnosed in later life are thus inextricably linked to a failure of sports’ morality and a failure of the practices of governance—in this instance the NFL Parties—to protect players from this risk.

Taking responsibility for one’s health and well-being is such a newly founded valiant, courageous and noble act. Athletes engaging in responsible health promotion activities are one means of ‘becoming moral’. Sport, then, has been decoupled from an instrumental rationality of risk that licenses certain risky practices that have an instrumental good attached to the state, such as those risks engaged with by public sector personnel, or private sector personnel who benefit members of public, such as the military, police, and fire services who face daily health risks.

Arguably this shift in the normative weight of sport practices like football can be understood as part of a larger biopolitical shift in governance toward practices of self-care and health management. Rose and Abi-Rached (2013), for example, speak of neuroscience knowledge as a new cog in the wheel of the biopolitical management of life that seeks to express the value of life and the ontology of being in an economy of health. Neuroscience values brain health and well-being as part of this wider health economy where the ‘good life’ values health over and above all else. Aristotle’s distinction between *zoe* and *bios*, or bare and political life, has been blurred (Agamben 1998). The rise of the ‘social’ realm or ‘matters of the household’ as Arendt (1958) had noted, emerges as *the* central political good. For scholars like Foucault (1990, 2008) and Italian philosopher, Esposito (2008) biopolitics transpired as an outcome of a liberal, and increasingly neoliberal, political rationality of governance that focuses on the protection of individual human life; for Esposito these individual protective measures around life emerge at the expense of more collective forms of social relations, and close off other ways of being that do not conform to valuing life itself above and beyond

other commitments and drives. Part of this rationality that seeks to govern and manage the unit of individual human life at the level of the population is a strategy that seeks to individualize and accord each subject responsibility for his or her own 'life'; governing individuals' 'souls' as Rose (1990) puts it, turns individuals' health into a moral issue and ensures subjects monitor their health and thus their soul as moral subjects accordingly.

While being careful not to demonize sport given its association with public health goods (i.e. exercise and health promotion), sporting practices like football that engage athletes in risky cultures, it seems, can no longer be exceptionalized without attention to how they might mitigate such health concerns. Indeed, even in exceptional political spheres that do engender rationalized 'appropriate' risks for the larger public good as noted, risk mitigation and health promotion strategies are becoming increasingly apparent in outward facing health promotion strategies (e.g. Chiarelli 2010; Ranby et al. 2011).

Discourses of risk and anticipation

As noted with reference to legal decision-making and settling lawsuits, framing, managing, and regulating any kind of risk such as concussion is also not politically neutral: institutional and political actors have vested interests in constructing and framing risk in relation to sporting concussion through 'laws, technological interventions and rule changes' (Bachynski and Goldberg 2014, 324). Where risky corporeal practices are decoupled from the good life, risk is also used as a concept to engage the larger public health rationale of governance. This arises through what Pickersgill (2011) calls an 'anticipatory discourse'.

The notion of anticipatory discourses overlaps with the nature of 'predictive and preventive medicine' (Rose and Abi-Rached 2013) that have a 'promissory character' (Williams, Katz, and Martin 2012, 241); they anticipate what might emerge and put regulatory measures in place to deal with these problems if and when they come to fruition. Anticipatory discourses and risk are interlinked through what Ulrich Beck and Anthony Giddens refer to as a 'risk society' that is central to modernity and is a society '... in which we increasingly live on a high technological frontier which absolutely no one completely understands and which generates a diversity of possible futures' (Giddens 1999, 3). This risk society is closely associated with anticipatory discourses because risk is a problem of modern society that is pre-occupied with the future.

Law and neuroscience are both anticipatory discourses in the sense that they do not simply respond and decide on things said, but instead actively construct future actions. In the case of the latter, neuroscience knowledge operates as a rationality of governance that engenders future actions by promising something other than what is. In the case of concussion this arises by way of future oriented explanations through the framing of 'neurofutures' (Martin 2015; Williams, Katz, and Martin 2012, 241). The legal case of *Re: NFL Players* (2016) makes this point clear: the case was hinged on the future promise of diagnostics. Where neuroscientists agree that CTE has only been diagnosed posthumously, researchers describe the 'holy grail' of CTE research as that which can diagnose CTE in living players. The case further argued that, despite research being nascent, it was clear that knowledge was building in the direction of the case; an argument was thus made that it would be unfair to discriminate against players because knowledge had not yet confirmed a link between concussion and CTE, and it was generally accepted that the tentative link was strong 'enough'. For instance, it was stated that 'the settlement recognizes that knowledge about CTE will expand

... Arguably, these uncertainties exist because clinical study of CTE is in its infancy' (79). Later: 'the settlement has some mechanism for keeping pace with science, in that the parties must meet and confer every ten years in good faith about possible modifications to the definitions of Qualifying Diagnoses' (90). From these examples one can glean that scientific and public expectations mobilized in and through law also help mobilize neuroscience knowledge as legitimate; in turn, neuroscience knowledge also works to legitimate law as a forward-thinking institution that is not simply dogmatic and prescriptive but that instead responds to public concerns.

The problem with anticipatory discourses is not simply the content of their claims but the function their engagement has on the field of neuroscience knowledge more broadly and on the governance of subjects more specifically. For Pickersgill (2011) such discourses add to the 'neuromania' and 'neuroexuberance' cautioned by Rose and Abi-Rached and by Morse noted earlier, in turn defining neuroscience as knowledge that must be taken seriously, bolstering its normative weight in the regulation of practices like sport. This normative weight is important to consider with reference to the very nature of the normative: neuroscience knowledge is framed in the language of scientific progress such that diagnosis will eventually be made entirely possible and will inevitably reveal the truth of what is claimed in the law. Thus, the law appeals to a futurity to rationalize its decision based on technological and scientific progress. Anticipation, risk, uncertainty, and diagnosis thus go hand in hand such that 'risk' can be realized and framed around wider governance agendas (Simon 2005).

Diagnosis, materialities, and brain imaging technologies

Despite anticipatory discourses being ambiguous they cannot survive on thin air and instead require the circulation of different scientific 'evidences' as a weight of support and rationale behind them. Pickersgill (2011) argues that imaging technologies are one such route through which this is made possible. Being regarded as an 'invisible injury' was helpful for the rationalization of decisions on concussion, because imaging technologies claimed to make it visible—or at least to make what is alleged to be the result of concussion, CTE, visible, thus adding credibility to neuroscience knowledge. While the knowledge produced by technology remains tentative and ambiguous, the interpretation and take up of the knowledge is transformable because it allows us to 'see' and imagine risk through visual biomarkers.

Emerging in various forms from X-rays invented in 1895 by the German physicist William Conrad Roentgen to computerized axial tomography scans, into more 'advanced' technology with PET and fMRI, neuro diagnostics have been presented as more reliable, scientific and objective (Satel and Lilienfeld 2013). In cases of concussion, imaging technologies such as MRIs have been used to examine brain anatomy, specifically grey matter, to view areas of the brain that appear to have 'scarring' from concussive related incidences, and more recently fMRIs, used to examine brain activity, have examined how concussive brains have 'abnormal blood flow' (Leddy et al. 2013). While experts have claimed that these imaging technologies do not currently display accepted evidence of CTE, they are nonetheless posited as technologies and biomarkers that can, and will, reveal the truth of this invisible injury. Neuroscience knowledge has thus changed the very ontology of concussion, providing scientists and clinical practitioners with what emerges as new 'evidence'. The 'explanatory gap' is filled with a new 'materialist ontology of thought' that has not, as Rose (2016) claims, been discerned

by philosophers, but rather with technology, that has made visible the mysterious and invisible.

For anthropologist, Joseph Dumit, imaging technology builds ‘... assumptions into its architecture and thus can appear to confirm them, while ... reinforcing them’ (2004, 81). Imaging technologies produce truths and confirm these truths through diagnoses that present themselves as objective factual data, despite the data they produce being highly interpretive. A central point raised in Satel and Lilienfeld’s critical text *Brainwashed* focuses on the importance of ‘interpretation’ in neuroscience knowledge that is often presented factually. Examining neurocorrelates on a brain scan is not value free science but rather is highly interpretive. That the reliability of brain imaging technologies and their interpretations have been questioned by neuroscientists themselves ought to be part of such a speculative analysis; a publication by Vul et al. (2009) highlighted this point, noting ‘puzzlingly high correlations’ that imaging studies claim to reveal.

Knowledge production concerning the materiality of the human mind now understood as brain also allows one to unify visual, material ‘results’ and diagnose effectively. Diagnostics have ‘unifying consequences’ in that they don’t just ‘sort things out, they also link things together’ (Rose 2013, 4). Sociologists interested in diagnostics consider not simply what the diagnosis of an illness or injury is, but also the diagnosis’ effects on subjects and on society, as well as how social values and subjects shape the very need and desire for such diagnostics. Petersen and Lupton’s (1996) remarks on the ‘new public health’ suggest that diagnostics give people control in a time when the prospect of disease and illness is deemed high.

As a tool for diagnostics, imaging technologies are part of neurosciences’ regime of normativity (Pickersgill 2011). The medicalization of concussion knowledge makes possible diagnostic claims that in turn produce new regulatory practices. Through media that displays brain scans of the normal and abnormal CTE brain, neuroscience knowledge permeates and is accepted as truth. The seductiveness of imaging technologies for the public and for those involved in the medical and legal realm also ought then to become a point of contention: the fMRI ‘... confers a great deal of scientific credibility to studies of cognition and that these images are one of the primary reasons for public interest in fMRI research’ (McCabe and Castel 2008, 344). The general public and the media, as well as those engaged in the legal profession, can be seduced into the claims that areas of the brain that are either normal or deviant regarding certain functions can be identified and corrected, and can likewise be seduced into regarding certain practices as being more or less moral.¹ The ‘discovery’ of CTE through neuropathological examination alongside neuroscientific means of imaging technologies that link concussion to diseases of the brain provide the ‘proof’ needed to civilize sport in line with larger public health agendas.

Diagnosis does not simply have a role in unifying disease but also has a role in making disease social; it is ‘an apparatus through which individuals ‘make up’ themselves and one another’ in order to differentiate between “normal” and “pathological” experiences ... relate to substances and practices ... and negotiate situations saturated with moral feelings and implications’ (Pickersgill 2014, 521). By unifying the consequences of concussive-related injuries, CTE as its final formulation manifest in the brain, can be made known, diagnosed, and the practices related to it—in this case sport—can be made subject to moral evaluation. Those participating in these practices can also be made subject to moral speculation and assessment.

In contrast to these skeptical views, one might argue that we should embrace these diagnostics rather than criticize them. Neuroregulatory mechanisms that make concussive injury abnormal rather than part of the normal hegemonic sport culture liberates players from brutality and violence; it also detaches players from abnormal behavior and puts them into a context where they can be diagnosed, worked on, and rehabilitated into normal society. Diagnosis is thus 'transformative' as it allows individuals the chance to embark on a 'moral career' that enables them to change their self perception (Goffman 1958; Rose 2013).

This transformative potential made possible through neuroscience knowledge is particularly significant for NFL players who have received various degrees of media attention regarding violent and aggressive tendencies off the pitch as well as on it; spectacular headlines regarding suicides of retired players, instances of domestic abuse, as well as murder suicide in the case of Joseph Belcher have engulfed media.² Medical diagnostics provide a possible rationale for this behavior that sideline the individual athlete's responsibility, placing the blame instead on the constitutive rules of the sport. Understood in the wider discourse of public health, 'sport as courageous' is transformed into 'sport as dangerous': for the individual engaged in this transformation of society's morality of sport, his or her behavior can be understood as a byproduct of a more fundamental moral problem with the practices inculcated in sport.

It is interesting to note here that the NFL class action lawsuit anticipated this relation between morality and behavior, and that this association was carefully dealt with, maintaining some distance between a complete reduction of the player's morality to sport-related concussion injuries. In doing so the case drew a distinction between neurocognitive symptoms of CTE and 'mood and behavioural' symptoms that might be regarded as 'deviant'. Where objectors claimed that CTE could be linked to both neurocognitive symptoms and mood and behavioral symptoms, the settlement drew a clear line between these arguing that the former had to be differentiated from the latter because the latter '... are common in the general population and have multifactor causation' (86), '... such as exposure to major lifestyle changes, a history of drug or alcohol abuse, and a high Body Mass Index ("BMI")' (41).

Those objecting claimed that such distinctions ought not to be made because mood and behavioral symptoms are precursors to neurocognitive ones. For example, athletes suffering from CTE are alleged to go through stages of headaches, depression, suicidality, and aggression before experiencing the neurocognitive symptoms. Yet such distinction and categorization was important for two reasons. First, the distinction enabled the legitimization of imaging technologies in rationalizing concussion as a 'real issue' based on its relation to CTE. This is because neurocognitive symptoms found in tau protein, for example, could arguably be traced to 'real' findings in the brain. Neuroselves could be seen in these images. In contrast it would have been regarded as more speculative to propose a link between a disease and behavior that could not so easily be 'validated'; this is despite attempts being made to 'find' and 'locate' behavior in specific regions of the brain.

Second, the law likely did not want to rely on a reductionist view of the subject that attributed behavioral symptoms to concussion-related injury because governance relies on the very notion that subjects can work on themselves and become good moral citizens in line with social norms. Morse (2015a, 2015b) argues that neuroscience knowledge will not change fundamental concepts of law such as freedom, culpability, and responsibility and that such claims are simply 'brain overclaim syndrome'. However, it is not simply the case

that the law could be fundamentally undone, as he argues, by neuroscientific reductionism of human behavior to the brain: rather it is also because governance requires we are constructed as free-willing subjects responsible for our own behavior. One must have the possibility to be rehabilitated and to work on one's self in order to become a good, moral citizen. Differentiating between behavioral and neurocognitive symptoms ensured medicalization was possible while still leaving space for the cultivation of responsible citizens who could choose to engage in good moral practices.

Conclusion

As medical ethicist and sociologist Faulkner (2003) writes, 'Evidence and governance are closely linked' in the field of health care. Health care is regulatory and credentialist as well as scientific. This applies also to neuroscience. It, too, is regulatory, credentialist, as well as scientific and thus discussions of neuroscience knowledge in sport ought not to be conceptualized, ethically, without this broader socio-political view. This paper has argued that when links between CTE and sport concussions are shored up through legal proceedings that draw heavily on neuroscience knowledge, concussion becomes not simply an issue for individual athletes, or for the NFL or other sporting bodies, but rather it is reframed as a public health concern. The medicalization of concussion and CTE made possible through technological windows to the previously unseen soul, reframes concussion, but more importantly reframes the sport of football more broadly construed, as a social problem. As a result, the reformulation of the values of life around classic liberal paternal views of risk and the benefits of the protection of individual life are at stake. Health—both of the individual athlete and of the broader public health—becomes the ultimate good that law and regulatory practices must protect, despite views to the contrary expressed by many.

This is not to suggest that health ought not to be part of a reflexive morality, particularly for those of us involved in, and who value, sport. This paper has not suggested that neuroscience knowledge is good or bad per se; rather, neuroscience knowledge is problematic when it becomes a regulatory discourse that is not critically analyzed in line with larger governance agendas that attempt to regulate and orient individuals toward a view of the good life that is, itself, subject to normative governance agendas. Indeed, in many respects, one could argue that neuroscience knowledge in the instance of concussion and football is a positive normative force: in response to a culture of sport that celebrates violence and glorifies a gladiatorial mentality, neuroscience knowledge could potentially be transformative in undoing the dominant hegemonic practices embedded in that culture that exceptionalize the practice of sport violence. On the other hand, however, we ought to also consider the practices that regulatory discourses close off. Moral connotations and expectations about how to live the good life and how to be a good citizen are attached to instrumental risk discourses (Lupton 1993) that, framed around public health, open up these existential questions regarding the ultimate good of human life. Perhaps this is a relative or particular view of ethics, but it is important to critically the wider socio-political context in which normative appeals to health are claimed, recognizing that not, in every instance, do subjects choose health over and above other values. Subjects engaging in practices normatively constructed as 'unhealthy' might not be deemed 'immoral' subjects as they are typically tarnished, but rather as subjects who value other ways of being that are not defined by an instrumental view of the health and longevity of life (Blencowe 2012; Metzl and

Kirkland 2010). Ethicists ought to question whether health and the rationalization of the protection of the subject ought to take such normative centre stage (Conrad 1994).

In short, neuroscientific knowledge ought to be ethically and critically reflected on as it is: discursive and regulatory, attached to larger systems of governance and constructs of the good. As a regulatory science we must be cautious of neuroreductionism: that is, the reduction in human experience to the brain, but also the reduction in the ultimate moral 'good' to 'brain health' and even more broadly, athlete health, that can be discerned through scientific evidence. Neuroscience knowledge is used to diagnose, unify and import such moral decisionism on sport; it therefore ought not to be closed off to discussion but rather should remain an open point of debate for those involved in sport ethics. How does neuroscience as a discourse help reorient the good life toward the larger governance agenda of public health? What is the good of sport participation if it is not *simply* biopolitical? Is there a moral good of sport, and for that matter a moral good of life in general, beyond 'life itself'?

Notes

1. Racine, Bar-Ilan, and Illes (2005) for example coined the term 'neurorealism' that claims that brain images are more real than other forms of data on human behavior (Satel and Lilienfeld 2013, 21). Imaging technologies allow us to view mental disorders as 'real things' thus contributing to their legitimization.
2. Dr Piotr Kozlowski, the physician preparing the postmortem pathology report claimed Belcher likely suffered from CTE given findings of tau protein tangles in seven sections of the brain hippocampus.

Disclosure statement

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