

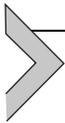
Towards a Socially-Just Neuroethics of Inequalities in Pain Treatment

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1. INTRODUCTION

Pain is a salient complaint for a wide range of cultures around the world, making it a near universal phenomenon (Good, Brodwin, & Good, 1994). In the United States, chronic pain affects an estimated 116 million people in the United States, and is the primary reason why people seek healthcare (IOM Committee, 2011; Meghani, Byun, & Gallagher, 2012). Prevalence rates for pain vary across race, ethnicity, socioeconomic status, and gender (Fillingim, King, Ribeiro-Dasilva, Rahim-Williams, & Riley, 2009; Institute of Medicine (IOM) Committee, 2011; Tait & Chibnall, 2012). However, in a bitter irony, the very populations who bear the greatest burden of chronic pain—women, people of colour, and the poor—receive the least care (Fillingim et al., 2009; IOM Committee, 2011; Meghani et al., 2012; Tait & Chibnall, 2012).

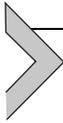
Identifying and addressing inequalities in the prevalence and treatment of pain is crucial to providing equitable and humane healthcare. While physicians and healthcare organizations have long ranked the undertreatment of pain as a primary ethical dilemma confronting pain medicine, attention has now turned towards the even more insidious problem of *inequalities* in the distribution of pain medicine (Green, Todd, Lebovits, & Francis, 2006). These disparities exist across all kinds of pain, no matter whether the source of pain is acute and tangible, like cancer or a fracture, or invisible and chronic, like fibromyalgia or back pain. Researchers have identified a broad range of factors that create these disparities, including: disparities in how groups perceive pain and choose to seek help for pain; differential exposures to hazards and injury; varying levels of trust in the healthcare system; broad disparities in how knowledge about pain is produced; the unequal distribution of trust and belief in and empathy for the pain patient as a credible reporter of their symptoms; and, in the United States, system-wide issues with access to health care (Meghani et al., 2012).

Neuroscience offers promising tools that have the potential to radically transform the treatment of pain. However, given deep and persistent inequalities in the prevalence and treatment of pain across demographic groups, care must be taken to ensure that new developments in neuroscience are created and used in ways that diminish, rather than increase or reify, these disparities. Although neuroethics has a broad mission to grapple with a wide range of social, ethical, and legal implications of neuroscience, in practice, neuroethicists tend to be focused more on how new knowledge and technologies might transform the collective understanding and control of the human mind, than on the perhaps less glamorous questions of how these technologies will affect already unequal societies.¹ Following Obasogie and Darnovsky's (2018) call to re-centre bioethics and, by extension neuroethics, more squarely on the broader social, cultural, political and economic dynamics that produce ethical concerns and, in particular, inequities, in the first place, this chapter shifts the focus of neuroethics to issues of justice.

With this in mind, I will direct attention towards the deeply historical processes that have created racialized and gendered institutions, state policies, myths and attitudes (e.g., Lara-Millán, 2014; Pryma, 2017; Wailoo, 2001, 2014), rather than focus my discussion on the inequities in

¹ The recent *Routledge Handbook of Neuroethics* is impressive in its breadth, but aside from a single chapter on feminist neuroethics, authors make only peripheral comments about social justice.

pain care on individual mechanisms—such as the unconscious processes that can lead to implicit biases in decision-making (Chapman, Kaatz, & Carnes, 2013). I am optimistic that an analysis that takes social, cultural, political and economic dynamics into account might better enable neuroscience to reduce these disparities and provide more equitable care. Situating the problem of pain treatment within a broad sociocultural and historical context makes it clear that technologies, no matter how innovative, will never solve the problem of treatment inequity because they are always reflections of the social world in which they were created. Instead, I argue that to reduce inequity we must engage in self-reflexive anti-sexist, anti-racist work.



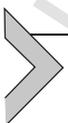
2. PAIN AND THE PROBLEM OF TRUST

Assessing and treating pain creates a fundamental challenge to one of the central premises of biomedicine: that there is objective, measurable knowledge outside of private experience (Good et al., 1994). Despite developments in neuroimaging that have enabled neuroscientists to visualize the development, structure and function of some of chronic pain's physiology, technologies are still lacking that can accurately transform the subjective experience of another person's pain into objective data (Davis et al., 2017). Chronic pain can be completely consuming and, at the same time, challenging if not impossible to describe fully to another person. Medicine offers people in pain few tools with which to communicate their internal and mostly invisible discomfort. Pain scales have improved, thanks to the incorporation of more questions that measure the variety of ways that pain can impact disability, quality of life, and emotional well-being (Breivik et al., 2008). However, these scales remain imperfect measures and difficult to interpret. As a friend with a newborn baby recently confided in me, how could she possibly answer her midwife's request to distinguish the pain she felt with breastfeeding as "pulling" or "tugging?"

In short, subjective self-reports of pain are unreliable, difficult to track longitudinally, and challenging to use to compare pain across individuals due to scale interpretation (see Buchman, Ho, & Goldberg, 2017 for an extended discussion on the meaning of objectivity in pain medicine). Objective, quantitative measurements tend to be more desirable in contexts in which trust is in short supply (Porter, 1996), which is certainly the

case with pain treatment. Although all therapeutic relations are built on trust, people in pain are particularly vulnerable to having their reports of symptoms discredited. In the midst of an opioid epidemic in which physicians, pharmacists, and patients are all subject to criminal oversight, people seeking relief from pain must demonstrate not only that their pain is genuine, but that their motivations for seeking analgesics are pure (Kempner, 2014; Pryma, 2017). Pain is also debilitating in ways that can increase precarity in employment and, ultimately, dependency on state managed welfare programs (Pryma, 2017). Here again, people in pain must submit themselves to the ostensibly objective judgement of a physician who is charged with distinguishing malingerers from those truly disabled by their symptoms.

Even when they are not seeking addictive drugs or permission to take time from work, the threat of moral judgements can overwhelm people in pain, who worry that their pain will not be taken seriously (Barker, 2005; Kempner, 2014). People in pain often fear that their pain will be dismissed as imagined, or that they will be characterized as neurotic or weak, especially if the source of their discomfort is invisible. Western culture continues to view all disorders through a binary lens whereby the body is considered real and the mind is considered unreal. Thus, the failure of biomedicine to attribute pain to a physical cause can cast doubt on the moral integrity of the person in pain (Kempner, 2014). This profoundly alienating stigma can lead people in pain to withdraw from their work and social life (Boersma & Linton, 2006). It is no wonder, then, that people in pain report that they expend enormous amounts of energy trying to appear credible (Werner & Malterud, 2003). However, the ability to present oneself as a credible reporter of symptoms is unequally distributed across demographic groups. Some healthcare providers systematically downgrade speakers' capacities to self-report their own pain based solely on discriminatory beliefs about the speakers' demographic group (Fricker, 2007). In addition, health care providers' empathy for those reporting symptoms of pain is not equally given. Understanding why this occurs requires a look back through history.



3. PAIN AND BIOLOGICAL CITIZENSHIP

Since at least the 18th century, cultural mythologies about human difference have been used to legitimate social inequality and to deter-

mine who has access to what anthropologists call biological citizenship—a political status in which biology allows individuals to make claims to certain rights and/or demands for access to resources and care (Petryna, 2003; Rose & Novas, 2007). Governments, corporations, religions, and political parties have all used biological theories of difference to decide which groups are capable of ruling and which groups need to be ruled, which groups can vote and participate in governance and which groups need to be protected, which groups can own property and which groups can be owned. Even today, some contemporary scientists continue to make claims that inborn moral, intellectual, and physical capacities vary depending on race, class, and gender (e.g. see discussions by Jordan-Young, 2011; Rollins, 2017; Vidaeff & Mastrobattista, 2003).

Historically, attributes of the nervous system have featured prominently in scientific discussions about the relative strengths and weaknesses of human populations. For example, in the 18th century, scientists assessed nervous systems as "strong" or "weak," which correlated with the quickness with which nerves transmitted intelligence and aesthetic sensibility (Beatty, 2015). In turn, scientists and physicians used these criteria to determine whether populations were civilized or primitive; white populations were said to have different nervous sensibilities and sensitivities than black populations; the upper-class had different nervous capacities than the working-class; and men had different nervous capacities than women (Barker-Benfield, 1992; Cheyne, 1733). Each of these identities intersected to produce bodies of varying abilities and worth. Over time, each group's perceived susceptibility and ability to persevere through pain has continued to have important political, economic, and social implications on contemporary medicine.

In the 18th century, colonial powers justified their enslavement, denial of political rights, and subjugation of Africans by arguing that black people had a different biological constitution than white Europeans, which was uniquely suited to the physical demands of hard labour under a hot sun (Omi & Winant, 2014). Africans were not only described as primitive but, as a people, they were said to be accustomed to living closer to nature (and far from the degrading effects of civilization). As a result, racial science constructed people of African descent as what Swedish naturalist Carolus Linnaeus termed *Homo afer*--a separate subspecies of human that had a robust, thick nervous system that transmitted signals slowly (Omi & Winant, 2014). This nervous sluggishness had ad-

vantages and disadvantages: thick nerves were thought to make people from Africa strong and resistant to the nervous diseases that afflicted Northern Europeans, but thick nerves were also (incorrectly) thought to slow the transmission of signals throughout the body, which produced an imperviousness to pain and a dullness of thought. In short, this was a convenient combination of traits for those who wished to argue that the brutal conditions of slavery were not, in fact, inhumane. Later, these same traits helped justify physicians' practice of trafficking black bodies across medical institutions for use in medical education and experiments. In the 19th century, medical museums solicited black bodies and body parts for their collections. Surgeons practiced their craft on black bodies, believing that black people could somehow endure surgery without pain relief. J. Marion Sims, the famous 19th century obstetrician, thought it acceptable to use unanaesthetized enslaved African-American women to develop a much-lauded surgical technique for the repair of vesicovaginal fistulas; an indication of how little empathy physicians at the time felt for black people and their suffering (Pernick, 1985; Washington, 2006).

In contrast, physicians fussed over the health of white, upper-class men and women who they believed were born with fine, delicate nerves (Barker-Benfield, 1992). These so-called sensitive nervous systems were thought to provide their possessors many advantages: the ability to think quickly and imaginatively, alongside a fine aesthetic, social refinement and taste, and broad intellectual capacities. But this delicacy also made the upper-class vulnerable to disease and illness, particularly nervous disorders. It should be noted however, that while upper-class women's delicate nervous systems might grant them some advantages, physicians often warned them against thinking too hard or wrongly. Worrying too much over matters of slight concern could render a white upper-class woman incapacitated, as vividly illustrated by Alexander Pope's (1712/1906) character Belinda who became incapacitated by a megrim after fretting about her stolen tress in the "Rape of the Lock."

Black women, on the other hand, have never been granted the indulgences provided to white women. Instead, in an awful paradox, white people have long glorified black women for their ability to remain strong despite the demands of multiple oppressive practices (hooks, 1981). Perhaps, as hooks (1981) has suggested, white people have only been able to rationalize black women's ability to survive brutal hardships by presuming that black women have sub-human, animalistic strength (hooks,

1981). Some physicians also appear to apply this same preternatural strength to black premature babies. Health care providers in the neonatal intensive unit widely believe black preemies to be stronger and more capable of survival than their white male counterparts (Oelberg, 2014; Wilder, 2015). Although I was not able to locate the origins of this myth, medical assumptions that black babies are naturally sturdier than white babies align with the broader history of medicine in the U.S., in which it has been long believed that black people have strong bodily constitutions that naturally feel little pain and, in which some physicians maintain an unreasonable belief that black people are somehow physiologically insensitive to social suffering.

Contemporary health care providers need not consider the thickness or robustness of the nervous system in order for this history to seep into their provision of care. Likewise, a doctor need not think of race as biological in order to imagine that black people have some kind of super-human immunity to pain. Nevertheless, these beliefs persist in popular culture and, to a lesser extent, in medical settings (Hoffman, Trawalter, Axt, & Oliver, 2016). Black bodies continue to be associated with an almost super-human level of strength and athleticism, alongside a reduced ability to experience pain (Waytz, Hoffman, & Trawalter, 2015).

To complicate matters, Wailoo (2014), in his political history of pain, argues that in every historical era, sexist and racist discourses about pain and the biological body are interpreted through the politics of that period. For example, discriminatory practices had long prevented people with sickle cell anemia from obtaining adequate medication for pain control (Ruta & Ballas, 2016; Zempsky, 2009). However, there was one brief moment in the 1970s when sickle cell anemia gained prominence both as a symbol of black suffering and as a metaphor for the social, economic, and political neglect of an entire people. In addition, newly empowered patients demanding rights upheld people with sickle cell as an exemplar of patients whose experience most needed to be listened to and believed (Wailoo, 2001). But these politics shifted in the 1980s with the rise of the war on drugs, mass incarceration and rhetoric from former US President Reagan about “welfare queens” dependent on government handouts (Wailoo, 2014). Physicians, wary of people who might be faking pain in order to obtain addictive opioids, became increasingly skeptical about their sickle cell patients' reports of pain, even though their patients clearly had sickle cell anemia, a condition in which pain is a well-known

symptom. Thus, credibility of people with sickle cell disease was once again reduced due to racial stereotypes, anxieties about urban crime, and increased moral conservatism about addiction.

Given this history and the broader politics of pain, it makes more sense to understand inequities in pain treatment as the product of structural and institutional processes rather than simply the aggregation of individual biases, for example patients' help-seeking behaviour or health care providers' individual biases. Take, for example, the case of chronic migraine, a highly disabling disease. If chronic migraine is analyzed using an individual-level analysis, it will appear that women receive better treatment than men. Women seek help for migraine more often than men and physicians are more likely to diagnose women than men (Buse et al., 2012), perhaps because chronic migraine is far more common in women than men and, therefore, physicians expect to see it in women (Kempner 2014). But an individual-level analysis cannot explain why a paltry 5% of people with chronic migraine receive a correct diagnosis and treatment (Dodick et al., 2016). This finding is far better explained by looking at the institutional history and broader politics that stigmatize women's pain across all medical fields. In this case, migraine's historical association with neurotic, hysterical white women has limited the research funding available for migraine and lowered the status of headache disorders in medical education (Kempner, 2014).

Lara-Millán (2014) makes a similar structural argument in his careful ethnography of an overcrowded public hospital's emergency room (ER), in which he identifies how triage workers use race, ethnicity, and gender as proxies of medical need as they determine the order in which patients ought to be allocated a bed. For example, he observes that nurses are particularly suspicious of African-American women who bring children to the ER, since they read them through a lens of welfare dependence, which by extension indicates drug seeking. In contrast, triage staff view African-American men in the ER with children as good fathers—an interpretation that protects them from criminal stigma. But rather than see these discriminatory practices primarily as individual acts of racism, Lara-Millán (2012) explains how this bias is the inevitable result of health care workers forced to allocate scarce resources in an institution fundamentally shaped by mass incarceration, policing, and crime control.

Structural forces might shape cognition in other ways, as well. Hoberman (2012) suggests that physicians' inurement to the pain and suf-

fering of black people may be a logical way to cope with the vastness of black suffering, more generally. Perhaps, then, physicians' tendency to discount white women's complaints about pain as neurotic and hysterical may also be viewed as the result of frustration that doctors are so often asked to treat ambiguous and disparate symptoms for which there is little research or knowledge. In any case, focussing on the institutions and structures that engender bias might be more productive than attempting to reform individual biases, which are not only resistant, but often implicit (Jacobson & Langley, 2015, pp. 1435–1446).

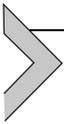


4. TOWARDS A SOCIALLY-JUST NEUROETHICS OF PAIN

If neurology historically played an important role in justifying the cultural ideologies that maintain social inequalities, then neuroscience, which is quickly growing in both scope and influence, potentially could transform our collective understanding of biological difference and social inequality. However, exactly how neuroscience will shape pain medicine remains uncertain. Now, more than ever, neuroethics must prioritize social justice.

What does a socially-just neuroethics look like? First, a socially-just neuroethics would take a critical perspective of neuroscience (Choudhury, Nagel, & Slaby, 2009), by beginning with the presupposition that neuroscience, like all knowledge production and dissemination, is a cultural practice, locally situated and entangled within larger political and economic contexts. The idea that knowledge reflects the world in which it is created is hardly new. One of the most robust findings in science, knowledge and technology studies is that scientific knowledge is not and cannot be objective, and instead reproduces the social relations in which it is created (Felt, Fouché, Miller, & Smith-Doerr, 2016). Neuroethicists who take this seriously will be forced to grapple with how the philosophical challenges and dilemmas raised by neurotechnologies emerge from and may affect social, political and economic dynamics. For example, rather than merely asking whether neuroimaging technologies fundamentally invade individuals' right to their own private subjective pain experience (e.g., Kolber, 2007), a socially-just neuroethics might also reflect on how privacy, itself, is a resource unequally distributed across societies (Anthony, Campos-Castillo, & Horne, 2017).

Second, a socially-just neuroethics would look beyond the conceptualization of inequality as the aggregation of individual biases and, instead, search for inequalities in how neuroscientific knowledge and technologies are produced, disseminated and used.. Instead of simply asking how a neuroimaging technology might enable providers to overcome implicit bias and help them make more objective assessments about patient pain levels, a socially-just neuroethics ought to ask whether neuroimaging technologies might, themselves, encode social stereotypes about culture? By starting from the premise that neuroscience itself reflects the social context in which it is produced, neuroethics can better locate potential problems before they start. In the following section, I describe three kinds of dilemmas that a socially-just neuroethics of pain, centred on issues of equity, will need to address.



GLOSSARY

- Biological citizenship** Describes how individuals' bodies and their injuries, genetic mutations, diseases, and disabilities, now form the basis for belonging, rights claims, and demands for access to resources and claims.
- Health status disparities** The variation in rates of disease occurrence and disabilities between defined population groups.
- Health inequalities** Avoidable disparities in health between defined population groups. These disparities typically develop from social and economic conditions, rather than from innate differences in the groups themselves.
- Intersectionality** A framework originally developed by legal scholar Kimberlé Crenshaw to describe how interlocking systems of oppression, for example social class, race and gender, create conditions that differently affect women depending on how where they are positioned within broader structures of power.

Neurofication	The process through which neuroscience takes the moral qualities, alongside moods, quirks, and other subjective characteristics that we typically attribute to the whole person and reduces them to features of the brain.
Neuro reduction	A paradigmatic or epistemological shift in which psychological processes are viewed in terms of neuronal processes.
Neurorealism	The ability of vibrant, colourful fMRI and PET scan technologies to validate an argument or to create the impression that otherwise ephemeral phenomena are real.
Socially-just neuroethics	An approach to neuroethics that prioritizes social justice and equity.

4.1. Tackling Neurorealism

Although many academic disciplines consider canonical the notion that all science is culture work, scientists typically present their work as objective reflection of an underlying reality (See Daston & Galison, 2010 for a history of objectivity in science). Some cultural critics and ethicists worry about the implications that this gap has for the public understanding of science, particularly when the research being disseminated involves the brain. Eric Racine, Bar-Ilan, and Illes (2005), coined the term neurorealism to refer to the ability of vibrant, colourful fMRI and PET scan technologies to validate an argument or to create the impression that otherwise ephemeral phenomena are real. Imaging technologies are technical renderings that use digitally manipulated colours to represent quantitative measurements assessing various metabolic processes (or, in the case of MRIs, the length of time it takes for hydrogen atoms to release the energy absorbed from radio-frequency waves; Dumit, 2004; Joyce, 2008). Cultural narratives promote the interpretation of MRIs as objective by framing them as high-tech real pictures that provide unmediated access to the inside of our bodies, which can tell a story about our health (Joyce, 2005). In addition, the study of brains and neurotransmitters seems like the kind of activity that ought to be done in a laboratory, separate from culture. Nevertheless, researchers have identified how neuroscientists draw on everyday notions of race, class, and gender to make decisions about what to research and how to collect data, which research

questions are interesting and how to interpret findings (Dumit, 2004; Joyce, 2008; Rollins, 2017).

Neurorealism is usually used to talk about how easily the public is duped into believing that neuroscience and its technologies allow for an objective and neutral view into the brain. But scientists and healthcare professionals are just as capable of over-estimating the value of neuroscientific research. That neuroscience is more easily understood to be objective and neutral just increases the importance of remaining vigilant about the ways that this knowledge can perpetuate and exacerbate social difference. Take, for example, the prospect that the tools and technologies of neuroscience are being developed to provide objective biomarkers of pain. One much-discussed possibility is that functional MRI (fMRI) could measure a neural signature or network of pain-related brain regions that could produce measures for use in clinical decision-making, or what some now call a "pain-o-meter" (Chiao & Mathur, 2016; Wager et al., 2013). Some believe that this technology could potentially solve some of the problems that cause pain disparities by avoiding the bias that patient self-reports introduce. For example, studies suggest that physicians tend to presume that women are more pain sensitive than men and more likely than men to report the pain that they experience (Hoffman et al., 2016; Wandner, Scipio, Hirsh, Torres, & Robinson, 2012). Physicians also rank the pain sensitivity of their patients by race and ethnicity. For instance, some physicians believe their typical white patients are the most pain sensitive, followed by the typical Asian patient, the typical Hispanic patient, and finally the typical black patient, whom they considered to be the least sensitive to pain (Cleeland, Gonin, Baez, Loehrer, & Pandya, 1997; Hoffman et al., 2016; Wandner et al., 2012).

One promise of an objective pain-o-meter is that patients would no longer need to worry that they were being perceived as liars or exaggerators. But how would we protect against a technology that encoded the race, gender, and class bias about pain that is already enacted in daily clinical practice? The history of technology is filled with examples of devices that appear to be objective and neutral, but which actually reproduce the social relations in which they were made. To name just a few examples, facial recognition technologies often do not see dark skin (Buolamwini & Gebu, 2018); automakers have long designed safety mechanisms, like airbag systems, using the dimensions of an average-sized man (Jain, 2006); and physicians continue to race-correct the

spirometers' measurements of lung capacity in a manner that systematically downgrades assessments of African-Americans' health—a practice that originated in order to argue that slaves were unfit for freedom (Braun, 2014). Producers of technology often don't realize that they are designing with a particular user (usually white, middle class) in mind or that their designs might privilege the values of healthcare providers over those of a diverse set of patients (Forsythe, 1996; Magnet, 2011). One can imagine how much more difficult, if not impossible, it would be to create an objective pain-o-meter meant to quantify and standardize a phenomenon that is inherently marked by intersubject variability in both brain and behaviour (Davis et al., 2017).

The more intractable problem is that little evidence suggests that inequalities in pain treatment would decrease even if it were possible to create a pain-o-meter capable of producing an objective measure of pain. For starters, to think otherwise is to forget that sophisticated technologies like these are typically prohibitively expensive for all but the highest-resourced healthcare systems in the highest-income countries. But, even if we could sort out access, the notion that a technology could eliminate gender and race-bias in care presumes that health care providers are equally invested in all of their patients. Studies find that physicians (particularly white physicians) feel more empathy towards white patients and that this gap increases as patients' reports of pain increase. Perhaps this explains why so many black men and women tell stories about how their requests for medical attention and pain medications are ignored even when their bodies are visibly undergoing extraordinarily painful experiences. For example, health care providers' failure to adequately address black women's complaints about pain and other symptoms may be partly responsible for the inequity that exposes black women in the U.S. to far greater risk of death from pregnancy-related causes as white women (Roberts, 1997). In short, if health care providers hesitate to treat the pain experienced by a black woman during childbirth, it is not clear what would be the added value of an objective test of her pain (Bridges, 2011; Roberts, 1997; Villarosa, 2018).

4.2. The Neurofication of the Subject

The ascendancy of neuroscience has raised a number of questions and concerns about how new understandings about the brain might reconfigure subjectivity, e.g. our relationships between our minds, brains, selves,

and the societies that we live in (e.g., Pickersgill, 2013; Rose, 2009; Vidal, 2009). How, for example, does thinking about a person's mental illness as a chemical imbalance, rather than, say, an emotional, psychic response to a trauma, alter their sense of selves (Rose, 2009)?

The term neurofication is one of the primary processes through which neuroscience is thought to shape subjectivity. Neurofication is the process through which neuroscience takes moral qualities, moods, quirks, and other subjective characteristics that we typically attribute to a whole person and reduces them to features of the brain (Rose, 2009). In neurofication, descriptors like competency, sociability, enthusiasm, argumentativeness, introspection, creativity, and eloquence are explained as the product of neurochemical reactions, rather than as the interplay between social, cultural, psychology, and neurobiological factors.

Some health care providers, neuroscientists, and patient advocates welcome neurofication, believing that brain-based explanations might destigmatize or, at least, help the public understand some of the less appealing behaviours and moods that often accompany disease (Buchman, Borgelt, Whiteley, & Illes, 2013; Pickersgill, Cunningham-Burley, & Paul, 2011).² However, embedding moral characteristics in the brain can also potentially exacerbate health disparities. Headache medicine provides a recent example of how neuroscientific explanations of personality can produce, rather than reduce, stigma (Kempner, 2014). In the last decades of the 20th century, headache doctors despaired that both medical doctors and the public continued to believe that migraine was a psychosomatic disorder that primarily affected neurotic women who could not cope with the everyday stresses of life. Headache doctors, therefore, celebrated two neuroscientific developments not only for the advances they represented in patient care, but because they believed these advances proved that migraine was a brain disease, rather than an invented problem of the mind. First came the 1991 approval of Glaxo's blockbuster drug, *sumatriptan*, which could abort a migraine in minutes by targeting specific serotonin receptors (Humphrey, 2008). Second came a series of high-profile brain imaging studies that located physical correlates in the brain associated with migraine (Cutrer, 2008). If migraine could be treated with drugs that worked on neurotransmitters, and if migraine could be imaged, then migraine must be real, legitimate and worthy of

² A positive example of neurofication might be how the discovery of chronic traumatic encephalopathy has enabled a redemptive narrative for former athletes' aggressive behaviour, substance abuse, and suicidal thoughts and behaviour.

care. However, much to the surprise of headache doctors, rather than undo previous psychosomatic descriptions of the migraine patient, neurobiological explanations for migraine neurified them. If the psychosomatic migraine patient seemed like they had an inability to cope, the patient with a migraine brain has a sensitive nervous system that requires an avoidance of stressful situations, regular meal schedules, and limited travel. The formerly neurotic migraine patient is now reconfigured as simply existing in a state of hyperexcitability, and advised to avoid particular foods, wear sunglasses indoors, abstain from alcohol, leave parties early, or request changes in their immediate environment (e.g., remove fluorescent lighting and scented products). If somebody were to challenge these patients as "demanding" or "high maintenance," the newly reconfigured migraine patient is advised to explain that it is not he or she who demands these changes, but his or her highly sensitive migraine brain. Ironically, the reinterpretation of the highly gendered personality and behavioural quirks associated with migraine as neurobiological has only served to reify them.

The neuroreduction of negative stereotypes associated with sex differences or racial categories into brain-based characteristics has profound implications for the future of equality (Martin, 2004). On one hand, brain-based explanations may alleviate individuals from the burden of personal responsibility for their personality quirks. On the other hand, attributing an individual's qualities to the brain, rather than to the more ephemeral mind or personality, we might counterintuitively create the impression that certain features of self are permanent. In this light, learning that an individual's propensity to be sensitive or aggressive is neurological, would not necessarily make them more attractive as an employee, a potential mate, a friend, or a neighbour.

4.3. Conceptualizing Difference

For the past three decades, biomedical researchers have engaged in a concerted effort to study diverse and inclusive samples, in part as an attempt to assess how medical research findings might shift as a result of human differences across populations, especially sex, gender, race and ethnicity (Epstein, 2007). Along these lines of inquiry, neuroscientists researching pain disparities are exploring whether gaps in pain prevalence may be partly explained by systematic variations in how demographic groups interpret and respond to pain. There now exists hundreds of ex-

perimental studies that have tested whether there are sex differences in pain sensitivity, and whether men or women are better at tolerating pain (Fillingim, 2017; Fillingim et al., 2009; Hashmi & Davis, 2014; Mogil, 2012). In a separate but parallel literature, researchers have examined differences in pain tolerance and pain sensitivity across race and ethnic categories (Rahim-Williams et al., 2007). To assess pain sensitivity, these studies expose research subjects to experimental stimuli that induce pain in a laboratory setting. By removing subjects from the clinic where multiple factors might affect their response to pain, researchers hope to isolate the contribution of biological sex differences and/or race and ethnic difference to the perception of pain.

Meta-analyses of studies seeking to find population differences in how groups respond to pain often find that white people, as a group, and men, as a specific gender category, are more able to tolerate pain than nonwhite people and women (Mogil, 2012; Rahim-Williams, Riley, Williams, & Fillingim, 2012). But these studies ought to raise some red flags. Western cultures associate both physical strength and strength of character with the ability to tolerate pain, so research that associates these qualities with white men—the demographic group that holds the most power—deserve additional scrutiny. Critical inquiry into these studies is especially important given Western medicine's long track record of using various brain-based measurements to argue that white men are cognitively superior to women, poor people, and people of colour (e.g., Gould, 1996).

Neuroscientists can learn from feminist science studies scholars and critical race scholars who have been quick to develop critiques of the underlying theoretical concepts and categories so often used to reify race, class and gender in biomedical research. Their critiques draw attention to how positivist, empiricist projects often render sociocultural context invisible and, instead, overemphasize categorical difference and present sexed and racialized brains as innate (Jordan-Young, 2011; Martínez Mateo, Cabanis, Loebell, & Krach, 2012; Schmitz & Höppner, 2014). Hashmi and Davis's (2014) critical review of the literature on sex, gender and pain research does exemplary work in this tradition, by explaining how biomedical researchers' seeming consensus that women are the more pain-sensitive sex may merely be the product of the kinds of methods and measures used in this body of research. Pain, Hashmi and Davis (2014) explain, is extraordinarily complex and difficult to measure using

experiments, which by virtue of the method, must simplify how the pain experience is operationalized.

How can neuroscientists prevent their studies on pain disparities from fuelling reductionist claims about difference? First, the very centrality of the brain and consciousness in the role of pain disparities should be contextualized and questioned. Neuroscience ought to investigate pain disparities as part of a broader investigation into biosocial influences that produce demographic differences in pain sensitivity. Neuroscience already understands the brain as plastic and responsive to the social world. Researchers ought to be prepared to discuss whether differences in pain sensitivity are innate or neural responses to broad inequities.

Second, neuroscientists should carefully consider not only which social categories they compare, but also how they operationalize these categories. When it comes to studying sex/gender, scientists too often act on the presumption that binary sex difference is of inherent interest, without articulating what it is about these categories they most want to learn. Are neuroscientists studying the influence of biological sex on pain sensitivity or does their experimental design use their subjects' gender as a proxy for some other variable, like exposure to risk or allostatic load?

Third, neuroscientists studying race and ethnic disparities ought to first familiarize themselves with the large social science literature that demonstrates how the socially-constructed boundaries of these categories shift over time, place, and culture (e.g., Omi & Winant, 2014; Roberts, 2011) and then reflect on how they are operationalizing race and ethnicity; what they believe they are measuring when they assess race and ethnicity as an independent variable, and whether that their analyses reify race/ethnicity as biological categories (e.g., Friedman & Lee, 2013).

Fourth, do researchers adequately articulate the limitations of their experimental method? For example, one might imagine that black research subjects would be more likely to express pain sooner in an experiment simply because they do not trust the experimenter to treat their bodies with respect. How can an experimental design in the United States control for black subjects' distrust in medical experimentation? How will experimental designs control the effect of social context across groups? For example, how can the researcher control for the effects of gender socialization in an experiment attempting to discern whether men or women are the more pain-sensitive sex?

Finally, the literature investigating differences between pain sensitivity and sex/gender and pain sensitivity and race/ethnicity rarely, if ever, intersect. Despite neuroscience's own admonition that sociocultural factors shape neurobiology and despite a massive literature demonstrating the myriad ways that race, class and gender act simultaneously to produce effects on the body, neuroscience does not always consider the *intersection* of these variables create different effects on bodies. In general, readers will assign unmarked research subjects (e.g. those whose identities are not identified as having a race or a gender), as having whatever demographic identity is most visible. Without an intersectional analysis of how various social forces shape brains, analyses that purport to analyze the men versus women's brains by default, will be interpreted as men's brains, whereas analyses that purport to analyze different pain responses in the brains of white people versus black people, by default, will be presumed to be investigating white brains.



5. FINAL THOUGHTS

The denial of adequate pain relief to anyone for any reason may be considered a human rights violation (Brennan, Carr, & Cousins, 2016). How much worse is it to systematically deny adequate pain treatment to people based on race, class, and gender?

Neuroscience has the potential to transform pain treatment and, indeed, for many disorders advances in neuroscience have already improved patient lives. The challenge now is to ensure that these advances are equitably distributed. In this chapter, I have argued that individual discrimination and implicit bias is best understood as the product of a long history of white male supremacy in science, medicine and politics. Neuroethics can and should help guide the development and use of neuroscience by ensuring that the broader social, cultural, political and economic dynamics that produce inequities are at the centre of its analyses.

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Abstract

Neuroscience offers tools that promise to radically transform the treatment of pain. However, care must be taken to ensure that the new neuroscience of pain is produced, disseminated, and used in ways that diminish, rather than exacerbate already existing deep and persistent inequalities in the prevalence and treatment of pain across demographic groups. In this chapter, I argue that neuroethics scholarship should demonstrate how inequalities in the treatment of pain are the logical result of deeply historical processes that have created racialized and gendered institutions, state policies, myths and attitudes. I begin by reviewing how, historically, social and political assessments of the biological and social value of women and people of colour were justified, in part, by racist and sexist scientific research on pain tolerance across populations. Given this social and political context, I then discuss ways that contemporary neuroscience could avoid exacerbating inequalities in pain treatment.

Keywords: Neuroethics; Pain; Inequality; Race; Gender; Social justice; Stigma; Neuroscience; Intersectionality