2007

Pain Detection and the Privacy of Subjective Experience

Adam Kolber
Brooklyn Law School, adam.kolber@brooklaw.edu

Recommended Citation
33 Am. J. L. & Med. 433 (2007)

American Journal of Law & Medicine, 33 (2007): 433-456

Boston University School of Law

Pain Detection and the Privacy of Subjective Experience

Adam J. Kolber[†]

I. INTRODUCTION

A neurologist with abdominal pain goes to see a gastroenterologist for treatment. The gastroenterologist asks the neurologist where it hurts. The neurologist replies, "In my *head*, of course."[1] Indeed, while we can feel pain throughout much of our bodies, pain signals undergo most of their processing in the brain. Using neuroimaging techniques like functional magnetic resonance imaging ("fMRI") and positron emission tomography ("PET"), researchers have more precisely identified brain regions that enable us to experience physical pain.[2] Certain regions of the brain's cortex, for example, increase in activation when subjects are exposed to painful stimuli.[3] Furthermore, the amount of activation increases with the intensity of the

---

[†] Associate Professor of Law, University of San Diego. For helpful comments, I thank Murat Aydede, Robert Coghill, Daniel Goldberg, Steve Hartwell, Ivy Lapides, Jane Ong, and Stacey Tovino, as well as the participants in the American Journal of Law & Medicine's "Brain Imaging and the Law" symposium and the Gruter Institute's "Law, Biology and the Brain" conference.

[1] Howard Spiro tells this joke in Howard Spiro, *Clinical Reflections on the Placebo Phenomenon*, *in* THE PLACEBO EFFECT: AN INTERDISCIPLINARY EXPLORATION 37, 46 (Anne Harrington ed., 1997).

[2] *See, e.g.*, Robert C. Coghill et al., *Pain Intensity Processing Within the Human Brain: A Bilateral, Distributed Mechanism*, 82 J. NEUROPHYSIOLOGY 1934 (1999) [hereinafter Coghill, *Intensity Processing*]; E.A. Moulton et al., *Regional Intensive and Temporal Patterns of Functional MRI Activation Distinguishing Noxious and Innocuous Contact Heat*, 93 J. NEUROPHYSIOLOGY 2183 (2005); R. Peyron, B. Laurent & L. Garcia-Larrea, *Functional Imaging of Brain Responses to Pain: A Review and Meta-Analysis*, 30 NEUROPHYSIOLOGY CLINICS 263 (2000); Carlo A. Porro, *Functional Imaging and Pain: Behavior, Perception, and Modulation*, 9 NEUROSCIENTIST 354, 357 (2003); Carlo A. Porro et al., *Temporal and Intensity Coding of Pain in Human Cortex*, 80 J. NEUROPHYSIOLOGY 3312 (1998).

[3] Among the areas of activation in the brain's cortex are the primary somatosensory cortex, anterior cingulate cortex, and prefrontal cortex. *See, e.g.*, Robert C. Coghill, John G. McHaffie & Ye-Fen Yen, *Neural Correlates of Interindividual Differences in the Subjective Experience of Pain*, 100 PROC. NAT'L ACAD. SCI. 8538 (2003) [hereinafter Coghill, *Interindividual Differences*]; Pierre Rainville et al., *Pain Affect Encoded in Human Anterior Cingulate But Not Somatosensory Cortex*, 277 SCIENCE 968, 969 (1997) (using PET scans to support "previous findings of significant pain-related activations" in the primary and secondary somatosensory cortices, the rostral insula, and the anterior cingulate cortex).

painful stimulus.[4] These findings suggest that we may be able to gain insight into the amount of pain a particular person is experiencing by non-invasively imaging his brain.

Such insight could be particularly valuable in the courtroom where we often have no definitive medical evidence to prove or disprove claims about the existence and extent of pain symptoms. In fact, pain is one of the easiest medical complaints to feign.[5] Yet, given that pain and suffering awards may represent about half of personal injury damage awards,[6] if even a small percentage of those awards involve feigned or grossly exaggerated symptoms, billions of dollars may be redistributed each year to malingering plaintiffs. On the other hand, if litigants raise genuine claims that we fail to recognize, billions of dollars may fail to reach those who properly deserve compensation for injuries.[7] In this symposium article, I will argue that, despite many conceptual and technological challenges, neuroimaging may someday play a critical role in the evaluation of pain claims.

In recent years, a burgeoning literature has developed on how neuroimaging may inform our understanding of deception,[8] moral and legal

---

[4] *See* Coghill, *Intensity Processing*, *supra* note 2, at 1936 ("Multiple regression analysis of the functional imaging data revealed that a number of cerebral cortical and subcortical areas exhibited significant, graded changes in activation linearly related to subjects' perceptions of pain intensity."); Porro, *supra* note 2, at 357 ("Pain intensity-dependent activations are found in cortical regions pertaining to the 'lateral' . . . and 'medial' . . . pain systems . . . in the insular cortex and supplementary motor area."); *see also* Rainville et al., *supra* note 3 (finding that subjects given hypnotic suggestion of increased painfulness from a heat stimulus felt more pain and had greater regional cerebral blood flow in the anterior cingulate cortex than they did without the hypnotic suggestion); Porro, *supra* note 2, at 358 ("Recent event-related fMRI studies also reveal cortical foci with graded responses to the intensity of heat stimuli, activated during both perceived warmth and pain.") (citations omitted).

[5] Alan J. Cunnien, *Psychiatric and Medical Syndromes Associated with Deception*, *in* CLINICAL ASSESSMENT OF MALINGERING AND DECEPTION 23, 41 (Richard Rogers ed., 2d ed. 1997). While it is difficult to estimate how often malingering occurs, neuropsychologists who make malingering evaluations report finding probable malingering in about 34% of chronic pain cases in which they are asked to make determinations. Wiley Mittenberg et al., *Base Rates of Malingering and Symptom Exaggeration*, 24 J. CLINICAL AND EXPERIMENTAL NEUROPSYCHOLOGY 1094, 1096 (2002) (based on adjusted data). Another study examined a group of patients receiving disability benefits for chronic pain who were referred for psychological testing because their doctors believed that their pain was largely psychological in origin. Evidence of malingering was found in over 40% of these patients. Roger O. Gervais et al., *Effects of Coaching on Symptom Validity Testing in Chronic Pain Patients Presenting for Disability Assessments*, 2 J. FORENSIC NEUROPSYCHOLOGY 13-14 (2001).

[6] *See* W. KIP VISCUSI, REFORMING PRODUCTS LIABILITY 102-04 (1991); Steven P. Croley & John D. Hanson, *The Non-Pecuniary Costs of Accidents: Pain and Suffering Damages in Tort Law*, 108 HARV. L. REV. 1785, 1789 (1995); Edward J. McCaffery, Daniel J. Kahneman & Matthew L. Spitzer, *Framing the Jury: Cognitive Perspectives on Pain and Suffering Awards*, 81 VA. L. REV. 1341, 1347 (stating that pain and suffering awards "account[] for perhaps one-half of the total tort damages paid out in the important cases of products liability and medical malpractice"). *But see* Neil Vidmar, *Empirical Evidence on the Deep Pockets Hypothesis: Jury Awards for Pain and Suffering in Medical Malpractice Cases*, 43 DUKE L.J. 217, 235 n.84 (1993) (questioning the availability of accurate data on this issue).

[7] *See* Steven I. Friedland, *Law, Science, and Malingering*, 30 ARIZ. ST. L.J. 337, 339 (1998).

[8] *See, e.g.*, Charles N. W. Keckler, *Cross-Examining the Brain: A Legal Analysis of Neural Imaging for Credibility Impeachment*, 57 HASTINGS L.J. 509 (2006); Sean Kevin Thompson, Note, *The Legality of the Use of Psychiatric Neuroimaging in Intelligence Interrogation*, 90 CORNELL L. REV. 1601 (2005); Paul Root Wolpe, Kenneth R. Foster &

responsibility,[9] behavior prediction,[10] and much more.[11] There has been very little analysis, however, of the societal implications of neuroimaging technologies that provide insight into our subjective experiences,[12] even though researchers have used neuroimaging to observe our brains while we experience not only pain but also happiness, sadness, anger, fear, and disgust.[13] While we are still a long way from understanding these complicated phenomena, neuroimaging has been and will continue to be at the forefront of neuroscience research into the nature of subjective experience. It may well be time to consider some of the legal and ethical issues that such technology may raise.[14]

Subjective experiences such as pain are private in two quite different senses. First, they are private in the descriptive sense. No one else knows exactly what I am feeling at a particular moment, and no one else can directly experience my feelings. While I can infer that others are in pain, I have uniquely direct access to my own pain. "One does not say that one is in pain on the grounds that one is groaning and assuaging one's injured limb."[15] Rather, "it is because I can introspect that I can say how things are with me *without observing what I do and say*."[16]

Second, subjective experiences are private in the normative sense. In some cases, we ought not be forced to reveal information about what we are feeling. For example, one might reasonably believe that we have some

---

Daniel D. Langleben, *Emerging Neurotechnologies for Lie-Detection: Promises and Perils*, 5 AM. J. BIOETHICS 39, 39 (2005).

9 *See, e.g.*, Patricia S. Churchland, *Moral Decision-Making and the Brain*, *in* NEUROETHICS: DEFINING THE ISSUES IN THEORY, PRACTICE, AND POLICY 1, 3 (Judy Illes ed., 2006); Stephen J. Morse, *Moral and Legal Responsibility and the New Neuroscience*, *in* NEUROETHICS: DEFINING THE ISSUES IN THEORY, PRACTICE, AND POLICY 33, 33 (Judy Illes ed., 2006) [hereinafter NEUROETHICS]; Joshua Greene & Jonathan Cohen, *For the Law, Neuroscience Changes Nothing and Everything*, 359 PHIL. TRANSACTIONS ROYAL SOC'Y LONDON B 1775 (2004); Richard E. Redding, *The Brain-Disordered Defendant: Neuroscience and Legal Insanity in the Twenty-First Century*, 56 AM. U. L. REV. 51 (2006); LAURENCE TANCREDI, HARDWIRED BEHAVIOR: WHAT NEUROSCIENCE REVEALS ABOUT MORALITY (2005); MICHAEL S. GAZZANIGA, THE ETHICAL BRAIN (2005).

10 *See* Henry T. Greely, *The Social Effects of Advances in Neuroscience: Legal Problems, Legal Perspectives*, *in* NEUROETHICS, *supra* note 9, at 245, 246-48; Jennifer Kulynych, Note, *Psychiatric Neuroimaging Evidence: A High-Tech Crystal Ball?*, 49 STAN. L. REV. 1249 (1997).

11 *See generally* Judy Illes, Eric Racine & Matthew P. Kirschen, *A Picture is Worth 1000 Words, But Which 1000?*, *in* NEUROETHICS, *supra* note 9, at 149.

12 *See* Hank Greely, *Prediction, Litigation, Privacy, and Property: Some Possible Legal and Social Implications of Advances in Neuroscience*, *in* NEUROSCIENCE AND THE LAW: BRAIN, MIND, AND THE SCALES OF JUSTICE 114, 141-42 (Brent Garland ed., 2004) (mentioning the possibility of using neuroimaging to detect and assess pain); *see also* Charles N. W. Keckler, *Cross-Examining the Brain: A Legal Analysis of Neural Imaging for Credibility Impeachment*, 57 HASTINGS L.J. 509, 544 (2006) (noting that neuroimaging techniques that reveal deception might inform assessments of malingered pain).

13 *See* Lisa F. Barrett & Tor D. Wager, *The Structure of Emotion: Evidence from Neuroimaging Studies*, 15 CURRENT DIRECTIONS PSYCHOL. SCI. 79, 79 (2006); *see also* K. Luan Phan et al., *Functional Neuroimaging Studies of Human Emotions*, 9 CNS SPECTRUMS 258, 264 (2004).

14 Stacey Tovino grapples with a wide-variety of privacy issues raised by neuroimaging in Stacey A. Tovino, *The Confidentiality and Privacy Implications of Functional Magnetic Resonance Imaging*, 33 J.L. MED. & ETHICS 844 (2005).

15 M.R. BENNETT & P.M.S. HACKER, PHILOSOPHICAL FOUNDATIONS OF NEUROSCIENCE 84 (2003).

16 *Id.* at 85.

interests in keeping private when we are in pain, how much pain we are in, what triggers our pain, and how sensitive we are to pain. Such privacy interests may partially explain why we legally restrict disclosure of medical records. Similarly, we may have interests in keeping private other subjective experiences like embarrassment and sexual arousal. Even though we sometimes betray our own emotions involuntarily through comments, gesticulation, and facial expressions, in some cases, we may plausibly have rights to be free from certain unwanted inquiries into our subjective experiences.

In Part II, I provide general background on the nature of pain and the ways in which we develop evidence that other people are in pain. In Part III, I describe how neuroimaging may, in the not-too-distant future, supplement our evaluations of pain claims by supporting genuine claims or, possibly, impugning malingered ones. In addition, I suggest that basic research into pain imaging may, in the more distant future, provide increasingly objective methods of assessing the severity of a person's pain and comparing that to the pain of other people. Finally, in Part IV, I discuss some of the legal and ethical issues raised by imaging technologies that reveal subjective experiences like pain. I suggest that future pain imaging technologies are likely to raise rather manageable privacy concerns because they would permit only limited intrusion into the privacy of our thoughts and character.

II. BACKGROUND

A. Pain Generally

There is much disagreement over exactly what pain is, as no simple definition adequately captures the concept. The International Association for the Study of Pain has influentially defined the phenomenon as "[a]n unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage."[17] This description highlights the fact that pain has several phenomenological components. Sensory components of pain include its perceived intensity, location in the body,[18] and texture (for example, pain can be sharp, burning, or stinging).[19] The process of sensing such aspects of pain is called nociception.[20] Affective and evaluative components of pain include the emotional distress or

---

[17] International Association for the Study of Pain, http://www.iasp-pain.org (follow "Resources" hyperlink at top of page; then follow "Pain Definitions" hyperlink; then follow "Pain" hyperlink).

[18] Rainville et al., *supra* note 3, at 968.

[19] Patrick Wall, Pain: The Science of Suffering 12 (2000) (describing sample terms used by psychologist Ronald Melzack to characterize the sensory components of pain).

[20] *Cf.* Colin Allen et al., *Deciphering Animal Pain*, *in* Pain: New Essays on its Nature and the Methodology of Its Study 351, 351 (Murat Aydede ed., 2005) (describing nociception as "the basic capacity for sensing noxious stimuli"); Robert C. Coghill, *Pain: Making the Private Experience Public*, *in* Pain: New Essays on its Nature and the Methodology of Its Study 299, 300 (Murat Aydede ed., 2005) (hereinafter Pain: New Essays) (describing nociception as the "reduced physical (i.e., neural) mechanisms responding to and encoding information about actual or impending tissue damage").

unpleasantness we associate with a sensation of pain,[21] characterized by words like "tiring, sickening, and annoying."[22]

The sensory and affective aspects of pain are processed, at least in part, in different regions of the brain.[23] In fact, some patients with disrupted cognitive abilities due to frontal lobotomies, cingulotomies, or certain drugs, such as morphine, report that they feel the sensory component of pain but find it "less distressing or bothersome."[24] Similarly, those with "pain asymbolia" do not have aversive reactions to the pain of small cuts or burns, yet they still recognize these experiences as being, in some sense, painful.[25] In rare cases, people are born completely insensitive to physical pain, having neither sensory nor affective reactions to painful stimuli.[26] This condition can be quite devastating as the afflicted are quite prone to cuts, bruises, and more serious injuries that those with normal pain responses know more instinctively to avoid.[27]

Because pain has both sensory and affective components, our reactions to pain depend on more than just sensory stimuli. Pain responses are "significantly influenced by psychosocial context, the meaning of the pain to the individual, the patient's cultural background, and the individual's beliefs and coping resources."[28] Emotional states like anxiety and depression also "dramatically influence[]" pain perception.[29] Thus, "severity of pain does not bear a simple relationship to the degree of tissue damage."[30] To take a dramatic example, the pain associated with an injury that occurs while saving a child from a burning building may feel far less distressing than the pain from an otherwise identical injury that prevents a person from saving a child.[31] Furthermore, when pain is induced in medical experiments, researchers tell subjects that their pain is only temporary and that subjects

---

21 Rainville et al., *supra* note 3, at 968.

22 WALL, *supra* note 19, at 12 (describing sample terms used to characterize affective components of pain).

23 *See* FLOYD E. BLOOM ET AL., THE DANA GUIDE TO BRAIN HEALTH 169 (2006) ("Measuring the level of sensory intensity is associated with activity in the primary somatosensory cortex, whereas the unpleasantness is associated with activity in areas of the frontal lobe cortex usually associated with emotion . . . ."); *see also* Rainville et al., *supra* note 3, at 970 (using functional neuroimaging to support "at least a partial segregation of function between pain affect and sensation").

24 Rainville et al., *supra* note 3, at 968. *See also* Murat Aydede, *A Critical and Quasi-Historical Essay on Theories of Pain*, *in* PAIN: NEW ESSAYS, *supra* note 20, at 31-32; BLOOM ET AL., *supra* note 23, at 169.

25 Aydede, *supra* note 24, at 32.

26 Michael Hopkin, *The Mutation That Takes Away Pain*, NEWS@NATURE.COM, Dec. 13, 2006, http://www.nature.com/news/2006/061211/full/061211-11.html.

27 *Id.* Researchers have recently found a very rare genetic mutation that causes the condition. *Id.* Assuming that everyone who has the mutation has the pain-free condition, then the presence of the mutation provides good evidence that an afflicted person is not experiencing physical pain. If so, this would be a very reliable, though rarely ever practical method, of detecting malingered pain.

28 Eric Eich et al., *Questions Concerning Pain*, *in* WELL-BEING: THE FOUNDATIONS OF HEDONIC PSYCHOLOGY 155, 160 (Daniel Kahneman et al., eds., 1999) (citations omitted).

29 *Id.*

30 Chris J. Main, *The Nature of Chronic Pain*, *in* MALINGERING AND ILLNESS DECEPTION 171, 172 (Peter W. Halligan, Christopher Bass & David A. Oakley eds., 2003).

31 E-mail from Robert C. Coghill, Assistant Professor, Department of Neurobiology and Anatomy, Wake Forest University School of Medicine, to Adam Kolber, Associate Professor of Law, University of San Diego (Nov. 17, 2006, 10:36:33 EST) (on file with author).

can cease to participate in the experiment whenever they so decide.[32] This affects the nature of the pain experience and makes it difficult to create well-controlled experiments that induce the kinds of pain we are likely to experience outside the laboratory.

Pain can be roughly classified as acute or chronic, though there is little precision in the distinction.[33] Typically, acute pain is viewed as more temporary or more a function of nociceptive input than chronic pain, which is thought of as more long term and more heavily influenced by psychological and social influences.[34] Among these influences, several studies suggest that those involved in litigation over personal injuries tend to have worse treatment outcomes than similarly injured people who are not seeking compensation.[35] Some cite these results to challenge compensation schemes that, through conscious or unconscious processes, seem to increase the severity of people's symptoms.[36]

B. INTROSPECTING PAIN

When we, ourselves, are in pain, we know it automatically through introspection. Under the traditional view, "[p]ains are said to be *private* to their owners in the strong sense that no one else can epistemically access one's pain in the way one has access to one's own pain, namely by feeling it and coming to know one is feeling it on that basis."[37] While we might infer that someone else is in pain based on his behavior, we need not resort to such observations to know our own pains. "[I]f it seems to me *that* I am in pain and I believe so on that basis, I am in pain."[38] According to this view, no evidence of pain can ever be more persuasive than one's honest, immediate first-person perceptions of the phenomenon. Thus, "if a person avows that he is not in pain, yet evidence from PET or fMRI suggests that he is, the latter is defeated by the agent's sincere utterance, and the inductive correlations of the data from PET and fMRI with the subject's being in pain need to be re-examined."[39]

Pain has also been deemed essentially subjective "in the sense that [its] existence seems to depend on feeling [it]."[40] Thus, it is not at all clear whether a person can be in pain without knowing it. On the one hand, I might plausibly say, "I was awakened by a pain in my shoulder," which seems to suggest that my pain precedes my awareness of it. On the other hand, I

---

32 WALL, *supra* note 19, at 63.

33 *See* Ellen Smith Pryor, *Compensation and the Ineradicable Problems of Pain*, 59 GEO. WASH. L. REV. 239, 253-57 (1991).

34 *See id.*

35 *See* George Mendelson, *Outcome-Related Compensation: In Search of a New Paradigm*, *in* MALINGERING AND ILLNESS DECEPTION, *supra* note 30, at 220, 222.

36 Pryor, *supra* note 33, at 280-91.

37 Aydede, *supra* note 24, at 3 (describing, though not advocating, the Cartesian view of pains and other bodily sensations).

38 *Id.* at 4.

39 BENNETT & HACKER, *supra* note 15, at 83.

40 Aydede, *supra* note 24, at 4.

might more precisely say that I was awakened by a pain precursor and that I did not actually experience pain until I was at least partially awake.[41]

While pain is typically thought to be fundamentally private and subjective, there is plenty of room for science to improve our understanding of our reactions to pain. For example, though we have unique introspective access to our own pain, the mere act of introspecting draws attention to pain in a manner that intensifies the phenomenon.[42] Seeking to analyze one's pain thereby alters its nature. Similarly, distraction from pain can ease its intensity.[43] Expectations that pain will subside can also ease pain intensity. When we unwittingly take placebos to treat pain, we expect our pain to subside, and it frequently does.[44]

Furthermore, while we may be experts about our own pain while it occurs, our memories of pain are often inaccurate. For example, our evaluations of painful episodes are heavily influenced by particular moments during the episode (such as the moment when the pain is most intense) and do not necessarily reflect accurate judgments of the total pain experienced during the episode.[45] Similarly, in a famous study, researchers showed that when we experience physically painful circumstances that extend over a period of time, we tend to remember especially the amount of pain felt at the end of the interval.[46] In the study, both control and experimental subjects received a colonoscopy, a screening procedure for colorectal cancer where a colonoscope is inserted through a patient's rectum into the lower gastrointestinal region.[47] In experimental subjects, however, after an ordinary colonoscopy, the colonoscope was left in patients' rectums for an average of one additional minute.[48] During this period, patient discomfort was somewhat less than it was when the colonoscope was more deeply inserted. The amount of pain experienced by experimental subjects at the end of the procedure proved

---

[41] *See generally* DANIEL C. DENNETT, BRAINSTORMS: PHILOSOPHICAL ESSAYS ON MIND AND PSYCHOLOGY 190-229 (1981); Ned Block, *On a Confusion About a Function of Consciousness*, 18 BEHAV. & BRAIN SCI. 227, 230-36 (1995).

[42] Coghill, *supra* note 20, at 302-03.

[43] *See, e.g.*, C.V. Bellieni et al., *Analgesic Effect of Watching TV During Venipuncture*, 91 ARCHIVES DISEASE CHILDHOOD 1015 (2006) (reporting that children distracted by television during venipuncture suffered less pain than those who were not distracted).

[44] *See generally* Spiro, *supra* note 1, at 42 (noting that expectations of improvement can contribute to placebo effects). Neuroimaging studies have improved our understanding of placebo pain relief, demonstrating that the brain responds in similar ways to placebo pain relievers as it does to standard opiod drugs. The research provides fresh support for the view that placebos can generate substantial pain relief that is much like the pain relief from conventional analgesics. *See, e.g.*, Ginger A. Hoffman et al., *Pain and the Placebo: What We Have Learned*, 48 PERSP. BIOLOGY & MED. 248, 260-62 (2005) (describing the recent neuroscience literature on placebo pain relief); Tor D. Wager, *The Neural Bases of Placebo Effects in Anticipation and Pain*, 3 SEMINARS PAIN MED. 22 (2005); Tor D. Wager et al., *Placebo-Induced Changes in fMRI in the Anticipation and Experience of Pain*, 303 SCIENCE (2004). Neuroimaging has also supported the view that patients with fibromyalgia, a chronic pain condition, have higher than normal pain sensitivity due to "augmented central nervous system processing of pain." Richard E. Harris & Daniel J. Clauw, *How Do We Know That the Pain in Fibromyalgia is "Real"?*, 10 CURRENT PAIN & HEADACHE REP. 403, 406 (2006).

[45] *See, e.g.*, Donald A. Redelmeier, Joel Katz & Daniel Kahneman, *Memories of Colonoscopy: a Randomized Trial*, 104 Pain 187, 189-92 (2003).

[46] *Id.*

[47] *Id.* at 187-88.

[48] *Id.* at 188-89.

particularly salient to their overall memory of the event. After the procedure, compared to control subjects, experimental subjects remembered less total pain, rated the discomfort of the colonoscopy to be less unpleasant, and were more likely to return for follow-up colonoscopies in subsequent years.[49] This was true even though the experimental subjects, on average, had longer colonoscopies and, as an objective matter, probably experienced more total pain.[50]

C. PAIN IN OTHERS

Despite the uniquely first-person aspects of pain, we can nevertheless still make judgments, with some level of objectivity, about the pain of others. For example, when a radiologist reviews a simple X-ray image of a severely fractured leg, he can typically report with great confidence that the patient is in pain. Thus, traditional diagnostic images are one form of evidence of a person's pain. We also make judgments about the pain of others by considering their self-reports. Hence, doctors diagnose and treat competent, adult patients by asking them how they feel. Patients communicate the extent of their pain with words, grunts, tones of voice, and perhaps facial expressions.[51] Doctors and pain researchers sometimes systematize these reports by having subjects report their pain using standardized verbal descriptions or numerical or visual scales.[52] Such standardized measurements may give us a reasonably good sense of whether a particular subject perceives a stimulus to be increasing or decreasing in painfulness and can also tell us how the subject rates the pain of two different kinds of stimuli, like heat pain compared to incision pain.[53]

We also assess people's pain based on their non-verbal pain behaviors. For example, a person may take pain medications, stay in bed, reduce total physical activity, and limit the range of motion of a limb.[54] We must rely heavily on our interpretations of the pain behaviors of those with limited ability to communicate verbally, including young children. Yet, even when our interpretations are aided by theories of brain structure and development and rough measures of pain like change in heart rate, there is still disagreement about, for example, whether male infants should be

---

49 *Id.* at 189-93.

50 *Id.* at 189.

51 *See* Eich et al., *supra* note 28, at 162-63.

52 *See id.* at 160 ("The primary forms of pain measurement used by clinicians with humans experiencing pain have been verbal pain descriptors, visual analog scales, numerical rating scales, and measurement of pain behaviors."). The McGill Pain Questionnaire is an example of a standardized test that attempts to measure subjective pain experience using numerical scales and standardized verbal descriptors. *See* Center for Gerontology and Health Care Research, Brown Medical School, Toolkit of Instruments to Measure End-of-Life Care, http://www.chcr.brown.edu/pcoc/Physical.htm (last visited May 9, 2007).

53 Even such intraindividual determinations are far from perfect. They require people to recall past experiences of pain, recent as they may be, and compare them to current ones. Yet, as noted, our memories of past experiences are quite imperfect. Eich et al., *supra* note 28, at 163-64. Furthermore, the very act of describing an experience may affect the way that we later recall it. *See* DANIEL GILBERT, STUMBLING ON HAPPINESS 40-42 (2006).

54 Jennifer S. Labus, Francis J. Keefe & Mark P. Jensen, *Self-Reports of Pain Intensity and Direct Observations of Pain Behavior: When are they Correlated?*, 102 PAIN 109, 119-21 (2003).

anesthetized before circumcision.[55] It is even more difficult to determine when a non-human animal is in pain and whether its experience of pain is phenomenologically like yours and mine.[56]

III. MALINGERING AND PAIN VALUATION

A. PAIN AND SUFFERING DAMAGES

When a defendant tortiously injures a plaintiff, in addition to pecuniary damages like medical expenses and lost earnings, the plaintiff can seek compensation for non-pecuniary damages, like pain and suffering. The phrase "pain and suffering" is broadly construed in legal contexts to permit recovery "not only for physical pain but for fright, nervousness, grief, anxiety, worry, mortification, shock, humiliation, indignity, embarrassment, apprehension, terror or ordeal."[57] I will focus on damages for physical pain, though these other experiences no doubt play central roles in the experience of physical pain and cannot be neatly compartmentalized.

There is much disagreement over the fundamental purposes of our tort regime and, hence, disagreement over the fundamental reasons why we compensate people for their tortiously-caused pain. Typically, tort theorists principally seek either to reduce societal harm[58] or to achieve corrective justice by putting aggrieved litigants in the position they would have been in were their rights not violated.[59] Either way, however, our tort system must make inferences about the magnitude of people's pain if it is going to optimally deter future harmful behavior or correct harms that have already occurred.

Despite the importance of pain assessment to tort law, we nevertheless have few ways to confidently evaluate pain claims, particularly because litigants often have incentives to exaggerate. People can lie about their pain experiences and can, to varying degrees, fake their pain behaviors. Evaluations of pain claims are particularly difficult when, as is often the case, medical evidence in the form of traditional diagnostic images tells us little

---

55 *See* J. Lander et al., *Comparison of Ring Block, Dorsal Penile Nerve Block, and Topical Anesthesia for Neonatal Circumcision: a Randomized Controlled Trial*, 278 JAMA 2157 (1997); N. Wellington & MJ Rieder, *Attitudes and Practices Regarding Analgesia for Newborn Circumcision*, 92 PEDIATRICS 541, 541 (1993).

56 Adam Kolber, Note, *Standing Upright: The Moral and Legal Standing of Humans and Other Apes*, 54 STAN. L. REV. 163, 182-91 (2001). Answers to such questions may not alone settle matters about animal cruelty and consumption, but depending on one's underlying views, they may well inform the debate. For example, in challenging the lack of protection we give to the interests of animals, Peter Singer forcefully argues that most animals can indeed feel pain. "Nearly all the external signs that lead us to infer pain in other humans can be seen in other species . . . ," including "writhing, facial contortions, moaning, yelping or other forms of calling, attempts to avoid the source of pain, appearance of fear at the prospect of its repetition, and so on." PETER SINGER, ANIMAL LIBERATION 11 (2d ed. 1990).

57 Capelouto v. Kaiser Found. Hosp., 500 P.2d 880, 883 (Cal. 1972).

58 *See, e.g.*, GUIDO CALABRESI, THE COSTS OF ACCIDENTS 26-31 (1970) ("Apart from the requirements of justice, I take it as axiomatic that the principal function of accident law is to reduce the sum of the costs of accidents and the costs of avoiding accidents.").

59 *See, e.g.*, George P. Fletcher, *Fairness and Utility in Tort Theory*, 85 HARV. L. REV. 537, 543-50 (1972) (outlining features of corrective justice).

about a patient's pain condition. Those reporting chronic low back pain frequently have no observable physical findings to support their claims.[60]

In particular, a pain assessment tool ought to help distinguish genuine pain symptoms from those that are faked. The current edition of the *Diagnostic and Statistical Manual of Mental Disorders* ("DSM") uses two principal classifications to describe those who are lying about their symptoms. It describes malingering as "the intentional production of false or grossly exaggerated physical or psychological symptoms, motivated by external incentives such as . . . obtaining financial compensation."[61] Similarly, those with "factitious disorder" also intentionally feign symptoms, though they do so "in order to assume the sick role,"[62] rather than to avoid work or obtain compensation.[63]

The mere fact that a person can offer no physical evidence of pain, however, does not mean that his reported symptoms are disingenuous. In some cases, we simply may not have the diagnostic tools to find that physical evidence. Also, it is well-established that patients may experience genuine chronic pain that is largely attributable to psychological factors.[64] For example, those with what the DSM deems "somatoform disorder" have physical symptoms that "are not fully explained by a general medical condition."[65] "Pain disorder," a kind of somatoform disorder, "is characterized by pain as the predominant focus of clinical attention" where "psychological factors are judged to have an important role in its onset, severity, exacerbation, or maintenance."[66] Ideal pain assessments tools would also help explain the extent to which a person's pain is caused by psychological factors as opposed to physical trauma or decay. The results would certainly be important in treatment decisions and perhaps also in damage assessments.[67]

In tort and other compensation schemes, factfinders try to assess pain claims by considering the credibility of complainants and by permitting expert testimony.[68] For example, doctors might testify about tests performed on a

---

60 Research in the late 1970s found that over three-quarters of those with compensable worker's compensation claims associated with low back pain had no physical findings supporting their complaints. John D. Loeser, *Low Back Pain, in* PAIN 363-77 (John J. Bonica ed. 1980). Despite improvements in our ability to detect physical injuries, it often still difficult to identify the cause of someone's back pain. *See* Gina Kolata, *With Costs Rising, Treating Back Pain Often Seems Futile,* N.Y. TIMES, Feb. 9, 2004, *available at* http://query.nytimes.com/gst/fullpage.html?sec=health&res=9A04EFDF173AF93AA35751C0A9629C8B63 (quoting Dr. Richard Deyo, a professor of medicine and health services at the University of Washington as stating that "[a] variety of studies have suggested that in 85 percent of cases it is impossible to say why a person's back hurts.").

61 AM. PSYCHIATRIC ASS'N, DIAGNOSTIC AND STATISTICAL MANUAL OF MENTAL DISORDERS 739 (4th ed. text rev. 2000) [hereinafter DSM-IV-TR].

62 *Id.* at 513.

63 *Id.*

64 *See* Michael Finch, *Law and the Problem of Pain,* 74 U. CIN. L. REV. 285, 303-06 (2005).

65 DSM-IV-TR, *supra* note 61, at 485.

66 *Id.* at 485, 498-503.

67 *See generally* Cornelius Peck, *Compensation for Pain: A Reappraisal in Light of New Medical Evidence,* 72 MICH. L. REV. 1355, 1379, 1386-96 (1974) (suggesting that, in some circumstances, tortfeasors ought not be liable for pain exacerbated by psychological features of the defendant, even when the tortfeasor is a cause-in-fact of the pain).

68 *See generally* CLINICAL ASSESSMENT OF MALINGERING AND DECEPTION (Richard Rogers ed., 1997); Friedland, supra note 7, at 340.

litigant. One standardized clinical assessment designed to identify "non-organic" low back pain was originally published in 1980.[69] Among the tests used as part of the assessment, doctors check whether a patient experiences pain when the lower part of his back is lightly touched.[70] Patients whose pain has a traditional physical explanation are not expected to experience increased pain.[71] Those who claim to experience increased pain when lightly touched may be faking or may have pain that is not explained by what were traditionally called "organic" symptoms.[72] In any event, those assessed as having principally non-organic symptoms are likely to have a "poor response to 'straightforward' physical treatment."[73] Tests of this sort are often inconclusive, however. Furthermore, this particular assessment tool was never intended and has never been validated for use in legal contexts.[74] In addition, if a witness is coached as to the "appropriate" pain responses, he can fake those responses rather easily.

In the 1960s, a number of researchers began touting an "objective" pain detection technique based on thermography.[75] Thermography uses infrared radiation to measure body surface temperature.[76] Some have claimed that these temperature readings can reveal soft tissue injuries or other painful conditions that do not appear in other diagnostic images.[77] Indeed, in a number of studies, thermography has shown promise as a means to supplement more traditional medical evidence.[78] The technique has a high rate of false positives, however, and has never been part of mainstream medical practice.[79] Litigants seeking to admit thermographic evidence have had only mixed success.[80]

---

69 Gordon Waddell et al., *Nonorganic Physical Signs in Low Back Pain*, 5 Spine 117, 117-25 (1980).

70 *Id.* at 118.

71 Such superficial tenderness, it has been claimed, "is almost always present in patients motivated by financial secondary gain and almost never in patients with well-demonstrated physical pathologic conditions that improve appropriately." P. Douglas Kiester & Alexandra D. Duke, *Is It Malingering, or Is It 'Real'?*, 106 POSTGRADUATE MED., Dec.1999, http://www.postgradmed.com/issues/1999/12_99/kiester.htm.

72 I doubt that pain conditions can be divided neatly between those that are principally "organic" and those that are principally "psychological." Such categories can, however, serve as helpful shorthand expressions for what is certainly a much more complex distinction in pain etiology.

73 Main, *supra* note 30, at 174.

74 *Id.*

75 *See* Douglas R. Dalgeish & Teresa J. Stewart, *Thermography in Missouri's Courts: Is the Frye Standard Alive and Well?*, 60 UMKC L. REV. 467, 475 (1992).

76 *Id.* at 474.

77 *Id.* at 474-475.

78 Andrew B. Lustigman, Comment, *A New Look at Thermography's Place in the Courtroom: A Reconciliation of the Conflicting Evidentiary Rules*, 40 AM. U. L. REV. 419, 427-30 (1990).

79 *See id.* at 419-20, 430-31.

80 For cases finding thermographic evidence inadmissible, see, for example, *McAdoo v. United States*, 607 F. Supp. 788, 795 (E.D. Mich. 1984); *Burkett v. Northern*, 715 P.2d 1159, 1161 (Wash. Ct. App. 1986); *Ferlise v. Eiler*, 495 A.2d 129 , 131 (N.J. Super. Ct. App. Div. 1985). For cases permitting thermographic evidence, see, for example, *Cherico v. National Railroad Passenger Corp.*, 758 F. Supp. 258, 263 (E.D. Pa. 1991), *aff'd without opinion*, 96 F.2d 12 (3d Cir. 1992); *Procida v. McLaughlin*, 479 A.2d 447, 451 (N.J. Super. Ct. Law Div. 1984).

B. STRUCTURAL IMAGING OF CHRONIC PAIN

Where thermography has generally failed, neuroimaging may someday succeed. A promising method of detecting chronic pain relies on one of the newest methods of magnetic resonance imaging known as diffusion tensor imaging ("DTI").[81] DTI allows us to examine the naturally-occurring diffusion of water molecules in brain tissue. The results allow us to "probe tissue structure at a microscopic scale well beyond the usual image resolution."[82] It is currently "the only approach available to track brain white matter fibers noninvasively"[83] and has "been used to demonstrate subtle abnormalities in a variety of diseases including multiple sclerosis and schizophrenia."[84]

At the annual meeting of the Radiological Society of North America in November 2006, a German research team announced that they used DTI to identify changes in brain structure associated with chronic low back pain.[85] The researchers used DTI to scan the brains of twenty subjects with a confirmed diagnosis of chronic low back pain and twenty healthy control subjects, and found identifiable structural differences in the brains of healthy subjects compared to chronic pain sufferers.[86] According to one member of the study team, the "results reveal that in chronic pain sufferers, the organization of cerebral microstructure is much more complex and active in the areas of the brain involved in pain processing, emotion and the stress response."[87]

The results and details of the experiment have yet to be published, so it is too early to assess its significance. If the research holds up to scrutiny, it may someday lead to a promising method of distinguishing genuine chronic pain sufferers from malingerers. If chronic pain causes changes in the brains of sufferers that make their brains recognizably distinct from those of malingerers, we may have a method of identifying certain malingered claims. Furthermore, it is unlikely that one can consciously create these sorts of structural changes to one's brain, making it difficult or impossible to fake the claim that one experiences chronic low back pain. It might also make it difficult to claim falsely that one does not experience such pain when one really does, were one seeking a physically demanding job in, say, the military.

---

81 On the principles of diffusion tensor imaging, see Alexandre F. M. DaSilva et al., *A Primer on Diffusion Tensor Imaging of Anatomical Substructures*, 15 NEUROSURGICAL FOCUS 1 (2003); Denis Le Bihan et al., *Diffusion Tensor Imaging: Concepts and Applications*, 13 J. MAGNETIC RESONANCE IMAGING 534 (2001). While DTI has principally been used as a method of structural brain imaging, there is some evidence that it can also be an effective new tool in functional neuroimaging. Le Bihan et al., *Direct and Fast Detection of Neuronal Activation in the Human Brain with Diffusion MRI*, 103 PROC. NAT'L ACAD. SCI. 8263 (2006).

82 Le Bihan et al., *supra* note 81, at 534.

83 *Id.* at 543.

84 *Id.*

85 Press Release, Radiological Society of North America, Chronic Back Pain Linked to Changes in the Brain (Nov. 28, 2006), *available at* http://www.rsna.org/rsna/media/pr2006-2/chronic_back_pain-2.cfm.

86 Abstract, Radiological Society of North America, Diffusion Tensor Imaging (DTI) Danisotropic Changes in the Brain Associated with Chronic Low Back Pain (Nov. 29, 2006), *available at* http://rsna2006.rsna.org/rsna2006/V2006/conference/event_display.cfm?em_id=4433436.

87 Press Release, Radiological Society of North America, *supra* note 85.

Of course, this research is still quite preliminary, and there are many reasons to remain cautious about its prospects. First, we need to know more about the significance of the identified structural changes in the brain. It is not clear whether chronic pain *caused* structural changes in the brains of sufferers or whether sufferers might have been predisposed to develop chronic pain because of certain features of their neuroanatomy. Second, it is not yet clear whether the group of chronic pain sufferers in the experiment included those with psychogenic pain as well as those with pain explained by traditional physical explanations. Third, the current results make generalizations about groups of sufferers compared to groups of controls: the technology does not distinguish the brain structure of an individual pain sufferer from anyone else's.[88] Fourth, the results are based on a small number of subjects, apply to just a particular kind of chronic pain, and have yet to be published and replicated by other researchers. Finally, whatever technology might eventually derive from this research, it will likely have some rate of false positives and false negatives. We would then have to decide whether the error rates are acceptable for some particular contextual application of the technology. Nevertheless, the results suggest a promising path for further research: there may, indeed, be structural differences in the brains of chronic pain sufferers that we may someday be able to reliably identify with non-invasive brain imaging techniques.

C. Measuring Pain More Generally

While malingerers entirely fabricate or grossly exaggerate claims, it is far more common that those seeking compensation engage in a more modest form of symptom exaggeration that arises during adversarial or administrative proceedings. In fact, even claimants who do not exaggerate their symptoms may still have difficulty accurately conveying the nature and extent of their pain. Thus, malingering detection is just a part of the much broader, more important, and less tractable task of valuing pain generally. Such valuation is notoriously difficult and explains why "compensation for pain and suffering is widely perceived as one of the tort beast's uglier heads."[89]

The Restatement (Second) of Torts acknowledges just how difficult it is to value pain and suffering in court:

---

[88] This sort of research typically uses group data, though the details of this particular experiment have yet to be made public.

[89] Croley & Hanson, *supra* note 6, at 1789.

> There is no direct correspondence between money and harm to the body, feelings or reputation. There is no market price for a scar . . . since the damages are not measured by the amount for which one would be willing to suffer the harm. The discretion of the judge or jury determines the amount of recovery, the only standard being such an amount as a reasonable person would estimate as fair compensation. . . . The most that can be done is to note such factors as the intensity of the pain or humiliation, its actual or probable duration and the expectable consequences. Since these factors are all indefinite . . ., it is impossible to require anything approximating certainty of amount even as to past harm.[90]

Pain valuation raises two distinct sets of questions: (1) How do we determine the quality and quantity of pain the plaintiff has experienced and will experience? and (2) Assuming we know the quality and quantity of pain a plaintiff has experienced and will experience, how do we attach to it a monetary value? The second question is essentially a normative one about how and why we ought to compensate people for tortiously-caused pain. For example, should the tort system fundamentally seek to compensate people for pain they have wrongfully experienced, or should it simply impose penalties on wrongdoers to deter future violations? For any given amount of pain, is there some unique, objectively fair way to value it? Contrary to the Restatement, should people be compensated for pain based on the amount of money it would take for them or for a reasonable person to voluntarily experience that pain?

Yet, once we get past these evaluative questions, we will still face the difficult empirical inquiry in the first question. Even if we agree that a given amount of pain should be compensated with a particular amount of money, how do we know how much pain a person is experiencing? How do we assess its duration and intensity? These issues are particularly challenging when subjects have incentives to be less than forthcoming. But even when people are entirely forthcoming, challenges persist whenever we try to communicate the deeply subjective, first-person nature of pain experiences.[91]

Suppose that A and B are both given an identical pain stimulus (for example, they are each poked in the hip with identical force by a hot piece of metal). Even if they rate their experiences numerically equal on a scale of 1-10, they may feel different amounts of pain but simply use identical numerical values to *describe* their pain. Pain with a value of 5 to one person may not be experienced in the same way as pain with a value of 5 to another. Consider, for example, that some pain scales inform subjects that a value of 10 represents the worst pain imaginable.[92] If so, subjects with more vivid imaginations may rate their pain lower than those who are less imaginative. Furthermore, even the process of eliciting self-reports may affect pain measurements, as subjects tolerate pain longer when queried by an experimenter of the opposite sex than of the same sex and when queried by a

---

[90] RESTATEMENT (SECOND) OF TORTS § 912 cmt. b (1977).

[91] *See generally* DANIEL GILBERT, *supra* note 53, at 46-53.

[92] WALL, *supra* note 19, at 11-12.

faculty experimenter rather than a student experimenter.[93] Thus, even if we had a perfect lie detector, we could still benefit from a pain detection technology that more objectively conveys pain intensity.

Similar problems persist when relying on non-verbal pain behaviors. The pain that makes one person cry does not necessarily have the same effect on another. The level of back pain that leads one person to stay home from work may be viewed as quite tolerable by another. Combining pain behavior data and self-reports may give us our best current evidence to make intersubjective determinations of pain. But even these behaviors are not perfectly correlated. A meta-analysis that compared self-reported pain measurements with measurements based on directly observed pain behaviors found only a low to moderate correlation.[94] The study authors concluded that "[r]esearchers and clinicians should avoid using either of these measures as a proxy for the other, and should rely on multiple sources of information about pain."[95]

D. Functional Imaging of Acute Pain

Once again, there may be—in the more distant future—a role for neuroimaging to assist in making intersubjective determinations of pain. In 2003, Robert Coghill and fellow researchers conducted an experiment using functional neuroimaging that may eventually inform our judgments of the relative pain experiences of different people.[96] The researchers exposed human subjects to acute pain—a heat stimulus—and had them rate the intensity of the pain on a scale of 1-10. Subjects had a wide range of pain sensitivities, with the most sensitive subject rating a 49°C heat stimulus as 8.9 out of 10, while the least sensitive subject rated this stimulus at 1.05 out of 10.[97] Based on such introspective reports, subjects were categorized into high, medium, and low sensitivity groups.[98]

The researchers then compared the areas of brain activation under fMRI of the high sensitivity and the low sensitivity groups. The high sensitivity group showed more frequent and more robust activation than the low sensitivity group in those areas of the cortex associated with pain intensity.[99] The researchers took these results to "validate the subjective report"[100] as an interindividual measurement, because subjects who rated their pain lower on numerical scales generally had less activation in regions of the brain associated with pain than did subjects who rated their pain higher on the numerical scale.[101]

---

93 Ibolya Kállai, Antonia Barke & Ursula Voss, *The Effects of Experimenter Characteristics on Pain Reports in Women and Men*, 112 PAIN 142, 144 (2004).

94 Jennifer S. Labus, Francis J. Keefe & Mark P. Jensen, *Self-Reports of Pain Intensity and Direct Observations of Pain Behavior: When are they Correlated?*, 102 PAIN 109, 119 (2003).

95 *Id.*

96 Coghill, *Interindividual Differences*, *supra* note 3.

97 *Id.* at 8539.

98 *Id.* at 8541.

99 *Id.* at 8538, 8541.

100 *Id.* at 8542.

101 *Id.* at 8541 (stating that the "concurrence between multiple individuals' patterns of regional brain activation and their subjective reports of pain provides an objective context in which to assess the subjective report of any given individual").

It is far too early to say whether this basic research will have practical applications. The technology faces several obstacles. First, as with the DTI data mentioned earlier, Coghill's team examined data across groups of subjects. This method does not yield inferences about the experiences of individual subjects. Until we can make pain assessments of individuals, the technology will have few everyday applications in law or medicine. Second, it is not yet clear precisely how uniform are the brain structures and mechanisms that generate our experiences of pain. Brain function is quite plastic and may vary considerably from person to person.[102] Also, different kinds of pain have quite different fMRI patterns of activation.[103] The less uniform are our experiences of pain, the more difficult it will be to compare one person's pain to another's. Furthermore, at least in the courtroom, we are more likely to seek measurements of chronic pain, rather than the acute pain measured by Coghill's team.

Finally, one of the greatest challenges to creating a successful pain detector—particularly one that relies on functional as opposed to structural imaging—is that unwilling subjects may develop countermeasures.[104] For example, we can develop some control over our heart rates, skin conductance, and performance on EEGs,[105] and thereby frustrate a variety of mechanisms designed to detect lies. We do not yet know the extent to which we can control the activation of particular brain regions in order to purposely generate inaccurate fMRI images.[106] One study suggests that, without any coaching, merely imagining pain will be insufficient to create the appearance of actual pain under fMRI.[107] At different times, subjects in the study experienced pain from a noxious stimulus and pain from hypnotic suggestion. At other times, subjects were asked to merely imagine feeling pain. When group data were analyzed, more activation was observed in pain regions of the brain when subjects experienced physical pain than when they experienced hypnotically-induced pain (though activation was observed under both conditions).[108] When merely imagining pain, however, subjects demonstrated little or no increase in activation in the brain's pain regions.[109]

On the other hand, with some training, we can develop control over the activation of pain regions of the brain.[110] Subjects given feedback from real-time fMRI images were able to increase or decrease activation in regions of

---

[102] *See, e.g.*, Coghill, *Intensity Processing*, *supra* note 2, at 1934 (stating that even subjects who have an entire "cerebral hemisphere surgically removed retain the capacity to be consciously aware of a painful stimulus presented ipsilateral to their remaining hemisphere" and that "[q]uantitative psychophysical analysis of these subjects reveals that they have almost no disruption of their capacity to experience and evaluate pain intensity").

[103] E-mail from Robert C. Coghill to Adam Kolber, *supra* note 31.

[104] *See* Jennifer Granick, *The Lie Behind Lie Detectors*, WIRED, Mar. 15, 2006, *available at* http://www.wired.com/news/technology/0,70411-0.html (claiming that fMRI lie detection is subject to simple countermeasures because "a subject can defeat the test by breathing deeply or by holding her breath").

[105] R. Christopher deCharms et al., *Control Over Brain Activation and Pain Learned by Using Real-Time Functional MRI*, 102 PROC. NAT'L ACAD. SCI. 18626, 18626 (2005).

[106] *See id.*

[107] Stuart W.G. Derbyshire et al., *Cerebral Activation During Hypnotically Induced and Imagined Pain*, 23 NEUROIMAGE 392 (2004).

[108] *Id.* at 395.

[109] *Id.*

[110] deCharms, *supra* note 105, at 18626.

the brain associated with pain perception and experienced corresponding increases or decreases in the amount of pain they experienced.[111] While this is a promising result for those seeking to treat pain, it complicates efforts to measure pain.[112] Successful methods of pain detection that use functional imaging (as opposed to harder-to-manipulate structural imaging) may require the development of countermeasures to thwart subjects' own efforts at fooling pain detectors.

The challenges involved in making intersubjective pain determinations suggest that applications of the technology are a long way off. Surely, it will be more difficult to assess the amount of pain a person suffers than it will be to identify those whose pain claims are entirely fake. Importantly, however, our methods of intersubjective pain comparison need not be perfect; our current methods of assessing a complainant's pain are far from it. So long as pain measurement using neuroimaging is a cost-effective supplement to our current system, the technology may well play a valuable role in medical diagnosis and perhaps pain dispute resolution.

IV. THE PRIVACY OF SUBJECTIVE EXPERIENCE

A. PAIN DETECTION AND SOCIETY

So far, I have shown how neuroimaging has already informed our understanding of pain phenomena. I have also shown how, despite numerous technological challenges, neuroimaging may someday serve as a valuable aid in determining whether a cooperative—or perhaps even an uncooperative—subject is experiencing pain.[113] Let us make the plausible supposition that a reliable method of neuroimaging for chronic back pain is developed that by itself, or in conjunction with other medical evidence, allows us to reach substantially more confident conclusions about the presence or absence of chronic back pain in a particular subject than we can now.

Such a pain detector could have many uses, especially by healthcare providers. For example, doctors might use the test to make medical diagnoses. Depending on its abilities, the detector might help reveal the extent to which a patient's back pain is due to physical tissue damage or to more psychological factors. It might also provide evidence of malingering,[114]

---

[111] *Id.* at 18626, 18628-30.

[112] *See id.* at 18627-30 (finding that subjects taught to control pain intensity using real-time fMRI feedback were significantly more successful than those taught other strategies to control pain that lacked fMRI feedback). The harder it is to learn pain control techniques, the harder it is to fool a pain detector and the more meaningful will be attempts to cross-examine people about whether they have practiced countermeasures.

[113] Importantly, for statistical reasons, it may be easier to use neuroimaging to support a pain claim than to rebut one. E-mail from Robert C. Coghill to Adam Kolber, *supra* note 31.

[114] Though it did not involve malingered pain as such, one neuroimaging study has suggested that PET scanning can play a valuable role in distinguishing subjectively experienced paralysis from simulated paralysis. The study explicitly mentions the possible application of this technology to the detection of malingered paralysis claims. *See* N.S. Ward, D.A. Oakley & R.S.J. Frackowiak, *Differential Brain Activations During Intentionally Simulated and Subjectively Experienced Paralysis*, 8 COGNITIVE NEUROPSYCHIATRY 295, 310-11 (2003); *see also* CRAIG W. MARTIN, WORKERS' COMP. BOARD OF BRITISH COLUMBIA - EVIDENCE BASED PRACTICE GROUP, COMPENSATION AND REHABILITATION SERVICES DIVISION,

leadings doctors to be either more cautious or more confident when prescribing narcotics and when writing up diagnoses to support insurance or disability claims.

Again, depending on the capabilities of the technology, doctors might also use a back pain detector to assess the condition of those who are unable to communicate because they have cognitive or motor impairments or are too young to speak. In fact, neuroimaging has already been used to better understand the cognitive capacities of those who cannot communicate. In September 2006, researchers reported using fMRI to image the brain of a patient believed to be in a persistent vegetative state while the patient was asked to imagine certain tasks, like playing tennis or moving around in her home.[115] The patient demonstrated activation in cortical regions of the brain that was indistinguishable from the brain activation observed in healthy, aware control subjects.[116] While there is much dispute over one neuroscientist's claim that the results provide "knock-down, drag-out"[117] evidence of consciousness in this patient,[118] the results show promise that functional neuroimaging will give us new insight into the thoughts and experiences of those unable to communicate.[119]

In addition to clinical applications, a reliable method of chronic back pain detection could be useful for health insurers and employers. Health insurers might require patients to demonstrate that they have chronic back pain prior to reimbursing treatment.[120] Whether insurers would actually do so might largely depend on the cost of the pain detection procedure, assuming they would have to reimburse it. Similarly, if costs are not prohibitive, employers in physically demanding industries like firefighting or the military might use a pain detector in medical screenings of new job applicants to weed out those who will be unable to perform well or who are disproportionately likely to require expensive medical care.[121]

A reliable pain detector could have many uses in dispute resolution, including worker's compensation cases,[122] Social Security disability hearings,[123] settlement negotiations and mediations, and civil (and perhaps

---

DETECTING MALINGERERS' HIDDEN TRUTHS? (2003), http://www.worksafebc.com/health_care_providers/Assets/PDF/ detecting_malingerers.pdf.

[115] Adrian M. Owen et al., *Detecting Awareness in the Vegetative State*, 313 SCIENCE 1402, 1402 (2006).

[116] *Id.*

[117] Benedict Carey, *Mental Activity Seen in a Brain Gravely Injured*, N.Y. TIMES, Sept. 8, 2006, at A1.

[118] *See* Neil Levy, *Persistent Vegetative States and Consciousness*, Neuroethics & Law Blog, http://kolber.typepad.com/ethics_law_blog/2006/09/persistent_vege.html.

[119] Because we cannot ask those who are unconscious about their pain experiences, however, it would be extremely difficult to know if our assessments based on diagnostic images are valid measures of pain. *See generally* Mendelson, *supra* note 35, at 225 (discussing diagnostic validity).

[120] On the use of neuroimaging by insurers more generally, see Tovino, *supra* note 14, at 847-48.

[121] *See id.* at 847 (discussing limits on the use of such tests imposed by the Americans with Disabilities Act).

[122] *See* Pryor, *supra* note 33, at 257-291 (discussing the relevance of pain adjudication to Social Security disability determinations).

[123] *See id.* at 291-304 (discussing the relevance of pain adjudication to worker's compensation cases).

even criminal) trials. To be useful in such settings, the pain detector must satisfy the pertinent venue's requirements for presenting scientific evidence. Federal courts and some state courts require that expert testimony satisfy the standard established in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*[124] Under *Daubert*, trial judges are required to determine if proffered scientific evidence is sufficiently reliable for admission by considering, *inter alia*, whether the kind of evidence presented has been: (1) empirically tested, (2) subjected to peer review and publication, (3) shown to have acceptably low error rates, and (4) generally accepted in the pertinent scientific community.[125] Other state courts apply the older standard established in *Frye v. United States*,[126] which, focusing on the fourth prong of the *Daubert* standard, permits admission of expert evidence that is generally accepted by the pertinent scientific community.[127]

For purposes of our current investigation, we may counterfactually assume that the pain detection method at issue has enjoyed widespread acceptance by the medical community and is deemed highly reliable by the courts. With that assumption, litigants who purport to have chronic back pain may voluntarily introduce pain detection evidence to bolster their claims. Of course, even if litigants can do so, they will still have to demonstrate other elements of their causes of action. For example, in tort litigation, plaintiffs will still have to show that their chronic pain was wrongfully caused by defendants' breach of a duty to the plaintiff.

In other cases, litigants may prefer not to introduce pain detection evidence, yet may be required to do so in order to pursue their claims. For example, under Federal Rule of Civil Procedure 35, when the mental or physical condition of a party is "in controversy," the court can order a party to undergo a medical or psychological examination "on motion for good cause."[128] Because the rule can effectively force a litigant to undergo tests into matters that are deeply personal, it is considered "one of the most intrusive forms of discovery."[129] The rule presses the boundary between our interests in public dispute resolution and our interests in maintaining the privacy of states of physical and psychological suffering. If neuroimaging turns out to be as powerful a tool as some think it will be, then it may also enable courtroom prying into pains, emotions, thoughts, and feelings that we might otherwise succeed in concealing.

B. PAIN PRIVACY

In 2005, a group of researchers provocatively declared that "[f]or the first time, using modern neuroscience techniques, a third party can, in principle, bypass the peripheral nervous system—the usual way in which we communicate—and gain direct access to the seat of a person's thoughts,

---

124 509 U.S. 579, 589-94 (1993).

125 *Id.* at 592-95.

126 293 F. 1013 (D.C. Cir. 1923).

127 *Id.* at 1014.

128 FED. R. CIV. P. 35.

129 Anthony S. Niedwiecki, *Science Fact or Science Fiction? The Implications of Court-Ordered Genetic Testing Under Rule 35*, 34 U.S.F. L. REV. 295, 295 (2000).

feelings, intention, or knowledge."[130] Such possibilities have raised fears that neuroimaging may someday threaten fundamental interests in the privacy of our minds. For example, Lynette Reid and Françoise Baylis state that "the starting assumption is that, intentions aside, others *cannot* 'read our thoughts' and so invade our privacy"[131] because "[o]ur thoughts—that is, our reasoning, our motivations, our attitudes, beliefs, and values—are our selves and our personal identity."[132]

It is questionable whether neuroimaging can ever, even in principle, give us direct access to the seat of a person's thoughts or experiences. There is little dispute, however, that neuroimaging can, in principle, allow us to make reasonable inferences about the thoughts or experiences of others. For example, as a primitive first step, Yukiyasu Kamitani and Frank Tong have used fMRI to determine the orientation of an image shown to subjects without relying on their self-reports.[133] Others claim that fMRI may someday give us reliable information about a subject's memories of a person or a crime scene or may reveal more generally whether a subject is being deceptive.[134]

Similarly, revelations of certain kinds of experiences—even if they are not thoughts in themselves—have the potential to allow inferences to be made about private matters. For example, fMRI experiments have identified brain regions associated with sexual arousal[135] that could potentially reveal a person's sexual proclivities or orientation. Other fMRI experiments seek to identify neural correlates of unconscious racial bias.[136] Applications of either sort of research could someday raise interesting privacy questions were neuroimaging to be used in litigation over sexual harassment or employment discrimination.

---

[130] Wolpe et al., *supra* note 8, at 39.

[131] Lynette Reid & Françoise Baylis, *Brains, Genes, and the Making of the Self*, 5 AM. J. BIOETHICS 21, 22 (2005) ("What is novel and particularly interesting about privacy and confidentiality with neuroimaging . . . is the predicted—and unprecedented—access to human thought.").

[132] *Id.*

[133] Yukiyasu Kamitani & Frank Tong, *Decoding the Visual and Subjective Contents of the Human Brain*, 8 NATURE NEUROSCIENCE 679, 679 (2005).

[134] *See* Thompson, *supra* note 8, at 1602 (suggesting that brain imaging could be used someday to reveal whether a person being interrogated recognizes a person in a photograph). *See generally* Charles N.W. Keckler, *Cross-Examining the Brain: A Legal Analysis of Neural Imaging for Credibility Impeachment*, 57 HASTINGS L.J. 509, 509 (2006) (suggesting that the "ability to examine in real time the response of the subject brain during a question and answer session makes it feasible to use [functional imagining] forensically, provided that the pattern of brain activity corresponding to deception is sufficiently well-characterized"); Nicholas Wade, *Improved Scanning Technique Uses Brain as Portal to Thought*, N.Y. TIMES, Apr. 25, 2005, at A19. One company, "No Lie MRI" has begun selling fMRI-based lie detection services, and a competitor, "Cephos Corp.," plans to do so in the near future. *See* No Lie MRI, Inc., http://www.noliemri.com (last visited May 9, 2007); Cephos Corp., http://www.cephoscorp.com (last visited May 9, 2007).

[135] Jorge Ponseti et al., *A Functional Endophenotype for Sexual Orientation in Humans*, 33 NEUROIMAGE 825 (2006). *See also* Bruce A. Arnow et al., *Brain Activation and Sexual Arousal in Healthy, Heterosexual Males*, 125 BRAIN 1014 (2002).

[136] *See generally* Elizabeth A. Phelps et al., *Performance on Indirect Measures of Race Evaluation Predicts Amygdala Activation*, 12 J. COGNITIVE NEUROSCIENCE 729 (2006); Mary E. Wheeler & Susan T. Fiske, *Controlling Racial Prejudice and Stereotyping. Social-Cognitive Goals Affect Amygdala and Stereotype Activation*, 16 PSYCHOL. SCI. 56 (2005); William A. Cunningham et al., *Separable Neural Components in the Processing of Black and White Faces*, 15 PSYCHOL. SCI. 806 (2004).

The use of pain detection in tort litigation, however, is not likely to raise privacy concerns of the same magnitude as could be raised by the courtroom detection of these other kinds of experiences. There are many reasons for this, and I will mention four. First, pain implicates weaker privacy interests because we are less likely to draw inferences (accurate or otherwise) about a person's character based on his experiences of pain than from, for example, his subjective experiences that reveal race or gender bias. Pain is more likely to generate sympathy for the sufferer than animus.

Second, we may have weaker privacy interests in our pain experiences because such experiences permit rather limited inferences about our thoughts. For example, one's state of chronic pain likely reveals little about his political and social views, while one's aversive reactions to certain societal groups may reveal much more. Certain measures of subjective experience have been thought, at least in principle, to reveal a great deal about our thoughts. As Justice Clarence Thomas has written when permitting blanket exclusion of polygraph evidence from criminal cases, "[t]he common form of polygraph test measures a variety of physiological responses to a set of questions asked by the examiner, who then interprets these physiological correlates of anxiety and offers an opinion to the jury about whether the witness . . . was deceptive in answering questions about the very matters at issue in the trial."[137] Were a reliable polygraph developed, it would represent a measurement of subjective experience that has the potential to invade strong privacy interests in our thoughts.

Thus, part of what makes pain privacy interests a bit weaker than our privacy interests in certain other experiences is that pain imaging implicates fewer of our background norms protecting thought privacy. While it is as yet unclear the extent to which the privacy of our thoughts is respected by law, there are many cases that speak approvingly, especially in the First Amendment context, of the importance of our "freedom of thought" and "freedom of mind."[138] In *Stanley v. Georgia*,[139] for example, the Supreme Court stated that "[o]ur whole constitutional heritage rebels at the thought of giving government the power to control men's minds."[140] More recently, in upholding a due process right to consensual sodomy, the Court wrote in *Lawrence v. Texas* that "[f]reedom extends beyond spatial bounds" and that

[137] United States v. Scheffer, 523 U.S. 303, 313 (1998).

[138] *See* Linda MacDonald Glenn, *Keeping an Open Mind: What Legal Safeguards Are Needed?*, 5 AM. J. BIOETHICS 39, 39 (2005); Bruce J. Winick, *The Right to Refuse Mental Health Treatment: A First Amendment Perspective*, 44 U. MIAMI L. REV. 1, 17-19 (1989) (arguing that the First Amendment limits intrusive government interference with our mental processes). For cases mentioning "freedom of mind" or "freedom of thought," see, for example, *Thomas v. Collins*, 323 U.S. 516, 531 (1945) ("The First Amendment gives freedom of mind the same security as freedom of conscience."); *Speiser v. Randall*, 357 U.S. 513, 536 (1958) ("For there can be no true freedom of mind if thoughts are secure only when they are pent up."); *Wooley v. Maynard*, 430 U.S. 705, 714 (1977) ("We begin with the proposition that the right of freedom of thought protected by the First Amendment against state action includes both the right to speak freely and the right to refrain from speaking at all."). I have argued elsewhere that we are entitled to a certain "freedom of memory," that is one component of our "freedom of mind." *See* Adam J. Kolber, *Therapeutic Forgetting: The Legal and Ethical Implications of Memory Dampening*, 59 VAND. L. REV. 1561, 1567, 1622-1626 (2006).

[139] 394 U.S. 557 (1969).

[140] *Id.* at 565.

"[l]iberty presumes an autonomy of self that includes freedom of thought, belief, expression, and certain intimate conduct."[141] Dicta in these cases suggest that we have rights to thought privacy, though it is not at all clear how courts will apply the language that is suggestive of such rights.

Laws protecting the confidentiality of medical information may well be a step toward protecting pain privacy.[142] Yet, we give much greater protection to medical information that reveals intimate thoughts rather than just private pains. For example, an article on the front page of the *Wall Street Journal* tells the story of Patricia Galvin who was in an automobile accident in 2001.[143] Galvin sought to collect disability payments from her insurer but was denied on the grounds that she was capable of returning to work. Her insurance company denied coverage based, at least in part, on information contained in the notes of Galvin's psychologist whom she had been seeing in therapy both before and after the accident. The insurance company gained access to these notes by taking advantage of a loophole in regulations of medical privacy under the Health Insurance Portability and Accountability Act.[144] Galvin was quite upset that the insurance company could gain access to her psychologist's notes, stating "I feel like now I have no privacy.... My most private thoughts, my personal tragedies, secrets about other people, are mere data of a transaction, like a grocery receipt."[145] The point being, no one claims that Galvin should have been able to keep private whether or not she actually experienced disabling pain that entitled her to disability payments. Rather, she had a privacy interest in the thoughts she expressed to her therapist that happened to bear on questions about her pain.

Third, while there are certainly those who seek to project an image of strength and imperviousness to pain, more typically, people share news of their distress with doctors, friends, co-workers, and sometimes even strangers. The search for a sympathetic ear may lead people to talk too much rather than too little about their pain.[146] So rather than focusing on the "privacy" of subjective experience, it is worth remarking that many people have little interest in keeping their pain private. Importantly, the right to "publicize" one's pain by being allowed to admit neuroimaging evidence of it in court may prove much more important than the right to keep pain experiences private. Thus, because we are generally less disposed to keep secret our pain, as opposed to other subjective experiences like sexual arousal, we may have a reduced expectation of pain privacy.

Finally, in the context of civil litigation over pain and suffering damages, the privacy interests at risk from an accurate pain detector do not seem

---

[141] 539 U.S. 558 (2003).

[142] Health Insurance Portability and Accountability Act of 1996, Pub.L. No. 104-191, 110 Stat. 1936 (codified as amended in scattered sections of titles 18, 26, 29, and 42 U.S.C.).

[143] Theo Francis, *Medical Dilemma: Spread of Records Stirs Patient Fears of Privacy Erosion*, WALL ST. J., Dec. 26, 2006, at A1.

[144] 45 C.F.R. § 164.506 (2006).

[145] Francis, *supra* note 143.

[146] In fact, even when we want to, it can be difficult to disguise our subjective experiences of pain. *See* Marilyn L. Hill & Kenneth D. Craig, *Detecting Deception in Pain Expressions: The Structure of Genuine and Deceptive Facial Displays*, 98 PAIN 135, 135 (2002) (claiming that "there is an empirical basis for discriminating genuine and deceptive facial displays").

particularly strong because our tort regime already expects litigants to offer or respond to medical evidence concerning their pain. Thus, we have already decided that one's physical pain is an appropriate subject of factual inquiry in court for which medical evidence is admissible. Not only do we admit medical evidence of pain and suffering to prove such damages, in most cases, it is affirmatively required. Moving from traditional diagnostic images to modern neuroimaging technologies presents only an incremental change in our practices.

Incremental as it may be, the transition would still raise interesting questions: How do we treat incidental findings of brain tumors or of other subjective experiences that are discovered when using neuroimaging to investigate pain?[147] Could the use of a reliable pain detector reveal too much about the credibility of a witness, such that pain detection testimony invades the province of the jury?[148] Should jurors be shown actual neuroimages when hearing expert testimony in court, or are they likely to be "seduced" into giving too much weight to evidence that may seem more reliable than it really is?[149] These questions, however, are variations on familiar ones about how to manage inadvertently discovered medical information, how to limit the scope of expert testimony, and how to provide evidence to jurors in a format that will encourage more accurate factual determinations. Pain imaging is less likely to raise the kinds of novel questions about our freedom of thought that might well be raised by the use of neuroimaging to assess certain other kinds of subjective experiences.

---

[147] *See generally* Judy Illes et al., *Incidental Findings in Brain Imaging Research*, 311 SCIENCE 783 (2006) (asserting that "[a]ll investigators engaged in brain imaging research should anticipate incidental findings in their experimental protocols and establish a pathway for handling them").

[148] Discussing the use of fMRI as a lie detector in criminal trials, law professor Carter Snead, former general counsel to the President's Council on Bioethics, has stated that "[t]he human dimension of being subjected to the assessment of your peers has profound social and civic significance. If you supplant that with a biological metric, you're losing something extraordinarily important, even if you gain an incremental value in accuracy." Steve Silberman, *Don't Even Think About Lying: How Brain Scans are Reinventing the Science of Lie Detection*, WIRED MAGAZINE Jan. 2006, at http://www.wired.com/wired/archive/14.01/lying.html. Though his comments are directed at criminal trials, his concerns might also apply to the use of pain detectors in civil litigation if doing so largely replaces the jury's job to determine the credibility of a complainant's claims of suffering with a biological metric.

In *United States v. Scheffer*, 523 U.S. 303, 317 (1998), the Supreme Court held that a rule of evidence barring polygraph testimony in air force courts martial did not violate the accused's constitutional right to present a defense. Thus, the accused was not permitted to offer exculpatory polygraph evidence. The Court's reasoning focused principally on the unreliability of the evidence. However, among the reasons given by Justice Thomas, joined by three other justices, was that even a reliable lie detector threatens the jury's core obligation to make credibility determinations in criminal trials. *Id.* at 312-13. According to Thomas, "[d]etermining the weight and credibility of witness testimony . . . has long been held to be the 'part of every case [that] belongs to the jury, who are presumed to be fitted for it by their natural intelligence and their practical knowledge of men and the ways of men.'" *Id.* at 313 (quoting Aetna Life Ins. Co. v. Ward, 140 U.S. 76, 88 (1891)).

[149] *See* Paul Bloom, *Seduced by the Flickering Lights of the Brain*, SEED MAGAZINE, June 27, 2006, http://www.seedmagazine.com/news/2006/06/seduced_by_the_flickering_ligh.php.

V. CONCLUSION

In his famous essay, "What is it Like to be a Bat?," Thomas Nagel argues that reductionist accounts of mental phenomena have great difficulty explaining subjective experiences.[150] Even if we knew everything there is to know about the neuroscience of bats, we still would not know what it is like to be a bat—to have the "subjective character of experience" that a bat has.[151]

When it comes to understanding the experiences of other humans, the problem is somewhat easier.[152] Because our brains are similar, we infer that other people have experiences like our own. Nevertheless, our subjective experiences are fundamentally private, such that they are difficult to transparently convey and are correspondingly easier to fake. As we become technologically better at penetrating the privacy of our experience in the descriptive sense, we will increasingly need to consider the privacy of our experience in the normative sense. Given the technological plausibility of at least primitive pain detection and the important role it could play in medical diagnosis and in legal disputes, it may not take long for incremental questions about the scope of pain privacy to begin to appear.

---

150 THOMAS NAGEL, MORTAL QUESTIONS 165-180 (1979).

151 *Id.* at 166-67.

152 *See id.* at 171-72 (stating that an "ascription of experience is possible only for someone sufficiently similar to the object of ascription to be able to adopt his point of view" and that "[t]he more different from oneself the other experiencer is, the less success one can expect with this enterprise").