

**UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
OAKLAND DIVISION**

TODD ASHKER, et al.,

Plaintiffs,

v.

GOVERNOR OF THE STATE OF
CALIFORNIA, et. al.,

Defendants.

Case No.: 4:09-cv-05796-CW

CLASS ACTION

Judge: Honorable Claudia Wilken

EXPERT REPORT OF MATTHEW D. LIEBERMAN

TABLE OF CONTENTS

	Page(s)
I. STATEMENT OF EXPERT QUALIFICATIONS.....	1
II. EXPERT OPINION.....	2
A. Is social interaction/connection a basic/fundamental human need? What does neuroscientific research reveal about the human need for social interaction/connection? Is it a need as basic as sleep, exercise or food?	2
B. What kinds of social interactions or connections are necessary/important to meet these needs?	5
C. What is the relationship between how the brain processes “social pain” and “physical pain”?	6
III. SUMMARY	10

I. STATEMENT OF EXPERT QUALIFICATIONS

1. I am a Professor of Psychology, Psychiatry and Biobehavioral Sciences at University of California, Los Angeles (UCLA). I am also Director of the Social Cognitive Neuroscience Laboratory at UCLA. I have published more than 160 book chapters and peer-reviewed articles, including many at the most prestigious scientific journals. I have also recently published the award-winning book *Social: Why Our Brains are Wired to Connect*. I have won several major awards in my field and my university for both research and teaching. I am the founding and current editor-in-chief of the scientific journal *Social Cognitive and Affective Neuroscience*. I received my B.A. from Rutgers University in 1992. I received my Ph.D. from Harvard University in 1999. My full *curriculum vitae* can be found as Exhibit A to this report.

2. My work broadly focuses on the intersection of social psychology and neuroscience and my early research is often associated with the founding of the field of *social cognitive neuroscience*. Most of the research in my laboratory uses functional magnetic resonance imaging (fMRI) to examine individuals' brain responses while thinking about or interacting with other people. Two lines of research in my lab pertain to the current report. First, we conduct fMRI studies examining how individuals are able to make sense of their social environments and infer what those around them are thinking and feeling. Second, in collaboration with Professor Naomi Eisenberger, I have conducted fMRI and behavioral studies examining *social pain* – the painful and distressing feelings that occurs when individuals are potentially or actually separated from others through rejection, exclusion, ostracism, or in response to the death of a loved one.

3. I have never testified in a court case previously.

4. I have been retained by counsel for plaintiffs in *Ashker et al. v. Governor of California, et al.*, pending in the United States District Court for the Northern District of

California.

5. I am charging \$150 per hour plus all expenses for my work on this matter

6. The findings and conclusions presented in this Statement are based on my years of research and analysis and the results of my review of materials pertinent to this case. As described below, I reviewed a particularly important article by Baumeister and Leary (1995). In addition, I examined more than a 1,000 articles that were published in the decade after Baumeister and Leary and cited this article.

7. I have been asked to address three issues in my testimony as follows:

A. Is social interaction/connection a basic/fundamental human need? What does neuroscientific research reveal about the human need for social interaction/connection? Is it a need as basic as sleep, exercise or food?

B. What kinds of social interactions or connections are necessary/important to meet these needs? What happens on the level of the brain when a person is deprived of social interaction/connection? How much deprivation of social interaction/connection triggers such a response – i.e. what does it take for the brain to register lack of social interaction/connection?

C. What is the relationship between how the brain processes “social pain” and “physical pain”? Is the “social pain” that results from lack of social interaction/connection similar to “physical pain”? If so, how?

II. EXPERT OPINION

A. Is social interaction/connection a basic/fundamental human need? What does neuroscientific research reveal about the human need for social interaction/connection? Is it a need as basic as sleep, exercise or food?

8. It is considered settled science within the field of psychology that humans and all mammals have a fundamental need for social connection. The seminal paper on this issue is

“The Need to Belong: Desire for Interpersonal Attachments as a Fundamental Human Need,” published in 1995 by Roy Baumeister and Mark Leary. This paper has been cited more than 8,300 times by other publications. It is actually the second most cited paper in the field of social psychology from the last two decades (with the first most cited paper also affirming, though not focusing, on the principle that social connection is a basic need). Unlike many seminal papers that gain notoriety by also being controversial, there has been no major objection to Baumeister and Leary’s claims. To examine this systematically, I looked up all articles and book chapters that cited this paper in the first decade after it was published. I could not find a single paper that took issue with the main claims of this paper.

9. Baumeister and Leary provide nine criteria which any fundamental human need ought to satisfy. It should “(a) produce effects readily under all but adverse conditions, (b) have affective consequences, (c) direct cognitive processing, (d) lead to ill effects (such as on health or adjustment) when thwarted, (e) elicit goal-oriented behavior designed to satisfy it (subject to motivational patterns such as object substitutability and satiation), (f) be universal in the sense of applying to all people, (g) not be derivative of other motives, (h) affect a broad variety of behaviors, and (i) have implications that go beyond immediate psychological functioning” (p. 498). The remainder of the article goes on to marshal evidence demonstrating that each of these claims has been met for belonging and social connection. Thus, the authors concluded that the need to belong is indeed a fundamental human need and scientific consensus has continued to support this conclusion. The authors characterize this need to belong as a need to form and maintain strong, stable interpersonal relationships.

10. Additional findings beyond the scope of the Baumeister and Leary article speak to the evolutionary role that social relationships have in our survival as a species. For instance,

mammalian infants are incapable of providing for their own food and shelter and thus only through a persistent social bond with a caregiver will an individual survive beyond infancy. Many non-mammalian species do not require this social bond for survival, but all mammals, including humans, do. Because adult mammals have large brains, relatively speaking, full-grown brains at birth would make the birthing process via the birth canal virtually impossible. Thus, mammalian infants are born immature, with less developed brains, but the trade-off is that all mammals must be cared for in infancy, making social connection a clear survival need for the species.

11. Additionally, a lack of social connection and social support have been examined as risk factors for morbidity (i.e. death) and were found to be a greater health risk than smoking 15 cigarettes a day or continuing to smoke after a diagnosis of cardiac heart disease (Holt-Lunstad, Smith, & Layton, 2010). Social isolation or a lack of social support has also been repeatedly associated with various deleterious mental and physical health consequences (Cohen & Wills, 1985; Hawkey & Cacioppo, 2010; House, Landis, & Umberson, 1988).

12. The scientific consensus is clear in support of the claim that social connection is a basic human need. To what extent is it comparable to other needs like food, exercise, and sleep? Each need has a different time scale depending on the physiological consequences of deprivation for each need. Without water an individual will die in a few days. For sleep, missing it for a night will clearly produce a deprived state but lack of sleep is survivable for many days. Humans have gone without sleep for 18 days though ethics concerns prevent discovery of the absolute limit in a controlled research context. Rodents have been kept alive for up to a month without sleep. Lack of exercise is unlikely to lead directly to death in most individuals, even over extended periods. However, lack of exercise is a catalyst for countless other negative

outcomes in terms of mental and physical health, cognitive functioning, and sleep. Thus, being deprived of exercise is clearly very deleterious to an individual.

13. Social connection is more of a need like sleep and exercise than food. No one will die from lack of social contact over a few days, but people will show evidence of being in a deprived state within a short period and a lack of social connection will likely produce a wide array of negative outcomes for an individual's mental and physical well-being before long.

14. As for the brain's contribution to understanding social connection as a basic need, the evidence will be described below in the penultimate section of this report. The short answer is that the brain has a neural system that registers various kinds of physical pain – each linked to a potential survival threat (loss of food, water, shelter). Thus the brain is evolved such that basic needs register physical pain in this network when those needs are in a deprived state. My lab and others have observed that when individuals are in a socially deprived state, they experience *social pain* and this produces neural activity consistent with it being a form of pain.

B. What kinds of social interactions or connections are necessary/important to meet these needs?

15. Scientific research has largely focused on whether certain factors relate to physical and mental well-being, rather than if there are certain specific cut-off levels for these factors below which negative outcomes are likely and above which they are not. That said, there are some suggestions regarding the kinds of social interactions and connections that are necessary.

16. First, in their paper “Need to Belong”, Baumeister and Leary (1995) defined belonging as a combination of “frequent interaction + persistent caring” with the latter referring to an interpersonal bond marked by stability, emotional concern, and continuation into the foreseeable future. Based on various pieces of evidence, they argued that the absence of either

one of these factors would produce a deficit in the need to belong and over time lead to negative physical and mental health outcomes.

17. Other work has specifically examined the consequences of having or not having a single stable confidant over time (Lowenthal & Haven, 1968; Miller & Ingham, 1976). A confidant is someone that one has an ongoing intimate relationship with where each party can disclose their thoughts and feelings and each party knows that they have an important place in the other's life. These studies found that the lack of a single confidant was associated with poorer mental and physical health outcomes, relative to having one confidant. Moreover, having a single confidant was found to have greater significance for these variables than having a greater amount of social interaction in one's life. An additional benefit of having a confidant, over and above the need for social connection is the well-established relationship between self-disclosure and mental health. Keeping one's thoughts and feelings to oneself can lead various negative physical and mental health consequences in their own right (Frattaroli, 2006; Pennebaker & Beall, 1986; Larson & Chastain, 1990). Finally, some more recent work by Sandstrom and Dunn (2014) suggests that more frequent contact with mere acquaintances can bolster well-being in addition to the benefit of contact with stronger social ties. This work does not suggest frequent contact with weak social ties replaces the need for a confidant, but it can supplement it.

C. What is the relationship between how the brain processes “social pain” and “physical pain”?

18. There is considerable evidence that has accumulated in mammalian and human research to suggest that the mammalian brain evolved to process social pain (i.e. the painful feelings associated with potential or actual social rejection, loss, or isolation) repurposing some of the same neural and neurochemical processes invoked during physical pain. One leading

account of this overlap between social and physical pain focuses on the fact that the brain has evolved to produce a pain response when any of our fundamental human needs (e.g. food, water, shelter) is in a deprivation state (e.g. hunger, thirst, pain from extreme heat or cold temperatures). Although each pain is different from the others, they share core features and processes that all fall into the category of pain and each of these draws our attention and motivates us to alleviate the deprived state.

19. Within the human brain there are two systems that process different aspects of physical pain. One system, located in somatosensory cortex, tracks the *sensory aspects of pain* and is critical for registering basic sensory information about a pain signal, such as indicating where the pain is coming from on our body (e.g. one's hands rather than one's back). A second system, in the dorsal anterior cingulate cortex (dACC) and anterior insula (AI) register the *distressing aspects of pain*. In other words, the dACC and AI, register the part of pain that bothers us and motivates us to change our behavior or take pain medication.

20. There is a database of more than 9,500 neuroimaging studies (*Neurosynth*) that allows researchers to look at different regions of the brain and identify whether those regions are best described as being involved in a particular psychological process. This is referred to as a reverse inference analysis. When applying this analysis to the dACC and AI, Neurosynth indicates that these regions are best described in terms of pain processes.

21. Interestingly, when neurosurgeons have removed part of the dACC or disconnected it from the other parts of the brain, patients will later report that they can still feel the pain and point to where it is on their body, but will also indicate that the pain no longer bothers them (Foltz & White, 1962). In addition, the dACC is among the regions most dense with opioid receptors. Opioids are a natural painkiller within the brain and their production is

stimulated by taking opiates such as morphine and heroin.

22. There are several lines of research, some with humans and some with animals, suggesting that social pain is processed by the brain as real pain, rather than as a kind of metaphorical pain. The first evidence comes from language. An analysis of more than a dozen languages around the world (MacDonald & Leary, 2005), from English to Mandarin to Inuktitut, all use the language of physical pain as the primary mode of describing social pain (e.g. “hurt feelings”, “broke my heart”). Scholars have long suggested that consistent linguistic overlaps of this nature may reflect deep commonalities in their psychological processing (Lakoff & Johnson, 1999).

23. The first biological evidence was collected by Dr. Jaak Panksepp in the 1970s. He gave non-sedating doses of morphine to canine pups that were separated from their mothers. In the absence of morphine, the pups produced high levels of separation distress calls but after morphine, the calls diminished dramatically. Human research has also shown that those with a genetic disposition (i.e. the OPRM genetic polymorphism) to need more morphine than others to manage their physical pain in the hospital also tend to show greater social pain distress after being socially rejected (Way, Taylor, & Eisenberger, 2009).

24. The lionshare of the data bearing on the hypothesis of overlap between social and physical pain comes from fMRI studies focusing on dACC and AI activity – the regions associated with physical pain distress. In collaboration with Naomi Eisenberger, I conducted the first fMRI study of social pain (Eisenberger, Lieberman, & Williams, 2003) published in the journal *Science*. We observed that when people played a video game that involves tossing a ball with two other people and then were excluded from the game there was selectively increased neural activity in the dACC and AI. Additionally, both of these regions showed increased

activity proportionate to the subjective feelings of social pain felt by each participant. If an individual reported feeling high levels of social pain then they showed more activity in dACC and AI than another individual who felt low levels of social pain. This work has been cited more than 2000 times and has been replicated dozens of times in labs around the world.

25. Recently, a meta-analysis by Rotge and colleagues (2015) aggregated the results from 46 fMRI studies of social pain and found strong evidence that the dACC was involved in social pain. The specific spot in the dACC identified in this analysis is in the same location that the Neurosynth database identifies as the hotspot for physical pain processing in the brain.

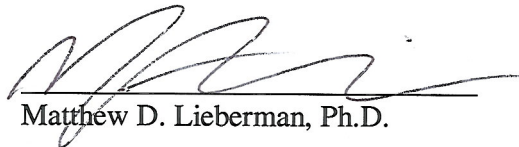
26. There are other notable findings from this fMRI literature on social pain. One recent study (Kross et al., 2011) examined the neural correlates of social pain and physical pain in the same group of participants. They observed overlapping responses in both pain distress regions like the dACC but also in the sensory component of pain in somatosensory cortex.

27. One particularly compelling fMRI paper (DeWall et al., 2010) examined the effects of taking Tylenol (i.e. acetaminophen) on social pain. Tylenol is commonly taken to relieve physical pain. The researchers argued that if social pain and physical pain rely on common neural processes then Tylenol ought to relieve social pain as well. In the first study, they found that those who took a dose of Tylenol each day for three weeks reported reduced “hurt feelings” on average than those who took an inert placebo pill each day. In the second study, they examined neural responses to the ball-tossing exclusion game in the MRI scanner after participants had taken either Tylenol or placebos. They found that those on placebos showed significant activity in the dACC and AI during exclusion relative to inclusion. In contrast, those who had taken Tylenol showed a diminished dACC and AI response during exclusion and the activity in these regions was not different than during inclusion in the game.

In other words, taking a common physical painkiller reduced both the subjective and neural correlates of social pain.

III. SUMMARY

In summary, just as humans have basic needs for food, water, shelter, and sleep, they also have a need for social connection. The best evidence suggests that to serve this need the social connection should involve frequent contact and a real bond of caring between individuals. Failure to provide for this need for social connection is likely to have various undesirable consequences. First, the social pain associated with social deprivation is registered by the brain as a type of genuine pain, just as other forms of physical pain are. Second, lack of social connection is a mortality risk on the order of smoking. To the extent that such needs are not being met at the Pelican Bay SHU, this would serve as a major threat, both short-term and long-term, to the physical and mental well-being of those incarcerated there.


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3/11/15
Date

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