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FROM THE EDITOR

Managing and Researching Neuropsychiatric Diseases in the Twenty-First Century

A mentor of mine once told me that after several years of practice in internal medicine, he returned to residency to specialize in neurology. When I asked why he chose to change specialties, he responded, "Because my patients were always asking me about their minds!" The human brain is a fascinating organ, the culmination of millions of years of evolution, but it's far from perfect. As our lifespans extend further we find that our delicate neuronal structures aren't fortresses of memories. Our skulls can't protect us from all traumas, and blood vessels are pipes that can both clog and burst. Things can go wrong easily with such a specialized organ, and, as my mentor reminded me, brain dysfunction is almost universally feared. Ask those who have cared for an elder, and some will respond that they fear slowly losing their memories and their ability to function independently. Ironically, ask neurologists their greatest fear, and some will respond with locked-in syndrome, a devastating condition in which the mind remains functional and aware but control over the body is lost [1]. Both responses highlight a fear of different types of loss of control, which tend to raise questions about selfhood, decision making, and technological enhancement—all relevant to the emerging field of neuroscience.

For me, research in neuroscience has always had an aspect of what I call "the creepy-cool factor." Neuroscience research is fundamentally "cool," as even our smallest discoveries in this field are advances in understanding the workings of a highly specialized organ. But, at the same time, these advances are inherently "creepy," as they are the result of experimental manipulation of memories, behaviors, and the very tissue that is the crux of what defines us as individuals. In the field of neuroscience, researchers are forced to question not only what they can discover but also what should be the limits of discovery.

This issue of the *AMA Journal of Ethics*® tackles several of the most recent "creepy-cool" discoveries in the field of neuroscience from a variety of perspectives with a view to illuminating ethical issues that arise in social, experimental, clinical, and political contexts.

Hollywood and science fiction writers can imagine technologies at a much faster rate than scientists can bring them to fruition and have even inspired scientists to invent technologies first depicted in a book or on the silver screen [2]. This developmental delay

can be beneficial, as it gives us time to reflect on ethical issues associated with technologies that have yet to be developed. The film and television series *Limitless* explored the consequences of a “smart pill,” forcing us as a society to consider the implications of both mental and physical enhancements. In recent years, Hollywood has been fascinated with the manipulation of memory, making it the focus of movies like *Memento* and television shows such as *Blindspot*.

Two essays in this issue provide perspectives on ethical dilemmas associated with memory-modulating technologies. Taking popular culture as a starting point, Julie M. Robillard and Judy Illes discuss the potential [impact of memory-modulating technologies](#) on the sense of self and the need to protect consumers and patients through social regulation, media support, and research guidelines. Eric Racine and William Affleck also evaluate [critiques of memory-modulating interventions](#) and argue that although the potential for abuse is real, the risks and benefits of the technologies should be weighed in particular contexts.

The cultural popularization of neuroscience has its counterpart in research. In 2013, President Barack Obama announced the funding of the Brain Research through Advancing Innovative Neurotechnologies® (BRAIN) Initiative because, in his words, “we can identify galaxies light years away, we can study particles smaller than an atom. But we still haven’t unlocked the mystery of the three pounds of matter that sits between our ears” [3]. Realizing the gravity of this topic, President Obama also asked the Presidential Commission for the Study of Bioethical Issues to examine the initiative’s ethical, legal, and social implications. B. Rashmi Borah, Nicolle K. Strand, and Kata L. Chillag examine the Bioethics Commission’s recommendations for research in the second volume of *Gray Matters* [4], focusing on [cognitive enhancement and neurological diseases](#) that might impact patients’ ability to give informed consent to participate in a clinical trial. Joseph J. Fins also addresses the issue of informed consent in research, with a particular focus on research on the [minimally conscious state](#).

While research continues, what can we do in the meantime not only for patients who are suffering from neurological and psychiatric disorders but also for their caregivers? Three articles in this issue examine treatment of neurological and mental health disorders from a range of perspectives. Laura N. Gitlin and Nancy A. Hodgson take a broad view of the clinical context, arguing that [multiple ethical frameworks](#) support clinicians’ outreach to caregivers of persons with dementia. Focusing on children rather than adults, MaryKatherine Brueck describes how [school-based mental health programs](#)—and primary care physicians’ involvement in such programs and partnerships with other specialists—can reduce health care disparities. Stepping outside the school and clinical environments, Blythe A. Corbett describes how [theater-based programs](#) can be used to treat children with autism spectrum disorder and argues that theater should be accessible to all.

Finally, what are some of the legal and policy implications of neuroscience technologies? The legal implications at the intersection of neuropsychiatric disorders and technologies go beyond the legal defense of “not guilty, by reason of insanity.” Joshua Preston, Jaleh McTeigue, Caitlin Opperman, Jordan Dean Scott Krieg, Mikaela Brandt-Fontaine, Alina Yasis, and Francis X. Shen examine the implications of early detection of [Alzheimer’s disease](#) for legal liability, patient privacy, and health insurance coverage. By contrast, Suparna Choudhury and Sheehan Moore focus on a much younger patient population, analyzing the methodological, social, and political quandaries associated with the use of [biomarkers for neuropsychiatric diseases](#) in adolescents. And, in the podcast, Allen Buchanan discusses how governments and health care systems can approve and [allocate neurotechnologies](#), which provide mental or physical enhancements, while also considering some of the ethical consequences of distributing these enhancements unequally.

Neuroscience is a rapidly changing field, and despite our tremendous breakthroughs so far, we still have a long way to go before the technological advancements highlighted in feature films and science fiction appear in our hospitals. In the meantime, we must consider new ethical concerns that arise with each of these potential scientific and clinical advances. As we conduct research on what makes us who we are, how we think, and how we remember, we are tasked with critically examining whether there should be limits to our knowledge while also contemplating how our discoveries will affect both current and future patients.

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ETHICS CASE

Who Should Assess the Needs of and Care for a Dementia Patient's Caregiver?

Commentary by Laura N. Gitlin, PhD, and Nancy A. Hodgson, PhD, RN

Abstract

Using a clinical case example, we examine whether health and human service professionals have a moral obligation to assess and address the needs of family caregivers of persons with dementia and, if so, the challenges in doing so under current health care and reimbursement mechanisms. We also discuss specific strategies for involving caregivers.

Case

It was subtle at first. A missed exit on the turnpike. A puzzled look when running into an old neighbor. A set of car keys in the fridge. Sally attributed it to normal aging at first, but after Hank called to say he was lost trying to drive to his sister's house, she knew something was wrong. During several appointments, other diagnoses were ruled out and the doctor diagnosed Hank with Alzheimer's disease. Sally's and Hank's lives quickly became filled with endless doctor's appointments, which meant less and less time for grandchildren and friends. By the time Sally had Hank dressed, fed, and set up in his chair each morning she was exhausted. She barely had time or energy to shower and curl her hair, something she would never have left the house without doing prior to Hank's diagnosis.

"Who knew our 'golden years' would be over so quickly?" Sally wondered as she organized the prescription bottles that now occupied their kitchen counter. "His and my blood pressure medication. His Alzheimer's medicine. My arthritis medicine. His heartburn medicine. Or was it his arthritis medicine and my heartburn medicine?" It was all becoming so complicated.

At Hank's latest neurologist appointment, Dr. Smith tested Hank's memory and reported that his mini-mental status exam (MMSE) results were similar to those from his previous appointment. Dr. Smith was pleased and convinced they had found the right dosage for Hank's medications, but he felt Sally just didn't look herself. Sally attended all of Hank's appointments, so Dr. Smith felt he knew Sally almost as well as he knew Hank. Over the past year, the impeccably matched outfits and perfectly coifed hair had disappeared. She looked exhausted and jittery, like someone who was constantly on edge. Dr. Smith wanted to ask if she was doing okay, but he didn't want to offend her. "She's not actually

my patient," he told himself, but seeing her look so radically different from the first time they met was nagging at him.

As Dr. Smith finished his examination, Sally squirmed uncomfortably in her seat, mentally preparing herself for another exhausting evening of cooking dinner and then cutting it into bite-size pieces for Hank, bathing Hank, and spending the night with a stranger she felt she barely knew anymore.

Dr. Smith thought to ask, "Before you go, Sally, how are you holding up?" and wondered whether he should.

Commentary

Sally represents the more than 15 million family and other unpaid caregivers of persons living with dementia in the United States [1]. Like Hank, most persons with dementia are cared for in their homes and depend upon family members for complex care needs over the long course of the disease [1, 2]. Tasks associated with caregiving increase in number and complexity with disease progression and can include (but are not limited to) daily, physically challenging, and often intimate forms of assistance with everyday living needs of bathing, dressing, toileting, feeding, moving or transferring the patient, and managing his or her medications. The caregiver must also ensure the patient's safety, well-being, and quality of life; coordinate care and care transitions; negotiate unwieldy and disjointed health and human service systems; accompany the patient to doctor visits; and advocate, protect, support, and comfort the person with dementia, particularly in health care encounters. All this must be done while often juggling other responsibilities such as childcare, caring for another family member, or working full- or part-time [3, 4].

These care tasks accumulate with disease progression and result in significant and well-documented physical, emotional, and financial consequences for families [3-5]. As families provide more than 80 percent of long-term care to older adults [1], and our health care system is therefore dependent upon family involvement, a comprehensive and family-centered approach to managing dementia is required [3, 4]. What this means is that, to ensure quality care and quality of life for Hank, the intertwined medical, social, emotional, physical, behavioral, financial, and familial challenges of Hank's progressing dementia must be carefully considered and addressed for both Hank *and* Sally.

The lack of [family-centered care](#) in current approaches to managing dementia is reflected in Dr. Smith's uncertainty about whether he should ask Sally how she's doing. As Sally is technically not his patient from a health system and reimbursement perspective—and as family-centric dementia care is lacking—Dr. Smith would likely be discouraged from responding to the visible physical expressions of Sally's stress and fatigue.

However, given that Sally's own health and well-being appear to be adversely affected by her increasing caregiver responsibilities, Dr. Smith should honor his impulse to address her visible physical and emotional decline during a clinical encounter by providing Sally with reassurance, support, and education. If Sally's own health declines, she may not be able to effectively care for Hank; that is, Dr. Smith's patient's welfare is at risk and might suffer if Sally's own welfare is compromised.

In deciding whether or not to ask Sally how she is, Hank's physician experiences what has been referred to in the health professional literature as "moral distress" [6]. Moral distress occurs when there is a perceived ethical conflict or "when one knows the right thing to do, but institutional constraints make it nearly impossible to pursue the right course of action" [7]. From a holistic and family-centered perspective, Dr. Smith is obligated to reach out to Sally about her own health and well-being, and he must consider the risks to his patient of not asking Sally how she is.

So, if Sally responds in a way that suggests she's not "holding up" all that well, how should Dr. Smith respond? Which strategies should he use to follow up? More generally, how should professional caregivers be trained to support and respond to the needs of nonprofessional caregivers as they both try to manage the patient's dementia? To understand the nature and scope of Dr. Smith's professional obligation to reach out to Sally, we draw upon classic ethical frameworks and guidelines. We also suggest specific strategies that clinicians can use to guide an interaction with a family caregiver. We conclude that, although there are short-term steps that clinicians like Dr. Smith can take, such as asking Sally how she is doing, changes at the policy, social, and cultural levels must also occur to help Dr. Smith and all professional caregivers offer family-centered dementia care to patients and the family members who care for them.

Key Ethical Frameworks

The situation of Sally, Hank, and Dr. Smith can be examined through the lens of the four foundational values in bioethics: autonomy, beneficence, nonmaleficence, and justice [8]. Although traditionally focused on an individual, these values can also apply to family members providing care to individuals with dementia. This applicability is illustrated by the philosopher Paul Ricoeur, who suggested that one's self should always be considered in relation to others and thus that the person—or, in this case, the patient with dementia—must him- or herself be understood in the context of his or her life space and sources of support (e.g., family caregivers and clinicians) [9]. Ricoeur's ethics of "oneself as another" endorses the value of inclusion, which is critical—particularly for understanding clinicians' obligations to caregivers and to persons with dementia who, at some point in the disease process, will become incapable of autonomous decision making. Table 1 defines each of the four values and indicates how involving family

caregivers in a clinical encounter with patients with dementia is critical to ethical practice.

Table 1. Four fundamental values in bioethics and their application to dementia care

Ethical value	Definition	Application to dementia care
Autonomy	Right to self-determination	Clinician needs to evaluate patient's capacity, inform individual and family caregiver of results of assessment, and determine jointly the right balance between safety and well-being, the patient's capability for independent decision making and actions, and when and how to involve the family caregiver.
Beneficence	Making decisions and taking action in best interest of patient	Clinician needs to reach out to family caregiver to assess his or her own health and well-being and capacity to provide ongoing care, as this is in the best interest of the patient with dementia.
Nonmaleficence	Pursuing actions that minimize harm	Clinician needs to reach out to family caregiver and provide education, support, referrals, and resources in order to minimize harm to caregiver and patient.
Truth-telling	Communicating openly and honestly	Clinician needs to inform patient of the importance of involving his or her care partner in decision making and is obligated to share the truth about the capacity of the patient and avoid deception.

Four other ethical frameworks support Dr. Smith in adopting a family-centered dementia care approach and reaching out to Sally. Utilitarian/consequentialist ethics suggest pursuing strategies that produce the greatest happiness for the greatest number of persons or from which the best results for all concerned can be achieved [10]. This perspective would thus support Dr. Smith's assessing and helping to meet Sally's needs, as it would, arguably, do the greatest good for Sally as well as Hank.

A deontological/Kantian framework similarly supports Dr. Smith's reaching out to Sally. In this framework, moral rules are not subjective standards but objective truths that have their source in humanity. Thus, Dr. Smith has a moral duty to reach out to Sally

from a humanitarian perspective [11]; asking about Sally's well-being serves as an act of general goodwill and also fulfills his specific moral duty to his patient.

In contrast, care ethics [12] seeks to promote well-being by emphasizing the importance of interdependent social relations. Assessing Sally's well-being is justified from a care ethics perspective that recognizes and honors Hank's and Sally's interdependence and mutual vulnerabilities.

One can also query the ethics of Dr. Smith's *not* approaching Sally and the health risks that no action might pose to her and Hank. Arguably, Dr. Smith's reaching out to Sally about her health would be unethical—and could possibly result in harm—if he is not prepared to responsibly follow up if she reveals that she is not doing well. Harm might result in this instance since Sally would not be provided viable recommendations or solutions and thus might conclude that nothing could be done to help her and relieve her care situation. Moreover, Sally would be deprived of care strategies that could be beneficial to her, Hank, or both of them. As a result, Sally's distress might increase and possibly harm Hank. However, this is a worst case scenario. The four fundamental ethical values guiding clinical encounters as well as several common ethical frameworks all point to and reinforce Dr. Smith's moral obligation to reach out to Sally *and* follow up with her if indicated.

In sum, from a family-centered care perspective, asking about how a patient's caregiver is doing and about his or her needs during a clinical encounter is the only ethical and moral stance that a clinician can assume [13, 14]. Although Dr. Smith's underlying concern that Sally's well-being poses a risk to his patient may be the cause of his moral distress, he also demonstrates empathy and moral sensitivity towards Sally's situation, which may help to mitigate his moral distress [15]. Regardless of his level of moral distress, he is obligated to ask how she is doing.

Barriers to Reaching Out to Caregivers

There are several barriers to clinicians' reaching out to caregivers. With few exceptions [16], the codes of ethics for physicians, nurses, and other health care professionals typically emphasize obligations toward individual patients and thus offer little guidance as to how to effectively involve caregivers. Electronic health records and reimbursement structures also focus on individual beneficiaries, thereby limiting potential to extend care to family caregivers. Furthermore, because medical training focuses on diagnosis and treatment, physicians can sometimes be ill-prepared to reach out to family members [14]. As Kleinman, the American psychiatrist and medical anthropologist, argues, there is a compelling need for serious discussion about caregiver needs and for reconsideration of medical education, practice, and research to address how to protect the autonomy and dignity of patients while effectively including family caregivers and addressing their needs [17, 18]. Lack of training combined with restrictions imposed by health insurers or

reimbursement incentives conspire to keep clinicians narrowly focused on patients with little attention to or understanding of their caregivers.

Strategies to Support Caregivers

While health systems will need to evolve and change to become family-centered and offer comprehensive [dementia care](#), there are strategies clinicians can use now [19]. A common complaint of caregivers is that no one asks how they are doing or what they do [4]. Thus, caregivers could benefit from simply being asked about themselves and having a compassionate listener who provides reassurance, support, education, and referral. As part of routine care of a patient with dementia (or if the caregiver is the direct patient), clinicians can ask how the caregiver is managing. They can also initiate discussions with the caregiver concerning the scope and nature of his or her care responsibilities, sources of appropriate support and assistance, and self-management of stress and health. Based on these discussions, clinicians can emphasize the importance of the family caregiver's managing his or her own health and stress and make recommendations to connect with local resources (e.g., the Alzheimer's Association, adult day services, the National Family Caregiver Support Program offered by the local Area Agency on Aging) for respite, support, and other services. Thus, clinicians can help forge stronger alliances with patients' caregivers by asking strategic questions and encouraging family caregivers to share their challenges [20, 21].

Another approach found to be helpful for some caregivers is the use of a written or recorded oral diary [22]. This strategy has been shown to help caregivers maintain their self-identity and enables them to pinpoint ethically complex challenges to inform discussion of possible solutions [23].

Health care professionals should also recognize that dementia caregivers (professional and nonprofessional) struggle, as they do, with ethical ambiguities in balancing the dementia patient's autonomy and right to self-determination with his or her safety and well-being [24]. These moral challenges, in the absence of support and guidance from health professionals, contribute to the burden of and a sense of isolation among caregivers [24]. Recognizing caregivers' ethical and care challenges is an important step in supporting the caregiver and helping him or her identify effective care strategies.

Finally, caregivers need concrete strategies for managing patients' psychosocial and behavioral changes and functional decline and would benefit from clinicians' attention to these clinical aspects of the dementia process [25]. Family caregivers face a broader array of daily care challenges—from the daily routines of physical care to existential and moral considerations—than physicians, who see patients typically only in clinical settings for acute medical issues and on a time-limited basis [26]. As clinical encounters tend to be short, it may not be possible for physicians to help family caregivers learn and practice care strategies. However, [referral](#) to other resources and health professionals

could be helpful. For example, based on Sally's description of her daily challenges, Dr. Smith could make a referral for an occupational therapist to conduct a home safety assessment, help Sally learn effective communication strategies to minimize Hank's behavioral symptoms, and modify the home environment to support Hank's daily function [27]. A referral for a home care nurse could provide important information to Sally about pain detection and ways to ensure proper hydration and, in addition, identify medication issues and address other common medical concerns family caregivers like Sally may have [28].

Nevertheless, physicians cannot meet their ethical obligations to families, and health care systems cannot deliver adequate dementia care, without policy-level changes that might influence social and cultural trends at the health care organizational and practice levels. With rare exceptions, discussions about supporting family caregivers of patients with dementia have been all but absent from current discourse on health care [29]. Rather, concerns about self-sufficiency, autonomy, and individual patient needs continue to influence policy discussions. Such concerns may be reinforced by the stigma associated with receiving help and the viewpoint among older people that dependence on others is burdensome [29, 30]. One reason that support for family caregivers is absent from the discourse on health care is that the work of family caregivers is largely undervalued and ignored, although ironically the health care system fully depends upon families for providing long-term care to older adults [4].

Clinicians must also be actively engaged in national discussions and [advocate](#) for the needs of patients with dementia and their family caregivers. One step would be to integrate into clinical practice quality indicators for dementia care that have been previously developed by the American Association of Neurology and other medical bodies [31] and the International Consortium for Health Outcomes Measurement for dementia [32]. Both offer quality indicators for dementia care that recognize the need for outreach to, and provision of education and support for, family caregivers as part of routine care of a patient with dementia. Another step might be to apply new reimbursement codes for care coordination. The Centers for Medicare and Medicaid Services now recognizes that care coordination of chronic conditions in primary care is critical and offers billing codes to offset clinical time in coordinating care and making referrals [33].

At a policy level, findings from current dementia care demonstration projects supported by the Center for Medicare and Medicaid Innovation [34] may yield new family-centered care models that can be adopted by clinical practices and supported through bundled or other payment structures. New payment models may be forthcoming if projects demonstrate better care at reduced costs. The various strategies for supporting caregivers—at the individual, organizational, and social level—are summarized in Table 2.

Table 2. Strategies for reaching out to family caregivers

Domain	Specific Strategies
Ask strategic questions about caregiving	<p>Ask about caregivers' own health and well-being (e.g., if they have respite opportunities and a support network in place, what are their specific daily care challenges).</p> <p>Recommend keeping a journal of care and listing decision-making challenges that can be discussed in future encounters.</p>
Engage in active listening	<p>Provide reassurance.</p> <p>Validate caregiver efforts.</p> <p>Show empathy.</p> <p>Reaffirm the ethical dilemmas (e.g., autonomy versus safety) caregivers experience and explore whether they view the patient as suffering.</p>
Offer resources	<p>Provide ongoing education about the disease and its clinical symptoms.</p> <p>Explain that behavioral symptoms (e.g., agitation, rejection of care) are part of the disease process, are not intentional, and may be expressions of unmet needs including pain, hunger, fatigue, and discomfort).</p> <p>Recommend that caregivers discuss their situation with their own physician.</p> <p>Refer caregivers to specialists (e.g., counselor, geriatric care manager) as needed.</p> <p>Refer caregivers to Alzheimer's Association for support groups, information, and access to the help line.</p>
Prepare office and office staff	<p>Integrate family education and support into office practices.</p> <p>As part of medical history taking, ask if a patient receives help from a family member, and, if so, ask the family member what care responsibilities he or she has and how he or she is doing.</p> <p>Provide readings and education to office staff about dementia and caregiving.</p> <p>Develop office protocol that recognizes and includes caregiver as part of the medical encounter.</p>
Advocate through medical organizations	<p>Advocate for changes in reimbursement to accommodate time spent with family unit.</p> <p>Support upcoming legislative changes to the Health Insurance Portability and Accountability Act (HIPAA) that may serve as a barrier to including families in decision making about the patient's care and their own health and well-being as well as other policies that recognize and support the role of family caregivers.</p>

Conclusion

The ethical dimension of providing medical care to patients with dementia and their caregivers is rarely discussed [35, 36]. The moral distress experienced by Hank's physician, Dr. Smith, is largely due to the restrictive context of health care delivery, which permits only a narrow focus on patients. However, the complexities of dementia require that health care assumes a social ecological perspective encompassing an understanding of the medical, social, financial, caregiver, and environmental contexts and needs of families living with dementia and that makes it possible for clinicians to help families meet those needs. Our health care system is not dementia ready, resulting in the experience of moral distress among practitioners as well as unethical practices (e.g., not reaching out to a family caregiver).

We suggest that, in dementia care, attention to family caregivers should be mandatory as their health and well-being are a critical part of the context of providing care to a patient with dementia. We show that regardless of the ethical framework employed, the resounding conclusion is that Hank's physician is obligated to reach out to Sally even in our current health care system. She is integrally bound to the health and well-being of her husband; thus reaching out to her would also help him. There is as well the moral obligation of justice to assure the health and well-being of family members who are intimately involved in caring for a patient with dementia.

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ETHICS CASE

Neuroethics and Disorders of Consciousness: Discerning Brain States in Clinical Practice and Research

Commentary by Joseph J. Fins, MD

Abstract

Decisions about end-of-life care and participation in clinical research for patients with disorders of consciousness begin with diagnostic discernment. Accurately distinguishing between brain states clarifies clinicians' ethical obligations and responsibilities. Central to this effort is the obligation to provide neuropalliative care for patients in the minimally conscious state who can perceive pain and to restore functional communication through neuroprosthetics, drugs, and rehabilitation to patients with intact but underactivated neural networks. Efforts to bring scientific advances to patients with disorders of consciousness are reviewed, including the investigational use of deep brain stimulation in patients in the minimally conscious state. These efforts help to affirm the civil rights of a population long on the margins.

Case

Sam had been driving his SUV when his car skidded on ice as he crossed the bridge around the corner from his apartment. The car tumbled over the guardrail and landed in the icy river below, causing Sam to lose consciousness. The first responders estimated that Sam had spent at least ten minutes underwater before two civilians were able to remove him from the car and pull him to the riverbank. The civilians immediately began CPR, but Sam never regained consciousness after the incident.

Sam's parents refused to give up hope and decided to send him to a rehabilitation center. One day while searching online for studies on persistent vegetative state (PVS) patients, Sam's mother came across a study that examined new ways to communicate with patients. The researchers had discovered that some PVS patients were actually in a minimally conscious state (MCS) and could communicate with the researchers with the right technology.

Molly was a bright neurology resident who had decided to take a research year while preparing her application for a fellowship. She had chosen to work on the MCS project after seeing families struggle with end-of-life decisions for PVS and brain-dead patients.

When she witnessed her mentor use the team's technology to interact with a patient who had been considered to be in PVS for the past five years, she was hooked.

Despite the breathtaking nature of their technology, however, the team members didn't pretend to be miracle workers. They realized their technology was still in its infancy and would require thorough testing before it could be implemented across the country. Until then, use of the technology adhered to strict rules. It could only be used to elicit yes or no answers from the patients to questions that were limited to a specific list: *Is the sky blue? Is the grass purple?* The researchers didn't want to ask anything serious that could potentially upset the study's participants.

Molly's mentor thought that Sam would be an ideal participant for the study. He had been a young healthy adult in his prime at the time of the accident, which had also occurred less than a year ago. The entire team was optimistic going into the testing session.

As Sam was wheeled into the testing room, his mother pulled Molly aside. "I know you're only supposed to ask him specific questions, but can you ask him if he wants all of this?" she asked. "Can you ask if he's in pain? Does he want us to keep providing care?"

Commentary

Before responding to whether a patient with a disorder of consciousness—a condition subsuming coma, the vegetative state, and the minimally conscious state (MCS) [1]—should be enrolled in a clinical trial or withdrawn from life support, we need to define relevant terms and be precise in our queries. The case concerns a patient who was thought to be in a persistent vegetative state but who might be in a minimally conscious state—two distinct conditions that are too often confused [2]. The case raises a number of ethical questions: Do we need to differentiate between patients who are in the vegetative versus the minimally conscious state when providing care to or withdrawing life support from patients? Is it ethical for someone who cannot give consent to participate in research? To answer these questions, we need to be clinically precise and differentiate these two brain states. As the old adage goes, good ethics begins with good facts.

Distinguishing Between the Vegetative State and the Minimally Conscious State

The persistent vegetative state was first described by the Scottish neurosurgeon Bryan Jennett and the American neurologist Fred Plum in a landmark 1972 article published in the *Lancet*. They described it as a "syndrome in search of a name" and characterized the condition as a paradoxical state of "wakefulness without awareness" in which the eyes are open but there is no awareness of self, others, or the surrounding environment [3]. Physiologically, patients in the vegetative state have an intact brain stem but no higher

integrative functions. They can maintain respiration and cardiac function, have sleep-wake cycles, and demonstrate a startle reflex [4].

Clinically, the vegetative state can be quite disconcerting and prone to misconstrual. Families naturally assume that the eye-opening, which marks the transition from coma to the vegetative state, indicates awareness and ability to interact with others. Because this is not the case in a patient who is vegetative, the realization can bring devastating disappointment, requiring sympathy and guidance from practitioners.

The vegetative state came to international prominence in the 1976 right-to-die case of Karen Ann Quinlan, a young woman in the vegetative state whose parents requested that she be taken off her ventilator when she did not regain consciousness [5]. Chief Justice Richard J. Hughes of the New Jersey Supreme Court asked Dr. Plum to serve as a court-appointed expert witness, where he confirmed the vegetative state diagnosis. Based upon his testimony, the court allowed for the removal of Ms. Quinlan's ventilator because there was "no realistic possibility of returning to any semblance of cognitive or sapient life" [6]. When the ventilator was removed, Ms. Quinlan survived, for a number of years, maintaining respiration with an intact brain stem. Dr. Plum, who was my teacher, told me he knew this would occur [7]. He had done an apnea test as part of his court-sanctioned neurological exam to assess brain stem function and differentiate the vegetative state from whole brain death [8]. To her parents and to members of the general public, however, Ms. Quinlan's survival was unexpected and suggested some important points of ethical and clinical relevance about what clinicians can do to help manage family members' expectations about loved ones in conditions like Ms. Quinlan's.

A Clinical Distinction that Makes an Ethical Difference

When the vegetative state was first described, it was only spoken of as the persistent vegetative state, but the nomenclature was updated in a 1994 Multi-Society Task Force report published in the *New England Journal of Medicine*: a vegetative state becomes persistent if it lasts for a month and permanent if it continues three months after anoxic injury and a year after traumatic injury [9, 10].

The prognosis for anoxic brain injury following the use of therapeutic hypothermia, when chilled intravenous saline is administered as a neuroprotective following a cardiac arrest, is evolving [11]. Therapeutic hypothermia was not administered to the patient in the present case, but his submersion in icy cold water following his car accident may have had a similar neuroprotective effect. This variable would need to be considered in his evaluation. Indeed, in assessing for brain death, patients who are hypothermic need to be warmed *before* they can undergo evaluation of brain stem function [12].

Returning to the categorization of the vegetative state, the distinction between persistence and permanence is critical because, until the vegetative becomes

permanent, patients can migrate into the MCS, a brain state introduced into the literature in 2002 [13]. Unlike the vegetative state, MCS is a state of consciousness. Patients in MCS can demonstrate intention, attention, and memory. They can track a loved one who enters the room, grasp for a cup, or even say their own name. Given the crucial difference between persistent and permanent vegetative states, we should strive for semantic clarity and abjure the confusing abbreviation *PVS*, which could indicate persistence or permanence. “PVS” may be the most dangerous abbreviation in all of medicine. As a philosopher might say, the distinction between the persistent and permanent vegetative state is a distinction that makes a difference.

Diagnostic Challenges

Beyond the relevance of the distinction between the persistent versus the vegetative state, the diagnosis of MCS is complicated by the fact that behaviors, which might indicate consciousness in the MCS patient, are manifested episodically and intermittently. As such, they can be missed.

When families report a behavior that might suggest consciousness, their claims can be discounted by clinicians as wishful thinking or evidence of deep denial [14]. For example, family members might sometimes see a loved one occasionally look up when they enter the room. Clinicians unschooled in these nuances do not expect patients labeled as “vegetative” to demonstrate evidence of consciousness. Families’ observations to the contrary might be doubted by clinicians because they seem to defy the diagnostic fixity of the vegetative state and what seemed to be an authoritative diagnosis made upon discharge from the hospital.

The problem with this formulation is that these conditions are not fixed diagnoses but rather brain states that can evolve in a way that defies recognition. While a patient discharged from the hospital with diabetes will not shed the diagnosis over time, patients who are discharged as being in the persistent vegetative state can evolve into the minimally conscious state. This evolution, coupled with the episodic demonstration of behaviors, which might indicate consciousness, can have implications for the accuracy of clinical assessment. Indeed, a startling paper found that 41 percent of traumatic brain injury patients in chronic care facilities who were thought to be vegetative were in fact in MCS when assessed with bedside neuropsychological testing [15, 16]. In other words, these patients appeared vegetative but were in fact minimally conscious.

The possibility that MCS patients might appear as if they were in a vegetative state is explained by the biology of the two conditions. In contrast to patients who are vegetative, those who are in MCS have intact neural networks [17, 18]. When these networks are inactive, the patients appear to be vegetative, but when the networks are activated, these patients can demonstrate evidence of consciousness either behaviorally or, as we shall see, on [neuroimaging](#) without an overt behavioral correlate [19].

Ethical Deliberation under Conditions of Clinical Uncertainty

In the case described above, the patient, Sam, has an ambiguous history. The case suggests both traumatic and anoxic brain injury from submersion of “at least ten minutes.” Generally, anoxia of this duration results in brain death, so perhaps the patient floated above the surface or benefited from the neuroprotective hypothermia of the ambient icy river water, as discussed above [11]. We just don’t know. As previously discussed, initial emergency care would need to warm the patient, since hypothermia is a contraindication to brain death testing [12].

The etiology of Sam’s brain injury is a critical part of his clinical history since traumatic brain injury (TBI) has a more favorable outcome than an anoxic injury [12]. This prognostic distinction is evident in the story of Don Herbert, a fireman who sustained anoxic injury in a house fire when his head was struck by a falling rafter [20]. He was initially communicative and then appeared vegetative. He spoke again nine years later, seemingly defying both what was thought to be a permanent vegetative state and the sequelae of anoxic brain injury. In retrospect, it became clear that Herbert had been in the minimally conscious state all those years and that his predominant injury was more traumatic than anoxic. Although he did sustain smoke inhalation, it was tempered by his oxygen mask which was askew, but near him when he was rescued. This mitigating factor likely yielded the more favorable outcome of traumatic injury [21].

Covert consciousness becomes the fundamental issue that should undergird our ethical obligations to patients in MCS [22]. First among these is a neuropalliative ethic of care [23], since MCS patients have the potential to experience pain, whereas vegetative patients do not. This creates an ethical mandate both to distinguish these brain states and to address the pain management needs of patients in MCS, who often are thought to be insensate and have invasive procedures done to them *without* proper analgesia. By knowing that a patient is in MCS, a clinician can help ensure that when these patients have potentially painful procedures they receive pain medication.

Research on Patients with Disorders of Consciousness

Returning to the question of how Molly should respond to Sam’s mother’s question about research participation prompts consideration of whether research should be done on patients with disorders of consciousness. Although important, this question is moot. Research is happening, with a modicum of early success. Neuroimaging studies have further elucidated MCS and demonstrated the possibility of cognitive motor dissociation in which patients who appear behaviorally to be vegetative demonstrate activity on passive and active paradigms with functional studies [24]. In one notable case, neuroimaging was used as a means of functional communication [25]. Pharmacological studies have helped foster, restore, or accelerate recovery into overt demonstrations of consciousness [26, 27].

I was a co-investigator on a study on [deep brain stimulation](#) (DBS) in MCS, which was published in *Nature* in 2007 [28] (I designed the ethical framework for the study [29, 30]). That study introduced bilateral electrodes into the intralaminar nuclei of the thalamus. An MCS participant who could only sometimes communicate with eye movement, was dependent on percutaneous endoscopic gastrostomy feeding, and had poor muscle tone, was able—with stimulation—to say six- or seven-word sentences, recite the first 16 words of the Pledge of Allegiance, go shopping with his mother and voice a preference about clothing, and tell his mother he loved her. He could also eat by mouth for the first time in six years, maintain secretions and masticate, and also sit up with improved tone.

Research in patients with disorders of consciousness was not always accepted, however. Ethically, to get the MCS study done, I needed to justify it as a phase I clinical trial that had only a hypothetical benefit and more than minimal risk to a participant who could not provide consent [30]. As I describe in *Rights Come to Mind: Brain Injury, Ethics, and the Struggle for Consciousness* [29], providing such a justification was seemingly an impossible task, but I made the argument that the risks were proportionate to the benefits, since DBS was vetted as a safe and reimbursed treatment for drug-resistant Parkinson's disease and that analogies to the dark legacy of psychosurgery were ill-placed. Psychosurgery, typified by lobotomy, was crude and ablative and done in an unregulated era [31]. In contrast, DBS for MCS was [neuromodulation](#) and did not destroy tissue. Moreover, unlike the earlier psychosurgery era, the research would be (and was) done with multiple IRB approvals and under a Food and Drug Administration Investigational Device Exemption [28]. Moreover, we chose participants who could be theoretically helped but not incrementally injured by DBS. We identified MCS participants with intact but under-activated networks and those for whom the likelihood of naturally occurring recovery had passed [28-30].

To critics who contended that DBS for patients in the minimally conscious state was unethical, I argued that as a field we were confusing informed consent with the Belmont Report's central ethical principle of respect for persons [29, 32]. It is one thing to do something to people without their consent or over their objections. This would entail a breach of self-determination and a disrespect of persons. It is quite another issue to demand consent from participants who cannot provide it, especially when the object of the intervention is to provide them with a neuroprosthetic that might allow the patient who is in MCS to communicate and participate in decisions that are relevant to them, including the decision of whether to continue therapy [29, 32-34].

Conclusion

So should participants with disorders of consciousness be enrolled in a clinical study? In theory, yes, if there is an appropriate trial with a plausible hypothesis and surrogate authorization. And what about Sam? I am less optimistic about the utility of any

intervention in his case given the more dire prognosis of anoxic injury and the lack of any evidence of minimal consciousness in the case report. The likelihood of restored functional communication would appear low, and it would be important not to foster false expectations and a [therapeutic misconception](#) [35, 36].

My counsel therefore is to be clinically vigilant for signs of improvement, acknowledging that those who are conscious have a civil right to be properly identified, diagnosed, and welcomed back from the exile imposed by injury [29, 37, 38]. With evolving neuroprosthetics, restoration of functional communication is within our grasp for properly identified patients [39, 40]. This is a worthy aspiration for clinical practice and research [41].

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IN THE LITERATURE

Advancing Ethical Neuroscience Research

B. Rashmi Borah, Nicolle K. Strand, JD, MBioethics, and Kata L. Chillag, PhD

Presidential Commission for the Study of Bioethical Issues. *Gray Matters: Topics at the Intersection of Neuroscience, Ethics, and Society*. Vol 2. Washington, DC: Presidential Commission for the Study of Bioethical Issues; 2015.

Abstract

As neuroscience research advances, researchers, clinicians, and other stakeholders will face a host of ethical challenges. The Presidential Commission for the Study of Bioethical Issues (Bioethics Commission) has published two reports that provide recommendations on how to advance research endeavors ethically. The commission addressed, among other issues, how to prioritize different types of neuroscience research and how to include research participants who have impaired consent capacity. The Bioethics Commission's recommendations provide a foundation for ethical guidelines as neuroscience research advances and progresses.

Introduction

On April 2, 2013, President Obama announced his vision for advancing neuroscience research. Through the Brain Research through Advancing Innovative Neurotechnologies® (BRAIN) Initiative, the president committed \$100 million to neuroscience-related research efforts at the National Institutes of Health, the Defense Advanced Research Projects Agency, the Food and Drug Administration, the National Science Foundation, and the Intelligence Advanced Research Projects Activity [1]. In order to maintain the "highest ethical standards," the president charged the Presidential Commission for the Study of Bioethical Issues (Bioethics Commission) with "explor[ing] the ethical, legal, and societal implications raised by this research initiative" [2]. Given the nature of the research that the BRAIN Initiative could fund, addressing and emphasizing the ethical issues surrounding neuroscience research was—and still is—a critical component of the initiative. The commission responded to the president's charge in two reports. The first report, *Gray Matters: Integrative Approaches for Neuroscience, Ethics, and Society*, focused on [integrating ethics](#) at all stages of the research process [3]. The second report, *Gray Matters: Topics at the Intersection of Neuroscience, Ethics, and Society*, focused on three "cauldrons of controversy": cognitive enhancement, consent capacity, and neuroscience and the legal system [4]. In particular, the Bioethics Commission's recommendations

regarding cognitive enhancement and consent capacity make direct and important contributions to forthcoming neuroscience research. The recommendations provide a framework that neuroscientists can use to critically evaluate the implications of their research and to ensure that future research endeavors are carried out carefully and ethically [5].

Cognitive Enhancement

The Bioethics Commission found widespread agreement about the promise that neuroscience research holds in addressing neurological diseases; beyond that, the extent to which neuroscience research can—or should—proceed was found to be a matter of debate [4]. In the second volume of *Gray Matters*, the commission focused on cognitive enhancement, defined as “*expand[ing] or augment[ing] function above typical or statistically normal ranges*” [6]. This area attracts opposing viewpoints, with some viewing enhancements as a means to human improvement and others as “threats to moral agency and dignity” [7]. The Bioethics Commission broadened consideration of cognitive enhancement to include anything that could be classified as “neural modification,” which includes any course of action that impacts the brain or nervous system. Neural modification need not involve any advanced technologies or procedures; for example, changes in diet and sleep can affect cognitive functions and, as such, can be a means of neural modification.

Given the new, broader definition of neural modification, the Bioethics Commission stated that “altering the brain and nervous system is not inherently ethical or unethical” [6]. The Bioethics Commission’s stance is an important contribution to an often-polarized topic [8]. The report emphasizes that, as neuroscience research progresses, assessments of the ethicality of neural modification practices must be conducted on a case-by-case basis and must include an evaluation of the risks and benefits of a particular practice and circumstance. Certain practices might be ethically acceptable in one instance and ethically problematic in another. For example, a pharmacological intervention can be ethically used to treat a diagnosed neurological disorder, but the same intervention’s use by a healthy person to augment cognitive performance might be ethically problematic. Assessments must also consider who is choosing the neural modifier, and for whom, as the assessment might vary depending on the parties involved. For example, instances in which adults with the capacity to understand and consent to neural modification choose a particular intervention for themselves might differ from instances in which adults are choosing that same intervention for a child or person who [lacks consent capacity](#).

There are at least three goals of neural modification, according to the new taxonomy proposed by the Bioethics Commission: to maintain or improve neural health, to treat neurological disorders, and to enhance neural functioning. In its ethical analysis, the Bioethics Commission stated that research on low-technology methods to maintain or

improve neural health and research to understand and treat neurological disorders should be prioritized over research on ways to enhance or augment human functioning, as these two goals advance individual and public beneficence, with less potential risk and possibility for irreversible change [4]. Such research can help provide necessary interventions to those who need them and who might benefit from them. After considering diverse perspectives on the future of [novel neurotechnologies](#) and the ramifications of conducting such research, the Bioethics Commission also recommended that funders support research to better understand novel neural modifiers that could enhance or augment neural function, noting that much of the data about practices used to augment cognitive functions, such as the use of prescription stimulants such as methylphenidate, were inconclusive [4]. A better understanding of these interventions is a critical prerequisite to evaluating their ethical use. However, the commission specifically urged that if interventions to augment or enhance human cognition become available, stakeholders ensure equitable access to them in line with public beneficence, justice, and fairness [4]. The research prioritization agenda put forth by the Bioethics Commission will help advance the field of neuroscience by encouraging funders to focus on research to understand and treat disease rather than high-technology cognitive enhancements based on hyped public interest and inconclusive existing data.

Consent Capacity

Neuroscience research focused on the etiology, pathology, and treatment options for neurological conditions cannot proceed without the involvement of study participants with those conditions. However, the nature of certain neurological conditions, such as [Alzheimer's disease](#), might impact a potential study participant's ability to consent to participate in a research trial; thus the inclusion of those with impaired consent capacity in research studies raises ethical challenges. Informed consent is a widely established condition for participation in a research study [9], and, in order to provide informed consent, people must have ability to consent, which includes skills such as understanding relevant information and using that information to make an informed decision about participation [10]. Researchers and [institutional review boards](#) sometimes reach an impasse when considering whether to conduct or proceed with research that necessitates the involvement of participants whose consent capacity might be impaired [4].

The Bioethics Commission recommended the responsible inclusion of research [participants with impaired consent capacity](#), warning that excluding such participants from research could stifle the development of preventive interventions, treatments, and cures [4]. The Bioethics Commission's recommendation provides a critical perspective on the benefits of including participants with impaired consent capacity in a research trial and could help alleviate the perceived obstacles for conducting research that necessitate the involvement of participants with impaired consent capacity.

At the same time, the Bioethics Commission emphasized the importance of additional ethical safeguards for these participants. One safeguard that the Bioethics Commission discussed is the federal regulatory requirement for a legally authorized representative (LAR) to grant permission on behalf of a research participant who lacks consent capacity. The report notes that the definition of a LAR in most states includes people who are authorized to make health care decisions, such as a spouse or parent; however, few states have a law that specifically extends this decision-making authority to research participation [4]. This regulatory gap serves as an obstacle to conducting research with participants whose consent capacity is or could be impaired. Researchers do not want to risk running afoul of federal regulations, but the guidance regarding the inclusion of participants with impaired consent capacity is often unclear. The unethical inclusion of research participants with impaired consent capacity is a risk that many researchers did not want to take [11].

The Bioethics Commission recommended that federal regulatory bodies clarify who can serve as a LAR for research purposes. Following the publication of the second volume of *Gray Matters*, a notice of proposed rulemaking (NPRM) for alterations to the Common Rule—US federal regulations that protect research participants [12]—highlighted this regulatory gap, citing the Bioethics Commission’s work, and included a proposed change that would allow a LAR to be designated for research purposes following a common practice standard if no state or local laws are in place [11]. The NPRM noted, in line with the Bioethics Commission’s recommendation, that the current definition of a LAR—and the lack of relevant laws at the state level—could unnecessarily hinder the progress of research [11]. Should the amended definition be included in the Common Rule, an important obstacle to conducting research involving participants who have or may develop impaired consent capacity will have been removed.

Although there have been decades of proposals and inaction regarding consent capacity, the Bioethics Commission made two important contributions intended to help researchers move forward. First, the Bioethics Commission was the first national bioethics advisory board to address this issue broadly and comprehensively. Previous groups focused on research involving persons with mental disorders [13] and persons institutionalized as mentally infirm [14] but failed to recognize the spectrum of disorders and conditions that can impair consent capacity. Second, this Bioethics Commission was the first national bioethics advisory body to influence a change in federal research regulations regarding this issue. Neuroscience research will advance more rapidly, and more ethically, due to the recommendations put forth by the Bioethics Commission and the upcoming change in federal regulation that will likely result.

Conclusion

The Bioethics Commission’s recommendations in the second volume of *Gray Matters* made an important contribution to the current debate regarding ethical issues in

neuroscience research. These recommendations provide an important framework that stakeholders in neuroscience research can use when planning their work and evaluating its ethical implications. Although assessments of the ethicality of neuroscience research might not always be straightforward and there might not always be consensus regarding the ethical implications of future research, it will continue to remain the responsibility of researchers, clinicians, research participants, and other stakeholders to respectfully and conscientiously engage with each other to ensure that such research moves forward in an ethical manner. The Bioethics Commission's recommendations can serve as an invaluable resource to guide researchers in this endeavor.

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STATE OF THE ART AND SCIENCE

Locating Risk in the Adolescent Brain: Ethical Challenges in the Use of Biomarkers for Adolescent Health and Social Policy

Suparna Choudhury, PhD, and Sheehan Moore

Abstract

Technological developments in neuroscience over the last 20 years have generated excitement about the potential of neuroscientific insights for the understanding of and intervention in children's and adolescents' behavior. This article introduces some ways in which new results from developmental cognitive neuroscience have been appropriated in the context of adolescent mental health. We also consider social and interpersonal factors that drive the use of neurobiological markers of mental disorders in pediatric psychiatry. Finally, we outline the current ambitions for using neurobiological biomarkers in adolescent mental health care and discuss some ethical challenges arising from the methodological, political, cultural, and social contexts of their application.

Introduction

The interest in neuroscientific expertise has spread rapidly beyond the laboratory, as interpretations about brain changes of young people increasingly provide an evidence base to guide psychiatric treatment, child-rearing, and policy. As researchers in neuroscience, psychiatry, and social science, we are interested in the interactions among science and the social, cultural, and political contexts of research. This paper examines ways in which new results from developmental cognitive neuroscience—in particular, brain changes discovered through neuroimaging techniques—have been appropriated in the context of adolescent mental health, reinforcing an emerging emphasis on neurobiological markers of mental disorders as diagnostic tools in pediatric psychiatry. We first outline current ambitions for the use of neurobiological biomarkers in adolescent mental health and social policy and then examine some scientific and ethical challenges that arise in the methodological, cultural, political, and social contexts of their application.

The New Science of the Adolescent Brain: Neuroimaging and Hopes for Biomarkers

Adolescent brain development became a major project in neuroscience following the first set of cross-sectional and longitudinal studies of children, adolescents, and adults using magnetic resonance imaging (MRI) technology in the 1990s [1]. For example, the correlation between structural and functional developments in brain regions revealed

through MRIs and performance on cognitive tasks that tap capacities such as impulse control and empathy has led neuroscientists and public commentators to link risk-taking and impulsivity—commonly associated with teenagers—to developmental processes in the brain during adolescence [2, 3].

Applying insights from neuroscience and determining whether the function, connectivity, or structure of an adolescent's brain signals the presence or risk of mental disorder or behavior like risk-taking is also of significance in the context of education and the [law](#). For example, "neuroeducation" curricula based on preliminary neuroscience findings are on the rise [4], supporting intervention programs for reading difficulties like dyslexia [5] and forming the basis for commercially available educational programs for educators to improve student performance (e.g., the Florida-based BrainSMART [6]). Furthermore, neuroimaging data played a role in marshalling support for the abolition of the juvenile death penalty in 2005 [7]. It also has been used to demonstrate neuroscience's relevance to legal decision making about adolescent culpability, as one prominent neuroscientist advised the defense team of a 15-year-old detainee at Guantánamo Bay on the basis of data on the immaturity of the neurocognitive systems implicated in cognitive control and reward-seeking behaviors [8]. Neuroscientists and policymakers have appealed to similar data to refine or reform policy guidelines in the context of adolescents and driving [9], safer sex [10], voting age [11], and occupational health and safety [12].

These translations of neuroscience findings into policy coincide with psychiatry's recent shift towards identifying "biomarkers," neurobiological traces that promise more precise means of identifying disorders and their subtypes than current psychiatric classification systems that rely on signs and symptoms. These biomarkers are physiological indicators akin to neural "signatures" that are not themselves causes of disorders but instead may help predict the probability of onset of a future disorder as well as treatment outcomes [13, 14].

Ethical Dilemmas Surrounding the Use of Neurobiological Biomarkers for Youth

The use of neurobiological biomarkers, which appear to have enormous potential, raises a number of practical methodological, social, and political challenges that have ethical implications.

Methodological issues. Recently, the National Institute of Mental Health (NIMH) announced its intention to transform psychiatric diagnosis through the Research Domain Criteria (RDoC) framework, which prioritizes neurobiologically based research on mental illnesses, deploying tools like fMRI with the ultimate goal of constructing a new classification system based on brain structure and function [15]. However, this approach has met with criticism from psychiatrists [16]. And as neuroscientists, psychologists, and philosophers have pointed out in recent years, while neuroimaging is a more powerful

and objective tool for identifying abnormalities than subjective reports and interpretations of experience and behavior, its validity and reliability for detecting risk of abnormality is limited [17-19].

Abnormalities in brain structure and function do not map neatly onto clinical or behavioral diagnostic categories, which are not simply biologically based but have been created within a specific historical and cultural context and thus might not describe a single pathological process [20, 21]. It is likely, for example, that various underlying anatomic networks would produce the symptoms that collectively are referred to as [attention-deficit/hyperactivity disorder](#) (ADHD). Moreover, children receiving the diagnosis belong to a heterogeneous population and have comorbidities [22], making identification of definitive ADHD predictors difficult. Some researchers have moved away from psychiatric categories by attempting to identify the neural correlates of emotional states and traits, but without conclusive results [23].

Distinguishing “normal” from “abnormal” brain structure and function is itself difficult, particularly because the brain’s plasticity during development means that children and adolescents are able to employ different or compensatory strategies to perform equivalent tasks. For example, two adolescents diagnosed with ADHD may have different patterns of brain activity during a given task because of their different developmental histories and the recruitment of different brain networks [24]. As an ADHD diagnosis can bring about dramatic changes in parenting and educational strategies and may require medication, such neural “signatures” on their own must be read with caution.

Additionally, it should be stressed that neuroscience can only provide *correlations* between adolescent brain changes and behavior, not causal statements. But practical decisions about health care, education, or legal responsibility premised on neuroscientific data either occur or do not [13].

Social issues. Although practitioners in medicine, education, and the law are interested in using neural signatures of disease to predict individuals’ risk of future disease as well as their propensities for antisocial or risky behaviors (e.g., poor decision making, impulsivity), the use of neurobiological biomarkers to identify young people “[at risk](#)” warrants debate. For instance, researchers have suggested that the new biodeterminism, or overemphasis on brain structure and function to account for increased risk-taking behavior ascribed to adolescents, serves to obscure differences in life experiences or the role of socioeconomic inequalities that may also explain risk-taking behavior, which has serious social consequences [2, 25]. The shortcomings of these applications of neuroscience research have been acknowledged by neuroscientists themselves, including prominent brain development researcher Jay Giedd, who cautions

policymakers against basing decisions about individuals on group data and who emphasizes the role of context in making sense of adolescent behaviors [26, 27].

Neuroscientists have acknowledged the general absence of context in lab-based experiments used to identify biomarkers. For instance, research on adolescents' apparent drive to seek novel sensations and rewards has not explored the possibility that this risk-taking behavior is adaptive to particular social contexts, and substantial leaps have been taken to draw links between abnormalities in neurocognitive maturation in small, lab-based samples and large-scale national statistics on car accidents, teen pregnancy, and drug abuse in particular countries [28]. Singh and Rose note that the use of psychiatric biomarkers to predictively label young people as "at risk" can have a [stigmatizing effect](#), associating them with antisocial or criminal behavior and potentially leading to medical intervention that ignores broader social contexts [13]. Stigma attached to mental health diagnoses disproportionately affects more vulnerable groups like adolescents, who may experience disruptions of identity formation, and for whom such stigma can be a deterrent from seeking diagnosis [29].

The plasticity with which psychiatric biomarker studies are concerned is itself an experience-dependent process that can only be understood in context. Increasingly, developmental, social, and cultural neuroscience theorizes the brain as encultured [30–32] or socioculturally *situated* [33]. To this end, researchers have stressed the value of biomarkers and individualized brain plasticity research *alongside* a consideration of environmental and socioemotional factors in identifying vulnerability to bipolar disorder [34].

Political issues. Neuroscience and government policy enjoy an increasingly close relationship: while national surveys on adolescent problem behaviors frame the puzzles that neuroimaging studies seek to explain, neuroscientific data are beginning to provide the evidence base for educational, clinical, and legal imperatives. As discussed above, neuroscientific data on cognitive control have been used in cases establishing the criminal culpability of adolescents [35], and neurobiological biomarkers that provide apparent indicators of future risk for antisocial behavior or mental disorder can be associated with assumptions about criminal behavior and psychopathology [13]. These stigmatizing predictions about possible future behavior may in turn influence legal argumentation and prosecution.

What might be called the neuroscientific model of responsibility and selfhood risks disempowering adolescents with a "blame the brain" heuristic that renders teenagers the passive subjects of their brains' development [36]. Teenagers and their parents are charged to "take control" of the teenagers' brains by understanding and intervening in brain development—and, in so doing, they both submit to the neurotherapeutic model and demonstrate their ability to make informed, autonomous decisions as individuals

stripped of any broader social context or influences [37]. This model of the proactive neurobiological self, then, points to the broader sociopolitical context—in which people come to think of themselves as subjects in need of treatment—and to the levelling effect of neuroscientific research that attempts to bracket off context. Biomarker research adds to the arsenal of individualized brain data a predictive metric that could lead to [intrusive psychiatric intervention](#) without the definitive presence of pathology. The moral imperative towards health and well-being of the general population is here shifted onto the individual [38], consistent with descriptions of (neo)liberal values of self-responsibility and self-management [39, 40], with potentially negative consequences for patients' self-management.

Conclusion

In spite of their limitations, brain-based biomarkers may be significant for psychiatry in the same way that neuroimaging is a powerful alternative to self-report and subjective interpretation, which may be unreliable as a means of prompting introspection [41] and of limited use with children and adolescents [42]. Neural biomarker studies may complement self-report [43], compensating for these methodological shortcomings. They may allow faster predictions of the efficacy of medications like selective serotonin reuptake inhibitors (SSRIs) [44] and enable earlier, preventative therapeutic interventions [45]. As these ambitious translations of biomarker research evolve, particularly in work with adolescents, it is crucial that researchers tread carefully through the ethical entanglements that emerge from the methodological, cultural, and social contexts within which the developing brain is situated.

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HEALTH LAW

The Legal Implications of Detecting Alzheimer's Disease Earlier

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Abstract

Early detection of Alzheimer's disease (AD) raises a number of challenging legal questions. In this essay, we explore some of those questions, such as: Is a neurological indicator of increased risk for AD a legally relevant brain state before there are any outward behavioral manifestations? How should courts address evidentiary challenges to the admissibility of AD-related neuroimaging? How should the government regulate the marketing of neuroimaging diagnostic tools? How should insurance coverage for the use of these new tools be optimized? We suggest that many voices and multidisciplinary perspectives are needed to answer these questions and ensure that legal responses are swift, efficient, and equitable.

Introduction

In 2010, an estimated 4.7 million Americans aged 65 and older suffered from Alzheimer's disease (AD), and by 2050 this number is projected to reach 13.8 million [1]. Although there is currently no cure for AD [2], new neuroimaging techniques are being developed to detect biomarkers for AD in its earliest stages [3-5]. Such biomarkers can identify atrophying neural tissue in people with AD before they manifest observable behavioral changes [6]. For clinicians, this early detection can help facilitate prevention or help slow the disease's progression [4]. Because early detection is seen as so important, in 2004 the Alzheimer's Disease Neuroimaging Initiative (ADNI) was formed to develop a range of biomarkers—including imaging, genetic, and biochemical—for the early detection and monitoring of AD [7, 8]. Research such as this has produced new diagnostic options for clinical use. For example, in 2012, the Food and Drug Administration (FDA) approved an imaging technique that uses positron emission tomography (PET) scanning with the radioactive tracing compound florbetapir F-18 to identify the accumulation of amyloid- β plaques, which are believed to play a central role in AD [9]. The clinical implications of these advances are being actively discussed [3, 4, 10, 11]. Scant attention, however, has been paid to the *legal* implications of what it means to test positive for a biomarker that suggests a higher probabilistic risk for developing AD.

As it is likely that early-detection technology for AD will become more widely used, the Shen NeuroLaw Lab at the University of Minnesota is exploring the ramifications that this technology will have for issues such as legal relevance, courtroom admissibility of evidence, government regulation, privacy, insurance, and employment. Among the questions we seek to answer are these:

1. Is a neurological indicator of increased risk for AD a legally relevant brain state before there are outward behavioral manifestations of AD?
2. How should courts address evidentiary challenges to the admissibility of AD-related neuroimaging?
3. How should the government regulate the commercial use, advertising, and marketing of neuroimaging diagnostic tools?
4. Who should—and should not—have access to a patient’s AD neuroimaging data?
5. Should insurance providers provide coverage for the use of these increasingly informative, but not yet dispositive, tools?

In this essay, we consider these questions, recognizing that they deserve a more extended discussion than we offer here. We present more questions than answers, but we aim to inspire a discussion about what it means to be [at risk](#) for a currently incurable disease like AD and how the legal system ought to respond.

Determining the Legal Relevance of Increased Risk for AD

To the extent that early detection technologies based on biomarkers are sufficiently reliable, practical, and ethical, they will likely have a great impact on how we understand, classify, and treat the multiple stages of AD. What is less clear is whether the presence of biomarkers is a *legally* relevant brain state. Most bodies of law—including tort, contracts, and criminal law—have traditionally demanded outwardly manifested behavior as a prerequisite for legal recognition of physical injury [12]. The advent of Alzheimer’s biomarkers thus poses a conundrum: how should the law treat a person who does not exhibit behavioral symptoms but whose brain is documented to have already altered in such a way as to suggest a higher likelihood of AD?

Consider, for instance, the following hypothetical situation involving a 50-year-old man named John, someone with no significant medical history. Let us assume the FDA approves a neuroimaging technique that allows physicians to diagnose people as being at an elevated risk of developing AD. Although John is well below the average age at which AD symptoms typically appear (age 65), he tests positive for the brain AD biomarker. What happens next?

For social security disability benefits, it is unclear if the positive biomarker result will matter (at least under current law). Currently, the Social Security Administration (SSA) provides disability benefits to applicants who demonstrate early-onset AD. The SSA

regulations state that the “diagnosis of early-onset AD is based on the combination of clinical and family history; neurological, cognitive, or neuropsychological examination; and neuroimaging” [13]. The regulations emphasize that “clinical information documenting a progressive dementia is critical and *required* for disability evaluation of early-onset AD” [13]. In our hypothetical case, John’s clinical record does not include behavioral manifestations of the disease. That is, John’s brain is altered in ways that suggest he will develop AD, but John is not yet consciously aware of experiencing memory loss.

Should disability benefits always require clinical manifestations? If not, what threshold of elevated risk needs to be met before John qualifies? The same question could be asked of insurance coverage. For instance, if John tests positive for an AD biomarker, should his insurer be required to cover the costs of (potentially expensive) treatments? Such questions are specific versions of the fundamental question concerning the use of AD biomarkers in the law: In what particular legal contexts, if any, should the law require behavioral manifestation of AD, and in what contexts should the law rely on predictive neuroimaging data alone? Put another way: How should the law treat a healthy person with a not-so-healthy brain?

The question will arise not only in disability and insurance law, but also in core legal domains such as contracts, torts, and criminal law. In each domain, issues of “capacity,” “competency,” and liability may be affected by AD biomarkers. Returning to our hypothetical case allows us to imagine some possibilities. Imagine that sometime after brain alterations are identified, John is convinced by a co-worker to invest his life savings in a business venture that fails. Does John have legal recourse on the grounds of contractual incapacity to void the contract (as those in the advanced stages of AD can sometimes successfully claim)? Or what if one day John forgets to put his car in park and it crashes into a house? If John is subsequently sued on the grounds of negligence, would he have a viable defense based on his early AD diagnosis? What if John forgets which way to enter a highway and crashes into an oncoming car, killing its passengers? Would he have a criminal defense to charges of vehicular homicide?

Even if John had been diagnosed clinically with AD, resolving many of these questions would be difficult because the law is currently struggling with how, if at all, an AD diagnosis should modify legal doctrine for people with Alzheimer’s [14]. For instance, in tort law, scholars are presently debating whether the standard for negligence liability should be the reasonable person or the reasonable person *with AD* [14]. AD biomarkers raise further novel questions that the law will likely need to address in the years to come.

Admissibility in Court

As legal challenges involving people with AD come before the courts, novel questions of evidentiary admissibility will surface. The 1993 Supreme Court decision in *Daubert v*

Merrell Dow Pharmaceuticals provides guidelines for federal courts to evaluate the admissibility of expert evidence. The factors to be considered include:

1. Whether the theory or technique in question can be (and has been) tested;
2. Whether it has been subject to peer review and publication;
3. Its known or potential error rate and the existence and maintenance of standards controlling its operation; and
4. Whether it has attracted widespread acceptance within a relevant scientific community [15].

Some state courts primarily use *Frye*, a 1923 case which held that in order to be admissible the expert evidence must “have gained general acceptance in the particular field in which it belongs” [16]. Given these standards, should juries be able to hear [testimony from experts](#) about the neuroimaging evidence of early AD diagnosis?

Looking first at *Frye*, the critical question will be whether the AD biomarker is generally accepted for the particular legal purpose for which it is proffered. Under *Daubert*, the court’s inquiry will be broader, focusing on whether there is research connecting the AD biomarker to the legally relevant behavior (e.g., what can be said about the relationship between the AD biomarker and contractual capacity?).

The science is presently clear that neuroimaging techniques utilizing radioactive tracers like florbetapir F-18 are not meant to be stand-alone diagnostic tools. Even the creators of florbetapir F-18 [17] note that it “is an adjunct to other diagnostic evaluations” [18] and a “positive [PET] scan does not establish a diagnosis of AD or other cognitive disorder” [19]. But evidence need not be dispositive to be admissible under either the *Daubert* or *Frye* standard. Indeed, as the Supreme Court noted in its *Daubert* opinion, the traditional methods of challenging admissible but shaky evidence are cross-examination and calling opposing experts to the stand [15].

Should judges exclude these types of diagnostic tools from the courtroom—at least for now? Or should they admit them but also allow for opposing expert witnesses and perhaps place limits on expert testimony? Neuroimaging evidence has been admitted in a host of other contexts [20]. It thus seems likely that attorneys will attempt to introduce neuroimaging biomarkers of AD into the courtroom as well. It would be wise for lawyers, judges, and doctors to develop guidelines for the contexts—if any—in which such evidence should be admitted.

Regulating Early Detection Technology

FDA regulation of neuroimaging technology is, and will continue to be, an important focus of scholars and practitioners [21]. The same can be said of how these technologies are marketed to the public. To be viable, neuroimaging companies require a sizeable market [22], and to build such a market one can easily imagine advertising departments running far ahead of the science, thus potentially creating a need for improved industry

self-regulation or government oversight. To use just one example that gives rise to these concerns, in 2012 a UCLA research lab launched the neuroimaging company MindGenesis™, which claimed on its website to be the “Rocky Mountain region’s first imaging center focused on finding and confirming Alzheimer’s disease and dementia sooner” and touted its PET scan approach to AD detection under the tagline “Life plan imaging begins here” [23]. MindGenesis’s problem was the inability of its technology to definitively distinguish AD from other forms of dementia. The company’s website was eventually taken down without government intervention, but had it stayed up, federal or state action may have been taken for false claims, as was done when a similar company claimed the ability to use PET scans to diagnose chronic traumatic encephalopathy [24, 25].

As our understanding of AD advances and neuroimaging technologies become increasingly available, more companies like MindGenesis will likely emerge. Balancing competing priorities will be important as a regulatory regime takes shape. The recent experience of a personal genomic company, [23andMe](#), might serve as a useful touchstone [26]. 23andMe is a private company that provides consumers with genetic information based on a DNA sample [27]. In 2013, six years after the company began offering genetic testing, the FDA sent a warning letter to 23andMe, stating “we still do not have any assurance that the firm has analytically or clinically validated the PGS [Personal Genome Service] for its intended uses, which have expanded from the uses that the firm identified in its submissions [for marketing approval]” [28]. A central concern is that consumers might experience unwarranted anxiety, or even make important health decisions, based on unreliable analysis of their genetic profile. 23andMe is currently going through the FDA regulatory process for specific disease tests, and the future of [federal regulation](#) in the area of personalized genetic testing remains uncertain [29].

The most important lesson for regulation of AD biomarker technology may be this: 23andMe was created in 2006, and the FDA warning letter did not occur until 2013. Thus for a number of years, the genetic testing marketplace operated without significant federal regulation. Whether the lack of regulation was good (because it promoted innovation and consumer choice) or bad (because it misled consumers about their health) depends upon one’s normative views about the proper role of federal regulation. We do not here posit a specific position on how extensively the FDA, the Federal Trade Commission (FTC), or other state or federal agencies should regulate companies developing and marketing AD biomarkers. But we do hope for improved communication between industry, regulators, and the public as neuroimaging for AD becomes more prominent.

Optimizing Insurance Coverage

Before its website was taken down, MindGenesis (the company discussed earlier that offered neuroimaging for AD) declared on its front page (in bold font), "Only You Need to Know!" [23]. The site told users that "You have total privacy with MindGenesis. No insurance provider, government agency, physician, or hospital has access to your results unless you give signed written permission for your files to be sent to another provider" [23]. MindGenesis was sensitive to the reality that medical privacy, especially about a matter as important as AD, would be at the forefront of consumer concern.

Protecting the privacy of genetic testing results requires several considerations. On the one hand, ensuring legal privacy protections might be straightforward. Since the passage of the Health Insurance Portability and Accountability Act of 1996 (HIPAA), more attention has been paid to how we regulate and protect a patient's medical records [30]. But it is unclear and perhaps doubtful that companies like MindGenesis and 23andMe fall under HIPAA's "covered entities" [31]. Thus, it could be that companies providing AD biomarker services will not be held to the same privacy protection standards as health care and insurance providers. One solution then may be to expand the definition of covered entities to include these direct-to-consumer companies.

HIPAA compliance aside, other vexing problems, overlooked by MindGenesis, are that (1) most consumers would need their insurance company to pay for the brain scan, and (2) if a costly intervention was recommended upon receiving the results, most consumers would need their insurer to pay for that intervention. It thus seems likely that consumers would need to voluntarily disclose the results of their brain scans to their insurers, which could lead to better health outcomes through coverage of AD treatments. But with disclosure comes the risk of discrimination: insurance companies might charge a higher premium based on the brain data.

Novel questions may be raised for employment law litigation as well. The Americans with Disabilities Act (ADA), applicable to businesses with 15 or more employees, defines "disability" as "(A) a physical or mental impairment that substantially limits one or more major life activities of such individual; (B) a record of such an impairment; or (C) being regarded as having such an impairment" [32]. The ADA further notes that "major life activities" include "the operation of a major bodily function, including but not limited to, functions of ... neurological ... [and] brain ... functions" [32]. Let us return to our hypothetical character John for a moment, to see whether he would be considered "disabled" under the ADA. On one hand, John is not yet experiencing any limitations in major life activities. He works as well as he always has. On the other hand, his brain functioning has changed, and continues to change, in such a way that it suggests he may develop AD in the years to come. But this is merely a probabilistic prediction based on neurological function. It is not legally dispositive. Is John "disabled" if it is estimated that he has an 80 percent chance of developing AD? What if the prognosis is a 51 percent

chance? These questions return us to our central issue: Under what circumstances should a brain state, independent of any observable behavioral change, be legally relevant? For instance, should an airline that learns that one of its pilots had tested positive for a biomarker for AD be able to reassign the pilot over the pilot's objection? We suspect that the public might feel differently depending on whether the person's AD diagnosis was likely to have such serious potential negative impacts.

In addition to the ADA, there remain open questions about whether the Genetic Information Nondiscrimination Act of 2008 (GINA) [33] would apply to neuroimaging AD biomarker information in the contexts of disability and health insurance. Congress enacted GINA to address the "potential misuse of genetic information to discriminate in health insurance and employment" [33]. GINA includes provisions stating that insurance companies cannot alter group or individual premiums on the basis of genetic information and cannot mandate individual genetic testing. But GINA's definition of "genetic information" would not necessarily include the brain data we are considering in this essay. GINA defines a person's "genetic information" as "(i) such individual's genetic tests, (ii) the genetic tests of family members of such individual, and (iii) the manifestation of a disease or disorder in family members of such individual" [33]. While genetics surely play a role in AD, genetic information is not required to obtain and analyze brain data. An employer could know nothing about our hypothetical character John's genetic profile, yet still know he tested positive for an AD brain biomarker.

While GINA protections may not apply to health insurance coverage, the Patient Protection and Affordable Care Act of 2010 (ACA) prevents insurer discrimination on the basis of "preexisting conditions" [34]. That is, if a person has AD, the insurance company cannot deny coverage or artificially inflate premiums on the basis of the AD diagnosis. Yet, as at least one commentator has observed, predictive neuroscience information, gathered *before* the onset of any symptoms, may not constitute a "preexisting condition" [35]. When the Alzheimer's Association explained the benefits of the ACA, it highlighted provisions concerning insurance for people with "early onset/younger onset Alzheimer's" [36]. It is not yet clear how the ADA would treat the category of "pre-onset" AD people.

Whether or not people in the pre-onset AD category should be given the same or similar legal protections as those with early-onset AD is not clear to us. On the one hand, we are concerned about insurers discriminating on the basis of nongenetic, predictive neuroimaging data. On the other hand, the steep costs of insuring people with AD must be considered as well. One complicating factor is the size of the population of people who would fit in this pre-onset category. Over 4.7 million Americans are currently diagnosed as having AD, a number expected to nearly triple by 2050 [1]. The number of people whose biomarker results suggest an elevated risk would be even greater, and they would be identified decades earlier than current AD detection methods allow. We

have not seen an estimate of the associated costs, but surely they are high. Balancing competing interests, in the face of such market realities, is a topic ripe for ethical and legal debate.

The Need for Continued Dialogue

To date, courts have struggled to incorporate evidence of AD into legal doctrine and practice [14]. The advent of brain-based AD biomarkers suggests that future litigation involving people with an elevated risk for AD will be even more challenging. In this essay we have raised more questions than answers. Continued dialogue is needed to explore in depth these and other legal questions surrounding the early diagnosis of dementia. For instance, in this essay we focused on AD, but it is only one of many forms of dementia, including dementia with Lewy bodies, vascular dementia, and frontotemporal dementia. Moreover, we did not consider the implications of early AD detection for areas such as estate law, end-of-life care, and family law. It is unclear how long it will take for brain biomarkers of AD to develop and how much longer still until we have more effective clinical treatments for AD. But it is not too early for the legal system to begin thinking carefully about how it will respond.

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POLICY FORUM

Promoting Access to School-Based Services for Children's Mental Health

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Abstract

Mental health issues are widespread among children, but many never receive adequate treatment. One political solution proposed to address this disparity would be to fund mental health services through school-based programs and support collaboration among community and health organizations to address the needs of children. Regardless of whether this policy is implemented, health care professionals have a responsibility to promote access to care and patient health, which may include actively participating in the development of programs to provide services to children with mental health disorders.

Introduction

According to a compilation of research studies from the Centers for Disease Control and Prevention (CDC), up to 1 in 5 children experience a mental health disorder [1]. Mental health disorders among children are described by the CDC as "serious changes in the way children typically learn, behave, or handle their emotions," which cause distress and compromise children's ability to function [2]. This definition encompasses a wide range of conditions, including attention-deficit/hyperactivity disorder (ADHD), anxiety, depression, obsessive-compulsive disorder (OCD), and substance use disorders, all with varying degrees of severity [2]. Of the 20 percent of children or adolescents experiencing mental health concerns, many never receive care [3]. A study funded by the National Institute of Mental Health (NIMH) found that access to care for mental health services for youth is limited. Of those diagnosed, roughly 36 percent with mental health disorders received further treatment through counseling, medication, therapy, or other assessments [3]. That only a third of youth receive effective diagnosis and treatment is significant, inciting a call to promote better access to care.

This article reviews a particular policy reform effort that would expand support for [school-based programs](#) that offer children mental health services, making not only more services available to children in need but also more extensive and effective training for teachers and other professionals who work with them. To date, this policy change has lacked the political momentum necessary to garner federal support for passage or implementation. Following the discussion of policy reform, this article will suggest interim mechanisms that public health advocates, including local stakeholders and health

care professionals, can utilize to more effectively advocate for and support children's mental health within their communities.

Promoting Access to Care through Policy

On March 3, 2015, during the first session of the 114th United States Congress, two similar bills, both titled the Mental Health in Schools Act (MHSA) of 2015, were simultaneously introduced in the House of Representatives and the Senate to amend the Public Health Service Act (PHSA) of 1944 [4, 5]. The PHSA was signed into law to consolidate all previously existing public health laws in a comprehensive document and to establish mechanisms to provide grants for research and qualified public health efforts [6]. Acting on a public health need, the MHSA 2015 promotes access to care through an efficient model: a school-based system for the provision of mental health services. The purpose of the MHSA 2015 is to:

1. "Revise, increase funding for, and expand the scope of [existing programming] in order to provide greater access to more comprehensive school-based mental health services and supports";
2. "Provide for comprehensive staff development for school and community service personnel working in the school";
3. Provide comprehensive training for parents, siblings, and other family members of children with mental health disorders and for "concerned members of the community," including educators and mentors who spend considerable time with students. This training involves the introduction of techniques used to identify at-risk behaviors, understand referral mechanisms, and support a positive school environment to prevent mental health disturbances [4, 5].

The MHSA 2015 was part of a package of legislation put forward to address the severe stigmatization of and lack of resources for children's mental health. The bills aimed to augment a program developed in 1999 called the Safe Schools-Healthy Students (SS/HS) program. The SS/HS program awards grants to qualified local education agencies (school districts) throughout the United States to fund programs to prevent violence and drug abuse and to provide behavioral, emotional, and social supports and mental health services [7]. Since its inception, the program has developed and utilized a collaborative model that shares resources with educational and health-related programs to increase services, awarding grants to more than 365 school districts in partnership with local agencies as of 2013 [7]. Between 1999 and 2013, the SS/HS program has seen a 263 percent increase in the number of students receiving school-based mental health care [8]. Although the program has been successful in its efforts, to address the large disparity of mental health resources a more effective distribution of resources is needed—a cause recognized by the sponsors of the MHSA 2015 and other advocates dedicated to bettering public health.

After its introduction in the 114th Congress, the MHSA 2015 quickly received attention and support from public health advocates. On March 25th, a letter of endorsement was sent to the bills' sponsors with 36 signatures from national organizations, including the American Psychiatric Association, the American Academy of Pediatrics, and the American Psychological Association [9]. However, even with this support from professional organizations, public health advocates, education systems, and other community organizations who have partnered with schools—local law enforcement agencies, YMCAs, and faith-based organizations, to name a few—the act has not yet gained the political momentum it needs to be adopted [8, 10]. Since 2007, five similar versions of the MHSA have been introduced in pairs to the House and Senate, all of which, after being referred to the subcommittee on Health, expired at the end of each session of Congress within which they were introduced [10]. While the attempts have been unsuccessful to date, advocates for children's mental health continue to recognize the immense impact that the Mental Health in Schools Act could have for the SS/HS program and other school-based health programs.

Addressing the Problem of Youth Mental Health Services through an Effective School Model

Directing resources to school-based programs for children's mental health provides services that are timely, accessible, and efficient and that reach the largest number of children possible [11]. The MHSA would provide the support needed to implement an increased number of successful onsite programs, providing systems of early intervention through prevention, assessment, and treatment for students whose mental health concerns could otherwise become a cause of disability [12]. For children whose mental health concerns go unnoticed or untreated, especially those between the ages of 12 and 17, rates of substance abuse, depression, and suicide substantially increase, leading to other health-related problems and lower quality of life [1, 13]. Early diagnosis allows for a more targeted allocation of resources and a more effective trajectory for health care [11]. Utilizing the school environment—where children spend a significant part of their day—for early intervention brings public health efforts to the students, meeting children where they are and therefore providing more accessible services to those in need. It also provides immediate and continuing resources to students without requiring families to search for already limited sources of care [13].

The existing SS/HS program aims to expand and provide care for students who would otherwise not receive it due to a lack of diagnosis or other barriers, such as restrictions on health insurance, lack of coverage, poor quality of services, or lack of health care providers within a reasonable proximity [14]. These barriers are augmented by social stigmas against mental health, which may discourage people from pursuing treatment [14]. The SS/HS program maximizes the potential for positive results throughout childhood development by providing preventative resources, early diagnostic testing, and follow-up care in a place where students spend much of their youth [15]. By providing

teachers, parents, counselors, nurses, and other key parties with the proper resources to address student health—including mental health training, assessment documents, and increased access to professionals—the SS/HS program has contributed to reducing the rate of suicide and other forms of violence and abuse for students with mental health problems [7]. Providing teachers with better instruction on how to recognize behavioral problems and how to provide quality behavioral assessments for [at-risk students](#) might assist in diagnosing and treating children’s mental health concerns by making available to appropriate professionals information about their students’ daily habits and classroom behaviors [16]. Cooperating with counselors onsite assists in mitigating the barriers to care previously described, thus minimizing costs and travel time for the student. These school-based programs are successful when community partners come together to focus efforts in a centralized location that can address the largest number of students most efficiently and effectively.

Physicians’ Role in Collaboration—Advocacy and Other Methods

The MHSA 2015 requires a community partnership to be facilitated between an education system and one community collaborator before a program is eligible to receive funding [4]. These partnerships can be formed with mental health service systems, social welfare services, or health care services, as well as individual physicians. While the systemic, multidisciplinary approach supported by the MHSA would provide quality care if successfully implemented and granted adequate funding, the promise of resources has yet to be made. Community stakeholders—including physicians—should continue to advocate for additional resources to promote access to mental health care for children while pursuing alternative routes for the provision of care.

Recognizing the immense impact of mental health disorders on children in their youth and throughout their lives, physicians have a collective responsibility to support efforts to reduce [disparities in access to care](#). The American Medical Association *Code of Ethics* states, “collectively, physicians should advocate for community resources designed to promote health and provide access to preventive services” [17]. The MHSA would strengthen an already-effective program for children’s mental health, the SS/HS. However, given that the bill has not passed Congress, physicians should look to other methods outside of advocacy to proactively promote access to mental health assessments, therapy, and treatment, and to strengthen initiatives that are already in place.

For example, physicians can partner with other professional organizations to become better equipped to respond to and treat children with mental health disorders. Primary care physicians are uniquely situated when it comes to mental health, as they may be on the frontline of recognizing mental health concerns in the children they see for regular appointments without necessarily having the training or resources to effectively address these concerns [18]. Partnering with local psychiatry and psychology clinics for training

can improve a primary care physician's ability to identify mental health disorders in children. Some states have already embraced this approach. In 2005, the Massachusetts Child Psychiatry Access Project (MCPAP) was developed to provide pediatricians with access to mental health specialists who help equip physicians with the skills necessary to effectively diagnose and treat mental health disorders. This goal is achieved by educating physicians to provide timely consultation when the patient is in the office, assess and treat the patient's needs within the scope of informed practice, and refer patients whose needs require a trained psychiatrist [19]. Although limited knowledge might be gained in this way, participating physicians can fulfill their role in promoting access to adequate health care by filling a gap in situations in which children might otherwise go without help. Acts like these, along with [advocacy](#) for and implementation of legislation like the Mental Health in Schools Act, may go a long way in narrowing the disparities in access to mental health care for children.

Conclusion

Childhood mental health disorders are a significant public health concern in the United States. Community organizations, education systems, local governments, health care institutions, and other key parties should continue to advocate for policies such as the Mental Health in Schools Act that allocate resources necessary to address the problem but should also consider utilizing other mechanisms, such as the partnership described above. Until adequate resources are gathered, individual and collective action, in the form of education and treatment, must be encouraged to initiate solutions at the community level.

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MEDICINE AND SOCIETY

Manipulating Memories: The Ethics of Yesterday's Science Fiction and Today's Reality

Julie M. Robillard, PhD, and Judy Illes, PhD

Abstract

The paper addresses recent advances in memory manipulation from the perspective of the four key pillars of neuroethics: the self, social policy, neurotechnology, and education and outreach. We provide examples for each pillar, assess their neuroethical implications, and conclude with a call for an ethics framework that is specifically tailored for the ethical challenges of memory manipulation.

Introduction

Understanding the basis of memory and treating memory disorders has been a focus of neuroscientists, physicians, and philosophers alike for over 2,000 years, starting with Aristotle's early comparison of memories with impressions in wax [1]. Advances using cutting-edge techniques such as optogenetics (a technique that involves the use of light to control brain cells) [2] and neural network analysis (programs and data structures patterned after the operation of the human brain) [3] reveal that memory is indeed like a wax impression: able to be formed and re-formed in surprising ways. Memory research now extends beyond questions about the consolidation and retrieval of past memories to explorations of the selective removal and addition of memories through pharmacological means, such as drugs, and technological means, such as direct or indirect brain stimulation [4], and in a range of organisms, from the microscopic worm *C. elegans* to humans.

Science fiction and other cinematographic genres have exploited the imagined potential of memory manipulation for half a century. In 1962, the Cold War suspense thriller, *The Manchurian Candidate*, told the story of a Korean War soldier who is brainwashed and reprogrammed to be an assassin. The story line includes the implantation of false memories during the mind-control process, a neuroscience-inspired phenomenon associated with the work of Pavlov and others in classical conditioning [5]. It is thus not surprising that in *The Manchurian Candidate*, the physician responsible for the brainwashing operations is affiliated with a fictional Pavlov Institute. The mystery and suspense of implanting thoughts and ideas into the human subconscious retains its wide appeal today. The 2010 drama, *Inception*, tells a tale of dream invasion and idea implantation inspired by lucid dreaming.

Cinema productions have also tackled the selective erasure of memories. For example, in the 2004 movie, *Eternal Sunshine of the Spotless Mind*, the protagonist undergoes a memory-erasing procedure to ease the pain of heartbreak. The movie also brings to the fore critical neuroethical challenges of memory manipulation, such as the interconnectedness of memory with learning, moral behavior, social harms, privacy, commercialization, and conflict of interest.

Since these films were released, neuroscientists have made great strides in understanding memory, with both clinical and social goals in mind. For example, they have investigated how emotional content can become dissociated from memories of specific events [6], which may play an important role in the treatment of post-traumatic stress disorder (PTSD), and the unreliable nature of eyewitness memory, which has significant implications for the justice system [7]. In animal models, the selective erasure of fear memories has been achieved through the ablation of specific groups of brain cells [8]. These investigations raise profound ethical questions.

Can Altered Memory Change the Notion of Self?

Philosopher John Locke suggested that memory provides the basis for personal identity [9]. Indeed, many scientists and philosophers today argue that identity is closely linked to autobiographical memory (a combination of episodic and semantic memories about a person's life) [10, 11]. Evidence supports that an integral component of the relationship between memory and identity is awareness: studies of people with dementia-related memory loss show that low levels of awareness about the extent of a person's memory loss are associated with poorer autobiographical recall and a more positive, sharper sense of identity [12]. Thus, it is hypothesized that a lack of awareness of memory loss may be protective against dementia's threat to identity.

However, the idea that memory is integral to identity is not uniformly supported by the evidence or universally accepted. The German philosopher Martin Heidegger, among others, argued that who we are is not limited to our self-reflective abilities but encompasses our relationships with others and how we are situated in the world [13]. Scientists have explored this hypothesis empirically, with sometimes surprising results [14]. Others argue that identity can be more closely tied to other personal characteristics. For example, Strohminger and Nichols studied 248 patients with frontotemporal dementia, Alzheimer's disease, or amyotrophic lateral sclerosis and found that changes in the patients' moral behavior, not memory loss, had the greatest impact on perceived identity [15]. More recent work based on the principles of affect control theory, which proposes that people maintain culturally based, emotional meanings in their interactions with others, suggests that affective identities (e.g., family, social, or professional roles) of older adult residents in long-term care facilities are preserved to some extent despite memory loss [16].

Given these findings, we can still ask, are the effects of selective memory erasure akin to the effects of dementia-related memory loss? In many ways, they are: in both cases, memory loss can lead to different experiences and different emotions in response to an environmental stimulus, and in both cases, other aspects of identity, such as relationships and affect, can be preserved [8, 16]. However, memory manipulation that is selective, desired (i.e., consented to), and static (i.e., not dynamic or degenerative) has different implications for the notion of self than dementia-related memory loss. For example, despite memory loss, people with Alzheimer's disease maintain social relations, personal preferences and character, the ability to value, and other facets of identity [17, 18], but they have no control over which autobiographical memories are lost or at what rate. Conversely, the selective manipulation of good and [bad memories](#) and of the emotions associated with them has implications for how people consciously construct their notion of self, and how they adhere to social norms.

Are Social and Public Policies Needed to Complement Clinical Guidelines?

Central to social and public policy concerns are questions about the role of memory manipulation, particularly in coercion. For example, should invasive memory erasure techniques involving surgical procedures like [deep brain stimulation](#) be used to prevent recidivism in criminals despite the potential risks of the procedure [19]? Would it be ethical to modify the emotional valence of a memory to alleviate the symptoms of a child suffering from PTSD if the long-term consequences of such a treatment are unknown? As the understanding of memory is deepened through science and medicine and selective manipulation of memories is investigated, it is imperative to consider these repercussions and develop relevant social policies [20]. To ensure that potential societal harms are limited, the upstream engagement of key stakeholders (e.g., researchers, members of the legal profession, patient advocacy representatives, and policymakers) in the research process is vital. While laws do not exist to regulate memory manipulation specifically, the importance of these issues is recognized by national and international initiatives such as the Presidential Commission on the Study of Bioethical Issues and the newly created ethics research area of the National Institutes of Health Brain Research through Advancing Innovative Neurotechnologies® ([BRAIN](#)) Initiative.

How Should Ethics Inquiry and Practice Respond to the Potential for Memory Manipulation?

Psychiatric neurosurgery is responding to intractable diseases of mental well-being through neurotechnological innovations such as deep brain stimulation, which is under investigation for treatment-resistant depression [21] and obsessive-compulsive disorder [22], for example. Some techniques are precise and irreversible (e.g., deep brain stimulation). Other interventions are reversible but less precise (e.g., transcranial direct current stimulation). The trade-offs for neurosurgical treatments of psychiatric illness, like the trade-offs for memory manipulations, must be measured in terms of both

professional responsibility for appropriate use of invasive interventions that directly modulate brain function and fair allocation of resources among the most vulnerable people in society [23]. These trade-offs will need to be managed through consultation with relevant stakeholders using a clinical ethics framework that takes into account medical indications, patient preferences, quality of life, and contextual features [24]. What lies in the future—human stem cells to restore or even enhance memory? Gene editing to record analog memories in the DNA of human cells? Extraordinary new capabilities in neurosurgery and emerging biotechnologies are giving rise to an ever-greater need for ethics frameworks that proactively consider and protect potential recipients of these treatments. The science fiction of yesterday may well be tomorrow's reality.

How Should Advances in Memory Manipulation Be Disseminated to the Public?

Advances in research and technology have accelerated the pace of discoveries about memory manipulation, but the processes underlying memory storage and consolidation still remain poorly understood. Communicating about memory manipulation thus presents challenges distinct from other areas of neuroscience in that the [connections between brain and mind](#), mind and personality, personality and identity, and identity and the fundamental concept of being are still being explored. Compounding the complexity of this challenge is hype promulgated by both traditional and new media, which tends to exaggerate the benefits of memory manipulation and minimize the risks; overly positive representations can lead to misunderstandings and false hope [25-28]. In addition, sensationalized findings about memory manipulation may encourage the early adoption, use, and promotion of unproven interventions, not unlike in other areas of biomedicine such as cancer and regenerative medicine [29]. Overly simplified, headline-driven communication may also compromise perceptions of expertise and authority, reducing public trust in science. Communicators, such as members of the media, academic journal editors, and scientists and clinicians themselves, will need to embrace participatory communication models, frame the science of memory manipulation in nonsensationalized, lay-friendly terms, and consider how to harness new media to deliver ethical and responsible reporting.

Conclusion

Memory manipulation represents a particularly complex challenge for scientists, who conduct research, and for clinicians, who seek to use the results to heal patients or reduce their suffering. It also represents a challenge for ethicists who bring questions and frameworks to bear on the issues to ensure that ethical science is not hampered, that the allocation of benefits is just, that risk is mitigated in research, and that the dissemination of discoveries and new knowledge benefits society as a whole.

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IMAGES OF HEALING AND LEARNING

Autism, Art, and Accessibility to Theater

Blythe A. Corbett, PhD

Abstract

Art has the ability to entertain and educate about many vital aspects of the human experience. Recently, innovative endeavors are providing greater accessibility to theatrical productions for people with autism spectrum disorder (ASD), prompting ethical questions about how accommodations to provide access to art and culture should be made, and for whom. This article uses an attributional model of stigma to explain potential differences in knowledge, attitudes, and behavior toward people with mental illness. This social cognitive model also provides clues about how to spur social change through translational education, familiarization, and advocacy to permit greater access to art for people with disabilities.

I regard the theater as the greatest of all art forms, the most immediate way in which a human being can share with another the sense of what it is to be a human being.

Thornton Wilder [1]

Autism

Autism (currently referred to as [autism spectrum disorder](#), or ASD, and used interchangeably here) is characterized by significant difficulty with reciprocal social communication; narrow, repetitive, or stereotyped thoughts and behavior; and atypical sensitivity to sensory stimuli [2]. A number of brain regions have been consistently implicated in the neuropathology of ASD, including those involved in emotion processing (e.g., amygdala, hippocampus), social cognition and theory of mind (e.g., medial prefrontal cortex, cingulate cortex, temporal parietal junction), face processing (e.g., fusiform network), and executive functioning [3-8]. The neuropsychological challenges impact many areas of an affected person's life, impeding his or her ability to engage in many social, community, and cultural events.

The overall prevalence of ASD, based on data collected from the Autism and Developmental Disabilities Monitoring Network sites [9], rose approximately 223 percent between 2002 and 2010 and in 2012 was estimated to be 1 in 68 children eight years of age (1 in 42 boys, 1 in 189 girls) [10]. Approximately thirty-two percent of these children have co-occurring intellectual disability (IQ \leq 70), 24.5 percent fall in the

borderline range (IQ = 71-85), and 43.9 percent have cognitive abilities in the average or above-average range [10]. There is no doubt that autism is a significant public health concern with significant costs to the affected individuals, their families, and their communities [11]. In the United States, it is estimated that the lifetime cost per person with ASD is \$1.4 million and, for those with co-occurring intellectual disability, \$2.4 million [12]. In tandem with the significant increase in prevalence over the last several decades, there has been an evolution in how autism is understood, detected, and treated [13]. This once rare and mysterious condition is now broadly familiar to the public because of the dissemination of scientific information on and the familiarity of autism in the media and news.

Despite the increasing prevalence and public awareness of autism, many parents of children with autism still struggle with the fact that their children are unable to engage in cultural and recreational activities. In particular, the hyper- and hyposensitivity to a variety of visual, auditory, and tactile stimuli can limit the ability of a child with ASD to partake in social activities [14]. For example, children with ASD often have difficulty attending movies due to the crowds, flickering lights, darkness, and loud noise. According to a recent report, children with ASD participate less frequently in community-based events than those without ASD due to a combination of social and physical barriers and fewer supports [15]. Moreover, attendance at events is often limited by their affordability and accessibility. However, efforts by people outside of traditional therapeutic settings are providing new opportunities for people with ASD and their families to engage with an essential part of human culture: the arts. As described below, people with autism and their families are finding acceptance and access through participation in theater. In the process they are helping to remove the barrier of stigma and embracing their right to engage in and with the community.

The Value of Art and Theater for People with ASD

The arts are an essential element of education, just like reading, writing, and arithmetic... Music, dance, painting, and theater are all keys that unlock profound human understanding and accomplishment.

William Bennett [16]

There is much to be gained from seeing, hearing, and experiencing art in a variety of forms. Many people with ASD excel in art and use it as a way to express themselves and share their unique perspective on the world [17, 18]. Some propose that the arts have the potential to nurture talent, reduce stigma, and provide a platform for others to see the "ability" in disability [19]. Art also provides an opportunity for persons with mental illness, such as schizophrenia, to build new identities and community [20]. Theatrical performances—dynamic, engaging, and narrative—have the rare ability to entertain and educate about many vital aspects of the human experience. Attending plays and musicals may provide an opportunity for people with autism and other disabilities to

stimulate their imagination, observe social communication, and experience storytelling in an entertaining and live context [21]. Should not such potential benefits be shared by all, even those whom some would argue may not fully appreciate the depth or breadth of the narrative?

New and innovative endeavors by groups such as the Autism Theatre Initiative [22] and the Theatre Development Fund [23] have created “autism-friendly” performances of Broadway and off-Broadway shows to give people with autism unprecedented access to these forms of theater [21]. Accommodations such as brighter lighting, reduced sound, and preparatory story guides help make the experience less intense and stressful—and therefore more relaxed and pleasurable—for the audience. These initiatives have received rave reviews. After experiencing the supportive and slightly modified show, theatergoers with autism look forward to subsequent sensory-friendly productions with great anticipation, and some have transitioned to traditional theatrical performances [21].

Some theater-based programs use theatrical techniques as a form of treatment for children with ASD [24-26]. For example, studies we have conducted have shown that SENSE Theatre®, a theatrical intervention program in which youth with ASD learn a variety of acting techniques with peer actors who model communication and behavioral skills, contributes to significant changes in participants’ social competence, communication, cognition, and interaction skills [27-30]. Whether people with autism are onstage or in the audience, published and anecdotal reports [21, 28] suggest that the theater provides a distinctive setting where they may thrive. The supportive context, active role-playing, and dynamic learning environment of the theater foster the development of key social skills that children with autism most need to learn.

Challenges to Making Theater Accessible to People with ASD

Man is unique not because he does science, and he is unique not because he does art, but because science and art equally are expressions of his marvellous plasticity of mind.
Jacob Bronowski [31]

To what extent is society responsible for making art equally available to all? In particular, should theater be accessible to all people with disabilities, including those with autism? To what extent should accommodations be made and for whom? According to Article 30 of the United Nations Convention on the Rights of the Child, participation in the arts is a right, not a privilege [32]. It is the right of all children to engage in their communities and participate in cultural, artistic, and recreational activities in accessible formats. While access to arts is a right, many people have difficulty engaging in cultural and artistic events due to perceived barriers—namely, [stigma](#). The vast majority (90 percent) of parents of children with ASD think that persons with autism are stigmatized, and stigma plays a significant role in predicting how difficult life is for the parents [33]. In addition to

stigmatizing peer and adult attitudes, limitations of services (e.g., availability of support), systems (e.g., affordability), and policies (e.g., environmental arrangements) contribute to reduced access to community participation [15].

Unfortunately, stigmatization of people with mental illness is long-standing. The term stigma originates from the Greek practice of branding slaves who had escaped with a mark called a sigma [34]. Subsequently, the term was extended to refer to any mark for perceived conditions deviating from social norms [35]. According to Thornicroft and colleagues [36], stigma contains three primary elements: lack of knowledge (ignorance), negative attitudes (prejudice), and negative behavior (discrimination).

Advanced by Corrigan, attribution theory provides a compelling social cognitive framework for understanding stigma [37]. Attribution theory is a classic model that helps explain how and why people attribute meaning to everyday events. In this model, causal attributions are based on the perceived locus of control (e.g., internal or external source), stability of the cause (e.g., extent to which change is possible), and controllability (e.g., the amount of influence a person has over an event to bring about change) [38]. For example, if others believe a person's behavior is (internally) caused and unchanged by interventions (stable) and that the person lacks motivation to change (limited control), then they might be less sympathetic to the person. It can also explain how the public selectively includes or excludes people from aspects of society, because the public may make attributions about the cause of the difference. Applied to mental health stigma, the model explains relationships between people's knowledge of, and their emotional reactions (e.g., fear, pity) and behavioral responses (e.g., helping, punishing) to, persons with mental health conditions [37]. In contrast to physical stigmas, most mental-behavioral conditions are perceived as onset-controllable (having a preventable cause) and unstable or reversible, contributing to the negative perceptions that the diagnosed person is somehow responsible for their condition. Consequently, research has shown that mental-behavioral (e.g., drug abuse) stigmas evoke less sympathy and helping behavior than physically based (e.g., blindness, cancer) stigmas [39].

Therefore, one explanation for the perceived difference in access granted to people with ASD is the public judgments that are made about people with different disabilities. For example, survey respondents more frequently expressed fear and distrust of, and social distancing from, people with schizophrenia than people with bipolar disorder or autism [40]. Ostensibly, some view people with schizophrenia as being more to blame for their condition, less responsive to treatment, and more helpless. In another survey in which respondents were asked about mental disorders using positive and negative stereotypes, autism was associated with high intelligence and creativity, and schizophrenia was associated with danger [41].

The attribution model has far-reaching implications not only for explaining stigma but

also for explaining how to bring about societal change by increasing knowledge of, and changing emotional reactions and behavioral responses to, persons with mental illness [37]. Familiarity with a condition like autism matters because knowledge of the disorder can decrease discriminatory behavior [42] and reduce social distancing. Moreover, survey respondents who were asked about individuals with a condition rather than simply about a disorder tended to be less negative and more compassionate [40]. These findings suggest that strategies that raise the visibility of individuals and not just disorders will be important for changing attitudes and behaviors. Efforts and programs that increase public awareness, education, and broader acceptance may alleviate the challenge of raising a child with autism [20]. These strategies can also be applied to other mental and physical disabilities. In this way, a translational approach that highlights similarities between disorders (e.g., between ASD and schizophrenia) rather than differences may be helpful in reducing social distancing. Since perceptions are inherently more negative for some disabilities, visibility alone will likely not suffice in garnering public acceptance of a given disorder.

Advocacy is another way to challenge the attributions the public makes about people with mental and physical disabilities. Caregivers of persons with autism have been extraordinarily resourceful, relentless, and creative in their advocating for the best interest of family members on the autism spectrum. These parental passions have contributed to the formation of several productive educational and funding organizations, including the National Alliance for Autism Research and Cure Autism Now, which merged to form Autism Speaks in 2005 [43]. Familial and professional caregivers of persons with disabilities and mental illness can embrace the power of advocacy and educate the public and media on mental health, which is a core mission of the National Alliance for Mental Illness [44]. In addition to public announcement campaigns and lobbying efforts, education on mental illness can be meaningfully conveyed through exposure, shared experiences, and artistic expression via attending theater. In this way, art can be seen as a form of [advocacy](#), a way to experience other perspectives.

Conclusion

As we contemplate ethical considerations of accessibility of theater for people with ASD, perhaps the more important question is why is such access exceptional? Inclusion for people with disabilities in arts and culture is not simply a matter of access, but a right. The theater is providing a welcome and supportive context in which people with autism and their families are finding greater access and acceptance. It has the potential to unlock understanding of the human experience for children with autism as well as the larger community. Through translational education that allows people to view a mental illness such as autism as merely difference and not deviance, social change is possible. As children with autism gain greater access to theater, with opportunities for reciprocal social communication, the community gains greater awareness of autism, thereby reducing the barrier of stigma.

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SECOND THOUGHTS

Changing Memories: Between Ethics and Speculation

Eric Racine, PhD, and William Affleck

Abstract

Over the past decade, a debate has emerged between those who believe that memory-modulating technologies are inherently dangerous and need to be regulated and those who believe these technologies present minimal risk and thus view concerns about their use as far-fetched and alarmist. This article tackles three questions central to this debate: (1) Do these technologies jeopardize personhood? (2) Are the risks of these technologies acceptable? (3) Do these technologies require special regulation or oversight? Although concerns about the unethical use of memory-modulating technologies are legitimate, these concerns should not override the responsible use of memory-modulating technologies in clinical contexts. Accordingly, we call for careful comparative analysis of their use on a case-by-case basis.

Introduction

Memory, in its different manifestations, plays a crucial role in everyday life as well as in the formation of a narrative sense of self-identity, created through linkages among memories [1]. Linguistically, the concept of memory suggests a monolithic capacity to remember. In reality, however, there are several different memory systems: for example, short-term memory allows one to retain information for short periods of time, while long-term memory allows one to remember knowledge, past events, and experiences associated with different contexts [2]. Working memory overlaps with short-term memory; it designates a task-oriented form of memory and attention required to manage daily tasks and likely involves multiple cognitive systems [2].

Memory “Manipulation”

Given how crucial memory is, its shortcomings can have wide-ranging consequences for daily living. Alzheimer’s disease (AD), for example, leads to memory loss as well as several other symptoms such as depression, insomnia, psychotic behavior, and anorexia that will eventually rob a person of the ability to recollect events crucial to his or her self-identity [3]. The fear of AD in the absence of effective treatment and prevention has generated a lucrative market for complementary and alternative medicine [4]. In contrast, post-traumatic stress disorder (PTSD) involves vivid revival of traumatic experiences such as war situations and sexual violence [5]. This memory dysfunction is a

result of endogenous (noradrenaline) stress hormones, which over-consolidate the traumatic memory, leading it to become easily reactivated by contextual cues that elicit strong conditioned emotional responses as well as hypervigilance and avoidance of trauma reminders [6]. The impact of such memory dysfunctions, whether they diminish or aggravate memories, helps to explain the long-standing public and scientific interest in advances that can shed light on the nature of memory and the treatment of its dysfunctions [7].

Of late, the possibility of “manipulating” memories through technologies, including pharmacological agents, has surfaced. Memory-modulating technologies include [deep brain stimulation](#) (DBS) as well as more promising and less invasive forms of neurostimulation such as transcranial magnetic stimulation (TMS) and transcranial direct current stimulation (tDCS) [8]. Pharmacological agents include donepezil for memory enhancement [9] and propranolol for the treatment of PTSD [10]. Moreover, a range of behavioral and neuroscience interventions have been deployed, e.g., electroconvulsive therapy (ECT) and cognitive-behavioral therapy (CBT), in the treatment of patients who suffer from traumatic memory-related symptoms [11, 12].

The use of memory-modulating technologies has generated controversy. Some of these devices (for example, do-it-yourself tDCS) can be built at home using YouTube videos as a guide [13]. The [use of pharmacological agents](#) has raised concerns about potential side effects and overuse, although some claims of drug efficacy lack evidence [14]. CBT and, in particular, exposure therapy for PTSD, has aroused few ethical concerns, even if some of its negative effects, such as symptom aggravation, could be similar to those of more technologically complex interventions [15].

Three common arguments are frequently voiced against the use of memory-modulating technologies. We discuss and evaluate each of these arguments, calling for case-by-case analysis of the ethical use of memory-modulating technologies in clinical contexts. These technologies may be considered unacceptable for some uses (e.g., enhancement and military uses because of the risks involved to soldiers without any health problem) but justifiable in others (e.g., therapeutic uses for patients who may stand to benefit from the intervention).

Do Memory-Modulating Technologies Jeopardize the Person?

One of the common fears associated with the use of some interventions, including ECT, TMS, tDCS, and propranolol, is that they will induce radical changes in the person’s identity or autonomy [16]. These fears are justified inasmuch as we know that memory changes produced by disease or trauma (as they occur in AD or PTSD) can create radical ruptures in the narrative of a person. These fears are also captured in terms like “memory manipulation,” which imply that the administrator of the intervention has a negative intent. Fears about the loss of [self](#) through memory modulation are also

reflected in Hollywood films such as *Eternal Sunshine of the Spotless Mind*, which features radical memory erasure procedures.

However, these concerns are both theoretically and empirically problematic. First, they presuppose that all memory is essential, which is not the case. In fact, forgetting is a fundamental component of maintaining personal identity [17]. Indeed, the inability to forget certain memories lies at the heart of disorders such as hyperthymnesia (a condition in which extremely detailed autobiographical memory interferes with other cognitive capacities and daily functioning) and PTSD. Second, there is limited evidence that concerns over the loss of personhood or personal identity are justified. For example, while the enhancing and impairing effects of tDCS on working memory have been reported in several studies [18], unanswered questions remain about the long-term sustainability of these effects and on the corollary inhibitory effects of tDCS on other brain systems [13]. Much the same could be said for TMS [19]. Similarly, DBS has been shown to enhance memory [20], but the applicability of this invasive surgical technique prevents widespread usage for this purpose given the risks involved. Propranolol is now being piloted as a treatment for PTSD [10], but it has been widely prescribed to patients over several decades as a treatment for hypertension, arrhythmia, migraines, and angina pectoris. To date, no significant problems with memory loss or concerns over the loss of self-identity have been reported [21]. Therefore, to a large extent, the argument that altering or attenuating certain memories will affect self-identity lacks evidence.

That said, it would be unwise to completely dismiss ethical concerns about the effects of memory-modulating technologies, which can include the perturbation of memories, at least for some of the older technologies like ECT [22, 23]. And, if misused—as was demonstrated by the unethical CIA-funded research program, Project MKUltra, which notably investigated the use of Lysergic acid diethylamide (LSD) and ETC for brain washing in the 1950s-1970s—technologies like ECT can have devastating effects on highly vulnerable people [24]. The evaluation of such practices by scholars [16, 25], while sometimes criticized as being overstated or excessively speculative [26], is an important component of a democratic watchdog system. Combined with research and clinical practice guidelines, this oversight can help ensure that memory-modulating technologies are only used in controlled research and clinical environments. We must be careful, however, that the focus on worst-case scenarios is not conflated with the clinical use of memory-modulating technologies that are desired—and potentially consented to—by patients.

Memory-Modulating Technology: Too Risky?

Beyond the potential effects of memory-modulating technologies on the identity of the person are concerns about the risks of these technologies, given the profound role of memory and the incomplete understanding of its contribution to other cognitive functions. The aggravation of traumatic memories and other unintended effects, such as

mood changes or the inhibition of other cognitive functions [27], could be highly consequential when easily available neurostimulation techniques such as tDCS are used without medical supervision [13].

The risks of memory-inducing interventions can be misunderstood not only because of the complexity of memory and its interaction with other cognitive systems, but also because enthusiastic or fear-mongering discourse in media reporting can overemphasize the positive or negative effects of memory-modulating technologies [28]. In reaction to positive reporting, researchers and clinicians may be tempted to jump on the bandwagon with a new fad or to downplay risks in favor of the promising benefits associated with a new technology. The possibility of a dismissive attitude toward risks could be fueled by ethical debates that focus solely on the technology's most controversial uses and applications and are therefore disconnected from patients' realities [26].

Despite the potential risks of memory-modulating technologies and the possibility of their being downplayed by the media and researchers, there are some rather substantive and invasive interventions such as ECT—and eventually DBS—that may be medically justified given the severity of the symptoms experienced by some patients who suffer, for example, from traumatic memories. In a clinical setting, some interventions may raise undue suspicion if taken out of context. For example, ECT is often considered negatively in the public domain even though it represents an important therapeutic intervention [29, 30]. Hence, we submit that the debate about memory-modulating technologies should focus on the reasons for their use and their related benefits and harms in specific clinical contexts. And when the benefits could outweigh the risks, patients (or their proxies) should be able to make informed decisions based on their judgment and preferences. This approach has been proposed for ECT, a controversial but nevertheless therapeutically effective technology [31].

Do Memory-Modulating Technologies Require Special Regulation or Oversight?

Given the risks associated with memory-modulating technologies and the misunderstanding of those risks, there could be a temptation to propose specific regulations or oversight mechanisms for their use. Examples of regulatory exceptionalism typically associated with technological feats (e.g., therapeutic and reproductive cloning [32]) are the Genetic Information Nondiscrimination Act in the United States [33] and restrictions on the commercial use of neuroimaging in France [34]. Such ethical and regulatory exceptionalism is sometimes warranted but we would urge caution because of its potential drawbacks. Stressing that genetic tests carried substantive and sensitive clinical information actually curtailed the acceptance of these tests by patients who would have benefited from them [35]. The restrictions on genetic testing also erroneously imply that other forms of examination (e.g., common blood tests) do not carry potential substantive risks of revealing important clinical information that could be used in discriminatory ways.

We suggest that any restrictions on access to memory-modulating technologies or other special regulations should be carefully considered by policymakers and other stakeholders with the goal of allowing well-justified uses to proceed. Special regulation could forestall research on these technologies or access to them. For example, ECT still carries a heavy stigma in the public eye [29, 30], one which is likely to make any patient who has undergone ECT treatment fear being stigmatized or discriminated and therefore think twice before undertaking this therapy. Likewise, clinicians involved in delivering such treatments may be viewed suspiciously and refrain from the appropriate use of the technology as a result [29]. Instead of stressing the exceptional nature of such an intervention, it is important to come back to the facts and carefully evaluate the impact of reducing access or proposing special oversight.

Conclusion

Memory is fundamentally important for everyday life, and its dysfunctions are associated with severe conditions that significantly reduce quality of life. There is a common fear that memory-modulating technologies will be used to fundamentally change people's self-identity and "manipulate" their memories. Although often dismissed as farfetched, the potential for such abuses is real and needs to be monitored, as the MKUltra experiments of the mid-twentieth century demonstrate. At the same time, the more common and predictable clinical uses of these technologies should be evaluated for their own risks and potential benefits to often-neglected patient populations. We urge careful comparative case-by-case analysis of the risks and benefits of different technologies in comparison with other treatment alternatives to ensure that undue caution does not limit their ethical and potentially beneficial use.

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