

# Sex Offender Law Report™

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## Brain Research and Pedophilia: What It Says and What It Means

by James M. Cantor

There is enormous public interest in the question: Is pedophilia in the brain? Although many public and professional discussions refer explicitly to what is or is not in the brain, most people are actually interested in the more implicit question: Are pedophiles responsible for their behavior? Although MRI research with pedophiles is still very new, concerns about the potential implications of research findings for our ideas about responsibility have been considered before. Such concerns accompanied the following questions:

- Is pedophilia in the genes?
- Are pedophiles born with it?
- Does it run in families?
- Can it change or be treated?

To scientists, these are entirely different questions, each requiring entirely different sets of research techniques. To the public, however, they are merely different roads to the same implicit concern: Are pedophiles responsible for it?

### Indications of Connection

The idea that pedophilia results from atypicalities in the brain dates back to the 1800s (e.g., R. von Krafft-Ebing, “Psychopathia Sexualis: A Medico-Forensic Study”

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### *Internet-Facilitated Sex Offending*

## Regulating Sex Offenders in the Web 2.0 Era, Part II

by Andrew J. Harris

**Editor’s Note:** *In the last issue of SLR, we reported on an emerging trend among state legislatures to restrict sex offenders’ access to various forms of social media, including social networks, Internet chats, and instant messaging. We reviewed the evolution, scope, and characteristics of state laws regulating sex offenders’ online activities, and discussed several legal challenges to these laws. Building on our prior presentation of the basic legislative and legal landscape, this article attempts to place the issues at stake into their broader context and to present some practical considerations that may help to guide the development of effective laws and policies in this area.*

In the last issue, we reported on two cases in which federal court rulings have blocked the implementation of bans on sex offenders’ use of social media. In **Doe, et al. v. Nebraska**, 734 F. Supp. 2d 882, 937 (D. Neb. 2010), the court rejected a general challenge to a Nebraska law that tightened the state’s registration and notification requirements, but singled out the law’s social networking ban and computer search provisions as particularly problematic, suggesting that the state had “gone too far” in enacting these measures. In **Doe v. Jindal**, 2012 U.S. Dist. LEXIS 19841 (M.D. La. Feb. 16, 2012), the court struck down Louisiana’s ban on social networking as overly broad, forcing the state’s legislature

to modify the scope of its restrictions (Louisiana Acts of 2012, Act No. 205).

We also discussed the arguments presented during a May 2012 federal trial in a case challenging Indiana’s ban on participation in social networks, chat rooms, and instant messaging. (**Doe v. Prosecutor of Marion County**, Case no. 1:12-cv-0062 TWP-MJD.) The ruling in this case—issued after our article had gone to press—rejected constitutional challenges set forth by the plaintiff, determining that the law was content-neutral, sufficiently narrowly tailored, and provided for ample alternative channels of communication. (**Doe v. Prosecutor of Marion County**, Entry Following Bench Trial on the Merits (Jun. 22, 2012).) On July 26, 2012, the plaintiffs filed an appellant brief with the Seventh Circuit Court of Appeals seeking reversal of the district court decision and a permanent injunction.

### Policy Context

Taken together, the federal district rulings from Nebraska, Louisiana, and Indiana suggest that the constitutional issues surrounding statutory bans on sex offenders’ use of social media are far from resolved. The Indiana ruling is particularly notable to watch—not only because of its pending review by the Seventh Circuit Court of Appeals—but because it is likely to be viewed as a “green

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(H.E. Wedeck, translator, 1965, original work published 1886), but the technology to examine the question did not develop until much later. Neuropsychological testing, including IQ testing, was available for much of the twentieth century, however, and repeatedly suggested the presence of brain differences among pedophiles and sex offenders against children, albeit with only non-specific indicators. (R. Blanchard, J.M. Cantor, and L.K. Robichaud, "Biological Factors in the Development of Sexual Deviance and Aggression in Males," in H.E. Barbaree and W.L. Marshall, eds., *The Juvenile Sex Offender* 77-104 (2d, 2006).) Pedophiles perform significantly lower on IQ and other neuropsychological tests. (J.M. Cantor, R. Blanchard, B.K. Christensen,

Educational Histories," 35 *Archives of Sexual Behav.* 743-751 (2006)).

Considered together, this family of findings suggests that any neuro-anatomic differences existed before the commission of any sexual offenses (and before any effects of incarceration or other sequelae). In addition, pedophiles are physically shorter in height than controls (J.M. Cantor, M.E. Kuban, T. Blak, P.E. Klassen, R. Dickey, and R. Blanchard, "Physical Height in Pedophilia and Hebephilia," 19 *Sexual Abuse: J. Res. & Treatment* 395-407 (2007)), indicating overall suboptimal physical development. Indeed, the magnitude of the height deficit (approximately 2.5 cm) is roughly double the effect of a mother smoking cigarettes during pregnancy. (K.R. Fogelman and O. Manor, "Smoking in Pregnancy and Development in Early Adulthood," 297 *Brit. Med. J.* 1233-1236 (1988).)

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***There is a long history of neurological and neuropsychological research associating behavioral disinhibition with damage to frontal brain regions.***

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R. Dickey, P.E. Klassen, A.L. Beckstead, T. Blak, and M.E. Kuban, "Intelligence, Memory, and Handedness in Pedophilia," 18 *Neuropsychology* 3-14 (2004); J.M. Cantor, R. Blanchard, L.K. Robichaud, and B.K. Christensen, "Quantitative Reanalysis of Aggregate Data on IQ in Sexual Offenders," 131 *Psychol. Bull.* 555-568 (2005).)

Research has also indicated that pedophiles have more frequently suffered head injuries causing unconsciousness before—but not after—age 13 (R. Blanchard, B.K. Christensen, S.M. Strong, J.M. Cantor, M.E. Kuban, P. Klassen, R. Dickey, and T. Blak, "Retrospective Self-Reports of Childhood Accidents Causing Unconsciousness in Phallometrically Diagnosed Pedophiles," 31 *Archives of Sexual Behav.* 511-526 (2002); R. Blanchard, M.E. Kuban, P. Klassen, R. Dickey, B.K. Christensen, J.M. Cantor, and T. Blak, "Self-Reported Injuries Before and After Age 13 in Pedophilic and Non-pedophilic Men Referred for Clinical Assessment," 32 *Archives of Sexual Behav.* 573-581 (2003)), and they have significantly greater probabilities of having failed a grade or having been assigned to special education classes during their school years (J.M. Cantor, M.E. Kuban, T. Blak, P.E. Klassen, R. Dickey, and R. Blanchard, "Grade Failure and Special Education Placement in Sexual Offenders'

Finally, pedophilic men and sexual offenders against children are also up to three times as likely as nonpedophiles to be non-right-handed (meaning left-handed, ambidexterous, or retrained to use right-hand after showing preference for left). (R. Blanchard, N.J. Kolla, J.M. Cantor, P.E. Klassen, R. Dickey, M.E. Kuban, and T. Blak, "IQ, Handedness, and Pedophilia in Adult Male Patients Stratified by Referral Source," 19 *Sexual Abuse: J. Res. & Treatment* 285-309 (2007); A.F. Bogaert, "Handedness, Criminality, and Sexual Offending," 39 *Neuropsychologia* 465-469 (2001); J.M. Cantor, R. Blanchard, B.K. Christensen, R. Dickey, P.E. Klassen, A.L. Beckstead, T. Blak, and M.E. Kuban, "Intelligence, Memory, and Handedness in Pedophilia," 18 *Neuropsychol.* 3-14 (2004); J.M. Cantor, P.E. Klassen, R. Dickey, B.K. Christensen, M.E. Kuban, T. Blak, N.S. Williams, and R. Blanchard, "Handedness in Pedophilia and Hebephilia," 34 *Archives of Sexual Behav.* 447-459 (2005).) Fetuses demonstrate on sonograms a hand preference for thumb-sucking before birth (P.G. Hepper, D.L. Wells, and C. Lynch, "Prenatal Thumb Sucking Is Related to Postnatal Handedness," 43 *Neuropsychologia* 313-315 (2005)), indicating that whatever chain of neurological events it is that leads to pedophilia, the first links of the chain were present prenatally.

**Theories of Brain's Connection to Pedophilia**

In attempting to locate more specifically what in the brain is related to pedophilia, researchers have pursued two competing theories, which might be designated the Frontal/Dysexecutive Theory and Temporal/Limbic Theory. The frontal theorists believe that pedophilia results from an inability to suppress sexual urges towards children. There is a long history of neurological and neuropsychological research associating behavioral disinhibition with damage to frontal brain regions. Although this might make frontal-lobe damage seem an intuitive prediction, the basis of the theory confuses child molestation (i.e., the behaviors) with pedophilia itself (the underlying sexual interest). That is, although one might hypothesize that child molesters lack sufficient ability to control their interests, there is little reason to suspect that experiencing the interests themselves represents a failure to inhibit anything. Teleiophilic (i.e., "adult-o-philic") men would not report that it is easy to suppress their sexual interests in children—they would report that they experience no such interest in children to begin with.

Temporal lobe theorists hypothesize that pedophilia results from differences in the anatomy of the limbic system, located deep beneath the temporal lobes of the brain. The limbic system consists of several anatomically primitive structures associated with basic motivations of survival, including the appetites for food and for sex. (These motivations are often nicknamed "the four F's": fight, flight, feed, and fornication.) Thus, the temporal theorists were predicting anatomical variations in the structure of sex-related brain structures. Neither theory received strong support, and the status of both was still unresolved when the first MRI studies appeared.

**MRI Studies Reveal Clues About Pedophilia**

It is easy to confuse structural magnetic resonance imaging (MRI) with functional magnetic resonance imaging (fMRI). Structural MRI produces high-resolution still-images of the brain, usually requiring about 10 minutes in the MRI scanner to conduct. Functional MRI uses the same MRI scanner, but with different settings on the machine: Instead of taking a long, slow pass through the brain to gather detailed (high

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resolution) images, fMRI takes multiple short, fast passes through the brain, about two seconds each. This offers less-detailed images, but greater speed—it can take the next “frame of the movie” quickly enough for us to observe the brain’s responses. Although fMRI was developed later than was structural MRI, one should not think of fMRI as superior to MRI; rather, each provides different types of information. Structural MRI is generally more informative about what might cause pedophilia, but it is fMRI that might provide an analogue to phallometric tests for pedophilia.

**Limbic Systems Differ.** To date, three samples of pedophilic men have been examined with structural MRI, contrasting them either with nonsexual offenders or with healthy controls from the community (as their control groups). A team of researchers led by Kolja Schiltz pursued evidence for the temporal/limbic theory, focusing their analyses on portions of the limbic system relevant to sexual behavior. (K. Schiltz, J. Witzel, G. Northoff, K. Zierhut, U. Gubka, H. Fellman, J. Kaufmann, C. Tempelmann, C. Wiebking, and B. Bogerts, “Brain Pathology in Pedophilic Offenders: Evidence of Volume Reduction in the Right Amygdala and Related Diencephalic Structures,” 64 *Archives General Psychiatry* 737-746 (2007).) They contrasted a sample of 15 nonviolent, incarcerated, pedophilic offenders against children with a sample of 15 healthy nonoffenders from the community. A sample of this size is generally insufficient for a valid statistical analysis of the entire brain. To conduct a valid analysis, researchers must narrow down their analyses (as Schiltz et al. did) to the parts of the brain in which they were hypothesizing brain differences to be. Because they were seeking confirmatory evidence for the temporal/limbic theory, it was at the temporal/limbic structures that they “aimed their telescope.” The result of their comparison was that the pedophilic group did indeed differ from the control group in certain parts of the limbic system. Although Schiltz et al. did not find significant differences in other parts of the brain, one must remember that “their telescope” was pointed at the limbic system.

**Frontal Circuit Differences.** Another team ran nearly the identical experiment, but instead of looking for confirmatory evidence for the temporal/limbic theory, Boris Schiffer and colleagues sought evidence in

support of the frontal/dysexecutive theory, hypothesizing differences similar to obsessive-compulsive disorder. (B. Schiffer, T. Peschel, T. Paul, E. Gizewski, M. Forsting, N. Leygraf, M. Schedlowski, and T.H.C. Krueger, “Structural Brain Abnormalities in the Frontostriatal System and Cerebellum in Pedophilia,” 41 *J. Psychiatric Res.* 753-762 (2007).) They contrasted 18 incarcerated, pedophilic offenders against children with 24 healthy nonoffenders from the community—but they “aimed their telescope” on frontal circuits and found evidence of brain differences in orbitofrontal and related regions.

**White Matter Deficiencies.** Finally, in an analogous set-up, my own team compared much larger samples (about four times the size), using outpatient (community-living) pedophiles and nonsexual offenders living in the community, recruited from parole/probation offices. (J.M. Cantor, N. Kabani, B.K. Christensen, R.B. Zipursky, H.E. Barbaree, R. Dickey, P.E. Klassen, D.J. Mikulis, M.E. Kuban, T. Blak, B.A. Richards, M.K. Hanratty, and R. Blanchard, “Cerebral White Matter Deficiencies in Pedophilic Men,” 42 *J. Psychiatric Res.* 167-183 (2008).) Instead of nonoffenders, we selected men with a history of convictions for nonsexual—and only nonsexual—offenses. This was intended to help control for group differences in the propensity to break the law. The greater size of this sample permitted a statistically sound and unbiased analyses of the entire brain. Our telescope was big enough for seeing the whole sky at once; we did not need to restrict our telescope to any preselected features of the brain. (That is, we had the statistical power to overcome the problem of multiple comparisons.) With a sample of this size, we would be able to see any differences no matter where in the brain they were. The neuropsychological data from my own team, as well as others’, repeatedly suggested the presence of only very general, diffuse, differences in overall brain function, and not any kind of specific difference in some specific brain region. So, although I would have favored the temporal lobe theory (if either), I had no strong evidence to convince me wholly of either theory. However, I was not at all expecting what my data did show: We all were wrong.

Despite having a larger sample, we did not observe any of the frontal/dysexecutive or related differences that Schiffer reported; nor, however, did we observe the temporal/

limbic differences that Schiltz reported. Indeed, our analyses revealed no significant group differences between the pedophiles and nonsexual offenders in any grey matter of the brain at all. As our analyses continued, we found differences entirely unlike the kind we expected. The differences between pedophiles and controls were not in the grey matter at all: The differences were in the white matter.

**White Matter and Grey Matter**

The white matter of the brain is not nearly as widely discussed as is its grey matter. Grey matter is composed of the bodies of brain cells (neurons), and white matter is composed of the long tails (axons) that project from the cell bodies. They are what connect the different parts of the brain or come down the spine, forming the spinal cord. The white matter can be thought of as the brain’s cabling system, conveying signals to and from the cell bodies in grey matter. Only very recently has the role of white matter been recognized in several behavioral disorders, including bipolar disorder, obsessive-compulsive disorder, and schizophrenia. (S.D. Bruno, G.J. Barker, M. Cercignani, M. Symms, and M.A. Ron, “A Study of Bipolar Disorder Using Magnetization Transfer Imaging and Voxel-Based Morphometry,” 127 (Part 11) *Brain* 2433-2440 (2004); H.E. Hulshoff Pol, H.G. Schnack, R.C.W. Mandl, W. Cahn, D.L. Collins, A.C. Evans, and R.S. Kahn, “Focal White Matter Density Changes in Schizophrenia: Reduced Inter-hemispheric Connectivity,” 21 *NeuroImage* 27-35 (2004); P.R. Szeszko, B.A. Ardekani, M. Ashtari, A.K. Malhotra, D.G. Robinson, R.M. Bilder, and K.O. Lim, “White Matter Abnormalities in Obsessive-Compulsive Disorder,” 62 *Archives of General Psychiatry* 782-790 (2005).) Indeed, although we are beginning to hear about various disorders now becoming seen as “disconnection syndromes,” at this point during our work, many researchers would simply skip white matter analyses to focus on grey. Nonetheless, despite applying all the analytical techniques we could think of, the same pattern of widespread white matter deficits kept emerging.

**Multiple Areas React to Imagery.** The presence of white matter, rather than grey matter, differences forces one to consider a new way of thinking about how brain structure might relate to pedophilia. The

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white matter does not “do” anything in the sense that grey matter does. How could cabling tissue matter? One possibility presented itself to us, arriving entirely by coincidence: At the same time that pedophilia research teams were working, other researchers were applying fMRI and other brain imaging techniques to identify which parts of the typical male brain reacts when shown nude (adult) models. Interestingly, these studies repeatedly showed that no single part of the brain reacts; instead, multiple areas of the brain react to erotic imagery. That is, rather than there being any single “sex center” detecting and responding to the stimuli, there appears to be a sex network, composed of multiple regions including visual areas (potentially for interpreting the visual stimuli), motor areas (potentially for imagining physical interaction), insular cortex (potentially

child is triggering (i.e., is wired to) the sexual responses.

**Reconciling Competing Research Findings**

Although thought provoking, this set of studies posed a problem: They all identified different parts of the brain. Are we researchers all just collecting junk data, or is there some logical reason for why we are seeing different things when trying to look at same thing? More specifically:

1. What would explain why the Cantor team would see white matter differences, while the Schiltz and Schiffer teams did not; and
2. What would explain why the Schiltz and Schiffer teams would see grey matter differences, while the Cantor team did not?

**Sample Size, Control Group Types.**

First, the reason that only Cantor identified white matter differences is very plausibly

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for integration of sensory stimuli), and others. If the brain’s processing of erotic imagery requires multiple brain regions, then we could have an explanation for the involvement of cabling tissue: Such cabling would be necessary to enable these different parts of the brain to function as a single network, and a problem in the cabling may plausibly produce a network that provokes sexual arousal when it otherwise should not.

**Built-In Social Instincts.** Humans are evolutionarily a social species, and we appear to have several social instincts built in. Being in the company of someone sexually attractive typically evokes (even without one’s awareness) flirtation, smiles, and solicitousness; being in the company of a child typically evokes protective, nurturing instincts; being the company of an aggressor typically evokes flight or subservience; and so on. It is tantalizing to speculate that pedophilia might result from a cross-wiring (or its neurological equivalent) of the anatomy that controls these instinctual reactions to socially relevant stimuli: Rather than responding to a child in the environment by triggering parental responses, the detection of the

due to the greater sample size (and, thereby, the greater statistical power). Moreover, both the Schiltz and the Schiffer studies directed their statistical attention to grey matter hypotheses only. The answer to the second question is plausibly in the types of control groups employed: The Schiltz and the Schiffer teams contrasted pedophiles with healthy nonoffenders from the community, whereas the Cantor team contrasted the pedophiles with offenders (who committed nonsexual crimes). That is, the samples used by the Schiltz and the Schiffer teams differed not only in terms of being pedophilic versus nonpedophilic, but also in their history of or propensity to break the law.

Thus, it is possible that the grey matter features identified by Schiffer and Schiltz were due to criminality, whereas the white matter features identified by Cantor were due to pedophilia specifically. Indeed, the grey matter areas emphasized by Schiffer and by Schiltz have previously been linked by other researchers to psychopathy. (J.R. Blair, “Neurobiological Basis of Psychopathy,” 182 *Brit. J. Psychiatry* 5-7 (2003); J.L. Müller, M. Sommer, V. Wagner, K. Lange, H. Taschler, C.H. Röder, G. Schuierer, H.E. Klein, and G. Hajak, “Abnormalities in

Emotion Processing Within Cortical and Subcortical Regions in Criminal Psychopaths: Evidence From a Functional Magnetic Resonance Imaging Study Using Picture With Emotional Content,” 54 *Biological Psychiatry* 152-162 (2003); J. van Honk and J.L.G. Schutter, “Unmasking Feigned Sanity: A Neurobiological Model of Emotion Processing in Primary Psychopathy,” 11 *Cognitive Neuropsychiatry* 285-306 (2006); K.A. Kiehl, A.M. Smith, R.D. Hare, A. Mendrek, B.B. Forster, J. Brink, and P.F. Liddle, “Limbic Abnormalities in Affective Processing by Criminal Psychopaths as Revealed by Functional Magnetic Resonance Imaging,” 50 *Biological Psychiatry* 677-684 (2001).) There exist other types of brain scans—such as diffusion tensor imaging and magnetization transfer imaging—that can provide additional information about white matter. As such technology continues to become available, we may observe greater detail about the white matter in pedophilia.

**Brain Function vs. Structure.** The second group of pedophilia brain studies measured brain function instead of brain structure (i.e., used fMRI instead of MRI). When someone is in an MRI scanner, we can present them with images, video clips, auditory narratives, and so on, and then detect whether and which regions of the brain respond. It is fMRI, rather than structural MRI, for which one might envision the development of something analogous to a phallometric test: Such a brain-based assessment would present various classes of stimuli of potential sexual interest to the subject (i.e., females and males, adults and children, etc.), but record subjects’ neural, rather than genital, responses. In such a set-up, one would expect that pedophilic men would respond most when shown stimuli depicting children, whereas teleophilic men would respond most when shown stimuli depicting adults.

Six preliminary fMRI studies have already been published. All six of these studies compared the responses of a sample of pedophilic men (some studies used heterosexual pedophiles; some, homosexual pedophiles; and some, mixed or undisclosed types) with those of nonpedophilic controls (either heterosexual, homosexual, or mixed/undisclosed). Four of the studies used an analysis aimed at revealing which parts of the brain respond to erotic stimuli. (T.B. Poepl, J. Nitschke, B. Dombert, P. Santtila, M.W. Greenlee, M. Osterheider, and A. Mokros, “Functional

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Cortical and Subcortical Abnormalities in Pedophilia: A Combined Study Using a Choice Reaction Time Task and fMRI," 8 *J. Sexual Medicine* 1660-1674 (2011); B. Schiffer, T.H. Krueger, T. Paul, A. DeGreiff, M. Forsting, N. Leygraf, M. Schedlowski, and E. Gizewski, "Brain Response to Visual Sexual Stimuli in Homosexual Pedophiles," 33 *J. Psychiatry & Neuroscience* 23-33 (2008); B. Schiffer, T. Paul, E. Gizewski, M. Forsting, N. Leygraf, M. Schedlowski, and T.H.C. Kruger, "Functional Brain Correlates of Heterosexual Paedophilia," 41 *NeuroImage* 80-91 (2008); M. Walter, J. Witzel, C. Wiebking, U. Gubka, M. Rotte, K. Schiltz, F. Bermppohl, C. Tempelmann, B. Bogerts, H.J. Heinze, and G. Northoff, "Pedophilia Is Linked to Reduced Activation in Hypothalamus and Lateral Prefrontal Cortex During Visual Erotic Stimulation," 62 *Biological Psychiatry* 698-701 (2007).)

These four studies examined the entire brain and, overall, identified the same parts of the brain (i.e., the sex network), regardless of whether one was in the pedophilic or nonpedophilic group, but with the pedophiles responding to imagery of children and the nonpedophiles responding to imagery of adults. Although informative in itself, the method of analysis used in these four studies does not provide information analogous to the sensitivity and specificity statistics that one would apply in actuarial risk prediction. That is, their methods could not produce a statistically valid diagnostic test; however, the remaining two fMRI studies did use such a method. (J. Ponseti, O. Granert, O. Jansen, S. Wolff, K. Beier, J. Neutze, G. Deuschl, H. Mehdorn, H. Siebner, and H. Bosinski, "Assessment of Pedophilia Using Hemodynamic Brain Response to Sexual Stimuli," 69 *Archives of General Psychiatry* 187-194 (2012); A. Sartorius, M. Ruf, C. Keif, T. Demirakca, J. Bailer, G. Ende, F.A. Henn, A. Meyer-Lindenberg, and H. Dressing, "Abnormal Amygdala Activation Profile in Pedophilia," 258 *European Archives of Psychiatry & Clinical Neurosci.* 271-277 (2008).)

**Potential for Replacing Phallometry.**

Whereas the four aforementioned studies explored the entire brain, the other two studies examined fixed points within the brain. (Sartorius et al. examined the center of the amygdala and Ponseti et al. examined an empirically identified subset of points.) This property allowed their results to be meaningfully expressed as sensitivity and specificity.

Although the Sartorius study did not perform the calculation, their reported results could be converted: They show an equivalent of 67% specificity and 67% sensitivity. Ponseti et al. did conduct this analysis, and found 88% sensitivity and 100% specificity. It is illustrative to compare those accuracy scores with those of volumetric phallometry: 61% sensitivity and 96% specificity. (R. Blanchard, P. Klassen, R. Dickey, M.E. Kuban, and T. Blak, "Sensitivity and Specificity of the Phallometric Test for Pedophilia in Non-admitting Sex Offenders," 13 *Psychol. Assessment* 118-126 (2001).)

The Ponseti values for fMRI and the Blanchard values for volumetric phallometry seem to suggest that fMRI might exceed the accuracy of phallometric testing; however, at least two important methodological issues need to be considered before the fMRI results could be applied in a forensic context. First, the participants in the Ponseti study all admitted to their pedophilic interests, whereas the participants in the Blanchard study all denied their pedophilia (despite having three or more sexual offenses against children). That is, the Blanchard study participants would likely have been more motivated to suppress their responses during testing (which is the typical situation in a forensic setting). Thus, the Ponseti study may be overestimating the sensitivity and specificity, whereas the Blanchard data may be underestimating it, relative to most clinical samples, which would typically contain both admitters and deniers. The second methodological issue is that fMRI is highly sensitive to motion artifacts: An examinee who wanted to invalidate the test could do so with even small movements of his head during testing. These challenges can potentially be overcome with continued research, but the data available do not as yet urge wholesale replacement of phallometry with fMRI.

**Directions for Future Research**

Overall, research programs on the causes of pedophilia are still in their infancy, with only a handful of studies completed. Nonetheless, these studies suggest some tentative conclusions, namely:

- The findings demonstrate early (prenatal) contributors to pedophilia, although unambiguously post-natal influences may yet be identified.
- Pedophilic brain structure appears to be only slightly different from typical brain structure, making diagnosis based solely on brain structure currently unlikely.

- The type of brain differences thus far reported are not consistent with what changes as a result of psychotherapy, surgery, or contemporary stem cell research.
- Pedophilic brains sexually respond in the same pattern as do nonpedophilic brains, but respond to stimuli depicting children rather than to adults.

The highly technical, maybe arcane, nature of fMRI leaves many people anxious about how measuring brain responses might be misused. Will we force whole groups of people to undergo brain-based screening procedures? Will we be removing from humanity the privacy of their very thoughts? An educated public can and should ask such questions, but these issues are not novel to brain imaging. There is nothing in this work that excuses anyone—scientist, clinician, or lawyer—from the contemporary bounds of professional ethics. Existing regulations for confidentiality and informed consent already bar abuses such as these. There is nothing to suggest that fMRI should be treated as a special or infallible technique. Rather, it provides us with the next increment in accuracy of the diagnostic decisions we have been making already.

There is not as yet any known method for converting pedophiles into nonpedophiles. It is my hope that, with continued research, we pinpoint the specific early, maybe prenatal, processes that ultimately lead to pedophilia. Armed with such knowledge, we may be able to provide early detection or a means of influencing the developmental trajectory. Early detection may also provide us with an opportunity to help teach individuals, perhaps still as children, tools to manage sexual interests that cannot be changed. Although these are as yet only possibilities, they hold the most promise for the greatest reward our field can offer: Instead of preventing a second offense, we may ultimately prevent the first offense.

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