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Neuroscience-based Psychiatric Assessments of Criminal Responsibility: Beyond Self-Report?

GERBEN MEYNEN

Abstract: Many legal systems have an insanity defense, which means that although a person has committed a crime, she is not held criminally responsible for the act. A challenge with regard to these assessments is that forensic psychiatrists have to rely to a considerable extent on the defendant's self-report. Could neuroscience be a way to make these evaluations more objective? The current value of neuroimaging in insanity assessments will be examined. The author argues that neuroscience can be valuable for diagnosing neurological illnesses, rather than psychiatric disorders. Next, he discusses to what extent neurotechnological 'mind reading' techniques, if they would become available in the future, could be useful to get beyond self-report in forensic psychiatry.

Keywords: insanity defense; forensic psychiatry; neuroimaging; neurological illness; psychiatric disorders

Introduction

Recent years have shown increased interest in the meaning and implications of neuroscience for the law, in particular, criminal law. A central theme concerns the implications of neuroscience for psychiatric assessments of criminal responsibility.[1] Many legal systems have an insanity defense, which means that although a person has committed a crime, she is not held criminally responsible for the act. The defense is intriguing, as it is related to several profound topics such as the distinction between madness and badness and the sources of severe crimes. In practice, a defendant will be evaluated by a behavioral expert, often a psychiatrist, and, depending on the jurisdiction, the judge or jury will ultimately decide about the matter.[2] In various legal systems, neuroscience has been used to answer the question about a defendant's legal responsibility. Meanwhile, some express concerns that neuroscientific findings may have too much impact on criminal justice. In this paper I consider the usefulness of neuroscience-based data for answering the question about a defendant's criminal responsibility within the context of a psychiatric evaluation. In this psychiatric context, criminal responsibility refers to the issue of legal insanity. I will use the terms criminal responsibility and legal sanity interchangeably. A central topic of this paper is the reliance of psychiatric assessments on self-report—and what neuroscience could mean in this respect, either now, or in the near future. Even though I focus on psychiatry, much of what is being said applies to psychology as well.

The outline of the paper is as follows. In the first section, I discuss some general characteristics of the insanity defense, highlighting a particular vulnerability of forensic psychiatric assessments:

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reliance on self-report. Next, I consider the current use of neuroscience within the context of evaluations of defendants' sanity.[3] I focus on how neuroscience could help to *diagnose* disorders in this forensic context.[4] I will try to delineate between the types of disorders where neuroscience may at present be relevant and disorders where it is much less likely to be helpful. Next, I consider whether possible future neurotechnological developments might yield psychiatrically relevant objective information by offering a form of 'mind reading.' Finally, I discuss three concerns and draw some conclusions.

Legal Insanity and Reliance on Self-Report

To answer the question about a defendant's sanity, the defendant will in principle be evaluated by behavioral experts. Even though their reports and testimony are important, if not crucial, the judge or jury will ultimately decide about the matter. Usually, a legal criterion is applied to determine the defendant's sanity. The most influential criterion for legal insanity in Anglo-American systems is the M'Naghten rule, which states

> that to establish a defence on the ground of insanity, it must be clearly proved that, at the time of the committing of the act, the party accused was labouring under such a defect of reason, from disease of the mind, as not to know the nature and quality of the act he was doing; or if he did know it, that he did not know he was doing what was wrong.[5]

This criterion merely concerns the defendant's *knowledge*: did he know the nature, quality, or wrongfulness of the act? Some consider this criterion too narrow, and many legal insanity criteria add another component to the knowledge element, namely, a control component. An example is the Model Penal Code insanity test, used in a minority of US states:

> a person is not responsible for criminal conduct if at the time of such conduct as a result of mental disease or defect he lacks substantial capacity either to appreciate the criminality (wrongfulness) of his conduct or to conform his conduct to the requirements of the law.[6]

The two components—knowledge/appreciation on the one hand and control on the other—reflect the Aristotelean model for responsibility and excuse.[7] This twofold model can be found in many jurisdictions, for example, in Italy and China.[8] So, if due to mental illness, the defendant did not know the nature/wrongfulness of the act or could not sufficiently control her behavior, she is considered insane.

Apart from the criterion that is being used, the burden of proof is important. This concerns the question about the threshold of proof (level of certainty) and who (the defendant, court, or the prosecution) has to prove what (either insanity or sanity). For instance, in a legal system, the threshold of proof may be 'by a preponderance of the evidence' and the defendant may have to prove that she is insane (so sanity is presumed unless the defendant provides sufficient evidence to the contrary). But other combinations are also possible; for instance, the prosecution may have to prove sanity. In fact, there are many differences between legal systems regarding the various aspects of the defense.

Also, legal insanity is one of the most intensely debated topics in criminal law.[9] One of the issues under debate revolves around the *reliability* of behavioral assessments of a defendant's sanity.[10] In brief, people may accept that in some cases a mental disorder impacted to such an extent on a person's behavior that it is no longer justified to hold her responsible for her actions and to punish her. However, people may be

skeptical that psychiatrists and psychologists can reliably determine the presence and impact of a disorder at the time of the crime. Why would reliability be an issue?

The nature of mental illness is important here. Psychiatry is a peculiar medical specialty because subjective mental states are central to psychiatric diagnosis. In other words, in psychiatry, first-person experiences take center stage. For instance, an essential criterion of panic disorder is that the person has *experienced* panic. This is different from diagnosing, for example, a tumor. A person can be diagnosed with a tumor without ever experiencing its presence; it may be an accidental finding. Even though not all criteria for mental disorders are related to first-person experience (such as weight loss in depression), many are (e.g., fears, hearing voices, being depressed or euphoric). The fact that psychiatry deals with these first-person phenomena makes it an intriguing field of medicine.

But it also entails a challenge. This has to do with how we obtain information about mental states. To a great extent, we obtain such information based on self-report, because the person herself knows (best) what is going on in her mind.[11] In other words, generally, information about another person's mental states is not directly epistemically accessible; it has to be mediated by self-report. Therefore, psychiatrists have to rely mainly on what patients tell them.[12] Of note, this is not only a limitation of psychiatry, as it is a limitation of the human condition: we have no direct access to other people's thoughts. Put differently, we are the gatekeepers of our thoughts.

Reliance on self-report is indeed an issue in psychiatry. As David Freedman and Simona Zaami write: "The limits of relying on a person to self-describe his/her own mental state are obvious."[13] If a person is not able—for instance, due to lack of insight—or willing to provide certain information about her mental state, the psychiatrist is unlikely to know it. At present, there is no blood test or imaging procedure to detect the presence of, for example, delusions, obsessions, compulsions, addictions, or hallucinations. For instance, if a patient doesn't *inform* a psychiatrist that she believes the secret service is following her, the psychiatrist may observe some paranoid behavior, but is unlikely to know the precise grounds of this behavior, let alone the content of the delusion (unless the person has informed others, who communicate the information to the psychiatrist). Consequently, in general, withholding relevant information or lying is likely to have more impact on psychiatric evaluation than on any other medical assessment.[14]

The challenge psychiatry faces may turn into a vulnerability in the court of law. The reason is that in the context of criminal law, people's words cannot be taken at face value. Surely, one cannot exclude the possibility that a patient in a healthcare setting is lying or withholding information, but in the court of law, the tendency to do so is considered increased. Lie detection is not used in hospitals within the context of doctor-patient relationships, but it has been and is being used in criminal justice contexts: *that* is the relevant setting.[15] In the courtroom, people may lie, remain silent, hide the (whole) truth, fake certain symptoms—these are recognized dangers in criminal justice. As Thomas Grisso writes, there is an "increased likelihood of error in reliance on the self-report of examinees in forensic cases, which often involve circumstances that could motivate examinees to exaggerate, minimize, or falsify the information they provide."[16] Because of the reliance on first-person accounts combined with the criminal law context, it can be feared that at least some defendants successfully mislead psychiatrists, and, possibly, escape the punishment they deserve.[17]

So, where possible, behavioral experts should find corroborating information.[18] But one cannot circumvent the fundamental issue that we usually obtain information about mental states based on what people themselves reveal about these states. Forensic psychiatry does not have a perfect solution for this profound problem.[19] So, what actually happens may be considered ironic: the same medical discipline that relies to such an extent on people's own words—psychiatry—is so often asked to perform assessments in the criminal law context, where words are considered less reliable.[20]

From this position of modesty, we may ask: Could neuroscience be of help here, by adding more objective information related to diagnosis? Could it make forensic psychiatric evaluations in that sense more reliable?[21]

Neuroscience and Criminal Responsibility: Practice and Limitations

The first thing to notice here is that neuroscience is already being used to answer the question about a person's sanity, for instance in the United States, United Kingdom, and in the Netherlands.[22] This is an example taken from the study in the Netherlands:

> "…a case of a man who is accused of fornication with a neighbor-girl. The abuse took place four or five times when she was about nine years old. The defendant is examined by a neurologist who finds a beginning of fronto-subcortical dementia in relation to Parkinson's disease. The behavioral choices of the defendant at the time of the offense were according to the neurologist, undoubtedly affected by the organic brain dysfunction. He reports: 'Directly related to the fronto-subcortical dementia is, in addition to the characteristic cognitive impairments, impulsivity, which occurs particularly in complex situations in which the defendant lacks an overview. As a result, the defendant was unable to control his impulses. He acted reflexively without overseeing the consequences. The defendant lacks the capacity for self-reflection, which prevents him from relating his actions to an appropriate framework of norms and values. In addition he was as a result of his cognitive impairment not able to interrupt his behavior once started.'"[23]

In this case, not just a neurologist, but also a psychologist reported, writing that the illness was "in an early phase," and there was "not a general disinhibition yet." In other words, some control was, apparently, intact. The court concluded that the defendant's criminal responsibility was diminished.

In their analyses, Katy De Kogel and Lizanne Westgeest also looked into the legal questions that were answered using the neuroscientific data, such as questions about intent, guilt/negligence, and duress.[24] The legal question that stood out concerned legal insanity. This can be considered in line with the words by Michael Pardo and Dennis Patterson, stating: "Proof of insanity and related issues constitutes, in our opinion, one of the more plausible avenues by which neuroscience may contribute to the law."[25] Why would that be the case? In my view, an explanation could be that regarding *this* question—unlike questions about intent, negligence, and duress—in the standard case, psychiatrists[26] are asked to provide their opinion. For medical doctors such as psychiatrists, it is not uncommon to consider the possibility of brain abnormalities. In other words, since the insanity defense 'invites' medical doctors in the courtroom, it opens the door to the wider array behavioral and medical assessments, including neuroimaging.

Neuroimaging can also be used to address qualms that a defendant is faking. An example is a Dutch extortion case. The elderly defendant was diagnosed with frontotemporal dementia.

The possibility that the defendant could have faked the disorder had been raised in the media. When the court had reached a verdict, on the website of the judiciary, it was stated that "it is very unlikely that the defendant can fake his brain disorder, which is shown, among others by the MRI-scan and PET-scan presented in the courtroom and the evaluation by the behavioral experts."[27] So, here, the scans were explicitly mentioned to refute the idea that the defendant malingered. Such use is in line with Dean Mobbs et al., who consider the question "Is the defendant faking an illness?" one of the "questions for which brain imaging might provide useful answers."[28]

Meanwhile, the fact that neuroscience is being used in the courtroom, and that it is taken into account regarding a defendant's sanity, in itself does not necessarily mean that the application is 'good,' correct, valid, or just. In fact, grave concerns have been raised about using neuroscience to answer legal questions such as those pertaining to the defendant's criminal responsibility.[29] The neuroscience may not be 'ready' for courtroom-use and jurors may be unduly impressed by brain scans.[30] It is at least possible that in some cases neuroscience has influenced the final decision improperly. But that does not mean that it should never be used in the court of law. For instance, DNA evidence may also unwarrantedly influence court decisions, but in general, the use of DNA in the courtroom is beneficial to the administration of justice.

The core issue regarding courtroom use is whether neuroscience is indeed helpful for answering the legal (normative) question at hand. Here, we should acknowledge that from mere neurobiological facts, we cannot immediately deduce a normative conclusion about the level of one's criminal responsibility.[31] More particularly, as we have seen, many legal systems use a specific legal criterion for insanity. All that counts in those jurisdictions is the extent to which the neuroscientific data are relevant with respect to that standard, such as the M'Naghten rule. For instance, if, in a M'Naghten jurisdiction, the neuroscientific data—even if they show abnormalities—do not tell us anything about the presence of a disorder or the defendant's knowledge about the nature, quality, or wrongfulness of the act; they are in principle irrelevant.

Next, regarding legal insanity, it is vital to recognize that no absolute certainty is required. To prove that a defendant has committed a crime, in the United States the threshold 'beyond a reasonable doubt' is used. The threshold of evidence for an insanity plea is often much lower: 'by a preponderance of the evidence.' This means that it should be more likely that the defendant is legally insane than that she is not. Consequently, tools and tests that are not one hundred percent reliable could still lead to sufficient proof given such a threshold. The relevant question, therefore, is whether neuroscience is of *added value*.[32] At the same time, it is of the essence to use sufficiently reliable tools and techniques. It is particularly important that the issue of 'ecological validity' is considered. The fact that a technique works in a highly controlled laboratory setting, does not necessarily mean that it works in the context of criminal law. Finally, as a rule of thumb, the neuroscience data should be considered in light of other information and evidence, and *taken together*, the evidence may lead to the conclusion that the defendant was insane.

Diagnosis, Neurology, and Psychiatry

Often, it is not the brain finding in itself that is immediately related to the

defendant's legal insanity. Rather, the brain finding is relevant as part of a diagnostic procedure to establish the presence of an *illness.* Of note, the presence of an illness is required by both M'Naghten and the Model Penal Code test, and in virtually all Western legal systems the presence of a mental illness at the time of the crime is an insanity criterion. Therefore, reliably establishing a disorder is legally relevant. Next, the (symptomatology of the) illness can be related to the required mental/behavioral incapacities—such as an inability to control one's behavior.

What is interesting in the described case above, is that it is a *neurologist*—not a psychiatrist—that is being cited. If we look at the cases in which neuroscience or, more specifically, brain imaging is considered helpful, these tend to be *neurological* cases, not psychiatric ones.[33] This is in a way unsurprising since in the diagnostic process of neurological diseases—such as dementia, brain trauma, tumors, hemorrhage, infarction, and epilepsy—neuroimaging is routinely used in clinical practice. Meanwhile, neuroimaging is not helpful in daily clinical practice for diagnosing *psychiatric* conditions such as psychosis, schizophrenia, bipolar disorder, depression, addiction, paraphilias, and impulse-control disorders.

At this point, it may be useful to say a bit more about the distinction between neurology and psychiatry.[34] They have a shared history, but during the second half of the twentieth century their ways parted.[35] While psychiatry has more to do with behavior and mental states,[36] neurology tends to be more focused on organic changes, which are not limited to the central nervous system, but also concern the entire peripheral nervous system (e.g., back pain due to a herniated disk and carpal tunnel syndrome). One could argue that while neurologists and psychiatrists share an interest in mental capacities (which can be undermined by, for example, dementia), psychiatrists are more interested in mental *content*. The reason for emphasizing this point is that at the moment, neuroscience is virtually unhelpful for giving insight into mental content, such as obsessions, delusions, hallucinations.

That does not mean that neuroimaging has not been used in the courtroom context with respect to psychiatric illnesses. As Georgia Gkotsi et al. write, neuroimaging data "are often introduced in order to prove the existence of an alleged psychiatric disorder, revealing its cerebral basis. In these cases, neuroimaging techniques are presented by the experts as a way to "objectify" a classic psychiatric condition from which the defendant allegedly suffers and which according to the defence has affected their responsibility."[37]

However, as said, neuroimaging etc. is not routinely used in diagnosing mental illnesses in clinical practice, and the specific neurobiological 'basis' of the abovementioned disorders has not been clearly established. This is obviously a problem for such use of neuroscience in the courtroom. Therefore, it is not surprising that Gkotsi et al. write: "As observed in a number of cases, the effort of defence experts to prove the existence of a psychiatric pathology on the basis of a neuroimaging technique has been largely unsuccessful…"[38]

Even though psychiatrists are usually asked to be experts in the context of legal insanity and even though psychosis—a psychiatric condition—is the 'classic' disorder for a successful insanity defense,[39] the cases where brain imaging can be straightforwardly helpful are more neurological in nature. It is, in other words, the nonstandard cases where neurodata are relevant.

How could forensic *psychiatric* assessments become more 'objective'? One way could be for objective neurobiological

criteria to be integrated into the criteria for mental illnesses, for instance regarding structural brain changes, an excess of certain neurotransmitters, or genetic parameters (if they would be found to be related to specific mental disorders). In that case, detecting a characteristic structural abnormality would directly contribute to the diagnosis of a particular psychiatric condition. If this happened, psychiatry would become more similar to neurology. But there is also another possibility, which does not require a change in the nosological criteria. They can remain 'first-person' criteria, but we would try to get more objective information about subjective mental states using neuroimaging. This would entail a form of brain-based 'mind reading.' Clearly, this is not possible at present, but, perhaps in the future, such a possibility could occur. In what follows, I will discuss some scientific advances indicative that some form of neurotechnological 'mind reading' might become available in the relatively near future. Since this concerns the future, and the future is uncertain, we cannot be sure about such developments.

Beyond Self-Report by 'Reading' Minds Using Neuroscience?

It may be instructive to say a few words about the concept of 'mind reading' in this neurobiological context before considering technological developments.[40] First, 'mind reading', as I see it, is a normal phenomenon: humans continuously try to read each other's minds, making use of a variety of sources of information, for instance, facial expressions, movements, gesticulations, and, last but not least, a person's words.[41] Such 'reading' of other people's minds enables us "to predict, explain, mold, and manipulate each other's behavior."[42] Mind reading is so important for our social existence that people experiencing difficulties in this respect—such as some people with autism—may encounter serious problems.[43] I will understand neurotechnological 'mind reading' as referring to 'mind-reading' procedures that rely to a nontrivial extent on brain-derived data.[44] Theoretically, brain-based mind reading does not entail any commitment to a particular philosophical view of the relationship between mind and brain. Just as long as the neuroimaging yields relevant information about a subject's thoughts, mood, plans, feelings, perceptions, desires, etcetera, it is a form of 'mind reading.'[45]

On a very limited scale, some mind reading with neuroimaging is possible in laboratory contexts, providing no more than 'proof of principle.' For instance, the group of Jack Gallant recorded BOLD signals in the occipito-temporal visual cortex of people who watched movies. Based on these signals, it turned out to be possible to reconstruct—to some extent—the movies they had been watching. The researchers themselves considered their results "a critical step toward the creation of brain reading devices that can reconstruct dynamic perceptual experiences."[46]

In 2016, Marcel Just and colleagues instructed undergraduates, who had "taken physics courses beyond an introductory level," to think about physics concepts such as electric current, light, and magnetic field. Combining fMRI and machine learning, the researchers were able to 'detect' the concepts these undergraduates were thinking about while lying in the scanner. Of note, these students could only think about a very limited number of physics concepts, but still, the findings can be considered significant.[47] More recently, Just's group reported that using a combination of fMRI and machine learning, they could distinguish between suicidal and nonsuicidal youth.[48] Whereas 'detecting' thoughts about physics

concepts has only very limited psychiatric utility, 'detecting' suicidality is highly relevant from a psychiatric perspective.

In neurology, significant results have been obtained using brain-computer interfaces (BCIs) in several groups of patients.[49] Basically, a BCI consists of a detection part and an output part. The detection part can be considered the mind reading component. Using BCI, a neurological patient may regain the capacity to communicate with other people or to make movements with the help of a robot arm. Generally, as far as BCI is helpful, it often enables a patient to regain control over functions that were lost due to paralysis. Whereas mind reading in neurology may be more therapeutic, in psychiatry it could be more diagnostic.

Of note, if forensic psychiatrists become able to use brain-based mind reading for diagnostic purposes, these techniques could simultaneously reveal important information about the relationship between the disorder and the crime the defendant is charged with. For instance, neuroimaging might not only indicate that the defendant suffers from a delusion, but also that she delusionally believes that the victim is conspiring against her, and intends to kill her. This may also shed light on the question of whether the defendant felt that it was justified to act against her imagined attacker—which in turn could be relevant in light of the M'Naghten and the Model Penal Code test. This would be an advantage of actual mind reading over merely establishing a disorder because of some biological marker, such as a structural brain change.

It is hard to predict how (fast) the research will develop from here, and when—if ever—techniques will be ready for use in psychiatry. Still, mind reading neurotechnology is currently a focus of several research groups and tech companies such as *Facebook* and Elon Musk's *Neuralink*. Clearly, what has provided a new impulse to these brain-reading technologies is Artificial Intelligence (AI). For instance, the results by Just's group were obtained using a combination of neuroimaging and a form of AI. Combining these techniques could mean that even if neuroimaging itself does not advance, the results may still get better because of progress in AI.

Moreover, AI could make it possible to combine neuroscience-based information with other types of information, for example, about one's online searching behavior—algorithms are already used to 'read' our preferences and needs based on our online searching behavior. Online searches have also been used in criminal cases to understand more about what a defendant had in mind.[50] In principle, AI opens up the possibility of integrating information from various technological sources, including neuroimaging, to corroborate psychiatric findings about first-person phenomena.

Three Concerns

Ethics

Obviously, these developments, should they become reality, raise ethical questions. At this point, it may be good to contrast neurology and psychiatry.[51] Applications in neurology will often concern BCI (robotic arms, speech assistance, exoskeletons), providing new ways of treatment to *restore lost capacities*, such as speech or movement. Psychiatry, meanwhile, has a profound interest in what actually goes on in a person's mind. More precisely, psychiatrists, especially forensic psychiatrists, tend to be interested—more than any other medical specialty—in the 'caverns' of our mind, the things most private to us, which we really want to hide from others. Therefore, privacy is *the*

concern regarding mind reading in the forensic psychiatric context.

Second, psychiatrists tend to use more coercion compared to neurologists, particularly in forensic psychiatry. This makes it important to recognize the relevance and ethical implications of coercion regarding these techniques in forensic psychiatry. Notably, coercion in psychiatry may take different forms, some more 'overt,' some more 'subtle.'[52] And, regarding coercion, it is not just the intention of the psychiatrist that counts, but also, how the actions and offers are *experienced* by the addressee. The very context of *forensic* psychiatry may well be important regarding how people experience the options—e.g., regarding mind reading technology—presented to them.[53]

Therefore, if these techniques will be used in a forensic psychiatric context, we should pay extra attention to privacy concerns as well as the issue of (perceived) coercion. In fact, prospects of psychiatric use of such far-reaching techniques may be considered particularly worrisome in view of historical examples of political abuse of psychiatry, such as in the former Soviet Union.[54]

Past Mental State

How helpful is it for a forensic psychiatrist to detect with brain-based mind reading—should this be possible—that a defendant is presently experiencing auditory commanding hallucinations?[55] Does that mean that the defendant was hearing voices *at the time of the crime*? Insanity assessments are backward-looking[56]; they concern a state in the past—and the past is gone. In itself, therefore, observing abnormalities now doesn't prove that they were present at the time of the crime. However, depending on the case, observing abnormalities now—e.g., detecting hallucinations using neuroimaging—may increase the likelihood that a person heard voices at the time of the crime. Of note, we cannot rule out the possibility that, somehow, in the future, information about past brain states will be detectable using neuroimaging. There could be a 'trace' of previous brain states which remains measurable. This is also currently true: if a brain tumor is observed today, from its characteristics, it may well be deducible that it must have been there already at the time of the crime. Memories are in a way traces of the past.[57] Therefore, in the future, neurotechnological detection of memories of the moment of the crime might provide important information about the past mental states. Detecting such memories could also be relevant in cases in which a defendant claims to suffer from memory loss.

A White Bear

There is one other thing that, in my view, deserves attention regarding the use of brain reading in these forensic and criminal law contexts. It concerns the "paradoxical effects of thought suppression."[58] Daniel Wegner and his colleagues performed an intriguing experiment. Thirty undergraduates were instructed to "report one's stream of consciousness." They were asked to report, while being alone, "everything that comes to mind" to a tape recorder. Some of the students received a further instruction: "try not to think of a white bear. Every time you say 'white bear' or have 'white bear' come to mind, though, please ring the bell on the table before you." The rest is history: trying not to think about the white bear had the opposite effect. As Wegner and colleagues write: "The paradoxical effect

of thought suppression is that it produces a preoccupation with the suppressed thought. These findings suggest that the task of suppressing a thought is itself difficult, leading people to hold the thought in consciousness repeatedly even as they try to eliminate it."[59] Decades later, the phenomenon is still considered essential, not only regarding normal mental functioning, but also in psychopathological conditions.[60]

Brain-based mind reading in forensic psychiatric assessments would mean that, what is 'recorded' is not what a person *says* (as was the case in Wegner's experiment), but what the person *thinks*. But the phenomenon of the white bear and the paradoxical effect would be likely to occur in this context as well. The reason is that a defendant who is undergoing brain-based mind reading may well want to avoid certain thoughts while lying in the scanner. She may try to avoid certain crime-related elements or other aspects of her mental life—phantasies, fears, frustrations etcetera, which she believes *would reflect negatively* on her. So, couldn't the very design of such a brain reading procedure in a criminal law context—similar to the white bear experiment—*evoke* what the defendant would want to suppress? And what the defendant tries to suppress need not be relevant to the case at all (the white bear had no personal relevance to the undergraduates either). The defendant may just try to suppress some negative thoughts, and merely because of the defendant's desire to suppress them, they may become very important in the brain 'recordings.' And how would that affect the evaluation and its interpretation? It is important to look at this aspect of mental functioning—the paradoxical effect of trying to suppress thoughts—because of the specific circumstances of criminal law and forensic psychiatric assessments. More generally, it may be difficult to interpret the specific meaning or weight of thoughts that are 'detected': are they just thoughts, fantasies, wishes, convictions, or intentions? Especially as people may deliberately try to steer their thoughts in certain directions. In fact, if we start using such technologies, we probably have to deal with some peculiarities of mental life, which include a level of spontaneity (thoughts popping up) and freedom to guide our thinking.

Conclusion

Reliance on self-report constitutes a vulnerability for psychiatric insanity evaluations. We considered whether neuroscience could help to increase the objectivity of these assessments. The first thing to note is that legal insanity is a normative, legal issue. There is no direct relationship between neuroscience and the legal norm. Hence, the relevance of a neuroscience finding regarding the legal question at hand has to be explicitly shown. As far as an illness is part of the insanity criteria, neuroscientific findings that contribute to establishing (or falsifying) the presence of a disorder, are, in principle, legally relevant. I argued that to the extent that neuroscience can provide solid input in this respect, it basically concerns neurological, rather than psychiatric, illnesses. This means that the cases in which neuroscience is currently helpful, tend to be nonpsychiatric and, consequently, nonstandard cases. Therefore, I conclude that regarding psychiatric illness, neuroscience does not really help to get beyond self-report. Still, the future could bring a change in this respect as it might become possible to 'read' mental content—central to psychiatric disease entities—using neuroimaging. However, such far-reaching techniques raise new concerns, foremost about privacy. So while these developments could add much-desired objectivity to psychiatric assessments of insanity, they may come at a price.

Notes

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2. Not in all jurisdictions are behavioral experts allowed to express their opinion on the 'ultimate legal issue' of the defendant's sanity; they may have to restrict themselves to what lies in the realm of the behavioral sciences.
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14. Still, the importance of subjective phenomena for diagnosis this is not unique for psychiatry; for instance, pain, a subjective experience, is also a criterion for migraine.
15. Not in all criminal justice systems though, and the extent of the use differs between jurisdictions. Meijer EH, Van Koppen PJ. Lie Detectors and the Law: The Use of the Polygraph in Europe. In: Canter D, Žukauskienė R, eds., *Psychology and Law: Bridging the Gap*. Aldershot: Ashgate; 2017; Iacono WG, Ben-Shakhar G. Current status of forensic lie detection with the comparison question technique: An update of the 2003 National Academy of Sciences report on polygraph testing. *Law and Human Behaviour* 2019;43(1):86–98.
16. Grisso T. guidance for improving forensic reports: A review of common errors. *Open Access Journal of Forensic Psychology* 2010;2:104.
17. As Fuger KD, Acklin MW, Nguyen AH, Ignacio LA, Gowensmith WN write: "Common public conceptions view the insanity defense as a loophole allowing the guilty to avoid responsibility for their actions." Fuger KD, Acklin MW, Nguyen AH, Ignacio LA, Gowensmith WN. Quality of criminal responsibility reports submitted to the Hawaii judiciary. *International Journal of Law and Psychiatry* 2014;37(3):272–80.
18. See note 16, Grisso 2010.
19. See also note 13, Freedman, Zaami 2019. See on detecting malingering and aggravation. Young G. *Malingering, feigning, and response bias in psychiatric/psychological injury. Implications for practice and court*. Dordrecht: Springer; 2014.
20. Of course, many people speak the truth in the courtroom as well.
21. See also note 4, Gkotsi et al. 2019. Regarding the limited reliability of forensic psychiatric

assessments, see also Gowensmith WN, Murrie DC, Boccaccini MT, McNichols BJ. Field reliability influences field validity: Risk assessments of individuals found not guilty by reason of insanity. *Psychological Assessment* 2017;29(6):786–94. And see also note 4, Scarpazza et al. 2018.

22. Farahany NA. Neuroscience and behavioral genetics in US criminal law: An empirical analysis. *Journal of Law and the Biosciences* 2015;2:485–509; See note 4, Gkotsi, et al. 2019; and de Kogel CH, Westgeest EJ. Neuroscientific and behavioral genetic information in criminal cases in the Netherlands. *Journal of Law and the Biosciences* 2015;2:580–605, respectively.
23. See note 22, de Kogel, Westgeest 2015:592–3 (with a minor change). See on this topic also Meynen G. Legal Insanity and Neurolaw in the Netherlands: Developments and Debates. In: Moratti S, Patterson D, eds. *Legal Insanity and the Brain: Science, Law and European Courts*. Oxford: Hart; 2016.
24. They also looked at genetic information, but this was only used in a small proportion of the cases.
25. Pardo MS, Patterson D. *Minds, brains, and law. The conceptual foundations of law and neuroscience.* Oxford: Oxford University Press; 2013.
26. Or other behavioral experts.
27. 'Veroordeling voor poging afpersing familie De Mol' 2015 Jul 2; available at www.rechtspraak.nl (last accessed March 20, 2020).
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29. Morse SJ. Brain overclaim syndrome and criminal responsibility: A diagnostic note. *Ohio State Journal of Criminal Law* 2006;3:397–412; see note 1, Bigenwald, Chambon 2019.
30. Shniderman AB. The selective allure of neuroscience and its implications for the courtroom. *The Jury Expert* 2014;26(4); see note 4, Scarpazza et al. 2018.
31. See also note 4, Gkotsi et al. 2019.
32. On this and what follows, see note 11, Meynen 2019; and note 1, Meynen 2016.
33. See also note 23, Meynen 2016.
34. And clearly, there is some overlap, e.g., regarding Tourette's syndrome and neurodegenerative disorders.
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37. See note 4, Gkotsi et al. 2019.
38. See note 4, Gkotsi et al. 2019.
39. Slobogin C. Neuroscience nuance: Dissecting the relevance of neuroscience in adjudicating criminal culpability. *Journal of Law and the Biosciences* 2017;4:577–93.
40. Some use the term 'brain reading,' see, e.g., Roelfsema PR, Denys D, Klink PC. Mind Reading and Writing: The Future of Neurotechnology. *Trends in Cognitive Sciences* 2018;22:598–610. See also, for the matters discussed in this section, note 11, Meynen 2019.
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42. Heyes CM, Frith CD. The cultural evolution of mind reading. *Science* 2014;344(6190):1243091.
43. See note 42, Heyes, Frith 2014.
44. This, as well as what follows about neurotechnological mind reading, is in line with Meynen G. Author's response to peer commentaries: Brain-based mind reading: Conceptual clarifications and legal applications. *Journal of Law and the Biosciences* 2018;5(1)212–6.
45. The term 'mind reading' is not ideal, because it does not concern actual 'reading,' but it is a term that is often used in this context (see note 42, Heyes, Frith 2014). See also Ienca M, Andorno R. Towards new human rights in the age of neuroscience and neurotechnology. *Life Sciences, Society and Policy* 2017;13:5. I will not use quotation marks around *mind reading* further in the text, but they are, in a way, intended.
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57. See also Yaffe G. Mind-Reading by Brain-Reading and Criminal Responsibility. In: Patterson D, M.S. Pardo MS, eds. *Philosophical Foundations of Law and Neuroscience*. New York: Oxford University Press; 2016.
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