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Forensic psychiatry and neurolaw: Description, developments, and debates

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ABSTRACT

Neuroscience produces a wealth of data on the relationship between brain and behavior, including criminal behavior. The research field studying the possible and actual impact of neuroscience on the law and legal practices, is called neurolaw. It is a new and rapidly developing domain of interdisciplinary research. Since forensic psychiatry has to do with both neuroscience and the law, neurolaw is of specific relevance for this psychiatric specialty. In this contribution, I will discuss three main research areas in neurolaw – revision, assessment, and intervention – and explore their relevance for forensic psychiatry. I will identify some valuable possibilities as well as some notable challenges – both technical and ethical – for forensic psychiatry regarding neurolaw developments.

1. Introduction

Neurolaw is a new, rapidly developing field of interdisciplinary research on the implications of neuroscience for the law and legal practices (Meynen, 2014). Neurolaw has a large area of overlap with neuroethics, and many neurolegal topics can just as well be considered as neuroethical issues, such as privacy and confidentiality in neuroscientific 'mind reading' (Meynen, 2014). Since forensic psychiatry has to do with both neuroscience and the law, neurolaw is of particular interest to this psychiatric specialty (Meynen, 2016b). In this contribution, I will explore the importance of neurolaw for forensic psychiatry.

Basically, neurolaw research can be divided into three domains (Katzenbauer & Meynen, 2017). The first area concerns *revision* of the law and legal practices. Neuroscience yields a wealth of results leading to an enormous increase of knowledge and information about brain and behavior. Such knowledge may provide grounds for reconsidering elements of the law and legal practices. For instance, some have argued that neuroscience convincingly shows that free will is an illusion, and based on that view, they propose to revise criminal law (see Section 2). The second domain concerns actual *assessments* of individuals using neuroscience techniques. These individuals can be, among others, defendants and prisoners. For instance, MRI may be used to diagnose a tumor in a defendant's brain. This is already happening, albeit in a small minority of criminal cases in the US as well as elsewhere (see Section 3). *Intervention* is the third area of neurolaw research. It considers whether and how direct brain interventions could be used in a way that is relevant for the criminal justice system, and forensic psychiatry in particular. Think of the possibility of deep brain stimulation (DBS) in treatment of a certain offender group (see Section 4).

Since neurolaw derives its relevance not only from the current state of neuroscience, but also from *anticipated developments*, at several points I will discuss possible future applications, such as brain based 'mind reading'. In that sense, we will be looking beyond today's horizon. There is a reason to do so, as Nadelhoffer and Sinnott-Armstrong explain: "The thoroughly interdisciplinary task of neurolaw is to stay a step ahead of the scientific progress on these fronts so that we can carefully think through the potential implications of introducing new neuroscientific techniques into the courtroom before they arrive."[1] Clearly, as far as the future is concerned,we cannot be sure about the course and speed of the developments. Yet, the future is too important to just "wait and see".

In this paper, in order to explore the relevance of neurolaw for forensic psychiatry, I will discuss each of the three domains – revision, assessment, and intervention – with an emphasis on the latter two.[2] Section 5 provides some concluding observations regarding technical and normative concerns.[3]

2. Revision and forensic psychiatry

Neuroscientific findings may give reason to reconsider elements of the law or legal practices. In this section, three examples of issues that have led to proposed law revisions are briefly discussed. First, the debate on free will in light of neuroscience observations, second,

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[1] Nadelhoffer & Sinnott-Armstrong (2012, p. 632).
[2] On this framework see also Meynen (2016a, 2016b).
[3] I distinguish between two types of normative concerns: legal issues on the one hand and ethical or moral issues on the other.

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adolescent brain development and criminal justice, and third, the neuroscience of control as related to the legal standard for insanity.[4]

Some have argued that neuroscience convincingly shows that free will is an illusion.[5] And since free will is required for responsibility, including criminal responsibility, they argue, no one is truly responsible for his or her actions. Furthermore, if no one is really responsible, there is no place for retribution, because nobody actually deserves to be punished. Therefore, the retributivist elements of the law, in particular criminal law, should be omitted – which would imply a far-reaching revision of criminal law. Although this line of reasoning has been the topic of much debate,[6] to my knowledge, it has not yet resulted in actual law revisions. Yet, the argument itself is clearly a neurolaw revision topic, since it proposes to reconsider a central element of criminal law based on – allegedly incompatible – neuroscience findings.

Could such a revision regarding the retributivist components of criminal law also be relevant for forensic psychiatry? If the law is no longer interested in a defendant's criminal responsibility, the insanity defense appears to lose its relevance, because this defense *exculpates* the defendant. If nobody is truly responsible, everybody is always exculpated, and there is no need for such a defense anymore (Meynen, 2016a). Yet, we should note that forensic psychiatrists not only play a role in insanity evaluations. They are, for instance, also involved in risk assessment. Risk will continue to be relevant even if retribution is omitted from criminal law, at least according to the consequentialist perspective suggested by (Greene & Cohen, 2004). Consequentialists can, they argue, justify punishment referring to protection of society (risk reduction), so psychiatrists could continue assessing defendants and prisoners.

The second revision example concerns adolescent brain development (Meynen, 2016a). Over the last decades, studies on the maturing brain consistently found that brain development continues for some years after the age of eighteen. Such findings were also presented to the US Supreme Court in so called Amicus Briefs. Probably these findings and pleas influenced U.S. Supreme Court decisions in *Roper* and *Graham*.[7] However, others have downplayed the impact of neuroscience findings on the Supreme Court's decisions (Glannon, 2011; Morse, 2011). Morse points to the fact that behavioral sciences already provided clear data about the course and nature of adolescent mental and behavioral development – neuroscience didn't add much. In any case, if it is true that neurosciences were not irrelevant in these legal decisions, the ‘adolescent brain’ is an example of neuroscience-based criminal law revision (Meynen, 2016a).

Penney has proposed another type of law revision, based on neuroscience, concerning the criteria for legal of insanity (Penney, 2012). Currently, not all jurisdictions have a control – or volitional – prong as an element of their insanity criteria; they may only include a cognitive element. For example, many jurisdictions use the *M'Naghten Rule*, which states:

> “At the time of committing the act, the party accused was laboring 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 what he was doing was wrong.”

This legal standard is only interested in epistemic issues: what did the defendant *know*? Whether or not – or to what extent – the defendant was able to control his or her behavior is irrelevant (see Meynen, 2016a).[8] Penney argues that a control prong should be part of the insanity test. One of his arguments is that neuroscience has convincingly shown the relevance and existence of problems of behavioral control in certain groups of people. Adding a control prong in those jurisdictions that are currently lacking such a component based on neuroscience information, would certainly fall within the neurolaw revision domain. This would also be directly relevant for forensic psychiatrists, because, when evaluating defendants, psychiatrists take into account the legal standard for insanity.[9]

In conclusion, because of neuroscience developments, there have been pleas for law revision regarding retribution, adolescents' culpability, and the inclusion of a control prong in the legal insanity standard. It is probable that regarding one of these – adolescent brain development – neuroscience has contributed to actual revisions, which is not a trivial issue. Future neuroscience-motivated law revisions could also be directly relevant to the forensic psychiatrist's task. This is one reason why it would be wise for psychiatrists to participate in debates about such neuroscience-motivated criminal law revisions.

3. Assessment and forensic psychiatry

As said, neurotechniques are already used in criminal cases, also in forensic psychiatric evaluations (De Kogel & Westgeest, 2015; Denno, 2015; Fuss, 2016; Rigoni et al., 2010). Such use often regards the detection of tumors, neurodegenerative conditions, and trauma-related brain lesions.[10] In fact, neurotests may also be performed to *exclude* the presence of pathological brain changes. In the standard case, imaging and laboratory tests in psychiatry are not used to confirm the presence of a mental disorder, rather to exclude a somatic (e.g., neurological) disease (Linden, 2012).

Some, among whom Morse, doubt that neuroimaging will be of much help to answer the legally relevant questions, e.g., concerning a person's criminal responsibility (Morse, 2018). Still, many agree that neuroscience can play a role in diagnosing certain medical conditions that, also depending on the jurisdiction, may be relevant for an insanity defense (or an automatism defense (Claydon, 2015)). In my view, it is difficult to exactly determine the value of neuroscience information and techniques in criminal cases *in general*. The reason is that criminal cases are about individuals and about their individual circumstances. Whereas in many cases, neuroscience won't be able to contribute anything, in others it may provide relevant – sometimes crucial – information, depending on the *constellation of findings* (Meynen, 2016a). This term should express that in a legal case, to answer a certain legal question, neuroscience information will always play its role amidst other information and evidence. While neuroscience may be powerless in many cases to help answering the question at hand, in others it may be highly valuable. And there are always peculiar cases in which neuroscience plays an unexpected role, e.g., because brain imaging reveals a tumor or neurodegenerative disease.

Yet, looking beyond todays' horizon, possibilities of a different kind of use of neurotechniques emerge, which are not aimed at detecting pathological brain changes. An example is the possibility of brain-

[4] See for the topics discussed in this section also Meynen (2016a, 2016b).

[5] See Greene & Cohen (2004) and see, e.g., Davies (2013) for a similar line of thought. Davies emphasizes that there is “converging evidence” (p.118) that we should doubt “the view of human agency implicit in the law” (p.113).

[6] Catley (2016) refers to this paper as “seminal” and a “celebrated essay”.

[7] Feld, Casey, & Hurd (2013) and Steinberg (2013), see also Catley (2016), according to whom English law has been less “receptive” to neuroscience evidence in this respect than the US legal system.

[8] The Model Penal Code test, meanwhile, does contain such a control prong. According to the Model Penal Code test, “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.” Model Penal Code (American Law Institute 1985). In many legal systems control issues can, in principle, result in legal insanity (Simon & Ahn-Redding, 2006).

[9] See, e.g., Knoll and Resnick: “When forming the opinion, the psychiatrist should use the exact language of the insanity standard employed in that jurisdiction at the time of the crime” (Knoll & Resnick, 2008). Still, this depends on the jurisdiction.

[10] Note that the conditions mentioned here are, first of all, neurological – rather than psychiatric – in nature. Surely, mental disorders may be associated with brain lesions, but, currently, those maladies that present with detectable brain lesions are usually considered to be neurological in nature.

based ‘mind-reading’ in forensic psychiatry, on which I will focus in the remainder of this section.[11] There are very different kinds of 'mind-reading' currently considered in the scientific debate; I will briefly discuss some types that could be relevant to forensic psychiatry.

The first type is brain-based lie-detection. Even though classical polygraph lie-detection remains controversial (Grubin & Madsen, 2005), currently there is an entire research field on brain-based lie-detection, mainly using fMRI. A major concern about lie-detection regards the possibility that the person who is tested takes ‘countermeasures’. These are deliberate actions by the subject to distort or manipulate the results of the test. The fact that such countermeasures are possible, clearly affects the reliability of the lie-detection technique (Ganis, Rosenfeld, Meixner, Kievit, & Schendan, 2011).

Why could lie-detection be helpful to forensic psychiatry in the first place? The reason is twofold (Meynen, 2017). Firstly, psychiatric assessments rely to a considerable extent – and certainly more than evaluations in any other medical discipline (Linden, 2012) – on history taking, and therefore, on the person's own words. Clearly, this is a vulnerability of psychiatric assessments, for instance, because patients may not know or remember something that is relevant, or because they may be reluctant to share certain information (paranoid patients unwilling to talk to the psychiatrist, for instance), or because they prefer to lie about certain issues (e.g., patients with antisocial personality disorder who want a prescription for benzodiazepines). Lying to a psychiatrist – “No, I don't hear voices”, “No, I don't have plans to end my life”, “No, I don't fantasize about having sex with children” – may have profound impact on the outcome of the assessment, also in terms of diagnosis. Therefore, in principle, lie-detection may be valuable in forensic psychiatry.

Secondly, in *forensic* psychiatry, because of the specific setting, people may be more tempted to lie and deceive compared to general mental health care. Malingering, faking, and dissimulation are important topics in forensic psychiatry (Feuerstein et al., 2005; Rogers, 2012). In fact, what happens in forensic psychiatry is that a medical practice that is highly reliant on what people say – psychiatry – is taken out of its usual health care context and put into a context – criminal law – in which the person's words may be a much less reliable source of information.

Considering the option of lie-detection, one of the first things that may come to mind is that it could negatively affect the doctor-patient relationship, because using such a technique is, in and by itself, a sign of distrust. In my view, this is a serious issue, because trust is a core value in medicine (Meynen, 2017). Still, sometimes the reliability of the information may be of great importance, and it could outweigh the possible negative effects on trust. In addition, some forensic psychiatric patients could themselves *request* to undergo a brain-based lie-detection procedure in order to invigorate their own words. Grubin (2010) provides the following perspective on polygraphy in forensic psychiatry:

> “For the forensic patient, polygraphy offers the opportunity to demonstrate that he is low risk, and it can encourage him to cooperate with treatment and management plans by making it explicit when he is not. It also allows intervention to prevent an increase in risk or relapse in symptoms. Although some may be worried that it will affect the therapeutic relationship with the patient, there is no evidence to suggest such an effect. After all, the aim is to encourage truth-telling rather than to catch the patient out in a lie.”

In light of this quote, it could be argued that even though a relationship of trust between a forensic psychiatrist and a patient may be desirable, the reality is that there may be some default distrust of a forensic patient. And lie detection could not so much introduce distrust as it could enhance reliability (and therefore trust), also because of the ‘encouragement’ to speak the truth that standard use of lie-detection might bring about; lie-detection may provide a powerful incentive to speak the truth. From this perspective, in principle, brain-based lie-detection could have a purpose in forensic psychiatry, if reliable techniques were available.

There are other types of mind-reading as well, different from lie-detection. Lies require statements by a defendant; as long as a defendant doesn't say or write anything, lies can never be detected. In that sense, lie-detection does not circumvent the problem that forensic psychiatry is to a large degree dependent on the person's spoken or written words. There may, however, be ways to get around this point. What could be done, in principle, in the future, is to 'read' a person's mind directly. This may sound like science fiction, but it is, in some form, already there. A patient in a ‘vegetative state’ turned out to be able to communicate with others by thinking about ‘tennis’ or ‘home’ – playing tennis being 'yes' and home being 'no'. The reason was that based on fMRI data, researchers could infer whether the patient was thinking of either 'tennis' or 'home' (Owen, 2012; Monti et al., 2010). In addition, Marcel Just reported that brain imaging combined with machine learning could 'detect' which physics concepts people were thinking of (Mason & Just, 2016). These remarkable findings are still far from actual ‘live’, real-time mind-reading of defendants in forensic psychiatric evaluations, but it is suggestive of such a technical possibility in the near future. Neuroscientific mindreading could make it possible to detect, for instance, delusions and auditory hallucinations, as well as sexual preferences – or make the presence of such phenomena less likely, which is also informative.

There is yet another purpose for neuroscientific mindreading techniques: to help predict recidivism. Currently, risk assessment tools in forensic psychiatry are far from perfect (Fazel, Singh, Doll, & Grann, 2012). Neuroscience may be helpful here as well. Using fMRI, a group of researchers was able to predict rearrest (Aharoni et al., 2013). Note that this is different from both lie-detection and the type of mind-reading just described. The reason is that even if a person's words can be checked using lie-detection and even if his thoughts can be ‘realtime’ read, this may, in itself, reveal very little about the risk of reoffending. There may be entirely different neurobiological parameters that are decisive for such a risk – and the person himself may not at all be aware of them. In other words, a defendant or prisoner may not be able to accurately assess his own risk of recidivism. For instance, a forensic psychiatric patient may sincerely feel that he is no longer a threat, and have the genuine wish never to commit a crime again (such intentions could even be visible when reading his mind), while in fact, he has a very high risk of reoffending (which could become clear in fMRI-based risk prediction). In this respect, it is of interest that a study showed that fMRI was better at predicting future behavior (namely using sunscreen in the next week) than the intentions expressed by the participants to use sunscreen (Falk, Berkman, Mann, Harrison, & Lieberman, 2010). So, neuroimaging designs may be better at predicting a person's future behavior than the person himself (Meynen, 2017). Clearly, it would be particularly helpful if the results of the risk assessment could also be used in order to intervene in such a way that the risk of that person is reduced.

Two concerns stand out regarding these forms of mind-reading (Meynen, 2017): first, their technical reliability, in particular the vulnerability of these techniques towards countermeasures and second, ethical and legal concerns, mainly regarding privacy[12] and the possibility of compulsory use of such techniques. For it may be that certain mind reading techniques could be used against a person's will. Under which circumstances would that be justifiable? These important issues will have to be addressed (see Section 5).

[11] On the matter of neuroscientific 'mind-reading' and forensic psychiatry, see also Meynen (2017), in which a tripartite framework for brain-basedmind-reading techniques is introduced. On conceptual issues regarding to neuroscientific 'mind reading', see Meynen (2018).

[12] See also Richmond, Rees, & Edwards (2012).

4. Intervention and forensic psychiatry

The third neurolaw domain is concerned with neuroscience-related interventions. One type regards *direct* brain interventions.[13] To my knowledge, these are not (yet) available for forensic psychiatric use.[14] Nevertheless, brain intervention in forensic psychiatry[15] is already considered as an option for the near future. For instance, Hübner and White discuss the possibility of neurosurgery for psychopathy (Hübner & White, 2016), while Fuss et al. discuss the possibility of DBS to reduce sexual drive in sex offenders.[16] Fuss et al. even identify certain brain areas of interest and argue that "compared with psychosurgical procedures, DBS is less destructive but rather reversible and more adjustable to the clinical symptoms and side effects. Small case series of DBS in the posterior hypothalamus to reduce aggressive behaviour have been performed successfully" (Fuss, Auer, Biedermann, Briken, & Hacke, 2015). At the same time they emphasize the ethical dimension of such a procedure, in particular regarding compulsory use:

> "Mandatory DBS … should absolutely not be an option … The motivation for DBS treatment should not be connected to any hopes/promises of prematurely leaving prison or a forensic treatment facility as in the 1970s when most of the imprisoned sexual offenders were released after the operation."

Although I sympathize with their view, I doubt whether it is realistic not to attach any hopes to such DBS interventions. When discussing the possibility of a far-reaching procedure like DBS with a forensic psychiatric patient, one will have to thoroughly discuss the potential consequences for the patient, in his or her own situation. What would be the pros and cons? What would it mean for him or her to have certain side-effects, and what would it mean if the DBS were successful? To me, it seems difficult to ignore the legal consequences of an effective therapy when weighing the pros and cons, in particular because of the relevance of such consequences for a patient; the possibility of being released is far from trivial.[17] At the same time, the point Fuss et al. make is relevant, and deserves serious reflection. Not only should the possibility of coercive treatment be carefully considered, but also forms of pressure and of "making an offer the person cannot refuse". Meanwhile, it is relevant that the DBS is reversible, which is different from traditional psychosurgery.

In any case, over the past few years the scope of conditions for which DBS is being used (in research settings) has widened considerably (Naesström, Blomstedt, & Bodlund, 2016), including impulse control disorders, which may be of particular interest to forensic psychiatry (Kasemsuk, Oyama, & Hattori, 2017). It might even be that future DBS devices become responsive to brain changes. In such a scenario, the DBS is not always active in the same way, but it could detect brain changes, predict future changes, and then respond to them.[18] Responsive and predictive brain implants may be valuable in forensic psychiatry: the DBS device could, for instance, respond to (neural correlates of) anger or sexual arousal – or more precisely: parameters associated with risk of re-offending. If it were possible to make such a DBS device, this could not only increase its effectiveness, but also reduce side-effects because the device only becomes active at certain points in time (Meynen and Widdershoven, 2017). Note that such a receptive and predictive brain implant combines assessment and intervention features: it continuously assesses risk parameters in the brain *and* it is able to respond with a particular type of stimulation to the increased risk parameters when measured.[19]

Even though the focus is on DBS, in the future, the direct brain-intervention may not only be surgical in nature. Gene editing techniques could enable us to mend the brain without surgery, avoiding surgical side-effects, but introducing other concerns.

Interestingly, Greely emphasizes that there may not be such a fundamental difference between brain interventions and traditional interventions to change criminal behavior:

> "I see no qualitative difference between acting directly to change a criminal's brain—through drugs, surgery, DBS, or vaccines, if proven safe and effective—and acting indirectly—through punishment, rehabilitation, cognitive therapy, parole conditions—to achieve similar ends. It is true that we understand better the likely effects of the traditional methods of trying to change criminals' behavior, including their strong likelihood of failure. Ignorance of a direct intervention's safety and efficacy would certainly be an important strike against its use, but if the intervention is proven safe and effective (again, to whatever standards one applies), direct and indirect interventions seem to me not importantly different."[20]

In other words, if we accept current medical intervention types used in criminal justice, then we may just as well accept brain implants, as long as they are sufficiently safe and effective.

Regarding interventions, two types of concerns stand out, which largely overlap with the assessment domain. The first type regards the technical aspects of the procedure. This concerns not only the effectiveness, but also its safety. Safety for the person himself in terms of brain damage or complications during the operation (such as hemorrhage), in terms of side-effects,[21] and in terms of harm to others (DBS could result in harmful behavior towards others, see, e.g., Müller et al., 2014). In the end, it will come down to the question: how safe is safe enough for the purposes? In order to answer this question, it is pertinent to know

[13] The neurolaw intervention domain need not be limited to surgical interventions, though, but can be considered more generally to encompass those applications that aim to *change the person's interaction with the environment* using brain technology. This means that brain computer interfaces, that, e.g., enable people to steer robotic arms with their thoughts also fall within the intervention domain. Such brain computer interfaces may also raise legal issues (Catley, 2016), but I will not discuss them here. Yet, they are highly relevant to neurology for paralyzed patients. In fact, whether or not a particular technique counts as assessment or intervention has mainly to do with its use. For instance, brain computer interfaces can also be used, in principle, to read a person's mind (Catley, 2016). If such a technique is used to read a person's mind within the context of a psychiatric assessment, this falls within the neurolaw domain of *assessment*. If, however, a similar technique is used to enable that person to perform daily life activities – thus changing the way in which the person interacts with his environment – this is an example of *intervention*. On the topic of intervention and forensic psychiatry see also Meynen (2016b) and Katzenbauer & Meynen (2017).

[14] If we leave out neurosurgical procedures to treat medical conditions such as brain tumors, mentioned above.

[15] For a discussion regarding the potential use of direct brain intervention in the criminal justice system, see Greely (2008).

[16] Non-invasive brain stimulation might also be an option, e.g., transcranial magnetic stimulation (TMS) (Greely, 2008; Heinrichs, 2012).

[17] See also Greely (2008, p.1135–6): "In the context of criminal sentencing, the convict may be given a choice between a sentence or a course of "treatment." The sentence is, we will presume, legitimate, imposed with due process of law and intended, one way or another, to protect or benefit society. In that case, the convict's choice is not entirely "free." It is certainly influenced by the knowledge that if he turns down the treatment, he faces, let's say, ten years in prison. Yet that prison term is legitimate, even presumptively just. And the treatment—assuming again that it has been proven safe and effective—is aimed at helping society (and arguably the criminal). We often make hard decisions, faced with real constraints. If the constraints created by the criminal justice system are legitimate, it seems hard to argue that a competent adult may not be allowed to make a choice between them."

[18] There is already an ethical debate about what such 'predictive brain implants' would mean for the person's autonomy (Gilbert, 2015; Widdershoven, Meynen, & Denys, 2015).

[19] There is still another type of neurolaw intervention: enhancement (Catley, 2016). This type of interventions is not 'treatment' but making a person 'better' in some respect – even though the line between the two is blurry (see Schermer, 2013). Yet, because enhancement concerns bringing about non-treatment changes, I will not consider it here, because psychiatry, as a medical discipline, is basically about treatment, not enhancement. (Still, if enhancement for certain mental faculties would become available it is not unthinkable that psychiatrists would play a role in the process, e.g., to perform a mental state examination before a procedure takes place.)

[20] Greely (2008, p.1134).

[21] Several cognitive and psychiatric side effects of DBS have been reported in the literature, among which depression, apathy, impulse-control disorders, disinhibition, hypersexuality (Müller, Walter, & Christen, 2014; Nassery et al., 2016; Pote et al., 2016), as well as personality changes (Müller, Bittlinger, & Walter, 2017).

and weigh the dangers of intervening and of not intervening. The possibility of hacking of a DBS device, as a new form of cybercrime, should also be taken seriously (Gasson & Koops, 2013).

Secondly, there are normative (ethical and legal) concerns. First of all, the possibility of compulsory use of direct brain interventions. In contrast to the assessment domain, privacy and confidentiality are less relevant in this domain, while the issue of freedom takes center stage: the freedom to refuse treatment and, in the same vein, the freedom of mind (Bublitz, 2011). Forced DBS could take away or modify parts of a person's mental life that – even though considered by society as riskful and perhaps abhorrent – are still valued by that person, or at least perceived as part of his identity. Brain implants may thus disrupt the integrity of a person's mental life. The question is: under what circumstances could an intervention in another person's brain – and mind – be justified?[22] Such questions may also have consequences for the revision domain. Bublitz (2011) argues:

> "When the natural boundaries of the mind, the skull, can be surmounted by neurotechnologies, normative boundaries have to be established. Thus, the law should recognise a mind-protecting right. In codified-law jurisdictions this means ultimately drafting and passing a bill; alternatively, existing statutes might be modified within the permissible margins of interpretation."

Developments in both the assessment domain and the intervention domain can give rise to law revision (Meynen, 2016a).

5. Concluding observations: technical and normative issues

Neurolaw is relevant for forensic psychiatry: each of the three domains of neurolaw research could impact on forensic psychiatric practice. Basically, regarding such developments, there are two types of concerns: technical and normative issues.

Technical qualms arise mainly in the assessment and intervention domains. They concern, firstly, the question of the reliability of the technique, in particular in a forensic setting, where subjects may be uncooperative and may be taking countermeasures to distort the measurements. At this point in time, it is safe to say that certain diagnostic procedures can be considered as reliable (e.g., MRI for circumscribed neurological conditions), but that brain-based lie-detection – let alone real-time 'mind reading' – are no technical possibilities for forensic psychiatry. An important point here is that the use of more than one technique may be helpful increasing the reliability of the evaluation: a brain MRI could be accompanied by a neuropsychological assessment. If the neuropsychological assessment fits the changes visible on MRI, this is important additional information. In forensic psychiatric practice, as a rule of thumb, it may be good not to interpret brain imaging without neuropsychological assessment (Katzenbauer & Meynen, 2017).[23] There is a second technical qualm, which mainly arises in the intervention domain: the safety of the procedure. Several types of safety worries can be distinguished, such as brain damage due to the procedure, side effects (e.g., of DBS stimulation), and harm to others because of unintended behavioral changes.

There are normative issues as well. They can be divided in two types of norms: legal and ethical. First of all, the law determines the *relevance* of neuroscience, for instance in the following way: suppose that in a particular jurisdiction, the *M'Naghten Rule* is in use as an insanity test. Then, the question of insanity comes down to whether a person knew the nature and quality of the act, and if he knew, whether he knew it was wrong. Whether the defendant was able to control his actions is not relevant according to *M'Naghten*. Neuro-techniques that help to assess behavioral control are, in principle, irrelevant in such a jurisdiction to answer the question about insanity.[24] In other words, the relevance of neuroscience techniques depends on the specific legal questions that have to be answered in a particular jurisdiction. There is yet another type of legal issue. It concerns the question whether certain techniques are *allowed.* For instance, there may be a test of admissibility of scientific evidence. In the US, *Daubert* and *Frye* are two different tests courts may use to determine whether techniques are allowed in the courtroom. In sum, ultimately, it is the law that determines the relevance of the technique as well as its admissibility.

Apart from the legal issues, ethical considerations should be taken into account as well. Even if the (criminal) law allows a forensic psychiatrist to perform certain types of neuroscientific assessment or to breach confidentiality, ethical or professional codes can still prohibit forensic psychiatrists to do so. A central normative – ethical as well as legal – topic concerns coercive use of assessment and intervention techniques. Basically, such use may be of two types: firstly, using direct physical force and, secondly, influencing a person's will (e.g., by threats).[25] Under which circumstances and in which ways is coercive use of a particular neurotechnique justified?

Finally, Morse draws attention to another ethical issue: "A major ethical lapse would occur if [forensic psychiatric and psychological] practitioners use neuroscience without the proper understanding" (Morse, 2018). This is a real risk because neuroscience is complicated[26] and because developments may go very fast, which makes it challenging to have up to date knowledge of the possibilities and pitfalls of a particular technique.

In conclusion, some emphasize the risks of using neurosciences in forensic psychiatry and call for caution – for good reasons. Naïve use of neuro-tools for legal and forensic purposes will do more harm than good. At the same time, neglect of potentially helpful neuroscientific insights and techniques – under the motto of 'being very cautious' – may also have negative consequences for the justice system, and for forensic psychiatric evaluations in particular. It could even result in a form of indifference and passivity regarding neuroscience developments. In my view, caution is a very valuable notion, just as long as it works both ways: trying to avoid the use of improper procedures, while also aiming

[22] See Bublitz (2011) for an interesting legal perspective. He emphasizes the right to "psychological integrity" as one of the fundamental rights in the EU; in addition, he states: "Almost ten years after its proclamation, the Treaty of Lisboa set in effect the Charter of Fundamental Rights of the European Union (EUCh) in December 2009. The Charter is the EU's first codified 'bill of rights' Art. 3.1 reads: "Everyone has the right to respect for his or her physical and mental integrity"."

[23] There is a conceptual issue here as well. One cannot draw direct inferences from data about the brain to judgments about rational capacity and control of criminal behavior, or lack thereof (Morse, 2011). As Morse and Roskies emphasize, "None of the criminal law's current criteria are brain states" (Morse & Roskies, 2013). There is, therefore, a significant gap between *empirical* judgments about the brain and *normative* judgments about the psychological capacity of criminal offenders. See on this matter also Meynen (2016a).

[24] They could still be relevant, however: when behavioral evidence is ambiguous, neurotechniques and the information they provide may help to disambiguate the evidence and help to inform a judgment about criminal responsibility.

[25] See the Stanford Encyclopedia of Philosophy on *Coercion*: "There are good reasons to treat coercion via the will and direct force or constraint applied to the body as two methods of a single kind of activity. First, though direct force is usually unsuited to get an agent to perform a specific action, both are well suited to preventing an agent from taking a variety of actions, with direct force or constraint often being more decisive. Second, the two techniques are often used hand-in-hand. For instance, police officers will shackle and man handle someone in custody who refuses to cooperate when given instructions to move or stay still. Also, prison inmates are coerced into remaining there by a combination of penalties for attempting escape along with physical obstacles that limit the feasibility of doing so." https://plato.stanford.edu/entries/coercion/

[26] One way to articulate the complexity of neuroscience interpretations is by the term 'inferential distance' (Roskies, 2008). Roskies emphasizes that to arrive at a neuroscientific conclusion, several inferences – or interpretative steps – are required. This is illustrated by fMRI: "Thus, functional MRI doesn't directly measure neural activity, but rather reflects the net effect of other physiological factors that are causally related in a rather *complex* way to downstream consequences of neural activity. From this signal, neural activity is *inferred* to have increased or decreased." (Roskies, 2008, emphasis added) Note that in the courtroom the inferential process is further complicated by the fact that not just the neuroscientist needs to reach a conclusion, but that the behavioral expert, prosecution, jury and judge also need to reach conclusions and make decisions based on the neuroscience findings.

to avoid disregarding potentially useful techniques – while taking into account the relevant legal and ethical issues. This implies that there is a duty for forensic psychiatrists to scrutinize current techniques for possible helpfulness in forensic psychiatric contexts and to stay up to date with the developments in order not to miss potentially useful neuroscience tools (Meynen, 2016a). This is a professional as well as ethical duty.

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