

Neurophilosophical Perspectives of Neuroimaging in Forensic Psychiatry—Giving Way to a Paradigm Shift?

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Forensic psychiatry is concerned with the relationship between psychiatric abnormalities and legal violations and crimes. Due to the lack of available biological criteria, evaluation and therapy in forensic psychiatry have so far been restricted to psychosocial and mental criteria of offenders' personalities. Recent advances in neurosciences allow a closer approach to the neural correlates of personality, moral judgments and decision-making. We propose to discuss the introduction of biological criteria in the field of forensic psychiatry and to establish rules as to what extent such biological criteria will be a better and more reliable choice in judging mentally ill criminals by using all available information that can be obtained by biological means.

Psychosocial and subjective criteria in forensic evaluation will be more and more accomplished by biopsychosocial and objective criteria. The responsibility of having committed a criminal act will no longer be exclusively defined by judging free and voluntary decision-making, but rather by brain-behavior relationships. What is often referred to as psychosocially determined mental processes thus could be complemented by estimating the degree of biopsychosocially determined neural processes. We conclude that such a process could contribute to a paradigm shift in forensic psychiatry, which will have profound implications for offenders, forensic psychologists and psychiatrists, the law and society in general. Copyright © 2008 John Wiley & Sons, Ltd.

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Recent progress in neuroscience raised a variety of questions on concepts and treatment in forensic psychiatry: First, is it possible to detect the reason for committing severe crimes in the criminal's brain? Or is it possible to trace urges such as those towards preadolescent children as found in pedophilic offenders back to their brains (Schiltz *et al.*, 2007; Walter *et al.*, 2007)? Will we be able to reproduce the emotional quality on which the crime was based and find deficits in emotion recognition in the accused persons (Wiebking *et al.*, submitted)? Second, would this insight allow us to detect a future risk, preventing severe delinquency by healing mental illness or excluding those who cannot be treated from society before crimes are committed? Furthermore, will criminal acts be prevented more reliably as reliable biological criteria of prediction are developed, referring to the fact that up until now we have lacked a risk assessment system that is fully satisfying (Hare, 2006; LeBourgeois, Pinals, Williams, & Appelbaum, 2007; Simon, 2007)?

Of course, as yet prognostic estimation of the risk for individuals to commit a criminal act still is hard to accomplish and biological criteria are still too far from being scientifically evaluated to contribute to final decisions in court or to find the right therapy regimens. However, the more we know about interactions of mental state and abilities to perform criminal offenses on one hand and biological changes on the other, the more we will be able to detect risks, thus contributing to the risk assessment that is done today. By doing this we will also be able to contribute to enhancing and improving the therapeutic process of patients in forensic psychiatric facilities.

Neuroscience is increasingly enabling us to reveal the neural correlates of originally philosophical and psychological concepts such as consciousness (Hoff, 2005; Northoff, 2004; Northoff & Bermpohl, 2004; Tononi & Edelman, 2000), free will (Wagner & Reinecker, 2003), personality (Canli & Amin, 2002), moral judgment (Greene, Somerville, Nystrom, Darley, & Cohen, 2001; Moll, de Oliveira-Souza, Bramati, & Grafman, 2002), decision-making (Bechara, 2004; Damasio, 1999a, 1999b, 2003a, 2003b; Fellows & Farah, 2005), and self (Gillihan & Farah, 2005; Kircher & David, 2003; Northoff, 2004). The detection of their underlying neural correlates has led to the development of new definitions and paradigms of these concepts. Many of them, however, are considered crucial in forensic psychiatry. Changes in these concepts thus imply a critical review of the status quo of risk assessment in forensic psychiatry. Being aware of the fact that current methods of risk assessment will not be replaced by biological criteria alone, in the near future we will face an increasing impact of such biologically and technically determined criteria in daily risk assessment, leading to gold standards that will include such methods. There can be no doubt that we need all available information to increase the reliability of risk assessment (Urbaniok, Endrass, Noll, & Rosegger, 2007).

Until now, neurobiological methods were estimated to be helpful in the sense of achieving merely diagnostic results resolving the biological underpinnings. With increases in our knowledge about the brain's function and its relation to actions of an individual, we will start to understand the assessment of risks referring as well to biological methods. As up until now standard methods of risk assessment have not been as precise as we expected them to be (Stadtland, Hollweg, Dietl, Reich, & Nedopil, 2005), there will be a wide range of further approaches of risk assessment that can enable us to understand biological details more precisely and thus improve

our actual standards (Nedopil, 2005). Furthermore, it will be extremely helpful to understand unsolved questions such as why the relationship between incarceration and recidivism among sexual offenders is not to be seen at all (Witzel, Northoff, Diekmann, & Bogerts, 2005; Witzel, Northoff, & Köhne, 2004). Obviously, the sentencing of sexual offenders to terms of incarceration appears to have little, if any, impact on sexual and violent recidivism following release (Nunes, Firestone, Wexler, Jensen, & Bradford, 2007), and their age is seemingly connected with biological processes that might lead to a decrease in relapse risk (Hanson, 2006).

Even in general psychiatry we face problems of delineating the demographic and clinical characteristics of high-risk psychiatric patients and of identifying modifiable aspects of aggression. Recently, there has also been increased interest in the development and testing of structured schemes for the assessment of risk for aggression within inpatient psychiatric settings. Yet, their ability to inform day-to-day treatment and management for purposes of identification and management of inpatient aggression is still to be considered rather weak (Ogloff & Daffern, 2006).

As an effect of ongoing changes, decision-making for example is no longer considered an exclusively rational process. Instead, it is considered to be strongly guided by emotional feelings (Bechara, 2004; Damasio, 1999a, 1999b, 2003a, 2003b; Fellows & Farah, 2005). If decision-making is indeed strongly guided by emotion, a murderer's decision to kill should be investigated in detail, if the technical methods to evaluate the degree of impact on an individual's ability to perform severe crimes are available and evaluated.

Up until now, predictions of severe delinquency have been based on somewhat unspecific risk factors, mainly relying on psychosocial criteria (Nedopil, 2005). Current methods, applying the Psychopathy Check List (PCL) developed by Hare (1991) for example, are mainly based on the individual psychologist's or psychiatrist's evaluation of personality.

The recent development of neuroimaging techniques step by step will allow neuroscience to perform more diligently an objective monitoring of the neural correlates of relevant core processes of moral judgment, decision-making, and personality. Allowing us to visualize distinct aspects of brain function (metabolites, blood flow, electric or magnetic changes, etc.), these techniques include positron emission tomography (PET), functional magnetic resonance imaging (fMRI), magnetic resonance spectroscopy (MRS), event-related potentials (ERPs), magnetoencephalography (MEG), and near infrared spectroscopy (NIRS) (Farah & Wolpe, 2004). Although application of these neuroimaging techniques in forensic psychiatry is in its infancy, some authors are already making reference to 'forensic neuroimaging' (Canli et al., 2002; Olson, 2005):

One goal of forensic neuroimaging is to determine, whether individuals with a reduced ability to feel empathy, guilt, or remorse for criminal acts exhibit a unique or distinctively to be detected neural signal. If so, this information could be used additionally to the methods currently performed by forensic psychiatry to monitor individuals at risk referring to their ability and risk to perform criminal acts or used in sentencing and parole decisions (Olson, 2005).

Neuroscience and neuroimaging thus seem advanced enough to enter forensic psychiatry. In our own investigations, for example, we found strong evidence for a mere biological criterion in pedophilic men who had committed severe pedophilic crimes (Schiltz et al., 2007). Thus, there are first considerable hints for having found

a biological trace and prerequisites of severe criminality. We assume that we will witness many such biologically based findings in the years to come and a specific discussion dealing with the use of such additional information, which should not longer be neglected.

However, the converse question must also be raised: Are the concepts and paradigms in forensic psychiatry ready for neuroscientific progress?

Treatment and management of patients in forensic psychiatry is very difficult and extremely time consuming (Witzel *et al.*, 2005), and last but not least highly expensive. Current research should strive to use all and even new approaches on mental illness to enable psychologists and psychiatrists to find a most effective treatment strategy for forensic psychiatric patients and to predict their risks of committing another crime most precisely in order to minimize risks for the community (Hare, 2006).

It can be argued that current concepts in forensic psychiatry should be extended in order to permit neuroscientific progress to enter this field, to achieve additional information about risk assessment and therapy evaluation as well. Given recent advances in neuroscience and its implications for underlying concepts and ethical questions (Farah, 2005; Farah & Wolpe, 2004; Illes & Kirschen, 2003; Illes, Kirschen, & Gabrieli, 2003; Moreno, 2003; Northoff, 2005; Northoff, Witzel, & Bogerts, 2006), we would like to propose a new field in forensic psychiatry to enhance the development of standards that will allow us to regularly evaluate and use the new approaches of neuroimaging in brain research (see also Figure 1).

ASSESSMENT IN FORENSIC PSYCHIATRY

Forensic psychiatry currently predominantly depends on clinical and subjectively based criteria (Nedopil, 2005). However, these criteria obviously very often vary interindividually and intraindividually by being assessed by different psychologists and psychiatrists (LeBourgeois, 2007). The main problem is that this can lead to different results in the assessments of an offender's level of responsibility and of the perpetrator's future probability of conducting further severe crimes. Moreover, therapy evaluation exclusively based on these criteria seems not to reach a level that is

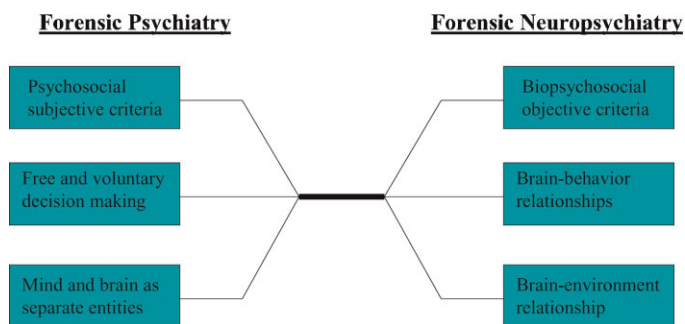


Figure 1. Paradigm Shift from forensic psychiatry to forensic *neuropsychiatry* in brain research.

desirable to meet highly reliable standards (Steadman & Keveles, 1972). Thus it should be discussed whether the additional use of biological criteria will be of further predictive use in evaluation.

Although specific treatment strategies for sexual criminals, for example, have proven to be efficient, authors have nonetheless reported false positive rates of about 65% for those perpetrators who had been judged dangerous by psychiatrists before, thus revealing a considerable level of inaccuracy in clinical forensic predictions (Kozol, Boucher, & Garofalo, 1972).

Therefore, it should be proposed to search for other criteria by using a different approach based on biological criteria such as those that neuroimaging can supply. Thus we will be able to achieve additional data that are independently assessed, avoiding subjective mistakes that originate mainly from individual assessment bias, but as well from systemic limitations of the tests. Numerous rating scales and algorithms have recently been developed for the assessment of an individual's psychiatric status in relation to violation of the law (Edens, Buffington-Vollum, Keilen, Roskamp, & Anthony, 2005; Grisso & Vincent, 2005; Herman, 2005; Miller, Amenta, & Conroy, 2005). Although rating scales such as PCL, HCR, and SVR 20 seem likely to be suitable for objectively measuring the risk of future criminality (Boer, Wilson, Gauthier, & Hart, 1997), the final decision remains within the domain of the psychiatric declaration, which could be optimized in quality and predictive significance if the information regarding the subject were extended to the biological field. Accordingly, these scales and algorithms mentioned still rely on subjective perspectives of the evaluating psychologist or psychiatrist, and we should try to help colleagues to perform a highly responsible and difficult job by supplying them with additional information. Still, the final psychiatric judgment will basically be a subjective approach, but combined it with biological criteria, which increasingly will be available in the immediate future, might lead to an increased level of predictive accuracy. As clinicians tend to produce errors in this area by focusing on dispositional variables (Monahan & Ruggiero, 1981), we should encourage the evaluation and application of new biological techniques.

It was further demonstrated that reliability based merely upon psychosocial biography is rather low (Quinsey & Ambtman, 1979). Experiments demonstrated the inability of forensic psychiatrists to achieve consistent results when the profiles of several offenders were presented and the risk of the subjects had to be assessed. The inter-rater agreement on the likelihood of an assault-related offense was considerably low (0.19–0.48). It was remarkable that teachers used as a control group achieved better results (0.24–0.57). Multiple regression analysis demonstrated that the psychiatrists' judgment revealed no distinctive elements. As a striking result we witnessed the results of another study, which revealed the psychiatrists' assessment abilities were often not better than these of people who were completely unexperienced in this field (Montandon & Harding, 1984). Nevertheless, these assessments may lead to severe consequences for individuals in trials and during the period of clinical treatment. Hopefully, the assessment ability of psychiatrists nowadays achieves a higher grade of predictive accuracy, but there is a striking doubt whether the risk assessment should be based on the methods mentioned above exclusively. Thus the need for additional investigator-independent—and thus hopefully more objective—criteria in current forensic risk assessment and therapy evaluation should lead to the development of an additional and strictly scientific

method of predicting crime and the outcome of treatment (Bandura, 1986; Finchham & Jaspars, 1980).

Biological criteria could contribute, for example, considering them to be objective criteria as they are provided by neuroscience, i.e. forensic neuroimaging in scanning the offenders' personality traits (Canli *et al.*, 2002; Moreno, 2003; Olson, 2005). This has also been called "brainotyping", and it reveals biological brain-based indices of the offenders' psychological states and traits (Farah, 2005). For example, functional brain imaging of murderers shows reduced brain function in the prefrontal cortex (Frierson & Finkenbine, 2004; Raine *et al.*, 1994, 1998). Many of the most abhorrent violent offenders show psychopathic personality disorders that can be characterized by moderate heritability (Slutske, 2001) and abnormalities in the orbital and prefrontal cortex and the amygdala (Blair, 2003, 2004; Brower & Price, 2001; Canli *et al.*, 2002; Kiehl *et al.*, 2001, 2004; Laakso *et al.*, 2002; Müller *et al.*, 2003; Wong *et al.*, 1997; Yang, 2005). Single case reports on pedophiles suggest abnormalities in the orbitofrontal and temporal cortices (Burns & Swerdlow, 2003; Cohen *et al.*, 2002; Dressing *et al.*, 2001; Flor-Henry, Lang, Koles, & Frenzel, 1991; Mendez, Chow, Ringman, Twitchell, & Hinkin, 2000; Wiebking, Witzel, Walter, Gubka, & Northoff, 2006). In our own investigations in this field we found alterations of the amygdala in most all pedophilic subjects remanded to a forensic treatment facility when sentenced (Schiltz *et al.*, 2007). Forensic neuroimaging could therefore provide biological brain-based criteria for additional forensic evaluation, which would complement the current psychosocial criteria, optimizing the risk prediction and therapy evaluation.

Thus, brain scanning could provide biological brain-based criteria of the offenders' personality traits; however, such additional information should be dealt with in a very careful way prior to an extensively performed scientific evaluation of these new methods. However, as yet there has been no striking evidence for neural correlates that reflect the type and severity of the offending behavior committed by the investigated subjects. Instead, they refer to the personality as a whole. Hence, the causal link between abnormal brain function on the one hand and striking abnormal personality traits and legal offenses on the other still remains to be explored intensively. To date we face initial results indicating that brain function, personality traits and legal offense might be dependent on one other (Canli *et al.*, 2002; Cohen *et al.*, 2002; Fagan, Wise, Schmidt, & Berlin, 2002; Mayberg, 1996; Raymond, Coleman, Ohlkerking, Christenson, & Miner, 1999). The fact that our knowledge in this field is still too limited to be of significant use in predicting violent behavior or criminal relapses should not lead to the conclusion that biological methods will never contribute to increased predictive accuracy. While methods currently used in forensic psychiatry are not promising further striking improvements, neuroimaging will give us the opportunity of a new approach.

The domains of forensic psychiatry are concerned with the risk assessment and evaluation of therapy of perpetrators to avoid further disadvantages for society in general. So far, we need further investigations in this field (Mulvey, Blumstein, & Cohen, 1986) to protect society from further criminal acts and as well to find a way to rehabilitate forensic psychiatric patients as quickly as possible, if there is no more risk to be detected in them (Witzel *et al.*, 2004). As we know regarding different investigations in this field, studies on risk assessment for example demonstrated that, instead of reasonable predictors, predominantly offense-related behavior such as

prior violence is strongly considered in predicting dangerousness (Cooper & Werner, 1990; Quinsey & Ambtman, 1979; Werner, Rose, & Yesavage, 1983). In contrast, we know from numerous studies that previous violence cannot be relied upon as a consistent predictor of future violent behavior (Black & Spinks, 1985; Ennis & Litwak, 1974; Hall, 1987; Holland, Holt, & Beckett, 1982; Pollock, McBain & Webster, 1989; Quinsey, 1979; Wenk, Robison, & Smith, 1972). All measures proposed by the evaluator will be aimed at reducing the risk and danger for society. Whatever conclusion the forensic psychologist or psychiatrists demonstrate in court, the result might be to consider the offender a social outlaw. Although colleagues working with forensic psychiatric patients give emphasis to an accurate prognosis and therapeutic aspects of forensic hospitalization, the effects for accused persons in court and later for patients in forensic psychiatry are highly dependent on their results for years to come. Considering additionally biological brain-based criteria as well as psychosocial criteria, the judgment and assessment generally might be more reliable and thus produce more clarity in predicting outcome and risk.

However, the elucidation of biological abnormalities raises the issue of possible and novel forms of pharmacological, psychotherapeutic or surgical therapy, such as those currently being developed in neuroscience (Chatterjee, 2004; Fins, 2003; Mashour, Walker, & Martuza, 2005; Sententia, 2004). As soon as there is a relevant therapeutical approach to biological and associated psychosocial and behavioral abnormalities, the focus of forensic evaluation will be extended: There will be a shift from mere analysis of risk to possible therapy strategies, thus giving hope even to those subjects who have been judged to be long-term patients up until now.

The additional use of neuroimaging procedures in the assessment of risk and as well in applying therapeutic strategies could lead to a perception of criminal individuals that is based on aspects of biological brain changes that provoked and started mental illness. The individual affected by mental illness that leads to the commission of serious crimes will be judged more objectively using biological criteria as well. Demonstrating that the criminal proband was not involved in the development of the brain disease that might have contributed to his criminal actions could make him even less responsible than people suffering from a heart attack who could have changed their style of living prior to the myocardial infarction. This is not to say that the philosophy of responsibility for criminal actions in court should be completely rewritten, but it could give more insight into the personal meaning of subjects with mental illnesses leading to delinquency.

Rather than reducing the commitment of a crime to merely psychosocial and biographical factors, using neuroimaging procedures the crime itself could then represent and explain the the relationship and interaction between biological damage in the sense of predispositions and the impact of psychosocial environment—thus the brain might be considered regarding the offenders' environment and thus as embedded (see below). The specific relationship between biological brain function and psychosocial environment could be helpful in establishing new approaches in assessment and therapy of mental ill offenders.

Finally, the concept of biological, brain-based criteria is expected to enter forensic psychiatry during the years to come, the neuroscientific dimension supplying forensic psychiatry with more detailed information. Analogously to biological psychiatry, we will face the development of a psychiatric field in the sense of biological forensic psychiatry. In order to avoid a splitting of biologically directed fields in psychiatry, we

should however try to establish a general biological approach that is directed to psychiatry as well as forensic psychiatry.

A split between biological and social forensic psychiatry would represent an incompatible development of a new field in psychiatry with the focus on biopsychosocial interactions cutting across such a division (see above). We therefore prefer to introduce the term forensic neuropsychiatry, with the term neuropsychiatry indicating a focus on biopsychosocial relationships (Northoff, Witzel, & Bogerts, 1997). Accordingly, the underlying concept will change from forensic psychiatry to forensic neuropsychiatry, which will be able to assess, describe and use biopsychosocial results in risk assessment as well as in therapy.

PARADIGM SHIFT IN THE DEFINITION OF RESPONSIBILITY AND BLAME

Moral and legal responsibility are based on and traced back to our ability to make decisions. If offenders are considered capable of making free and voluntary decisions, they will be held responsible. Mental illness might lead to the inability to meet free decisions, thus the resulting in the defendant being exculpated.

The offender must be able to select alternatives without confounding his decision-making process. Thus, the decision is made voluntarily. This absolute sense of free and voluntary decision-making can be presupposed to be a mental process taking place within a psychosocially determined environment. The decision to commit a crime is thus traced back to an aberrant mental attitude caused by the “wrong” psychosocial environment—to realize this and to change his aberrant mental attitude the offender is placed in jail as a sort of psychosocial educational means. Taken together, contemporary forensic psychiatry can be said to base its concepts of responsibility and blame upon free and voluntary decision-making as a psychosocially determined mental process. This, in turn, provides the opportunity to consider subjects to be not guilty in the sense of penal law and to be sentenced to detention hospitals instead of being sent to prisons.

Recent advances in neuroscience show that decision-making is not merely a psychosocially determined mental process; instead, it is a bio-psychosocially determined neuropsychological process. As such, decision-making might not be as free and voluntary as presupposed in forensic psychiatry. Bechara (2004) and Damasio (1999a, 2003a), for example, demonstrated that decision-making is not only modulated by cognitive function but also strongly guided by emotion. The total lack of emotion leads to aberrant decision-making, as can be seen for example in “cold-hearted” murderers and extremely violent criminals (Blair, 2004; Canli *et al.*, 2002; Damasio, 1999a, 2003a). Regarding this, it is important to refer to the crucial role of emotions in committing a crime, because differential involvement of cognitive and emotional function implies different characterization of decision-making. Cognitive functions such as categorization, judgment, distinction, etc. allow us to prefer alternative choices and subsequently free and voluntary selection of the most appropriate one from which the individual expects to profit best.

However, with emotions being involved in decision-making, the alternatives available to an individual may be biased according to his or her current emotional

state. For example, a depressed state, even in a healthy subject, biases the development of alternatives, preferring those with predominantly negative outcomes. The development of alternative choices in emotionally guided decision-making might therefore no longer be considered as “free” as assumed in current legal concepts that influence daily practice in forensic psychiatry.

Furthermore, because of predominantly negative feelings the selection might also be biased with regard to unfavorable choices. Selection of choices in emotionally guided decision-making might thus no longer be as “voluntary” as assumed in general. Obviously there is an “emotional bias” that confounds our ability to make “free” and “voluntary” decisions in an absolute sense. Such “emotional bias” could, for example, be of central importance in pedophilia. In a recent study, pedophilic subjects were demonstrated as showing severe abnormalities in the Iowa Gambling Task (IGT), a measure of emotionally guided decision-making (Wiebking et al., 2006). Additional tests of other emotional dimensions revealed deficits in recognition, identification, and discrimination of other persons’ emotions, thus accounting for what has been clinically described as ‘emotional immaturity’ (Cohen et al., 2002; Fagan et al., 2002). Most importantly, a significant correlation between the IGT as well as the emotional tests mentioned above and sexual–pedophilic symptoms was observed. The decision-making of our pedophilic probands should not thus be characterized either as “free” or as “voluntary”.

Emotional processes involved in decision-making can be shown to be connected with specific neural correlates. Neuroimaging studies and observations in patients with brain lesions show that the medial orbital and ventromedial prefrontal cortices (MOFC, VMPFC) are crucially involved in emotionally guided decision-making (Bechara, 2004; Damasio, 1999a, 2003a; Hornak et al., 2004; Northoff, 2004; Rolls, Tovee, & Panzeri, 1999). Other regions include the sub-cortical and cortical areas of the limbic system, a system that is also considerably involved in emotional processing (Murphy, Nimmo-Smith, & Lawrence, 2003; Panksepp, 1998; Phan, Wager, Taylor, & Liberzon, 2002). Similar regions have been shown to be of high importance in developing moral judgments. They are activated much more intensively than by emotional judgments (Greene et al., 2001; Moll et al., 2002). Most importantly, the very same regions have been shown to be abnormally altered in criminal psychopaths and pedophiles (see above and Canli et al., 2002). These findings suggest that decision-making and moral judgment based upon neural processing in relation to emotions are probably abnormally altered in at least some groups of offenders.

It will be important to demonstrate that the current basis for determining responsibility and blame is the access to free and voluntary decision. This kind of free and voluntary decision should be referred to if an offender is to be blamed in court for committing a crime. Thus in most legal systems it is very important to distinguish between free (voluntary) and non-free (involuntary) decision-making in performing a criminal act (Hart, 1968). Only if the latter is the case can the offender no longer be held fully responsible and culpable for committing a crime. Thus, it will be of high interest to discuss the question of whether the introduction of bio-psychologically determined processes in decision-making will lead to a new insight regarding responsibility of offenders. Neuropsychiatric investigations on this subject will have to deal with this question.

Voluntary decision-making even in healthy subjects is not compatible with recent insight in neuropsychological processes such as emotions involved in making decisions. In merely psychosocial terms, therefore, free and involuntary decision-making in an absolute sense should be referred to as a myth. Instead, brain behavior directly connected with decision-making and moral judgment should be considered when defining the domain of responsibility and blame (Denno, 2003; Greene *et al.*, 2001; Morse, 1998). Accordingly, there is a need to sensibly shift the domain of responsibility and blame regarding free and voluntary decision-making of merely psychosocial terms to brain-behavior relationships which are closely connected to our decision-making and related to emotions.

Accordingly, we may conclude that the nature of irresponsible behavior changes. Criminal acts should no longer only be traced back to psychosocially determined mental processes that are referring to free and voluntary decision-making in an absolute sense. Instead, criminal acts must be assumed to be caused by biopsychosocially determined neural processes governing decision-making in relation to emotions. This type of decision-making can no longer be considered "free" and "voluntary" in a traditional sense: Responsibility and blame are thus to be explained by biopsychosocially determined neural processes rather than by psychosocially determined mental states.

Finally, the concept of sentence with regard to the definition of responsibility and blame should be discussed. If responsibility and blame are defined by free and voluntary decision-making originating from a psychosocially determined mental process, the sentence will be considered to be a punishment intending to force the sentenced offender to change his decision-making process and moral judgments. This concept, even when trying to focus on therapy, would therefore be restricted to rather unspecific therapy without revealing processes that could directly interfere with the disorders to be found in the offender.

However, when responsibility and blame are defined by determined neuropsychological processes, being sentenced to prison will be of no remarkable effect, as can be seen in worldwide available statistics referring to the risk of recidivism of prisoners (Nunes *et al.*, 2007).

In this regard we have to recognize that the offenders' personality traits bias their decision-making process and moral judgment in an emotional respect. Any action designed to force them to change these must be considered senseless as they will remain principally unable to change them by virtue of their very personality.

The concept of sentencing thus should be discussed to find ways of interactions that will lead to a changing pattern of behavior and will redefine the efficacy of sentencing. Thus prisoners could benefit from a specific therapy in regard to their altered brain-behavior relationships. This might lead to a change in their specific personality states and traits in order to enable them to meet more appropriate decision-making and moral judgment. Even in difficult cases there will be a variety of concepts to be developed in the field of ambulant therapy to avoid recidivism. Sentencing can thus be complemented by specific therapy to decrease the number and the severity of criminal acts.

Accordingly, the concept of sentencing focusing on responsibility and blame needs to be discussed in order to realize that there is a need of detecting changes of abnormal decision-making processes in order to enlarge our therapeutic strategies of such altered brain behavior that originally generated these processes.

METAPHYSICAL PRESUPPOSITIONS ABOUT MIND AND BRAIN

Forensic psychiatry is bound to evaluate mentally ill criminals and thus dealing with the processes of decision-making, which is related to the committed crime with regard to the psychosocially determined mental processes. What does this imply in a metaphysical respect? Mental processes presuppose the metaphysical assumption of mind. This raises the question of the relationship between mind and brain/body, which is discussed as the mind–brain problem in philosophy (Moreno, 2003; Northoff, 2004). Does current forensic psychiatry presuppose mind–brain dualism or does it reduce the mind to the level of the brain? The current neglect of biological brain-based criteria in favor of an almost exclusive focus on psychosocial criteria and mental processes supports the impression that in forensic psychiatry of today the mind is assumed to be a separate metaphysical entity, clearly distinguishable from brain and body. Accordingly, forensic psychiatry seems—at least implicitly—to presuppose mind–body dualism.

This bias of mind–body dualism hereby may be related to the predominant importance of the normative level as distinguished from the descriptive level that characterizes neuroscience. The neuroscientific perspective concerns empirical criteria, which remain merely descriptive, because they do not imply any norms or values. For example, the characterization of decision-making as brain based and involving neural processes focuses only on empirical criteria and thus concerns the descriptive level. In contrast, the normative level focuses on elucidating norms and values; it therefore no longer focuses on the brain itself; instead, it focuses on the mental processes within the respective psychosocial context out of which norms and values result (Northoff, 2004). For example, decision-making is no longer considered in descriptive terms; instead, it is considered in normative terms, e.g. in relation to norms and values of the psychosocial environmental context. Since offenders and criminals violate norms and values, forensic psychiatry is forced to focus on the normative level and to consider decision-making in predominantly normative terms, which however should not be confused with the implication that forensic assessment would be restricted to ascribing “guilt”. The current normative focus, however, largely neglects a descriptive level and this further implies that the psychosocial environment becomes detached from both brain and body, resulting in implicit mind–brain dualism in forensic psychiatry.

Given recent advances in neuroscience, this neglect of the descriptive level can no longer be maintained. As we have demonstrated in the cases of decision-making and moral judgment, neuroscience promises descriptions in domains that have so far been exclusively described in normative terms. The concepts originally characterized as merely normative thus need to be characterized both descriptively and normatively. What does this imply for metaphysical presuppositions about mind and body? Inclusion of the descriptive level implies that empirical criteria characterizing brain and body function should no longer be neglected in forensic accounts of decision-making. Most importantly, brain and mind need to be related to each other in order to link descriptive and normative levels. Metaphysically, this implies a mind–brain interaction (see Moreno, 2003; see also for example Eccles, 1977; Penfield, 1972).

Mind–body interaction still maintains the assumption of mind and body as separate and distinct metaphysical entities, which interact with each other. If,

however, decision-making can be traced back to brain-based neuropsychological processes, the assumption of any kind of mind—irrespective of whether or not it is interacting with the brain—becomes rather problematic. Although this leads some neuroscientists to favor a mind–brain reductionism (Farah, 2005; Moreno, 2003), by doing so a crucial problem would be raised in forensic psychiatry: Complete reduction of the mind to the brain implies that the normative level is traced back to and completely accounted for by the descriptive level. In the same way as forensic psychiatry almost completely neglected the descriptive level, mind–brain reductionism implies the reverse, the neglect of the normative level.

Accordingly, mind–brain reductionism is as inappropriate for forensic psychiatrists as mind–brain dualism is for neuroscientists (Kennedy, 2004; Notterman, 2004), since this will no longer allow the inclusion of norms and values, both strongly depending on the psychosocial context.

Regarding the fundamentals of the conceptualization of the forensic patient, the forensic psychiatrist is confronted with a dilemma. Both types of mind–body solution, whether dualism with or without mind–brain interaction or monism as reductionism of the mind to the brain, are insufficient to fully account for the complex bio-psychosocial interaction between descriptive and normative levels.

One possible solution for future forensic neuropsychiatry therefore is to be seen in focusing on the interaction between brain and environment to account for the link between the descriptive and the normative levels. Thus the relationship between brain and environment becomes doubly crucial: the environment in relation to the brain as well as the brain in relation to the environment.

In order to avoid both mind–body reductionism and mind–body dualism, the brain could no longer be defined as isolated from the environment, as an “isolated brain”. Instead, the brain should be defined as intrinsically related to—and thus embedded within—the environment: what has been called the “embedded brain” (Northoff, 2004). The “embedded brain”, being crucial in decision-making and moral judgment, accounts for brain–behavior relationships as well as for bio-psychosocial relationships (Gabbard, 2005), as focused on in forensic evaluation (see above). Moreover, the concept of the brain as “embedded brain” enables the descriptive and normative levels to be linked. Finally, the definition of the brain as “embedded brain” implies that the metaphysical problem of mind–brain relationship becomes replaced by the question of brain–environment relationship (Northoff, 2004; Tononi & Edelman, 2000; Varela & Shear, 1999).

The characterization of the brain as “embedded brain” implies a paradigm shift in the metaphysical definition of the mind–brain relationship. Most importantly, thus, the focus of metaphysical considerations on forensic psychiatry is no longer on different entities (substances or properties), such as the mind and brain, but is placed, instead, on relationships, such as that between brain and environment. This changes the nature of explanation. The cause of moral violation and crime is no longer an abnormal mind making aberrant decision and moral judgment. Instead, the cause of moral violation and crime is traced back to a dysfunctional brain–environment relationship manifested both in abnormal brain-based neuropsychological processes and in aberrant norms and values. Accordingly, the nature of explanation shifts from an abnormal mind to a dysfunctional brain–environment relationship.

Finally, the concept of mind and brain itself might change as well. If the concept of brain and mind as metaphysical entities is replaced by the relationship between brain

and environment, metaphysics in forensic psychiatry focuses on relationships—and specifically on that between the brain and the environment—rather than on entities. This itself favors the consideration of mental and neural states as distinct forms of describing brain–environment relationship rather than being associated with different entities such as brain and mind. Brain and mind would then no longer be considered metaphysically. Instead, they are then considered epistemically, as distinct forms of description (Gabbard, 2005). Accordingly, the concept shifts from that of brain and mind as metaphysical entities to that of mind and brain as distinct ways of describing the brain–environment relationship.

In practice, the shift in metaphysical assumptions about entities such as brain and mind would support that both diagnosis and therapy in forensic psychiatry need to focus on relationships rather than on merely influencing either brain or mind. This in turn would allow the linking of the descriptive and the normative level and thus the creation of a direct relationship between abnormal brain functions on the one hand and aberrant decision-making and moral judgment leading to the crime on the other. Elucidation of the brain–environment relationship might thus be considered crucial in accounting for a crime in biosychosocial terms. For example, pedophiles demonstrated abnormal emotionally guided decision-making in the Iowa Gambling Task (IGT) (Wiebking et al., 2006). The very same task has been shown in healthy subjects to be associated with neural processing in the ventromedial prefrontal cortex (VMPFC) (Damasio, 1999a). Considering abnormal emotionally guided decision-making in pedophiles, we would expect an abnormal relationship between VMPFC function and IGT performance. This is just an initial step in relating the descriptive and normative levels to each other without subsuming or even reducing them.

Prognosis in forensic psychiatry would thus no longer focus on abnormal mental decision-making and moral judgment, but rather on the possibility of restoring the dysfunctional brain–environment relationship. Depending on environmental influences, anatomical and functional brain states develop in different ways. This underlines the importance of investigations on the relationship between anatomical and functional brain states as well as environmental influences. Research on neuroplasticity and neurodevelopment (Braun & Bogerts, 2001) as well as investigations on effects of therapeutic efforts in forensic patients on brain functions might thus be considered of high importance in accounting for complex brain–environment relationships.

CONCLUSION

We have referred to the impact of recent advances in neuroscience in the field of forensic psychiatry. As far as the forensic evaluation, definition of responsibility and blame and metaphysical presuppositions about mind and brain are concerned, it was argued that introduction of neuroscientific methods, especially those from the advancing field of neuroimaging, would lead to a paradigm shift in forensic psychiatry (see Figure 1).

Forensic evaluation shifts from the analysis of merely psychosocial subjective criteria to that of bio-psychosocial and objective criteria. The definition of responsibility and blame shifts from free and voluntary decision-making as a psychosocially determined mental process to brain–behavior relationships referring

to decision-making as a biopsychosocially determined neural process. Finally, the shift of metaphysical presuppositions about mind and brain concerns the replacement of the concept of brain and mind as isolated metaphysical entities, including the concept of a brain–environment relationship with the brain being referred to as the “embedded brain”.

Such a paradigm shift could also contribute to resolving some of the ethical dilemmas present in current forensic psychiatry. For example, therapy of offenders is legally permitted only if the personality, which means the brain as a whole, remains unchanged—whatever this means. If, however, abnormal personality features are brain based, performing therapy on brain function with consecutive restoration of “normal” decision-making functions and moral judgment implies making therapeutic changes in the structural personality. For example, parts of the brain will have to be altered in their original anatomy and function. This will have implications for the legal context: possible therapy and subsequent structural changes of the brain will be necessary to achieve the therapeutically desirable changes in the offender’s personality. Changes may be considered that result in personality changes being no longer contradictory to forensic neuropsychiatric therapy. Furthermore, legal changes would have to accommodate the necessary changes in the concept of sentencing and in the definition of responsibility and blame. However, the legal system itself also has to be referred to as a system exhibiting special social interactions, leading to the probable discovery of alternative ways of regulating as depicted here (Appelbaum, 1998; Hart, 1968).

Prior to the transformation of current forensic psychiatry into forensic neuropsychiatry, many empirical issues must be resolved and the emerging field of forensic neuroimaging must be developed and evaluated to a much greater extent. This will allow us to see a more clear-cut distinction between offenders as psychiatric patients and offenders as “healthy” subjects. Findings both highly specific and sensitive are needed to add sufficiently discriminative aspects when establishing biological markers of forensic diseases. Results as they are reported for example in the prefrontal cortex (Burns & Swerdlow, 2003; Mendez *et al.*, 2000) still have to be regarded with caution. Differential alterations of these regions during decision-making, moral judgment and emotional processing in the different groups of forensic offenders need to be demonstrated. Based upon their distinct approaches to sexual acts, we assume different psychological and neural correlates of sexual violation in violent psychopaths and seductive pedophilic sexual criminals. This comparison between different forensic groups, which differ only in one specific—but legally relevant—characteristic (*i.e.* whether their approach to the sexual act is either violent or seductive) while having in common others (legally prohibited sexual acts), is needed in order to further specify results from forensic neuroimaging. It is also necessary to distinguish between state and trait markers. Canli and Amin (2002) focused predominantly on trait markers and found traits of the personality that could predispose an individual to commit a crime. However, what still remains unclear is how such traits affect and causally impact the decision to commit a crime.

At this point, further scientific investigations are urgently needed that broaden our knowledge on how the interaction of traits and the situational context, *i.e.* the individual acute state, is represented on a neuronal level.

As a further, probably slower, effect of the paradigm shift depicted here, forensic neuropsychiatric clinics will not only be considered merely locations to prevent risk

and danger for society by containing offenders. Instead, forensic neuropsychiatric clinics might be much more regarded as therapeutic clinics where dysfunctional brain–environment relationships are improved. As a final effect of this paradigm shift, there might be a society that will learn, at least partly, to consider crimes and offenses as symptoms of a mental disease, as is commonly known in the case of drug addiction.

The introduction of modern neuroscientific techniques in clinical practice in forensic neuropsychiatry may therefore contribute to reduce the moral stigma society currently attributes to offenders and criminals. Taken together, forensic psychiatry in the form of forensic neuropsychiatry will be able to provide therapy on the biopsychosocial basis of the offenders' personality, with forensic evaluations focusing more on therapy than responsibility and guilt, which could finally reduce society's fears with regard to mentally ill criminals.

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