

1. Introduction

According to Jeffrey Rosen (2007), the breakthrough of neuroscience having an impact on law can be dated back the case of Weinstein from the early 1990s. The case dealt with a 65-year-old man who had brutally killed his wife and had thrown her out of the window afterwards to make it look like suicide. His lawyers then suggested not to hold him guilty due to a mental disorder namely an abnormal cyst, which encompassed the brain “like a spider web” (Rosen, 2007). In the end, Weinstein was held guilty but his charge was reduced to manslaughter only. This case therefore implies what value neuroscience might add to law in the future.

In recent years critiques of collective sentencing and imprisonment have gained importance. Alarming numbers of overcrowded prisons and extraordinary high rates of recidivism have drawn attention towards legal proceedings and the imposition of sanctions and sentences. Moreover, assessments of forensic psychologists appeared to be of rather less accuracy in terms of predicting the propensity of a perpetrator to re-offend. At the same time, the field of neuroscience has experienced significant progress in exploring our brains and the connection to our minds. More precisely, the research on correlations between specific brain functioning and appertaining human behaviour has remarkably advanced in recent years. Certain methods have been developed allowing for brain imagining and lie detection to a certain extent. For this reason, the field of ‘neurolaw’ has emerged with emphasis on the impact of neuroscience on law. Proponents of the latter suggest that neuroscience may serve as evidence to support solving questions of guilt and punishment and help to advance the forecast of future criminal behaviour. Especially in the light of emerging neuroscientific findings both legal and neuroscientific scholars have argued for a reform of the justice systems towards more individualized litigation and a greater focus on rehabilitation instead of incarceration.

Conventional rehabilitation methods such as occupational and psychological therapies, however, largely experience scepticism and reluctance among the public and policy makers due to rather unsatisfactory results (Chen & Shapiro, 2007). Nevertheless, a growing number of scholars believe that neuroscience may indeed add value to rehabilitation methods and thus improve general results. Although imprisonment brings along some problematic issues, according to the German Ministry of Justice (2013) probation as an alternative also shows its limitations namely high rates of recidivism of those who were out of prison based on probationary sanctions. Nevertheless, linked to effective

neuroscientific rehabilitation methods probation could gain more popularity. Therefore, the question arises in how far could probation be an alternative to imprisonment when linking it to effective neuroscientific rehabilitation methods? To which degree would this be legally and ethically acceptable?

To answer those questions, this paper briefly assesses the debate of imprisonment and recidivism first in relation to retributivism of society. Then brain disorders and different methods of rehabilitation are discussed in particular real-time fMRI neurofeedback. The following section elaborates the concept of probation and its potential as alternative to incarceration if linked to neuroscientific rehabilitation. The paper concludes with explaining the problematic nature of certain rehabilitation measures and an assessment of legal and ethical issues.

2. Punishment: The Problem of Incarceration

When a person commits an offence of unlawful character he or she will be punished for doing so. This concept of punishment is utterly accepted by society and every child is raised and educated with regard to it. Nevertheless, due to the fact that offences may be of different severity punishment has to be appropriate as well as proportional. At present times, however, overcrowded prisons imply potential overcriminalization of offences. Additionally, incarceration bears high costs for both prisoners and society.

2.1. Criminal Law Theory: Retributivism and Society

Criminal justice practice involves three major components: criminalization, enforcement and punishment. Criminal law theory addresses all three components. This paper, however, focuses only on punishment as component. There used to be two main approaches to justify punishment that are commonly recognized: retributivism and utilitarianism, which may be considered as the best-known version of the consequentialist theory (Brown, 2012). Retributivist adherents believe that punishment needs to be imposed on the offender because he or she deserves it. Retributivism may also be called the 'agent-relative' doctrine because it requires that the perpetrator's culpability alone determines the degree of punishment. As Moore (2010) states: "[f]or a retributivist, the moral responsibility of an offender also gives society the duty to punish" (p.90). Moreover, supporters believe in a broader authority of the state meaning a wider range of obligations than it is believed

in other approaches. In this context, only the punishment by the state for wrong actions meets offender and victim with respect. In fact, these norms rather than the aim to improve public order and safety are the state's main goals for enforcing criminal law. Opposed to this, adherents of the utilitarian theory believe that punishment needs to have the goal of improving the safety and well being of society as a whole (Gruber, 2010). Utilitarianism as an approach focuses only on the consequences of an action and does not consider the intrinsic character of a plot itself. In the context of this theory, it is assessed whether criminal punishment in fact has a net benefit for the society. To be more concrete, punishment is regarded as tool used "to deter, rehabilitate, or incapacitate, so its form should be designed to serve those goals" (Brown, 2012, p.74). In other words, utilitarians perceive punishment as an instrument designed particularly to foster a specific aim. Jeremy Bentham was the first to clearly formulate utilitarianism as a theory with the purpose that society should maximize its utility meaning the minimization of aggregate pain and maximization of aggregate pleasure (Bentham, 1970). Moreover, he was the first to unambiguously state that prevention of criminal acts shall be given priority: "general prevention ought to be the chief end of punishment, as it is its real justification" (Bentham, 1970, p.396).

In the beginning of the twentieth century retributivism lost importance and was neglected as a legitimate goal of the society. However, towards the end of the century the retributivist theory gained attention again and finally established itself as the dominant theory of criminal prosecution. Jean Hampton (1991-1992) stated that "[t]here has been a steady rise in the popularity of retributivism over the last decade, which is surpassing given its near death in the 1950 and 1960s" (p.1659). Several courts incorporated retributivism in their criminal jurisdictions and several states of the US even adopted retributivist features in their penal codes.

Generally speaking, criminal law with distinction to civil law has a rather harsh character as it defines offences by the fault that has been done and the blameworthiness. Nevertheless, many observers argue that especially the Anglo-American codes "overcriminalize, meaning that statutes label conduct as criminal that should not be so label[ed] because the conduct is not sufficiently harmful and wrongful, and committing it does not manifest culpability" (Brown, 2012, p.29). Although it spread in recent years, the Problem of overcriminalization as presented in the United States appears differently and more limited in Europe. However, "European countries are increasingly creating crimes that prohibit conduct well before it causes harm" (Molina, 2011, p.127). Despite that, in

continental Europe the principle of culpability is largely respected meaning a person may only be punished if he or she is culpable. In this context, Europe does not have those strict liability offenses and therefore less overcriminalization. Moreover, continental Europe's law system prevents offenders from being punished twice for the same perpetration (Molina, 2011). Neuroscience with its new findings will certainly have an impact on law meaning in particular "people's moral institutions about free will and responsibility" (Green & Cohen, 2004, p.1775). In this context, "a shift away from punishment aimed at retribution in favo[u]r of a more progressive, consequentialist approach to the criminal law" may be expected (p.1775).

In a general sense, the criminal justice systems around the world show retributivist features. Moreover, retributivist principles have a powerful moral and political appeal (Tonry, 2004). This is because the society largely belongs to the libertarian notion of free will, which is perceived as partly integral of human dignity (Green & Cohen, 2004). Libertarian free will implies that human beings are free agents being alone responsible for their actions and free from any determination or constraints. Moreover, all "free will theists" believe that libertarian freedom is crucial for moral responsibility. Therefore, Libertarian freedom is the freedom to act on own accounts with sufficient control of one's nature, predisposition and desires, such as pride and jealousy. Responsibility, in this regard means that one had a free choice and could have acted differently (Clarke, 2003). As Kant (2002) already put it in his work, punishment must be adequate and proportionate to a person's internal 'wickedness' rather than only serving future social welfare (p.179). Nevertheless, it has to be stated that retributivism as it was 20 years ago is hardly any existent. The emphasis shifted also towards safety and well being of society instead of just punishment because the offender deserves it. At present times, the common legal approach towards criminal law does indeed show also utilitarian elements whereas a retributivist tenancy and the aim compensate the victims of an offense with 'adequate' punishment prevail (Green & Cohen, 2004). In that context, the persistent criminal law theory could be described as utilitarian retributivism. Certainly, there is always the tension between sanctions that work and sanctions that hurt (Cullen & Gendreau, 2001). Nevertheless, prosecution has rather departed from the purely punitive approach towards a more societal approach.

2.2. Incarceration and Recidivism: A Complex Relation

The term rehabilitation is rather broadly used meaning any form of treatment after criminal offences. Incarceration in this sense is the most common method used to treat

criminal offenders (Eagleman & Flores, 2012). There is a common presumption that one more offender in prison is one less criminal person in the streets (Cullen, 2006). For a long time now, it is generally accepted and believed that incarceration as such is a deterrent tool against potential criminal offenders. More specifically, deterrence theories assume that harsh punishment is likely to reduce future individual criminal behaviour. In this context, the public as well as policy makers are largely convinced that serving a prison sentence has “powerful deterrent effects” (Gendreau et al., 2000).

In recent years there has been a substantial increase in the number of prisoners, which suggests that imprisonment is the most frequently used form of sanction to incapacitate offenders (Drago et al., 2011). Certainly, this is also linked to overcriminalization as mentioned earlier. For example between 2001 and 2010 the number of prisoners increased by 41,54 percent in the France, by 21,9 percent in Italy, by almost 4 percent in the Netherlands and by 26,7 percent in the United Kingdom. In the United States between 2001 and 2009 the numbers of prisoners increase by 17,2 percent (Eurostat, 2009). However, imprisonment as treatment bears non-neglectable physical costs and social consequences for the respective perpetrator and society. For instance, serving a prison term largely implies the destruction of social contacts and personal relationships of the perpetrator. Moreover, it may damage employment opportunities and thus takes away the basis for an independent life after prison. On top of this, certain studies suggest that serving a prison term implies the production of more criminality. In this context, the data of specific research clearly suggests that prison, as deterrent tool, is not supported. Rather the opposite is assumed meaning that prisons can be perceived as “schools for crime” (Gendreau et al., 2000, p.4). This is mainly because being in jail means being introduced to other criminal offenders with diverse criminal backgrounds. It is not unusual that criminal circles are being established in prison, which may lead to potential drug use and membership of gangs both during the time of sentence and afterwards (Eagleman & Flores, 2012). For this reason, Cullen (2006) argues that all policies supporting this common presumption that offenders in prison do not pose a grave risk by recklessly distributing short and long prison sentences are “destined for failure” (p.667).

Sutherland (1939) already identified that “the essential reason why a person becomes criminal is that they have been isolated from the culture of the law-abiding group” (Sutherland, 1939, p.595). In that sense, criminality is the by-product of isolating a person from culture and therefore, imprisonment as it implies even greater isolation is not likely to enhance this problem. Early criminologists understood that any treatment could only

be successful and effective if the target is the cause of recidivism (Cullen & Gendreau, 2001). Already Sutherland (1939) recognized that “a large proportion of the offenders under the care of any agency are recidivists” (p.585). Moreover, he suggested that harsh punishment of the offender is ineffective because it does not address the cause that once produced the criminal act. In their study of 2007 on harsh prison conditions and recidivism Chen & Shapiro (2007) made use of individual-level data and found evidence that being incarcerated in higher security prisons indicates that after release the person shows a higher tendency to re-offend. On top of this, Drago, Galbiati & Vertova (2011) argue that “[a]lthough it is to some extent a popular view that being tough on inmates can “rehabilitate” them, we do not find evidence supporting the idea that harsher prison conditions reduce recidivism” (p.107). The empirical analysis based on the Italian Department of Prison Administration (DAP) rather showed that harsh prison conditions in general increased rates of recidivism. In particular the growth in numbers of deaths among Italian prisoners revealed a significant increase in re-offences of fellow inmates (Drago, Galbiati & Vertova, 2011).

The Office of Justice Programs (OJP) belongs the United States Department of Justice. It is an agency with emphasis on crime prevention through research and development. The graph below withdrawn from their database illustrates the rates of re-arrests of offenders released in 1994 from prisons in 15 States of the United States.

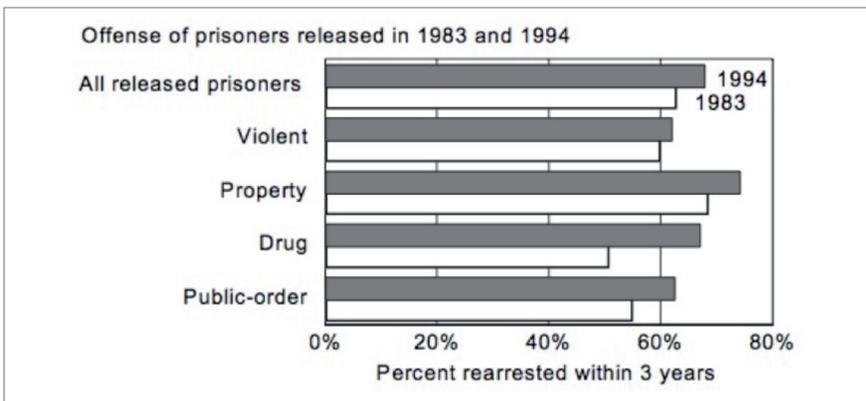


Figure 1: Re-arrests of prisoners released in 1983 and 1994 in the US; Source: Langan & Levin (2002), *Special Report of the Bureau of Justice Statistics, June 2002*

In 1994 almost 300 000 prisoners were release in 15 States of the US. Of those a percentage of 67.5 was rearrested within three years after the first criminal act. In comparison, a similar

study of 1983 estimated only 62.5 percent of rearrests among the released. The highest rates of rearrests as illustrated in the graph can be found among property offences with more than 70 percent. Nevertheless, drug and public order offences as well as violent acts show also high numbers above 60 percent. The record makes clear that a considerable amount more than half of the released offenders in those 15 States repeatedly committed a criminal offence within three years after release. Generally speaking, this implies how serious the problem of recidivism in fact is. Those findings are supported by the study of Spohn & Holleran (2002) where they found no evidence that incarceration lowers the rates of recidivism of drug offenders in any kind. Instead the opposite had to be noted stating that offenders who had to serve a prison term generally showed higher rates of re-offending (Spohn & Holleran, 2002).

In Europe on the contrary, general rates of recidivism depend on the effectiveness of the different systems for criminal justice. So far there is little harmonization and standardization achieved between the European member states. Nevertheless, there are several common features that can be discovered as identified by the European Sourcebook of Crime and Criminal Justice Statistics. The most important predictors of re-offending are past criminal offences meaning “the highest rates being from offenders with the longest criminal history” (Aebi et al., 2010, p.294). However, no relationship could be identified between the degree of seriousness of an act and rates of recidivism. In Germany, for instance, a study from 2004 until 2007 of the Ministry of Justice showed that of all incarcerated people in that time frame only 33,7 percent re-offended within three years after release (German Ministry of Justice, 2013). According to the Ministry of Justice of the United Kingdom (2013), England and Wales have recidivism rates of only 26,9 percent in terms of an offence committed within one year after release with a court conviction. These numbers do not appear particularly high, however, they include all offenders regardless whether they were imprisoned in the first place or convicted differently. In other words, these numbers incorporate any offences of civil law, public law and criminal law and therefore the propensity of being incarcerated is usually rather low in particular with the former two kinds of offences. The Dutch Ministry of Justice (2013) recently published a study on recidivism rates in the Netherlands with distinction to whether were incarcerated or punished otherwise. These numbers appear to be much more expressive as almost 50 percent of former inmates re-offended within two years after release.

Already Sutherland (1939) favoured correctional policies that would facilitate social contacts of offenders. For that reason, he suggested probation as tool of ‘punishment’ in

order to allow and support perpetrators to establish social relations within the society rather than isolating them. Furthermore, he argued to make use of parole, which is similar to probation but only begins after a certain period of serving a prison term. In this context, the most beneficial option would be individualized ‘punishment’ serving as an effective tool due to the fact that imprisonment alone does not necessarily protect society in the future (Sutherland, 1939). This “leads to the inescapable conclusion that, when it comes to reducing individual offender recidivism, the [successful method] is appropriate cognitive-behavioural treatments which embody known principles of effective intervention” (Gendreau et al., 2000, p.4).

3. Brain Disorders and Different Methods of Rehabilitation

Any kind of obstacle that hinders a person to think and decide freely and independently may be considered as mental or brain disorder. Such disorders clearly affect a person’s ability to choose and thus it has also an effect on the process of making decisions (Buchanan, 2000). Consequently, “this could indeed explain why [it] undermine[s] our capacity – at least in some instances – to conform our conduct to the requirements of the law” (Meyen, 2013, p.94). Kalis et al. (2008) identified three different stages in the decision-making process of a person. First, options are generated, second, options are selected and third, the action is initiated. Each of those different phases of decision-making can potentially be affected by mental disorders.

Recent studies showed evidence that people with psychopathic tendencies have some kind of attention-deficit disorders. It appears that those people have difficulties to identify reasons against performing a certain action (Shaw, 2012). Furthermore, Breiter et al. (2001) explain a relation between a dysfunction of neural mechanisms and impulsive behaviour. The former can potentially lead to different impulse disorders, such as abuse of drugs and gambling issues. ADHD patients⁷, as another example, showed correlations with taking higher risks when making decisions (Meyen, 2013). Those capacity deficits may be potential targets for neuroscientific rehabilitation methods. More precisely, neuroscientific methods, such as fMRI Neurofeedback, might facilitate a “better distinction between those cases in which a mental disorder is related to an increased risk of recidivism and those in which

7 ADHD stands for ‘adult attention deficit hyperactivity disorder’

this is not at all the case” (Meyen, 2013, p.97). The following sections outline the challenges for neuroscientific rehabilitation measures and specific methods, which may be used.

3.1. The Problem of Awareness

A brain injury through whatever reasons may cause impaired self-awareness and harm rational decision-making. Nevertheless, the absence of awareness of brain disorders does have consequences for patients participating in rehabilitation programs and thus their well-being. This is in particular because the main goal of rehabilitation methods is to address and eliminate disorders in the brain of the patient. More precisely, “[a]wareness is an important issue to address in brain injury rehabilitation” (Fleming & Ownsworth, 2006, p.475). Therefore, it is essential to improve self-awareness among offenders suffering brain abnormalities. Furthermore, self-awareness has to be achieved prior to cognitive rehabilitation measures in order to make the latter effective and successful (Simmond & Fleming, 2003). In this context, the terms awareness and disorders in the brain have to be defined. Although, there is no unilateral definition of it, Prigatano and Schacter (1991) put emphasis on self-assessment describing awareness as “the capacity to perceive ‘self’ in relatively ‘objective’ terms while maintaining a sense of subjectivity” (p.13). The term disorder on the other hand was clarified by Barco et al. (1991) as “inability to recognize deficits or problem circumstances caused by neurological injury” (p.129). As mentioned earlier, there is a need for awareness interventions as part of the rehabilitation programmes, which are individually tailored for the clients. The difficulty, however, lies in the fact that awareness as such cannot be measured in numbers but rather has to be inferred (Simmond & Fleming, 2003). On top of this, there has been almost no critical analysis of the issue, although it is generally understood that neuroscientific rehabilitation methods are profitably for the clients and society.

Prigatano (1991) states that a difference could be detected between patients who successfully completed the rehabilitation program and patients who abandoned the treatment. The former showed a good self-awareness, whereas the latter showed discrepancies between the ratings of members of staff and their self-awareness. These results shows two things: first, that self-awareness plays a significant role in the results of effective rehabilitation and second, that if there is no self-awareness effective rehabilitation may not have the desired impact on the client. In other words, the general problem of self-awareness lies in its character of being a “substantial barrier to successful rehabilitation outcome” (Prigatano, 1999, p.146).

3.2. Rehabilitation and Correctional Measures

As mentioned earlier, incarceration as ‘rehabilitation method’ portrays a rather problematic issue bearing decisive costs and consequences. Opposed to this common presumption that offenders are harmless when being in prison there is also the common wish that imprisoned perpetrators would leave prison less criminal than when they were incarcerated in the first place (Cullen, 2006). Rehabilitation in terms of enhancing criminal offenders still holds a rather unpopular position because it potentially brings benefits to the perpetrators and thus is considered as ‘welfarist’ (Gruber, 2010). This was brought to a point where voices even called for a permanent incapacitation and thus incarceration to ensure the safety of society. This is why utilitarian adherents used deterrence as their crucial justification for punishment.

Many rehabilitation methods can be considered as progressive concept in line with the “culture of control” by Garland (2001), which describes current legal systems as more adaptive towards social control. Moreover they can be said to compete with the system of ‘mass incarceration’ (Nagin et al., 2006). The challenge therefore is to bridge the gap between simple incarceration and policies for correctional practice. In this context, however, a clear vision of rehabilitation and correctional practices is needed, in particular because the range of possible corrections differs immensely in terms of severity of the intervention (Cullen, 2007). For this reason, it’s the task of criminologists to establish clear guidelines for rehabilitative and correctional measures.

Most incarcerated people show severe difficulties in controlling their impulses. However, it would be wrong to assume that those people are actually oblivious to what is best for them. It is rather the frontal lobe that is responsible for long-term considerations and that is sometimes powerless against short-term desires and urges treated in the amygdala (Eagleman & Flores, 2012). Hence, it is essential to bear in mind that “the brain operates like a team of rivals” (Eagleman & Flores, 2012, p.165). In that sense, it is important to include the latest scientific findings and incorporate them into the justice system in order to better understand what actually is taking place in the minds of criminal offenders. Cullen & Gendreau (2001) even suggest reducing punishment and harming while giving offenders certain rights in order to keep them in the community by any means.

The task therefore is to create a system providing for individual risk assessment, such as a ‘neurocompatible criminal justice system’. While no system should treat similarly

situated individuals differently fair systems should not fail to account for the differences” (Eagleman & Flores, 2012, p.166). Up to the present individual risk assessment has indeed taken place already. For instance differences are made between adults and adolescence due to their different stages in the development of controlling impulses. Moreover, there is made a distinction between crimes of passion and premeditated offences. Nevertheless, the problem of recidivism is not yet solved as mentioned earlier and therefore, individual risk assessment has to be extended. In particular because reports on criminal offenders often differ dramatically from how they actually behave once released. For instance, when assessing the condition of sex offenders before being released “psychiatrists and parole board members had the same predictive accuracy as coin-flipping” in determining whether a person would be likely to re-offend (Eagleman & Flores, 2012, p.167).

Recently, evidence has grown that rehabilitative treatments for offenders in statistical terms do in fact reduce the recidivism rates. In addition it has been found that punishment-oriented treatments for offenders are rather ineffective and do not improve the numbers of re-offenders (Cullen, 2006). Furthermore, the expense factor of rehabilitation treatments is decisive due to the fact that – according to a growing body of evidence – the latter is much more cost effective than conventional punishments, such as incarceration. Nagin et al. (2006) conclude that especially with emphasis on juvenile offenders the threshold to an approach of rehabilitation, which is in particular public reluctance, is more presumed than fact.

Neuroscientific rehabilitation methods do include occupational therapies, psychological therapies and brain interventions. Occupational therapies in that sense imply the use of treatments geared to further develop, recover, or maintain daily routine and working skills of patients suffering from mental disorder. Psychotherapy implies therapeutic treatment aiming at an increase in the sense of well-being of the patient. Finally, brain interventions can be performed through different methods, such as electric stimulation, pharmaceuticals and surgery. This paper, however, focuses on real-time fMRI neurofeedback only and its potential contributions to the criminal justice systems. Some scholars describe real-time fMRI neurofeedback as non-invasive (Caria et al., 2012), whereas others such as Greely (2012) define all sorts of behavioural treatments as brain interventions. This paper assumes real-time fMRI to be among non-invasive behavioural treatments and thus no brain intervention as such.

3.3. Real-Time fMRI Neurofeedback

Real-time functional magnetic resonance imaging (fMRI) is a method, which detects changes in hemodynamic properties of the brain meaning changes in the blood-oxygen level- dependent (BOLD) in relationship with engagement in different mental tasks. Real-time fMRI or fMRI Neurofeedback allows the observer to measure brain activity while the person being tested is addressing different tasks. This subsequently allows the experimenter to non-invasively study the effects of brain activity on behavioural characteristics by choosing specific tasks for the person to be tested (Caria et al., 2012). Prof. Dr. Goebel, professor for cognitive neuroscience at Maastricht University, described real-time fMRI as close to meditation in which they found which parts of the brain visualize different states of mind.⁸ It therefore can be described as visualization of task-related brain activity or as 'frontal lobe workout' according to Eagleman and Flores (2012). Presumably, the most striking application of neurofeedback is the possibility to take possession of "volitional control of localized brain activity using real-time fMRI [...] protocols" (Caria et al., 2012, p.487).

Certainly, an individual study for each patient has to be designed in advance defining the physiological target and response and thus the study depends on the behavioural effects that are desired. The procedure works as follows: a patient lies in the scanner and receives online information through a screen on how active a particular part of his or her brain is at the moment. The delay of the protocol as such is only a few seconds and thus there is almost real time transfer of data from the person's brain, namely from the artifact detection to the estimations of activation. The neurofeedback then is projected on the screen and can be directly observed by the patient. The latter then attempts to control the activation in the targeted brain area by using different mental strategies. These can include "anything from simple finger tapping to mental imagery or complex cognitive tasks" (Sulzer et al., 2012). Neurofeedback as such is usually presented as 'thermometer display' or scrolling curve showing the activation of the brain. Each run may take up to 15 minutes and may be repeated up to five times within the session. Usually patient enjoying this treatment do have around ten sessions. The overall aim is to get patients to practice volitional control activation in specific parts of their brains. In other words, when a patient performs a task the neurofeedback tells him or her directly afterwards how active certain

8 Personal Meeting with Prof. Dr. Goebel on April 23, 2013 at the Faculty of Psychology

brain areas were during the specific performance of the task. The patient's assignment then is to work on this brain activity and gain control over it using the given feedback. After the patient has successfully completed the sessions he or she will be tested whether the acquired skills can be applied without feedback while performing different tasks in different settings.

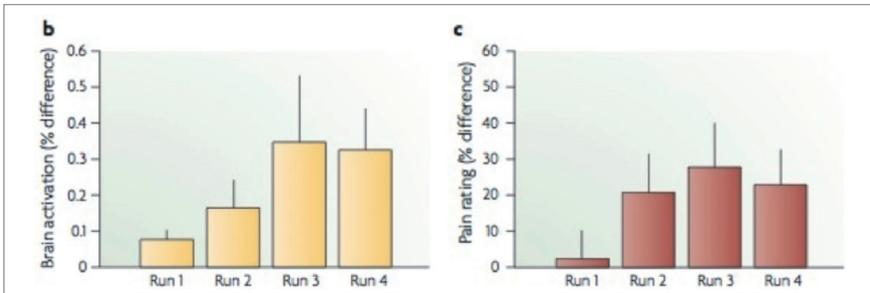


Figure 2: Impact of training on brain control and pain perception; Source: deCharms (2008)

Figure two illustrates in how far training can lead to spatial control over activation of areas in the brain and a change in for instance pain perception thereof. Part b) of the figure shows an increase in the average difference in functional MRI (fMRI) signals received from a patient's brain. Each run consisted of five cycles, in which the patient was asked to switch between increasing and decreasing brain activity. As can be detected from the bars, there is a learning process in which patients showed increasing control over their brain activation. Part c) of the figure shows the perception of pain of the same patient. In this experiment it can be clearly detected that there is a correspondence between the degree of brain activity and the perception of pain. More precisely, due to more runs the patient was able to increasingly control his or her subjective pain experience (deCharms, 2008).

Generally speaking, the more we learn about brain activities and their impact in behaviour, the more rational approaches one can make towards solving potential disorders. Up to present times, neurofeedback deals with disorders in the brain namely stroke, addiction and autism, which are decisive challenges of public health for the method (Caria et al., 2012). Nevertheless, the method has high potential for more development in particular towards patients with neurological or psychological disorders, as less is currently known about the latter. Therefore, it is particularly crucial to distinguish between training to improve circuits, which show deficits and training of 'compensatory' circuits, which are to replace lost functions. In recent years, real-time fMRI studies have shown that learned

control over brain activity in certain areas responsible for motor, sensory, cognitive and emotional processing can be acquired in relatively few neurofeedback sessions. The process of learning includes “updating expectations of the outcome proportionally to prediction error, in a way that across trials the expected outcome converges to the actual outcome” (Caria et al., 2012, p.492). In other words, real-time fMRI neurofeedback contributes to changes and potentially to an optimisation in the patient’s behaviour.

4. Probation as Alternative: Effective Rehabilitation in lieu of Jail

As mentioned earlier, rehabilitation methods enjoy controversial debates among the public and policy makers. Nevertheless, certain studies have suggested that the public opinion on such measures is not as negative as often presumed in particular with juvenile offenders. Previously, public surveys often revealed that more severe methods of punishment were demanded also towards juvenile offenders. Admittedly, this was mostly in the context of extremely violent offences, such as school shooting and other rampages. When surveyed in a neutral context, however, citizens were much more willing to support rehabilitative programs instead of incarceration for juvenile offenders (Nagin et al., 2006). In a specific study on treatments of juvenile offenders, Nagin et al. (2006) found that “respondents on average expressed somewhat greater willingness to pay for rehabilitation [...] than for longer incarceration [...] of youths charged with serious crimes—and even greater willingness to pay for an early childhood prevention program” (p.642). These findings serve as evidence that citizens are generally willing to pay for rehabilitative treatments that assure to diminish crime among juveniles and for preventive programs instead of longer periods of imprisonment. Moreover, the results are of importance for policy makers as the latter “often justify expenditures for punitive juvenile justice reforms on the basis of popular demand for tougher policies” (Nagin et al., 2006, p.627). Furthermore, Farrington and Welsh (2007) found that there is also growing proof that early programs for interventions are effective and successful. These findings in turn might imply the possibility of a coherent framework of neuroscientific interventions from the moment of committing the crime until adulthood. In that sense, policy makers should move away from quickly supporting punitive treatments and rather consider rehabilitative measures as response to public opinion.

This leads to the question of probation and its possible benefit when linking it to rehabilitative measures. Probation is a form of sentencing that allows the perpetrator to stay out of prison with judicial supervision and under certain conditions determined by the court. It is a legal tool to both deter and punish criminal offenders. Generally speaking, the measure is considered as a “rehabilitative process intended to give an offender the opportunity to develop skills and moral principles necessary to forestall future criminal activity” (Stickels, 2007, p.33). In practical terms, however, perpetrators mostly fail to satisfy their probationary guidelines usually resulting in a recantation of probation and thus imprisonment. In 1991, nearly half of all prisoners in the United States committed their latest offense while being out of prison on probation (Dilulio, 1997). This is supported by the study of the Germany Ministry of Justice (2013) on recidivism where perpetrators with probationary sentences show higher rates of recidivism. The main reason for this phenomenon is that offenders after conviction are left without support for reintegration in society away from the criminal environment. As Dilulio (1997) puts it “we spend next to nothing on the systems, and get about what we pay for” (p.41). In order to make probation a more effective and thus successful toll, investments have to be made. In addition, an improvement in probationary statistics would serve the general interest due to the fact that probation is by far more cost effective than incarceration.

Linking it to neuroscientific methods, such as fMRI Neurofeedback, the process of probation could be supported. Unfortunately, statutes and laws often require incarceration of offenders having committed certain acts. At the same time, however, prosecutors often face cases in which they have to impose incarceration despite the fact that the risk of recidivism is low and rehabilitation rather likely. Generally speaking, a low propensity of re-offending and good prospects of rehabilitation could cause incapacitation of prisoners to be useless (Seave, 1993). In those cases lawmakers should be encouraged to foster probationary sentences based on correctional and rehabilitative measures. This approach should be pursued in particular, when there is a low risk of recidivism given. Certainly, there might be the possibility of disparities between offenders having committed similar crimes in terms of punishment. Nevertheless, the states of mind and different motivations should be taken into consideration and thus individualized sentencing in order to ensure effectiveness and long-term societal benefits. Therefore, even if the law required imprisonment prosecutors could downward punitive measures towards probationary penalties in correlation with rehabilitative measures (Seave, 1993).

Generally speaking, it is recommendable to actively engage an offender in his or her own rehabilitation process. With real-time fMRI direct feedback is given to the patient and therefore success can be directly measured. In that sense the patient is part of a 'game' against his or her own brain and thus actively engaged in the process. As mentioned earlier the feedback is usually indicated in a thermometer display or scrolling curve but may also be shown as virtual reality in terms of reaching for a coffee mug or computer games (Sulzer et al., 2013). By designing real-time fMRI as a sort of 'computer game' and thus making it increasingly visual the method is more accessible for the patient. On top of this, the method might arouse the patient's ambition to achieve high scores in the 'game' and hence the willingness to participate in more sessions in order to continuously increase the scores. In particular juvenile offenders could show high interest in participating in fMRI neurofeedback due to its appealing character and resemblance to computer games. Nevertheless, the method might also be attractive for adults due to its simple handling and room for self-determination.

If, however, there is a high risk of re-offending in the beginning, parole sentences could portray another alternative. Parole refers to the early release of a convicted offender before the actual term of prison ends. If the criminal commits again an unlawful act within a certain period of time set by the court the remaining time from the first conviction will be added to the second one (Fabel & Meier, 1999). In other words, if probation is too risky at the time of the trial then imprisonment combined with effective rehabilitation methods, such as real-time fMRI, should be an option. If the offender then shows good conduct and progress in his or her neurofeedback results then the parole boards could be consulted and decide upon a possible early release. Members of parole boards generally estimate the propensity of an offender towards new criminal behaviour. As Eagleman & Flores (2012) argue, the reductive accuracy in this context is rather low and flawed. Therefore, real-time fMRI could contribute to more accurate parole decisions and thus simultaneously help to decrease recidivism rates.

5. Legal and Ethical Issues

"As neuroscience learns more about the causes of human behavior[s], it will give us new ways to change those behavior[s]" (Greely, 2012, p.163). Nevertheless, neuroscience as a tool to determine a person's culpability remains a controversial issue. This is mainly due to the complexity of the brain and the difficulty to assess whether certain behaviours are

to be labelled as disease or not. The distinction between a normal brain and an abnormal brain is not made naturally but by norms determined by humans, which are changed and adjusted every once in a while. For instance, it is rather commonly accepted that rehabilitation methods are used to cure depression. However, using such methods to treat 'wrong' sexual orientations would most probably cause a controversial public debate. As mentioned earlier, imprisonment of perpetrators is a controversial issue especially with regard to re-integration after having served a prison term. Nevertheless, the limitations of incarceration are well known and can be predicted whereas for instance neuroscientific rehabilitation methods may cause negative side effects that are not predictable at the moment.

Generally speaking, ethical issues do have legal implications in any case. Neuroscience poses a controversial topic and certainly has legal issues in particular with regard to the fundamental principle of autonomy. Despite the fact that autonomy as principle appeals universally it experiences different applications in different legal systems. The principle as such is rather simple allowing for self-determination and self-rule for states, associations and individuals. In other words, one is allowed to do what he or she wants, however, with some moral restraints not to overexcite the own autonomy to a degree where it affects another individual's autonomy. It implies that the state is not allowed to interfere with a person's life "except to the extent that this interference is warranted by the common good of society as a whole" (Sellers, 2008, p.2). Autonomy as such is one of the most important justifications in law as the latter protects liberty and autonomy of an individual. For this reason, autonomy can be regarded as a product of law. The principle of autonomy is also closely linked to the concept of privacy, which prevents unwanted intervention into private lives of individuals. Sellers (2008) defines privacy as "the negative expression of the positive value expressed by autonomy" (p.2). Despite all differences in legal systems, the common denominator is protection of liberty. In this context, privacy and autonomy can be regarded as fundamental elements of liberty and therefore of law as such.

The right to privacy is a human right and understood as describing the area in which individuals can act autonomously. It implies the control over personal space, flow of information and relationships (Post, 2010). In this context, the question arises whether neuroscience in particular brain imagining (fMRI) poses a risk to the right of privacy. The most commonly known fear of neuroscientific methods is that it may force people to reveal private thoughts against their own will possibly even without knowing it. Neuroscientific methods are currently on an ascending branch and thus its possibilities

in the future appear to be great and ground-breaking. Another important aspect is the concept of bodily integrity referring to the physical inviolability of human bodies. In this context, again the principle of autonomy is highlighted together with self-determination over the own body (Post, 2003). Many neuroscientific methods among others drugs pose a risk to this principle as they 'invade' the human body. Real-time fMRI Neurofeedback as such is generally seen as non-invasive. Nevertheless, the scanning of brain activity during task performance still means 'looking into a person's body' and in that sense even neurofeedback could arouse debate. In other words, even this method may be regarded as infringing bodily integrity and the right to privacy.

Sellers (2008) stated that any form of 'invading' the brain infringe the right to privacy and thus bodily integrity and are therefore prohibited unless they serve the society. The question arising in this context is where the line between unlawful invasion and the benefit for society is drawn. In order to facilitate an appropriate use of neuroscientific methods certain rules should be determined allowing it to be a rather undisputed tool.

First of all, neuroscientific interventions of any kind need to be a voluntary act. However, even if an adult offender is given the choice of receiving such treatments it is difficult to assess whether the choice was fully freely made. Pressure may come from different directions meaning family members, colleagues and society in general (Greely, 2012). Therefore, the offer of a treatment as such must be genuine and not a threat. On top of this, the intervention must only be aimed at addressing the specific behaviour for which the offender was convicted (Shaw, 2012). Secondly, the aim should by no means be to perform a fundamental personality change. Any efforts made to convert the offender's opinion should be based on rational dialogue. Neuroscientific methods, however, could be used to facilitate this intended moral dialogue by enhancing the offender's capacities. For instance, neuroscience could help to improve attention capacities of perpetrators and thus foster their ability to consider different options before performing an act. Moreover, it could support to improve an offender's warning system in order to help him or her to resist self-defeating behaviour (Shaw, 2012). Nevertheless, it has to be stated that the line between enhancing capacities and re-shaping the offender's values is rather thin.

6. Conclusion

This paper has outlined the pressing problems judicial systems face at present times. Recidivism rates are very high and do not show a tendency to decrease in the near future. Moreover, prison populations show likewise extraordinary high numbers and with regard to recent years the number of incarcerated offenders is about to even increase in the future. At the same time, however, national societies in particular in the United States and in Europe show features of retributivism believing as mentioned before that one more offender in prison is one less criminal in streets (Cullen, 2006). Concluding from that there is a general need for reform due to the fact that the current system appears flawed and ineffective. The growing field of neuroscience holds great potential for new options, which could help to improve current judicial systems. Despite the controversial debates about neuroscience and its legal and ethical implications, it is a field of research with new technologies and methods with great capabilities. In that sense, we doubtlessly should make use of it in order to extract the best and benefit to improve the current systems. Albeit, it has to be stated that at present times individual risk assessments are done already to a certain degree and prosecution shows a more proactive behaviour in particular with juveniles.

This paper offers an approach on how neuroscientific methods in particular real-time fMRI or Neurofeedback could be used in a beneficiary way to improve the system and thus enlarge the benefit of the society. Certainly, this approach is opposed to conventional retributivism, as it is understood that retributivist thinking brings no benefits to the society as a whole but rather attempts to compensate the victims alone. In this context, offenders should not only receive imposed punishment but rather be actively engaged in it. Conventional incarceration does not live up to these expectations as it implies passive behaviour of the offender. Rehabilitative measures on the contrary provide for active engagement of the perpetrator and thus appear to be much more useful. In particular fMRI neurofeedback with its 'game-like' method allows the offender to actively participate in his or her rehabilitation process and thus implies potential higher success. Consequently, this paper argues that probation should more often be considered as alternative to incarceration when being linked to fMRI neurofeedback. As mentioned earlier, certain studies predict positive changes towards recidivism rates when making use of such neuroscientific methods. Nevertheless, it is important to mention that in reducing recidivism rates the focus should not only be on rehabilitation methods and brain disorders due to the fact that biological facts are not the sole cause of misconduct. Not all people

with mental deficits engage in offences, whereas not all offenders do in fact have brain disorders. Certainly, there are many other factors involved, such as the environment of the offender and most importantly parental education. To be more precise, there is a mutual influence between mental capacities and other influencing factors. This paper, however, emphasises only the neuroscientific elements and their impacts.

To conclude with, societies would benefit more from effective rehabilitation methods instead of simple incapacitation, which may cause potential re-offences. The approach does not necessarily substitute contemporary legal systems. It should be rather seen as an added value and a possible alternative to present methods. If the use of neuroscientific rehabilitation methods appears to be not successful there is still the opportunity to return to the old model of incapacitation. If, however, real-time fMRI Neurofeedback unfolds great potential in the upcoming years the method could also be utilized as preventive measure for 'danger groups'. In particular juveniles with problematic backgrounds who are predestined to get into trouble could be made familiar with the 'game' of Neurofeedback. Among those could be children from deprived areas, where parents do not have the capabilities to care for their children. A project as such could be conducted in cooperation with child protective services.

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