**Changing the Criminal Character**

**Nanotechnology and Criminal Punishment**

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**Abstract:** While many scholars have considered the broad ethical implications of emerging technologies, far fewer have considered their potential impact on criminal sentencing. The criminal law’s aim of social order, and punishment of wrongful acts, is achieved via certain ‘principles of punishment,’ which traditionally guide the structure of criminal offenses and punishment. This paper argues that use of nano-tracking devices and nano-neuroscience in the form of neuro-castration would represent a shift away from retribution as a primary justification for criminal punishment. Further, sentences utilizing nano-neuroscience may promote a new model of rehabilitation aimed at changing an offender’s character, rather than his environment. Such manipulation of an offender’s character, especially if it is involuntary, comprises a violation of autonomy. The paper concludes that the principles of punishment do not justify the use of nano-tracking and nano-castration, especially in light of the ethical concerns they entail.

“But it is not true that if acts in accordance with virtue have themselves a certain character they will be done justly or temperately. The one who does them must also be in the right state of character when he acts. First, he must act knowingly, second, he must choose the acts, choosing them for their own sake, and third, he must act from a *firm and unchanging character*.”

– Aristotle, Nicomachean Ethics, 1105a (emphasis added)

1. **Introduction**

This paper examines how certain advances in nanotechnology might impact criminal punishment. While many scholars have considered the broad ethical implications of emerging technologies, such as neuro-nanotechnology, few have considered their potential impact on criminal sentencing. This paper discusses the potential gains and ethical implications of two types of technological advances for sentencing: advanced tracking devices enabled by nanotechnology, and nano-neuroscience, including neural implants.

The key justifications for criminal punishment - including incapacitation, deterrence, rehabilitation, and retribution – apply very differently to criminal sentences using these emerging technologies than they do to traditional imprisonment. Traditionally, the criminal law incapacitates offenders by limiting their access to most environments (e.g. via house arrest, prison, and in rare cases in the US, death), and deters offenders via external disincentives in the form of criminal punishment. Both approaches respect the offender as an autonomous rational agent: that is, they attempt to manipulate the offender’s choices by altering his environment, not by altering the offender himself. However, nanotechnology, by way of implanted tracking or neural devices, may allow us to incapacitate or deter by altering an offender directly. For example, a pedophile who commits criminal sexual assault might be implanted with a nano-scale radio frequency identification (RFID) mechanism – one so small that it could never be located by the offender - that allows for continuous tracking. The offender might also be subject to “neural castration” via nano-neurological implants. Both of these sentencing measures skip a step in the usual process of attempting to change offender behavior: instead of manipulating the environment with the hopes of changing the offender’s decision-making, the offender himself is (possibly permanently) changed.

I argue that such programs have a reduced deterrent effect compared to imprisonment, and incapacitate more narrowly than imprisonment – with regard to specific crimes, such as sexual or domestic assault – instead of guarding against all criminal activity. I further argue that use of these technologies may not be viewed as severe as traditional sentences, and that they are unlikely to assuage a community’s moral outrage at the crime committed. Thus these new technologies may also fail to promote the principle of retribution.

Further, even though neural implants can be seen as rehabilitative, changing an offender’s second order preferences (via permanent change to first order preferences) can be seen as infringement upon his autonomy. Thus the sort of involuntary manipulation of psychological states that might occur in the case of “nano-castration” would be a severe ethical violation. Additionally, serious thought must be given to question of whether a criminal offender can effectively consent to nano-neuroscientific procedures. I will argue that such procedures are unlikely to meet Bomann-Larsen’s “appropriateness-constraint” because they cannot be tailored specifically enough to address only the criminal behavior at issue.

The paper concludes that the principles of punishment do not justify the use of at least two of the sentencing policies that might be enabled by nanotechnology; nano-tracking and neuro-castration. The principles of punishment are better met via traditional sentencing, and use nano-neuroscience can be seen as starting down a slippery-slope that will ultimately lead to violations of offender’s autonomy.

1. **The Principles of Punishment**

Many feel the primary aim of the criminal law is social order or control 1, 2. This goal is achieved by via certain ‘principles of punishment,’ which guide the structure of criminal offenses and punishment. In the US, the criminal law has certain stated aims. Although US criminal law is codified into 52 criminal codes (one for each state and the District of Columbia, as well as the Federal code), there is much similarity amongst the codes, due to the influence of the American Law Institute’s Model Penal Code (MPC). The code has acted as a guide to state legislators, and instituted a wave of state reforms in criminal law after it was promulgated in 1962. Recently, the “purposes” section of the sentencing provisions of the MPC was substantially revised, representing a shift from deterrence and incapacitation to retribution as the criminal law’s primary justification.[[1]](#footnote-1) However, each of the principles of punishment listed below is cited as justification for punishment under the MPC:

(1) Deterrence of harmful acts. This principle includes both specific deterrence of a particular offender from recidivating, and deterrence of the general population from committing a particular class of acts.

(2) Incapacitation. This principle indicates that offenders who are not likely to be deterred may be held to prevent them from recidivating.

(3) Rehabilitation. This principle envisions that an offender might be somehow taught not to recidivate.

(4) Retribution. This is the principle of ‘just deserts,’ where the offender is thought to deserve to have something bad happen to him, because he has performed a harmful act. It is also thought to perform the function of assuaging social outrage that may arise due to performance of a harmful act.[[2]](#footnote-2)

The content and structure of the criminal law can be justified by looking to the principles of punishment. For example, the two requirements that must be met for one to be found guilty of a crime in a common law system, and the gradations of culpability, can be understood via these principles. To return a guilty verdict, a judge or jury must find the defendant (1) committed the act that caused criminal harm voluntarily (the voluntary act requirement), and (2) had a certain mental state with regard to that act (the mental state requirement). Generally, the mental state requirement means the offender must have performed the act that caused criminal harm purposely, knowingly, recklessly or negligently 4.

Thus, an offender’s intent is crucial to determinations of responsibility and punishment 5. Criminal harm closely related to an offender’s desires – acts that cause harm desired by the offender – are punished under the law most severely; whereas acts performed “on accident” are not punished at all. The difference in treatment between the two sorts of acts is justified by the principles of punishment in the following way: In comparison with acts performed on accident, acts closely related to an offender’s desires are (1) most likely to be *deterred* by threat of punishment; (2) more indicative of future dangerous acts, and thus the offender is a better candidate for *incapacitation* and *rehabilitation*; and (3) more morally reprehensible and thus more deserving to *retribution*. However, a person who accidently trips and thus discharges their gun (1) would not have been *deterred* by threat of punishment; (2) is not likely to be dangerous in the future and thus is not a good candidate for *incapacitation* and *rehabilitation* (extreme klutziness notwithstanding); and (3) is not deserving of moral condemnation or *retribution*.

Further, the length or type of criminal sentences can be justified by the principles of punishment. In the US, a person who desires the death of another, and then kills them, is found guilty of first degree murder and thus is subject to more punishment than one who kills recklessly. Only a very severe penalty stands a chance of deterring the offender who directly desires to commit criminal harm. And, the “intentional” offender is most likely to be dangerous in the future, and thus is a candidate for long-term incapacitation. He is also more morally blameworthy and therefore deserves retribution.

Different theories regarding the legitimacy and purpose of the criminal law emphasize different principles of punishment as more important. Consequentialist justifications of criminal law, such as those offered by Jeremy Bentham, tend to emphasize the principles of deterrence and incapacitation, as they have easily identified consequences for social order 1. According to the consequentialist view, in addition to identifying and punishing harmful acts already committed, the criminal law also attempts to process offenders in a way that will prevent future harm to society. The principles of deterrence, incapacitation and rehabilitation achieve this in an obvious way by either convincing or forcing an offender not to do further harm; or by changing an offender such that they are less likely to do criminal harm. Thus, the criminal law attempts to secure social order by “…announc[ing] to society that [criminal] actions are not to be done and [attempting] to secure that fewer of them are done” 2: 6.

The principle of retribution is thought to further social order by minimizing vigilante justice and strengthening citizen support for the rule of law, as well as serving some psychological aim of making victims and the community ‘feel better’ about a crime. Retribution, however, is also thought to entail the moral condemnation of criminal acts. That is, according to the principle of retribution, it is right to punish someone even if it does nothing to further the aim of social order, because they have committed a moral wrong. As HLA Hart noted, “…meeting the moral evil of misconduct with suffering is, as Kant urged, good *per se*, so that, even on the last day of society, the murderer not only may but must be executed” even though that execution will have no good consequences for society 2: 65.

Some scholars argue that retribution is the most important of the justifications for punishment 6, 7. According to “legal moralists” the criminal law’s primary purpose is to achieve justice by punishing those who are morally culpable in the performance of some wrongful action 7. Even legal moralists, however, believe that the principles of deterrence and incapacitation serve as secondary justifications of punishment 6. Hart similarly argued that multiple principles of punishment grounded the criminal law. He argued that while the primary aim of the criminal law was social order, the criminal law recognizes offenders as ‘thinkers’ who should only be culpable when they can foresee the application of punishment for an act, because this is the grounds for moral culpability. The defenses available to criminal culpability, Hart argued, indicate that punishment is not applied in a common law system based purely on deterrent or incapacitative effect 2. Thus Hart attempts to ‘side constrain’ a consequentialist theory of law with the notion that humans are agents who are responsible when they choose to commit harmful acts.

This paper will assume that all four of the justifications for punishment listed above are legitimate. This seems to be a safe assumption, given that most of the disagreement about the justifications for punishment concern which of these four principles should be considered primary. Because I conclude that none of these justifications are likely to be better served via use of the technologies discussed, my argument will remain relevant regardless of which justifying principle one considers most important.

1. **Nano-Tracking Devices**

New technologies are already being used in an attempt to more efficiently execute existing sentencing policies. Most often, the “efficiency” sought is monetary. The US incarceration rate has almost doubled in each decade since 1970, increasing from 135 per 100,000 US residents in 1978 to 244 in 1988 to 460 in 2003 8. As a result of this rise in prisoners, state corrections expenditures were the second fastest growing component of state budgets during the 1990s 8. State prison operating expenditures totaled $28.4 billion in fiscal year 2001, with a nationwide average annual operating cost per inmate of $22,650 9.

When compared with incarceration, home detention and electronic monitoring (EM) programs are substantially cheaper. Older EM programs, such as one in New York City, cost only $2.91 per offender a day, or $1,652 a year 10. However, even newer, more sophisticated EM programs involving GPS tracking are considerably less expensive than incarceration. The Napa County Board of Corrections recently adopted a GPS EM program, noting that the program cost only $15 a day in comparison to the $109 a day cost to keep offenders in jail 11.

Electronic monitoring was first used in 1984 in Florida as a part of a house arrest program 12. Some sort of home confinement with electronic monitoring was in place in all 50 US states by 1990 13. In most cases, electronic monitoring is done via an ankle bracelet. At timed intervals, the ankle bracelet sends a radio frequency or GPA signal to a receiver. If an offender moves outside of an allowed range, the police will be notified. The first generation bracelets consisted in a radio-frequency transmitter unit that sent a signal to a fixed location receiving unit in the offender's residence. The residence unit then used either a land line or a cellular network to relay information to a service center computer. If the offender is not at the residence at times stipulated, an alert message is sent to the service center, and then relayed to the supervising probation or parole officer 13.

As mentioned above, second-generation electronic monitors include GPS technology. The offender either carries a GPS cell phone unit that receives a signal from the ankle unit, or both functions are combined into one ankle unit 13. At least fourteen states have statutory provisions regarding GPS tracking of sex offenders 14. A Florida statute, entitled Jessica’s Act, requires persons convicted of sexual offenses against children under the age of twelve to be subject to lifetime electronic monitoring. Pennsylvania and California have similar provisions 14. A Massachusetts statute allows courts to impose GPS tracking systems on domestic abusers who have violated restraining orders and have been identified as dangerous after an assessment 14. In some of the programs, the offenders bear the cost of monitoring: in Massachusetts, they are charged $8 a day for a cell phone-like device that clips to a belt, an ankle bracelet and a home charger. The offenders’ movements are then monitored by three control centers, and if they break an “exclusion zone” around the victim or her children, the police are notified 15. Twelve other states have passed similar legislation, and as a result, about 5,000 domestic abuse offenders are being tracked nationwide 15. [[3]](#footnote-3)

However, GPS technology has its limitations. In the UK, more than 17,000 individuals, including criminals and suspects released on bail, are currently subject to monitoring under curfews requiring them to stay at home up to 12 hours a day. However, almost 2,000 offenders a year escape monitoring by tampering with ankle tags or tearing them off. The UK Ministry of Justice is thus investigating the use of subdermal chips 16. In addition, officials reported losing track of offenders when they were in the shadow of large buildings.

Many feel that radio frequency identification (‘RFID’) technology is the next generation of tracking device 17. In 2004, the Food and Drug Administration approved use of subdermal RFID in humans. Currently, over 2000 people have RFID chips implanted in their bodies, including children in Britain and the Mexican Attorney General and his staff 17. The Department of Defense is supposedly considering use of RFID technology to track soldiers and carry information about their health onto the battlefield 17. To date, in the US there has been no federal legislation either encouraging or prohibiting the use of tracking implants in the criminal justice system 17.

Unlike GPS technology, which relies on a network of satellites to transmit signals of a wearer’s location, RFID tags communicate with proximate readers via radio frequency 17. This, however, requires that a RFID infrastructure be in place 17. Some infrastructure already exists in the US: in many states, for example, RFID systems allow for cars to avoid manually paying tolls, instead using a RFID ‘E-Z pass’ 18. [[4]](#footnote-4) It seems state criminal justice systems could utilize these already existing networks, and implement new ones, as a means to start using RFID chips as a way to track criminal offenders. It is possible that at some point federal legislation may allow for a unified tracking system across state boarders.

RFID chips, like ankle bracelets, may still be removed by offenders if their implantation site is known. Nanotechnology, however, will inevitably enable smaller, and more efficient, RFID tagging. A 2007 article in the magazine ‘Industry Week’ makes this clear: 19

Let's start with how RFID works. Imagine something that looks a little like a 2"x2" decal with an X-shape on it and a tiny dot at the center. The dot is a microchip. The X is the antenna, which, in our example, uses silver as a conductor. With current technology, the effective reach of the device is governed by the size of the antenna. That means more silver is required, increasing size and cost. That's where nanotechnology can help. Nanotechnology could enable a denser layer of silver nanoparticles on a thin film, which would make possible a smaller and thinner antenna that could provide the same (or better) signal. Smaller size, greater functionality, less cost. Now let's throw in durability. Decreasing the size of the antenna can also improve the longevity of the devices. Larger, thicker antennae are more susceptible to being bent and broken. In addition, there's an air-tight package around the antenna, which can crack, exposing the antenna silver to oxidizing air. Smaller units offer less room for damage.[[5]](#footnote-5)

A bit later in the article, the author notes: “When RFID prices get to a penny, where can the market go? Just about anywhere. Tags can go into Fido's collar to help the dog catcher bring him home safe. Soldiers and equipment in the field would never be ‘off the grid’” 19. And criminal offenders could be continuously tracked for the rest of their lives.

If a nano-RFID doesn’t already exist, it soon will. And, as noted above, it seems that the criminal justice system would certainly be interested in cheaper, more reliable tracking of offenders, especially given that tracking has already been accepted as a legitimate sentencing tool.[[6]](#footnote-6)

1. **Nano-neural Interventions and Implants**

Nanotechnology has already been used to detect activity of individual neurons via platinum nanowires 20. This allows for an understanding of the brain at the neuron-to-neuron interaction level. And because nanowires can deliver electrical impulses as well as receive them, they allow for the direct stimulation of neurons which can then allow for manipulation of brain processes 20: and, potentially, manipulation of thought.

In addition, quantum dot technology is being used to gather information in the brain at the level of the neuron. Nano-sized functional quantum dots can help build data-capture devices that are easy to use by neuroscientists 21. Many feel that nanotechnology will eventually allow for targeted interactions with neurons and glial cells, the cells responsible for signal transmission in the brain. As explained by Armin Grunwald:

Nanotechnology offers a range of possibilities for gathering, storing, and distributing

personal data in an increasing extent. . . [Furthermore] passive observation of people

could, in the distant future, be complemented by actively manipulating them—for

instance, if it would be possible to gain direct technical access to their nervous system or

brain. . . These possibilities are regarded by some to be not only realistic, but even

certain. 22

It seems clear that nanotechnology will eventually allow us to visualize and track functional responses in neurons, and this means we will be provided information about a person’s thoughts remotely. In addition, several brain probes and implants are already being used in neurosurgery, although many of them are still investigational 20. Nanotubes, particularly made of carbon, hold great promise for replacing conventional silicone implants in the brain, “…because of their interesting electronic properties and reduction in scar formation” 20. Ultimately, such nano-neurological implants could be used not only to track neuronal activity, but to manipulate neuronal activity. This translates into the ability to *manipulate* thought; possibly via transmission or implantation of desires or beliefs 23.

As indicated above, it is most likely that nanotechnology, including neuro-nanotechnology, will initially be used to more effectively achieve sentencing policies already in operation. For example, imagine a defendant, John, was found guilty of the molestation and murder of a young boy who lived next door. As a part of his sentence, John is forced to register as a sex offender. He is also required to participate in a castration program. Below we will consider how nano-neuroscience might be used on an offender such as John.

Eight US states ([California](http://en.wikipedia.org/wiki/California), [Florida](http://en.wikipedia.org/wiki/Florida), Iowa, Texas, Oregon, Wisconsin, [Louisiana](http://en.wikipedia.org/wiki/Louisiana), and [Montana](http://en.wikipedia.org/wiki/Montana)) have chemical castration laws 24. [[7]](#footnote-7) California was the first state to use chemical castration as a punishment for sex offenders 25. In cases where the victim is under 13 years of age, California judges can require first-time offenders to undergo chemical castration. After a second offense, treatment is mandatory. In Iowa and Florida, offenders may be sentenced to chemical castration in all cases involving serious sex offenses. As in California, treatment is mandatory after a second offense. Louisiana Governor [Bobby Jindal](http://en.wikipedia.org/wiki/Bobby_Jindal) has signed a bill allowing Louisiana judges to potentially sentence all convicted rapists to chemical castration 26.

Depro-Provera is the drug most often used for chemical castration. 25 It is an analogue of the female hormone progesterone, used to reduce the normal level of testosterone in a male by fifty percent – a level equal to the level found in pre-pubescent boys 25. [[8]](#footnote-8) The drug reduces sex-drive, often diminishing ejaculator fluid to zero. Capacity for an erection can disappear almost immediately or slowly over some months. In some, however, the capacity for an erection may never disappear completely 25.

Depo-Provera has potentially serious side effects, including thromboembolism, weight gain, fatigue, malaise, mild depression, hypertension, hyperglycaemia, and liver problems 27. Moreover, to maintain the effects of Depo-Provera, a high volume of injection is required regularly. Most chemically castrated men will probably receive 400 to 500 milligrams of Depo-Provera per week, which amounts to an injection of 2.5 milliliters into each buttock each time 28. This high volume of injections, and the subsequent side effects, may contribute to the high dropout rate seen with voluntary chemical castration 28.

In addition, there is no guarantee that chemical castration actually works. Individuals vary in their response, and men given oral doses as high as 700 milligrams per day have still reported regular sexual arousal 28. Studies indicate that the drug, when used in conjunction with ongoing counseling, allows most pedophiles to self-regulate their sexual behavior. However, because the drug does not eradicate sexual attraction to children, and often does not completely eliminate sexual activity; its success often depends upon an offender’s attitude to the therapy. If an offender wants to stop preying upon children, the drug can help them to do so. If they do not, the drug can only hinder their attempts to perform sexual assault.

Let’s go back to our sexual offender, John. We first might imagine that nanotechnology could be used in addition to chemical castration. John could agree to have nanotechnology (such as functionalized quantum dots) implanted in his brain to gather information. Multiple quantum dots could be implanted, some in the area where the man held representations of children, others in areas indicating sexual arousal, and another few on the pathway between these two areas. If the dots ever detected simultaneous activity, this information was transmitted to John’s parole officer who was then under an obligation to track John down and investigate. This would provide a safe-guard to ensure the chemical castration was working.

Or, neurological castration could be achieved via direct inhibition of activity in certain parts of the brain (e.g., within the hypothalamus), or by blocking connectivity between areas of brain (e.g. between representations of children and sexual arousal). Remember, some neuroscientists claim that active manipulation of brain states via nanotechnology is not just realistic, “…but certain22.” We are already inhibiting brain states in cases of epilepsy and Parkinson’s. It may be that a nano-technological approach to castration may be more successful, and have far fewer side effects, than current methods.[[9]](#footnote-9)

One might imagine that neurological castration could just be the beginning of nano-enabled neurological sentencing. If it became possible to neurologically inhibit strong violent responses to stimuli, the state might offer offenders the chance to submit to this operation in exchange for a shortened or commuted sentence.[[10]](#footnote-10) Granted, at the moment this possibility is more fiction than science. However, given the success in drug interventions on aggressive behavior – for example, with tranquillizers and some anti-depressants – it doesn’t seem impossible that neuroscience could discover a more targeted means of delivering the same result.

1. **Application of principles of punishment**
   1. *Deterrence*

The principle of deterrence is supposed to reduce crime by setting the expected cost of committing a crime high enough to dissuade potential criminals from choosing to commit illegal acts 29, 30. The idea behind deterrence is that potential criminals have a choice regarding their actions, and they will opt to commit a crime if the expected gain exceeds the expected cost 31. The expected cost is the probability of being punished, reflected in arrest and conviction rates, operating in conjunction with severity of punishment 31.

Measuring deterrent effect is notoriously difficult 32. It is generally thought that more severe punishments have a greater deterrent effect 33. However, “[a]t least since the time of Beccaria, it has been commonly accepted that the certainty of detection and punishment is of greater consequence in deterring people from committing crimes than is the severity of the penalty” 33. Criminals, like all human beings, are not purely rational actors, and they have a tendency to discount future punishment in light of immediate gains.

One expect that any sort of monitoring system where the offender is free to move about his home or within his community will have a lesser deterrent effect than incarceration, if the probability of arrest and conviction is high enough. Incarceration will be viewed by most potential offenders as a more severe punishment because it is a greater infringement upon liberty. This is why incarceration is reserved for more severe felony offenders. One who is being electronically monitored while under house arrest may enjoy the comforts of their own home, eat the food they wish, and visit with friends and family. An offender being monitored who is not on house arrest enjoys relative freedom to move about their community and go to a job, school, church, etc. For the potential offender considering the cost of committing a crime, incarceration is going to be granted a heavier weight than monitoring, and thus would seem to have a larger deterrent effect.

For example, Jasper is a young man considering stealing a car so he can drive to Florida to see his girlfriend. Before he commits the crime, however, he is likely to consider the possibility that he might get caught, tried, and criminally punished. If Jasper knows he will be released under electronic monitoring if he is found guilty of stealing the car, he is probably more likely to commit the crime than if he thinks he will serve 5-7 years in prison for stealing the car.

Electronic monitoring, however, does appear to have *some* deterrent effect, even if it is much less of a deterrent than incarceration 34. One study suggested the longer the amount of time on electronic monitoring, the lower the likelihood of recidivism. This effect, however, varied by offender type 34. One might imagine that new generation nano-tracking may have a slightly higher deterrent effect than ankle bracelet monitoring, due to its potential permanence within the offender’s body and the inability of offenders to tamper with the tracking devise. As indicated above, nano-tracking also has the possibility of being life-long; in the very least, the tracking devise will be a permanent fixture in an offender’s body, even though it may be turned off.

This slight increase in deterrent effect in comparison to traditional monitoring systems, however, would seem to be outweighed by the ethical concerns raised by the technology. Although an implanted nano-tracking device does not attempt to manipulate offender decision-making, it does breach the traditional “self” designator: the skin-boundary. More worrying, though, is the permanence of nano-tracking devices, especially when considered in conjunction with the geographic range over which offenders can be tracked. Nano-tracking, like all new generation monitoring, might allow for global tracking of offenders, instead of just monitoring whether an offender leaves or infringes upon a specific geographic area.

These potential gains - from the perspective of law enforcement - mean that offenders would have to either consent to be monitored wherever they might go for the rest of their lives, or trust the government to “turn off” the tracking device when their sentence had been served. In many cases the former may violate the idea that a sentence should be proportional to the particular crime for which is found guilty. This worry about the proportionality will be discussed in more detail below under the principle of retribution. And trusting the government to switch off the tracking devise seems unwise. Currently, the United States National Security Agency has attempted to justify warrantless monitoring of international and domestic phone calls as a part of the “war on terror.”[[11]](#footnote-11) Permanent tracking devises capable of global monitoring seem ripe for abuse.

Let’s now consider whether the use of nano-castration can be justified by the principle of deterrence. There are no reliable studies measuring the deterrent effect of the threat of castration versus the threat of incarceration. One would hope that castration would be a sentencing option only for fairly serious sexual crimes. Therefore, one would think the offender’s crime would also warrant a fairly long sentence of incarceration. Given these two options, incarceration would be likely to have at least the same deterrent effect, and possibly as stronger deterrent effect, when compared to castration. Although there is no doubt that limiting a person’s sexual activity has severe ramifications for quality of life, it still seems that incarceration would have a stronger deterrent effect, because incarceration is a more encompassing limitation of liberty. When one is chemically castrated, ones’ sexual life is restricted (but not permanently); but if one is incarcerated, *all* aspects of a person’s life are restricted. In the case of nano-castration, the castration would be permanent, and thus a potentially stronger deterrent effect than chemical castration.

However, both chemical and nano-castration, if administered as involuntary programs, or if administered in cases where an offender feels they have no reasonable means to refuse, are ethically troubling because of the way in which they may violate offender autonomy in two different senses. First, they may impact second order desires via manipulation of first order desires. And second, the offer of castration in exchange for a lighter sentence may be coercive and thus an infringement of autonomy.

Bomann-Larsen argues that autonomy is the capacity to act according to one’s own decisions, without the controlling influence of others, and to form these decisions on the basis of one’s own beliefs, desire and values 35. She further claims that interventions, such as castration, which impair the motivational capacity of an agent decrease her autonomy. Similarly, Gerald Dworkin has argued that autonomy is the capacity to raise the question of whether one identifies with or rejects the reasons for which one acts 36. Dworkin argues that autonomy is a “…second-order capacity of persons to reflect critically upon their first-order preferences, desires, wishes, and so forth and the capacity to accept or attempt to change these in light of higher-order preferences and values. By exercising such a capacity, persons define their nature, give meaning and coherence to their lives, and take responsibility for the kind of person they are [34: 20].”

While the threat of incarceration may attempt to deter a person from acting upon certain first-order desires (such as the desire to murder or perform a sexual assault), it does not hinder his or her ability to reflect upon and hold second-order values. Neither does incarceration itself. One may hold dearly to a selfish preference to hold one’s own interests above others, or to cause others harm, while in prison. However, a person who is “…kept ignorant or who is lobotomized or who is manipulated in various ways” suffers from infringement upon his autonomy [34:17]. Involuntary castration doesn’t just stop a person from acting upon first-order desires; it changes their first-order desires. It may also render second-order preferences unnecessary, or ineffective. Hence, it is a violation of offender autonomy.

Imagine the case of two different convicted pedophiles, Robert and Frank. Robert hates the fact that he has first order desires to have sex with young boys. He wishes these first order desires weren’t effective, and instead wants to have first order desires for normal sexual relations with an adult. Frank, on the other hand, thinks he is showing real love for the boys he abuses. He values being the sort of person who has sexual relations with boys, and is glad his first order desires for sex with boys are effective.

Incarcerating Robert and Frank need not have any impact on their first order sexual desires, or on their second order values regarding their sexual preferences. They are still likely to have sexual desires, although they cannot be acted upon. And although incarcerated, Robert and Frank may still feel badly, or good, about these first order desires. However, if we castrate Robert and Frank, especially via means that would affect permanent change, we take away a whole category of first order desires. We also make ineffective – in a sense, we might as well erase – their second order sexual preferences as well. That is, their higher order desires to make certain first order desires effective regarding their sexual lives become useless, because first order desires for sex no longer arise. Thus, autonomy is impacted because second order desires are impacted.

And in the case of nano-castration, this impact on autonomy is just a bit more worrying, because it can’t be undone: the castration is permanent. Therefore Robert and Frank’s characters are permanently altered.

But what about voluntary nano-castration? Might we offer castration in exchange for a lighter or shorter sentence? One should be allowed, according to Bomann-Larsen, “to tie ones own hands” regarding specific motivations while still preserving their autonomy [33]. But even so, consent for more specific motivational interventions is invalid if the offer is inappropriate because it is coercive. To not be coercive, an offer must meet the “appropriateness-constraint” [33]. This constraint means that the treatment should not go beyond what is necessary in order to correct the behavior for which the criminal is imprisoned. In the case of castration, it would seem that this constraint cannot be met: castration necessarily impacts all sexual behavior, not just deviant or criminal sexual behavior. And again, with nano-castration, sexual behavior would be effectively eliminated permanently.

In sum, a traditional sentence of incarceration at the very least equally serves the principle of deterrence when compared to castration. Further, nano-castration isn’t likely to be any more of a deterrent than chemical castration. But any sort of castration entails serious ethical concerns because it changes first order preferences and makes second order preferences ineffective. Thus, castration violates an agent’s autonomy. And nano-castration is even more worrying than chemical castration because the effects of such an operation would be permanent.

* 1. *Incapacitation*

The Federal Sentencing Guidelines state that a repeat offender is “more culpable”. This increased culpability is not intended as a judgment of the instant criminal act or of the level of wrong-doing exhibited. Instead, the Sentencing Guidelines acknowledge that one goal of sentencing is to recognize and incapacitate those who are likely to be dangerous in the future; it is a “… judgment about the defendant’s will in general, his character. …The habitual offender has shown himself to be impervious to deterrence 6.”

Traditionally, the criminal law responds to the increased culpability of the recidivist by incarcerating him: the dangerous offender’s ability to commit crimes is controlled by restricting his access to people and things. It is thought that the long sentences imposed on the repeat offender exhibit an intention to “…warehouse career criminals until their energy for criminal acts has waned 6.”

The traditional means of incapacitation – placing an offender in a prison cell – incapacitates with regard to *any* further crime. An offender who is sent to prison for 45 years after his third rape conviction isn’t just kept from committing future rapes; he is incapacitated with regard to all possible crimes. However, monitoring offenders, including monitoring via nano-tracking devices, isn’t incapacitative in this sense. Even an offender on monitored house arrest still has some chance of recidivating because many crimes can be committed from the home. Further, if the offender were to leave the home in violation of his house arrest, it is likely that he would be able to commit crimes before he was captured. Similarly, an offender who was monitored and asked to stay away from certain persons or places could easily commit crimes violating these rules before they were caught.

Even though house arrest may incapacitate to some degree, the primary aim of a tracking device, nano or otherwise, is not to incapacitate, but to deter the offender, and to find an offender if they violate their parole or commit a new offense. So it would seem that the use of nano-tracking cannot be justified by the principle of incapacitation.

Nano-neural implants, such as one which neurologically castrates an offender, may incapacitate with regard to specific types of crime (e.g. sexual assaults). However, it is unlikely an implant could incapacitate with regard to all crime as a prison cell does (and if it could, it would certainly violate Bomann-Larsen’s “appropriateness-constraint” by eliminating all anti-social behavior in response to conviction for a particular crime).

Targeted incapacitation may have some value, as it could address the threat of recidivism in a more offender-specific manner without denying an offender all their fundamental liberties. For example, it seems pretty clear that castration may incapacitate with regard to sexual, but not other, crimes. In this case the tax payers may be seen as getting more ‘bang for their buck’: the offender is incapacitated without society having to bear the cost of housing and feeding the offender. And the offender gets to enjoy some liberties while they are incapacitated with regard to their specific criminal tendency.

However, as discussed above, there is an important ethical difference between incapacitation via incarceration and incapacitation via neurological interventions. Incapacitation via incarceration or house arrest limits offenders’ choices for behavior without necessarily changing their first order desires or breaching their autonomy – at least in the sense that they are able to continue to review their desire based upon second-order preferences. Incapacitation by manipulation of internal chemical states, as accomplished by chemical castration, or by direct manipulation of desires, as nano-castration might enable, changes the behavior of an offender by changing preferences, not by changing an offender’s ability to act upon them.[[12]](#footnote-12)

In theory, nano-neurological interventions may someday enable direct manipulation of second-order preferences via manipulation of the brain - although admittedly current science is not even close to knowing where in the brain such second order preferences exist. If such a surgery were to become possible - where second order preferences could be inhibited or created within a person’s brain - this sort of surgery would be even more of an ethical violation than castration, because it would constitute direct manipulation of a person’s values or character.

* 1. *Retribution*

The justifications for criminal punishment tend to wax and wane in their influence upon criminal justice policy based upon political zeitgeist. Indeed, in an attempt to explain the dramatic increase in incarceration rates in the past few decades, some have argued that there has been an ideological shift in the principles of punishment: while rehabilitation was considered an important aim of punishment up to the early 1970s, rehabilitative programming is now a tiny percentage of penal costs 8. In the 1980s, sentencing that was seen as “tough on crime” gained political capital and increased substantially. As Michael Tonry notes, “Some other governing rational for sentencing policy was bound to take the place left empty when rehabilitation lost favor. In both academic and policy circles, that place was taken (sometimes implicitly) by retribution or ‘just deserts’ 37.”

Retribution morally condemns a criminal act and offender, and metes out punishment (an offender’s “just deserts”) based upon the level of moral wrongdoing he has committed. In so doing, retribution “permits consideration of popular revulsion toward certain kinds of offenses 6.” That is, the level or type of sentence may be chosen in part to acknowledge, or in response to, the moral outrage of the community.

In short, it is unclear that either of the nano-technologies discussed above provide an offender with his “just deserts” when contrasted with incarceration. This is because, for reasons discussed above, both nano-tracking and nano-castration are in some ways *less* severe punishments than traditional incarceration because they allow for more offender freedom. However, the permanency of these interventions also makes them seem *more* severe than is warranted.

The principle of retribution requires that a criminal sentence be proportional to both the crime committed and the type of offender. Thus, the crime of homicide warrants a more severe sentence than the crime of theft, and a 12 year old offender, or an insane offender, are less culpable than a normal adult offender. It would seem that the principle of retribution might justify house arrest or monitoring as a sentence for minor crimes. However, in these cases nano-tracking would seem to be “overkill” because it can be both global and permanent. Offenders found guilty of such minor crimes would have to either consent to be monitored for the rest of their lives, or trust the government to “turn off” the tracking device when their sentence had been served. It is difficult to imagine the sort of crime would be serious enough such that it be proportional to impose a possible lifetime of monitoring, but not serious enough to warrant incarceration. Tracking devices that can be removed would have the guarantee of being turned off, and thus proportional.

With regard to nano-neuroscientific interventions, it would seem these are only appropriate “just deserts” for serious crimes, ones that traditionally warranted at least some incarceration. No crime creates more “moral outrage” than sexual offenses against children. One can only imagine the outcry if a pedophiliac offender was released after nano-neural interventions. If the public sees incarceration as a fair and just response to this sort of offense, it seems possible that castration will fail to satisfy to the moral outrage of the community. Overall, a community may not feel satisfied with sentences that provide an offender with more personal liberty, or have a rehabilitative ‘feel’ (as castration might), and so in this sense, this sentence may be too lenient to be retributive.

On the other hand, the reason why nano-castration fails Bomann-Larsen’s “appropriateness constraint” is because it isn’t appropriately proportional to the specific crime committed: it is too broad. So in this sense castration would seem to be too severe a sentence, or too retributive.

In sum, it seems the principle of retribution cannot justify the use of the new nano-enabled technologies.[[13]](#footnote-13) That is, it doesn’t seem that the principle of retribution is more efficiently or better met via sentences using the nanotechnologies. And once again, the ethical concerns implicated by the technologies must be kept in mind.

* 1. *Rehabilitation*

Rehabilitation is the idea that offenders can be reformed such that they won’t recidivate. For the first seven decades of the 20th century, rehabilitation was often thought to be the dominant principle of punishment, especially among correctional elites and criminologists 38. Rehabilitation has since fallen out of favor as a justification for punishment, except in the realm of juvenile justice - and more and more juveniles are now being sent to adult court so they are eligible for ‘adult’ sentences 6. The Federal sentencing guidelines outright reject rehabilitation as a goal of punishment.[[14]](#footnote-14)

Nano-tracking would seem of little relevance to rehabilitation as it isn’t thought to have any rehabilitative effect. However, nano-neroscience could potentially allow us to re-embrace the principle of rehabilitation by providing a means to directly change offenders into law-abiding citizens. As mentioned above, one might imagine that nano-castration could just be the beginning of criminal rehabilitative programming using neuroscience to remove anti-social behavior. One wonders whether nano-neuroscience, or other neuroscientific techniques such as DBS, could eventually be a source of what some might call an “artificial conscience,” via methods similar to the government imposed chip that stopped Spike the vampire from feeding in the fabled television show, Buffy the Vampire Slayer.[[15]](#footnote-15)

The criminal law assigns responsibility based upon the fundamental assumption that an offender ‘owns’ his intentions, or beliefs and desires, and if those intentions cause criminal harm, he can be punished 5. Virtue ethicists, such as Aristotle – cited at the beginning of this paper – add the requirement that virtuous or evil acts come from a “firm and unchanging” character trait; a trait that “goes all the way down.” Aristotle feels that such acts are indicative of the sort of person who performs them; therefore, a choice to commit homicide that springs from one’s character truly deserves to be labeled an immoral act and punished 39. Note that this requirement agrees with the commonsense way we speak of ourselves: when we do things outside our character, we often say ‘something came over me’ or ‘I wasn’t myself.’ Further, Aristotle’s requirement is reflected in aspects of our criminal justice system; “three strikes laws”, and aggravating factors at capital sentencing that look to future dangerousness, for example. When one acts out of character it is less likely a judge or jury will find any criminal harm was committed ‘purposely’ (the level of intent which earns the highest level of criminal culpability). However, when one is acting against or outside of character – for example, when a criminal defendant has no prior criminal record – he is likely to be given a lesser punishment.

As indicated above, involuntary manipulation of psychological states via nanotechnology, even in the name of rehabilitation, would appear to be a severe violation of autonomy because it would permanently render useless an offender’s ability to second-order preferences, and thus character, even once they were released. However, even if consent could be reliably granted for nano-neurological rehabilitative interventions – which I have argued it cannot – a new ethical concern emerges when considering use of nano-technology in the name of rehabilitation; namely, do we really want to permanently neurologically alter citizens into a certain idea of what it is to be a “good” citizen? Up to recently, persons who violate the law are allowed to remain the sort of person they are (even if that person was a pedophile), although the space within which they are allowed to be that person is limited to a jail or prison. And after an offender served their time, persons are released to continue to pursue their preferences. Alternatively, persons might be released from prison if our idea of moral standards changes and their desires are no longer deemed criminal (*e.g.*, consider what happens with political prisoners when there is a regime change). Before permanently altering offenders based upon a current legal and moral code, we will also need to claim that the code to which we mold their new character is in a sense “timeless.”[[16]](#footnote-16)

Traditional rehabilitative programming attempts to change preferences for illegal behavior. Often such programming tries to get offenders to adopt different second order preferences, via therapy, or attempts to change the offender’s first order preferences, often by attempting to change his environment. For example, job training or GED programs might be seen as attempting to encourage offenders to value being law-abiding or responsible, and to diminish a criminal’s preference for stealing things by helping them earn money to buy them. Drug rehabilitation programming usually commonly consists in therapy (individual or group); drug testing and skills learning programs. Rarely, there is a pharmacological component such as methadone maintenance, but drugs are not usually given as a form of treatment for substance abuse.

In both of these examples an offender may resist the effects of such programming if they really wish to. That is, an offender could continue to value theft or drug use despite the programming, and continue such behavior if released from custody. However, this is not the case where castration serves as rehabilitative programming. With castration - especially nano-castration – there is no choice for the offender to make their second-order sexual preferences effective after the castration occurs because the first order sexual preferences are directly removed. And again, if it became possible to directly inhibit or implant second-order desires, this outcome is even more severe.

Consider the following example. James is the sort of character who, once his mind is made up, nothing can change it. He has decided that short people – adults less than 5 feet tall – literally have no reason to live. Hence, he has decided to dedicate his life to killing short people.

Jane, on the other hand, can be talked into anything. Indeed, James talks her into killing Jonah, who is 4’11”. Both are convicted of first degree murder. As a part of their punishment, the court requires that they submit to “aggression-elimination” surgery, which in most cases effectively reduces violent recidivism rates to almost zero, before they are released after each serving their 14 year prison sentences.

Now, James would have continued to kill short people once he was released. (Remember, he is just that hard-headed sort of person who is determined to let his hatred for short people guide his acts.) Thus, the surgery does indeed alter James’ character in a way that any traditional sort of rehabilitative programming, which respected autonomy, would not.

Similarly, Jane’s character is also changed by the surgery: Jane may, or may not have recidivated depending upon what sort of crowd she fell in with after being released. Her wishy-washy character would be fundamentally changed by the surgery, at least with regard to aggressive acts. Thus in both James and Jane nanotechnology would have permanently altered second-order preferences, or a character trait, that would otherwise be ‘firm and unchanging.’ Both James’ and Jane’s autonomy was breeched.

One might argue that it isn’t such a bad thing to eliminate these persons’ ability to choose to kill, or that they ‘gave up’ the right to maintain a certain type of character when they committed a murder. First, I fundamentally disagree: one never gives up their right to be a certain sort of person, even if they give up the right to live freely amongst others *as* that sort of person.

Second, just as any sort of castration impacts all sexual expression, not just criminal sexual expression, the sort of surgery described above impacts all use of aggression – even when, let’s say, one needs to be aggressive to defend one’s life. The cases of James and Jane both violate Bomann-Larsen’s “appropriateness-constraint.” Indeed, at this point I might offer the following conclusion regarding this constraint: change to an *agent’s character* is never an appropriate or proportional response to a wrongful *act*, and thus no nano-nuerological intervention will ever meet this constraint. An act is a behavior within a particular context in a single time-slice. An autonomous agent, or a character, is ‘bigger’ than a single act, or even multiple acts: It is a self.

1. **Conclusion**

The criminal law’s aim of social order, and punishment of wrongful acts, is achieved via certain ‘principles of punishment,’ which traditionally guide the structure of criminal offenses and punishment. The argument above has shown that these principles do not justify the use of at least two of the sentencing policies that might be enabled by nanotechnology; nano-tracking and nano-castration, especially in light of the ethical concerns they entail. Nano-tracking is worrying due to its permanency; and any sort of nano-neuroscientific intervention potentially violates an offender’s autonomy.

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1. The old “purposes” section stated that:

   (1) The general purposes of the provisions governing the definition of offenses are:

   (a) to *forbid and prevent conduct* that unjustifiably and inexcusably inflicts or threatens substantial harm to individual or public interests;

   (b) to *subject to public control* persons whose conduct indicates that they are disposed to commit crimes;

   (c) to safeguard conduct that is without fault from condemnation as criminal; …

   (e) to differentiate on reasonable grounds between serious and minor offenses.

   (2) The general purposes of the provisions governing the sentencing and treatment of

   offenders are:

   (a) to *prevent the commission* of offenses;

   (b) to promote the *correction and rehabilitation* of offenders;

   (c) to safeguard offenders against excessive, disproportionate or arbitrary

   punishment; …

   The new “purposes” section, drafted in 2004, states that:

   (2) The general purposes of the provisions governing the sentencing and corrections, to be discharged by the many official actors within the sentencing and corrections system, are:

   (a) in decisions affecting the sentencing and correction of individual off enders:

   (i) to render punishment within a range of severity proportionate to the gravity of offenses, the harms done to crime victims, and the blameworthiness of offenders;

   (ii) when possible with realistic prospect of success, to serve goals of offender rehabilitation, general deterrence, incapacitation of dangerous offenders, and restoration of crime victims and communities, provided that these goals are pursued within the boundaries of sentence severity permitted in subsection (a)(i); and

   (iii) to render sentences no more severe than necessary to achieve the applicable purposes from subsections (a)(i) and (ii); . . . . [↑](#footnote-ref-1)
2. Some also argue that ‘restoration’ is a principle of punishment that should guide the criminal law system. This principle would require offenders to somehow ‘restore’ the victim and society, or make them ‘whole’ again. It is unclear that this principle is currently taken seriously in the US, although there have been some pilot programs aimed at introducing it. For a general discussion of restoration, see 3 G. Johnstone and D. Van Ness, *Handbook of Restorative Justice*, (UK 2006). [↑](#footnote-ref-2)
3. http://www.nytimes.com/2009/05/09/us/09gps.html?\_r=3&th&emc=th [↑](#footnote-ref-3)
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6. However, there is some worry that the statutes allowing advanced tracking of offenders will fail to pass constitutional review. Although the Supreme Court has not yet issued a ruling dealing with GPS tracking devises, statutes that continuously track offenders – including in protected areas such as the home – might violate the wearer’s Fourth Amendment rights against unreasonable search and seizure. However, a statute that only transmitted data of the offender’s whereabouts when he had entered a ‘forbidden zone’ would avoid this problem. Similarly, any statute that tracks all offenders of a certain type – such as sex offenders – without an individualized finding of dangerousness might violate the Fourteenth Amendment. [↑](#footnote-ref-6)
7. There is another problem with castration as a sentencing tool: it may be discriminatory, as it only applies to male offenders. [↑](#footnote-ref-7)
8. Skinner v. State of Oklahoma, Ex. Rel. Williamson, 316 U.S. 535 (1942), held that forced punitive sterilization is unconstitutional. It seems unlikely that the current Supreme Court will uphold the Louisiana chemical castration statute, which provides a form of punitive forced sterilization. [↑](#footnote-ref-8)
9. Again, however, there are questions about whether neuro-castration would pass constitutional muster. The Eighth Amendment forbids punishments that are ‘cruel and unusual’. Such a punishment does not appear to be crueler than current measures designed to create the same deterrent effect, such as permanently incapacitating, imprisoning or institutionalizing, or chemically castrating an individual. Nano-neuroscientific approaches could be deemed “unusual” in the common language sense of the word, but probably not in the way the Supreme Court has interpreted the Eighth. To be “unusual” in this sense a punishment must be rare (in that it is not practiced by a critical mass of states) and violate “evolving standards of decency”. (see Furman v. Georgia 408 US 238 (1972)) [↑](#footnote-ref-9)
10. Greeley has suggested that deep brain stimulation (DBS) could also provide a method of inhibiting activity in areas where over-activity may contribute to criminal activity. [↑](#footnote-ref-10)
11. http://www.nytimes.com/2005/12/21/politics/21nsa.html?ex=1292821200&en=91d434311b0a7ddc&ei=5088&partner=rssnyt&emc=rss [↑](#footnote-ref-11)
12. As is discussed below, some criminal justice rehabilitative programs attempt to do this as well, such as drug addiction interventions and job training. However, both of these rehabilitative programs work by the normal means of learning. If an offender really wanted to resist the effects of such programming, they could hold onto their second order preferences and go back to using drugs or stealing after the programming were over. [↑](#footnote-ref-12)
13. As an aside, it is interesting to note that the current emphasis on retributive sentencing has resulted in a shift at both the state and federal levels away from indeterminate sentencing systems - where the judge or jury are asked to determine the appropriate sentence - to determinate ones, whereby conviction of a specific crime results in a specific sentence. 8 S. Steen and R. Bandy, "When the policy becomes the problem: Criminal justice in the new millennium" (2007) 9 Punishment and Society 5-26. Thus many of the sentencing strategies enabled by emerging technologies, including electronic monitoring and chemical castration, may automatically follow from a specific type of guilty verdict. This contributes to worries about involuntary rehabilitation programs, discussed below. [↑](#footnote-ref-13)
14. 28 U.S.C. §994(k). [↑](#footnote-ref-14)
15. Every time Spike attempted a violent act against humans, the “chip” caused him severe head pain preventing him from performing the act. Eventually he stopped trying to act immorally. The question posed to the characters on the show (and the viewers) were: (1) To what extent is the altered Spike different than those of us who act morally due to the inculcation of moral rules? (2) Is Spike now a “good” or “bad” guy? (3) The difference between humans and vampires was that they lacked a soul: Can we now say that Spike has a soul? [↑](#footnote-ref-15)
16. A related matter is the ethical question of authority and regulation: who gets to decide which prisoners are eligible for alteration? How serious will the antisocial desires have to be to deserve alteration? Further, if state or federal legislature(s) mandates alteration of certain classes of offenders, judges and juries are still left with the task of categorizing the offenders. Such decisions can be biased, as we have seen with the historically racially-biased system of applying the death penalty. [↑](#footnote-ref-16)