# Enhancing Equality

## *1 The Basic Bioconservative Worry: Inequality*

Bioconservatives like Francis Fukuyama, Leon Kass, Michael Sandel, Jurgen Habermas, Bill McKibben and many others worry about enhancement. They see it as threat to human equality and the fundamental dignity of man. This basic worry erupts in the form of various arguments, but the basic concern is, I believe, a unitary one: the Argument from Equality.

Fukuyama puts the worry this way:

> "The first victim of transhumanism [the project of enhancing human beings] might be equality. … Underlying this idea of the equality of rights is the belief that we all possess a human essence that dwarfs manifest differences in skin color, beauty, and even intelligence. This essence, and the view that individuals therefore have inherent value, is at the heart of political liberalism. But modifying that essence is the core of the transhumanist project. If we start transforming ourselves into something superior, what rights will these enhanced creatures claim, and what rights will they possess when compared to those left behind? If some move ahead, can anyone afford not to follow? These questions are troubling enough within rich, developed societies. Add in the implications for citizens of the world's poorest countries for whom biotechnology's marvels likely will be out of reach and the threat to the idea of equality becomes even more menacing." (Fukuyama 2004)

Francis Fukuyama

Michael Sandel (2004) argues that by engaging in enhancement we will lose humility, solidarity and a sense of responsibility for the worse off, thereby failing to treat them as equals. Instead, we need to appreciate the "giftedness" of life.

"To appreciate children as gifts is to accept them as they come, not as objects of our design or products of our will or instruments of our ambition. Parental love is not contingent on the talents and attributes a child happens to have. …. Their qualities are unpredictable, and even the most conscientious parents cannot be held wholly responsible for the kind of children they have. That is why parenthood, more than other human relationships, teaches what the theologian William F. May calls an 'openness to the unbidden.' May's resonant phrase helps us see that the deepest moral objection to enhancement lies … in the hubris of the designing parents, in their drive to master the mystery of birth. Even if this disposition did not make parents tyrants to their children, it would disfigure the relation between parent and child, and deprive the parent of the humility and enlarged human sympathies that an openness to the unbidden can cultivate."

Being open to the unbidden is important, for Sandel, in fostering humility, responsibility and solidarity.

"A lively sense of the contingency of our gifts – a consciousness that none of us is wholly responsible for his or her success – saves a meritocratic society from sliding into the smug assumption that the rich are rich because they are more deserving than the poor…"

It is obvious, even to bioconservatives, that we are all born unequal. Some have wretched diseases from birth and die young. Others abuse their bodies for a lifetime, yet live long. Some are strong, others are weak. Some are beautiful, others are ugly. Some are stupid, others are smart. It is not often put as bluntly as that, but most of us know that no two people, even identical twins, are identical, and nor are they exactly equal in any physical, psychological or social state.

However, equality as a moral ideal is not a description of the way the world is or how people are, but an ideal of how people should be treated: that regardless of these existing physical, psychological and social inequalities, they should be treated equally as persons (Singer 1985). This can mean many things, but the core idea is that by virtue of his or her humanity, each person has an entitlement to be considered in the same way as any other person. So each person's suffering, hunger, thirst and other basic needs matter equally. The life of each person matters equally and should be treated by political institutions, the law and social norms equally.

Bioconservatives worry that either the motivation to enhance, the act of enhancement or the result of enhancement will constitute inequality or lead to people being treated unequally. How could this be so? Since equality is a prescriptive ideal, how could changing the empirical world affect the nature of or the effectiveness of a moral prescription? Since these are different ontological categories, it is puzzling how these writers relate one to the other. The problematic nature of this relationship can be seen through an analogy.

Imagine that I am a caterer running a children's party. I bring out the birthday cake. I am told to divide it equally amongst the 10 children. According to the Objection from Equality, something I do to the children may affect my equal division of the cake. How could modification of the 10 children affect my division? Well, if I had given one of the children plenty of food already, that child would not be hungry. If I hypnotized a child to have an aversion to cake, that child would not want the cake. If I had invited one of my own children, I might want to give that child a bigger slice.

But notice that none of these modifications necessarily leads to me divide the cake unequally. Nor does it affect the truth of the fact, if it is indeed a truth, that the cake should be divided equally. It is up to me to divide the cake into 10 equal pieces or not. The children might react differently to receiving their piece, or I might feel differently about it, but they would still receive an equal share if I respected equality.

The proponents of the Objection from Equality engage in aversion of the naturalistic fallacy. While they do not derive an "is" from an "ought", but they do that "is" affects or somehow determines or changes "ought". "Ought" might imply "can" but it does not imply "is". If I ought to divide the cake equally, this is not affected merely by contingent empirical facts, such as my feelings, the children's feelings, or whether they have been enhanced or not. What I ought to do is determined by certain normative facts or principles, together with relevant empirical facts.

Perhaps the bioconservative worry is a more pragmatic one. Perhaps they worry that the way the world is and the way people are, various enhancements *will* lead to people being unethically treated more unequally. This is a pure empirical speculation without any robust evidence adduced to support it.

Here is  one way in which it seems unlikely. Consider two children: one of them is a gifted musician by nature, while the other has been enhanced to be a gifted musician. The first does not owe her success to anyone. She was just lucky. Those who win a lottery do not feel a debt to the other losers who are now worse off than them. By contrast, the enhanced musician owes a debt to the person who enhanced her. Indeed, Habermas worries that this relationship is so strong that the enhanced is subordinated to the will of the enhancer.

Sandel's worry can be turned on its head. If the enhancer is the State, the enhanced owes a debt to the State (to the people who contributed to and made possible her enhancement). This would increase a sense of solidarity and fellow concern.

However, I will now give two other arguments that enhancement would reduce rather than increase inequality. The first addresses the brute fact that natural inequality exists with profound consequences

for how individuals' lives develop, the quality of their relationships and morality. Enhancement can be used to correct this natural inequality. Secondly, the concern that individuals will care less about others and will be more disposed to treat others unjustly can be addressed by enhancing the very mechanisms involved in these dispositions. That is, we can enhance the moral dispositions that cause social inequality.

## *2 What is Justice?*

There are several theories of justice, including Utilitarianism, Egalitarianism, and Prioritarianism (this section on Justice is drawn from Savulescu 2009: 177-187).

Utilitarians argue that enhancements should be distributed to provide the greatest benefits to the greatest number (i.e. to bring about the most good). Enhancement is not unjustif some people are worse off, even badly off, provided that enhancements are distributed according to a principle of equality that holds that each individual should count for one and that nobody should count for more than one. That is, provided that enhancements are allocated strictly to bring about the greatest good, with no eye to social privilege, status, wealth or other irrelevant consideration, then that distribution is just.

Egalitarians argue that enhancements should be distributed so as to provide equal consideration of equal needs. Enhancements should alleviate need in individuals as much as possible. The greater a person's need, the greater that person's entitlement to resources. According to one egalitarian theory of justice, Rawls' Justice as Fairness, we should distribute enhancements so that the worst off in society are as well off as they can be (Rawls 1971). According to Prioritarians (Parfit 1997: 202-221), we should not give absolute priority to the worst off, it does give some priority to those who are worst off, but we should also aim to maximise the well-being of all members of society.

In "Rights, Utility and Universalization" (Mackie 1984: 86-105), John Mackie suggests that everyone has a 'right to a fair go'. According to a maximizing version of giving people a "fair go," we should give as many people as possible a decent (reasonable) chance of having a decent (good) life. This is a plausible common-sense principle of justice which has also been called "sufficientarianism."

I find "a fair go" to be a plausible conception of justice.G etting a "fair go" means having a fair chance of receiving an intervention that has a reasonable chance of providing a reasonable extension of one's life and/or a reasonable improvement in its quality, or access to basic goods necessary for those. A fair go entails that each person has a legitimate claim to medical care when that care provides that person with a reasonable chance of reasonable extension of a reasonable life and/or a reasonable improvement in its quality. Comparable legitimate claims are those referring to similar needs. As many comparable legitimate claims should be satisfied as possible. Provided as many comparable legitimate claims are being satisfied as possible, there should be equality of access.

However, for the present argument, which substantive view of justice we accept does not matter. For the purposes of argument, I will adopt the right to a fair go. However, any of the other accounts of justice could be used to make similar points.

## *3 The Profound Consequences of Natural Biopsychological Inequality*

This section 3 on the Consequences of Natural Inequality is drawn from Savulescu (2010).

### *3.1 Well-Being*

Many biological and psychological characteristics can profoundly affect how well our lives progress and whether we have  a “fair go”. One example is impulse control. In the 1960s Walter Mischel conducted impulse control experiments in which 4-year-old children were left in a room with one marshmallow each, after being told that if they did not eat the marshmallow, they could later have two. Some children ate it as soon as the researcher left, while others used a variety of strategies to help control their behaviour and ignore the temptation of the single marshmallow. A decade later, the researchers re-interviewed the children and found that those who were better at delaying gratification had more friends, better academic performance and more motivation to succeed. Whether the child had grabbed for the marshmallow had a much stronger bearing on their SAT scores (the USA’s standardised test for college admissions) than did their IQ (Mischel et al. 1988). Impulse control has also been linked to socioeconomic control and avoiding conflict with the law.

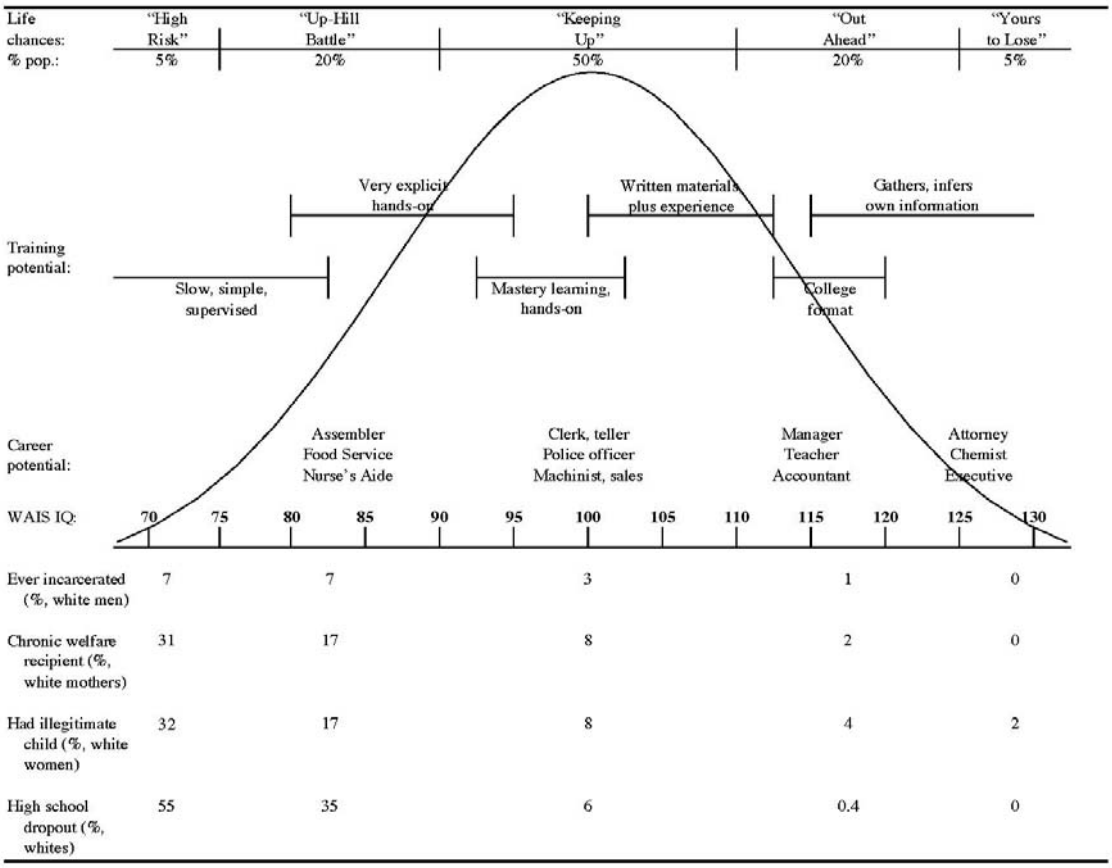
Impulse control is what some philosophers call an “All Purpose Good”: it is a good for a person no matter what that person’s plan for life or particular way of being or context. Self-control is valuable whether you want to be a philosopher, doctor, builder, entertainer or soldier. Other examples of all purpose goods include memory, self-discipline, foresight, patience, a sense of humour, and optimism.

## *Cognitive Inequality*[i]

One of the most important all purpose goods is general intelligence, or *g* (short for the *g*eneral mental ability factor). This is a proficiency in learning, reasoning and thinking abstractly. It is the ability to spot problems and to solve them. It is not specific knowledge, but the ability to accumulate and apply it.

General intelligence or *g* naturally varies in a normal distribution within a given, defined population. For western populations, it famously follows a bell curve with a mean of 100 and a standard deviation of 15 points. Intellectual disability for medical, legal and social purposes is arbitrarily defined as an IQ two standard deviations below the mean (below 70). However, where one finds oneself on this curve as a result of the natural lottery profoundly affects one’s life chances and opportunities, what one can

do and who one can be.




Source of figure: Gottfredson, 1997: 79-132, figure 3 and table 10.

For example, the US Department of Education (1993) estimated the levels of typical cognitive functioning of American adults in its National Adult Literacy Survey (NALS). This involved a nationally representative sample of 26,000 individuals aged 16-65. It grouped scores into five levels of functioning. The following table illustrates these levels of functioning, together with the fraction of adults for whom this is the maximum level of functioning they achieve in everyday tasks.

| **NALS Level** | % pop. | **Simulated Everyday Tasks** |
|---|---|---|
| **5** | 3% | • Use calculator to determine cost of carpet for a room<br>• Use table of information to compare 2 credit cards |
| **4** | 17% | • Use eligibility pamphlet to calculate SSI benefits<br>• Explain difference between 2 types of employee benefits |
| **3** | 31% | • Calculate miles per gallon from mileage record chart<br>• Write brief letter explaining error on credit card bill |

| | | |
|---|---|---|
| **2** | 27% | • Determine difference in price between 2 show tickets<br>• Locate intersection on street map |
| **1** | 22% | • Total bank deposit entry<br>• Locate expiration date on driver's license |

The lowest level involves being able to perform tasks no more difficult than totalling two entries on a bank deposit slip or locating the expiration date on a driving licence. For 22% of Americans, this is the highest level of functioning which they can achieve with 80% probability. Level 2 tasks are more cognitively complex because they require the use of two pieces of information, drawing a simple inference and ignoring a bit of distracting information. An example of this is determining the difference in price between two show tickets listed on a simple flyer or locating a specific intersection on a street map. For 27% of Americans, this is the highest level of functioning; they cannot routinely do more complicated tasks, such as calculating miles per gallon from a mileage record chart – a Level 3 task. NALS Level 2 corresponds roughly to IQs of 86-97 (Gottfredson: 1997).

The US Department of Education has stated that people at Levels 1-2 are below the literacy level required for "competing successfully in a global economy and exercising fully the rights and responsibilities of citizenship" (Baldwin, et al. 1995; Gottfredson 1997: 114)

The US Army has long known that people with intelligence at the low end of the normal range are unfit intellectually for military service. The army administers IQ-like tests of "trainability". Since the second world war, the army has been forbidden by law from inducting anyone from the bottom 10% (IQ 80 and below), and its own minimum standards rule out anyone below the 15$^{th}$ percentile (below IQ 85). In practice, entry into most military jobs requires scores above the 30$^{th}$ percentile (above IQ 92), which means that about a third of induction-age youth lack the cognitive ability to qualify for even the simplest jobs in the army (Gottfredson 1998).

The US Army is not constrained by political correctness or fine-sounding ideological redescriptions of reality. One representative from the Defence Advanced Research Projects Agency wrote: "The world contains approximately 4.2 billion people over the age of twenty. Even a small enhancement of cognitive capacity in these individuals would probably have an impact on the world economy rivalling that of the internet."[ii]

Cognitive Enhancement is one way of overcoming one of the biological barriers to a good life and a life of opportunity. And it can be cheap. One in three people in the world don't get enough iodine. This can cause mental slowness. A deficiency of iodine in pregnancy results in the loss of 10 to 15 IQ points in the fetus. Around the world, this results in more than 1 billion IQ points of mental capital being lost each year. Iodising salt costs only two to three cents per person per year. There may be other cheap methods of cognitive enhancement. For example, choline (which occurs naturally in eggs) may increase fetal IQ if given in pregnancy.

As drugs are developed to treat memory loss in Alzheimer's disease, these drugs are likely to be effective also for normal age-related memory loss, which occurs after the age of 40.

Drugs are already being used to improve cognitive performance in the normal range. Modafinil is a new class of drug originally developed for narcolepsy. It is now also prescribed for shift workers. It improves executive function, wakefulness, and working memory. It is now widely used by academics, other professionals and college students in the US to enhance cognitive performance. Used daily it would cost about $100-$200 per month, compared to smoking one pack of cigarettes per day, which costs $60 per month.

It has been estimated that "Ninety percent of the prescriptions are for off-label usage"[iii]. Sales of this drug have grown exponentially. One version, Provigil (Cephalon), has increased sales from $75 million in 2001 to $500 million in 2005. If this growth were to continue, the market in 2018 would be $US70 billion. Modafinil will go generic in 2012, which will mean it will probably only be worth US$7-10 billion in 10 years' time.

In April 2008, an online survey of individuals who read the journal *Nature* revealed that roughly one in five respondents use prescription drugs to improve their focus, concentration or memory (Maher, 2008). A total of 1,400 people from 60 countries responded to the online survey. The subjects were asked specifically about the use of three drugs. Here are the fractions of respondents who had used them:

1. Methylphenidate (Ritalin) 62%
2. Modafinil (Provigil) 44%
3. Beta-blockers 15%

Other drugs were also used:

–Adderall, a drug prescribed for ADHD containing a mixture of amphetamines
–Centrophenoxine
–Piracetam
–Dextroamphetamine Sulfate
–Ginkgo
–Omega-3 fatty acids.

There are a range of other enhancers available even today.

| **Drug** | **Effect** | **+** | **-** |
|---|---|---|---|
| Sugar | Stimulates, memory improvement, self-control improvement | Legal, very cheap, safe, well studied | Bad for teeth |
| Modafinil | Increased alertness, better executive function | Well studied, apparently safe and non-addictive | Risk of overexertion? |
| Caffeine | Increased alertness | Legal, very cheap, safe, well studied | Quasi-addictive |
| Nicotine (enhancing cholinergic drugs) | Increased alertness, memory enhancement | Legal | Biased studies? Addictive, smoking unhealthy |
| Choline | Enhance memory in offspring of pregnant rats | Easily accessible, legal, long-term effects | Unknown long-term side effects |
| Amphetamine | Increased alertness, memory enhancement, reorganisation | Well studied | Not legal, addictive, preservation |
| Dopaminergic drugs (e.g. Ritalin) | Attention, working memory | | Recreational use |
| Beta blockers | Calming, reduce impact of anxiety in traumatic memory | | |
| Ampakines | Memory enhancement, increased alertness | | Experimental, seizure risk? |
| CREB-inhibitors | Memory enhancement | | Experimental |

Cognitive enhancers could be used to correct natural inequality and give people a "fair go". If we used cognitive enhancers to bring as many people as possible above the line of sufficient cognitive functioning, we would be both correcting natural inequality and promoting justice. Where does this line lie? It certainly does not lie at an IQ of 70, where the line is currently arbitrarily drawn. The US Department of Education has stated that people at Levels 1-2 are below the literacy level required for

“competing successfully in a global economy and exercising fully the rights and responsibilities of citizenship.” The upper limit of Level 2 corresponds to an IQ of about 97. So for practical purposes, we could aim to increase the cognitive abilities of the bottom half of the population: all those with an IQ less than 100.

None of this implies that these cognitive limitations are primarily biological (though their causation is likely a mixture of biology and sociological). It is important to recognise that embracing biological enhancement does not imply biological causation. There is nothing intrinsically wrong with employing biological solutions to social problems. What we want is the best solution to the problem, and that might be biological or biological/social. The differences in IQ might be entirely due to social inequality, although I strongly doubt that this is the case. However, given the way the world is, the best solution might still be some kind of biologically assisted, enhanced education programme (Savulescu 2010).

## *3.2 Natural Biopsychological Inequality and Moral Behaviour*

Not only does our own biology and psychology limit our cognitive performance, with profound consequences even for normal people in some cases. It can also represent a constraint on us acting morally.

An extreme example is psychopathy. In 1993 two bodies were found on a country road in Ellis County, Texas. One was male, one female. The boy, 14, had been shot, but the 13-year-old girl had been stripped, raped, and dismembered. Her head and hands were missing. They were killed by Jason Massey, aged 20. He was a psychopath.

Massey was nine years old when he killed his first cat. He added dozens more over the years, along with dogs and even six cows. He had a long list of potential victims and his diaries were filled with fantasies of rape, torture, and cannibalism of female victims. He was a loner who believed he served a “master” who gave him knowledge and power. He was obsessed with bringing girls under his control and having their dead bodies in his possession.

We are all familiar with stories about psychopaths. Such people seem to profoundly lack normal human empathy. Often, even their parents realise there is something wrong with them, even from a very young age.

“I have had to work so very hard to distance myself emotionally from my own daughter. I would do anything to make it ‘right’. My husband and I have done everything in our power to help her. We can do no more. I still love her, but I know that she is who she is, and that just about kills me.” (Narcissist Personality Disorder Forum 2011)

“I also have a son 18 years of age. He has exhibited problems since childhood. He also has rages, lies. Manipulates. He is now off to a very good college and is extremely bright, which actually makes it more lethal. He just hasn't been right since birth. He is no longer living with me and I pray he does well in life. My therapist said I did everything I possibly could for him including therapy since age 3.” (Narcissist Personality Disorder Forum 2011)

According to the major textbook of psychiatry (*DSM-III-R* 1987: 343-344):

“Antisocial Personality Disorder is five times more common among first-degree biological relatives of males with the disorder than among the general population**.** The risk to first-degree biologic relatives of females with the disorder is nearly ten times that of the general population….Adoption studies show that both genetic and environmental factors contribute to the risk of this group of disorders, because parents with Antisocial Personality Disorder increase the risk of Antisocial Personality Disorder… in both their adopted and biologic children.”

In other words, there are good reasons to believe that antisocial personality disorder and psychopathic behaviour have significant biological and even genetic contributors.

People with an antisocial personality have a limited range of human emotions, and in particular they lack empathy for the suffering of others. Empathy may be provided by some remarkable neurons located in the inferior frontal cortex and the anterior part of the inferior parietal lobule of the brain. These nerve cells are active when specific actions such as picking an object of food and eating are performed; but what makes them remarkable is that they also fire when another animal, the experimenter or even a robot performs the same action. A mirror neuron fires as though the observer were performing the action. Evidence is mounting that the region of the brain known as the insula provides the substrate for our understanding of the emotions of others.

The activity of insula neurons underpins the emotion of disgust. The mirror system for hand actions and the mirror system for emotions are more active in people who are empathic as judged by questionnaires. The same thing applies to children, in whom the degree of activity of mirror neurons induced by observations and imitation of facial expression correlated with empathic concern and interpersonal competence. Children with autism-spectrum disorders who are socially isolated and have difficulty demonstrating warmth and interpersonal connectivity also have disturbed activation of the mirror neurons. There are good reasons to believe that autism-spectrum disorders have a strong genetic causation. So at least in these groups, not only is there an emerging biological pathway being identified, but the ultimate cause of such behaviour may be strongly genetically influenced.

Mirror neurons are thus important candidates to represent what philosophers call the “Theory of Mind”, or the ability to infer other people’s mental states, thoughts and feelings.

The upshot of this is that our own biology and psychology may represent barriers preventing us from empathising with other people and from understanding their mental states. At any rate, there is the prospect that biopsychological interventions could enhance moral behaviour. A crude example of this is the chemical castration of paedophiles. Here, the use of hormonal manipulation to reduce sex drive is offered to paedophiles to reduce the frequency of re-offending.

Psychopathy is not the only example of failed moral behaviour. Ordinary criminal behaviour is another example, and this too may be influenced by biology. Caspi and colleagues investigated the relationship between the presence of a change in the gene encoding for monoamine oxidase A (MAOA), a neurotransmitter metabolising enzyme, and the tendency towards antisocial behaviour in a large cohort of New Zealand males (Capsi et al. 2002). They found that men who had been mistreated as children *and* were positive for the polymorphism conferring low levels of MAOA were significantly more likely to exhibit antisocial behaviour than those who had been mistreated but lacked the change. Both groups were more likely to exhibit antisocial behaviour than those who were not mistreated. This suggests a possible interaction between mistreatment and MAOA deficiency in causing antisocial behaviour. It also raises the possibility that the pharmacological manipulation of MAOA may influence the development of such behaviour.

The neurotransmitter serotonin has been linked to less aggressive behaviour. There is an inverse relationship between indices of serotenergic function and impulsive aggressive behaviour. For example, depleting serotonin leads to more aggressive behaviour. And drugs such as Selective Serotonin Reuptake Inhibitors like Prozac increase cooperation and reduce aggression. Perhaps violent offenders should be on Prozac! At least, we should study its effect scientifically.

Oxytocin, a hormone released by the hypothalamus, has been shown to influence the ability to infer another person’s mental state. It increases our willingness to trust other people, but this does not extend to all risk-taking, only to social risks. For example, it prevents the decrease of trust after betrayal, even after several betrayals. It also reduces the fear of social betrayal.

The degree to which we are prepared to trust others and are willing to cooperate, especially in large groups, varies from one individual to the next. This variation has a biological basis that can be altered by biological interventions. For example, by the administration of oxytocin and drugs like Prozac.

None of these interventions represents pure or effective “moral enhancers.” But the science of moral enhancement is perhaps like the science of cancer 100 years ago. We have yet to scratch the surface. Yet these show that biologically influencing moral behaviour is possible in principle.

It is important to recognize that important moral failing is not restricted to criminals. All of us fail morally in important ways. In a series of 6 publications with Ingmar Persson[iv], we have argued that ordinary people have moral dispositions which are limited in important ways by virtue of our evolutionary history. We have limited altruism, restricted to small in-groups, we tend to free ride, derogate members of out-groups, are biased towards the near future, not prone to make significant sacrifices, and our ordinary morality has evolved to have strong proscriptions against harming in-group members but no requirements to aid, especially to aid out-group members. In addition, we believe that there is a moral difference between the consequences of what we intentionally do and what we foreseeably and avoidably allow to occur. These features of ourselves, we have argued, make solving global collective action problems like climate change and global poverty very difficult to address through voluntary action.

Even our conceptions of fairness may be determined in part by our own individual biopsychological natures. Here is one reason to believe this. In the Ultimatum Game, there are two players, a proposer and a responder. The proposer divides a reward. For example, the proposer can divide 10 rewards between two pots in different ways (five and five or eight and two, for instance). The proposer can choose one of two trays, each with two pots with a different distribution of rewards. The responder then accepts his share or can reject the offer altogether, in which case each gets nothing.

When this experiment is done with chimps, responders generally accepted 2/8 distributions without any sign of dissatisfaction, even when there was an equal distribution of five raisins in each pot on the alternative tray. In contrast, under similar conditions, adult human responders as a rule respond by rejecting the offer, thereby forgoing a smaller reward in order to punish the proposers for their blatant unfairness.

However, humans differ in terms of how much unfairness they will tolerate in the Ultimatum Game. Some will accept a 4/6 distribution; others only 5/5. What is remarkable is not that humans differ from each other, but that when human identical twins play the proposer and responder roles of the Ultimatum Game, there is a striking correlation between the average division with respect to both what they propose and what they are ready to accept as responders. There is no such correlation in the case of fraternal twins. Since identical twins share the same genes (and these twins have been separated at birth), this strongly suggests that the human sense of fairness has some genetic basis. In humans, the rejection of unfair offers is more than 40% genetically determined, with a very modest role for environmental influences.

In the body of work cited above, Persson and I have argued that we should embrace the possibility that the modification of our moral dispositions by pharmacological and other biological manipulation should be considered and explored. Such an argument addresses the concerns of bioconservatives regarding inequality. Our moral dispositions and choices create social inequality. One way to address that inequality is to change the dispositions of people who make those choices. After all, gross social inequality already exists. It is time to treat the cause rather than the symptom of the disease. And the disease is our limited set of moral dispositions.

## *3.3 Biopsychological Inequality and Autonomy*

Another familiar objection to enhancement employed by Jurgen Habermas is that when parents choose to enhance their children, they are subjecting the individual to the will of somebody else. Sometimes this is put in terms of a child's right to an open future, based on the idea that children should be left in their natural state until they are competent to decide whether and how to change.

This objection fails for two reasons. Firstly, in many cases there is no maximally open future but different mutually exclusive futures. An example is gender assignment for intersex conditions. For many years, children born with ambiguous genitalia were assigned to be female, and surgically modified to appear fully female. The argument was that it was important for parents to bond and parents needed a certain sex. And it was important to shield the child from the cruel teasing and social discrimination that an uncertain sex would invite. However, many people with intersex conditions now resent the modifications made to them. They wish they had been given the choice to remain as they were born, or to decide themselves which sex they wanted to be once they had grown into adulthood.

This might be regarded as a straightforward case where options should be left open, with the open future argument implying that sex should not be assigned. But this is false. The choice is between two mutually exclusive lives: one involving early sex assignment and (supposedly) greater bonding and higher self esteem, and the other involving an open sexual assignment but greater teasing and lower self esteem. I am not arguing in favour of sex assignment. I am arguing that parents and doctors are faced with two options with different risks and benefits.

To take another example: being a great musician requires training from a very early age. One cannot leave the enhancement of musical talent until a child is grown up, because then it will be too late. If it is employed, such enhancement must be employed early if it is going to be effective.

These arguments about the compromise of autonomy fail for a more important reason related to natural inequality. Autonomy is not merely competent choice. It is rational choice. I have argued for this claim at length (Savulescu 1994, 1995, 1997, 2007; Savulescu and Momeyer 1997), but here is a synopsis. Autonomy is self-determination. It involves self-understanding and forming a conception of what life is best for oneself. It involves evaluating options according to their consequences and how likely those consequences are, and how those consequences match one's own evaluative judgements for one's own life. Mere choice is what characterises animal behaviour. Autonomous choice is normatively evaluative choice.

Now plainly autonomy requires rationality on such an account. But rationality is not equally distributed: people vary in terms of their rationality, and even within the same individual rationality varies from time to time, being influenced by a whole host of situational and contextual circumstances.

Since Kahneman and Tversky first began to describe the psychological biases and heuristics that constrain human rationality, increasing numbers of psychological barriers to fully rational decision-making, even means-end rationality, have been identified. But increasingly we are also coming to understand how states of our own biology can frustrate rational choice and how it might be manipulated to improve rationality and so enhance autonomy.

In recent work from Cambridge, Coates and colleagues described how levels of testosterone and cortisol (naturally occurring hormones) could lead to irrational decision-making, which could in turn contribute to financial crisis (Coates & Herbert 2008). This is not to say that hormonal fluctuations have caused recent financial crises; but they may well have contributed. While their focus was on financial decisions, their findings have implications for how autonomous decisions are when they are influenced by hormonal factors.

Coates and colleagues found that city traders who have high morning testosterone levels make more than average profits for the rest of that day. These researchers hypothesised that this may be because testosterone has been found to increase confidence and the appetite for risk – qualities that would augment the performance of any trader who had a positive expected return. However, previous studies have shown that administered testosterone can lead to irrational decision-making. So if testosterone continued to rise or became chronically elevated, it could begin to have the opposite effect on a trader's profitability by increasing risk-taking to unprofitable levels. They argued that this is because testosterone has also been found to lead to impulsivity and sensation-seeking, to harmful risk taking, and in extreme cases (such as among users of anabolic steroids) to euphoria and mania.

Testosterone may therefore underlie a secondary consequence of the 'winner effect' in which a previous win in the markets leads to increased, and eventually irrational risk-taking in the next round of trading.

Professor Joe Herbert, from the Cambridge Centre for Brain Repair, has said:

> "Market traders, like some other occupations (such as air traffic controllers), work under extreme pressure and the consequences of the rapid decisions they have to make can have profound consequences for them, and for the market as a whole. Our work suggests that these decisions may be biased by emotional and hormonal factors that have not so far been considered in any detail…." (Coates and Herbert 2008).[v]

I described before the importance of impulse control and the ability to delay gratification. If one is not able to withstand temptation it is impossible to set and achieve long term goals for one's own life. A person incapable of standing back, of rationally reflecting, would not be an autonomous agent. He would be an animal. The degree to which this is possible varies from person to person, and is open to enhancement.

## *3.4 Inequality and Love*

There are a number of biopsychological constraints on our capacity to love which are a product of our evolution (Savulescu & Sandberg 2007). And these are distributed unequally across humans.

Love for humans, as other animals, passes through three stages:

1. **Lust** promotes mating with any appropriate partner.
2. **Attraction** makes us choose and prefer a particular partner.
3. **Attachment** allows pairs to cooperate and stay together until their parental duties have been completed.

Each of these states has a different basis in brain activity associated with the activation of different neurotransmitters and hormones. Neuroimaging of studies of romantic love has shown activations in regions linked to the oxcytocin and vasopressin systems, activation in reward systems, and systematic deactivation in regions linked to negative affect, social judgement and the assessment of other people's emotions and intentions.

For various reasons, including evolutionary considerations, each of these states may pass or disappear. And this is amenable to biological manipulation. Consider the example of attachment, which is involved in pair bonding. The failure of pair bonding is part of the explanation for increasing divorce rates, which are approaching 50% of marriages in many countries.

Much work in social neuroscience studying pair bonding has gone into examining the mating habits of monogamous prairie voles (*Microtus ochrogaster*) and closely related but polygamous meadow voles (*M. montanus*) (e.g. Winslow et al. 1993; Young et al. 1999; Lim et al. 2004). The vole pair bonding

systems are based on the neurohormones oxytocin and vasopressin. These also modulate other social interactions such as infant-parent attachment and social recognition and trust. The receptors for these hormones are distributed differently in monogamous and polygamous voles.

The sexual behaviour of these voles can be altered. The infusion of oxytocin into the brains of female prairie voles and vasopressin in male prairie voles facilitated pair bonding even in the absence of mating (while the non-monogamous meadow voles were unaffected). Researchers used gene therapy to introduce a gene from the monogamous male prairie vole into the brain of the closely related but polygamous meadow vole. Genetically modified meadow voles became monogamous, behaving like prairie voles. This gene, which controls a part of the brain's reward centre, is known as the vasopressin receptor gene.

A recent study identified a similar gene in humans: the Vasopressin Receptor 1a (AVPRIA) gene (Walum et al. 2008). This has previously been associated with autism, age at first sexual intercourse, altruism, and creative dance performance. This study assessed relationships on a Pair Bonding Scale (PBS) and found pair bonding was significantly lower for men carrying allele (gene variant) 334 than for those who did not have this allele. The effect was dose dependent – pair bonding was even lower for carriers of 2 x 334 alleles.

What this shows is that people are not equally fit for certain kinds of relationships. Carriers of the 334 variant more often reported marital crisis, including the threat of divorce in the last year. 15% of men with no 334 allele reported such a crisis, compared to 34% of men with two copies. The frequency of unmarried men was higher among 2 x allele 334 carriers (32%) than men with no 334 allele (17%), even though all the cohabiting individuals in the trial had been in a relationship for at least five years and the majority of all the couples involved were the biological parents of adolescent children. Women also expressed more dissatisfaction with partners who carried the 334 allele: women married to men with 1 or 2 x allele 334 reported lower affection expression, dyadic consensus and dyadic cohesion. The 334 variant is associated with increased activation of the amygdala, which is a brain region known to be of importance for pair bonding. These findings suggest that people may vary in their capacity to sustain a long-term loving relationship. This capacity is amenable to alteration.

## *4 Radical Possibilities*

Drugs like Modafinil and Ritalin scratch at the surface of enhancing human capacities and increasing human freedom by removing biological and psychological limitations on human freedom to act and be. But more radical modifications are possible in principle. Scientists have created a range of radically enhanced non-human animals. The most striking example is Supermouse, created by scientists at Case Western Reserve University in Cleveland, Ohio. Supermouse is a genetically engineered mouse which runs for up to six hours at a speed of 20 metres per minute before needing a rest. This results from changes to the metabolism of glucose. The genetic change means that the glucose metabolising gene – PEPCK-C – is over-expressed in the skeletal muscle, which avoids the muscle-cramping effects of build-up of lactic acid, which is normally experienced during prolonged exercise. The researchers will use the new mouse to study the effects of diet and exercise on longevity and cancer risk, and potentially to better understand the genetic basis of inherited conditions that lead to muscle wasting in humans.

Supermouse is more active: it has seven times more cage activity than normal mice. It has greater endurance – it ran 6 km on a treadmill (compared with the normal mouse, who could only manage 0.2km). It has improved metabolism – it ate 60% more but had half the body weight and only 10% of the body fat of a normal mouse. It had an extended lifespan: 'survived longer and looked healthier'. It had extended youthfulness: mice of 30 months were still twice as fast as six-month-old normal mice and were reproductively active at 21 months (and up to 30 months), which is equivalent to being

reproductively active as a woman at the age of 80. Supermouse was healthier and had lower cholesterol levels.

Humans have the same gene as supermouse. We could create superhumans today with the same abilities as supermouse. Scientists have recently created a fluorescent human embryo by successfully transferring a gene from a jellyfish into a human embryo. This proves in principle what has long been known in non-human animals. Transferring genes from one species to another can be safe and effective, as can genetic engineering.

At present, scientists are trying to unravel the genetic contribution to human physical and mental ability, performance and behaviour in the field of behavioural genetics. For example, scientists are trying to elucidate the contribution of differences in genetics to aggression and criminal behaviour, alcoholism and addiction, anxiety, personality disorders, psychiatric diseases, homosexuality, maternal behaviour, memory and intelligence, personality traits such as neuroticism and novelty seeking, and sprint/endurance performance in sport. This knowledge may make it possible to predict behaviour and ability, as well as opening the door to biological interventions to improve performance. But as animal research has shown, it is clearly possible in principle to radically improve performance.

## *5 Conclusion*

Our biological and psychological nature as individuals represents a barrier to our own wellbeing, to moral behaviour and to love. And these barriers are unequally distributed. Far from being a threat to equality, enhancement may be required for people to be treated equally. This is true in two ways. If employed according to a principle of justice, like sufficientarianism to provide as many people as possible with a fair go, enhancements could be used to correct natural inequality in cognitive ability, moral disposition, capacity to love and autonomy. Secondly and most importantly, they could be used to enhance the very dispositions which create social inequality. Our sense of fairness, empathy, sympathy, willingness to make self-sacrifices, commitment to equality vary naturally from individual; they are influenced by biological factors; we could use biology to enhance the attitudes and commitments to achieve equality.

There are four ways to increase equality. We can do so by altering our natural environment, social environment, psychology and biology. We should consider *all* options and make an active, reasoned choice. We should not privilege biological or psychological interventions over social change, but should consider them all as candidates for improvement.

If equality is an ideal worth achieving, I strongly suspect we will have to change the dispositions of people to achieve it.

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[i] I would like to thank Prof. Linda Gottfredson for valuable data and for opening my eyes to the social implications of intelligence. See *http://www.udel.edu/educ/gottfredson* for a full archive of her groundbreaking work.

[ii] See US Army: Proposal Submission, at http://www.dodsbir.net/solicitation/sttr08A/army08A.htm

[iii] See http://www.provigilweb.org/p12.htm

[iv] http://bit.ly/egA9aF

[v] http://www.sciencedaily.com/releases/2008/04/080414174855.htm