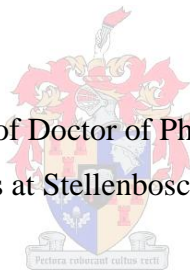


# **HARM AND ENHANCEMENT: PHILOSOPHICAL AND ETHICAL PERSPCECTIVES**

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## **DECLARATION**

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## ABSTRACT

The distinction between treatment and enhancement is often considered to be a morally significant boundary, which, at the very least, marks the limits of our moral obligations. This conviction holds despite the fact that treatment and enhancement are situated along a continuum of interventions that are directed towards the improvement of human functioning. The distinction between these two sorts of interventions is based upon a notion of normative normality, which suggests that we are morally obligated to provide interventions which are directed toward the achievement of normal functioning, but that no obligation exists to improve functioning beyond this point. This dissertation will subject this position to critique by examining the constitution of normal functioning, and by suggesting that this kind of functioning cannot operate as a normative standard which determines the limits of our moral obligations. The moral desirability which we attribute to the achievement of normal functioning is based upon the independent ethical imperative to promote the possibilities for well-being of moral agents. This motivation, however, equally suggests that we will be obligated to provide certain kinds of enhancement interventions which will be likely to promote the welfare interests of moral agents, when these become available. This argument also implies that the development of enhancement technologies will require us to rethink our ethical conception of harmful non-benefits. We currently think of the non-provision of medical treatment and some environmental enhancements, such as education, as harmful to the extent that state intervention is justified to rectify this. We recognise that such non-provision, and the resultant failure to promote the welfare interests of moral agents, where such promotion is possible, harms persons by putting them in a worse position than they could have been in, with regards to their chances of leading a good life. The new technological possibilities offered by the prospect of genetic enhancement mean that we might soon have a better alternative, in terms of our chances of leading a good life, to the level of functioning that we have thus far been able to achieve. This implies that the non-provision of these enhancements would be harmful to the extent that intervention to bring about this provision would be justified.

## OPSOMMING

Die onderskeid tussen behandeling (“treatment”) en verbetering (“enhancement”) word dikwels geag ‘n skeiding daar te stel wat van morele belang is, in soverre dit ten minste, die perke van ons morele verpligtinge afbaken. Hierdie oortuiging geld ten spyte van die feit dat behandeling en verbetering op ‘n kontinuum van ingrype wat op die verbetering van menslike funksionering gerig is, geleë is. Die onderskeid tussen hierdie twee tipes ingrype is gebaseer op ‘n bepaalde begrip van normatiewe normaliteit, wat suggereer dat ons moreel verplig is om ingrype te voorsien wat daarop gerig is om normale funksionering te bewerkstellig, maar dat geen sodanige verpligting bestaan om funksionering duskant hierdie punt te verbeter nie. Hierdie proefskrif sal laasgenoemde posisie aan kritiek onderwerp deur die manier waarop ons normale funksionering verstaan, te ondersoek, en deur aan die hand te doen dat hierdie tipe funksionering nie as normatiewe standaard wat die perke van ons morele verpligtinge bepaal, kan dien nie. Die morele gewenstheid wat ons toeskryf daaraan om normale funksionering mee te bring, is op die onafhanklike etiese imperatief om die moontlikhede vir welstand van morele agente te bevorder, gebaseer. Hierdie motivering doen egter eweseer aan die hand dat ons verplig sal wees om sekere tipes verbeteringsingrype te verskaf wat waarskynlik die welsynbelange van morele agente sal bevorder, wanneer sulke verbeteringsingrype beskikbaar word. Hierdie argument impliseer ook dat die ontwikkeling van verbeteringstechnologieë van ons sal vereis om ons etiese konsepsie van skadelike nie-voordele opnuut te deurdink. Tans dink ons dat die nie-voorsiening van mediese behandeling, sowel as sommige omgewingsverbeterings soos opvoeding, tot so ‘n mate skadelik is dat staatsinmenging met die doel om dit reg te stel, geregverdig is. Ons erken dat sulke nie-voorsiening en die gevolglike versuim om die welsynbelange van morele agente te bevorder, waar sulke bevordering moontlik is, mense skade berokken deur hulle in ‘n slegter posisie te plaas as waarin hul kon gewees het, ten aansien van hul kanse om ‘n goeie lewe te leef. Die nuwe tegnologiese moontlikhede wat die voortuitsig van genetiese verbetering ons bied, beteken dat ons binnekort ‘n beter alternatief mag hê vir die vlak van funksionering wat ons tot dusver kon bewerkstellig, ooreenkomstig ons kanse om ‘n goeie lewe te leef. Dit impliseer dat die nie-voorsiening van hierdie verbeterings skadelik sal wees tot die mate wat ingrype om hierdie voorsiening teweeg te bring, geregverdig sal wees.

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## 1 Introduction

The possibility of the development and use of technologies which could alter the constitution of the human genome is a topic which has, in recent decades, received a great deal of attention in the field of biomedical ethics. In particular, the ethical status of any future use of genetic *enhancement* technologies in humans is a contentious issue. Genetic enhancement technologies are “any technolog[ies] that directly alter the expression of genes that are already present in humans, or that involve the addition of genes that have not previously appeared within the human population...for the purpose of human physical, intellectual, psychological, or moral improvement” (Baylis & Robert 2004: 3). Many people instinctively feel uneasy about the potential application of these interventions (Davis 2009: 148). However, it is not always easy to precisely express the reasons for this ethical discomfort.

My focus in this dissertation will be the ethical status of genetic enhancement in humans. In particular, I would like to subject arguments against enhancement to critique by calling into question ethical distinctions which are often made between genetic enhancement and other practices with which it seems to have a great deal in common, but which are themselves regarded to be morally desirable, or even morally obligatory practices. My purpose will be to show that, if the differences between genetic enhancement and these practices are ethically irrelevant, genetic enhancement, contrary to a great deal of critical opinion and public feeling, may not only be morally acceptable, but morally obligatory.

Before continuing to lay out the broad problem that I wish to address, however, it is necessary to provide a motivation for the importance of this study, particularly at a stage when such genetic technologies are not yet practically viable.

### **Why it matters: the importance of a study of the ethical status of genetic enhancement**

As previously stated, the question of the ethical status of genetic enhancement in humans has received a fair amount of attention in bioethical debate. However, the question may be posed as to why this topic is so contentious if the practices which it considers – interventions which will alter the genetic makeup of the human person, and particularly, genetically enhance the human person – are not yet, and may not for the foreseeable future be, technically feasible. An initial objection, therefore, to the project which I wish to embark upon in this dissertation, is that it is pointless to argue about a technology that is “foreseen but not yet accomplished”

(Billings, Hubbard & Newman 1999: 1873). It is therefore necessary to make some preliminary remarks as to why the ethical status of genetic enhancement is, indeed, a topic which merits attention.

I would like to contend that it is not only important to embark upon an ethical debate about the ethical status of genetic enhancement *although* enhancement technologies are not yet possible, but that it is crucial to get to grips with the ethical problems posed by such technologies *before* they become a practical reality. The issues evoked by the possibility of genetic interventions are profound, and pose new challenges to the discipline of bioethics, as well as to our current conceptions of human nature and self-creation. The difficulty of negotiating these unfamiliar ethical waters is described by Sandel as follows: “When science moves faster than understanding, as it does today, men and women struggle to articulate their unease”. He contends in this regard that “the genomic revolution has induced a kind of moral vertigo” (2004: 51). If we do not wish to find ourselves incapacitated by this “vertigo”, and therefore unprepared for the dilemmas posed by the successful development of enhancement technologies, it is essential that we grapple with these dilemmas now<sup>1</sup>.

In addition, and as Gardner points out (1995: 69), if there is something ethically objectionable about enhancement technologies, the best chance we have of prohibiting the use of such technologies in practical terms is to prevent any further steps being taken to research genetic enhancement in humans. In order to make this decision, and to facilitate a practical ban on such research if we should determine that genetic enhancement is unethical, research into the ethical status of genetic enhancement is necessary.

However, there is a further objection to be countered. One could contend that the genetic interventions which I wish to consider are unlikely to ever become practical possibilities, and belong in the realm of science fiction<sup>2</sup>. I would like to suggest that such a proposal is foolhardy. The reality is that genetic enhancement technologies have entered the scientific imagination, are currently being researched (even if this research is in its infancy), and, although many of the individual envisaged technologies will fail, eventually, bearing in mind the rapid advancements in medical science which we have witnessed during the last century (Fukuyama 2002: 79), some will reach a stage where they can be safely used (Mehlman 2003:

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<sup>1</sup> This point is echoed by, among others, Allhoff (2005: 42), Kass (2003: 10), Mehlman (2003: 10, 2005: 81), and Tsien (cited in Weiss 1999: A1).

<sup>2</sup> See for example Daniels (2009: 42).

3). Baylis and Robert express this view<sup>3</sup> as follows: “[D]espite the likely failure of particular genetic enhancements, there are some of us who will *inevitably attempt* to engineer the human genome for the purpose of improving *Homo Sapiens*. And...some will succeed” (2004: 3)<sup>4</sup>.

However, even if we allow for the *possibility* that genetic enhancement in humans will never become a practical reality, we can still see the sense in making allowance for the possibility that it could, and considering the moral dilemmas that this possibility may hold. Agar makes this point as follows:

It is better to have principles covering situations that turn out to be impossible than to have no principles for situations in which we suddenly find ourselves...We need principles for situations that may never eventuate, but whose possibility cannot be ruled out given our current state of knowledge (2004: 34).

However, the objection which suggests that genetic enhancement will remain forever within the realm of science fiction does contain a kernel of truth. Popular opinion, and sometimes bioethical argumentation, often imagines possibilities for genetic enhancement that are probably, based on our current knowledge of how genes work, beyond its scope. This not only confuses the issue, but evokes horrifying scenarios that prejudice, particularly, the general public against genetic enhancement. It will be necessary, therefore, to provide some idea of the possible prospects of genetic enhancement, based on scientific fact, early in this dissertation.

### **Stating the problem: if better is good, does resisting enhancement amount to harm?**

The supposition that genetic enhancement is morally problematic relies upon a conviction that there is some morally significant distinction between genetic enhancement and other practices with which it appears to have a great deal in common. These latter practices are not only regarded to be morally inoffensive, but are also considered to be moral goods, the non-provision of which can be harmful.

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<sup>3</sup> For a fuller discussion of Baylis and Robert’s argument that the development of genetic enhancement technologies is inevitable, see their 2004: 17-25.

<sup>4</sup> Buchanan strengthens this point by arguing that policy makers would be highly unlikely to ban enhancement technologies, should they become a reality, because some enhancements would probably offer “significant gains in productivity”. If this is true, it follows that it is not only the technical possibility of genetic enhancement technologies that is inevitable, but also the use of (at least some) enhancements, and it is therefore even more important that we should focus on the “ethically responsible” use of enhancement technologies (2008: 16).

The distinction which I want to focus upon in this dissertation is the distinction between the practice of medicine and the provision of enhancement technologies, which I will refer to as the treatment-enhancement distinction. (I will also consider, to a lesser extent, the distinction between environmental and technological means of enhancement). The broad question which I wish to answer in this dissertation is as follows: if it can be shown that the differences between genetic enhancement on the one hand, and medical therapy and environmental enhancement on the other, are not ethically relevant, it becomes likely that genetic enhancement may not only be ethically permissible, but also ethically desirable or obligatory. In this case, if genetic enhancement technologies become readily available, it would be a moral mistake to refrain from making use of them. Can it be shown, then, that to resist enhancement is harmful?

This question arises out of the fact that human enhancement, in its broadest application, implies simply the improvement and betterment of human beings. To enhance, when used in reference to capacities or characteristics, is “[t]o raise in degree, heighten [or] intensify” (Burchfield 1989), and “especially to increase or improve in value, quality [or] desirability” (Gay 1984). The improvement or increase of capacities such as intelligence, physical prowess, or memory, for example, via education or exercise, is generally regarded to be something that is beneficial and desirable, and is endorsed rather than rejected (Parens 1998b: viii). In other words, “[t]o enhance is to make better, so how could anyone object to enhancing anything, especially our own, notoriously flawed selves?” (Buchanan 2008: 1).

It seems that both therapy and enhancement are directed towards this sort of improvement of human beings, as both interventions seek to improve human functionality, broadly construed. In the case of therapy, this improvement of human functioning is achieved via the correction of defects and the eradication or reduction of propensities to particular diseases (Satava 2003: 249), in order to lessen the limits which these conditions place upon the level of human functioning. In other words, the primary goal of therapy is to cure, eradicate, or correct disorders or diseases, where disease is defined as “a [negative] departure from species-typical normal functioning” (Holtug 1999: 137). Enhancement, on the other hand, is directed towards the improvement of human functionality via the manipulation of an individual’s normal genetic constitution, by, for example, increasing abilities and capacities such as intelligence or physical strength (Fenton 2008: 5, Gordon 1999: 2023). In other words, enhancement aims at supplying or improving specific non-disease characteristics that are valued (Anderson 1989: 682). Both therapy and enhancement, then, are directed towards the

improvement of human functioning. In one case, this is realised by the correction of capacities that are damaged by the presence of disorder or disease, and the restoration or achievement of normal functioning, and in the other, by reaching beyond the capacities that are usual for a human to have. In the former case, this improvement of functioning is seen as ethically praiseworthy, but in the latter case, it is regarded to be morally problematic, or, at best, morally permissible but not desirable or obligatory. Are the differences between these two practices morally relevant in a way which would justify this ethical distinction?

To identify the factor which distinguishes therapy from enhancement, we can imagine the range of human characteristics as being represented on a sliding scale<sup>5</sup>. At the bottom of this scale would be death or non-existence, where functioning is absent altogether, and where the range of human possibilities is therefore nil. Above this zero point, we could place varying levels of impairment, moving up the scale as impairment lessens in degree, from extremely severe impairment where functioning is entirely curtailed at the bottom of the scale, to minor or trivial impairment just below the minimum level of species-typical functioning. Interventions which bring about an upwards movement in human functioning in an individual person towards the point of normal, or species-typical functioning, are regarded as therapeutic. Any practice which increases capacities or improves functioning beyond the range of normal functioning is, on the other hand, enhancing.

It is therefore clear that what distinguishes therapeutic from enhancing interventions is the effect of interventions relative to the range of normal species-typical functioning. The distinction which is made between morally obligatory therapy and morally contentious or optional enhancement seems to be based on the supposition that an improvement of capacities beyond the level of species-typical functioning is regarded as somehow illegitimate, or at the very least non-obligatory, whereas a movement from a point of sub-normal functioning towards normal functioning is not only considered to be legitimate, but also ethically desirable.

The argument in support of the ethical desirability of therapy is based upon the assumption that the effect of medical treatment promotes the interests of the affected moral agent in such a way that its non-provision is significantly harmful (Harris 2000: 97-98). However, I want to suggest that closer interrogation of the moral motivations for treatment (and for

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<sup>5</sup> Sober suggests that “from the point of biology, it makes sense to think of disease, health, and enhanced function as all falling on a single continuum” (2000: 353).

environmental enhancements) may reveal that very similar types of harms would result from a failure to intervene in an individual's genetic makeup in order to enhance it through positive genetic engineering. If a failure to make use of genetic enhancement brings about significant harms, this would suggest that genetic enhancement ought to be actively pursued as a moral good.

Erik Parens asks us to consider whether, in the context of the debate around genetic enhancement, "better [is] always good" (1998a: S2). I would like to suggest that if it can be convincingly demonstrated that better *is* always good in the context of human functioning, this good ought to be actively pursued, and - to take this argument one step further - to fail to pursue this good would actually amount to the infliction of harm. This supposition runs contrary to the current objections to genetic enhancement, and goes a step further than the vast majority of the current arguments in favour of the moral permissibility of genetic enhancement.

However, there are further objections to genetic enhancement, prevalent in the literature, which do not focus on the inherent features of genetic enhancement itself (in terms of its tendency to exceed normal functioning), but rather upon likely undesirable social consequences, which, it is suggested, would follow from the widespread use of genetic enhancement<sup>6</sup>. These objections must also be dealt with, and, if they are found to be persuasive, safeguards or guidelines must be suggested which would protect against such negative consequences. I would like to suggest that it is possible to imagine circumstances under which these objections could be nullified, and therefore, under which genetic enhancement could and should be actively pursued as a moral good.

In order to put forward the argument which I have outlined above, it is necessary to firstly establish the scientific facts of the matter. These facts include the manner in which genes influence human traits, the current state of research into genetic technologies which seek to manipulate these traits, and the limits which the former facts place on the latter endeavours. A study of the relevant literature about the state of scientific research into genetic enhancement, to the extent that this is accessible, and the limits that such research will likely be subject to, based on the nature of genes, will therefore be the focus of Chapter 2.

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<sup>6</sup> See for examples Anderson (1989), Kamm (2005) and Parens (1998a).

Secondly, in order to advance my own argument in favour of the moral desirability of genetic enhancement, it is necessary to provide a detailed summary of the current bioethical arguments around this topic. Chapter 3 will therefore provide an overall review of the body of literature which considers these questions.

In Chapter 4, I will turn to the main body of my argument in favour of a moral obligation to enhance. Firstly, I will describe at some length the conceptual basis of the treatment-enhancement distinction, before subjecting this distinction to critique. I will argue that the underlying moral motivations for medical treatment (and for environmental enhancement) suggest that enhancement, too, may be a moral obligation. I will then go on to suggest, via an analysis of the notion of harm, that a failure to enhance could be harmful.

In Chapter 5, I will further define the concept of morally obligatory enhancements, in order to show that this category will exclude some sorts of “enhancing” interventions which will remain ethically problematic. I will then attempt to provide some idea of how we ought to rate the moral obligation to enhance in comparison to our other moral obligations, and will try to suggest some ways in which we could guard against the negative consequences which could result from the (widespread) use of enhancement technologies. Lastly, I will make some remarks about who will be responsible for providing enhancement interventions to particular individuals, taking into account the notion of special relationships.

In Chapter 6, I will conclude my discussion by pointing out some of the wider implications of the argument which I present. I will also identify some of the limits of my study which invite and provide scope for further investigation.



## 2 The Nature of Genetic Functioning

### Genetic enhancement and science (fiction)

Any bioethical interrogation of a new medical technology demands a basic understanding of the pertinent scientific facts. In the case of genetic enhancement, the attainment of such an understanding is complicated by the fact that this is currently a speculative technology, and while some practical experimentation has already been carried out on animals, genetic enhancement in humans is not yet a practical possibility. An investigation into what is likely to be achieved by genetic enhancement, and genetic engineering in general, is therefore currently a partially imaginative exercise.

However, it is essential that we do not let our imaginations run away with us. This is a tempting possibility. The idea that we will one day be capable of altering or manipulating our genetic makeup - thereby attaining a greater, and indeed a fundamental, level of control over what makes us who we are - has captured the popular imagination. Myriad science fiction texts and Hollywood blockbusters have taken this idea and run with it. The portrayals of genetic enhancement in popular culture range from the sublime<sup>7</sup> to the ridiculous<sup>8</sup>. Almost as a matter of principle, these images of genetic enhancement evoke a world gone awry as a result of the practice of this technology. Genetic enhancement, it seems, is almost invariably represented as having sinister consequences, and is often portrayed as having a fundamentally transformative effect on the world of social interaction as we know it, whether in the form of a world characterised by discrimination, as in the film *Gattaca* (1997); a world in which the human goods that we currently value have been destroyed or replaced, as in Aldous Huxley's *Brave New World* (1932); or by almost complete obliteration of humanity itself, for example in Margaret Atwood's *Oryx and Crake* (2003) and *The Year of the Flood* (2009).

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<sup>7</sup> In Sharon Shinn's science fiction romance, *Archangel*, an elite group within the human population, known as "angels", have been genetically engineered to endow them with certain "supernatural" powers – they have large wings which enable them to fly and heated blood which allows them to withstand adverse weather conditions. These genetically engineered beings commune with their "god" Jovah (which is in fact, a spaceship orbiting the earth) once a year when they sing the "Gloria" that ensures peace and harmony on earth for the following year (1996).

<sup>8</sup> Greg Bear's foundational science fiction text, *Blood Music*, describes a world in which an experiment by a rogue scientist to create intelligent genes, which he injects into his own body, results, firstly, in radical enhancement of the individual. Ultimately, however, the intelligent cells take over individual human bodies, and dissolve them, until the entire world is transformed into a mass of organic matter, and individual humanity is obliterated. Not only do the genes take over the world, and eventually the universe, but the scientist who triggers the apocalypse blames the genes themselves – "They made me do it! The goddamn genes!" (1985: 66).

Of course, these images do not arise in isolation. Rather, they are emblematic of a general discomfort with the idea of genetic enhancement, or genetic engineering as a whole, which is itself associated with a greater uneasiness with the idea of interfering with nature by technological means (Sandel 2007: 6). These negative representations of genetic enhancement can in turn serve to reinforce such negative attitudes towards genetic enhancement – a negative portrayal of science in fiction can contribute towards a negative attitude towards science in reality<sup>9</sup>.

Negative attitudes towards genetic enhancement are doubly problematic in this context, because images of genetic enhancement, both in the popular imagination and in popular culture, are often based upon a fundamental misunderstanding of the nature of genetics, and therefore upon a misrepresentation of the probable nature and scope of future genetic enhancements. These misrepresentations can lead to an outright, and often unreasonable, moral rejection of genetic enhancement technologies<sup>10</sup>. As Agar suggests, “Hollywood gives bad moral advice about enhancement technologies precisely because it gets the facts about them wrong” (2004: 21).

Bioethical debate around the topic of genetic enhancement, while for the most part avoiding the unrealistic portrayals of genetic enhancement found in popular culture, is also not immune to a tendency to imagine the possibilities of genetic enhancement (and other new medical technologies) without due consideration of the facts<sup>11</sup>. Bioethics should provide a serious and

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<sup>9</sup> This is attested to by a survey conducted by Gerbner in the late 1980s which found that “U.S. adults who consume popular culture frequently (habitual viewers) are more likely than infrequent viewers to hold negative opinions about science, to believe that science is dangerous, to consider scientists odd and peculiar people, and to feel that a career in science is undesirable” (cited in Kirby 2000: 208).

<sup>10</sup> Of course, this does not exclude the fact that there may be very good arguments against genetic enhancement which are based upon reasonable expectations of what such technologies would be likely to achieve, or that representations of genetic interventions in popular culture may capture the essence of these objections. For example, the possibility of genetic discrimination, as depicted in the film *Gattaca* (1997) is a concern often raised in bioethics literature (see, for example, Ledley 1994: 157).

<sup>11</sup> Consider this panic inducing excerpt from the abstract of a paper by Richard Satava: “Technology is rampant, exponentially growing beyond the bounds normally comprehensible by the human mind. Many of these technologies are so fundamentally disruptive that they challenge the very practice of science. Discoveries once unimaginable except in science fiction are appearing at such a rapid rate that there is no time to evaluate their moral and ethical implications in a deliberate and measured fashion...[These technologies] will revolutionize what it means to be human and what the ultimate fate of the species will be” (2003: 246), and later in the paper, “no politics or regulation could stop the stampede of science” (2003: 247). This language recalls the Hollywood thriller rather than the measured deliberations of bioethics, with “rampant” and “stamp[ing]” technology portrayed as the villain, and the human “species” as the victim. Leon Kass uses similar rhetoric when he refers to the danger of “bio-engineered perfection” as a “wave of the future” that will “sneak up on us before we know it and, if we’re not careful, sweep us up and tow us under” (2003: 10). Bill McKibben, the popular environmentalist, is comparably vehement when he warns us, in an article discussing the perils of genetic enhancement, that “[e]very time you turn your back this technology creeps a little closer. Gallops actually, growing and spreading as fast as the internet. One moment you’ve sort of heard of it; the next moment it’s everywhere” (2003: 22).

considered evaluation of the ethics of genetic enhancement, and, as I have argued in Chapter 1, could even be expected to provide a blueprint for ethically responsible research into, and future application of, genetic enhancement technologies. However, for such an investigation to be reliable and useful, it is necessary that it is based upon the consideration of realistic scientific possibilities – our “moral evaluation” of genetic technologies must proceed from “full and accurate representations of...genetic engineering and genomics”<sup>12</sup> (Agar 2004: 21). Misunderstanding the science of genetic enhancement may lead to “unwarranted emotional reactions” (Motulsky 1983: 135) that are misplaced.

An initial point to be made before embarking upon a discussion of the limits of genetic engineering, is that we must firstly accept another limit – it is highly unlikely that any layman will be able to provide an exhaustive explanation, or achieve a complete scientific understanding, of genetics and genetic technologies – the very complexity of these fields makes their technological intricacies difficult to understand. Agar points out that this does not imply that we are therefore unable to make moral judgements about genetic engineering, and that we should “cede our moral authority to scientists” (2004: 21). In fact, scientists involved in genetic research may themselves be limited in their ability to objectively evaluate the ethics of their subject matter, because of their common assumption of the beneficial nature of scientific research in general (Morton 2005: A25). It does imply, however, that we should strive to achieve, at least, a broad understanding of the technologies in question in order for our moral evaluations thereof to be reliable and serious. Agar uses the analogy of doctor-patient relations – a doctor will find it difficult to explain the detailed intricacies of a medical condition to a patient, but can still provide a “morally transparent description” of a condition which “must at least gesture towards the deeper scientific truth” (2004: 23). In the same way, bioethicists and members of the public who seeks to make moral judgement about genetic engineering should also be able to grasp such a morally transparent description of the likely possibilities of genetic interventions, so that they do not find themselves arguing against a straw man. It is for this purpose that I will attempt to provide a broad picture, rather than a detailed diagram, of the possibilities of genetic enhancement.

Before I go on, I would like to reiterate what I have previously stated in my introductory chapter. One argument which has been made against an ethical investigation into the moral status of genetic enhancement is that it is not now, nor is it ever likely to be, a practical

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<sup>12</sup> In the parallel case of the ethics of cloning, for example, Agar points out that those who “persist in thinking of clones as mindless automata are unlikely to have worthwhile views about the ethics of reproductive cloning” (2004: 160).

possibility. Some of the limits and difficulties which may hinder the development of genetic enhancement and which will be discussed in this chapter may appear to make that possibility even more remote. However, as I have previously argued, while it is true that genetic enhancement of humans is not currently technically feasible, and while there are weighty problems which are likely to beset future research into this topic, it is unlikely, given the swift rate of scientific progress made in recent years, and the current research being conducted into the human genome, that some form of genetic enhancement will never be a realistic possibility. What *is* of value in this objection, however, is an emphasis upon the need for vigilance against an attitude which overestimates the likely possibilities of future genetic enhancement.

This chapter will be divided into four sections:

In the first section, I will attempt to provide some simple definitions and explanations of basic genetic terminology, which will be used in this chapter and throughout this dissertation.

In the second section, I will discuss two complexities inherent in the relationship between genes and human functioning that are often overlooked, and draw attention to the implications that these complexities have for the development of genetic enhancement technologies. I will illustrate these complexities with examples from animal experimentation, which will also serve to provide some idea of the current state of research into genetic enhancement technologies.

In the third section, I will examine a scientific fallacy which often infects attitudes towards genetic enhancement – the fallacy of (simplistic) genetic determinism. Taking genetic determinism seriously tends to lead to an overestimation of the influence genetic interventions will be likely to have, both on the affected individual, and on society as a whole.

Finally, I will summarise the implications which the scientific facts of genetic functioning have for the possibility of the successful development of genetic enhancement technologies, as well as for the limits of these technologies.

## **Some basic concepts**

This section will attempt to provide a brief outline of the most central concepts of genetics. As previously stated in the introductory section, it is not possible to provide an exhaustive account of human genetics. Rather, an attempt will be made to present a sketch of the manner in which genes work in the human body, and thereby to introduce simple definitions of basic concepts.

The basic physical and functional unit of hereditary in all biological organisms is the gene, which consists of a particular sequence of DNA (deoxyribonucleic acid) bases. DNA is “made up of millions of nucleotides”, each of which “contains one of the four nitrogenous bases” known as adenine, thymine, guanine and cytosine (commonly referred to as A, T, G and C). The relevant nitrogenous base is linked to a “deoxyribose unit, [which is] in turn linked to a chemical group containing a phosphorous atom” (Omoto & Lurquin 2004: 2). The sugar phosphate molecules form the outside of the DNA molecule, and the bases the inside. The bases are loosely bonded together in pairs – adenine is bonded with thymine, and guanine with cytosine. This forms the double helix structure famously identified by Watson and Crick in 1953 (Omoto & Lurquin 2004: 8).

A gene constitutes a segment of DNA that is involved in producing a polypeptide chain, or protein. A common, but mistaken, perception of genes tends to view the relationship between genes and human traits as direct – our genes determine our characteristics. However, genes do not work directly on human traits. Rather, they code for amino acid sequences, which make up the proteins which are the basic building blocks of physical structure and biological functions (Robinson, Fernald & Clayton 2008: 896). The instructions for coding proteins are “transmitted indirectly through messenger ribonucleic acid (mRNA)” (DOE Human Genome Program 1992: 7). In other words, genes are “translated into amino acids that assemble themselves into proteins [that] make up our physical structure, catalyze the chemical reactions that keep us alive and regulate the expression of other genes” (Pinker 2009: MM24).

Genes occupy a specific site, or locus, on one of the twenty-three chromosomes, which are “thread-like structures located within the cell nucleus composed of an extremely long, double-stranded DNA helix tightly folded around proteins called histones” (Millodot 2009), one copy of each of which is inherited from each parent, giving forty-six chromosomes in total.

The complete genetic material of a biological organism makes up the genome of the relevant organism (Mai, Young Owl & Kersting 2005). This genome is the entire gene map, or sequence, on all of the chromosomes (Youngson 2000), which contains all the information necessary for making an organism. The human genome is thought to contain about 3 billion base pairs of DNA, and between 20,000 and 120,000 genes, although opinions vary as to this latter number (*The Nature of the Number* 2000: 127). The most reliable estimate is probably that of the Human Genome Project, which has estimated that the genome contains between 20,000 and 25,000 protein-coding genes (International Human Genome Sequencing Consortium 2004: 931).

The concept genome is often used interchangeably with the concept “genotype”, although technically these terms differ in meaning slightly – while the genome refers to all the genetic material contained in the chromosomes of an organism, the genotype is the “complete genetic constitution of an individual at a particular location (locus) in the genome” (Millodot 2009).

The genome of an organism can be distinguished from its phenotype, which refers to all the traits or characteristics which are attributable to a particular organism, as influenced by the genome, as well as its interaction with the environment (Hall & Morton 2002). The complexities of the relationship between genome and phenotype will be the focus of the remainder of this chapter.

### **The complexity of genetic functioning**

A popular argument made against genetic enhancement can be captured in the intuition that “nature often knows best” (Bostrom & Sandberg 2009a: 377). This argument suggests that there is a high possibility that attempts to intervene genetically in the human organism will fail to have the desired effect, or worse, that these interventions will go badly wrong. In the latter case, critics argue that the intervention will harm rather than benefit the affected individual, and possibly, in the case of germline engineering, will also harm their descendants (Murray 1991: 58). If this is indeed likely to be the case, this provides us with a good reason to refrain from any attempt to genetically enhance human beings, as such a result would undercut any further arguments in favour of enhancement. The question is whether this intuition is indeed reliable. To evaluate this, we must consider what scientists have thus far discovered about the nature of genetic functioning.

### *The human genome project*

Within recent decades, great strides have been made in our understanding of the human genome, and the manner in which genes impact upon the functioning of the human organism. Less than half a century after the discovery of the structure of the DNA molecule by James Watson and Francis Crick - a discovery which initiated the “modern revolution in genomics” - virtually the entire human genome has been sequenced (Mehlman 2003: 10). The achievement of this latter milestone was the main objective of the Human Genome Project.

The Human Genome Project was a scientific research project originating in the United States, but with a variety of international contributors, including researchers from the United Kingdom, Japan, France, Germany and China. The project began formally in 1990, and was an undertaking with the central goal of the establishment of the complete sequence of the human genome (Mehlman 2003: 17). In other words, the intention was to identify the complete sequence of the estimated 3 billion base pairs of DNA. This main goal was achieved, and the project therefore completed, in 2003, two years ahead of schedule.

The project was “heralded as the initial and necessary step for attaining a complete understanding of the hereditary nature of humankind” (Gannett 2010: 1). Its implications are often regarded primarily to be the improvement of the prospects of genetic therapy and a better understanding of the genetic contribution to disease (Collins 1999: 28, Collins & McKusick 2001: 543, Greenhalgh 2005: 545). However, the outcomes of the project also have obvious consequences for the prospects of human genetic enhancement, given that genetic therapy and genetic enhancement can be seen as two different stages on a continuum of possible genetic interventions.

While virtually all the genes in the human genome have now been identified, scientists have yet to establish anything like a comprehensive account of what these genes, on an individual level, do, and how they do it. While we do know something about the function of many genes, we are a long way from understanding exactly how genes function in the human organism – we do not yet have a complete grasp of the manner in which they interact with one another and their environment to form the complex traits of human (and other) organisms, particularly when these traits are behavioural. Contributors to the Human Genome Project themselves emphasise that “the path from genes to proteins to development of a particular trait is still a mystery” (McInerney & Rothstein 2008).



However, the collection of knowledge of human genetics that scientists have thus far accumulated *has* identified some aspects of genetic functioning which render it immensely complex. In this section I would like to discuss two features of genetic functioning, or the relationship between genes and human traits, which will complicate any attempt to intervene genetically in the human organism. I will then go on to say something about the complexity of human traits themselves, particularly behavioural traits, which are often regarded as a likely target of genetic enhancement technologies. I will use some examples from animal experimentation in the field of genetic engineering to illustrate these points, as well as to provide some insight into the current state of scientific research on this topic.

### *Two complex aspects of genetic functioning*

The two characteristics of the relationship between the genome and human characteristics that I wish to discuss are interrelated, and together, they emphasise that “genes do not have a one-to-one relation to the characters they effect” (Charlesworth 2001: 782). I will identify each of these characteristics in turn, and discuss their consequences for the prospects of genetic engineering separately, before going on to draw out their joint implications.

Firstly, human traits of any level of complexity are polygenic. This means that a single human trait<sup>13</sup> is determined or influenced by more than one, and usually by multiple, genes<sup>14</sup>. This is true of the vast majority of disease traits, such as diabetes (Greenhalgh 2005: 545, Permutt et al. 2010: S308) and breast cancer (Pharoah et al. 2002: 33), as well as physical-structural traits such as height (Weedon et al. 2008: 575). However, the polygenic nature of traits is most apparent in the case of human behavioural traits, as these traits are particularly complex – the number of genes influencing a particular trait seems to increase depending on the complexity of the given trait (McInerney & Rothstein 2008).

This feature of genetic functioning has fairly obvious implications for the level of difficulty involved in effectively accomplishing specific genetic interventions. It is not simply a matter of altering the expression of one gene and ending up with the desired result. Many genes are involved in affecting even a single aspect of human functioning – for complex behavioural characteristics there may be “hundreds or thousands of genes” (Pinker 2009: MM24)

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<sup>13</sup> The extent to which it makes sense to refer to a “single human trait”, particularly when it comes to complex behavioural traits, will be discussed later in this section.

<sup>14</sup> Traits are also influenced by environment. I will return to this point in the next section.



involved. An intervention which acts upon only one, or even a few genes, may only make a negligible difference to a given characteristic.

These difficulties have been evident in early failures to achieve the genetic enhancement of physical traits in animals. Consider this example of an attempt to genetically engineer swine:

Efforts to genetically improve the growth of swine have involved insertion of transgenes encoding growth hormone. Nevertheless despite the fact that growth hormone transgenes are expressed well in swine, increased growth did not occur, [a]lthough the transgenic animals fortuitously have less body fat (Gordon 1999: 2023).

Gordon suggests that this failure probably resulted from the fact that this genetic intervention worked on “one relevant locus and attempt[ed]...to improve it in isolation”. However, the polygenic nature of the physical attribute of growth rate in swine implies that “[d]ozens or perhaps hundreds of genes may influence [this] trait” (1999: 2023)<sup>15</sup>.

The example cited above also has bearing on the second characteristic of genetic functioning which I wish to identify. Not only did the genetic engineering of swine not produce the desired effect, but it produced an effect (reduced body fat) which was unforeseen. This is probably attributable to the fact that many genes are pleiotropic. In other words, genes may influence more than one trait (Agar 2004: 29).

We can consider this example, also provided by Gordon, which illustrates this feature of genetic functioning:

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<sup>15</sup> Gordon also points out that this characteristic of genetic functioning explains why another type of genetic manipulation - selective breeding - *has* achieved great success historically. This type of genetic engineering works on all loci simultaneously (1999: 2023). Motulsky, in making the point that “[g]enetic manipulation is not a new development” emphasises the point that selective breeding is an instance of “[g]enetic manipulation by design” that has been practiced in society for many years, although mainly in animals, while unplanned selective breeding can be argued to sometimes take place in the human species in choosing like partners (1983: 135). There has, however, been at least one attempt in the last few decades to embark upon a limited program of intentional selective breeding in humans with the express purpose of enhancing intelligence. This attempt was initiated by the Californian millionaire Robert K. Graham, a retired optometrist who made his fortune from the invention of shatterproof eyeglasses (Silver 1997: 160). Graham set up a sperm bank called the Repository for Germinal Choice in the late 1970s, which offered prospective mothers (or at least those with high intelligence) the opportunity to use sperm from Nobel Prize Winners, and (when most of these prospective donors proved resistant to the idea) from gifted young scientists, for insemination. This project produced over 200 children before its demise in the 1990s, although it is difficult to determine whether the project was successful, as most of those who made use of its services have chosen to remain anonymous (*The Genius Sperm Bank* 2006).

Another spectacular failed attempt at enhancement resulted from efforts to increase muscle mass in cattle. When expressed in mice, the avian *c-ski* gene...induced massive muscle hypertrophy. This prompted efforts to produce cattle expressing a *c-ski* transgene. When gene transfer was accomplished, the transgenic calf initially exhibited muscle hypertrophy, but muscle degeneration and wasting soon followed. Unable to stand, the debilitated animal was killed (1999: 2023).

As is evident in this example, the pleiotropic nature of many genes greatly increases the possibility that things could go badly wrong in attempts to intervene genetically in the human organism, as the intervention could have unforeseen effects, adverse or otherwise, on traits other than those that the intervention is aimed at. This risk demands that we take seriously the possible dangers of genetic engineering, and emphasises that we have a long way to go in establishing the exact functions of genes before we can begin to think about the practical use of this technology in humans.

Taken together, these two aspects of complex genetic functioning, along with our thus far imperfect understanding of this functioning, make it difficult, at this time, to predict with certainty the likely outcomes of genetic engineering - a point echoed by Baylis and Robert (2004: 3). The complexity of genetic functioning has even resulted in a straightforward rejection of the idea that the manipulation of genes will have any meaningful effect on the phenotype of the resulting individual (Graham 2002: 172). What this also implies is that even when we reach a point at which genetic engineering can be safely accomplished, the straightforward, dramatic, single effect results that many envisage when they think of genetic enhancements may never come to pass, as the very nature of genetics will in all likelihood restrict the scope of enhancements.

The considerations mentioned above may also explain why genetic therapy is considered to be a less challenging prospect than genetic enhancement (Sober 2000: 352). These interventions do not make an attempt to “overhaul” the complex system of genetic functioning entirely, but rather to “figure out what has broken, and how to fix it” (Bostrom & Sandberg 2009a: 176); in other words, to determine what has gone wrong in the expression of a particular gene and to restore this aspect of genetic functioning to normality, which could be regarded as a decidedly more modest goal. However, many scientists even doubt the likely effectiveness of therapeutic interventions, pointing towards the polygenic nature of most diseases and the influence of the environment upon the expression of the contributory genes,

and therefore to the phenotype of disease (Greenhalgh 2005: 545)<sup>16</sup>. In addition, the line between therapy and enhancement is not so clear cut. Many incidences of genetic therapy will be likely to target the reduction in functioning caused by disease, the cause of which is unlikely to be attributable to single loci. These interventions will therefore also need to be complex in the same way that interventions aimed at the enhancement of function will be, as they will be of a similar type. For example, interventions aimed at improving functioning, such as those aimed at improving muscular development and functioning of patients with disorders such as muscular dystrophy, or improving intellectual functioning in patients affected by Alzheimer's disease, would presumably be of a similar sort to those used to enhance the muscular and intellectual functioning of individuals in the normal ranges.

All of this belies the manner in which the popular media generally reports on genetic research. News reports habitually proclaim that scientists have discovered a gay gene (Connor 1995), a gene which causes antisocial behaviour (Recer 2002: 3), a gene which causes intelligence (Wade 1998), and so on. As the preceding discussion has revealed, this is highly misleading as to the nature of the interaction between genes and complex human characteristics, and results in an exaggeration of the possibilities, and therefore the ethical perils, of genetic enhancement, particularly with regard to its effects on society (Agar 2004: 11), leading in turn to an unreasonable moral rejection thereof. I will briefly illustrate the above with reference to a human trait that is often emphasised as an obvious target for genetic enhancement – the trait of intelligence. I will then use this trait to illustrate a further difficulty likely to be encountered in any attempt to genetically enhance complex behavioural characteristics.

Gardner, in considering the possibility of cognitive genetic enhancement, notes that “[m]any genes affect cognitive abilities and each of those genes may affect many other body systems” (1995: 68), immediately drawing attention to the manner in which the polygenic nature of intelligence, and the pleiotropic nature of the genes which influence this trait, impose obstacles to the successful achievement of the genetic enhancement of cognitive functioning. The polygenic nature of the trait of intelligence implies that altering the expression of one gene (or more than one gene) which influences the trait of intelligence may have an insignificant effect. Bostrom and Sandberg, also emphasise this difficulty, citing Craig and

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<sup>16</sup> Greenhalgh believes that there are better means than gene therapy available to treat diseases like diabetes that are already technically feasible and easily accessible (2005: 545). If she means to imply that it is therefore irresponsible to devote scientific research efforts and funds to investigating genetic interventions at the expense of providing already available treatments, this echoes an argument which we will consider further in the following chapter.

Plomin as stating that “[s]tudies of the genetics of intelligence suggest that there is a large number of genetic variations affecting individual intelligence, but each accounting for only a very small fraction (1%) of the variance between individuals” (2009a: 319). For this reason, insertion of or manipulation of a single gene which affects intelligence may not have a drastic effect (Bostrom & Sandberg 2009b: 319). On the other hand, the pleiotropic nature of many of the genes which affect intelligence simultaneously implies that any attempt to alter the expression of these genes may have unforeseen or undesired effects on other traits. Of course, this risk increases with each additional gene that is altered, and the polygenic nature of intelligence implies that multiple genes will probably need to be altered to achieve dramatic enhancement of this trait. I will illustrate these problems by means of an interesting case study.

In a study published in 2001, researchers at Washington University claimed to have discovered in experimentation on mice that “[g]enetic modification of forebrain NMDA receptors can...influence pain perception”. In this experiment, the overexpression of the protein NR2B, a contributory component of cellular proteins called NMDA receptors, resulted in mice having enhanced perception of minor pain for longer periods of time (Wei et al. 2001: 164). The implication of this study is that deactivating or reducing the expression of NR2B may reduce the perception of long-term chronic pain in other species, including humans, without removing the protective qualities of pain perception, as the reduction of the expression of NR2B would seem to limit the perception of chronic pain, while leaving the rest of the pain perception system intact (Wei et al. 2001: 168). Some critics also suggest that making use of genetic engineering to reduce NR2B expression may be an ethically desirable course of action which could be used to reduce the pain experienced by factory farmed animals (Shriver 2010: A27).

However, this experiment not only reveals something about the genetics of chronic pain perception, but also indicates the difficulties likely to be experienced in the successful and predictable achievement of genetic enhancement of cognitive abilities and other complex traits of this nature. This is because the first characteristic associated with overexpression of NR2B in mice was not a heightened perception of chronic pain, but an enhancement of learning and memory.

The mice used in the Washington University experiment were originally genetically engineered by researchers at Princeton. The extra copy of the NR2B gene was initially

inserted to research the enhancement of cognitive abilities. The results of this experiment were that “overexpression of NMDA receptor 2B (NR2B) in the forebrains of transgenic mice [led] to enhanced activation of NMDA receptors” which caused the affected mice to “exhibit superior ability in learning and memory in various behavioural tasks” (Tang et al. 1999: 63)<sup>17</sup>. The mice were found to “acquire new knowledge twice as fast, and [to] retain it for around four to five times longer [than] their normal counterparts” leading them to be referred to as “Doogie” mice, after the “television teen genius, Doogie Howser MD” (Agar 2004: 10). This suggests that, due to the pleiotropic nature of genes, “a genetic manipulation conferring enhanced cognitive abilities may also provide unintended traits, such as increased susceptibility to persistent pain” (Wei et al. 2001: 168). Even if, as one of the original Princeton researchers maintains, the Washington University experiment does not show that the mice experienced enhanced pain, but enhanced memory of pain (Weiss 2001: A2), this still implies that an enhanced memory may not always be an uncomplicated benefit to the affected individual, as all the consequences of this enhancement cannot be foreseen.

This case shows how difficult it may be to separate human traits from one another, and by extension, to separately enhance, human traits. If, as seems to be the case, “memory formation and pain sensation...share components of a common physiological pathway” (Stull 2001: 21), this has perilous implications for the use of genetic engineering when an intervention is directed either at enhancing memory or at treating chronic pain.

There is one further point which can be taken from this case. The creation of the NR2B-enhanced mice was heralded, particular in the popular press, as the successful creation of smart or “Doogie” mice (Leutwyler 1999, Weiss 2001: A2). The suggestion was that mice had been genetically enhanced for *intelligence*. However, the trait of intelligence is extremely complex (Harris 1992: 141, Newson & Williamson 1999: 328). Memory, and the accompanying ability to learn, is one aspect of this multifactorial characteristic, the importance of which very few people would dispute. However, there are a multitude of other factors which make up this trait, which might include creativity, rational thinking, spatial perception, and could even be argued, in the case of genius, to include a certain measure of nonconformity. Intelligence cannot only be attributed to increased powers of memory, but is constituted by some combination of these and other factors. This has two implications. Firstly, because it is difficult to agree upon what exactly constitutes intelligence, it may be difficult to agree upon what counts as a successful enhancement of intelligence. Secondly,

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<sup>17</sup> These results have since been reproduced in experiments on rats (Wang et al. 2009).

even if we can agree upon the traits that constitute intelligence, the problem of the polygenic nature of traits is exacerbated, as a multitude of traits, each of them complex and influenced by multiple genes, will probably need to be enhanced to truly achieve enhancement of intelligence to the level of genius. Whether this will ever be possible remains an open question.

### ***Practical genetic engineering: some examples from animal experimentation***

The discussion above as to the complex relationship between genes and traits may seem to indicate that the obstacles facing genetic enhancement, at least of complex behavioural traits, are insurmountable. In fact, some degree of success has already been achieved in animal experimentation.

Firstly, there are examples of the successful manipulation of the physical characteristics of animals by genetic means. Increases in growth rate and muscle mass have been accomplished. This is obviously a desirable economic goal for farmers of livestock and other animals reared for human consumption. I will discuss three examples of these successes.

A company called AquaBounty Technologies has succeeded in producing salmon which grow at twice the normal rate (although they do not reach a larger size than normal salmon). This has been achieved by the insertion of a growth hormone gene into an Atlantic salmon from the Chinook salmon as well as a “genetic on-switch from the ocean pout, a distant relative of the salmon”. This causes a divergence from normal functioning in that the salmon, which do not typically produce growth hormone in colder weather, are able to do so all year round (as does the ocean pout) (Pollack 2010: A1).

In another case, researchers at Harvard University have created “Schwarzenegger” mice, who gain muscle more easily than normal mice, and appear to be immune to muscular wasting associated with old age, as a result of the insertion of “the gene that produces a protein associated with muscle growth known as insulin-like growth factor type 1 (IGF-1)”. IGF-1 is also present in humans (Agar 2004: 10-11).

Mice have also been genetically engineered to prevent them from expressing a protein called myostatin, which seems to regulate the limits of muscle development and function. The result was mice who exhibited “dramatic increases in skeletal muscle mass, with individual muscles

weighing about twice as much as those of wild-type mice” (Lee 2004: 63). It has been shown that the “predicted myostatin protein sequences” are identical in humans and mice (as well as other species such as rats, pigs, chickens and turkeys), suggesting “conservation of function” of myostatin across these species (Lee 2004: 64).

Other interventions which affect physical functioning have also been successful. Researchers at the University of Washington have succeeded in altering the vision of squirrel monkeys. Usually, “male squirrel monkeys have only two of the colour pigments known as opsins, unlike people who have three”. Insertion of the gene which codes for the “missing red pigment” (Wade 2009: D3) has allowed them to “discriminate between two colours which had looked identical to them before treatment” (Shapley 2009: 737).

There is also some evidence of the possibility of the successful manipulation of behavioural traits in animals. In one experiment, researchers were able to influence “partner preference” in voles via the manipulation of a single gene, resulting in a previously promiscuous subspecies of voles exhibiting monogamous behaviour (Lim et al. 2004: 754). Another study shows that it is possible to “turn lazy monkeys into workaholics by altering the reward centre in the brain” (Savulescu 2005: 36, see also Liu et al. 2004). In addition, despite the complications which have arisen in the experiment to increase the expression of NR2B gene, this research does show that it is possible to genetically enhance memory. Other studies also suggest that genetic interventions aimed at manipulating complex behavioural traits such as timidity (Carey 2005) and aggression (Bhanoo 2011) in mice have met with some success. As research is currently being conducted in humans “to understand the genetic basis” of characteristics such as “aggression and criminal behaviour, alcoholism, anxiety, antisocial personality disorder, maternal behaviour, homosexuality and neuroticism” (Savulescu 2005: 37), it is by no means beyond the realm of possibility that similar manipulations will be successful in altering complex behavioural traits in our own species too.

These studies, among others, show that despite the complex nature of genetic functioning, it would be foolhardy to assume that some form of genetic enhancement will never be a practical possibility, even if it is not equivalent to the dramatic, single effect enhancements often envisaged by science fiction and the popular press.

However, there is another factor which we need to consider. Genes influence human functioning in complex ways, but they are not the only influences which impact on human



traits. To illustrate this, I will now turn to a discussion of another common misapprehension with regard to genetic functioning – the fallacy of genetic determinism.

### **The fallacy of genetic determinism: what *really* makes us who we are?**

A project launched by the BBC in the year 2000 is attempting to follow the maturation of twenty-five British children from birth until the age of twenty, and professes to tackle the question as to “[w]hat makes us who we are”. In particular, it attempts to arrive at some conclusions as to the respective contribution of “genes and environment” to individual human identities (Livingstone 2005: 11). This question is another incarnation of the old nature versus nurture debate. As it turns out, it is difficult to determine the extent to which each of these aspects exerts influence in establishing the phenotype (Sober 2000: 360). What can, however, be ascertained with some certainty is that both genetics *and* environment matter - “genes are only part of the story” (Silver 1997: 213) - and this has implications for the prospect of genetic engineering. A focus on the possibility of genetically altering, and specifically enhancing, human traits, can lead to an absence of appreciation of the extent to which environment plays a role in determining these traits. It is therefore of vital importance in any discussion of the ethics of genetic enhancement to avoid the attitude that *only* genes matter in the determination of characteristics. This attitude is known as genetic determinism, and amounts to an assumption, or conviction, that genes are wholly or primarily responsible for the determination of the eventual human phenotype, or that “a person’s genome causally necessitates her every significant characteristic” (Agar 2004: 71). Such an attitude both accompanies and causes a lack of emphasis on the role of environment.

Genetic determinism has its own set of ethical perils. The history of eugenics, particularly in Nazi Germany (Buchanan, Brock, Daniels & Wikler 2000: 37), but also in campaigns which resulted in the forced sterilisation of tens of thousands of the supposedly unfit in, among other countries, the United States during the first half of the twentieth century (Bruinius 2006: 11), was based upon a similar attitude - namely, that human traits could be solely attributed to natural inheritance<sup>18</sup> - and this viewpoint, combined with class bias and racism, led to the designation of certain sections of society as innately inferior. This resulted in a conviction that “social problems had both a biological basis and...a potential biological remedy”

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<sup>18</sup> Buchanan et al. point out that there were notable exceptions to this emphasis on nature as opposed to environment in the history of eugenic thought. For example, the “French and Brazilian eugenic movements were at least as concerned about neonatal care as with hereditary”, and believed that “parents passed onto their children characteristics acquired during their lives” (2000: 32).



(Buchanan et al. 2000: 41) – a “remedy” which routinely involved gross human rights violations, and, in its worst incarnation, resulted in genocide.

The horrors resulting from the eugenic project have engendered a standpoint of wariness towards many endeavours which seem to bear similarities to it, including research into genetic enhancement. It is therefore fairly ironic that genetic determinism, which is a similar attitude to that which provided a foundation for eugenic thinking, now grounds one form of an unreasonable rejection of the possibility of genetic enhancement. This rejection is based upon an overestimation of “what enhancement technologies can achieve” (Agar 2004: 11).

Sober confirms that genes “influence how organisms develop”. However, they are not the only mechanisms by means of which this occurs. Non-genetic causes (grouped together as “environment”) also play a role in determining how the individual develops. In other words, “there is more to biology than genetics” (Sober 2000: 347), and the genetic traits which we inherit are not “fixed and unmodifiable” (Dawkins 1976: 3).

Genetic determinism, in contrast to this standpoint, tends to perceive genes as “self-sufficient or autonomous causes of traits or behaviours” (Buchanan et al. 2000: 23). As Steven Pinker points out, this perception is completely accurate in some contexts. For example, in the case of some genetic diseases, such as Huntington’s disease, “everyone with the affected gene who lives long enough will develop the condition” (2009: MM24). In this case, we can rightly consider the gene as an “autonomous cause” of a particular disease trait – it has in a very real sense determined this aspect of the phenotype.

However, this is not the case for all diseases. For example, scientists think they have identified genes on chromosome 20 that are associated with type II diabetes (Greenhalgh 2005: 545), but the presence of these genes is “neither necessary nor sufficient” (Permutt et al. 2002: S308) for the *manifestation* of the disease – the likelihood that the individual with the relevant genes will eventually develop diabetes is highly dependent on environment, and particularly lifestyle. This is true for most other diseases too – “variation...among people...in their susceptibility to a given disease” may only be contributed to in part by “a given gene...and non-genetic factors frequently also contribute to the variability” (Charlesworth 2001: 682).

Physical characteristics, such as height, can also be influenced by environmental factors such as nutrition, as is evident in the increase in average height in industrialized nations over the last century (Gudbjartsson et al. 2008: 609). However, variability of the phenotype as a result of environmental influences is most strongly evident with regard to complex behavioural traits (Charlesworth 2001: 682, Resnik 1994: 30).

We can once again make use of the trait of intelligence as an example. As Gordon points out with regard to cognitive functioning, “[t]he genome only provides a blueprint for formation of the brain; the finer details of assembly and intellectual development are beyond direct genetic control and must perforce be subject to innumerable...environmental influences” (1999: 2024). This means that while genes undoubtedly contribute towards one’s level of intelligence (Agar 2004: 28), they are not the only contributing factor<sup>19</sup>. Genes should therefore not be viewed as “determining causes”, but rather as “influences” which contribute towards individual human phenotypes (Agar 2004: 28-29).

McInerney and Rothstein of the Human Genome Project sum up this interaction between genes and environment as follows:

With disorders, behaviours, or any physical trait, genes are just a part of the story, because a variety of genetic and environmental factors are involved in the development of any trait. Having a genetic variant doesn't necessarily mean that a particular trait will develop. The presence of certain genetic factors can enhance or repress other genetic factors. Genes are turned on and off, and other factors may be keeping a gene from being turned “on”. In addition, the protein encoded by a gene can be modified in ways that can affect its ability to carry out its normal cellular function (2008).

As this extract illustrates, the claim that human phenotypes are constituted by both genetic and environmental influences does not imply a simplistic dichotomy of genetics and environment, both legitimately and separately affecting human functioning. Rather, these two factors interact with one another in myriad ways from the point of conception onwards, with our genes interacting with their environment, which includes other genes (Dawkins 1986: 170), and the environment influencing the way in which genes are expressed in individual human organisms (Agar 2004: 71, Horowitz 2010: 77). In addition, human beings are not only being shaped by their environment but shaping it in return in a “reciprocal, co-defining

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<sup>19</sup> Some studies suggest that the genetic contribution to intelligence in a population is approximately 50%, although these results are controversial (Newson & Williamson 1999: 330).

relationship” (Buchanan 2011: 204). This feature of genetic functioning can only be appreciated by a perception of genes not merely in terms of what “they are (their fixed DNA sequence)” but also “what [they] do”; in other words, the expression of genes by means of their coding for “proteins that are the building blocks of life” (Robinson 2004: A27). It is this latter process that is subject to environmental influences. Genes cannot accurately be regarded as a blueprint for a particular phenotype, as their mere presence or absence is not deterministic for the resulting organism. Rather, what matters is the manner of their expression, which is a complex matter (Moss 2003: xvii). The study of how experience and environment (including the presence of other genes) affect the expression of genes is an emerging field known as epigenetics (Carey 2010: D7). Moss describes the complex interactions that result in the phenotype as follows: “the achievement of the phenotype must be the result of an epigenesis within which chromosomal, cytoplasmic, and environmental constituents become mutually and reciprocally causal, instructive, and determinative of the outcome” (2003: 43).

Turkheimer gives a good description of this interactive process in his discussion of the relative contributions of genes and environment to human personality and behaviour:

Individual genes...and their environments (which include other genes) interact to initiate a complex developmental process that determines adult personality. Most characteristic of this process is its interactivity: subsequent environments to which the organism is exposed depend upon its earlier states, and each new environment changes the development trajectory, which affects future expression of genes, and so forth. Everything is interactive, in the sense that...any individual gene or environmental event produces an effect only by interacting with other genes and environments (2000: 161).

Consider this simple example taken from the BBC documentary, *Child of Our Time* (2010). Identical twins Alex and Ivo have the same genes. However, their parents, and the boys themselves, have noticed subtle differences in their personalities, which have been evident from a fairly young age. Ivo is more artistic and tends to be attracted to pursuits that have traditionally been perceived as more feminine, while Alex is more dominant, focused and given to more traditionally masculine play. A facial perception expert determines that there are subtle differences in the shape of their faces – Alex has a wider jaw, while Ivo’s is narrower. This difference can be attributed to tiny differences in their uterine environment. The makers of the programme suggest that as Alex has a subtly more masculine face, this has

led his parents (and others) to treat him, subconsciously, in a slightly different way to Ivo, which has resulted in the differences in personality between them. This example of the posited interaction between genes and environment shows the extent to which these two factors are interrelated in their influence on individual human identities.

What implications does this have for the prospect of the development of genetic interventions? The interaction between genes and environment reminds us that we should be wary of overestimating the level of control which we will be able to achieve by means of genetic engineering to determine the phenotype. This does not imply that we will have no control – this would imply going to the other extreme of environmental determinism. As Pinker puts it with regard to the influence of environment on a trait such as height, “no one thinks Kareem Abdul-Jabbar just ate more Wheaties growing up than Danny DeVito” (2009: MM24). To altogether ignore the influence of genes, one would “be the sort of person who thinks it is only living in kennels which makes dogs different from cats” (Glover 1984: 26). Genes undoubtedly play a “fundamental role” in determining human traits (Charlesworth 2001: 682). However, their influence on these traits will be “probabilistic” rather than deterministic (Pinker 2009: MM24).

Environmental influences are the strongest on the complex behavioural aspects of the phenotype. Of course, social behaviour is undoubtedly influenced by genes – “genetic variation between individuals leads to variation in social behaviours” (Robinson, Fernald & Clayton 2008: 896). However, in this case, genetic enhancement probably will not be able to achieve the desired effect in the absence of certain environmental factors (Agar 2004: 117). Being genetically engineered for intelligence will not have the desired effect on the phenotype without environmental stimulus, for example.

All of this implies that we can no longer perceive of the genome as “a relatively passive blueprint guiding organismal development” – rather, “genomes in fact remain highly responsible throughout life to a variety of stimuli” (Robinson, Fernald & Clayton 2008: 896). This means that fears of genetic enhancement as a deterministic technology by means of which we will be able to control and direct the resulting human phenotype, particularly its behavioural aspects, are based upon an overestimation of what genes can do.

## Conclusion

This chapter has attempted to summarise the relationship between genotype and phenotype, and the implications which some characteristics of this relationship have for the prospects of genetic engineering, and specifically for genetic enhancement. The major point to be taken from this summary is that the interaction between the genome and the eventual characteristics of a particular organism is complex. This complexity is often “overlooked in media reports hyping scientific breakthroughs on gene function, and, unfortunately, this can be very misleading to the public” (McInerney & Rothstein 2008).

I have identified two aspects of genetic functioning which contribute to this complexity – the polygenic nature of most human traits, and the pleiotropic nature of many genes. These two features emphasise that human beings (and other biological organisms) are “a marvel of evolved complexity”, and, by their nature, complex systems are difficult to enhance (Bostrom & Sandberg 2009a: 375). Currently, we have not reached a level of understanding of genetic functioning which would ensure that genetic engineering would be either safe or effective. As we do not yet fully understand how the complex human organism works, particularly with regard to its genetic component, the prospect of genetically enhancing biological systems is extremely daunting, as it is difficult to predict the effects of our interventions – “[c]hanges to imperfectly understood complex systems produce effects that, relative to our knowledge, are random” (Agar 2004: 162). The obstacles which must be overcome before practical use could be made of genetic enhancement are immense (Allhoff 2005: 42).

However, our understanding of genetic functioning is increasing as scientists continue to conduct research into this topic. The successes that have been achieved in the genetic enhancement of animals show that it is not unreasonable to expect that we may one day reach a stage when the genetic enhancement of humans will be a practical possibility. However, the nature of genetic functioning, and particularly the influence of genes on multifactorial behavioural traits, suggests that genetic enhancement will be more subtle and less dramatic than commonly thought, and certainly less drastic than the representations of genetic enhancement in science fiction would have us believe.

The limits of future genetic enhancements, particularly with regard to complex behavioural traits, are also suggested by the joint and interactive contributions of environment and genetics to the human phenotype. The claim that human functioning is influenced by both

these factors is not equivalent to a denial that the genome has, to some extent, a deterministic effect on the corresponding phenotype. It is clearly the case that genes have a profound influence on who we become. Twin studies have clearly indicated that this is the case. However, these same studies have also indicated that environment, too, has a role to play in the formation of human identity (Agar 2004: 27-28). Therefore, genetic enhancement alone will never give us complete control over the total range of human characteristics.

All in all, “[m]any of the dystopian fears raised by...genomics”, and often imagined in popular culture, “are simply out of touch with the complex and probabilistic nature of genes” (Pinker 2009: MM24). This is worth bearing in mind as we move onto a discussion of the various moral arguments which have been made against the development of genetic enhancement.

### **3 The State of the Debate**

#### **Introduction**

The possibility of the genetic enhancement of humans is a contentious and emotive issue, as I noted in my introductory chapter. To many, the prospect of the development and use of interventions which aim to manipulate our genetic makeup evokes an attitude of discomfort or repugnance. Some contend that the goals of enhancement technologies, or the means by which these goals will be achieved, represent a threat to important aspects of our humanity, or fear that enhancement's potential for harm may outweigh its positive consequences. To others, genetic enhancement offers exciting opportunities for the improvement of individual human beings, society and the species as a whole. This chapter will attempt to draw out the reasoning behind these contrasting positions as such reasoning has emerged in bioethical debate over the last decades.

Some of the positions which will be discussed in this chapter will be interrogated at length later in this dissertation, while others are presented here simply in order to provide a general summary of the enhancement debate as it stands. I will firstly consider three kinds of arguments against the development and use of genetic enhancement, as well as the criticism which has been levelled against these arguments<sup>20</sup>. Secondly, I will summarise the positions which maintain that the practice of genetic enhancement is morally acceptable, and, in some cases, that enhancement is a moral obligation.

#### **Three groups of arguments against genetic enhancement**

The possibility of the development and use of genetic enhancement technologies has been subject to critique from a number of standpoints. Broadly speaking, three different sorts of

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<sup>20</sup> Buchanan suggests that the debate surrounding enhancement is chiefly characterised by a division, not between “pro-enhancement” and “anti-enhancement” schools of argument, but between “anti-enhancement” and “anti-anti-enhancement” views (2011: 13). This is largely borne out in the structure of most of this chapter, where I consider anti-enhancement views, and then the arguments levelled against these views. Opinion is often divided between those who oppose enhancement, for various reasons, and those who find the arguments advanced against enhancement unconvincing (or at least, unconvincing with regard to all enhancements under all circumstances) and therefore regard some enhancements to be morally acceptable, or beneficial, under some circumstances. Julian Savulescu and John Harris, whose contributions I will consider towards the end of this chapter, perhaps come closest to what Buchanan would characterise as “pro-enhancement”, as they regard enhancement as positively morally desirable, or even obligatory, in some contexts, although even in this case, this does not represent an unqualified acceptance of the desirability of all enhancements.

arguments against genetic enhancement can be identified<sup>21</sup>, although in practice, as shall become evident, there is often overlap between these groups.

The first group of arguments which I will consider are arguments which take as their main focus the inherent nature of genetic enhancement itself. These arguments take issue with the combination of goals and means expressed in a desire to enhance human beings by the manipulation of their genetic makeup. What is usually seen as problematic about these goals and means is that the pursuit of genetic enhancement is perceived as a threat to human nature, either in terms of its potential to undermine species membership, or in terms of the posited likelihood that genetic enhancement will undermine values and attitudes that are regarded as foundational to our uniquely human identities. I shall term this group of positions *arguments from human nature*.

The second group of arguments is concerned not with the inherent nature of genetic enhancement as such, in terms of its internal goals and means, but rather with the possible consequences that would result from the use of such technologies. These arguments hold that if enhancement is practiced, either in single instances or by multiple users, undesirable consequences would or could follow, which would outweigh any possible benefit which genetic enhancement could produce. In other words, it is not something internal to the technology of enhancement which is considered to be problematic, but some external result. This group of arguments is based upon a consequentialist approach to ethics, which regards the wrongness of actions as deriving from the results which they produce. I shall term this group of arguments *consequentialist arguments*.

The third group of arguments have largely to do with genetic enhancement as a medical technology. These arguments consider the nature of medicine, and question whether the goals of medical practice and research are compatible with or appropriate to the technology of genetic enhancement. I shall term this group of arguments *goal compatibility arguments*.

I shall summarise each of these groups of arguments in turn, as well as considering the critique which has been levelled against each position.

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<sup>21</sup> For alternative delineations of objections to genetic enhancement, see Baylis & Robert (2004: 5-6), DeGrazia (2005: 262), and Parens (1998a: S1).



### *Arguments from human nature*

Many people feel uneasy or uncomfortable about the prospect of genetic enhancement, but find it difficult to articulate this unease (Kass 2003: 17). The positions which I will consider here suggest that the underlying reason for this ethical discomfort is that the project of genetic enhancement holds a revolutionary new capacity to alter or transform our “humanness” (Anderson 1989: 682). However, it is not always clear what is meant by this. What aspects of human nature does genetic enhancement have the potential to transform, and why might we regard such a transformation as problematic?

There are two versions of the argument that genetic enhancement will transform human beings to the extent that what we currently think of as human nature will be unrecognisable or obliterated. Firstly, there is a concern that genetic enhancement will change our genetic makeup in such a way that we (or at least some of us) will no longer be members of the human species in terms of our genetics and biology, and that this will weaken or undermine human commonality and threaten our recognition of the moral status of others. Secondly, there is a concern that the goals and means of genetic enhancement will undermine or come into conflict with attitudes or values that we regard as foundational to our humanity, and that this will have a dehumanizing effect on enhanced individuals and on society as a whole. In other words, the first concern is principally to do with the genetic basis of species membership and its role in determining moral status, and the second focuses upon the values and attitudes that give meaning to our humanity.

#### *Genetic enhancement threatens species membership*

Genetic enhancement is aimed at the manipulation of the human genome. This lies at the core of the argument against genetic enhancement which holds that such genetic interventions are morally dubious because they imperil our genetic identity as human beings. The Universal Declaration on the Human Genome and Human Rights expresses the basis of such a position in its statement that the “human genome underlies the fundamental unity of all members of the human family” (UNESCO 1997: 3). What this implies is that our genetic code serves as the biological marker of our membership of the human species, and therefore also functions as a common bond between us. Because genetic enhancement (and genetic engineering in

general) will work to alter the human genome, some critics (Annas 2001, Fukuyama 2002<sup>22</sup>, Silver 1997) have expressed concern that this will undermine human nature in terms of the genetic species membership of those who are enhanced.

Why should this be concerning? Is there anything intrinsically unethical about enhancing ourselves out of the genus *Homo sapiens*? The possible danger of taking the human out of human lives (Agar 2004: 89) is evoked in the next few lines of the Universal Declaration on the Human Genome and Human Rights. According to this document, not only does the human genome underlie our species membership, but it also serves as a foundation for “the recognition of [the] dignity and diversity” of all members of the human species (UNESCO 1997: 3). In other words, there is a suggestion that species membership, bestowed by a shared genetic code, is the basis for our recognition of human dignity, human rights and the moral status of other people, as it is the source of our commonality. The contention here is that there is “an intimate connection between human nature and human notions of rights, justice, and morality”, and that human nature is equivalent to “the species-typical characteristics shared by all human beings qua human beings” (Fukuyama 2002: 101). These characteristics are a “genetic endowment” possessed by each “member of the human species” (Fukuyama 2002: 171). Therefore, according to critics such as Fukuyama (2002: 102), and Annas, Andrews and Isasi (2002: 153), attempts to alter or manipulate the human genome for enhancement or other purposes have the potential to transform the human species itself, and therefore threaten to undermine the basis for human morality and universal human rights.

This argument encompasses a concern about posthumanism. Again, this concern is based upon the idea that genetic enhancement will transform human nature to the extent that enhanced individuals will no longer be categorised as members of the species *Homo sapiens*. The boundaries that currently determine membership of the human species will be eroded as two “subspecies” (Sandel 2007: 15) emerge – humans who maintain their naturally given genetic characteristics, and posthumans who are genetically enhanced. The use of genetic interventions could even result in the existence of multiple groups of beings who, through

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<sup>22</sup> Fukuyama’s approach, in fact, combines a focus on species membership with some elements of the concern which I will consider next – that genetic enhancement is likely to rob us of some of the values and attitudes which make us human. Fukuyama never adequately describes what the central feature of our humanity is, but refers to it as “Factor X”, which is the “essential human quality” that is “worthy of...respect” and that remains when we “strip away all of a person’s contingent and accidental characteristics” (2002: 149). He expresses the view that “biotechnology will cause us in some way to lose our humanity – that is, some essential quality that has always underpinned our sense of who we are and where we are going” (2002: 101), but he regards this quality as having a genetic basis: “human nature is the sum of the behaviour and characteristics that are typical of the human species, arising from genetic rather than environmental factors” (2002: 130).

their divergent uses of genetic enhancement, have each developed their own distinct nature or genetic identity, and who are “related to one another only through a common ancestor (the human race)”. There is a suggestion that this development, as a result of its destabilisation of our “sense of moral community” based on common species membership (Buchanan et al. 2000: 95), will lead to a failure of such groups to respect the rights and dignity of other groups who no longer share their genetic identity, and could also have the potential to lead to what Agar refers to as “polarization” (2004: 134) between enhanced posthumans and unenhanced humans (Annas 2001, Annas, Andrews & Isasi 2002, Fukuyama 2002, Silver 1997)<sup>23</sup>.

Is it the case that genetic enhancement will threaten species membership in the way that these critics envisage? DeGrazia seeks to cast doubt on such a conviction. Firstly, he argues that genetically engineered beings would still be hominids, and that the case could be made for regarding “all hominids, or at least some hominids in addition to *Homo sapiens*...as human”. Secondly, he argues that the basis of our species membership could be seen as resting upon the identity of our biological parents, proceeding from the view that “it is debatable whether genetic interventions on...*Homo sapiens* gametes could produce an individual of another species”, making genetic enhancement subsequent to the conception of individuals “irrelevant to species membership” (2005: 278). DeGrazia argues that even if genetic interventions rendered the enhanced individual unable to reproduce with members of the human species, “these individuals would still be “human” in any sense that might be normatively important” and that this would not constitute “a case of violating an inviolable core trait” (2005: 278).

Other critics, in contrast to DeGrazia, accept that genetic enhancement might threaten species membership, but raise the question as to why the human genome, as the basis of our identity as members of the species *Homo sapiens*, should be regarded as something which we should fight to preserve, or even that we could preserve (Juengst 2009: 50), given that it is itself the result of millennia of alteration. In other words, they question why “merely remaining human [should be considered] some manner of moral achievement” (Agar 2004: 91) when our genetic code is simply the result of a process of evolution which has responded to “an enormous array of random forces, accidental environmental contingencies, and stochastic

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<sup>23</sup> The possibility of polarization, and the potential of such polarization to lead to discrimination between the enhanced and the unenhanced, and, in the worst manifestations of this discrimination, to enslavement or genocide – a possibility considered by Annas (2001) – will be discussed later in this chapter as a consequentialist argument.

genetic events” (Caplan 2009: 201). Unless we think that human nature cannot be improved upon, it is difficult to defend the claim that we ought not to intervene to enhance human capacities, even if this does constitute altering human nature (Buchanan 2011: 115, McConnell 2010: 421).

If this is the case, it is unclear why improvements to the human genome, even if these are enacted by genetic manipulation which will alter the human species, should be regarded as morally problematic. The human genome is, after all, still subject to evolutionary forces, and will continue to change in the future, and it is unclear to critics of the above argument precisely why random change exacted by evolution should be preferable to directed change exacted by human interventions, if it cannot be shown that the latter is considerably more risky than the former (Buchanan 2011: 137, Caplan 2009: 202, Harris 2007: 34). If genetic engineering entails a move away from what we currently regard to be human nature, based on our genetic characteristics, then this will merely constitute a hastening of a process that will occur in any case as a result of evolution – “[n]atural selection and selective pressures make it unlikely that in a few million years our descendants will be physically or mentally much like us. So what genetic engineering threatens here is probably doomed anyway” (Glover 1984: 36). Harris, who argues strongly against the contention that ceasing to be genetically human should be ethically concerning, cannot see “any powerful principled reason to remain human if we can create creatures, or evolve into creatures, fundamentally “better” than ourselves”. He notes “the absurdity” of the idea that the preservation of our evolved human natures should be considered a moral requirement, by imagining the results of “our common ape ancestors getting together with a simian agenda to block evolution so that simian nature would be preserved” (2007: 40).

Human nature also cannot be said to be determined purely by our biological characteristics. What we think of as human nature, is, instead a result of “the complex relationships between genes and environment” and “the reciprocal influences between biological and cultural evolution”. Therefore, “the claim that our nature is our biology is both misleading, and, to the extent that it is true, less important” (Buchanan 2011: 7). Human nature is not wholly determined by genetic identity, and as such, the threat to human nature from genetic engineering is, at the very least, overestimated.

This point is also relevant to the assertion that genetic enhancement’s potential to undermine species membership is concerning because our common genetic code is the basis for our

recognition of moral status, human dignity, and by extension, universal human rights. Commentators respond to this assertion by questioning whether human nature, as the basis of human rights, can be reducible to brute biological characteristics. Rather, “there are many candidates for the qualities that serve to give us our inalienable rights” (Juengst 2009: 52). The moral status of beings is usually regarded as being conferred by morally relevant traits, such as the ability to feel pain (which confers some degree of moral status upon animals) or to experience suffering, or to have the capability to fulfil certain functions (Fenton 2008: 4), and is not solely dependent upon our “taxonomy” (Juengst 2009: 52). Theories of human rights usually regard such rights as stemming not simply from our genetic identity as human beings, but rather from the presence of interests – morally relevant beings have an interest in being treated in particular ways. While we might feel intuitively that “all humans have ‘human rights’ precisely because they are human”, an interrogation of this idea reveals that it is “problematic as a theory of moral status” (Beauchamp & Childress 2009: 68). Rather, we are inclined to grant moral status, and associated rights, to those beings which have certain capacities, such as the ability to reason, to form a conception of themselves as the subject of autonomous action, and to engage in moral deliberations, and while such qualities usually correspond with human species membership, this is neither a necessary nor a sufficient condition for our recognition of such moral status (Beauchamp & Childress 2009: 68). To deny this conception of rights and to insist instead that rights and moral status are bestowed upon us solely as a result of our genetic identity as human beings is to indulge in what Peter Singer refers to as speciesism (1993: 88) - the belief that moral status is conferred by the brute fact of our membership of the human species, based upon a prejudice towards those of our own kind. This amounts to the “moral idolatry” of the human genome (Juengst 2009: 52). If such a conception of moral status is unreliable, and moral status depends instead upon the presence of morally relevant characteristics, this implies that genetic enhancement, despite its potential to erode the current boundaries of species membership, is not necessarily a threat to our recognition of the rights of others.

The notion that our moral status is conferred by our morally relevant characteristics, however, raises another quandary. At present, most people make a distinction between the moral status of human beings and the moral status of non-human animals on the basis of such characteristics (such as the human capacity for rationality), and believe that this morally significant distinction allows us to treat animals in certain ways (raising them for consumption for example) that would not be acceptable with regard to the treatment of humans. If enhanced beings possess these moral status conferring characteristics to a much

higher degree than us, could this imply that these enhanced beings would be *morally justified* in considering unenhanced humans as beings of lesser moral status, implying that they could therefore treat them accordingly? A related question is whether, if those who are enhanced are of vastly superior intelligence and competence in comparison to those who are not enhanced, it would be *justifiable* for the latter group to behave paternalistically towards the former group, by restricting their autonomy and liberty for their own good, in the same way that we currently believe it is justifiable for competent persons to behave paternalistically towards incompetent persons whose mental functioning diverges sharply from that which is species-typical (Wikler 2009: 341-356).

Buchanan argues that neither of these results are likely, because “the concept of human rights is a threshold one, not a scalar one” which implies that once a being achieves a particular threshold of morally relevant capacities and capabilities, the degree to which they possess them is irrelevant to their possession of moral status (2011: 215). This implies that after the threshold level is reached, moral status is inviolable (2011: 221). Enhanced being would therefore not be justified in treating unenhanced beings as though they were beings of lesser moral status, as, on the threshold view of inviolability, they would not be.

Thus, not all critics are wary of the prospect of posthumanism. Some even delight in the possibility – those who describe themselves as transhumanists, in opposition to the positions described above, are excited by the prospect that genetic enhancement may allow us to become “beings with vastly greater capacities than present human beings have” (Bostrom 2004: 493), and are not concerned about the possibility that this might imply that we could no longer be regarded as members of the human species.

Ultimately, critics who reject the argument against genetic enhancement described above, which appeals to the importance of the preservation of genetic species identity, aver that this argument fails to answer the question as to “why [evolved] human nature” should be regarded as a static standard which “tells us everything about what is good or desirable in terms of the traits humans should possess” (Caplan 2009: 201). They therefore do not believe that the possible threat to species membership justifies a general moral condemnation of genetic enhancement technologies.

While the arguments summarised above assume that genetic enhancement threatens human nature because this human nature rests in our genetically determined biological characteristics

(Fenton 2008: 3), there is another set of arguments, which I will consider next, that also focus on the threat that genetic enhancement poses to human nature, but regards the basis of this human nature as lying not simply in our genetics, but in the manner in which we give meaning to our lives in our attitudes towards nature, ourselves, and each other. Agar refers to this group of arguments as “argument[s] from meaning” (2004: 61).

*Genetic enhancement threatens values and attitudes that constitute human nature*

The dehumanizing effect attributed to genetic enhancement by arguments from meaning is related to the posited potential of such interventions to undermine values and attitudes towards ourselves and the world which are regarded as constitutive of human nature, or which give content to our notion of “what it means to be human” (Robert 2005: 28). These objections are less easy to formulate in clear terms, but are more sophisticated than the foregoing arguments in that they do not simply reject genetic enhancement purely on the basis that it threatens the brute biological fact of human species membership. They therefore do not fall prey to speciesism. Rather, these positions are concerned that genetic enhancement will threaten aspects of human nature that are *valuable*. In other words, the fear is that genetic enhancement will “give us what we say we want, but only in a form purged of its proper human significance” (Agar 2004: 61).

Leon Kass, one of the principle proponents of arguments from meaning, acknowledges that his conviction as to “the intrinsic threat of dehumanization” or “superhumanization”<sup>24</sup> (2003: 10) posed by the possibility of genetic enhancement is difficult to formulate, but claims that genetic enhancement represents a threat to the “fundamental aspects of *being human*” (2009: 273) which “have something to do with what is natural, or what is humanly dignified, or with the attitude that is properly respectful of what is naturally and dignifiedly human” (2003: 17). What values and attitudes do critics of genetic enhancement consider to be “humanly dignified”? Or, what aspects of our current mode of existence are regarded as constitutive of proper human nature? In this section, I will consider the contributions of Kass and Sandel, among others, who attempt to offer answers to these questions.

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<sup>24</sup> Kass suggests that “dehumanization” and “superhumanization” are equivalent – “[t]o try to turn a man into a cockroach...would be dehumanizing. To try to turn a man into more than a man might be so as well” (2003: 20).



*Mastery and givenness*

Both Michael Sandel and Leon Kass offer versions of the argument that genetic enhancement is problematic because it expresses an attitude of mastery towards the natural world, and, more importantly, towards our own selves, and in so doing undermines the appropriately human acceptance of givenness.

Sandel, in his essay, *The Case Against Perfection* (2004), and the later book of the same name (2007), takes issue with the “drive to mastery” which he believes is expressed in the pursuit of genetic enhancement. He describes this pursuit as “a Promethean aspiration to remake nature, including human nature, to serve our purposes”. Sandel sees this “drive to mastery” as destructive of an appreciation of the “giftedness” of our natural human abilities and endowments (2007: 26-27). This “giftedness” entails a recognition that our abilities are “not wholly our own doing, nor even fully ours”<sup>25</sup> – a recognition that fosters an attitude of “humility” (2007: 27). Sandel sees this appreciation of giftedness as being threatened by the ability that genetic enhancement would give us to alter or shape our own characteristics – if we have the ability to genetically shape our own capacities, these could no longer rightly be regarded as “gifts for which we are indebted” but would instead be perceived as “achievements for which we are responsible” (2007: 86-87). This, for Sandel, is an inappropriate “habit of mind and way of being” (2007: 96).

Leon Kass, the onetime chairman of The President’s Council on Bioethics, also takes issue with the attitude of “mastery” or “hubris” which he regards as central to the project of genetic enhancement (2003: 18). Both Sandel and Kass express moral disquiet at the prospect of the development of technologies which will enable us to master, control or manipulate nature, particularly our own natures. However, as Kass notes, the difficulty which such an argument immediately encounters is that we typically do not wish to humbly accept the givenness of disease and dysfunction (2003: 19). What Kass therefore seeks to argue is that there is something different, and morally objectionable, about the drive to enhance human nature. Kass sees this difference as lying in the attitude expressed in genetic enhancement “that seeks

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<sup>25</sup> Sandel also argues that because the practice of genetic enhancement is likely to undermine an appreciation of the giftedness of our human characteristics, and will instead encourage a mindset which regards us as being responsible for the establishment and manipulation of our own traits, this will also undermine human solidarity and have negative consequences for social justice. This implication will be discussed later in this chapter in the context of the consequentialist argument that genetic enhancement could contribute towards or exacerbate injustice.



wilful control of our own nature” and contrasts this with medicine as “servant and aid to nature’s own powers of healing” (2003: 18), a point which Sandel echoes:

Although medical treatment intervenes in nature, it does so for the sake of health, and so does not represent a boundless bid for mastery and domination. Even strenuous attempts to treat or cure disease do not constitute a Promethean assault on the given. The reason is that medicine is governed, or at least guided, by the norm of restoring and preserving the natural human functions that constitute health (2007: 46-47).

Buchanan rejects the notion that any desire to enhance is self-evidently motivated by a desire for mastery. He points out that all enhancement interventions cannot be assumed, without further argument, to be necessarily expressing a desire for mastery or for total control over the given world, and as such, the argument against enhancement based upon this false premise fails (2011: 79). Such a claim is a “vast empirical generalization...about the psychology of those who pursue enhancement” which unjustifiably excludes the possibility “that some may seek an enhancement in order to be *better* in some particular way without thereby desiring to achieve total mastery of the conditions of life” (2011: 9). In this way, this criticism of enhancement makes poorly motivated claims without any empirical backup.

The critics of this position are also unconvinced by the insistence that intervening in our own natures to bring about enhancement constitutes hubris, while intervening in our own natures to cure or prevent disease or dysfunction does not (McConnell 2011b: 376). Buchanan regards this as an example of “[m]urky rhetoric masquerading as argument” (2011: 2), and sees the use of “grand-sounding, but deeply ambiguous catchphrases and slogans” as a substitution for reasoned argument (2011: 3). He argues that it is simply illogical to assert that it is acceptable to transform the given when it comes to curing disease and dysfunction, but not when it comes to improving normal functioning (2011: 3). In his view, it does not follow from the fact that “one ought to be appreciative of the good things one has and aware that many of them are unearned” that “one should refrain from ever trying to improve one’s life or the lives of others” (2011: 3). Harris echoes this point in his failure to be persuaded by the argument that we should accept the “gifted nature” of human talents but not the giftedness of disease and disability (2007: 112). While both Kass and Sandel argue that the distinction between treating disease and enhancing function lies in the fact that medical practice aids or

restores natural human functioning<sup>26</sup>, Harris reasons that disease and disability are themselves an aspect of natural human functioning, and that “no systematic account of relevant moral differences” between medicine and enhancement is offered (2007: 125). Thus, under this view, a rejection of interventions that seek to manipulate nature would necessarily exclude the practice of medicine altogether (2007: 35).

It is not only through the practice of medicine that we routinely seek to exercise “wilful control over our own nature” (Kass 2003: 19). Attempts to master nature, and specifically, attempts to act upon and improve our own natures and the natures of others, are hardly novel pursuits – they are constitutive not only of the goals of medicine, but also of law, child-rearing and education, and the striving towards improvement and enhancement has always been a project which characterises human life (Buchanan 2011: xi). In fact, Caplan points out that the whole history of human culture and civilisation is the history of human attempts to alter and shape the naturally occurring state of affairs, including our naturally occurring human natures – we have “long tinkered with ourselves using all manner of technologies from clothing to medicines to agriculturally produced food to telescopes to computers to airplanes” (2009: 202), and in this sense, “Sandel’s warning that one should not imperil giftedness comes several millennia too late” (Buchanan 2011: 79). Harris fails to comprehend why the difference in means that genetic enhancement represents makes a moral difference, taking into account our routine attempts to alter our nature and the nature of our children through interventions such as “education or child-rearing” (2007: 125).

Critics of genetic enhancement do, however, seek to make a distinction, of the sort which Harris rejects above, between attempts which parents make to alter their children’s natures through education and child-rearing and attempts which make use of genetic enhancement. They consider such a distinction as lying in the attitude towards the parental project which is expressed in attempts to genetically enhance one’s children – an attitude which they regard as destructive of an appropriate parental mind-set. I will consider this argument next.

### *The parental project*

Proponents of arguments from meaning regard parental interventions which aim at the genetic enhancement of their children to be a particularly troubling form of the drive to mastery.

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<sup>26</sup> There are obvious overlaps between this argument and the goal compatibility arguments which will be considered later in this chapter. Both rely upon some notion of natural or normal human functioning to ground their claims.

What concerns these critics is that parents who choose to genetically enhance their children (probably at an embryonic level) will be expressing an attitude which is wrongheaded in the context of what we currently regard to be appropriate models of parenting.

Sandel's argument in this regard stems from his discussion of the notion of "givenness", as discussed above. The appreciation of givenness is central to what Sandel suggests is the proper attitude of parents towards their children. This attitude entails an "openness to the unbidden" (2007: 86), which implies a commitment to the appreciation of children as "gifts", and a willingness to "accept them as they come, not as objects of our design, or products of our will, or instruments of our ambition" (2007: 45). Genetic enhancement in this context is therefore regarded as illegitimate because of the disposition it expresses – the "anxious excess of mastery and dominion that misses the sense of life as a gift" (2007: 62)<sup>27</sup>. The central concern here is that parents might begin to regard their children as products, which would undermine the unconditional love and acceptance which we currently regard as foundational to the proper parental stance (Bostrom 2004: 497).

Of course, much of the parental project as it is currently conceived involves active attempts to improve one's children, through means such as education and moral instruction, as mentioned above. However, Kass believes that such traditional modes of child-rearing are distinct from genetic enhancement, as the latter is conducted with an idea of "what it takes to grow up to lead a decent, civilized, and independent life", where such an idea is based upon "cultural teachings that have stood the test of time" rather than the drive to achieve "wilful control over our own natures" (2003: 19).

A further concern with regard to the relation between genetic enhancement and the parental project is the worry that the use of genetic enhancement will restrict the autonomy of enhanced children. Because genetic enhancement is seen as an attempt to determine the characteristics of a person, some critics believe that in the case of parents choosing to enhance their children, this process could be overly deterministic (McKibben 2003: 25), as parents could make choices expressing their own idea of the good life, which will curtail possible life choices for their children and for future generations (Birch 2005: 22, Cooke 2003: 37, Dekker 2009: 91). Kass refers to this as the problem of "genetic despotism of one generation over the next" (2003: 16).

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<sup>27</sup> Sandel does not see this problem as arising solely in the context of genetic enhancement, but believes that it is also evident in other "high-pressure child-rearing practices" (2007: 52).

Of course, it is not the case that in the absence of genetic enhancement, children are entirely free in terms of the establishment of their characteristics and their choice of life plans. The genetic lottery ensures that we are all born subject to a particular genetic makeup, the selection of which is beyond our control. Habermas, however, argues that there is a moral difference between the determination of one's characteristics by the genetic lottery and (at least partial) determination of one's characteristics by means of genetic enhancements chosen by one's parents. He describes this moral difference as lying in the introduction of a "previously unheard-of interpersonal relationship [that] arises when a person makes an irreversible decision about the natural traits of another person" that restricts "the fundamental symmetry of responsibility that exists among free and equal persons" (2003: 14). Habermas suggests that this is because genetic enhancement deprives the enhanced individual of the opportunity to take up a "revisionary" stance towards self-understanding, which would restore the balance to the "asymmetrical responsibility that parents have for their child's upbringing". Rather the affected individual would remain "blindly independent on the nonrevisable decision of the other" (2003: 14).

Harris and Lewens criticise Sandel's conception of the appropriate parental attitude as being one which is "open to the unbidden" (Sandel 2007: 86). Openness to the unbidden implies an attitude which accepts the contingent characteristics of the children one might have with unconditional love. However, Harris points out that "openness to the unbidden also implies openness to disease, misfortune and calamity – things which parents and other members of society try to avoid and prevent, and which they are morally congratulated for" (2007: 116). Lewens argues, in addition to this, that there is "no contradiction in parents being disposed to love their children however they might turn out, while seeking to influence their children's lives so that they go as well as possible" (2009: 355) – in fact, we would usually regard parents who seek such influence to be fulfilling an important parental duty.

Bostrom, too, rejects the notion that genetic enhancement technologies will necessarily undermine unconditional parental love. Calling upon the example of in vitro fertilization, which evoked similar concerns in the past, he notes that the evidence suggests that "[p]arents will in fact love and respect their children even when artificial means and conscious choice play a part in procreation" (2004: 497). To assume or predict that the use of genetic enhancement in reproduction will necessarily or self-evidently undermine or distort the

parental project, and the relationship between parent and child, is to assume too much without any empirical assurances that this will indeed be the case (Buchanan 2011: 10).

The argument against genetic enhancement from the perspective of the distortion of the parental project also faces a further criticism, specifically with regard to its concerns that genetic interventions will reduce the autonomy and freedom of enhanced children whose parents have chosen those interventions. This criticism is that these concerns seem to be vulnerable to accusations of adherence to genetic determinism, an attitude which I have discussed in Chapter 2. To determine or manipulate (some) of our genetic characteristics does not, by any stretch of the imagination, imply that the actual expression of genes in terms of attributes and behaviours will be determined solely by the presence or absence of these genes, and therefore the idea of parents prescribing life plans for their children which they will necessarily conform to is unscientific. This point is made by Agar (2004: 126), and Buchanan, who accuses Habermas of subscribing to “the crudest sort of genetic determinism” (2011: 5) in his insistence that “[b]eing at odds with the genetically fixed intention of a third person is hopeless [as t]he genetic program is a mute and...unanswerable fact” (Habermas 2003: 62). If Habermas does not intend to express this sort of genetic determinism, but rather intends to say something about the “self-perception” of individuals as “being the undivided author of [their] own li[ves]” (2003: 63, my italics) - in other words that the individual could not “regard [themselves] as free”<sup>28</sup> (Buchanan 2011: 5) - this also fails to convince. If, in the first place, this intends to convey that the individual would not be empirically capable of regarding herself as free, this is based upon “a vast empirical generalization about what people are...capable of thinking, without a shred of evidence to support it”, and in the second, if Habermas means that the individual could not “correctly” see themselves as free (Buchanan 2011: 5), this once again falls back into the trap of genetic determinism (Buchanan 2011: 6, McConnell 2011a: 5). In addition, the opposition which this argument constructs between environmental and genetic enhancement, in terms of their respective effects upon autonomy, underestimates the extent of control which parents already exert over the phenotype of their children via the method of environmental enhancement (Buchanan et al. 2000: 160).

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<sup>28</sup> Tonkens describes Habermas’s position as follows: “even though the enhanced child may turn out to be just as autonomous...as nongenetically manipulated humans, the worry is that she may nonetheless not come to understand herself as being able to decide for herself what kind of life she will lead. The difference would be in her mental orientation and in her (admittedly misguided) understanding of herself as someone whose life course was dictated to her by her parents based on the fact that she was genetically altered” (2011: 277). Tonkens implies that this position assumes that genetically altered children would be more likely than others to subscribe to the (false) doctrine of genetic determinism (2011: 291). However, no empirical evidence is provided to support this claim (2011: 281).

Agar also suggests that it might be possible for regulation of enhancement technologies to exclude the possibility of parents making use of very specific enhancements that would obviously “rule out plans founded on conceptions of the good life radically opposed to the parents’ conception” (2004: 106). In other words, the suggestion is that the (legal) availability of enhancements should constrict choice by limiting accessible interventions to those suitable to pursuing a wide range of life plans, rather than operating to constrict free choice (Brock 1998: 55, Kline 2007: 20-21, Schmidt 2007: 195). In other words, only enhancement of attributes which are largely neutral with regard to competing conceptions of the good should be endorsed (Dekker 2009: 98).

If such safeguards were to be introduced, it is likely that enhancements could in fact operate to expand autonomy. Provided that improvements are not limiting (in that they are beneficial only with regard to the achievement of a very specific life plan), enhancement could be regarded as an intervention aimed at “intentionally *promoting* [children’s] expected autonomy” as “children with greater talents...will have more options open to them” (Savulescu & Kahane 2009: 282). There are many enhancements (Lewens suggests an increased attention span, for example) which would be beneficial in all or most conceptions of the good life. These enhancements, even if chosen by another, would not seem to violate what Feinberg refers to as a child’s “right to an open future” (1980: 124), and their use would therefore not necessarily conflict with, but could promote, good parenting (Bostrom 2004: 499, Davis 2008: 264, Newson & Williamson 1999: 339, Schmidt 2007: 191).

This argument is not incompatible with the conviction that “we may have genuine ethical concerns with the efforts of some parents to use some enhancements” where these efforts are an expression of “procrustean parenting” (Lewens 2009: 356) and are directed towards enforcing a particular life plan upon their children. However, this does not constitute an argument against enhancement as whole - the problem here is bad parenting rather than the enhancement technologies themselves (Caplan 2009: 208, Savulescu & Kahane 2009: 284), and such examples of bad parenting are already prevalent, as acknowledged by Sandel, in “the heavily managed, high-pressure child-rearing practices that have become common these days” (2007: 52). Such a parental attitude is morally troubling in the level of control which it seeks over the lives of children, but the fact that it could be manifested through the technology of genetic enhancement does not imply that all choices in favour of enhancement would necessarily express such an attitude. Harris argues (2007: 125) that it is instead likely that most parents will still approach the decision to enhance with what Kass refers to as an idea of

“what it takes to grow up to lead a decent, civilized, and independent life”, informed by the same “cultural teaching that have stood the test of time” (Kass 2003: 19) that currently govern child-rearing practices. Harris points out that “these teachings tell us to do the best for our kids and to give them whatever advantages we can” (2007: 125), an aspiration that does not necessarily come into conflict with enhancement technologies.

*The structure of agency and the value of effort*

Michael Sandel advances a further objection to genetic enhancement which primarily considers the means by which this technology will bring about improvement. In his view, “[o]ne aspect of our humanity that might be threatened by enhancement and genetic engineering is our capacity to act freely, for ourselves, by our own efforts, and to consider ourselves responsible – worthy of praise or blame – for the things we do and for the way we are” (2007: 25). Sandel’s implication here is that “enhancement threatens human agency” (2007: 26) because our achievements could no longer be regarded as flowing (entirely) from our own action, but would rather be the result of technological achievement.

Sandel’s point here is related to the value we ascribe to the effort which we expend in achieving our goals. Enhancement technologies, in the point of view of some critics, bypass the “substantial discipline and effort” which we currently invest in our attempts to “produce the desired feature or capability” and negates the fact that “a valued human activity is [sometimes] defined in part by the means it employs, not just by the end at which it aims” (Brock 1998: 58). We ascribe virtue to the means which are employed when our advantages are acquired through effort and hard work, and therefore regard the resulting advantages as honourable and deserved. The advantages that could be acquired through genetic enhancement, however, would be regarded as unmerited, as they are not acquired through such virtuous means (Mehlman 2003: 112).

Kass also argues that the striving for self-improvement is valuable in and of itself (as opposed to the passive improvement granted by genetic enhancement) as this partially constitutes “the deep structure of natural human activity” (2003: 22). Genetic enhancement is therefore problematic because it “produce[s] changes in us by disrupting the normal character of human being-at-work-in-the-world” (2003: 24), which is characterised by our recognition of “the relation between our doings and the resulting improvement [and] between the means used and the end sought” (2003: 22).



Harris objects to this account of the value of effort. In his view, despite the fact that it would seem that genetic enhancement represents a shortcut, we can still “take pride in our choice of appropriate means to our ends”. In addition, he points out that many enhancing technologies “leave plenty of room for effort, skill training [and] hard work” (2007: 133). This is particularly the case for genetic enhancements, which, as has been noted in Chapter 2, will only affect genotypes. The causal relationship between genotypes and phenotypes will vary, and will depend upon environmental influences, including one’s own actions and efforts, a point which Sandel concedes in his assertion that “the roles of effort and enhancement will be a matter of degree” (2007: 25). While enhanced individuals may be engineered for high levels of intelligence, for example, this genetic disposition is worthless without education, with all the associated effort in terms of study and discipline which that implies.

Allhoff also makes two points in opposition to an argument against genetic enhancement from the perspective of the value of effort. Firstly, he points out that “successive generations have always had more resources available to them than previous generations”, and that we routinely expend less effort in the achievement of our goals than our ancestors. Motorised transport, technological study aids, and domestic appliances, amongst other technologies, have greatly reduced the effort and transformed the means by which we realise our ends. We do not regard this as problematic, or the ultimate achievement of our goal as any less laudable, as a result. Secondly, he points out that some people, due to their genetic advantages as provided by the genetic lottery, do not need to expend as much effort to achieve their objectives as others. We do not regard their accomplishments as any less valuable, or any less their own, despite this (2005: 46). In addition to this point, many of the advantages that members of society enjoy, such as the advantages enjoyed by children born into wealthy families, are undeserved, and are not the result of their own efforts (Mehlman 2003: 112). Genetic enhancement would therefore not seem to represent an unprecedented departure from the existing state of affairs.

Taken together, these counter arguments suggest that genetic enhancement may not represent the kind of novel disruption to human agency that critics of enhancement suggest it would. However, there is a final argument against enhancement from the need to preserve human values which also criticises the posited easy solutions which genetic enhancement offers. This argument emphasises the importance of vulnerability to human nature.



*The goodness of fragility*

Human beings are by nature vulnerable creatures, and are susceptible to misfortune, adversity, disease and disability. Critics of enhancement technologies suggest that the revolutionary potential of genetic enhancement to reduce or nullify this human fragility is morally problematic. The reasoning behind this position is that the physical and mental frailties of human beings, which will be the targets of enhancing technologies, are in fact valuable aspects of the human condition, or, in other words, that “the limitations” which our bodies impose upon us with regard to the achievement of our goals “might have ethical significance that [will be] imperilled by efforts...to overcome all such limitations” (McKenny 1998: 223).

Winkler argues in this regard that the “power over uncertainty or contingency” (1998: 242) which enhancement technologies offer us could lead to a sacrifice of our “full humanity” (1998: 248), as this humanity is partially constituted by a tendency to “love and honour the body in all its fragility, imperfection and finitude” (1998: 249). Why should we feel that the fragility of the body is something to be valued, taking into account that much of the history of civilisation represents an attempt to overcome it? One of the principal answers offered in reply to this question is that the experience of our frailty and vulnerability makes possible important modes of “self-formation” in our responses to adversity (McKenny 1998: 235). Our failure to recognise “the goodness of fragility” (Parens 1995: 141), then, will actually impoverish rather than improve human beings, by, for example, obliterating the experience of caring for others who are more vulnerable than ourselves, or by removing the opportunity to develop capacities of perseverance and forbearance in response to our own finitude.

Kass extends the argument that fragility is the basis of many valuable human capacities and attitudes as follows:

[T]here is a connection between the possibility of feeling deep unhappiness and the prospects for achieving genuine happiness. If one cannot grieve, one has not loved. To be capable of aspiration, one must know and feel lack. As Wallace Stevens put it: Not to have is the beginning of desire. There is, in short, a double-barrelled error in the pursuit of ageless bodies and factitiously happy souls: human fulfilment depends on our being creatures of need and finitude and hence of longings and attachment (2003: 27).

Critics of this argument against genetic enhancement point out that enhancement technologies would not make us invulnerable (Harris 2007: 68), and would therefore not remove all adversity or contingency from our lives (Buchanan 2011: 81, Savulescu 2007: 287) – enhancement does not offer heaven on earth. Is it still problematic that genetic enhancement is at least *directed* towards the eradication of human fragility, even if this is a goal which can never be completely accomplished?

It is not clear to all commentators on the enhancement debate why this should be so, or why human fragility should be regarded as a valuable aspect of functioning that it is central to human nature. This perspective is based upon a particular worldview which is not universally shared. Rather, some critics insist that it is not “intuitively obvious that there is necessarily...anything good about aging, or death, or human fragility” and believe that “the use of genetic enhancement to address these issues would be valuable” (Allhoff 2005: 45). Indeed, the use of multiple technologies to counteract such frailty has been regarded as morally laudable over the course of history, and it is unclear why genetic interventions should be an exception to this. Savulescu characterises positions which reject genetic enhancement on the basis that it will reduce human frailty as expressing the warped argument that “because life is unpredictable, and good can come out of bad, we should choose the bad or be indifferent to it, or allow it to occur...when we can easily and foreseeably avoid it” (2007: 286). This is an argument which fails to convince proponents of genetic enhancement. Rather, critics such as Harris suggest that “removing limits from our bodies and minds” will not reduce the possibilities for human fulfilment, but will make our lives “fuller” than their unenhanced versions (2007: 136). Thus, Harris argues that arguments against genetic enhancement from the goodness of fragility are founded upon a particular “conception of the scope of life and its possibilities”, and a restriction of genetic enhancement based on this particular worldview would be “tyrannical” in the face of competing conceptions of the good life which do not regard frailty as an important human value which ought to be preserved (2007: 137).

*Is the transformation of human nature ethically concerning?*

The arguments against genetic enhancement from the perspective of human nature are concerned that this technology will undermine our capacity to be fully human, either in terms of our genetic species identity, or in terms of our ability to live authentic human lives, as constituted by the presence of certain values and attitudes which are posited as giving these

lives uniquely human meaning. The criticism of these positions argue either that these arguments are mistaken in their perception that genetic enhancement will threaten our humanity, as they rest on a confused understanding of the concept of human nature (Daniels 2009: 25), or that, even if enhancement does hold the possibility that human nature will be transformed, this is not necessarily ethically concerning, and our discomfort at this prospect is misplaced.

This is, firstly, because attempts to alter human nature are hardly new. Human nature has not only been subject to change through evolutionary processes, but also through our own environmental interventions (Daniels 2009: 33). Compared to human beings of the not-too-distant past, today “we are taller, we live longer, we have more inclusive ethical codes” (Lewens 2009: 354). These are changes that are at least partially the result of human action, including the use of technological interventions. Opponents of the argument against genetic enhancement from the perspective that human nature should be preserved therefore aver that it is unlikely that the transformation of human nature could be considered an “ethical firebreak” (Lewens 2009: 355) which excludes any future attempt to pursue enhancement technologies. Secondly, these critics posit that genetic enhancement has great potential to transform human nature for the better without necessarily endangering important goods which we value – our evolved human identities “contain...bad as well as good characteristics and there is no reason to believe that eliminating some of the bad would so imperil the good as to make the elimination of the bad impermissible” (Buchanan 2009: 141). Finally, transhumanists argue that even if genetic enhancement, in its capacity to “develop greater capacities...of a far higher order than those we can realize as un-enhanced biological human beings” (Bostrom 2004: 495), does have the potential to radically transform human meaning, it could also offer new and unimagined forms of meaning to our lives which we currently cannot contemplate (Agar 2004: 62), and which a restriction on genetic enhancement would unjustifiable deny us.

I will now consider a further group of arguments against genetic enhancement which consider not the effect of genetic enhancement upon the preservation or transformation of human nature, but instead consider whether a rejection of genetic enhancement technologies might be warranted because of the likelihood that such interventions would bring about bad consequences.

### *Consequentialist arguments*

Consequentialist arguments against genetic enhancement hold that there are negative consequences which are likely to follow from the use of enhancing technologies. As these consequences are ethically undesirable, proponents of these arguments contend that we should seek to avoid them, and should therefore refrain from practicing genetic enhancement. In other words, the contention is that a risk-benefit analysis of the consequences of genetic enhancement shows that the possible benefits of this practice are outweighed by their potential to bring about harm (Brock 2005: 391, Buchanan 2008: 2). There are two possibilities here. On the one hand, genetic enhancement, despite the benefits that it might appear to offer, may also have negative consequences for the person who is enhanced, implying that the balance of benefits and harms produces a negative result for the enhanced individual overall. On the other, although genetic enhancement may benefit the individual, the result of many individual decisions to enhance may be bad for society, which could result in tension between autonomous individual decisions and the interests of the community as a whole (Brock 2005: 378).

The first risk of genetic enhancement to be considered is the possibly medically hazardous nature of enhancement technologies, a risk which affects the enhanced individual. Critics express the concern that the practice of genetic enhancement will be dangerous, as the nature of genetic interventions render them particularly vulnerable to the risk of unintended consequences. The remaining three sets of negative consequences which I will consider are consequences for society as a whole. Firstly, I will examine the suggestion that the use of enhancing technologies will result in increased levels of injustice, as inequitable access to such technologies will exacerbate social and global inequalities. Secondly, I will consider the possibility that the practice of genetic enhancement could rely upon and perpetuate existing prejudice, and engender new forms of discrimination based on the presence or absence of enhanced characteristics. Finally, I will summarise the position which holds that the adoption of genetic enhancement technologies will partially be driven by social pressure. The contention here is that the resulting widespread use of enhancement technologies could result in homogenization, or could lead to the goal of enhancing interventions being negated by their becoming self-defeating.

*Risks to the individual: genetic enhancement is medically hazardous*

The first consequentialist argument against genetic enhancement is that the procedure may be medically hazardous (Anderson 1989: 686, Borenstein 2009: 524, Kamm 2009: 127, Kass 2003: 14, Mehlman 2003: 71, The President's Council on Bioethics 2003: 48), in that it could go wrong, and inadvertently cause (possibly irreversible) harm to the recipient of the intended genetic intervention, as well as to their offspring and descendants.

While the possibility of dangerous and unforeseen side-effects is always a relevant concern in choosing whether to embark upon new medical procedures, genetic enhancement (and genetic engineering in general) is seen as particularly vulnerable to such concerns. As already discussed in Chapter 2, the pleiotropic nature of genes, in that most genes appear to have more than one function (Coors & Hunter 2005: 21) and to affect more than one body system (Gardner 1995: 68) implies that it may be difficult for researchers to predict the entire effect of a given genetic intervention. Coors and Hunter draw our attention to an incidence of genetic intervention in mice, which caused over-expression of the p53 gene. This intervention reduced the incidence of cancer in the affected mice, but also significantly lessened their life expectancy (2005: 21). This example illustrates the danger that “even modest alterations in the best studied genes...can have completely unexpected consequences for aspects of the organism that were not at all suspected to be related to the function of the gene”, even when the attempted intervention is therapeutic, and that these unexpected consequences may reveal themselves only some time after the intervention (Coors & Hunter 2005: 22).

This risk is amplified, as previously discussed, by the polygenic nature of most complex human traits which would likely be the targets of enhancement interventions (Agar 2004: 29, Robertson 2003: 477). It is possible that successful genetic enhancement would require the manipulation of multiple genes, thus increasing the risk of unintended and harmful consequences, due to the pleiotropic nature of each altered gene. Therefore, it seems possible that doctors contemplating genetic interventions will not be sure whether they will “unexpectedly harm” their proposed subjects (Fletcher 1983: 516).

A second point which is raised in support of the particularly hazardous nature of genetic engineering has to do with the inheritability of germline genetic interventions. Genetic

interventions are usually classified as somatic cell or germline interventions<sup>29</sup>. Somatic cell genetic interventions (whether therapeutic or enhancing) entail “the insertion of a...gene into somatic, or body, cells of a patient”, while germline interventions, often viewed as more controversial, aim at genetic alterations at the level of the “gametic cells” in such a way that “children of the patient would receive the [altered] gene” (Anderson 1989:682). Germline genetic interventions, even in their therapeutic manifestations, are unique technological interventions in that their effects would not be limited to the treated patient, but would be passed onto their offspring (Brock 1998: 62, Murray 1991: 58). Where the safety of a particular intervention has not been established, or, more pertinently, where unforeseen negative effects of an intervention are delayed, the future person may be harmed by a genetic intervention which affects them but which they have not consented to. The possibility of “unpredictable [and] long term iatrogenic risks” (Juengst 1991: 590) may be a good reason to avoid at least germline genetic interventions which could “allow untold numbers of people to be put at a significant risk of harm” (Berger & Gert 1991: 68).

Finally, the medical risks associated with genetic enhancement may be greater than those associated with therapeutic genetic interventions, as “enhancements may have relatively broad effects on complex, multifactorial traits” (Brock 1998: 61). Anderson suggest that “replacing a faulty part is different from trying to add something new to a normally functioning, technically complex system” and that “correcting a defect in the genome” is less likely to “endanger the overall metabolic balance of the individual cells as well as the entire body” (1989: 686) than enhancement.

Thus critics argue that genetic enhancement is likely to be medically risky, not simply because genetic enhancement would be a novel technical procedure, but also because the nature of the practice itself makes it particularly vulnerable to danger. However, the fact that a procedure is risky does not necessarily give us reason to avoid it, if the potential benefits would be very great. For example, we might have reason to undertake an extremely risky medical procedure if we knew that the potential benefit (for example, the preservation of life) would be so great as to justify this risk. Critics of genetic enhancement, however, hold that the benefits of genetic enhancement would never be as great as the benefits of a therapeutic intervention. In other words, a risk-benefit analysis of a proposed instance of genetic therapy and genetic enhancement respectively would always give us greater reason to proceed with

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<sup>29</sup> See for further discussion on this distinction Anderson (1989: 682), Juengst (1997: 125-126), and Murray (1991: 58).

the former intervention than with the latter, even if the risks are comparable, because the benefits of therapy, particularly with regard to the relief of suffering and the restoration of species-typical functioning, are clearer than the benefits of enhancement<sup>30</sup> (The President's Council on Bioethics 2003: 39).

Not all commentators are convinced that medical risk is a definitive argument against the practice of genetic enhancement. While safety concerns, particularly with regard to new and revolutionary interventions, should be at the forefront of researchers' minds, these seem to suggest the need for the utmost caution, rather than the need for an outright ban on genetic interventions, whether they are aimed at therapy or enhancement (Baylis & Robert 2004: 14, Glover 1984: 43). If genetic interventions are inherently more risky than other novel medical interventions, this simply calls for more caution, not a complete rejection of genetic technologies. If it can be shown, through extended and careful research, and controlled clinical testing, that genetic interventions can overcome the difficulties identified above, and could be practiced in a relatively safe and effective manner, this objection simply disappears.

Secondly, the possible effect of enhancements on future generations is not unique to genetic interventions. As Moseley points out, "[h]umans alive today do many things which may have unforeseeable and negative consequences for future generations but which appear ethically acceptable" and that normal procreation in general is subject to this very same complaint (1991: 643). If we assume that rational persons will not choose interventions that run clear risks of bringing about obviously negative consequences for their offspring and descendants, we cannot reject genetic interventions purely on the basis of remote and vague risks which have not been proven without calling into question many other human practices, especially in the realm of scientific interventions, which we currently consider to be not only ethically acceptable, but desirable.

If the use of genetic interventions does imply an element of risk, it may well be true that "where there is an appreciable degree of risk...the benefit of an enhancement that produces some trivial improvement to the quality of an already good life might be judged less valuable than an intervention that saves a life or dramatically ameliorates a genetic disease" (Harris & Chan 2008: 339). However, this does not rule out enhancement where the risk-benefit ratio is more favourable, and ultimately, critics argue that this judgement should be performed on a

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<sup>30</sup> This point is echoed in the goal compatibility arguments against enhancement which will be discussed later in this chapter.



case-by-case basis and by the individual concerned (Harris & Chan 2008: 339). The argument that a risk-benefit analysis of interventions aimed at improvement rather than therapy will be more likely to suggest that genetic enhancement should be avoided also ignores the “significant benefits” which many forms of enhancement offer (Agar 2004: 163), and therefore cannot rule out the practice of genetic enhancement in general.

Neither is the obligation to responsibly evaluate the risks and benefits of genetic enhancement unique to this practice. Rather, an “insistence on rigorous risk assessment and on only proceeding if in all the circumstances of the case the risks are acceptable is a feature not only of all medical and scientific advance but of all human decision making whatsoever” (Harris 2007: 33). Kass echoes this point: “many good things in life are filled with risks, and free people if properly informed may choose to run them”. Ultimately, “the big issues” with regard to the ethics of genetic enhancement “have nothing to do with safety”, and “the ethical issue of avoiding risk and bodily harm is independent of whether the risky intervention aims at treating disease or at something beyond it” (2003: 15).

Thus the risks of genetic enhancement, with regard to the possibility of its safe application, cannot provide a definitive argument against this practice. The risks involved accrue to the enhanced person, and as such, critics argue that these should be evaluated by the individual concerned. I will now turn to three sets of possible societal consequences of genetic enhancement which critics have identified as militating against the development and use of enhancement technologies altogether.

### *Risks to society: genetic enhancement and difference*

The risks to society which critics attribute to the practice of genetic enhancement are all associated with the effects of difference. Genetic enhancement of human beings aims at the improvement of human characteristics – “in the context of interventions which impact on human functioning, an enhancement is clearly anything that makes a change, a difference for the better” (Harris 2007: 36). In other words, the goal of enhancement is to bring about a change for the better in a particular human feature or a multitude of features, so that a differentiation can be made between the unenhanced, inferior quality of a particular characteristic and the enhanced, superior quality. This is the central motivation for the genetic enhancement of human beings. It is also the source of some of the central concerns, in terms of the effect of genetic enhancement upon society, which many critics have identified



as militating against current research into and the future practice of genetic enhancement. These are concerns about the effect of genetic enhancement on social justice and inequality, the possibility that the use of genetic enhancement will rely upon, perpetuate, or engender discrimination, and the prospect of the exertion of social pressure in favour of enhancement. As Buchanan points out, these concerns are situated within the framing assumption that the benefits of enhancement are primarily accrued to the individual, and that this benefit should be balanced against the possibility of “social or collective harms” which the (widespread) use of enhancement may bring about (2011: 36).

*Genetic enhancement will contribute towards injustice*

As indicated above, concerns about the compatibility of genetic enhancement and justice are specifically related to the qualitative difference between enhanced and unenhanced future members of society. The worry here is that genetic enhancement will bring about profound inequalities between individuals and groups in society which will be unjust, particularly when the inequalities brought about by genetic enhancement will be based upon, and will serve to widen, existing social inequalities, and particularly, the gap between the rich and the poor (Brock 1998: 59-60, Cooke 2003: 34, Davis 2009: 149, Mehlman 2003: 109).

The reasoning behind this argument is easy to grasp - if genetic enhancement technologies are, at least initially, expensive procedures which are not covered by national health schemes or health insurance, they will be purchased on the free market, and it is likely that only those who are already financially advantaged will be able to make use of them, for themselves and for their children<sup>31</sup>. These genetic interventions will bring about improvements which will in turn provide “advantages in competitions for social goods such as wealth, status or power”<sup>32</sup> (Gardner 1995: 69). This improved ability to compete will therefore increase the variance of the distribution of social goods (Gardner 1995: 74), contributing to “the widening gap between the well-off and the less-so” (Robert & Baylis 2004: 12). Parens expresses this concern as follows: “[t]hose who already have economic resources will readily gain access to new technologies. And those new technologies will make them stronger competitors for more resources” (1998a: S8). Similar concerns are raised by, among others, Gordon (1999), Juengst (1998), Kiuru & Crystal (2008), McKibben (2003), and Mehlman (2003).

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<sup>31</sup> DeGrazia considers the equivalent case of cosmetic pharmacology and identifies a similar problem (2000:38).

<sup>32</sup> The question as to whether genetic (and other) enhancements are valuable because they are good for the enhanced person in themselves or because they confer a competitive advantage will be discussed later in this chapter.

Some critics have concerns which extend beyond the likely tendency of genetic enhancement to amplify existing social divisions. They worry that the sustained use of enhancement technologies over time will have the potential to create a “genetic aristocracy” (Faust 2008: 411). In other words, they are concerned that the discrepancy in the availability of genetic enhancement, where this discrepancy tends to advantage those in society who are already better off, and where this advantage is compounded over time as the enhanced are increasingly competitively privileged, will create two distinct classes of human beings (*America’s Next Ethical War* 2001: 22) and that this stratified class system will result in the disappearance of the current (albeit limited) possibility of “mobility between the lower and the upper classes” (Bostrom 2004: 502).

Taking this suggestion even further, some critics worry that if enhanced capabilities are inheritable, these two classes may eventually develop into “subspecies” (Baylis & Robert 2004: 9, Sandel 2004: 52). This is a concern that has already been discussed in the first section of this chapter, but is relevant here in the light of the possibility that the human/posthuman divide will run along the current lines of disadvantage/advantage. The concern discussed previously as to the possibility that the development of subspecies will undermine moral commonality is raised here again in the worry that this divide will interrupt notions of justice as each group fails to identify with the other as fellow members of a distributive community (Annas 2001).

This problem of moral identification is also raised by Sandel in his discussion of the notion of “solidarity”. He argues that “perfect genetic control would erode the actual solidarity that arises when men and women reflect on the contingency of their talents and fortunes” (2007: 92). The contention here is that appreciation of the “giftedness” of our genetic attributes tends to lead us to regard the relative advantages and disadvantages bestowed upon us as contingent, rather than as a result of our own achievements, and therefore, the more advantaged are more inclined to share, to some extent, the fruits of these advantages with, and to take an interest in, the fate of those who have been less fortunate in the genetic lottery “through no fault of their own” (2007:91). If, however, our attributes are no longer the result of chance, but within the realm of human control (and are therefore the result of our own achievement), this has the potential to undermine this attitude. Sandel seems to be suggesting that the use of genetic enhancement could lead to a form of moral degeneration in society, in that the eradication of the appreciation of the “giftedness” (2007: 85) of human attributes and

the “explosion of responsibility” (2007: 88) for the determination of genetic traits could lead to a general devaluation of the demands of justice (particularly distributive justice), which currently relies upon the idea that members of society are not (entirely) responsible for the position in which they find themselves, and that therefore other members of society owe them solidarity and some form of compensation for disadvantage.

The issue of the effect of genetic enhancement upon justice is not only relevant *within* societies, but also *between* societies (Harris 1992: 197, Mehlman 2003: 127). There is already concern that the goods of new biotechnological advances may not be made available in many African countries as a result of their prohibitive cost (Benatar 1998: 169). It is likely that this pattern would be continued with regard to enhancement technologies, and that countries and societies which are already advantaged materially in comparison to others may enjoy the benefit of the genetic enhancement of their citizens, while poorer countries cannot (Harris 2007: 62, Singer 2009: 286).

In particular, in countries where greater provision is made for access to healthcare beyond the primary level, it is likely that genetic enhancement will be distributed more equitably among the population than in countries where only the wealthy will be able to fund it. This implies that the ethical issues at stake in any discussion of genetic enhancement are not confined to the sphere of personal morality, but are significant in terms of global bioethics. This is particularly relevant in the African context, where the distribution of healthcare resources, and particularly the just distribution of global health resources, is already a major ethical concern. Davis articulates the concern that genetic enhancement may represent a misallocation of resources in a context where the basic health needs of millions of people remain unfulfilled<sup>33</sup> - a concern also expressed by Kass (2003: 15) and Mwase (2005: 87-88) - as follows:

[I]t is unjust to be devoting resources to longer and better lives for citizens of First World nations, when people in Swaziland barely make it to their thirties. After all, we already know how to save millions of lives and how to make other millions of lives dramatically better. We do not need genetic engineering to provide all children with mosquito netting or vaccinate<sup>34</sup> everyone against measles (2009: 149).

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<sup>33</sup> Buchanan argues that even the need for basic nutrition is not currently being met, which itself could be considered a form of cognitive enhancement: “adequate nutrition...allows people to function better cognitively...than malnourished people in less developed countries” (2008: 9).

<sup>34</sup> In fact, vaccination *is* a technological enhancement: see Buchanan (2008: 9). I will revisit this in the next chapter.

Not only do critics worry that research into genetic engineering will represent a misallocation of funds in the context of grossly unequal global access to basic, existing medical therapies, but also that such costly research may deplete the resources available for research into conventional medical therapies, particularly research into the treatment of diseases which primarily affect the developing world. (Baylis & Robert 2004: 15, Kamm 2005: 13). Is it just, for example, that research into the technology of genetic enhancement should eat up resources which could be better used for additional research into tropical diseases such as malaria?<sup>35</sup> Or, “given our scarce resources, should enhancement be at the top of the list of things to which we should be attending?” (Kamm 2005: 13).

It is indisputable that enhancement technologies, not distributed equally to all members of society, will create inequality. As pointed out above, this stems from the very nature of genetic enhancements themselves. The aim of these technologies is to create a qualitative difference between human characteristics, where the enhanced characteristic can be considered *better* than the unenhanced characteristic. On average, this will imply a qualitative difference between the characteristics of the enhanced and the unenhanced in general. There is no doubt, therefore, that if some are enhanced while others remain unenhanced, there will come to exist inequality between these two groups which will extend beyond naturally occurring genetic inequality. However, critics who suggest that “enhancements that create inequality among people are ethically concerning”, particularly where such “inequality [is generated] on an economic basis” (Kiuru & Crystal 2008: 335)<sup>36</sup> are going a step further. Brute inequality does not necessarily imply injustice. For the inequality created by genetic enhancement to be morally concerning, it must also be *unjust*. This raises some difficult questions, as the notion of justice itself is extremely difficult to define or to reduce to a single theory of justice (Harris 1992: 192). I will discuss this issue generally as it has been raised in the literature, and will include references to specific theories of justice as far as this is possible.

To counter the allegation that the inequality fostered by genetic enhancement is *unjust*, critics point out that, rather than being born genetically equal, we are all already subject to the

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<sup>35</sup> It is already the case that research into medical problems that affect the developed world vastly outweighs research conducted into problems affecting the developing world – some studies suggest that “90% of all medical research [is] undertaken on 10% of the global burden of disease” (Benatar & Singer 2000: 824). Equally shocking are the statistics from “UNICEF’s report on *The State of the World’s Children*” that state that “1.4 million...children under the age of five died in 2003...from lack of drinking water and basic sanitation” (cited in Robert 2005: 28). As Robert points out, “[w]e can safely presume that they did not die for lack of biotechnological enhancement” (2005: 28).

<sup>36</sup> See also De Melo-Martín (2004: 74-75) on this point.

natural genetic inequality imposed by the genetic lottery (Holtug 1999: 138) and nobody can be said to deserve their natural genetic attributes (Mehlman 2003: 111). Some of us are naturally genetically advantaged, and some are less fortunate (Brock 1998: 67), and nature does not take notions of “fairness” into account (Savulescu 2006: 331). However, critics of this counter argument could suggest, firstly, that this naturally given inequality is not the result of human action and therefore not within the sphere of behaviour that can be morally censured. Rather, according to some theories<sup>37</sup>, this natural inequality may even be interpreted as imposing a moral demand upon us to counter or balance the advantage or disadvantage which results. The situation of genetic enhancement is different – here, what specifically concerns many critics is the possibility of the development of a situation in which enhancements are available only to those in society who are already wealthy and powerful – in other words, that the competitive advantages that accompany genetic enhancement can be bought in a way that natural genetic advantages cannot be, and that this model of access to enhancement technologies is unjust.

However, many commentators point out that it is already the case that financially advantaged members of society can buy competitive advantages. We are not only already subject to naturally occurring inequality as a result of the genetic lottery, but also to inequality brought about by expensive *environmental* enhancements available only to the wealthy - for example, private school education (Brock 1998: 60, Silver 1997: 9 & 225) - which indisputably exacerbate social inequalities between the rich and the poor, and the purchase of which is not subject to restrictions (Moore 2000: 118). The new possibilities offered by genetic enhancement for parents to shape their children are not changes of motivation but “changes of degree and means” (Brock 2005: 378). If critics are so concerned with the possible inequality which may be caused by the future use of genetic enhancements, why are they seemingly unconcerned with already existing, and often extremely debilitating inequality which is already present, and which is clearly intensified by the ability of the wealthy to access environmental enhancements?

Harris has this to say as to why we do not restrict the purchase of educational privilege and other environmental enhancements:

[B]uying educational privilege in a context in which not all can afford to do so is certainly unfair in some sense. But if we defend people’s rights to do this it is because we feel it is right

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<sup>37</sup> Such theories include Egalitarianism, Justice as Fairness, and Prioritarianism.

to encourage people to provide goods for their children and wrong to deny them these goods even if not all can obtain them (2007: 27).

For this reason, Harris argues that it is not wrong to provide benefits to your children in other contexts (such as the context of genetic enhancement) even “when others cannot match your efforts” and even when this “will probably confer an advantage”, as it is “doubtful ethics to deny a benefit to any until it can be delivered to all”. Harris argues strongly that “[f]airness...does not require that benefits should not be provided to any” until they are widely accessible (2007: 28), and sums up this position as follows:

So when enhancements make life or lives better they are justified if they do just that if they also confer positional advantage that is no part of their justification and will in fact always constitute a moral disadvantage of their use, although whether this disadvantage constitutes a decisive argument against either the use or the permissibility of the enhancement will depend upon many other factors, among which are the degree of advantage, the degree of unfairness it creates, and the likelihood of the unfairness being minimized over time or by other factors such as compensation (2007: 30).

Savulescu also denies that unequal access to genetic enhancement is necessarily unjust. He asserts that “when enhancements are purchased or developed with private funds in a legal and legitimate way, there is no violation of the requirements of distributive justice”. Of course, this position relies on “free-market or libertarian” conceptions of justice (2006: 331), but to the extent to which economic policies that are at least partially based upon these theories prevail in much of the world today, it is not necessarily the case that an exacerbation of the inequality between the rich and the poor is unfair in an intrinsic sense.

However, there are a multitude of other theories of justice which could come into conflict with this position. These would include Utilitarianism, Egalitarianism, Rawls’s conception of Justice as Fairness, and Prioritarianism (Savulescu 2006: 331). In each of these theories, there is a conviction that there is some standard (such as the maximisation of general well-being, the presence of need, or the maximisation of the position of those who are worst off in society) which should govern the distribution of resources which go beyond one’s access to financial resources. This would seem to include the distribution of goods such as enhancement.

Is it necessarily the case that the use of genetic enhancement will contravene these standards, thereby giving rise to unjust inequality and widening existing gaps between the rich and the poor, or could alternative possibilities for the use of genetic enhancement technologies exist which could diminish, rather than exacerbate, inequalities between people? Savulescu expresses this possibility as follows: “It is no doubt true that enhancement technologies might create inequality and injustice. But their use may also *reduce* inequality, injustice and unfairness” (2006: 321).

How might this be so? Firstly, we can consider the argument that suggests that while genetic enhancements may initially only be available to the wealthy, this is a necessary evil which will ultimately give way to a situation in which the distribution of enhancements will be more equitable. Moore points out that the vast majority of new medical technologies are initially only available to the rich, but as they are further developed and refined, costs are lowered, and eventually “procedures that were once cost prohibitive are...available to everyone”. He questions why genetic enhancement should be an exception, and how we could justify a ban on a system that “yields everyone better prospects in the end, [so that] the resulting initial inequality of distribution is hardly objectionable” (2000: 117). Harris makes a similar argument (2007: 31), and draws comparisons with other modes of enhancement. He argues that formal education and literacy, which could both be considered enhancing technologies (Bostrom & Sandberg 2009b: 312), were initially only available to the wealthy, and resulted in social inequality (a point echoed by Buchanan 2011: 43), but are now increasingly available to all, and have had enormously beneficial consequences for society as a whole (2007: 14).

Secondly, critics such as Faust address the possibility that genetic enhancement could be used to improve our ethical sensibilities through genetic means – in other words, that “genetic moral enhancement” (2008: 397) could be used to improve our sense of responsibility towards others, and could thus increase our feelings of solidarity and heighten our moral intuitions as to the demands of justice, rather than merely being used as a tool to gain a competitive edge over others.

However, some critics go even further than this and suggest that active use could be made of genetic enhancements in order to counter or diminish the natural inequality that is the result of the genetic lottery, the results of which are “arbitrary from a moral perspective” (Rawls 1971: 64). If our natural genetic advantages and disadvantages are not something which we can be



said to deserve (Rawls 1971: 86), an argument can be made for the redistribution of genetic goods by the means of genetic enhancement, favouring not the wealthy and powerful, but those who are worse off genetically (Brock 1998: 68, Farrelly 2002: 73, Harris & Chan 2008: 338, Holtug 1999: 138)<sup>38</sup>. Buchanan et al. (2000: 303) argue that “the new genetics...creates hitherto unimaginable opportunities for including more people as effective participants in fulfilling forms of social interaction”. In their estimation, this would take place primarily through the use of genetic therapy, but also, to some extent, through the use of enhancement (2000: 302). While this alternative may be somewhat idealistic in terms of the current financially driven medical market, it does at least indicate that the obligation to reduce inequality can be called upon as a motivating factor for the development and use of genetic enhancement, rather than a factor militating against it. Holtug, for example, suggests that “people who are badly off through no fault of their own” (1999: 42), for example, because of genetic disease, should be compensated to satisfy the principle of justice, which accords with Rawls’s theory of justice in that morally arbitrary natural inequalities may require compensation (1971: 86). One of the acceptable methods of compensation is genetic therapy. However, people may also be badly off through no fault of their own, while still falling within the range of species-typical functioning, if they are “less intelligent, less talented, [or] less attractive” than others. If genetic enhancement can be used to compensate for their disadvantage in the “genetic lottery”, this seems to be a legitimate reason for practicing it, although Holtug only regards it as a “pro tanto” reason which can be overridden by other ethical considerations, namely, that the need to compensate people who suffer from greater disadvantage through genetic and other disease is more urgent and should be given preference (1999: 142). Holtug, in his discussion, draws attention to a valuable point: it seems nonsensical that “one should be troubled by a disadvantage that precludes a person from reaching the [normal] minimum, but not at all by the disadvantage that is compatible with reaching it” (1999: 140). According to some theories of justice in healthcare<sup>39</sup>, society is obliged to provide treatments which are directed towards the achievement of normal functioning, as this is a precondition for equality of opportunity. However, natural genetic

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<sup>38</sup> Harris argues strongly against the position, expressed here, that the pursuit of equal opportunity provides a moral justification for the pursuit either of “health or...enhancements”. His conviction is that these practices should be sought because they are good for the affected individuals, and while “equality of opportunity is something we should try to maximize in the delivery of improvements in health or in functioning...it seems only tenuously and contingently connected to our reasons for so doing” (2007: 47). Therefore, in his view, while we should “attempt to ensure equal opportunity to access [the] goods” of enhancement, these goods are morally desirable goods in their own right, and not simply because they could improve upon the equality of opportunity offered by the natural lottery, although this could be a “separate...additional reason to support the moral right to healthcare” (2007: 48).

<sup>39</sup> The normal function model of healthcare, which shall be considered later in this chapter in the context of goal compatibility arguments against genetic enhancement, and extensively in the following chapter with regard to the treatment-enhancement distinction, is one such theory.



inequalities which do not constitute deviations from normal functioning may also decrease fair equality of opportunity. One could therefore formulate an argument which suggests that society is obliged to provide enhancements which are directed towards the achievement of such equality<sup>40</sup>. The introduction of genetic enhancement technologies may therefore demand a rethinking of our notions of justice. In some sense, the “natural distribution” of abilities would no longer be “simply [a] natural fact” (Rawls 1971: 87). If we develop the ability to alter this natural distribution, this state of affairs, too, would fall within the province of a theory of justice, and “natural” goods could also be available for redistribution<sup>41</sup>.

Savulescu echoes the point that genetic enhancement could be used to reduce inequality, by drawing our attentions to two alternatives: “We can allow our lives to be determined by the natural lottery, or by wealth. Both of these lead to injustice”. In contrast to this, he suggests that “[j]udicious use of enhancement, based on a rational policy” can, in fact, operate to reduce inequality and injustice (2006: 336).

Even if we do not make active use of genetic enhancements to reduce inequality, some critics argue that it would still be possible to regulate the use of these technologies in such a way that unjust inequality would be limited. Faust points out that “society has many ways to monitor, evaluate, regulate (or ban) change”, and goes on to draw comparisons between the regulation of in-vitro fertilisation and pre-implantation genetic diagnosis (much of it self-imposed by the relevant service providers) which militates against sex-selection (2008: 411). Savulescu makes a similar point, by rejecting the argument that the use of genetic enhancement will necessarily lead to a situation in which “the rich get richer, the rich get smarter, the smarter get smarter, and the smarter get richer” (2006: 334). Rather, he argues that “how enhancement technologies are made available is up to us...We have the power to dictate policy on the employment of enhancement technology” (2006: 335). Thus, the inequality likely to result from genetic enhancement could be at least partially countered by introducing social policies to militate against this (Bostrom 2004: 503, Resnik 1994: 37). Buchanan goes even further than this, and calls into question the “framing assumption” that enhancement interventions would necessarily be “market goods” which could only be accessed by those individuals who could afford them. He argues that “[h]istorically, governments have shown a

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<sup>40</sup> I will develop such an argument in the next chapter.

<sup>41</sup> Rawls makes such a tentative suggestion of this nature, although not explicitly with regard to genetic enhancement: “In the original position...the parties want to insure for their descendants the best genetic endowment...The pursuit of reasonable policies in this regard is something that earlier generations owe to later ones” (1971: 92).

keen interest in increasing productivity”, leading them to devote resources to goods which serve this end, such as “education and public health”. The same could, and probably would, be the case for enhancements which would tend to increase productivity (Buchanan 2011: 37). To assume that technological enhancements would necessarily be accessible only to the rich, and that this would exacerbate social inequality, may be an overly negative assumption.

Building on the point that that some enhancements would be likely to increase productivity, the argument has been made that genetic enhancement could have positive effects on society collectively, even if enhancement is not universally available (Newson & Williamson 1999: 345), as the benefits of genetic enhancement, such as improved efficiency in production and research and an associated increase in general well-being<sup>42</sup>, would also be accrued to those in society who are not enhanced (Buchanan 2008: 10, 2011: 36). We can imagine a situation, for example, in which the cognitive enhancement of some individuals would increase the rate of research into the treatment of disease, or lower the prices of goods and services, which would benefit everyone. Buchanan suggests that:

[A] balanced consideration of the pros and cons of enhancement should take seriously the fact that some of the most discussed kinds of enhancements will create the potential for increases in the well-being of very large numbers of people, including those who do not have the enhancement (2008: 11).

If it is the case that enhancement would benefit everyone in society, regardless of whether they were themselves enhanced, this would seem to satisfy conceptions of justice such as Rawls’s difference principle, as the social goods offered by enhancement, even when distributed unequally, would benefit even those who were unable to access enhancement technologies. This would satisfy the Rawlsian prescription that “the social order is not to establish and secure the more attractive prospects of those better off unless doing so is to the advantage of those less fortunate” (Rawls 1971: 65). The possibility of moral enhancement, particularly of those in positions of power, is another example of an enhancement that would probably improve the lot of everyone in society, by, for example, reducing the likelihood that human beings will cause widespread harm by the misuse of advanced scientific techniques, or by increasing the propensity of human beings to take action to reduce global inequalities and to preserve ecological environments (Persson & Savulescu 2011).

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<sup>42</sup> Buchanan suggests that the enhancements most likely to achieve this would be cognitive enhancements, enhancement that extend human life, enhancements that “compress morbidity and disability near the end of life”, and enhancements that improve the functioning of the human immune system (2011: 45).

However, even if, as the above arguments suggest, genetic enhancement will not necessarily lead to injustice within societies, the question as to the just distribution of enhancement globally, and the possibility that genetic enhancement will exacerbate inequalities between societies, must still be considered. Critics such as Buchanan argue in this regard that the opposite could be true – in other words that genetic enhancement could “help [to] close the gap between [people of more developed countries] and people of less developed countries” (2008: 17) – he uses the example of enhancements which could strengthen the immune system. However, whether this would be likely to be the case in the face of current global trends in terms of expenditure on healthcare in various parts of the world remains to be seen.

Harris argues in this regard that while there are no easy answers to ensuring equitable distribution to genetic enhancement, globally or otherwise, the benefits of genetic enhancement are such that research and application of enhancement technologies should not be postponed until they could be available to all, as this would “considerably delay” the achievement of the valuable and beneficial consequences of such technologies (2007: 31). In his discussion of one particular type of enhancement, that of life extension, he makes the following point:

The introduction of any new complex and/or expensive technology raises [the problem of just distribution]. The impact on global justice or on justice within societies is important and must be addressed; it is a principled objection, but not an objection in principle to the introduction of life-extending therapies. The principle requires that strenuous and realistic efforts be made to provide the benefits of the technology justly and as widely as possible, not that the benefits be denied because of the impossibility of ensuring adequate justice of provision (2007: 63).

Thus, critics argue that while the question of the equitable distribution of genetic enhancement technologies is an important one for public policy and requires more consideration, this is an argument primarily about the distribution of the goods of genetic enhancement and does not constitute a definitive argument against the use of enhancing technologies (Caplan 2009: 200, Sandel 2007: 16), particularly as a ban on the use of enhancing technologies would imply limiting autonomy (Bostrom 2004: 503). Some critics even argue that the discussion around inequality of access to enhancement implies an acknowledgement that enhancements are, in themselves, beneficial goods which we desire (Bostrom & Sandberg 2009b: 329, Dees 2007: 379). In other words, we should differentiate

between moral arguments about the technology of “genetic enhancement *itself* and its *distribution*” (Allhoff 2005: 44). This suggests that while the possibility of the just distribution of genetic enhancement certainly needs to be carefully considered, particularly in a context where the goods of healthcare are already distributed unequally (in other words, in the context of an existing “distributive scheme” (Allhoff 2005: 45) which is either already unjust, or which, applied to the technology of genetic enhancement, would be unjust), the difficulties likely to be encountered in this regard do not imply that the technology of genetic enhancement should be rejected outright. In fact, a blanket ban may even exacerbate the problem of inequality, as those who are wealthy enough will be able to access enhancement technologies through a potential black-market. In contrast, where “the legitimacy of enhancement is recognized, new regulatory institutions can be developed to facilitate the wider and more rapid diffusion of highly beneficial and safe enhancements” (Buchanan 2011: 19). However, critics of genetic enhancement raise a further problem with regard to its potential to bring about difference. This is that enhancement technologies may contribute towards or be used in the service of prejudice and discrimination, or that the novel changes which they will produce in human beings may engender new forms of discrimination.

*Genetic enhancement will rely upon or engender discrimination*

The problem as to genetic enhancement’s possible association with discrimination has two parts. Firstly, critics have suggested that specific uses of genetic enhancement may rely upon, and therefore perpetuate existing societal prejudices. Secondly, they speculate as to whether genetic enhancement could engender new forms of prejudice based upon the presence or absence of enhanced characteristics.

The first possible association between the use of genetic enhancement and discrimination considers the problem in the context of pre-existing prejudice prevalent in society. The question is whether technologies aimed at genetic enhancement may come to be used in specific ways which are motivated by discriminatory attitudes. A related issue is the concern that if such usage is sustained or widespread, this may perpetuate, uphold or maintain prejudice.

This concern is, in fact, an issue which has been debated in bioethics for some time, and is not unique to the debate around genetic enhancement. There has often been an expression of unease as to the possible uses which could be (or are) made of certain biomedical

technologies, particularly those technologies which are selective, such as pre-implantation genetic diagnosis followed by in vitro fertilization, and prenatal screening followed by selective abortion. These concerns have focused primarily upon two forms of discrimination – discrimination based upon gender, and discrimination based upon disability.

There is some evidence that the use of screening technologies has, in some instances, been motivated by discriminatory attitudes towards women or the disabled. For example, in countries such as India and China, the bias towards male children has resulted in a trend towards sex-selective abortion (Arnold, Kishor & Roy 2002, Junhong 2001, Sen 2003, Sudha & Irudaya Rajan 1999, Zhu, Lu & Hesketh 2009). One can also make the argument that prenatal screening and selective disability for abortion, in some cases, relies upon or perpetuates discriminatory attitudes towards the disabled (Hall 2008).

In the same way, it is possible that the use of genetic technologies could contribute towards or rely upon discrimination or prejudices that are already present in society (Juengst 1998: 42), turning “reproduction into another means of expressing prejudice” (Agar 2004: 148)<sup>43</sup>. Imagine that a genetic intervention is developed which would enable one to choose to alter one’s skin colour (Mwase 2005: 86), or to alter one’s sexual orientation. In a world in which racism and homophobia remain problematic, individuals might choose to alter these characteristics for themselves or for their children (Brock 1998: 64), thereby “colluding with social prejudice [and] worsening its effects” (Agar 2004: 109-110), in order to escape social disadvantages that result from such prejudice, or because of feelings of inferiority which result from continued exposure to it, or, in the case of parents choosing to alter their child’s sexual orientation, because they themselves subscribe to such discriminatory attitudes. If regular use were to be made of such interventions, this would reinforce and strengthen negative stereotypes and prejudice in society. It would also avoid the issue of prejudice and the demand it makes upon us to enact positive change at a societal level by instead circumventing the problem of prejudice through genetic alteration (Agar 2004: 149, Juengst 1998: 42).

Agar points out that the problem with using genetic interventions in the service of discriminatory attitudes is not a problem which stems from the technologies themselves, but rather rests in pre-existing discriminatory attitudes – making use of genetic interventions

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<sup>43</sup> Little makes a similar point with regard to the ethical problems of cosmetic surgery which is driven by “suspect norms”, and regards the practice of such surgery as constituting a kind of “complicity” with such norms (1998).

motivated by these discriminatory attitudes is to “seek biotechnological solutions to problems that have nothing at all to do with genes” (2004: 151). We cannot discount the possibility that enhancement technologies will be used to express our “uglier attitudes”, but this is true of many activities (Martin & Peerzada 2005: 27) and does not constitute a moral argument against such activities in themselves. Our focus should therefore be on changing *these attitudes*, rather than rejecting any intervention which could conceivably express them. Agar acknowledges that simply recognising that certain harms are caused by morally unacceptable prejudices, such as racism or homophobia, does not reduce the reality of the experience of those harms. However, he rejects the argument that parents (and presumably individuals on their own behalf) should be allowed to make use of enhancement technologies “to spare their children the harms...inflicted by racists and homophobes” (2004: 156), as he finds it difficult “to imagine a successful fight against prejudice in the very society in which there is a widely exercised freedom on the part of parents to remove from their children the characteristics that would make them objects of prejudice”, and that the harm to society that this would imply could not be justified (2004: 157). He therefore argues for a ban or limit to be placed on such genetic interventions, although some critics suggest that such a ban would conflict with reproductive autonomy<sup>44</sup>.

The second problem raised by critics with regard to the practice of genetic enhancement and its possible association with discrimination is the question as to whether it is possible that discrimination may be caused by the use of enhancement, where such discrimination is based upon the differences brought about by enhancing interventions. This problem has been raised by Anderson, who points out that discrimination may be directed either towards those who make use of medical technologies to bring about genetic improvements, or against those who either cannot or will not make use of them (1989: 689). The possibility of discrimination against a “genetically challenged” underclass of society is often raised as an objection against genetic enhancement (Moore 2000: 117). Some critics even suggest that in its worst manifestations, such discrimination could lead to the enslavement of one group by the other, or even to genocide (Annas 2001).

Savulescu disputes the suggestion that discrimination is a necessary outcome of the use of genetic enhancement, as he believes that this attitude relies upon a simplistic form of “social

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<sup>44</sup> It is worth noting that these genetic technologies cannot actually be described as enhancements – they are, in fact, neutral alterations, which are only beneficial in the presence of prejudicial attitudes which inflict unjustified harm upon those with certain characteristics.

determinism” which holds that we have “no control over social attitudes and practices”. He argues, in opposition to this, that our treatment of the enhanced and the unenhanced is entirely our choice, and that is also our responsibility to ensure that policies are put in place to protect the interests of all (2006: 335). According to this view, the possible consequence of discrimination between the enhanced and the unenhanced is not a direct consequence of the use of genetic technologies. Rather, it is linked to the human tendency to discriminate on the basis of difference, and it is this tendency that must be continually guarded against, both as it manifests itself today, and as it could manifest itself in the future through the use of genetic enhancement.

### *Social pressure to enhance and the “Tragedy of the Commons”*

A further negative consequence associated with the qualitative differences which genetic enhancement will bring about is the possibility that “personal freedom may be threatened as people feel obliged to avail themselves of [enhancing] technolog[ies]” (Baylis & Robert 2004: 12) in order to avoid finding themselves worse off than others in society (Gardner 1995: 72). Thus the choice as to whether to make use of enhancement technologies, whether for self-improvement or for the improvement of one’s children, will no longer be truly free, but will be heavily influenced by societal pressure (Kass 2003: 16, Borenstein 2009: 520, Robertson 2003: 479), which will require enhancement in order to maintain the ability to compete with others.

However, if this social pressure results in a high take-up rate for genetic enhancement, this will, according to critics, raise two further concerns, both of which relate to the so-called “Tragedy of the Commons, in which genuine and sought-for gains to individuals are nullified or worse, owing to the social consequences of granting them to everyone” (Kass 2001: 19). The first of these is the possibility that genetic enhancement will bring about increased homogenization, while the second is that many decisions in favour of enhancement will render the technology self-defeating.

The possibility that genetic enhancement will bring about homogenization (Agar 2004: 134) is based upon the concern that popular or dominant conceptions of the good life and our “lack of imagination as designers” (Kamm 2009: 128) will result in the use of genetic



enhancements which conform strongly to a limited number of genetic models<sup>45</sup>. If many in society make similar choices, this will in turn reduce valuable diversity and lessen the possibility for genuine freedom and individuality (Kass 2003: 16).

Singer disagrees that this is likely to be a problem. He points out that “only if [genetic enhancement] was very widely used for a long time in a way that tended to focus on a small number of genotypes” would the problem of homogenization arise, and if this started to happen, we would be able to take note of this and take action to prevent it (2009: 284). Harris also calls into question whether homogenization would result to the extent which critics of enhancement suggest. While he concedes that there is a possibility that use of genetic enhancement could reduce some differences (granted that all or most people are enhanced) he is not convinced that this will introduce concerning levels of conformity – as people’s capacities and skills differ, so the augmentation of these skills will also differ in similar ways (2007: 128), and the enhancement of general purpose capacities and abilities need no more lead to homogenization than compulsory education (Fox 2007: 23).

Social pressure to enhance may, however, have another undesirable consequence. Critics suggest that if the practice of genetic enhancement is motivated by a desire to gain a competitive advantage, widespread use could lead to the technology becoming self-defeating (Brock 1998: 60, Juengst 1998: 42, Robertson 2003: 475, Singer 2009: 282). Any competitive advantage which a particular enhancement would give would be nullified by universal access to such an enhancement, and this would result in a situation where “no one’s position would change” (Parens 1998a: S8), or in which the “biological arms race” sparked by the use of enhancement technologies would simply result in a “level playing field” (McKibben 2003: 23).

It is suggested, for example, that the enhancement of the characteristic of height would be “collectively self-defeating” (Sandel 2004: 53). If many people were to make use of genetic technologies to enhance height, others would become “shorter relative to the norm” (Sandel 2004: 53), which would provide a good motivation for them to make use of an enhancement conferring height in their turn. However, this would nullify the competitive advantage of the enhancement, as everyone would now be tall (to the extent that this term would maintain its meaning).

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<sup>45</sup> The possibility that genetic enhancement may be motivated by social prejudices, as discussed in the previous section, may also contribute towards homogenization.



Brock criticises this position by pointing out that there are “non-competitive” benefits or “intrinsic goods” which could be conferred by genetic enhancement (cited in Parens 1998a: S8). In other words, he argues that it is not always correct to assume that genetic enhancement would be sought for competitive benefit. The “positional value” of enhancements can be contrasted with their “independent value” (Agar 2004: 127) or “intrinsic value” (Singer 2009: 282), which does not vary with regard to whether it is possessed by others. It may be true that one could seek an enhancement of intelligence in order to perform better than others in tests or in the workplace. Greater levels of intelligence, however, could also be sought in order to be more capable of enjoying various pursuits. For example, Parens suggests that higher levels of concentration would enable one to better appreciate Shakespeare. This would be beneficial for the individual concerned without reference to the advantage it might give one over others (1998a: S9). Harris & Chan support this view, claiming that “there are many valid reasons to seek out enhancements other than to gain an edge over one’s competitors. Enhancements are good for the enhanced individual independently of any competitive advantage they also confer” (2008: 338). In other words, the qualitative differences bestowed by genetic enhancements are “*instrumentally* good for us when and because [they] enable...us to realise our ends more reliably and effectively” (Persson & Savulescu 2008: 162), and this benefits us whether or not they (also) confer a competitive advantage, although in practice, it is likely that many or most enhancements will confer combined competitive and instrumental advantages (Agar 2004: 128).

A different point of view is offered by Buchanan. He argues, in contrast to the position that enhancements could be self-defeating, that some enhancements would in fact be likely to have a “network effect” (2011: 48). This implies that the usefulness or benefit of the enhancement would increase, rather than decrease, as more individuals have it. An improvement of cognitive functioning could be an example of such an enhancement, as “[l]arge numbers of individuals with increased cognitive capabilities will be able to accomplish what a single individual could not”, as in the current situation of herd immunity (2011: 48). Widespread use of genetic enhancement would be good for all concerned in this context.

Harris, however, argues that concerns as to the possibly self-defeating nature of genetic enhancements misunderstand the moral motivation for enhancement in the first place. Enhancements, in his view, should not be sought for competitive advantage. Rather, their use should be motivated by the desire to confer “absolute... goods” which are “good for people

not because they confer advantage on some but not on others” but simply because they are beneficial for the enhanced person. Thus, according to this view, the possibly self-defeating nature of genetic enhancement is only a problem for those who (illegitimately) seek enhancements for positional advantage, and is not problematic “for the enhancing technology” itself (2007: 29).

*Does the possibility of bad consequences preclude genetic enhancement?*

The consequentialist arguments summarised above raise concerns as to the possible negative consequences of genetic enhancement, for individuals and societies. Critics of these arguments suggest that they do not provide definitive reasons to avoid genetic enhancement, although they may emphasise the need for caution, or indicate that measures should be taken, in terms of social policy, to provide safeguards against the risks posed by enhancement technologies (Cooke 2003: 35). Some critics also emphasise that we should not underestimate the possible benefits of genetic enhancement, not only for the individual, but also for society (Buchanan 2008: 3, Buchanan 2011: 18, Fenton 2010: 150, Mehlman 2003: 154). In other words, in conducting a risk-benefit analysis of the possible practice of genetic enhancement, we should consider the “social cost of *not* making use of enhancement technologies” (Buchanan 2008: 3, 2011: 37). Graham expresses this as follows:

We cannot rationally advocate a ban on some piece of biotechnology on the grounds that the outcomes could be catastrophic, without at the same time acknowledging that banning it could also be catastrophic...Everything turns on the (no doubt tedious) business of calculating respective costs and benefits (2002: 130).

This might suggest that even in the presence of risk, the development and use of genetic enhancement technologies could still be morally justified. However, this does not imply that the possible negative consequences of genetic enhancement should be dismissed or ignored, and this has in fact not been the case in the literature which argues against a complete rejection of genetic enhancement – “writers who reject the view that we should never engage in biomedical enhancement uniformly recognise that the risk of unintended bad consequences is a serious problem” (Buchanan 2011: 179). This acknowledgement need not imply that we should reject the enhancement project entirely, or that it is *prima facie* morally illegitimate. It merely implies that the moral application of enhancement technologies should take these

possibilities into account and try to introduce measures and safeguards to counteract the risk. What such a moral application of enhancement might look like will be the topic of Chapter 5.

### *Goal compatibility arguments*

The final group of arguments against the use of genetic enhancement is concerned with the incompatibility of the pursuit of enhancement technologies with the posited goals of medicine. These arguments rely upon a model of medical practice developed by Norman Daniels, among others (Daniels 1985, Daniels 2000, Sabin & Daniels 1994: 10), which I will consider extensively in the next chapter. According to this model, “medicine’s primary goal is to restore people to the normal function that disease and disability diminish and which is the necessary condition for them to pursue their life plans” (Parens 1998b: 4).

The central focus of the normal function model of medicine is the determination of the requirements of “justice in the design of a health care system” (Daniels 1985: ix). In other words, proponents of this model seek to answer the question as to what kinds of interventions members of society are entitled to receive under a just model of healthcare (Beauchamp & Childress 2009: 248, Sabin & Daniels 1994: 5). The answer to this question links “the requirements of justice to a broad entitlement to services needed to protect or restore species typical functioning” (Buchanan et al. 2000: 310), as such functioning provides the basis for “fair equality of opportunity” (Daniels 1985: x). It argues that the “moral goal” of medicine is the “remov[al] of impediments to full participation in society” (Agar 2004: 82), and that this determines which services we are morally obliged to assist people in obtaining (Daniels 2000: 309).

The standards of the normal function model of medicine therefore exclude the pursuit of genetic, or other forms of technological enhancement, from the sphere of the “proper goals of medicine” (Parens 1998a: S1), as enhancement does not merely seek to restore normal functioning, but to improve upon such functioning. While the argument as it stands above does not necessarily imply that technological enhancement is intrinsically unethical – merely that genetic enhancement does not constitute a moral obligation in the context of just healthcare – it does suggest that the goals of genetic enhancement are incompatible with the goals of medicine, implying that the practice of technological enhancement should be excluded from the practice of medicine altogether.

Of course, doctors already exceed the goals of medicine in this sense. Some medical professionals offer interventions such as “nontherapeutic cosmetic surgery” (Silver 1997: 219). Thus the use of medical technologies in the service of enhancement is hardly unprecedented.

Parens argues that even if we do regard the participation of the medical profession in enhancement interventions as unethical, this does not necessarily imply the moral exclusion of the practice of technological enhancement in other contexts. He illustrates this point by asking us to imagine that there exists a group of people called “schmocters” practicing “schmedicine”. This group does not claim to operate within the sphere of activity of medical practice, and their activities are therefore not bound by what the normal function model considers to be appropriate medical goals. Their main focus is instead “using new biotechnologies to enhance human capacities” (Parens 1998a: S6). It would seem that in this context, the practice of genetic enhancement would be morally acceptable. As Buchanan points out, “even if one accepts the controversial view that enhancement is not a ‘proper’ end of medicine, that tells us nothing about whether enhancement is morally permissible” (2011: 27).

However, Daniels makes a further suggestion, which could exclude the practice of genetic enhancement altogether. This suggestion is related to the idea that the goal of achieving species-typical functioning is morally laudable and desirable because of the great benefits that the achievement of “fair equality of opportunity” offers. These benefits are, according to Daniels, so great as to justify the risks of medical treatment, even where such treatment might be particularly risky, as in the case of therapeutic genetic interventions. However, the improvement of “normal” traits, by this standard, does not justify taking such risks, because when “we are trying to improve on an otherwise normal trait, the risks of a bad outcome, even if small, outweigh the acceptable outcome of normality” (2009: 38).

With Daniels’s insistence that a risk-benefit analysis of genetic enhancement will exclude its ethical acceptability, we return to the consequentialist arguments discussed in the previous sections. As has been indicated, not all commentators agree that the risks of genetic enhancement will necessarily outweigh its benefits. However, the normal-function model has been subject to critique on another level. Some critics question whether Daniels’s argument as to the goals of medical practice, particularly with regard to its reliance on the notion of normal or species-typical functioning, is tenable. The concept of normal functioning is

central to goal compatibility arguments against genetic enhancement, but this concept may be more fluid than it appears. Silvers, for example, argues, from a disability rights perspective, that what is normal is determined not by some natural standard, but by a particular social structure (1998: 116). Other critics take issue with the distinction, made on the basis of a clear delineation of this concept, between morally required treatment and morally dubious enhancement. Buchanan, for example, criticised the idea that morality directs us towards the achievement or preservation of normal functioning, and does not require us to reach beyond this goal. As he puts it, “[n]ormal functioning...is simply functioning that is typical of the organism as it happens to be now”, without reference to what we value (2011: 3-4) and a tendency to prize normal functioning above all else is to “confuse human good with what evolution delivers” (2011: 4). Harris, too, fails to see why the achievement of normality should circumscribe the motivations for medical interventions. Rather, he argues that “the most usual motive for using technology to intervene in the natural lottery of life is for the sake of the harms this will prevent or the goods that this will bring about” (2007: 54), and that enhancement technologies are compatible with these goals. Thus, critics of the argument against genetic enhancement from the perspective of the incompatibility of its aims with the proper goals of medicine argue that normality may not be the standard by which the ethical acceptability of genetic and other interventions should be judged. This idea will be subject to further interrogation in the following chapter.

### *Conflicting views on the moral acceptability of genetic enhancement*

As the variation of the arguments thus far considered has indicated, there is a great deal of disagreement as to the ethical acceptability of the practice of genetic enhancement. As has been shown, some critics express moral discomfort at the prospect of the development of this technology as a result of its potential to undermine human nature. However, opponents of these arguments regard this discomfort as misplaced, and do not feel that this is a convincing argument against genetic enhancement, as many of the arguments against genetic enhancement from human nature, consistently applied, would also call into question the ethical status of other practices which we regard as morally desirable, such as the practice of medicine, child-rearing and education. Others are concerned about the possible negative consequences of the practice of genetic enhancement. While critics of this argument regard some of these posited risks as unrealistic, others are indeed acknowledged as realistic possibilities, and these could merit the introduction of policies and guidelines to guard against such negative consequences. Finally, there is the suggestion that the pursuit of genetic

enhancement is incompatible with proper medical practice. However, this argument is criticised on the basis of its reliance upon the concept of normal functioning, a critique which I will extend.

The preceding sections of this chapter have sought to provide an outline of the types of argument which are advanced against the development and practice of genetic enhancement. I will now move on to a discussion of two kinds of arguments in support of the moral acceptability of genetic enhancement.

### **Two groups of arguments in favour of genetic enhancement**

As indicated above, many critics do not find the arguments against genetic enhancement, as described in the previous sections of this chapter, to be convincing. The rejection of these arguments alone seems to imply the moral acceptability of genetic enhancement. Those who support this conviction, however, offer two positive arguments to support their position, which differ in degree. Firstly, some critics argue that members of society should be free to choose in favour of enhancement, for themselves or their children, if they so desire, on the basis of the principle of respect for autonomy. Secondly, others argue that genetic enhancement is not merely ethically acceptable, but ethically desirable or obligatory, as a result of its tendency to promote human welfare.

I will firstly consider the arguments in favour of the moral acceptability of enhancement on the basis of autonomy. Secondly, I will consider the contribution of two critics who regard genetic enhancement to be an ethical obligation.

#### ***Genetic enhancement is morally acceptable***

The position that genetic enhancement is an acceptable practice, which at the very least should not be excluded or disallowed as a legitimate choice, rests upon the principle of respect for autonomy. This is one of the four principles of medical ethics, as formulated by Beauchamp and Childress (2009: 103). Personal autonomy amounts to “self-rule that is free from both controlling interference by others and from certain limitations such as inadequate understanding that prevents meaningful choice” whereby “[t]he autonomous individual acts freely in accordance with a self-chosen plan” (2009: 99).

The principle of respect for personal autonomy is therefore used to support the contention that competent persons should be allowed to exercise their right to self-determination, as described by Moore as follows:

As sovereign and autonomous agents, especially within the liberal tradition, we are afforded the moral and legal space to order our lives as we see fit. As long as respect for others is maintained we are each free to set the course and direction of our own lives, and to develop our capacities and talents accordingly (2000: 101).

The right to self-determination, as described above, therefore seems to include the right to choose genetic enhancement, if this accords with one's conception of the good life.

Respect for autonomy could be regarded in different contexts as a negative obligation, which implies that “[a]utonomous action should not be subject to controlling constraints by others”, or as a positive obligation, which would include the obligation to “disclose...information” and to take “actions that foster autonomous decision making...[by] making options available” (Beauchamp & Childress 2009: 104). In the context of genetic enhancement, the duty to respect personal autonomy is regarded by most critics as a negative obligation<sup>46</sup>. It would therefore not demand an obligation on the part of the state to provide enhancement services to everyone, in part because of the “great cost and limited benefit” of such an undertaking (Buchanan et al. 2000: 208). It would also not imply “an entitlement to the cooperation of anyone”, but would stipulate that if others, for example researchers or healthcare providers, choose to willingly cooperate with individuals in the pursuit of genetic enhancement, interference in the exercise of that right should be prohibited (Harris 2007: 74).

There is a particular component of the right to autonomy which specifically supports the moral acceptability of choosing to genetically enhance one's (future) children. This component of autonomy is referred to as the right to reproductive autonomy.

The posited right to reproductive autonomy<sup>47</sup> holds that the right to “freedom in activities and choices related to reproduction” (Roberts, cited in Buchanan et al. 2000: 206) is underpinned

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<sup>46</sup> Whether the right to genetic enhancement could be considered a positive obligation will be considered later in this dissertation. Some of the arguments discussed in this chapter, such as the suggestion that genetic enhancement could be used as a tool to reduce social inequality, could imply that this would be the case.

<sup>47</sup> Savulescu and Kahane formulate the principle of procreative autonomy as follows: “If reproducers have decided to have a child...then any procreative option selected by reproducers is morally permissible as long as it is chosen autonomously” (2009: 279).



by the general principles of personal autonomy, including the interests that we have in self-determination and the promotion of our well-being (Buchanan et al. 2000: 214-220). Reproductive choices are inextricably linked to well-being, because “reproduction is an experience full of meaning and importance for the identity of the individual and her physical and social flourishing” (Robertson 2003: 450). The principle of reproductive autonomy thus recognises that parents have interests in when they choose to reproduce and in what type of children they will have, because these factors will fundamentally affect their lives (Brock 2005: 382, Robertson 1983: 408-410). The right of prospective parents to make choices in favour of genetic interventions which will influence, to some extent, the characteristics of their future children, is, according to proponents of the moral acceptability of genetic enhancement, assumed by the principle of reproductive autonomy.

Of course, this principle equally implies that parents should not be obliged to make use of such interventions. Agar emphasises this conviction in his advocacy of “liberal eugenics”. He argues that genetic engineering could be used to “dramatically enhance reproductive choice”, but that parents should not be obliged to choose in favour of genetic enhancement:

Prospective parents may ask genetic engineers to introduce into their embryos combinations of genes that correspond with their particular conception of the good life. Yet they will acknowledge the right of their fellow citizens to make completely different eugenic choices. No one will be forced...to genetically engineer their embryos (2004: 6).

Respect for autonomy, including autonomy in the sphere of reproductive choices, enables competent persons to order their lives according to their own conceptions of the good. However, the right to exercise autonomy is not an absolute right. This right could be overridden by “competing moral principles” (Beauchamp & Childress 2009: 105). Such competing moral principles include the moral duty which we have to respect the interests of others. This conviction follows Mill’s doctrine that interference in the freely-chosen activities of individuals is warranted only when the interests of others are likely to be negatively affected (Mill 1956: 92, Singer 2009: 280). Thus the right to autonomy, including the right to reproductive autonomy, could “conflict with other rights and interests” (Brock 2005: 381), and if it can be shown that the exercise of reproductive liberty “is seriously harmful to others or to society” (Harris 2007: 74), this would justify the restriction of such harmful reproductive choices.



As the preceding sections of this chapter have shown, there is disagreement among critics as to whether the practice of genetic enhancement would be detrimental to the interests of others. Many commentators argue, as indicated previously, that the interests of other members of society, or the interests of society as a whole, do provide a reason to avoid genetic enhancement, or at least to limit the right to autonomy by disallowing or regulating certain types of enhancement. The right to exercise reproductive autonomy in the context of genetic enhancement is limited not only by the interests of society, however, but also by the interests of the future child who the enhancement intervention will affect, as suggested above in arguments which reject some forms of genetic enhancement on the basis that they would curtail the child's right to an open future.

However, if the interests of the child set limits on the right to reproductive autonomy in the context of decisions in favour of genetic enhancement, there is another possibility to be considered. By this standard, these same interests could weigh in favour of a positive moral requirement to make use of enhancement technologies. The remaining arguments which I will examine in this chapter consider this possibility.

### ***Genetic enhancement is a moral requirement***

The argument that genetic enhancement is a moral requirement, obligation or duty, proceeds from the conviction that enhancement is beneficial, and contributes to well-being. According to those who support this argument, we have good reason to benefit others and to promote their well-being, and this suggests that we should choose in favour of genetic enhancement for others for whom we are responsible (for example, dependent children) or that we should assist others in the pursuit of genetic enhancement if we are able.

I will consider two arguments in favour of the moral desirability of genetic enhancement. The first is advanced by Julian Savulescu, and is supported by his principle of procreative beneficence. This argument is primarily concerned with the posited parental obligation to choose genetic enhancement on behalf of one's children. Secondly, I will examine the contribution of John Harris, who argues that genetic enhancement is a general moral good.

*The principle of procreative beneficence*

Julian Savulescu first advanced the principle of procreative beneficence in the context of the ethical debate around the possible genetic selection of one's future children at an embryonic level through the use of preimplantation genetic diagnosis (PGD) and in vitro fertilization (IVF). He formulates this principle as follows:

If couples (or single producers) have decided to have a child, and selection is possible, then they have a significant moral reason to select the child, of the possible children they could have, whose life can be expected, in light of the relevant available information, to go best or at least not worse than any of the others (Savulescu & Kahane 2009: 274)<sup>48</sup>.

The child "whose life can be expected to go best" is also referred to as "the *most advantaged child*" (Savulescu & Kahane 2009:275).

This principle implies that parents should not choose to bring into existence a child who is likely to suffer from disease or disability, if it is possible to instead bring into existence a healthy child. However, it also implies that parents should select the child who is most advantaged genetically in terms of non-disease traits or characteristics, if they have access to this information. Savulescu's argument here is based upon the conviction that there are some "non-disease genes [that] affect the likelihood of leading the best life", and that we have a reason to use information which is obtainable about these genes when making reproductive choices (2001: 413). We have reason to do so either because this will maximise well-being, as the child with the best prospects will benefit more than other possible children by being brought into existence, or because it will bring about the best outcome (Savulescu & Kahane 2009: 277).

In the context of the ethical debate surrounding the selection of future children on the basis of preimplantation genetic diagnosis, Savulescu's goal is to formulate a principle which explains the wrongness of certain reproductive decisions which are non-person-affecting. The problem of non-person-affecting wrongs was initially posed by Parfit (1984: 352), who points out that it is difficult to explain the wrongness of any action that has resulted in the existence of a person whose life is worth living, even if the alternative existed to bring about the existence

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<sup>48</sup> This principle was modified slightly from the original formulation, which stated that "couples (or single producers) should select the child, of the possible children they could have, who is expected to have the best life, or at least as good a life as the others, based on the relevant, available information" (Savulescu 2001: 413).

of a different person who would have enjoyed a much greater quality of life. Parfit uses the example of a woman who is advised by her doctor to wait to conceive, as a temporary ailment would result in the birth of a child with severe disabilities, whereas this could be avoided by delaying conception for a month. If the woman ignores this advice, our instinct is to regard this as morally blameworthy behaviour. However, it is difficult to explain why this should be the case, given that the life of the child with severe disabilities is worth living. This child has not been harmed by being brought into existence, as the alternative to its conception was non-existence<sup>49</sup>. The decision to delay conception would have resulted in a different child's existence, and thus the severely disabled child has not been harmed by its mother's decision. Her action in refusing to delay conception is therefore not person-affecting, as there is nobody who has been made worse off by it.

Savulescu seeks to argue that despite this, the principle of procreative beneficence implies that some form of "harmless wrong-doing" (2001: 418) has nonetheless been perpetrated. He argues that there is indeed a moral reason for parents to choose not to have a child likely to have severe disabilities if it is possible to instead have a child who will enjoy normal functioning. This moral reason lies in the obligation to maximise well-being or bring about the best outcome, which also implies that parents should choose the child with the most advantageous personal characteristics, even in contexts where disease traits are not at issue. Savulescu and Kahane contend that "[m]ost people will agree that there is a moral defect in parents who intend to conceive a child but are indifferent to whether their future child will be born with the potential for a good life". If this is the case, they suggest "it would seem that they should also have reason to *aim* to have children who are more advantaged rather than leave this to chance or nature" (2009: 276).

An initial objection to Savulescu's principle of procreative beneficence is advanced by critics who argue that the notion of impersonal wrongdoing, while intuitively appealing, is in fact implausible. Although we might instinctively feel that choosing to bring into existence a child with worse prospects than other possible children is wrong, the fact that no one is

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<sup>49</sup> David Benatar (2006) argues, in contrast to this, that we are always harmed by being brought into existence, regardless of our particular traits or characteristics. He bases this argument on the "asymmetry of pleasure and pain", and suggests that, while the absence of pain is a positive good, the absence of pleasure cannot be bad unless there is some existing person who experiences the absence of pleasure as a deprivation. Before we are brought into existence, there is no such existing person, and therefore, the fact that it is always "better never to have been" implies that we ought not to reproduce at all.

harmful by this choice might suggest that this moral intuition is unreliable (Bennett 2009: 266, Herissone-Kelly 2006: 166).

I will not consider the merits of this objection here, as the application of the principle of procreative beneficence to genetic enhancement circumvents the problem of non-person-affecting wrongs. The duty to maximise well-being and to produce the best child possible posited by the principle suggests that parents should genetically enhance their future children if they have the opportunity, as Savulescu regards enhancement as an intervention which “increase[s] human well-being” (2006: 326) as “[m]any of our biological and psychological characteristics profoundly affect how well our lives go” (2005: 37). However, the maximisation of well-being in this case accrues to a specific child – the selection here is not between alternative children, but between two sets of characteristics for a future person. Therefore decision-making in the context of genetic enhancement *is* person-affecting, which seems to suggest that the obligation to enhance stands even in the face of the above objection.

Savulescu stops short of an argument which suggests that the moral obligation to genetically enhance or to select the best child justifies coercion. Rather, it is a moral obligation of the sort which justifies persuasion, comparable to the obligation implied by “[y]ou should stop smoking” (2001: 415). The moral obligation implied by the principle of procreative beneficence, according to Savulescu’s argument, is limited by the competing principle of procreative autonomy discussed above, although there are no easy answers as to how these principles should be balanced (2001: 425). It could also be limited by the conflicting interests of others, such as the parents of the prospective child or their existing children (Savulescu & Kahane 2009: 278).

Savulescu’s final analysis is that we must not only take moral responsibility for the consequences of a decision in favour of enhancement, but also for the consequences of a decision to forego enhancement. If we have the opportunity to practise genetic enhancement, and we fail to do so, we must accept responsibility for the results of the genetic lottery. He believes that the potential of genetic enhancement to “do better than chance”, combined with the moral requirement to maximise well-being and to bring about the best outcome, implies a moral obligation to enhance (2004: 16, 2005: 39, 2007: 285). Those who advocate a ban on technologies which would enable parents to select or create the best child must therefore hold themselves “responsible for the outcome, even if nature delivers it” (2007: 288).

Critics have taken issue with the principle of procreative beneficence in that its conception of the “best life” is “undetermining”. The difficulty in determining which complex set of characteristics would be likely to result in “the best life”, and the “diversity of preferences...and beliefs” about what constitutes such a life, implies, according to these critics, that it “would not...be possible to identify the rational choice with respect to any particular feature of an embryo or possible child” (Parker 2007: 28; see also De Melo-Martín 2004: 79, Herissone-Kelly 2006: 166)<sup>50</sup>.

Savulescu rejects the argument that the multiplicity of conceptions of the good life renders us incapable of making qualitative judgements as to which characteristics will contribute to well-being. He argues that there are “general-purpose means...that are valuable no matter what kind of life a person leads” (2007: 284), and that we regularly make judgements about the relative value of certain capacities. These judgements are evident in our references to “virtues, strength[s] of character and character flaws [that] all represent characteristics, which our normative language represents as being good or bad”. Again, he questions whether “our ignorance of what makes a good life [is] really so great...that we want to leave the distribution of such traits to chance” (2007: 285). Rather, Savulescu argues that we can say with some degree of certainty that some general-purpose enhancements will increase the likelihood of leading a good life and will maximise well-being, and this gives us a moral reason to seek such enhancements for our children.

I will now consider another argument which suggests that genetic enhancement is a moral obligation. In this case, the obligation stems from the simple contention that enhancement is beneficial.

*Enhancement is good for you!*

John Harris’s main point of departure is that the primary motivation, and the only necessary motivation, for choosing to intervene in the natural lottery, is the moral obligation to benefit others and to avoid harming them (2007: 50, 2007: 54). If we recognise such an obligation, we should accept that genetic enhancement is a moral duty, because enhancements are

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<sup>50</sup> Critics of Savulescu’s argument also raise other points in opposition to the moral acceptability of enhancement, which have already been discussed in the preceding sections of this chapter, such as the contribution of frailty towards the experience of a good life (Parker 2007: 282), concerns about social justice (Birch 2005: 20, De Melo-Martín 2004: 80), the self-defeating nature of the selection of certain characteristics (Birch 2005: 24, De Melo-Martín 2004: 79), and the possible reduction of children’s autonomy (Birch 2005: 22). As these arguments have been summarised elsewhere, I will not repeat them here.

beneficial in that they “are so obviously good for you” (2007: 36). The goodness of enhancement is implied by its very definition: “[i]f it wasn’t good for you it wouldn’t be an enhancement” (2009: 131).

Harris’s argument that “the most usual motive for using technology to intervene in the natural lottery of life is for the sake of the harm this will prevent and the goods this will bring about” (2007: 54) also leads him to deny that there is a morally relevant difference between treatment and enhancement – for him, “the overwhelming moral imperative for both treatment and enhancement is to prevent harm and confer benefit” (2007: 58). As “human enhancement is good by definition”, and because enhancements benefit the enhanced individual, this moral imperative implies that “enhancements are a moral duty” (2007: 185) in an equivalent way to interventions aimed at the treatment of disease and disability. Therefore, Harris argues that enhancement is morally obligatory simply by virtue of its tendency to promote the welfare of human beings (Sparrow 2011: 32), which is also the motivation for the practice of therapeutic medicine. The pursuit of enhancement is, for Harris, simply a natural extension of this practice.

While Harris argues for the morally obligatory nature of genetic enhancement, his presumption in favour of liberal freedoms and the principle of respect for autonomy prevents him from regarding genetic enhancement as a matter for state coercion. Harris argues that “citizens should be free to make their own choices in the light of their own values, whether or not these choices and values are acceptable to the majority”. Interference with this freedom can only be justified by “good and sufficient reasons”, such as the likelihood that serious harms will occur without such interference (Harris 2007: 155).

This seems to indicate a tension in Harris’s argument that is also present in the application of the principle of procreative beneficence to genetic enhancement (Sparrow 2011: 33). Both Harris and Savulescu regard genetic enhancement to be a moral obligation, but neither see this as an obligation that is a matter for state interference or coercion, as a result of the competing principle of autonomy. Is this a logically coherent position? Harris argues that intervention in the autonomous decision-making of others is only merited by the possibility that serious harms would occur in the absence of intervention. However, it seems that Harris *does* imply that a failure to enhance could cause harm to others.

The implication that a failure to enhance could be harmful is firstly supported by Harris's rejection of the argument that there is a significant moral difference between "acts and omissions". In other words, Harris argues that the consequences which are brought about by taking action, and consequences which are brought about by refraining from taking action, are morally equivalent, a view which he regards as "incontrovertible" (2007: 80). In Harris's estimation, "[a]ll actions are redescribable as omissions and vice versa" (Bortolotti and Harris 2006: 37). Considering the example of proxy medical consent in situations where patients are incapable of consenting to medical procedures for themselves, he argues that those who make decisions on behalf of incompetent patients in this context are obligated to consent to such procedures as these would be in the patient's "best interest". A failure to consent, which would thereby deprive a person of beneficial medical treatment through inaction, "would harm [the incompetent patient]" (2007:81). In other words, a failure to provide an intervention which would promote the welfare of a person, where such an intervention is readily available, amounts to harming the affected person.

However, as indicated above, Harris argues strongly that there is a continuum between "treating or curing dysfunction and enhancing function", as both of these interventions promote human welfare. This, combined with the conviction that "the withholding of a benefit that could be conferred harms the potential recipient" so that "to withhold a benefit is always damaging [and is] always something a decent person has a moral reason not to do" (2007: 189), implies that to withhold enhancement where it could be conferred, and certainly to restrict the rights of others to make use of enhancement interventions, would inflict harm. If Harris's conception of the "harm-benefit continuum" (Bortolotti & Harris 2006: 49) as described above is correct, the implication is that the moral obligation to enhance is supported both by the principle of beneficence (the duty to benefit others), but also by the generally more stringent claim of nonmaleficence (which implies that we should not harm others) (Beauchamp & Childress 2009: 150).

This might suggest, in opposition to Harris's disavowal of the possibility of state intervention, that the state would be justified in intruding upon personal or reproductive autonomy to, at the very least, actively encourage the use of genetic enhancement, in order to prevent the harm that would otherwise be incurred. Sparrow worries that these implications of Harris's argument are undeniable, and that this might result in a system of coercive state eugenics (2011: 40).



However, there may be a problem with the logic of Harris's argument. Bayles suggests that it does not follow "[f]rom the fact that a person would be better off were one to act in a certain way...that failure to so act harms him", and that this kind of reasoning collapses "the distinction between harm and non-benefit" (Bayles 1976: 298). Harris's argument seems to conflate the moral obligation that implies that one should not inflict harm with the obligation that one should promote good, by arguing that "the reasons we have not to harm others...are continuous with the reasons we have for conferring benefits on others if we can" so that "to decide to withhold a benefit is in a sense to harm the individual we decline to benefit" (Harris 2001: 386). However, as indicated, the legitimacy of this reasoning is questionable.

It is precisely this component of Harris's argument which I would like to examine further in the following chapter. Harris argues that there is a continuum between causing benefit and avoiding harm, and that this provides a moral reason to genetically enhance humans. While this argument can be criticised on the basis of its conflation of harm and non-benefit, I would like to suggest that the enhancement debate, particularly in its interrogation of the principle of normality as briefly described above, does, in fact, lend itself towards an interpretation of harm which suggests that failing to confer the benefit of enhancement is harmful. I would like to argue that this is because the distinction between bringing about harm by omission and failing to bring about benefit is based upon the notion of "normality" – this concept sets limits on the kind of behaviour which can be regarded as harmful. If it can be shown that normality is a fluid concept, or that it is unreliable as a moral marker of the border between avoiding harm and conferring benefit, this has implications for the moral status of genetic (and other) enhancements, and might suggest that society would be justified in intervening in personal autonomy to encourage the practice of genetic enhancement. It would also, however, have important implications for the way in which these concepts are currently used in bioethics.

## **Conclusion**

The arguments described above have provided some indication of the divergence of views in the enhancement debate. Those who argue against the development and practice of genetic enhancement approach this argument from a number of different perspectives. However, what all these perspectives have in common is the distinction which they make between the moral acceptability of therapeutic interventions, and the morally dubious nature of enhancement interventions. The reasons for this distinction vary from the tendency of enhancement interventions to undermine human nature or to bring about bad consequences, to



their incompatibility with the proper goals of medicine. Those who disagree with these arguments think that the practice of genetic enhancement is acceptable on the basis of the principle of respect for autonomy. However, some go even further than this and argue that enhancement, because of its tendency to promote welfare, is a moral obligation, although not an obligation that justifies state intervention or coercion. I would like to situate my argument within these latter positions, but I will suggest that these arguments, particularly in the questioning of the distinction between withholding benefits and causing harm which is expressed by John Harris, fail to fully acknowledge that the full implication of such a position may indeed justify some form of social intervention in personal autonomy which would favour genetic enhancement.

## 4 In Support of the Moral Obligation to Enhance

### Introduction

In the previous chapters, I have provided a simple overview of the nature of genetic functioning, with emphasis upon the probable limits that the nature of this functioning imposes upon the development of genetic engineering, and particularly, genetic enhancement. I have also summarised the most prevalent schools of argument against genetic enhancement, and have tried to show that anti-enhancement arguments which protest against genetic enhancement in terms of its inherent moral undesirability fail to provide decisive moral reasons to avoid altogether the development of such technologies. However, some of the arguments against genetic enhancement which focus upon the possible negative consequences of its use, while they do not constitute a persuasive argument against genetic enhancement under all circumstances, are worthy of further consideration, and may suggest that governments should institute safeguards in the form of policies which would curtail, or exercise control over, some possible uses of enhancement technologies. I will return to this topic in the following chapter.

At the end of the previous chapter, I considered two positive arguments, offered by Julian Savulescu and John Harris respectively, in favour of the use of genetic enhancement. I would now like to provide my own argument which supports similar conclusions. I wish to show that (some) enhancement technologies are not only morally acceptable, but are also positively morally desirable, and that this moral desirability imposes some degree of moral obligation upon us, either personally or as a society, to provide such enhancements.

The development of this argument will proceed primarily by means of a critique of the position which holds that the distinction between treatment and enhancement is morally significant. I want to suggest that the moral weight given to this distinction is dubious, because the reasons which underlie the posited moral obligation to provide (some) medical therapies are identical to, or continuous with, the motivations for providing enhancing interventions. I will do so by interrogating the notion, prevalent in bioethics literature, and influentially developed by Norman Daniels, that we are obligated to improve human functioning, via medical technology, only up to a point where that functioning falls within the range of normality, or species-typicality, because this range of functioning is closely related to the achievement of one's fair share of the normal opportunity range. I choose to develop

my argument via such an interrogation because, firstly, the normal function model expresses an attitude towards enhancement that is prevalent in society, and secondly, a critique of this attitude is revealing as to the usual moral impetus for medical therapy, which, I will argue, similarly motivates genetic enhancement.

My critique in this regard will have two parts. Firstly, I will argue that some functional limitations, which are the result of normal variation, limit opportunity in a way which is comparable to the effect of some diseases and disabilities upon persons. In this case, our moral obligation to provide enhancing interventions which improve functioning within the normal range is equivalent to our obligation to provide treatments. The failure to provide treatment and enhancement is similarly harmful to moral agents when this failure results in a similar limiting of opportunity, and the moral obligation to intervene is supported in both cases by a commitment to egalitarianism. Secondly, I will argue that the moral desirability that we attribute to medical treatment and environmental enhancements results from a recognition of the fact that our natural, species-typical functioning, as determined by evolution, can, and should, be improved upon in accordance with human interests. In other words, we have a *prima facie* moral obligation to improve the capacities of moral agents in ways which will expand their opportunity ranges and impact positively upon their well-being. This *prima-facie* obligation extends to the use of enhancement technologies to improve upon normal functioning in general, and a failure to acknowledge this may be harmful to human persons.

My aim in this chapter is not to provide an argument which supports a moral obligation to enhance across the board. In the following chapter, I will attempt to provide some idea of the range of enhancements that I consider to be morally obligatory, and the conditions under which this moral obligation holds. I do not exclude the possibility that the use of some enhancing interventions could, indeed, be morally reprehensible, where these interventions do not result in the promotion of well-being overall, but instead limit one's range of opportunities, or where they result in morally questionable trade-offs with other important human values. Even where I do suggest that the provision of enhancements *is* morally desirable, I do not think that the *prima facie* obligation which accrues as a result of this moral desirability cannot be trumped by other ethical considerations – in other words, that we may have more important obligations to which the obligation to enhance would be secondary.

The conclusions I hope to offer here are clearly relevant to the enhancement debate, but their significance is not necessarily limited to this sphere. This argument has important implications for the way in which we think about our moral motivations for action generally, particularly with regard to the lines that we draw between morally obligatory behaviour and behaviour that is morally acceptable but not required. I would like to show that the development of enhancement technologies both inspires and requires a revision of traditional ethical reflection upon our actions, as it holds the possibility that characteristics which greatly impact upon how well our lives go, but which were previously beyond the scope of mankind's influence, will now fall, at least partially, within the sphere of human control. This implies that we should interrogate whether the moral boundaries which we traditionally construct are objective, and based upon good ethical reasoning, or whether they are structured in terms of some normative idea of the status quo, and should therefore be revisited in the light of these new technological possibilities.

### **The moral boundary between treatment and enhancement**

The conceptual distinction between treatment and enhancement is commonly regarded as a moral boundary (Little 1998: 162). Specifically, it is seen as marking the limits of our moral obligations. It is relatively uncontroversial to claim that there is some level of prima facie obligation attached to the provision of medical treatment. In other words, it is frequently argued that we ought to seek to ameliorate the negative impact of disease and disability upon moral agents if we are able. This conviction is expressed both in terms of the obligations which we regard as constitutive of personal morality, and in terms of the obligations which we attribute to society or to the state<sup>51</sup>. However, one rarely encounters the argument that we should be obliged to provide biotechnological or genetic enhancements to moral agents, even when such enhancements could have the potential to greatly improve persons' lives. Rather, enhancement is usually regarded either as permissible, but not obligatory, or as positively

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<sup>51</sup> For example, we generally think that parents or caregivers are morally obliged to seek medical treatment for their children when this is required (Savulescu 2005: 37), and their withholding of such treatment often results in state intervention (Diekema 2004: 243). The moral controversy surrounding the South African government's delay in the rollout of antiretroviral medicine (Koenig 2006: 1378) indicates that many people also think that governments have some level of obligation to provide (at least) some kinds of medical treatments to their populations. I do not wish to assume here that this moral obligation holds under all circumstances, for all people, and for all sorts of interventions, but rather that a general feeling exists that there is some kind of moral desirability attached to medical treatment that results in some level of moral obligation on the part of moral agents to provide it, if they are in a position to do so. This general feeling does not seem to be present in the case of enhancement.

undesirable<sup>52</sup>, so that interventions which transgress the border between treatment and enhancement are regarded as raising a “moral warning flag” (Daniels 2000: 320). These common polar moral attitudes indicate that the moral relevance of the distinction between treatment and enhancement is widely acknowledged (Mahowald 2006: 21).

In this section, I will interrogate this distinction, firstly, by describing the conceptual basis upon which it rests. This conceptual basis necessarily invokes the category of normal or species-typical functioning. I will then identify the justification provided for the *moral relevance* of the treatment-enhancement distinction, which constructs normality as a normative boundary concept, before going on to criticise this justification.

***The treatment-enhancement continuum: where do we draw the line?***

The distinction between treatment and enhancement remains a central feature of the ongoing discussion about enhancement in bioethics literature (Resnik 2000: 365). As indicated above, making such a distinction and insisting upon its moral relevance is necessary in order to differentiate between morally desirable medical treatment and morally optional or undesirable enhancement.

The emphasis upon the distinction between treatment and enhancement sometimes results in a tendency to treat these two concepts as though they stand in opposition to one another (Juengst 1998: 31, Lin & Allhoff 2008: 35) - in other words, as though they are antonyms. In fact, as is recognised by other critics (Kiuru & Crystal 2008: 329, Mahowald 2006: 2), and as I noted in my introductory chapter, treatment and enhancement exist along a continuum, as interventions which have a great deal in common. Both are biotechnological interventions which are directed towards the improvement of functioning.

What, then, is the basis of the conceptual distinction between these two sorts of similar interventions? Or, to put it another way, what is the cut-off point, on the scale of functioning, after which an improving intervention ceases to be a treatment and becomes an enhancement?

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<sup>52</sup> Kass expresses the feelings of many about enhancement when, after affirming the moral desirability of medical treatment, he warns that “the powers made possible by biomedical science can be used for non-therapeutic or ignoble purposes, serving ends that range from the frivolous and disquieting to the offensive and pernicious” (2003: 9)

To determine this cut-off point, we can recall the sliding scale of functioning which I introduced at the outset of this dissertation. We can imagine the level of functioning<sup>53</sup> of an individual person as being represented by a horizontal, straight line, the defining, but excluded, left boundary of which would be the death, or non-existence, of the individual, as this constitutes a complete absence of function. From this zero point, the level of functioning moves from that which is least advantageous to human beings to a level which is most advantageous (Mahowald 2006: 21). Both therapeutic and enhancing interventions are directed towards moving the level of functioning of a particular human being to the right.

Treatments are those interventions which seek to ameliorate (the effects of) illness, disease and disability in order to allow the individual to achieve a state of health. In other words, therapeutic interventions operate on the left-hand portion of the line, moving functioning towards the centre. Enhancement, on the other hand, seeks to go beyond the achievement of health. It targets human functioning in a way which has nothing to do with disease conditions, but which is instead aimed at the improvement of normal functioning. Enhancing interventions, then, are those that move functioning towards the right from the point on the line which represents healthy, normal functioning.

Therefore, while treatment is aimed at the achievement of normality by the correction of states of disease or disability which diverge negatively from this functional standard, enhancement is as an intervention which reaches beyond this goal to improve upon normal levels of functioning (Berger & Gert 1991: 673-674, Colleton 2008: 2, De Grazia 2000: 36, Kiuru & Crystal 2008: 329, Kline 2007: 16, Mehlman 2003: 53, Schwartz 2005: 18). Normal functioning, in other words, is the point on the line which separates interventions which count as treatments from those which count as enhancements<sup>54</sup>.

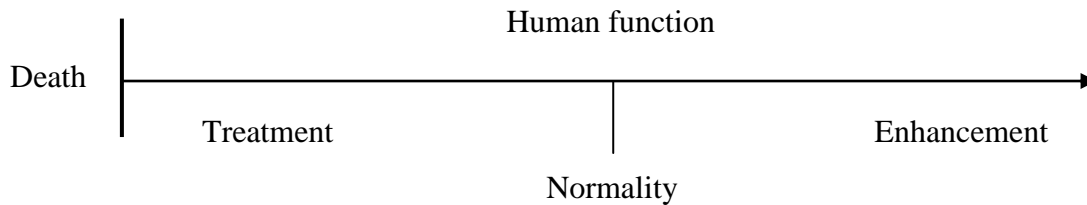
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<sup>53</sup> I (somewhat simplistically) refer here to the overall functioning of the individual, rather than the functioning of a particular subsystem. While both therapy and enhancement *are* in fact directed towards the improvement of the functioning of particular subsystems, I assume that those interventions which we pursue (and certainly those that we ought to pursue) are those which would bring about overall improvement via the local improvement of particular functions. This assumption will be discussed in detail later in this chapter, as it is fundamental to my argument.

<sup>54</sup> Juengst has sought to offer an alternative delineation of the concepts of treatment and enhancement by making reference, not to some ideal of functional normality, but to the etiology of the condition which a specific intervention is directed towards preventing or treating. His contribution suggests that we should define interventions primarily with regard to whether or not their objective is to treat or prevent disease (Mehlman 2003: 55), where disease is defined as “a biological process that moves from discoverable causes (genes, germs, or environmental insults) through a robustly confirmable process of pathogenesis that yields characteristic signs and symptoms that, in turn, reduce function below species-typical norms” (Juengst 1997: 138). This accords with the commonsense view that treatment is at its most basic level, an intervention which aims to ameliorate disease and to restore health (Kalokairinou 2011: 179, Resnik 2000: 366). However, as Juengst acknowledges, this delineation of the treatment-enhancement distinction requires taking up a rather old fashioned view of

We can therefore, based on the discussion thus far, represent the continuum between treatment and enhancement in Figure 1:

**Figure 1**



The usefulness of the category of normal functioning, and particularly its role in determining the distinction between treatment and enhancement, as outlined above, has been influentially developed by Daniels (1985, 2000, 2009), who builds on the work of Boorse (1975, 1977). Boorse describes “health as [the] absence of disease”, and diseases and disabilities as “internal states that depress a functional ability below species-typical levels”. In other words, diseases and disabilities are states that represent a negative divergence from “normal functioning” (Boorse 1977: 542). Daniels concurs with this notion of health as “the absence of disease”, where “diseases are *deviations from the natural functional organization*<sup>55</sup> of a typical member of a species” (1985: 28).

In other words, normal functioning encompasses “the performance by each internal part [of the human organism] of all its statistically typical functions with at least statistically typical efficiency”, which is defined as an efficiency level “within or above some chosen central region of their population distribution” (Boorse 1977: 558-559). Disease or disabling conditions, then, are those conditions which negatively impact upon the capacity of biological subsystems to perform the functions which, by their design, they are directed towards performing<sup>56</sup>. For example, asthma constricts and inflames the airways, and thereby reduces

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diseases as “entities in their own right, reifiable as processes or parts in a biological system, with at least as much ontological objectivity and theoretical significance as the functions that they inhibit” (1997: 125). In addition, this model of treatment, while it may serve to define what we mean by therapeutic interventions, cannot show *why* we should treat disease without referring to its impact upon functioning.

<sup>55</sup> Daniels states that “[t]he task of characterizing this natural functional organization falls to the biomedical sciences” (1985: 28).

<sup>56</sup> This description of human biology is akin to Aristotelian teleology, although this relation is not something that I can pursue here. See Foot (2001: 33-34) for a description of how “Aristotelian categoricals (life-form descriptions relating to the species)” allow us to establish “norms” against which to judge whether a particular

the breathing capacity of the lungs. The function of the lungs, arising from their natural evolutionary design, is to bring oxygen into and expel carbon dioxide from the body, and this disease condition compresses the functional ability of these organs below species-typical levels.

The motivation for medical treatment, under this view, is the achievement of normal functioning in individual human beings. We regard disease and disability as undesirable because they “interfere with one or more functions typically performed within members of the species” (Boorse 1975: 58) resulting in “the patient’s ability to function [being] well below that of a typical person” (Colleton 2008: 2). Disease is “an adverse departure from species-typical normal functioning” (Holtug 1999: 137) which treatment seeks to correct for. Therefore, “[h]ealth care needs will be those things we need in order to maintain, restore, or provide functional equivalents (where possible) to normal species functioning”<sup>57</sup> (Daniels 1985: 32). The conceptual distinction between treatment and enhancement, then, on the basis of the notion of normality, “draws a line between services or interventions meant to prevent or cure (or otherwise ameliorate) conditions that we view as diseases or disabilities and interventions that improve a condition that we view as a normal function or feature of members of our species” (Daniels 2000: 309). An enhancement, by this standard, is any “intervention that improves a subsystem in some way other than repairing something that is broken or remedying a specific dysfunction” (Bostrom and Sandberg 2009b: 312).

However, there is, of course, no single standard or level of functioning which constitutes normality for everyone. Rather, normal functioning encompasses a wide range of human functionality, within which there exists a great deal of variation. This variation is still regarded as falling within the range of normality as long as it accords with “a generally uncontroversial baseline of species-normal functional organization” (Daniels 1985: 31), although the extent to which a particular characteristic can deviate from the population mean and still be considered normal is not always clear (Mehlman 2003: 53).

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individual’s functioning is “as it should be, or, by contrast, to a lesser or greater degree defective in a certain respect”.

<sup>57</sup> This definition leads Daniels to incorporate environmental, non-biotechnological interventions under the category of health-care needs. These include “adequate nutrition and shelter; sanitary, safe, unpolluted living and working conditions; exercise, rest, and some other features of life-style; [and] non-medical personal and social support services” (1985: 32), although he does not expand on these inclusions.



To determine what is normal for a particular individual, one must consider not only the broader range of species normality, but also the functioning that is typical for that individual's specific reference class. This reference class is "a natural class of organisms of uniform functional design; specifically, an age group of a sex of a species" (Boorse 1977: 555). Functioning is normal if it falls within the range of functioning that is typical for other members of one's reference class.

Therapy, it then seems, is directed towards the improvement of human functioning, where this diverges from normality, to at least the minimum level of functioning which could be regarded as normal or species-typical for an individual's particular reference class. However, some interrogation of this idea shows that even this does not sufficiently describe the goal of therapeutic interventions. If an individual with an IQ of 140 is afflicted with a disease that negatively affects her mental functioning, but where this reduced level of functioning is still within the range of normal species-typical functioning for her reference class, so that her level of mental functioning is equivalent to that of a person with an IQ of 90, one would be unlikely to dismiss her need for medical treatment. Rather, one would seek, by treating her disease, to restore her functioning to what it would have been in the absence of the disease. Even an intervention which restored her mental functioning to the level where her IQ score would be 110 would only be regarded as a partial success. Conversely, the normal function model does not regard the goal of medical practice to be an improvement of the level of functioning from the lower to the mid or upper ranges of reference class-typical functioning in situations where the individual's position in those lower ranges is the result of the natural lottery and not of disease or disability.

Therefore, therapy aims to achieve, in a particular individual, the level of functioning that would have pertained for that individual, as a result of the genetic lottery, in the absence of disease or disability. In other words, the normal function model regards therapy to be directed towards "getting people back to 'normal' [by] restoring an individual's functional capacity to the species-typical range for their reference class, and within that range to...the particular capability level which was the patient's genetic birthright" (Juengst 1997: 129). This restores to the individual "that portion of the normal range [of functioning that] his skills and talents would have made available to him were he healthy" (Daniels 1985: 34).

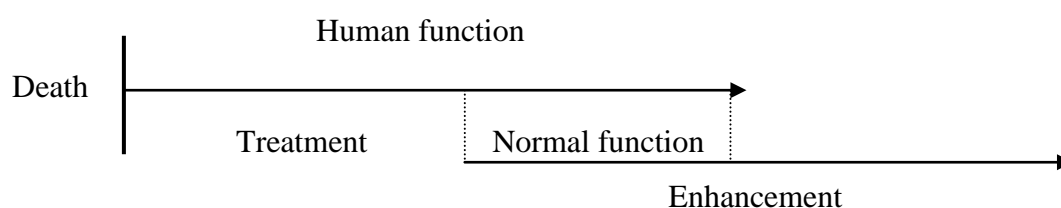
This of course implies that improvement of functioning from one level to another may count as treatment in the case of one individual and enhancement in the case of another, *even where*

*the ultimate result achieved is directly equivalent and where the method of intervention is identical.* Whether the given intervention counts as a treatment or enhancement depends upon the individual's original share of the genetic lottery in the absence of disease or disability. A person whose functioning falls within the lower ranges of normal functioning for their reference class, where this is the result of genetic accident and not a disease condition, would be enhanced by an intervention which improved this functioning, regardless of whether or not this improvement exceeded the upper ranges of normal functioning for their reference class. Thus, as Kamm points out, it is not only "improvements that no human being has yet evidenced" which are perceived as enhancements, but also improvements to one's given position in the genetic lottery to a level which could be regarded as quite normal for other people more advantaged by this lottery (2005: 5).

To illustrate this curious feature of the treatment-enhancement distinction, we can consider a well-known example (Buchanan et al. 2000: 115). Two boys have a predicted adult height of 160 cm, which is within the lower ranges of species normality. However, one of the children has been diagnosed with growth hormone deficiency resulting from an earlier brain tumour, which has resulted in reduced production of growth hormone by the pituitary gland in comparison with the level of growth hormone which would have been produced in the absence of the tumour. Therefore, without the disease condition, the child's predicted adult height would be greater. The other child's maximum capacity for growth is simply the result of his inherited genetic constitution. In both cases, hormone injections could increase predicted adult height. However, in the first case, this would be considered a therapeutic intervention, and in the second, an enhancing intervention, despite the fact that the results, and the method via which they are achieved, would be identical.

Thus, one could represent the range of therapeutic and enhancing interventions schematically in Figure 2.

**Figure 2**



As is evident, the line between treatment and enhancement is not identical for everyone, and there is some overlap between these two sorts of interventions. The particular position of this line on the continuum of human function is determined for a given individual by genetic accident.

However, it is not always easy to determine where the line between treatment and enhancement falls for a given individual, as we cannot always establish the constitution of a person's genetic birthright, in the absence of disease and disability, with certainty. This is especially the case for congenital conditions. The recent controversy surrounding Oscar Pistorius's inclusion in the South African Olympic squad (Imray 2012) illustrates this. Born without fibulae, double amputee Pistorius runs on prosthetic blades. Because we cannot know what Pistorius's natural ability would have been in the absence of his congenital condition, we cannot accurately determine whether these blades are "functional equivalents" to normality (Daniels 1985: 32), or enhancing interventions which improve upon his given genetic level of function. In this case, the Court of Arbitration for Sport, which was responsible for deciding whether Pistorius could compete in able-bodied events as a normal competitor, attempted to evaluate his functioning (for example, his metabolic rate, his running action, and the vertical force which he creates during movement) by comparing it to other members of his reference class (male able-bodied athletes of a similar age) (McArdle 2008). This indicates that under circumstances where congenital conditions make it difficult to determine what a patient's genetic birthright would be in the absence of disease or disability, the appropriate goal of medical therapy would be to achieve for that patient at least the minimum level of functioning which would be normal for their reference class.

Even in cases where we can identify the distinction between therapeutic and enhancing interventions with some level of certainty, it is still not clear why such a distinction should be morally relevant (Buchanan 2011: 26, Dees 2007: 377, Quigley & Harris 2010: 128). This mere conceptual designation "is of no moral significance" in and of itself (Buchanan 2011: 27). We must therefore now examine the motivation for the conviction that the distinction between treatment and enhancement matters morally. In other words, why might there be some degree of moral obligation attached to medical treatment, directed towards the achievement of normal functioning, but not to biotechnological enhancement which reaches beyond normal functioning?

### *The moral significance of normality*

As noted previously, enhancement is often treated as a “moral boundary concept” (Juengst 1998: 29). This implies that defining a particular intervention as a treatment or as an enhancement plays both a “descriptive and normative role” (Juengst 1998: 30). In other words, under this view, the treatment-enhancement distinction not only tells us what a given intervention is, but provides us with some measure of guidance about what we ought to do.

The general contention here is that the “[p]rovision of therapeutic interventions is broadly...morally obligatory, while [the] provision of enhancing interventions is, at most, optional” (Mahowald 2006: 33). Therefore, “the line between therapy and enhancement is the line where medical necessity stops and optional or elective procedures begin” (Colleton 2008: 73).

This contention seems to endure even in the face of the widespread acknowledgement (Buchanan 2011: 26, Chadwick 2008: 25, Gifford 2008: 44, Glover 1984: 31-32, Mehlman 2003: 53-55) that the line between treatment and enhancement can be problematic. This indicates that while there is some overlap between these two conceptual categories as a result of the fact that they exist upon a continuum, as pointed out above, this does not necessarily imply that the distinction collapses altogether (Lin & Allhoff 2008: 36). While it may be “fuzzy” at times (Mahowald 2006: 22), the treatment-enhancement distinction, founded on the notion of normal functioning as the absence of disease, is, “for the general run of cases”, clear enough (Daniels 1985: 30). The question remains, however, as to why normality should be considered a normative goal, beyond which we are not required to go.

The divergent attitudes towards the moral desirability of treatment and enhancement are all the more difficult to explain when we consider the following. Not only are these sorts of interventions similar in type, in that they are directed towards bringing about an upwards movement upon the continuum of human function, but they also appear to be similarly motivated. This similarity lies in the fact that both treatment and enhancement are directed towards bringing about a change in the physical condition of a particular individual that is better for that individual than their previous condition. In other words, both treatment and enhancement are desirable, from the perspective of the affected individual, because they

contribute towards an increased level of well-being<sup>58</sup>. The “overall expectation” of both treatment and enhancement, then, is that they will “improve the life of the individual in some way” (Mahowald 2006: 24).

However, the conviction remains that other moral agents are only under a moral obligation to intervene, via medical technology, to improve the functioning of others up to the level of normality. Beyond this, interventions may be desirable from the perspective of the individual, but they are not considered to be *morally* desirable from the perspective of others. Proponents of this ethical distinction explain this discrepancy by referring to the importance of the achievement of normal functioning in protecting a fair range of opportunity.

Daniels, whose discussion of the treatment-enhancement distinction is primarily directed towards the delineation of the category of medical necessity (2000: 309), and the determination of the requirements of justice with regard to the provision of healthcare (1985: 17), argues strongly that there is a “special connection” between “normal species functioning [and] the opportunity range open to an individual” (1985: 45). In other words, “protecting normal functioning contributes to protecting opportunity” (Buchanan et al. 2000: 122).

The level of functioning which a particular individual enjoys determines the opportunities which are available to them in a relatively obvious way - the higher that level of functioning<sup>59</sup>, the greater their range of opportunity. One’s range of opportunity is also closely associated with well-being, as the wider this range, the greater the number of opportunities available for preference fulfilment.

Of course, both treatment and enhancement, viewed as interventions which increase the level of human functioning in a particular individual, will tend to increase the opportunity range available to that individual. Both interventions would therefore be beneficial to a given individual, as they tend to increase the availability of opportunities for preference fulfilment and therefore increase well-being. However, we do not usually think that we are always obligated to maximise the well-being of all moral agents. Rather, we assess the “importance of claims” that moral agents make upon us by referring to a “scale which gives more weight

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<sup>58</sup> Of course, it is not always the case that treatment and enhancement will, in fact, ultimately result in an increased level of well-being – both these interventions can go wrong or fail to achieve their aims. However, they are, at the very least, directed towards the achievement of this goal.

<sup>59</sup> Again, I refer here to the level of overall functioning, as determined by the level of functioning of relevant subsystems.

or importance to certain kinds or categories of preferences over others” (Daniels 1985: 36). One of our strongest interests is in not being unfairly disadvantaged by a gross discrepancy in our range of opportunities in comparison to others. This sort of disadvantage is precisely what results when functioning diverges sharply from a species-typical norm. Normality, then, is regarded to be a normative goal because it provides us with some kind of fair baseline of opportunity which minimises unjust disadvantage likely to result from functional divergence from this standard.

The normal function model therefore argues that treatment is morally desirable primarily because it enables people to “become normal competitors, free from disadvantages caused by disease or disability” (Sabin & Daniels 1994: 10). As such, it is closely related to egalitarianism (Mahowald 2006: 23). We have some level of moral obligation, imposed upon us by the demands of justice, to provide moral agents with a fair share of the normal opportunity range. The normal opportunity range for a particular society is “the array of life plans reasonable persons in it are likely to construct for themselves” (Daniels 1985: 33). Disease and disability constrict these available life plans in a way that is disadvantageous to those affected. As these are “conditions that we are generally not responsible for” (Buchanan et al. 2000: 114), we should attempt to correct for them via medical treatment in order to facilitate a reasonably fair societal distribution of opportunity<sup>60</sup>. Medical treatment, then, is morally desirable because it aims to provide moral agents with, at least, “a fair go” in comparison to others (Mackie 1985: 87).

Enhancements are not directed towards the achievement of a normal opportunity range for a specific individual. As such, while they may be beneficial to that individual, they do not serve to counter unfair disadvantage and are therefore not required by justice. This is why proponents of the normal function model do not think that the provision of enhancement is desirable from a moral point of view, or that it constitutes a moral obligation.

However, the normal function model must now deal with the problem of normal human variation. Differing levels of function, where these levels fall within the range of normality, can nonetheless constrict or expand one’s range of opportunity, and therefore one’s

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<sup>60</sup> The egalitarian basis of the normal function model suggests that “it will be more important to prevent, cure, or compensate for those disease conditions which involve a greater curtailment of an individual’s share of the normal opportunity range” (Daniels 1985: 35). In other words, the greater the negative impact which disease or disability has upon functioning, the greater the strength of our moral obligation to provide medical treatment to correct for it.

opportunities for preference fulfilment and one's possible level of well-being. As Daniels acknowledges, this effect upon well-being seems to be "morally arbitrary", as "we do not deserve advantages or disadvantages" which are attributable to "genetic accident" (1985: 40) any more than we deserve the disadvantage which results from disease or disability. Why should we be required to correct for "mental retardation" via treatment to restore mental functioning to the ranges of normality in order to combat unfair disadvantage, but not to correct for the disadvantage which accrues as a result of "mere dullness", when these two sorts of disadvantage do not appear to be "qualitatively different" (1985: 34). In other words, if our natural genetic inheritance is not something which we can be said to deserve, and we are able to intervene to improve this genetic inheritance, why should we not regard this, too, as a requirement of justice? In this regard, "[e]nhancement to benefit the [genetically] worst off would be an effective way of achieving a laudable aim" (Sandberg & Savulescu 2011: 106).

Daniels acknowledges that this is a problem area for the normal function model, but nonetheless maintains that "[o]nly where differences in talents and skills are the results of disease and disability, not merely normal variation, is some effort required to correct for the effects of the 'natural lottery'" (1985: 34). In this regard, "the unequal distribution of human capacities" is regarded to be a given "fact that health care will not change" (Sabin & Daniels 1994: 10). It is impossible to equalise opportunity entirely, because "[t]he share of the normal range open to an individual is...determined in a fundamental way by his talents and skills", and this is simply given by the genetic lottery. We can never entirely correct for the inequality resulting from natural variation – this is a brute fact of life which, according to the normal function model, falls outside the boundaries of our moral responsibilities. We are morally obliged to reduce the disadvantage resulting from disease and disability, but "[f]air equality of opportunity does not require opportunity to be [exactly] equal for all persons" (Daniels 1985: 33). This point is strengthened by the conviction that we must balance concerns about fairness with other concerns about "efficiency" (Buchanan et al. 2000: 132). In a context where resources are limited, the normal function model seeks to draw a relatively uncontroversial line which defines the limits of our obligations to others, and relies upon the common conviction that "not all unchosen competitive disadvantages are unfair and require elimination or compensation" (Buchanan et al. 2000: 129). We are morally obliged, under this view, to respect and promote the "fundamental interest" which people have in "protecting their share of the normal range of opportunities" (Daniels 1985: 36), but we are not obliged to

provide moral agents with more than this, even when their share of the normal opportunity range is smaller than that of others.

### ***Concluding remarks***

In this section, I have sought to describe the basis of the distinction between treatment and enhancement, and to determine the motivations for regarding this distinction as morally relevant. This motivation appears to be the conviction that we ought to promote and maintain normal functioning, because this sort of functioning gives moral agents access to their fair share of the normal opportunity range, the possession of which human beings have a fundamental interest in.

I now want to go on to problematise the argument described above. To do this, I will firstly make some preliminary remarks about the constitution of what we regard to be species-typical functioning.

### **The genesis of normal functioning**

Normal functioning is characterised by two seemingly conflicting features, which call into question the normative force attributed to it by the normal function model. These features complicate the moral relevance of the distinction between treatment and enhancement, and suggest that we may have to re-examine the limits of our moral obligations to others, as I will argue later in this chapter.

Firstly, I will discuss the genesis of species-typical functioning via the contingent process of evolution, and secondly, I will note the role of human action in constructing normality. The former calls into question the idea that our natural biological functioning is in any way morally desirable from a human perspective, while the latter shows that human beings have recognised this by shaping normal standards of human functioning according to what they value.

My goal in this section is not to argue that the content of normality cannot be determined. I do not wish to call into question the substance of the concept itself, although I will argue that its borders are fluid and subject to change, both via evolution and by directed human action. Rather, I want to create the grounds for doubt that normality is a category that can or should



tell us what we owe to other moral agents, in terms of the moral distinction it supposedly grounds between interventions which are aimed at achieving this level of functioning, and interventions which go beyond it.

With this in mind, I will discuss each of the features of normality identified above in turn.

### *Species-typical functioning as the result of evolution*

The characteristics which we regard as typical of our species are, to a large extent<sup>61</sup>, determined by the process of evolution. This has two important implications which are problematic with regard to the normative status attributed to species-typical functioning. Firstly, this sort of functioning, as a result of the evolutionary process, is morally arbitrary - evolution is “indifferent to how well our lives [go]” (Savulescu 2005: 38). Secondly, species-typical functioning, as subject to the ongoing process of evolution, is not fixed.

The assertion that species-typical functioning is morally arbitrary is not intended to suggest that evolution is an entirely random process. Rather, this process, which has shaped the constitution of the human species over millennia, tends towards the maximisation of reproductive fitness - the path which evolution has taken has been determined by the demands of “[s]urvival and reproduction”. However, this does not imply that evolution necessarily tends towards the improvement of the human organism, from the perspective of what humans “rightly value” (Buchanan 2011: 4). In other words, as Dawkins puts it, “[n]atural selection does not see ahead, does not plan consequences, has no purpose in view” (1986: 21). Normal human functioning is “an accident” (Silver 1997: 32) – a by-product of the process of evolution, wherein “gains and losses are simply advantages and disadvantages from the point of view of gene survival” (Glover 1984: 34).

What we take to be normal functioning, then, is “simply functioning that is typical of the organism as it happens to be now, as a result of the highly contingent path its species has traversed so far” (Buchanan 2011: 3-4). This is a given which we must deal with. However, because evolution does not proceed with a view to the maximisation of human well-being, there is no reason to believe that this sort of functioning is valuable, or that it ought to be preserved. It is clearly the case that evolution has contingently resulted in aspects of functioning that we do value and appreciate. However, there are also features of our naturally

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<sup>61</sup> I will argue in the next section that these characteristics are also partially constructed by human action.

given human natures that are less valuable from a moral perspective, and which we seek to transcend. This is the case not only in terms of our moral sensibilities, which often come into conflict with our natural instincts, but also in terms of imperfections in our biological design (Powell & Buchanan 2011: 51)<sup>62</sup>.

The second implication of the genesis of normal functioning via evolution is that this sort of functioning is, to some extent at least, fluid. It is the result of millennia of change, and remains constantly in the process of change (Harris 1992: 171). Because changes to the constitution of our species-typical functioning occur in a way that is tremendously slow, these changes are unobservable in a human lifetime. However, the study of evolutionary biology teaches us that while biological human nature may be staid, it is not rigid. In other words, “species-typical functioning is a shifting boundary” (Chadwick 2008: 28). While we can speculate, we cannot know what implications future evolutionary changes will have for human functioning.

Does this suggest that human beings should attempt to direct the ongoing process of evolution if they are able? Some critics argue that we should avoid this temptation. Evolution, they say, may be morally blind, but this does not guarantee that our goal-directed interventions will be likely to improve upon it. Fukuyama is one such critic. He warns that “doing nature one better isn’t always that easy; evolution may be a blind process, but it follows a ruthless adaptive logic that makes organisms fit for their environments” (2002: 98).

However, as pointed out above, the process of evolutionary adaptation is directed solely by the goal of reproductive fitness. There is nothing to suggest that the sort of functioning which this process results in is “optimal functioning...or even satisfactory functioning...*from the standpoint of what we value*” (Buchanan 2011: 4). Human beings do not only value reproductive fitness. In fact, under some circumstances, they might value other sorts of functioning more than reproductive fitness. Glover provides this example to illustrate this point:

If we could engineer a genetic change in some people which would have the effect of making them musical prodigies but also sterile, this would be a hopeless gene in terms of survival, but this need not force us, or the musical prodigies themselves, to think of the change as for the

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<sup>62</sup> Powell and Buchanan, in this regard, cite examples of flawed biological design in humans such as the urinary tract in males, the sinus, the inability to synthesize Vitamin C, the pharynx, and the birth canal’s passage through the pelvis (2011: 51-52).

worse. It depends on how we rate musical ability as against having children, and evolutionary survival does not dictate priorities here (1984: 34).

The implication of all of this is that, because evolution has not necessarily resulted in morally optimal functioning (in other words, functioning that maximises human well-being), we could be justified in, or even obligated to, improve this functioning if we are able. This may be in the interest of (future and existing) moral persons. In other words, morality may require us to take action to direct the development of species-typical functioning according to our values and in the interests of human beings, rather than passively accepting the ongoing and morally arbitrary changes to this functioning via the blind process of evolution<sup>63</sup>.

In addition, the claim that “[t]here are good prudential reasons to defer to the natural order of things and not to think that human beings can easily improve on it through casual intervention” (Fukuyama 2002: 97) implies the rejection of a wide range of interventions which human beings have *already* enacted upon their environment and their own natures, which are foundational to human culture, and which have constructed, to a large extent, what we think of as normal human functioning. I will discuss this construction of the category of normal functioning via human action in the following section.

### ***The role of human intervention in the construction of normality***

What do we mean when we talk about normal functioning? Is this sort of functioning purely the brute result of evolution? In other words, is what we regard to be normal functioning simply a natural given?

It is immediately evident that this is not the case, *by the standards of the normal function model itself*. This model posits normality as being the state which human beings are in, *in the absence of disease and disability*. However, susceptibility to disease and disability is a fundamental feature of normal, natural functioning, and these conditions are likely to affect most human beings at some point in their lives. The absence of disease and disability cannot be achieved without human intervention, in the form of the provision of medical treatment and preventative measures. In other words, “diseases that cause the need for therapy are also ‘natural’” (Witthøft Nielsen 2011: 25). Dysfunction as a result of disease and disability is a species-typical feature of human functioning.

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<sup>63</sup> I will develop this tentative suggestion later in this chapter.

Susceptibility to disease and disability is, like any other complex aspect of human functioning, partially attributable to one's genetic disposition and partially attributable to environment. As such, diseases and disabilities cannot be regarded as external invaders that must be fought off by medical treatment in order to restore a pre-existing state of affairs, given by nature. Rather, the predisposition to diseases and disabilities, and individual resistance and reaction to particular diseases, is variable, and depends to a large extent on one's inherited genetic makeup, which determines, along with the given environment, how one's functioning will be affected by these conditions.

Human beings regard disease and disability as undesirable, both because it is often associated with suffering, and because, through its negative impact upon the level of human functioning, it constricts the range of opportunity available to those affected by it<sup>64</sup>. Despite the fact that human susceptibility to disease is an entirely normal and species-typical aspect of human functioning, we therefore attempt, via various therapeutic interventions, to counter the effects of these conditions. The use of medical therapy to counter disease and disability is, in many populations and for many disease conditions, so widespread as to be almost universal. This widespread availability and application of medical treatment has, within these populations, *altered what we think of as normal functioning*.

To illustrate this, we can consider the example of pregnancy and childbirth. These processes are, of course, fundamental components of normal human functioning. The World Health Organisation estimates that around 15% of women develop serious complications during pregnancy and childbirth which could lead to mortality or severe disability in the absence of medical treatment (cited in Johanson, Newburn & Macfarlane 2002: 892). In other words, it is relatively normal to develop serious complications during childbirth. These may be attributable to natural susceptibility to infection, pre-existing disease conditions which are aggravated by pregnancy (Hoyert 2007: 3), or may be directly obstetric in nature. In the latter case, many of these complications are probably related to sub-optimal evolutionary design which has resulted in "the birth canal passing through the female pelvis"<sup>65</sup> (Powell &

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<sup>64</sup> Again, I will return to this point later in this chapter.

<sup>65</sup> This suboptimal design probably results from the strong selection in the history of human evolution for "bipedalism, due in part to the scattering of resources and the inefficiency of knuckle-walking as a means of locomotion". The survival advantage gained by bipedalism outweighed "the substantial costs associated with the reconstruction of the hominid skeleton in order to accommodate this new form of locomotion, including some of the highest rates of neonatal and maternal birth mortality in the animal kingdom" (Powell & Buchanan 2011: 57).

Buchanan 2011: 52). However, the development and availability of medical treatments for these complications lower the risk of pregnancy and childbirth considerably, so that maternal mortality is no longer normal where such care is widely available to the population. This is illustrated by the discrepancy in maternal mortality rates in the United States between 1915 (607.9 deaths per 100,000 live births) and 2003 (12.1 deaths per 100,000 live births), which indicates the drop in these rates as medical technology advanced (Hoyert 2007: 1). In 1990, average maternal mortality ratios were 27 per 100,000 live births in “more developed countries” and 480 per 100,000 in “less developed countries”, with “ratios as high as 1,000 per 100,000 live births for eastern and western Africa” (Johanson, Newburn & Macfarlane 2002: 892), which suggests that the widespread availability of advanced medical care in developed countries dramatically reduces the statistical likelihood of dying as a result of pregnancy or childbirth<sup>66</sup>.

These examples indicate that the development and application of medical technology has in fact changed what we think of as normal functioning. We no longer think of maternal mortality as a relatively normal occurrence. The content of the category of normal human functioning, where this is defined in terms of statistical typicality, as well as what we think of as being the norm, is not what it was “100 years ago” (Witthøft Nielsen 2011: 26), nor is it standard across all populations. The availability of medical treatment, therefore, does not merely assist us in achieving a pre-existing, given standard of normal functioning by combating disease conditions which cause us to diverge from this standard, but actually determines what this standard is.

The role of medical treatment in determining the content of normal functioning is also evident in the phenomenon of increased life expectancy. Fukuyama notes that life expectancy at birth in the United States rose from “48.3 years for men and 46.3 years for women in 1900 to 74.2 for men and 79.9 for women in 2000” (2002: 57). This is partially attributable to the increasingly successful treatments that have been developed for a range of conditions which previously would have (quite naturally) shortened life. The increase here is considerable - life expectancy increased by more than 50% in a century in the example cited above - and indicates the way in which the range of available “lifesaving therapies” actually function as “*life-extending* therapies” (Harris 2007: 61, my italics) which, taken together, significantly alter the statistically normal human lifespan. We therefore cannot claim that “our idea...of

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<sup>66</sup> Of course, these discrepancies are also partially attributable to environmental improvements not directly related to medical treatment. I will discuss the role of human manipulation of the environment in the determination of the constitution of normal functioning later in this section.

normal life-expectancy” is determined only by species-typical functioning, as given by evolution (Chadwick 2008: 28). Rather, the increase in “normal” life expectancy over the last century, and the difference in life expectancies between the developed and developing worlds, shows that the constitution of normality is, to a large extent, influenced by human intervention, which includes the development and widespread use of medical technologies.

These examples call into question the conception of “freedom from disease” as a “value neutral notion” (Boorse 1977: 572). Rather, the pursuit of medical treatment is driven by a recognition that susceptibility to disease and disability are aspects of our natural, biological humanity, as determined by evolution, that are undesirable because of the effect which they have on our well-being. Only human values can ground this evaluation. The achievement of a particular level of functioning as a result of the amelioration of disease has no significance independent of the value which is attributed to such a level of functioning by human beings. In this sense, human interventions, in the form of medical therapies, alter our conception of what it means to be “naturally human” through the use of technology (Withthøft Nielsen 2011: 26), by reshaping the category of statistically normal human functioning in accordance with what human beings value.

We do not only interfere with our naturally given functioning via the means of medical treatment, however. Our manipulation of our environments also determines, to some extent, what is normal for human beings. For millennia, the human species has interacted with, and altered aspects of, their environment in a way which has contributed to the development of culture and the constitution of human nature. The drive to improve ourselves is not new. In fact, it can be said to have characterised human history and the movement towards civilisation from the outset (Harris 2007: 15).

In other words, human transformation and manipulation of the environment have been foundational to the development of civilisation, and its results are constitutive to our way of life to such an extent that they are, in any practical sense, irreversible (Buchanan 2011: 40). Such transformations and manipulations include the development of agronomy, science and literacy. The benefits which have accrued to human beings as a result of these enterprises include improved nutritional levels, and in turn “greater resistance to disease and longevity”, increased cognitive capabilities and increased capacities to interact with and communicate with others (Buchanan 2011: 38). These developments have fundamentally altered what we think of as normal functioning. Buchanan elaborates upon this point as follows:

We *now* consider literacy, the use of computers, and the ability to engage in large-scale coordinated, complex activities through the functioning of institutions to be ‘normal’ capabilities for human beings, but for most of the time in which human beings existed they were not (2011: 41).

These interventions have also had a direct contribution towards the constitution of our biological functioning as a species:

Human action has shaped human biology and altered the genome as long as there have been human beings: a series of non-biomedical enhancements of human capacities, from the agrarian revolution, to the emergence of cities and political institutions, to advances in transportation technologies, has triggered processes of natural selection and mixed previously isolated gene pools (Buchanan 2011: 1-2).

In other words, human activity influences, to some extent, the course of evolution. Environmental interventions have had an effect upon where and how we live and who we (are able to) come into contact with, and have also resulted in vast numbers of individuals “surviving to reproduce who otherwise would not [have]” (Buchanan 2011: 41), and this has altered the constitution of our gene pool. This indicates that normal human biology is the result of a complex interaction between evolutionary determined characteristics and environmental interventions. The long-established tendency of human organisms to act upon and alter their environments is probably partially the result of evolution, as a characteristic which seems to be innate to human beings (Miller 2005: 171), and this natural tendency, in turn, results in the environmental advances described above, which then have some impact upon the ongoing course of human biological evolution (Ereshefsky 2007: 60), and so on.

Not only does human manipulation of and interaction with the environment have some impact upon the course of evolution, but evidence suggests that these interventions also have some impact upon the biological (as opposed to the cultural or societal) functioning of individual human beings. The development of agriculture and the associated improvement in nutrition have “facilitated neurological development” (Buchanan 2011: 39). Scientific research made possible by the development of literacy, numeracy, and cooperative institutions have resulted in improvements to our living conditions that have altered our average height and life expectancy (Lewens 2009: 354). In addition, studies indicate that “[t]he acquisition of reading and writing skills...change[s] the brain organization of cognitive activity in general, as



well as specific abilities”. These studies “provide...hard evidence on how culture changes the brain and how the environment can influence brain development” (Ostrosky-Solís 2004: 3; see also Buchanan 2011: 39, Harris 2007: 15).

All of the above suggests that what we regard to be normal human functioning is not static, and neither is it equivalent to natural biological functioning as the given result of evolution. Rather, normal functioning, and our conception thereof, is partially constituted by human intervention, both in terms of the development and use of medical therapies, and the manipulation of the environment.

### ***Concluding remarks***

The constitution of normal human functioning via human intervention, and the discrepancy between this sort of functioning and the natural biological functioning given by evolution, entails, in a sense, a recognition of the first feature of normal human functioning discussed above, namely, that the sort of functioning which evolution results in is not necessarily “optimal functioning...or even satisfactory functioning...*from the standpoint of what we value*” (Buchanan 2011: 4). The aspects of statistically normal human functioning which are a result of human intervention, and the differences between this functioning and that which is given by our biological makeup, are an indication of the extent to which human beings attempt to shape their own natures and influence their own functioning in accordance with what they value.

In other words, we do not simply accept the opportunity range bestowed upon us by nature, but act upon our own natures, and the environments in which we live, to expand this range of opportunities, *because this contributes towards our level of well-being*. Daniels indirectly recognises this when he notes that the normal opportunity range of a given society, as “the array of life plans reasonable persons in it are likely to construct for themselves”, is not simply a function of brute biology, but is also “dependent on key features of the society – its stage of historical development, its level of material wealth and technological development, and even important cultural facts about it” (1985: 33). This indicates the way in which human beings do not simply accept what they are given, but habitually make changes to themselves and to the world in order to increase their opportunities for well-being, and, in so doing, change the content of normal human functioning.



Normal human functioning is therefore not a category that is fixed. Rather, the content of this category changes as “people alter their conception of what it means to be normal, and as the characteristics of the population change over time” (Mehlman 2003: 54). To a very great extent, these characteristics are altered by human intervention, directed by human values. The question must then be asked: do these interventions not constitute a form of enhancement of normal functioning? And if so, how can we meaningfully introduce a distinction between these sorts of intervention and those which we usually refer to as enhancements?

In the light of the discussion above, I now want to return to the moral significance of the treatment-enhancement distinction. I want to make an argument for the moral desirability of enhancement interventions, and suggest that there may be some (limited and *prima facie*) level of moral obligation attached to the provision of such interventions, in precisely the same way that there is some level of moral obligation to provide medical treatment. These similar sorts of moral obligation are based upon what the normal function model itself explicitly and implicitly regards to be the motivations for medical treatment – the imperative to fairly distribute opportunity, and the value attached to an increased range of opportunity.

### **The moral obligation to enhance**

In this section, I want to argue that the normal function model cannot convincingly motivate the contention that our moral obligations towards others are limited to the provision of means whereby they can achieve normal functioning. Rather, I will suggest that enhancement is morally desirable in a way which makes its provision a *prima facie* moral obligation, both where this enhancement improves functioning within the normal ranges, and where it reaches beyond these ranges.

My argument in this regard is divided into two parts. Firstly, I will argue that the limiting of opportunity which results from differences in capability levels within the ranges of normal functioning is not qualitatively different from that which results from disease and disability. Indeed, in some cases, it may be directly equivalent. In other words, natural variation can disadvantage individuals by restricting opportunity in a way that is comparable to the effects of (some) diseases and disabilities. Because of this comparable limiting of opportunity, the moral principles explicitly adhered to by the normal function model may lead to the conclusion that we ought to make use of enhancement technologies to counter the disadvantage caused by natural variation when these technologies become available, just as

we should make use of medical technologies to counter the disadvantage arising from disease and disability.

Secondly, I will suggest that our moral obligations are not limited to the provision of interventions which tend to counter disadvantages experienced by moral agents in comparison with others, although this may be an important primary goal. The possible future availability of interventions which could improve upon elements of our species-typical functional design would, I will argue, impose an obligation upon us to provide such interventions. We ought to seek these enhancing interventions because they are morally desirable, in that they will be likely to expand opportunity and promote well-being. As such, the obligation to enhance does not arise in isolation. Rather, the moral motivations for genetic and other forms of biotechnological enhancement are continuous with the moral motivations for medical treatment and for the environmental interventions which improve human lives. As I will attempt to show, both of these sorts of interventions *are* in fact enhancements, where an enhancement is regarded to be any intervention that is directed towards the improvement of species-typical functioning directed towards the promotion of human well-being.

After I have made the case for a general obligation to enhance, I will go on, in the final section of this chapter, to work out the details of this obligation in greater detail. In doing so, I will suggest that the rejection of enhancement technologies is harmful to human persons. A failure to provide enhancements which would counter disadvantage in ways that are equivalent to the effects of treatment imposes harms upon moral agents that are equivalent to the harms imposed by a failure to provide (some kinds of) medical care. In addition, a more general failure to provide enhancements, even if these are not directed at the achievement of fair equality of opportunity, harms moral agents by putting them, via this omission, into a worse position than could otherwise have been the case.

### ***Egalitarian enhancements and the promotion of fair equality of opportunity***

The normal function model, as described earlier in this chapter, argues that we have a moral obligation to treat disease and disability because these conditions cause negative divergence from species-typical functioning. This negative divergence in turn limits an individual's opportunity range "*relative to that portion of the normal range his skills and talents would have made available to him were he healthy*" (Daniels 1985: 34). Moral agents have a fundamental interest in maintaining or achieving the level of functioning which is normal (for

them) in the absence of disease and disability, because this is closely related to their ability to enjoy “fair equality of opportunity” (Daniels 1985: 33).

This argument makes two assumptions. Firstly, it assumes (or seems to suggest) that the limitation of opportunity imposed by disease and disability is generally of a greater magnitude than the limitation of opportunity imposed by discrepancies in natural variation. Secondly, it assumes that even when inequalities within the range of normal functioning impose comparative limits on opportunity, this discrepancy in opportunity ranges is not unfair to an extent that requires correction via the technological improvement of functioning. I will consider each of these assumptions in turn.

### *What limits opportunity?*

The assumption that disease and disabling conditions limit opportunity to a greater extent than natural human variation is, in a general sense, correct. This general tendency is at the root of the normal function model’s emphasis upon the moral importance of treating the former conditions. However, I want to suggest that the moral significance attributed to the treatment-enhancement distinction constructs a dichotomy between states of disease or disability, on the one hand, and discrepancies in normal variation, on the other, that is unreasonable. This dichotomy is unreasonable because normal variation can impose limits on opportunity which are qualitatively similar, and sometimes roughly equivalent, to those imposed upon by some disease conditions.

To show why this is so, I need to revisit a distinction which I earlier put aside in my description of the treatment-enhancement distinction. In this description, I referred to the effect of therapeutic and enhancing interventions upon the *overall* level of functioning of the individual. However, these interventions achieve this effect via their primary goal of improving *local* functioning, or the functioning of particular subsystems<sup>67</sup>. For example, a treatment that restores or improves one’s ability to hear improves a particular functional ability of a particular biological subsystem – the hearing capacity of the auditory system. The improvement of this particular functional ability in turn improves the ability of the individual

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<sup>67</sup> I will acknowledge in the next chapter that not all improvement of local functioning necessarily results in an improvement of overall functioning, or at least not in a way that applies universally (the effects of some enhancements will be desired by some of us but not by others). I will argue that this is an important measure by means of which we must determine whether particular enhancing interventions are morally obligatory (or, when not chosen, morally problematic).

to function in general, by expanding the means available for interaction with others, and by raising the level of their communicative abilities. The ability to communicate effectively is foundational to our ability to function effectively in society in general<sup>68</sup>, and the improvement of this ability therefore widens the individual's opportunity range overall.

Clearly, not all dysfunction impacts upon one's available range of opportunities to the same extent. While some functional limitations constrict their related opportunity ranges almost altogether, other instances of functional limitation have a negligible, or non-existent, impact upon opportunity. Glover explains this as follows:

[A] limitation of functioning creates disability only if (on its own or *via* social discrimination) it impairs capacities for human flourishing. It would not be a disability if there were a failure of a system whose only function was to keep toenails growing. With arrested toenail growth, we flourish no less (2006: 9).

As Glover notes, the extent to which functional limitation impacts upon opportunity range is partially dependent on the particular conditions of the society or environment in which we are situated. The normal opportunity range, as noted earlier, is the array of life plans within a society which members of that society could reasonably construct for themselves. In a society which is not literate, dyslexia does not constrict opportunity because it does not deprive the individual affected by it of any opportunities that they might otherwise have had (Buchanan et al. 2000: 123). The relation between the conditions of society and the extent to which functional limitation restricts opportunity is foundational to theories which hold that disability is (partially) socially constructed. These theories argue that "some physical and mental inabilities or losses of functioning" are "more disabling" under particular social circumstances, which include "the way society works in terms of its physical set-up, and...the sorts of social interaction and ways of living that are expected of its members (Gillam 1999: 164). Alison Davis explains this as follows:

If I lived in a society where being in a wheelchair was no more remarkable than wearing glasses and if the community was completely accepting and accessible, my disability would be an inconvenience and not much more than that. It is society which handicaps me, far more seriously and completely than the fact that I have spina bifida (cited in Newell 1999: 172).

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<sup>68</sup> The use of sign language by persons who are deaf operates as a functional equivalent to hearing, in this regard.

I do not want to suggest that I subscribe to the view that (all) limitation of species-typical functioning restricts opportunity only, or mostly, as a result of societal circumstances. I merely want to point out that functional limitation impacts upon one's range of opportunities in a way which is related to the contribution of that particular function to one's overall ability to function in a given society. Functional limitation of subsystems that are responsible for locomotion or sight will greatly restrict one's range of opportunities, without intervention, in every human society that we can think of, as these are foundational to our ability to function and survive as a species. Functional limitation of cognitive subsystems which enable literacy, however, will, as noted above, only restrict opportunity in literate societies<sup>69</sup>. Functional limitation of the subsystems that facilitate toenail growth, however, will not restrict opportunity in any society that human beings have formed thus far.

This does not imply that the functional limitation of toenail growth, as caused by disease, is any less a departure from species-typical normality than functional limitation of our ability to see or walk. Diseases which impact negatively upon the ability of a particular bodily subsystem to fulfil the function which its natural evolutionary design directs it towards - in this case, the function of toenail growth - result in a divergence from normal, species-typical functioning regardless of whether this functional limitation restricts opportunity. The point I am trying to make here is that not all local limitation of function, attributable to disease or disability, results in a reduction of one's level of functioning overall (one's ability to function in society), and that where the level of overall functioning is reduced, the extent of that reduction is different for different conditions.

Of course, it is still the case that the achievement of species-typical functioning, via the eradication of the local functional limitation caused by disease and disability, is *closely related* to the achievement of an otherwise unavailable range of opportunities, even if not every limitation of function significantly impacts upon opportunity. However, I would like to argue that it is not necessarily the case that only disease and disability constrict one's opportunity range in a way that it is significant. Sometimes, these conditions do not impact negatively upon one's ability to function in society in a way which is any more extreme than the negative impact upon societal function imposed by normal variation in human capability sets. I will try to illustrate this.

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<sup>69</sup> This assumes that the cognitive subsystems which are associated with our ability to read and write do not also ground other functional abilities, such as verbal communicative skills, which *are* important in non-literate societies.

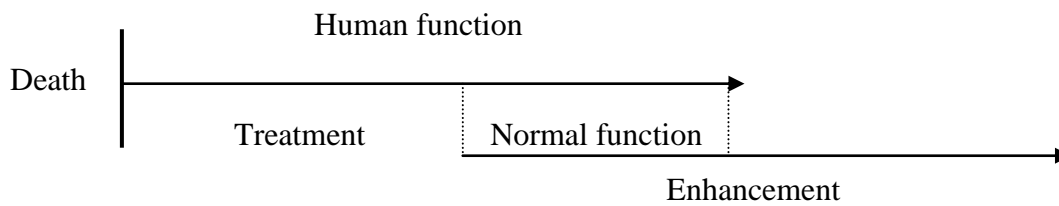
Some of us are afflicted by disease conditions that inhibit our level of functioning to such an extent that very few life plans are available to us. Some of us are highly advantaged by the genetic lottery and have a very wide array of available life plans that we could reasonably hope to pursue. Most of us fall somewhere between these two points. Perhaps we suffer from diseases or disabling conditions that, while they constrict our functioning, and therefore opportunity range, to some extent, nonetheless leave a wide range of opportunities for the pursuit of our idea of the good life open to us. However, even if we are not affected by conditions that can be described as diseases or disabilities (although the overwhelming majority of us will be affected by these conditions at some point), our particular characteristics will impose some limitations upon the life plans which we can reasonably hope to pursue, to a lesser or greater extent. In other words, “[n]early all of us who have no recognized disability, perhaps *all* of us, still have functional limitations” in comparison to others (Glover 2006: 10), and these functional limitations act to constrict our personal opportunity range.

Despite the fact that our non-disease characteristics usually impose some degree of functional limitation upon us, we “count functional limitations as disabilities” which we are obliged to treat “only when there is a contrast with normal human functioning” (Glover 2006: 11). (To reiterate, normal human functioning, here, is construed as the (wide) range of individual levels of human functioning that results from the genetic lottery in the absence of disease and disability). We do this despite the fact that normal variance in human functioning may result in considerable discrepancies in capability sets and therefore considerable differences in individual opportunity ranges.

Do we make these distinctions because disease and disability always result in greater discrepancies in individual opportunity ranges than normal human variation in ability? I would like to suggest that, despite the fact that this may be an aggregate tendency, it is relatively common for (some) differences in normal human variation to impose an equivalent, or greater limit upon one’s normal opportunity range, in comparison to others, than (some) disease conditions. In other words, there may be attributes that do not constitute a departure from the range of normal, species-typical functioning, which nonetheless negatively impact upon one’s range of opportunities in a way which cannot be regarded as any less fundamental than the effect of (some) diseases or disabilities.

Before I go on to make this argument, however, I would like to note that there are obviously many diseases and disabilities which impose or threaten to impose a greater constriction upon one's level of functioning and opportunity range than any possible variation in non-disease capability sets. To illustrate this, and to start to show where the effect of normal variation is comparable to that of disease and disability and where it is not, I refer back to the schematic representation of human functioning given in Figure 2.

**Figure 2**



Clearly, those conditions which result in a level of functioning which could be placed on the extreme left-hand portion of the line are not comparable to the effect of normal human variation. For example, diseases that threaten life, and therefore threaten to obliterate one's functioning and range of opportunity altogether, are obviously not comparable to natural variations that impose some functional limitation. Seriously disabling conditions such as anencephaly and Tay-Sachs are examples of conditions which would be placed at the far left of the range of human function, although we can think of many others. Anencephaly, "a condition where the top half of the brain is completely absent" implies the complete absence of consciousness, whereas Tay-Sachs "implies early degeneration, accompanied by a great deal of suffering, and death before the age of four" (Hall 2008: 11). These conditions preclude the achievement of any opportunity range comparable to that resulting from any level of normal human variation, and there are a wide range of diseases, illnesses and disabilities which threaten life or constrict human functioning in ways which are similarly incomparable to normal human variation.

Nonetheless, I do not believe that this fact invalidates the point I am trying to make here. Of course, there are some diseases and disabilities which cause functional limitation that is not comparable to the limitation caused by human variation. But I do not think that this is the case for all diseases and disabilities. It is true that "[a]ll disabilities involve functional limitation" (Glover 2006: 8). However, the extent to which this local functional limitation constricts one's opportunity range differs with regard to the degree to which this affects our



ability to function in society overall. By this standard, the functional limitation imposed by disease or disability *may, in some cases*, be comparable to the functional limitation imposed by normal human variation.

This is, of course, most evident when a particular level of overall functioning falls within the range of normal human variation, but is the result, in the case of one individual, of disease or disability, and in the case of another individual, of normal human variation. In this case, the overall level of functioning for one individual, in the presence of disease and disability, is equivalent to the overall level of functioning for another individual, where all subsystems are functioning normally (in other words, where all subsystems are at least minimally fulfilling their functions in accordance with their natural design).

This is precisely the situation in the example discussed earlier in this chapter, in which two children present with a directly equivalent level of predicted adult height. In one case this is the result of a disease condition, and in the other case a result of normal human variation. Local functional limitation, in comparison to others, is present in both children. In the first case, there is a limitation of local function, resulting from disease, in comparison to the species-typical ability of the pituitary gland to secrete growth hormone. In the second, there is a limitation of local function, resulting from natural variation, in comparison to a greater capacity for growth in others more advantaged by the genetic lottery. But the impact of this local functional limitation upon the level of general functioning is exactly the same in each case, and to the degree that shortness constricts one's available range of opportunities, the extent of that restriction in each case is identical<sup>70</sup>.

Of course, it is easy to make such a judgement in this case, because the equivalent effect is grounded upon the physical characteristic of height, which is quantifiable. We can probably think of similarly quantifiable examples, such as the possibly equal impacts of some diseases and levels of normal variation upon capabilities such as sight, flexibility, strength, hearing, and so on. As Boorse states, "there are whole broad classes of undesirable physical conditions, conditions that restrict one's physical well-being, which do not appear as diseases in medical texts. It is undesirable to be mildly below average in any valuable physical quality" (1977: 544). In cases where disease affects these characteristics to an extent which is not outside the ranges of normal variation, the undesirable impact is equivalent.

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<sup>70</sup> This assumes, of course, that the social context is relevantly similar.

However, even when the functional limitation imposed by disease and natural variation is not directly equivalent in a way which is quantifiable, we can still make comparative judgements about the limitation imposed by natural variation, on the one hand, and disease on the other. Even when the undesirable effects of disease are not identical to those of natural variation, in that they do not affect physical functioning in exactly the same way, we can still make comparative judgement values about their relative impacts upon opportunity. Boorse, for example, argues that “shortness [as a result of natural variation] may reduce a person’s quality of life much more, in the long run, than a minor allergy or viral infection” (1977: 544-545).

Thus far, we have spoken about the possibly equivalent impact of natural variation and disease upon our physical characteristics. However, how can we evaluate the impact of natural variation upon opportunity with regard to our complex behavioural characteristics<sup>71</sup>?

While we can never measure this effect in a way which is akin to our measurement of height, for example, this does not imply that we cannot make some kind of evaluative judgements about the extent to which certain behaviours limit opportunity in comparison to others within the higher normal ranges. Sometimes these judgements will simply be attributable to common sense – for example, the conviction that a high capacity for empathy will better enable us to relate to others and will make relationship-forming easier, and that functional limitation of this capacity will conversely restrict one’s opportunities in this regard. However, we can also call upon evidence from empirical studies that suggest that lower levels of some behavioural abilities restrict one’s available range of opportunities to a very great extent.

One such study attempted to determine the impact of levels of impulse control - or the ability to delay gratification - upon one’s general chances of success in life. The experiment proceeded by showing preschool age children “two sets of reward objects” - one marshmallow as opposed to two. The children were then told that if they waited a certain amount of time (about fifteen minutes), they could have two marshmallows. However, if they chose not to wait, they could only have one (Mischel, Shoda & Peake 1988: 688-689). The

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<sup>71</sup> This is further complicated by the fact that it is difficult to determine the relative contributions of environment and one’s genetic constitution to the formation of such characteristics, as was noted in Chapter 2. This is of course also true with regard to quantifiable characteristics such as height, but variability of the phenotype as a result of environmental influences is most strongly evident with regard to complex behavioural traits (Charlesworth 2001: 682, Resnik 1994: 30). Despite this complication, it is likely, as was also noted in Chapter 2, that natural variation in our genetic constitutions does have some impact, and probably a significant impact, upon the eventual determination of our behavioural characteristics, and it is this impact which I am considering here.

study found that the extent to which children were able to delay gratification (measured by the length of time they “were willing to delay for a preferred outcome”) predicted their “cognitive and social competence and coping as adolescents” (Mischel, Shoda & Peake 1988: 692):

[T]hose who delayed longer are more verbally fluent; use and respond to reason; are attentive and able to concentrate; are planful and think ahead; are competent and skilful; are resourceful in initiating activities; are self-reliant and confident; become strongly involved in what they do; can be trusted and are dependable; are self-assertive; are curious, exploring, and eager to learn; and show concern for moral issues (Mischel, Shoda & Peake 1988: 690).

The children who delayed longer were also better able to cope with stress and less likely to display characteristics regarded to be negative, such as immaturity, jealousy, and poor social skills (Mischel, Shoda & Peake 1988: 690). In other words, those children with a high capacity for impulse control were, as adolescents, outperforming those children who were less able to delay gratification to a very noticeable extent.

While any attempt to measure the effects of complex behavioural traits in this way is complex, the results of this study strongly suggest that one’s level of impulse control has a highly significant impact upon how well our lives go, and that those with low levels of this trait are functionally limited, in terms of their ability to flourish in society, in comparison to those with higher levels. Other studies suggest that traits such as intelligence and the ability to self-motivate may have analogous predictive values (Gagné & St Père 2002, Rowe, Vesterdal & Rodgers 1998, Sternberg, Grigorenko & Bundy 2001). In other words, we could be disabled by a low level of functioning with regard to particular capabilities which have a strong contribution towards our ability to function overall, even if such a level of functioning falls within the normal ranges (Savulescu, Sandberg & Kahane 2011: 13-14).

Taking into account the above, it is difficult to argue that the effect of lower capability levels in valuable behavioural traits on opportunity ranges is any less profound than the effect of some diseases and disabilities, even where these diseases and disabilities significantly limit function. These effects may also be more difficult to counter via the means which are available to us at present. For example, a lack of mobility certainly limits functioning in a way that limits opportunity. We attempt to correct for this via the provision of functional equivalents to normality (for example, wheelchairs or prosthetics) and via the structuring of society (making buildings structurally accessible to wheelchair users and introducing

workplace policies which foster employment opportunities for those who are disabled). While a limitation of locomotive functioning clearly still limits opportunity, because it closes off some life plans to those affected by it which could otherwise have been pursued, it does not, alone, negate the possibility of human flourishing. It is very hard to make evaluative judgements about the extent to which different functional limitations impact upon one's range of opportunities. However, the studies cited above allow us to tentatively suggest that low levels of impulse control, for example, may affect one's chances for success in life, and limit one's range of opportunities in comparison to others, in a very generalised way that can (at least) be compared to the similar limits imposed by some disabilities, even when these are significant. We can try to counter these effects by manipulating characteristics environmentally<sup>72</sup> (for example, by imposing discipline). However, the strong predictive trends towards low levels of flourishing which result from the very early presence of an inability to delay gratification, as documented by the study above, indicate that this characteristic is at least partially resistant to such environmental manipulation.

It seems that we can conclude without too much controversy that “[m]any of our biological and psychological characteristics profoundly affect how well our lives go” (Savulescu 2005: 37). If the opportunity range for a given individual is the array of life plans which that individual could reasonably hope to pursue, then the opportunity range variance between individuals is clearly vast. What I have tried to show here is that the impact which our characteristics have upon our capacity to flourish depends not at all upon whether they result from disease conditions or natural variation, but is rather directly related to the extent to which these characteristics constrict our range of opportunities in comparison to others. It therefore seems that, if we propose, as the normal function model does, that we are morally obliged to counter the disadvantageous limiting of one's opportunity range in comparison to others by disease and disability, we should be equally obliged to intervene to counter the comparable disadvantage imposed by natural variation, where the local functional limitation resulting from this natural variation inhibits our general functional ability to an equal extent. This obligation accrues, in other words, in the area of overlap, indicated in Figure 2, between treatment and enhancement.

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<sup>72</sup> We do often think that the improvement of functioning via environmental manipulation is morally obligatory, especially where failure to provide such environmental intervention may limit a person's opportunity range in relation to others. For example, children are legally required, in many countries, to attend school and receive a basic education until a certain age. Parents who severely neglect their children are also subject to legal action (Gelles & Shwartz 1999: 97). Even where the state does not intervene, we frequently make personal moral judgements about the behaviour of parents and caregivers who “bring up their children badly”.

However, we must now turn to the second assumption inherent in the normal function model. As noted above, this model assumes that even when inequalities within the range of normal functioning impose limits on opportunity, this is not *unfair*. It therefore matters not that disease conditions and natural variation in ability might result in equal disadvantage in terms of an equally limited level of general functioning. The fact remains that we are obliged to intervene in the former case, but not the latter, because we are only required to correct for *unfair* disadvantage. Can this proposition be defended?

*Is limited opportunity resulting from natural variation fair?*

The contention of the normal function model is this:

Fair equality of opportunity does not require opportunity to be equal for all persons. It requires only that it be equal for persons with similar skills and talents. Thus individual shares of the normal range will not in general be *equal*, even when they are *fair* to the individual. The general principle of fair equality does not imply levelling individual differences<sup>73</sup> (Daniels 1985: 33).

The question is, if via the advent of genetic enhancement technologies, we are able to intervene in a relatively cost-effective way to level *those individual differences which impact severely upon one's opportunity range in a way that is comparable to disease or disability*, why are we not obliged to do so? Why do only those “differences in talents and skills [that] are the results of disease and disability, not merely normal variation [require] some...effort to correct” (Daniels 1985:34)? It is unclear why this should be the case, given that a comparable difference in talents and skills has a comparable effect upon well-being, and imposes a comparable disadvantage, regardless of the cause of that difference. The distinction made between treatment and enhancement, where their effect upon the range of opportunities is comparable, seems to be a morally arbitrary standard for determining our moral obligations, because it seems to imply that “one should be troubled by a disadvantage that precludes a

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<sup>73</sup> Note that the moral obligation to enhance which I am arguing for here does not imply that all individual differences should be levelled, nor it is likely that the enhancement project could ever achieve this, taking into account the complexities of genetic functioning discussed in Chapter 2. Rather, we are obliged to enhance, for the sake of equality of opportunity, only where it can be shown that the functional ability to be enhanced has some significant impact upon the range of opportunities available to us, and that the proposed intervention will therefore positively impact upon our range of opportunities by lessening the disadvantage in this range which we experience in comparison to others. This moral obligation does not accrue to a wide range of variation in functional abilities and individual characteristics where this does not apply.

person from reaching the [normal] minimum, but not at all by the disadvantage that is compatible with reaching it” (Holtug 1999: 140).

This moral arbitrariness is supported by two other factors. These factors are, firstly, the normal function model’s tendency to rate the strength of our relative obligations to provide medical treatment according to the extent of the limitation that a given condition imposes upon us, and secondly, the fact that the model makes some allowance for the correction of the unequal distribution of natural capacities via environmental means.

The normal function model does not regard the strength of our moral obligation to provide treatment to be equal for all conditions. Rather, it rates the moral importance of such treatment according to a particular standard. This standard takes into account the degree to which our normal opportunity range is limited by a particular disease or disability - in other words, “how good or bad a person’s health state is for that person” (Bognar 2008: 97). The greater the curtailment imposed by disease and disability upon our opportunity range, the greater the moral imperative to treat the relevant condition. This ranking of our moral obligations derives from a conviction that “we must judge the relative well-being of individuals or groups in order to assess the urgency or importance of claims they make on us” (Daniels 1985: 36). However, this seems to deprive the distinction between treatment and enhancement of its moral significance. If, as I have tried to show, the relative disadvantage resulting from natural variations and disease conditions can, in some cases, be identical, this is surely worthy of equal moral consideration. To say that the overall functioning of two individuals is limited in comparison to the overall functioning of another individual to precisely the same extent, but that we are only obliged to intervene in one case, seems to dismiss the imperative to “judge the relative well-being of individuals or groups in order to assess the urgency or importance of claims they make on us” (Daniels 1985: 36). In cases where natural variation limits overall functioning to a greater extent than a particular disease, the insistence that we are only required to correct for the latter condition seems ludicrous. Neither the functional limitation of disease and disability, nor the functional limitation of natural variation, are characteristics that people deserve, in that “they did not choose to develop [such limitations]” (Sabin & Daniels 1994: 10). In other words, the limitation of opportunity is not deserved and not fair in either case. I cannot see any reason for suggesting that our moral obligation to intervene applies in one case and not the other, given that the level of limitation is the same, simply because the cause of that limitation differs.

Daniels seems to indirectly recognise this. Following Rawls, he implies that we could indeed be required by justice to counter for the moral arbitrariness of undeserved natural disadvantages by environmental means, for example, by redistributing resources or making special allowances for the naturally disadvantaged within “the educational system” (1985: 46). If this is the case, though, why should we not also be required to make use of technological interventions to counter for natural disadvantages in the same way?

Daniels later concedes this point, and acknowledges that the treatment-enhancement distinction cannot “map unqualifiedly onto the moral boundary between obligatory and nonobligatory services” (2000: 313), so that “sometimes concerns about equality of opportunity might oblige us to provide some genetic interventions even when they...[are] not treatments of disease” (2000: 314). This possibility is hinted at by Rawls himself:

[I]t is...in the interest of each to have greater natural assets. This enables him to pursue a preferred plan of life. In the original position, then, the parties want to insure for their descendants the best genetic endowment (assuming their own to be fixed). The pursuit of reasonable policies in this regard is something that earlier generations owe to later ones, this being a question that arises between generations. Thus over time a society is to take steps at least to preserve the general level of natural abilities and to prevent the diffusion of severe defects...We might conjecture that in the long run, if there is an upper bound on ability, we would eventually reach a society with the greatest equal liberty the members of which enjoy the greatest equal talent (1971: 92-93).

Despite his concession, Daniels nonetheless maintains that “the levelling of the playing field goes only so far” (2000: 316). Daniels’s position here seems to rely on the supposition that the demands of efficiency would run contrary to the imperative to radically equalize opportunity (in other words, that it would, from a Rawlsian social contract perspective, “be better for contractors...to *mitigate the effects* of [natural] inequalities by redistribution of other important goods”, as redistribution via genetic enhancement technologies could be inefficient and would ultimately make everyone worse off (Daniels 2000: 317).

Of course, morality demands that we take such concerns into account. I do not want to suggest that the moral obligation to enhance in order to bring about equality of opportunity is a primary obligation that trumps all others. This must be balanced against other concerns, such as efficiency. In the context of the finite availability of resources, it will still be more important to mitigate the effects of diseases and disabilities that curtail opportunity to a



greater extent than natural variation. However, where the effects of (particular) diseases and disabilities are equivalent to the effects of (some forms of) natural variation, the *prima facie* moral obligation to correct for this effect is the same. This moral obligation may, of course, come into conflict with concerns about efficiency, and this must necessarily be weighed up in the case of each proposed intervention. However, an attitude that holds that inequalities in our natural capacities are fair because they are simply natural givens that we are presented with, is, or will be, an anachronism in a context where we have the ability to directly determine, via genetic intervention, the partial constitution of these abilities. We think we are obliged to take environmental action to improve the range of opportunities people will have by manipulating their non-disease characteristics, via interventions such as education and discipline. We think we are obliged to provide some restitution or correction for undeserved socio-economic inequalities (Daniels 1985: 34). We think we are obliged to restore or achieve species-typical functioning for people, where their divergence from this standard of functioning unjustifiably limits their overall ability to function in society. Are our natural capacities really the only exception to this general moral obligation to equalise opportunity, or is this exclusion simply a hangover from a time when any direct manipulation of our genetic characteristics seemed impossible?

In other words, when rating our moral obligations to intervene in and improve the functioning of individuals, what should count is not whether a condition constitutes a divergence from the patient's genetic birthright in the absence of disease or disability. Instead, what should count is the impact which the individual's level of functioning has upon the level of disadvantage which they are likely to experience. It may be the case that disease and disability *in general* constricts opportunity to a greater extent, and that "meeting health-care needs [therefore has] a definite *tendency* to promote happiness" (Daniels 1985: 27), but this does not imply that we should therefore stick to a hard-and-fast rule which holds that we are morally obliged to treat but not to enhance in cases where both interventions will similarly contribute to fair equality of opportunity.

Nature does not take notions of "fairness" into account with regard to the distribution of natural capabilities (Savulescu 2006: 331). However, human beings do. Where we are in a position to improve natural capabilities, the principle of fairness seems to require that we ought to do so.

Thus far, I have argued that enhancement is obligatory in cases where natural variation limits opportunity in a way that is comparable to the effects of disease and disability. Given that medical treatment is seen to be morally desirable because it promotes equality of opportunity by countering disadvantage (according to the normal function model), enhancing interventions which have an analogous effect would be desirable for precisely the same reasons.

However, I now want to go further than this. Enhancement may not only be morally required because it could promote equality of opportunity, but also because it is good for us in a more general sense.

### ***Beneficial enhancement and the promotion of well-being***

The preceding argument suggests that the equalisation of opportunity via enhancement and therapy is comparably morally obligatory in like cases. However, the obligation to enhance, as imposed upon us by the requirements of justice, never demands that we go beyond the upper ranges of normality<sup>74</sup>. We are not obligated to provide enhancement interventions, under this view, to those who are most advantaged by the genetic lottery, because their high level of overall functioning implies that their opportunity range is not (significantly) limited in comparison with anyone else. Indeed, fair equality of opportunity might make such enhancement morally *impermissible*, because the higher level of functioning which it would achieve for some would disadvantage others by comparison.

Does this imply that enhancement beyond the upper ranges of species-typical functioning is therefore forever off-limits? I want to argue that, on the contrary, a case can be made for a *prima facie* moral obligation to provide these sorts of enhancements too, although this ethical imperative can come into conflict with, and justly be overruled by, competing moral principles that are of greater importance. The moral obligation in this case stems from the obligation to promote the well-being of other moral agents in ways which do not have to do with frivolous or particular individual preferences. Because enhancement, through its widening of one's opportunity range, achieves this effect, this intervention is morally

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<sup>74</sup> Wilkinson (cited in McConnell 2011a: 2) distinguishes between “non-disease avoidance” enhancement within the normal ranges whereby one “choos[es] a trait the absence of which would not constitute having a disease” but which would not exceed normality, and “super-normality” enhancement, whereby “traits are improved beyond the normal range for humans”. The argument that I have put forward thus far justifies the first kind of enhancement but not the second.

desirable. In this regard, enhancement is simply the latest development in a series of human interventions which have altered our naturally given level of functioning in accordance with human values.

I would like to suggest that species-typical functioning, as it is constructed by the normal function model, cannot function as a minimum standard against which we judge divergent levels of human functioning and determine our moral obligations. This is because it is the result, as it currently stands, of a series of human interventions which have characterised civilisation from the outset, which have aimed to improve natural, evolutionarily determined functioning. This improvement has occurred against the background of the dual recognitions that our naturally given functioning is not optimal from the perspective of our level of well-being, and that we ought to promote the level of human well-being, simply because it is good for us. Normal human functioning, as it currently stands, is highly unlikely to be the climax of this process, nor ought it to be.

*Is health (the only thing that is) desirable?*

To illustrate why this is so, we can return to the work of Boorse. Boorse's development of the concept of health is adapted by Daniels to develop a theory about the moral obligations attached to the provision of healthcare. However, this conception of health, as the normal, species-typical functioning of human beings, where such normal functioning is constituted by the performance of subsystems in accordance with their natural design (1975: 77) cannot, according to Boorse himself, function as a standard in terms of which we can determine the limits of our moral obligations. This is, first of all, because not all disease conditions are (seriously) undesirable. In this regard, Boorse distinguishes between disease (as a deviation from functional health) and illness (a normative description of an undesirable state which results from disease, and which impacts upon the overall functioning of the individual and merits special moral consideration) (1975: 56). While it may be the case that "essentially all serious physiological diseases will satisfy the...requirement of an illness, namely, undesirability for its bearer" (1975: 60), there may be some disease conditions (for example, the mild infections intentionally caused by vaccinations) which are on balance desirable (1975: 61). Other conditions, such as diseases which cause infertility and do not affect functioning in any other way, are not necessarily undesirable to those affected by such conditions – the desirability or undesirability of such a condition would depend upon their context (1975: 53)

In other words, Boorse suggests that “[h]ealth is not unconditionally worth promoting”. Even more importantly for the argument I wish to make here, however, is his suggestion that “what *is* worth promoting [is not] necessarily health” (1975: 60, my italics). This can be illustrated as follows.

In attempting to develop a definition of health as the achievement of normal functioning in accordance with naturally given design, Boorse develops an analogy between the state of health in a human organism and a vehicle in good working order. We regard a vehicle to be in good working order when its functioning accords with its design, or when each of its component parts adequately perform their designated function. Similarly, the human organism is healthy when all its component subsystems are functioning in a way that accords with its natural design. However, as Boorse notes, the fact that all parts of a vehicle are functioning as they are designed to does not suggest that the design of the car as a whole is in itself a good one (1975: 59).

We can develop Boorse’s analogy here further. The designers of a vehicle presumably have some type of normative intention that a vehicle will function well<sup>75</sup>. However, the design of the human organism is largely attributable to the process of evolution. As noted in an earlier part of this chapter, there is no reason to think that evolution, which tends towards the maximisation of reproductive fitness, has produced a design that is good from the perspective of what human beings value. This suggests that good health, as the absence of disease and disability and the performance of human functional subsystems in accordance with their natural design, does not tell us everything about what could be desirable for human beings. In fact, this natural design may contain elements that are undesirable from the perspective of what we value<sup>76</sup>, and which we ought to improve upon if we are able.

### *Treatment as enhancement*

One way in which human beings have recognised that normal functioning, in accordance with evolutionary design, is not necessarily optimal functioning, is precisely through the

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<sup>75</sup> This may of course be combined with concerns about, for example, cost, and what counts as a good design will depend upon what people find to be most valuable. For instance, some people would prefer a fuel-efficient vehicle, others would be more concerned about the engine’s power and maximum speeds, while some would be most concerned about safety, or some combination of these values.

<sup>76</sup> We can refer here again to Powell and Buchanan’s list of examples of sub-optimal human evolutionary design (2011: 51-52).

development of medicine. To illustrate this, I want to point out that, if we regard susceptibility to disease, disability and environmental injury to be a universal human characteristic, as surely we must<sup>77</sup>, it will become clear that therapy too is an enhancement of species-typical functioning.

As noted earlier, it is entirely normal, in terms of our species-typical, evolutionarily determined functioning, to be vulnerable. We are naturally susceptible to disease, which our normally functioning immune systems cannot always fight off. Our normally functioning bodies are naturally vulnerable to environmental insults which can disable and destroy us. Our normally functioning genetic hereditary systems result in mutations (the grounds for evolutionary change) which sometimes disadvantage us by causing us to be born with genetic disorders. These same normal mechanisms of heredity endow the vast majority of us with genes that increase our likelihood of developing certain forms of dysfunction. None of these features of natural humanity are in any way divergences from the overall general functioning that is species-typical for the genus *Homo sapiens*. Some of us may be more advantaged in this regard, in that we may be stronger, or more robust. But even those of us in the upper ranges of functional ability to resist disease remain, to a great extent, vulnerable to disease conditions and disabilities. There is no such thing as perfect health, because it is not in our natures to be perfectly healthy, at least not forever, and this holds for all of us.

It is in this context that we can point out that vaccinations are an enhancement rather than a treatment by the standard of the normal function model, because they improve upon the normal, species-typical human capacity to resist disease (Buchanan 2011: 47). However, I would like to point out that it is not only vaccinations that are enhancements by this standard, but all medical treatments.

Let us first take the example of the human capacity to resist environmental insults. Imagine a situation in which a pedestrian is involved in a traffic accident. Because his body's functional design is naturally vulnerable to force which his bones are not strong enough to withstand, his tibia and fibula bones are badly fractured (let us imagine that this individual's bone strength is in the highest ranges of normality). Without an intervention which sets and immobilizes these bones (for example, the use of a plaster cast) the bones will heal naturally anyway, but they will not heal as quickly (because of unintentional movement) and, because the fracture is a

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<sup>77</sup> Our mortality, after all, is based upon this universal characteristic.

severe one<sup>78</sup>, they could heal in a suboptimal position which will restrict future function. This is an example of a relatively simple human intervention, which we call medical treatment, which aims to restore normal functioning. In fact, this intervention increases a particular, normal functional ability in human beings – the ability of the bones to heal – above species-typical levels (healing is quicker and more successfully restores function than would be the case without intervention).

If this does not seem clear, we can consider the human susceptibility to bacterial infections. Many bacteria are helpful with regard to human functioning, for example food digestion, so this susceptibility is an entirely normal aspect of human functioning. However, sometimes infection by harmful bacteria causes illness, and we can treat such infection via antibiotics. This is clearly an improvement of the human functional ability to resist harmful bacterial infections – the systems which are responsible for resisting infection would not so easily be able to do so in the absence of the therapeutic intervention. In addition, intervention in the form of the provision of antibiotics when we recognise the effects of harmful bacteria enhances the normal ability of the body to distinguish between harmful bacteria (from our perspective) and beneficial bacteria, and to treat these two sorts of bacteria differently.

In other words, medical treatment functions as an enhancement of the species-typical ability of human beings to resist disease, disability, and environmental insult. It is directed towards the achievement of functioning, in each subsystem of the body, that accords with its natural functional design. This idealised functioning, however, is not normal, nor is it species-typical. We are all susceptible to conditions which impact upon this functioning, and the increased ability to resist or to correct for these conditions, as a result of medical treatment, constitutes an enhancement of our normal level of functioning. In other words, “all successful therapies are enhancing” (The President’s Council on Bioethics 2003: 14-15).

If susceptibility to disease is a normal aspect of human species-typical functioning, why do we think that the provision of medical treatment is morally important? Is it because, as the normal function model suggests, we have a duty to protect the fundamental interest which people have in achieving and maintaining their fair share of the normal opportunity range in the absence of disease and disability?

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<sup>78</sup> The fracture is serious despite the fact that we have imagined this individual’s bone strength to be in the highest normal ranges, because the force of the accident was such that it would have had this result even in the context of the lowest possible normal levels of bone vulnerability.

There are two reasons why this cannot fully explain the moral motivations for the provision of medical treatment. Firstly, the alternative description of treatment as enhancement which I have offered above implies that one's share of the normal opportunity range, as determined by the genetic lottery, includes one's divergent capacity to resist, and one's genetic tendency towards, particular diseases and disabilities. This can be illustrated by once again referring back to the case of two children with equivalent predicted adult heights. In this case, both the genetic susceptibility to cancer and the genetic tendency towards shortness are determined by natural variation in functioning which is entirely normal (Buchanan et al. 2000: 116). Therefore, medical treatment in the former case (and in fact in every case) constitutes an enhancement of the affected individual's natural and normal resistance to disease.

Suppose, we accept this argument, and acknowledge that treatment is a form of enhancement. Suppose, too that we accept the argument in the previous section, and accept that enhancements which contribute towards fair equality of opportunity are obligatory to the same extent as analogous treatments. Treatment, if we accept these arguments, promotes fair equality of opportunity not just by removing particular limits to opportunity (by countering the effects of specific diseases) but also by generally enhancing one's level of resistance to disease. In other words, where an individual's susceptibility level to disease (as constituted by their environment and their genetic constitution) disadvantages them in comparison to others who are less susceptible (or in comparison to those of us who are most healthy), the principle of fair equality of opportunity gives us a good reason to intervene to correct this disadvantage, and this reason holds even if we regard treatment to be a form of enhancement. However, nothing that I have said yet gives us any reason to improve species-typical functioning beyond the upper ranges of normality. Indeed, the imperative to promote equality of opportunity suggests, if anything, that this could be morally problematic unless such an improvement was available to all.

I agree that the principle of fair equality of opportunity gives us a good moral reason to provide healthcare (and to provide some kinds of enhancement, as I have suggested above). We have a fundamental interest in not being at an unfair disadvantage in terms of our opportunity range, and other moral agents ought to respect and promote that interest. However, I don't think that this is the only reason that healthcare is morally desirable, and this brings me to my second critique of the normal function model's description of the motivations for the posited moral obligation to treat.



*The moral imperative to promote well-being*

To illustrate this critique, I would like to pose two similar thought experiments. The first one is, in fact introduced by Daniels (1985: 55), in his defence of the normal function model against the accusation that it is guilty of circular reasoning<sup>79</sup> (Buchanan 1984: 64, Stern 1983: 345).

Daniels asks us to imagine that “a disease is widespread, even universal in a society”. He suggests that this disease is a form of “anaemia which affects all and is debilitating across the board”. It would seem that in this case, “impact on the normal opportunity range will not tell us how important it is to treat this disease, since it hurts all individuals equally”. In other words, the disease does not disadvantage anyone in comparison to others, and therefore has no impact on *fair equality* of opportunity – everyone’s opportunity is equally affected. Daniels insists that the “opportunity account” is still helpful, because “it is not only a principle governing competitive advantage”. The moral importance of treating this disease arises because the condition “keeps each individual from carrying out *any* life plans that *otherwise would be reasonable* in his society” (my italics).

However, one could respond to this by asking: so what? Why does it matter that the life plans that would be available in the absence of the anaemia are not available, if they are not available for everyone? Assuming that the condition does not result in other consequences which are morally undesirable, for example, physical suffering, why should we take action to ameliorate its effects? Presumably not all life plans can be closed, as the sufferers are still living and performing basic functions within their society. Their life plans may be very limited in comparison to what would be available in the absence of the condition, but they are not limited in comparison to the life plans available to others, as these are all similarly constricted, and so the imperative to intervene cannot result from the principle of fair equality of opportunity.

Nonetheless, our moral intuition is that such an imperative *does* exist. What is its basis? This basis is simply that an increased range of opportunity is valuable to moral agents in and of itself, because of its tendency to promote well-being. *We have a fundamental interest in an*

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<sup>79</sup> This accusation suggests that the normal function model cannot determine our moral obligations as to the provision of medical treatment, because the availability of health care partially constructs the normal opportunity range. The moral desirability of the achievement of this opportunity range therefore cannot be used to suggest that health care is morally obligatory without circularity.

*increased level of well-being, simply because it is good for us, and independent of whether this increased level contributes to fair equality of opportunity.*

We can further illustrate this by thinking of another example. I have suggested that susceptibility to disease is a normal aspect of human functioning, even within the upper ranges of functional ability to resist disease. The level of susceptibility to disease differs as a result of normal human variation. Within a given society, let us imagine that there is one individual - call her A - who we can identify as having the lowest levels of susceptibility to disease, or conversely, the highest capacity to resist disease. The normal function model suggests that we are required by the principle of fair equality of opportunity to counter the effects of disease and disability because these are likely to result in unfair disadvantage, or detract from the affected individual's fair share of the opportunity range, and moral agents have a fundamental interest in avoiding these results. Imagine that we are given a choice between intervening in human functioning in two sorts of ways, and these interventions will be similar in terms of cost, safety, and efficacy. If we choose Intervention X, this will raise everybody's capacity to resist disease to be equivalent to that of person A, and nobody will be unfairly disadvantaged by their comparatively greater risk of developing diseases. Only those diseases that would have affected A, despite her greater resistance levels, will now affect everybody. These diseases will not cause physical suffering, but will limit overall functionality to some small extent and will therefore impact negatively upon opportunity for everyone in exactly the same way. The negative impact upon opportunity in these cases will not be as significant as that which would have accrued (unequally) in the absence of the intervention, but it will still be present, although equal in magnitude for everyone. If we choose Intervention Y, however, we can increase everyone's ability to resist disease, including A's<sup>80</sup>. We would therefore enhance the capacity to resist disease beyond the highest ranges of normality in society<sup>81</sup>. In this case, the total negative impact upon opportunity which will result from disease will be smaller than in the case of Intervention X.

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<sup>80</sup> Both Intervention X and Intervention Y could have their own (possibly morally problematic) consequences which would have to be taken into account, in a real world scenario. For example, these interventions could result in considerable life extension for everyone, which could cause huge practical problems (although we would still be somewhat susceptible to disease, and vulnerable to environmental insults, so this would not result in immortality). However, for the sake of the thought experiment, we should put these to one side for the moment, and assume that these high levels of resistance to disease would not affect the normal human life span as it currently stands. I am trying to establish only whether we have a *prima facie* obligation to enhance, which would have to be balanced against other practical and ethical considerations that I will consider in the next chapter.

<sup>81</sup> This is exactly what happens in the case of vaccinations, as noted earlier, although we obviously cannot vaccinate against all or even most diseases at present.

It seems counter-intuitive to suggest that there is no moral difference between choosing Intervention X and Intervention Y (although that moral difference might not be small). We ought, it seems, to choose Intervention Y. The only explanation for this conviction is that there is always a moral obligation, when we have to make a choice between two available ranges of opportunities for moral agents, to choose the greater range, because this greater range is more likely to promote well-being, and this moral obligation holds *even where the greater range of opportunities exceeds that available within the upper ranges of species-typical normal functioning*. This moral obligation, can of course, be outweighed by other competing moral obligations that are more important.

Of course, this moral obligation comes into effect only where there is a greater range of opportunities conceivably available which we can reasonably hope to achieve by a given intervention. The reverse applies too: as soon as there is a conceivable greater range of opportunities available for a moral agent that we can reasonably hope to achieve by means of a given intervention, we are morally obligated to provide that intervention.

Thus medical treatment is not only morally required because it contributes towards fair equality of opportunity, although this is one of its primary goals and partially explains its moral desirability<sup>82</sup>. It is also required because it is good, in and of itself, to improve one's overall functioning, which widens the range of opportunities of moral agents and tends to promote their well-being. The moral desirability of health is therefore strongly related to its tendency to promote well-being. However, "if it is well-being not health that is intrinsically valuable", this suggests that "human enhancement [is also a] moral obligation" (Savulescu 2005:37), because "the empirical link between the enhancement of human capabilities and increases in well-being is strong" (Buchanan 2011: 45). In other words, "[i]f we have an obligation to treat and prevent disease [based on a duty to promote well-being], we have an obligation to try to manipulate [human] characteristics to give an individual the best opportunity of the best life" (Savulescu 2005: 38).

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<sup>82</sup> I have not considered the moral desirability of medicine in terms of its tendency to prevent or alleviate suffering. I do think that this consideration explains the moral importance of medical treatment independently of any other effect which it might have. However, the morally significant interest which we have in avoiding suffering cannot explain why there should be any moral importance attached to the treatment of diseases and disabilities which do not cause suffering (Down syndrome which presents with no associated health problems, for example, or congenital blindness), and for these sorts of conditions, there must be some other moral principle at stake. (I am referring here to the experience of physical pain rather than emotional suffering, as I think this latter kind of suffering is closely associated with pain itself, or with the limiting of opportunity, particularly in comparison to others).

The imperative to promote opportunity and well-being which I have posited here lies behind the drive which has characterised human life from the outset – to improve, via environmental and medical interventions, the living conditions, capabilities, and level of natural functioning of human beings. As Hobbes famously pointed out, life in its natural state is “solitary, poor, nasty, brutish, and short” (1968: 41). We take action to improve the natural state bestowed upon us by evolution not only because we think it is good to counter disadvantage, or because it is good to reduce suffering, although these are both important moral goals. We take action to improve ourselves, and to manipulate the world around us, to enable us to function more effectively, simply because better is good for us. It is good for us to be able to communicate more successfully and with more ease, to be stronger and fitter, to be more resistant to disease, to be more intelligent, and to be better able to control our natural impulses. These things are good for us because they widen our range of opportunities for preference fulfilment, because they enable us to better achieve our (individual) goals, and because they contribute towards our well-being. Enhancement, directed at the promotion of human well-being, should therefore be placed in “the historical context of human development” (Buchanan 2011: 44).

The imperative to promote well-being also explains why many people think we are morally obliged to provide medical services such as contraception and non-therapeutic abortion. As both Daniels (1985: 31) and Boorse (1977: 545) acknowledge, the conditions which these interventions “correct for” (fertility and pregnancy) are absolutely normal in terms of human functioning – in fact, they are a sign that the relevant bodily subsystems that govern these processes are functioning exactly as they ought to in terms of their evolutionary design. By the standard of the normal function model, then, these reproductive services do not qualify as healthcare needs (although Daniels suggests they may be morally important for other reasons). They actually inhibit or limit particular local functions associated with reproduction. However, when they are desired, they enhance overall functioning by improving our natural species-typical ability to control fertility and to separate sexual intercourse, which we value in and of itself, from child-bearing. This expands our range of opportunities, by giving us decision-making power over when and if we will have children (which is of fundamental value in determining how well our lives go) and by promoting our capacity to enjoy interpersonal relationships. Contraception and abortion are not morally required because we have a fundamental interest in achieving our fair share of the normal opportunity range. They may, however, be morally required because their availability tends to promote human well-being.

I have tried to make the argument that we always have a moral obligation, when we have to make a choice between two available ranges of opportunities for moral agents, to choose the greater range, because this greater range is more likely to promote well-being. I have tried to show that this moral obligation holds *even where the greater range of opportunities exceeds that available within the upper ranges of species-typical normal functioning*. Placed in this context, it seems that we always have a prima facie obligation to enhance. The term “enhancement” should be taken to mean any intervention which tends to promote the well-being of the human person overall, by improving their functioning in comparison to the species-typical level of functioning bestowed upon us by evolution. By this standard, medical treatments, beneficial manipulations of the environment, and interventions which improve our functioning beyond levels which are currently regarded to be normal, are all morally obligatory enhancements.

However, it is important to note that the moral obligation which accrues is not equal in every case, any more than it is equally morally important to treat cystic fibrosis and a cough. The strength of our moral obligation depends on the effect of the intervention on one’s range of opportunity, and the resultant effect on their well-being. In the next chapter, I will attempt to provide some rough guidelines as to how we should rate our moral obligations in this regard, as well as defining the category of morally obligatory enhancements in greater detail. I will also make some comments about other moral obligations which could invalidate the prima facie moral desirability of enhancement which I have established here.

### *Are all interests equal?*

Before I go on, however, I must consider one objection to this argument, which I hope to counter with some further remarks. One could object to the moral obligation I have posited above by suggesting that it is too demanding. If, as I seem to have suggested, we are always obligated to promote the well-being of moral agents, what is to stop me from demanding that you fulfil your obligation to promote my well-being by sending me on a five-star all expenses paid holiday to Hawaii?

I think there are two reasons why this objection fails. The first has purely to do with practical application – by being too demanding, the general obligation to promote well-being collapses. The second emphasises that the moral obligation to promote well-being which I have

established here is closely related to (and limited to) an expanded range of opportunity and the provision and promotion of the general conditions for welfare.

We must firstly consider how a very general obligation to promote well-being would operate in practical terms. As I have repeatedly argued, the duty to promote well-being is only *prima facie*, or to phrase this differently, a “conditional duty” (Ross 1930: 19). We do not consider such duties in isolation, but in the context of our entire spectrum of moral obligations. So, for example, you are not only obligated to promote *my* well-being, but the well-being of all moral agents equally<sup>83</sup>. If the well-being of all moral agents will be promoted by a trip to Hawaii, or by similarly extravagant preferences (although I do not think that this is likely to be the case, as I will argue in the next section), then we are equally morally obligated to provide this to everyone, but this general obligation weakens each specific obligation to the point of non-existence<sup>84</sup>, as it is impossible to fulfil. In addition, we have other duties which are (inestimably) more important than the duty to promote the well-being of moral agents by sending them to Hawaii. In other words, there are particular kinds of contributions to well-being which we consider to be more fundamental than others, and this brings me to my second point.

What I want to argue here, is that while the satisfaction of each of our interests may contribute towards our well-being, we have different sorts of interests which contribute towards well-being in different ways. Some kinds of interests are more fundamental to well-being, and therefore of more moral importance, than others. To illustrate this, we can refer to a distinction which Feinberg introduces between our *ulterior* interests and our *welfare* interests.

Ulterior interests are those interests which are specific to an individual. For example, individuals may have interests in “producing good novels or works of art, solving a crucial scientific problem” and so on. (Individuals may also have interests in enjoying holidays in Hawaii). These interests differ for each of us. They are determined by the individual differences between us in terms of our set of values and our conceptions of the good. Therefore, we might disagree with regard to whether each other’s ulterior interests are worth promoting.

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<sup>83</sup> Of course, we also have special obligations to certain persons because of the existence of special relationships. I will consider this point at greater length in the following chapter. For the purposes of this example, I am referring to the moral obligation which we have towards others who do not have special relationships with us.

<sup>84</sup> This also seems to suggest that the obligation to enhance, when conceived as applying equally to all moral agents, is weakened to the point of non-existence. I will make some suggestions about why this might not be the case in the next chapter, by referring both to special relationships and to duties we attribute to the state.

In this regard, you might disagree that my ulterior interest in going to Hawaii *is in fact in my best interest* from your perspective. You may think that it is far more beneficial for me to finish this dissertation on time. I am not required to agree with you, but neither can I force you to agree with me. Our differences depend on the values and preferences that we (choose to) hold, and while we can try to convince others that our values are more worthwhile, we will not always be successful.

Our ulterior interests, while often remaining relatively constant, are also not fixed, in that our preferences or values may change. I may later come to agree with you that going to Hawaii is less beneficial than finishing my dissertation, and therefore regret that you accepted my previous subjective estimation of the relative effects of these two courses of action on my well-being.

Related to this point, we should note that the satisfaction of ulterior interests may in fact act to *constrict* rather than to expand our opportunity range. If I have an ulterior interest in becoming an Olympic athlete, and I determine that high-cost athletic training will therefore promote my well-being, the time and effort which I will need to devote to this goal will close off other life plans to me. This will not necessarily be undesirable to me from a personal perspective, but its desirability cannot be formulated in terms of the obligation to promote well-being by *widening the range of opportunities* which I have argued for in the foregoing section.

A general obligation to promote everyone's ulterior interests is therefore not only so demanding that it nullifies the obligation on an individual level, but problematic, because these interests are to a great extent the result of individual values and chosen preferences which others may not recognise, which are not necessarily forever fixed, and which are not directed towards the widening of opportunity ranges, and therefore the promotion of these interests cannot be shown to be a general good in every case<sup>85</sup>.

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<sup>85</sup> We may still be morally required to satisfy these interests, especially in the context of special relationships. We usually think that the nature of the relationship between two parties affects the type of obligations which arise between these parties (Glannon & Ross 2002: 155). For example, we think that parents should consider the well-being of their children to be more morally important than the well-being of strangers. We therefore think that it is morally admirable when parents seek to promote the ulterior (specific) interests of their children (provided they are indeed their children's interests and not their own), even when they sacrifice some of their own ulterior interests to this end.



Welfare interests, on the other hand, are those interests which are universal for all people. These interests are in “the necessary means” which are the precondition for our achieving our “more ultimate goals”. In other words, they are the basis for the advancement of each one of our ulterior interests. As such, they are the precondition for welfare or for well-being *in general*. Feinberg includes under the category of welfare interests<sup>86</sup>:

[C]ontinuance for a foreseeable interval of one’s life,...physical health and vigour, the integrity and normal functioning of one’s body, the absence of absorbing pain and suffering or grotesque disfigurement, minimal intellectual acuity, emotional stability, the absence of groundless anxieties and resentments, the capacity to engage normally in social intercourse and to enjoy and maintain friendships, at least minimal income and financial security<sup>87</sup>, a tolerable social and physical environment, and a certain amount of freedom from interference and coercion (1984: 37).

Feinberg’s suggestion that the *minimal* fulfilment of these interest is of fundamental moral importance seems to bear some resemblance to the normal function model, as he regards an interest in “achieving a much higher level of a particular element of welfare than is actually required” as a form of ulterior interest (1984: 57).

I do not agree with Feinberg on this point. I cannot see why an interest in achieving a higher level of any one of the capabilities identified in this category is not itself a welfare interest<sup>88</sup>. Unlike ulterior interests, an interest in achieving a higher level of these capabilities is not dependent upon one’s particular set of values or one’s conception of the good. A higher level of any one of these “generalized means” (Feinberg 1984: 42) will, for all of us, regardless of our conception of the good, increase our range of opportunities by improving upon our general ability to fulfil our ulterior interests. An interest in increasing these abilities is one which is fundamental to human beings because we all have an interest in being better able to achieve those (particular) goals in life which we have chosen, and to increase the available possibilities through which we can realise our individual conceptions of the good life.

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<sup>86</sup> I will expand on the category of welfare interests in the next chapter.

<sup>87</sup> The notion of financial security could be problematic for the moral obligation to improve our welfare interests which I am trying to argue for here, as its inclusion under this category of interests seems to suggest that we ought to maximise financial security in general by redistributing financial resources so that everyone is equally benefited by them (given that this is a finite resource). While I cannot pursue this at any great length, I will tentatively suggest that in the context of an existing distribution of socio-economic resources in society that is not unjust (I will not speculate as to what this might be as this is outside the realms of this study), individuals with (relatively) equal ranges of opportunities would be equipped to pursue a higher level of financial security, to the extent that this was important to them, as an ulterior interest.

<sup>88</sup> Apart from, possibly, financial security – see the previous footnote.

The distinction which I have introduced here between ulterior and welfare interests explains why our moral obligation to fulfil the latter sort of interests is a great deal stronger than our moral obligation to fulfil the former. In the promotion of well-being, not all sorts of interests count the same. Some interests are specific to individuals, whereas the promotion of others can be recognised as being good for moral agents, by expanding their range of opportunities, in general. In addition, the promotion of welfare interests has an impact on our ability to promote (our own) ulterior interests, and provides us with (enhanced) means to fulfil these too. As such, the advancement of our welfare interests may not be the only way to promote our well-being, but the advancement of these interests provides the basis for the further promotion of that well-being by equipping us with an enhanced ability to promote our ulterior interests for ourselves. “The attraction of the concept of a welfare interest lies precisely in its pluralism: welfare interests are those necessary for *whatever* more ultimate aims the person may select” (Von Hirsch 1986: 705). The promotion of welfare interests therefore tends to promote choice and does not require us to elevate or privilege one conception of the good over another, or to adhere to a set of ulterior interests which we may not share.

Therefore, the sort of enhancements which we are obliged to pursue are those which will advance our welfare interests. These are general-purpose enhancements. We are entitled to pursue enhancements which promote our ulterior interests for ourselves on the basis of an autonomous decision, but we are *not entitled to choose them for others*<sup>89</sup> *without their explicit agreement*, as this will be overly prescriptive and deterministic, and will imply the imposition upon others of a particular set of values which cannot be evaluated from an objective perspective. On the other hand, the advancement of our welfare interests is always a good thing for the individual because this improves the “generalized means to the advancement of his various ulterior interests”, whatever these may be, and including even those “that have not suggested themselves yet to the person who will one day have a stake in them” (Feinberg 1984: 41). The promotion of these interests “is good for a person *in any case*, whatever his beliefs or wants may be” (Feinberg 1984: 42). Viewed in this way, enhancement can be regarded as a means to promote autonomy (Juth 2011: 36), as it increases “the capacities to do the things we need to do in order to effectuate our plans”<sup>90</sup>.

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<sup>89</sup> Including our children, as I will argue in the next chapter.

<sup>90</sup> The fact that we will still need to expend effort in order to achieve our ulterior interests also seems to invalidate the argument against enhancement from the value of effort which I discussed in the previous chapter.

I must now turn to the final question which I will consider in this chapter. We usually regard a failure to promote the welfare interests of moral agents up to a minimum level (for example, by a failure to provide treatment or environmental interventions which allow us to function in a minimally normal way) to be harmful to those agents. Can we make an argument that suggests that failure to provide enhancements may be harmful in an analogous way?

### **Enhancement and harm**

In this section, I want to examine the relationship between enhancement and harm. In order to do so, I will have to deconstruct the extraordinarily complex relationship between harm and non-benefit.

To fail to take an action which improves an individual's situation is usually regarded, not as an instance of harm, but as an instance of non-benefit (Bayles 1976: 298). However, there are cases when we do regard the withholding of a benefit to be harmful. We usually think that it is harmful to withhold medical treatment, for example. Given the validity of the argument above, which suggests that the motivations for medical treatment and enhancement are closely related, can it be the case that a failure to enhance could be similarly harmful?

To determine whether this is the case, I will firstly try to determine what we mean by the concept harm.

#### ***What is harm?***

What do we mean when we say that a particular event harms someone? At its most basic level, to be harmed is to be made worse off (Bayles 1976: 293). In other words, "for a person to be harmed by some event, her life must go worse because of it" (Holtug 2002: 364).

It is relatively obvious that this definition of harm implies that we ought not to inflict it. Making other moral agents worse off is, in a fairly uncontroversial way, bad for them. We therefore usually believe that we ought not to take actions which are harmful to others, and this is often expressed as the moral principle of nonmaleficence (Beauchamp & Childress 2009:149, Ross 1930: 21).

Of course, not all harm results from morally blameworthy behaviour. For example, an (unpreventable) disease condition that results in blindness harms the one who is blinded by making him worse off, but nobody is *morally responsible* for this effect. In other words, sometimes (in fact, often) harms result from causes that are independent of human agency. When we talk about morally blameworthy acts of harming, which it is our moral obligation to avoid, we imply that the person so harmed is also “wronged” by another (Feinberg 1992: 4). This is the type of harm which I am referring to here.

In some cases, while we might acknowledge the prima facie wrongness of actions that harm moral agents (Beauchamp & Childress 2009: 152), we nonetheless think that such actions are justified. For example, we sometimes think that harm is justified in cases of punishment. We might think that this is justified because of a competing moral obligation to avoid some greater harm, by, for example, preventing future behaviour which could be harmful to other moral agents or to the one who is punished. Alternatively, we might think that the infliction of harm is justified because a particular individual, by their past behaviour, deserves to be harmed as a matter of justice, or that they have, through this behaviour, given up their right not to be harmed. We might also harm someone temporarily (for example, when we treat them with chemotherapy) in order to gain some greater net benefit for them. In other words, the obligation not to harm does not hold in all circumstances, but must be weighed against our other moral obligations.

Feinberg works out the concept of harm in some detail in *Harm to Others*, in order to determine “what sorts of conduct...the state [may] rightly make criminal” (1984: 3). This project proceeds in accordance with Mill’s contention that “the only purpose for which power can be rightfully exercised over any member of a civilised community, against his will, is to prevent harm to others” (1956: 52). Feinberg’s goal then, is to determine when behaviour is harmful and can therefore justly be punishable, or forbidden, by law. While our legal obligations are not necessarily equivalent to our moral obligations (Thiroux 1980: 15), Feinberg’s contribution here is illuminating.

Feinberg contends that harm makes someone worse off by “the thwarting, setting back, or defeating of an interest” (1984: 33). These interests are “distinguishable components of a person’s well-being” (1984: 34). Harm is regarded, in general, as a morally impermissible action, because it frustrates an interest or interests of the affected person, and this makes them worse off.

The notion of being worse off necessarily invokes the (possible) existence of two alternative states of affairs. These states of affairs are distinguished on the basis of a value judgement - we determine that one state of affairs is worse for a person than an alternative state of affairs which is better for them.

It is fairly uncontroversial to claim that it is possible to bring about the worse state of affairs for a given individual both by acting and by failing to act. For example, we can put someone into a state that is (considerably) worse for them by shooting them, or by allowing them to drown when we could easily have prevented this (Holtug 2002: 360). In both cases, two alternative possible states of affairs exist – one which is worse for the affected person, and one which is better. In the first case, we bring about the worse state of affairs by our direct action. In the second case, we fail to prevent the worse state of affairs from coming about by our omission.

Can we say that our moral behaviour in each case is equally morally blameworthy? In other words, is there a significant difference between acting to cause harm, and failing to act to prevent harm? This question has been hotly debated in bioethics<sup>91</sup>. The general consensus seems to be that this distinction, by itself, cannot tell us anything about the morality of the relevant behaviour without knowledge of relevant, additional facts about the context of the situation (for example, the intentions of a person in acting or failing to act).

In the example provided above, for instance, we might be inclined to regard the harmful action of shooting to be more seriously wrong than the harmful omission of failing to prevent drowning (although we would tend to regard both sorts of behaviour as being generally morally reprehensible), even if they resulted in equivalent harm for the affected individuals (the loss of life as opposed to its continuance). This is because we might have to consider the extent to which the act or omission was carried out with deliberate, pre-meditated intention, which would increase the associated level of blameworthiness. However, this does not imply that the shooting was more seriously wrong *because* it was an act and not an omission (and therefore that acts are always more seriously wrong than omissions). In order to better illustrate this, we can instead imagine a situation in which the intention behind an act and an omission is identical.

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<sup>91</sup> This debate often centres on the distinction between “killing” and “letting die”, with specific regard to the debate around the morality of active and passive euthanasia respectively. For examples, see Beauchamp and Childress (2009: 174), Begley (1998: 865) and Hope (2000: 227).

Let us imagine that A stands to gain an inheritance upon the death of B, and therefore decides to kill B in order to receive this inheritance sooner. A decides that the least detectable method of killing will be to trick B into eating some poisonous mushrooms, the ingestion of which will certainly be fatal. However, the night before he can act upon this plan, he notices that B has himself mistakenly picked some poisonous mushrooms and is preparing them for dinner. A is aware that the ingestion of these mushrooms will kill B. He therefore simply fails to prevent B's death by notifying him of this fact. It is difficult to argue in this case that there is any moral distinction between A's planned action and his unplanned but deliberate<sup>92</sup> omission.

We have now established that moral agents can inflict wrongful harm both by acting and by failing to act. We have also established that the notion of harm necessarily invokes two alternative states of affairs, one which is better and one which is worse for a person in terms of their interests, and that the harmed person is caused to be in the worse state of affairs when the better state of affairs would have pertained in the absence of the harming action or omission. We must now distinguish between two alternative delineations of harming. The first maintains conceptual integrity by introducing a clear distinction between harm and non-benefit, but at the cost of excluding from the category of harmful behaviour omissions that we usually regard to be harmful. The second threatens to collapse this distinction, but also accords with our commonsense intuition that some instances of non-benefit *are* harmful.

### ***Two conceptions of harm***

The two delineations of harm which I wish to discuss in this section differ in their description of the harmed agent's prior position. The first categorisation of harmful behaviour regards it as necessary, in the case of both acts and omissions, that the prior position of the harmed agent is the better position. The second categorisation, on the other hand, allows that, in the case of harmful omissions only, the prior position of the moral agent may be in the worse position. In the first case, a harmed person is made worse off than he was before, and, in the second, a harmed person is made worse off than he could have been.

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<sup>92</sup> In other words, for an omission to be morally similar to a (deliberate) action, it must be the case that the agent who fails to perform a particular action is aware that this failure will result in a particular result, and deliberately chooses not to act regardless. In so doing, he makes himself responsible for the result.

*Harm makes one worse off than one was before*

The contention that harm makes one worse off than one was before entails that a harmful behaviour (whether an act or an omission) moves a person from a position which is better for them to a position which is worse for them. In other words, for a behaviour to count as harmful, it is necessary for the harmed person to have been in a better position before the (causal) behaviour or event began which moved them from this prior position into a worse position. The harmful behaviour therefore causes the interest of the harmed person to be set back, where in the absence of that behaviour this setting back would not have occurred. This condition, when regarded to be necessary for a behaviour to be considered harmful, is described by Feinberg as “the worsening test” (1992: 7).

To illustrate how one’s interests may be set back by either an act or an omission, we can refer back to the example of blindness. One’s interests are set back when one is blinded because one is deprived of one’s interest in seeing, along with one’s interest in all the “future worthwhile experiences and opportunities for which...seeing [is] necessary” (Hall 2008: 80). Harm which passes the worsening test only results, in this example, when one is moved from a position where one is able to see into a position where one is blind. This can occur as a result of an action, whether deliberate or negligent (the harming agent A intentionally and actively damages the eyes of B or negligently performs particular actions which run a great risk of damaging the eyes of B). It can also, however, result from inaction or omission (A is aware that B has contracted a disease which will inevitably lead to blindness, but chooses not to act to counteract or cure this disease, despite A’s awareness that such a cure is easily available and that only he can provide it). In the latter case, A allows B to move from the better into the worse position by his omission. In other words, he fails to “prevent a...decline in...[B’s] fortunes from [B’s] normal baseline” (Feinberg 1984: 136).

This is all very well, and thus far accords with our commonsense idea of harm. However, we should note what behaviours are excluded from the category of harm by the worsening test. If B presents with congenital blindness, or with a pre-existing condition of blindness, and A chooses not to counteract or cure this disease, despite A’s awareness that such a cure is easily available and that only he can provide it, A does not harm B, but merely fails to benefit him. Therefore, according to the first categorisation of harmful behaviours, “whether one is harmed by an event is determined by reference to where he was before” (Feinberg 1984: 54). It is



only a regression from this original position that is regarded to be harmful. The concept of harm, under this view, “requires [the] worsening [of] a prior condition” (Feinberg 1984: 99).

To further distinguish the meanings of harm and non-benefit according to the prescriptions of the worsening test, we can formulate these meanings in terms of net-loss or net-profit. If we regard a given individual’s “normal baseline” to be the point on the scale of interests where “a person’s interest line usually is, or at any rate where it was during the period before the present episode began” (Feinberg 1984: 138), harmful behaviour is the sort of behaviour which results in a net loss in interests for that person, in that they are made worse off than they were before. Anything which results in a gain in their net interests from their normal baseline, however, is “windfall profit” (Feinberg 1984: 138). In this regard, behaviour which prevents a loss in the interest scale from the baseline is construed as “active aid”, whereas behaviour which brings about a profit in the interest scale is construed as “gratuitous benefit” (Feinberg 1984: 130).

Why might we think that this limited description of harm is problematic? A conceptual categorisation, as mentioned with regard to the treatment-enhancement distinction, has no moral significance in and of itself, unless distinctions between concepts also tell us something about the relative moral importance of particular behaviours. To determine whether this is the case, we must look at the moral weight which is given to the distinction between harm and non-benefit.

#### *The moral distinction between harm and non-benefit*

When we think about our moral obligations, we usually conceptually separate “[o]bligations not to harm others” from “obligations to help others” (Beauchamp & Childress 2009: 150). These are often expressed as the duties of nonmaleficence and beneficence respectively. Ross states that duties of beneficence “rest on the mere fact that there are other beings in the world whose condition we can make better”, while the duties of nonmaleficence “may be summed up under the title of ‘not injuring others’” (1930: 22).

The distinction between these two sorts of duties is relatively clear. While “we are not morally required to benefit persons on all occasions, even if we are in a position to do so”, we do think that we have a prima facie duty not to harm others. In other words, “we are not morally required to perform all possible acts of generosity or charity that would benefit

others” (Beauchamp & Childress 2009: 199), but we are, as a general rule, obliged not to harm others, in the absence of competing moral obligations. There is clearly some sort of relation between this notion of harm, in terms of its prima facie moral prohibition, and Mill’s legalistic suggestion that “the only purpose for which power can be rightfully exercised over any member of a civilised community, against his will, is to prevent harm to others” (1956). We tend to think of harms as the sorts of actions, or inactions, which we are always required to avoid because of the moral claims which other agents have upon us.

In other words, “nonmaleficence is apprehended as a duty distinct from that of beneficence, and as a duty of more stringent character” which is “prima facie more binding” (Ross 1930: 22-23). We *generally* regard the obligations of nonmaleficence to be of more moral importance than the obligations of beneficence (Beauchamp & Childress 2009: 150), and this is related to the fact that we *always* have a conditional duty not to harm others, but *do not always* have a prima facie duty to benefit others.

Note that this does *not* imply that the moral obligation not to harm is *always* of greater moral strength than the duty to benefit. We do sometimes think that we have a strong “moral *obligation* to act for the benefit of others” (Beauchamp & Childress 2009: 197). For example, in the example above, we would tend to think that A’s obligation to provide B with the easily available cure for blindness is of far greater strength than his obligation not to harm B in some trivial way, because the impact on B’s interests is much greater in the former case than the latter.

However, when we have such a strong obligation to benefit, we tend to express that obligation in a particular way. Because we might regard the obligation to benefit, where the benefit is of a great magnitude and of a particular kind, to be a prima facie duty of the type that prohibits harm, we tend to want to formulate this duty in such terms. In other words, we want to say that some instances of non-benefit are harmful, regardless of the prior position of the affected agent. This is because we might think of some sorts of non-benefits as inactions which we are required to avoid as a result of the moral claims which other agents have upon us, and we normally describe these sorts of inaction as harmful. This inclination is expressed in the second, and alternative, categorisation of harm that I will now describe.

*Harm makes one worse off than one could have been*

The second conceptual connotation of harm does not take into account the prior position of the harmed agent. Instead it regards harm broadly as deriving from any event, intervention or omission which makes the harmed agent worse off *than he could have been*. This is expressed by Feinberg in “the counterfactual test”, which holds that harmful behaviour occurs when “B’s personal interest is in a worse condition...than it would be in had A not acted<sup>93</sup> as he did” (Feinberg 1992: 7).

This definition includes in its scope all those instances of harm that are included under the first definition, whereby interests are set back from a prior, superior position to a position in which one is worse off. However, it also includes under the category of harmful behaviour those sorts of behaviours which “thwart” or “impede” (Feinberg 1984: 33) the advancement of interests from a worse prior position to a better position. In other words, A’s failure to provide B with a cure for his congenital, prior blindness thwarts his interest in achieving sight, and therefore puts B in a worse position than he could have been in. Under the counterfactual definition of harm, A’s failure to benefit B is harmful to him.

There is no doubt that, as it is stated above, the counterfactual description of harm collapses the distinction between harm and non-benefit. Any omission that fails to put me into a better position than I could otherwise have been in, by the above description, harms me. Quigley and Harris feel that, because of the “continuum between harms and benefits”, it follows that “to decide to withhold a benefit is in a sense to harm the individual we decline to benefit” (2007: 129). In other words, your failure to give me R 1,000 thwarts my interest in having an extra R 1,000 and put me into a worse position (not having an extra R 1,000 to spend) than would have otherwise been the case (having an extra R 1,000 to spend). However, our moral intuition is that your omission here is not harmful. It therefore seems that we must add something to this definition, in order to specify which kinds of non-benefit cause harm.

Feinberg’s solution to this problem is to introduce the notion of a “harmed condition”. A harmed condition is regarded to be a condition which is (substantially) “below the centreline” (1984: 54). Such a condition is “a state in which a person is handicapped or impaired...that has adverse effects on his whole network of interests” (1992: 6). Feinberg seems to imply

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<sup>93</sup> “Acted” here is broadly construed to include omissions.

that failures to act which keep a person in such a harmed condition, when remedy is (easily) available, constitute harmful behaviours:

If the point of the interest curve...is near the bottom of the chart, then the conduct of another that prevents it from improving can itself be harmful. When a person's situation is bad enough, simply to maintain it there when one could let it improve, may be to harm that person (1992: 5).

By this definition, the failure to benefit congenitally blind B by providing the easily available cure for blindness keeps him in a harmed condition (the state of blindness) and is therefore harmful to him. My lack of an extra R 1,000 is not a harmed condition, because I am not impaired in a way which affects my whole network of interests by my lack of R 1,000<sup>94</sup>, and therefore I am not harmed by your failure to provide me with this, despite the fact that this failure puts me into a worse condition than I could otherwise have been in.

What does all of this imply? It seems that the counterfactual definition of harm is trying to capture some specific quality of certain kinds of benefits. This quality seems to be that certain kinds of benefits promote the interests of moral agents in a particular sense which renders the provision of these benefits *prima facie* moral obligations. In other words, all that we are trying to say by the assertion that a particular act or omission is harmful is that we have a *prima facie* moral obligation not to behave in such a way, because of the particular type of impact that such an act or omission will have on the fundamental interests of moral agents. Therefore, the failure to perform any *prima facie* obligatory act of beneficence is by definition harmful, whereas the failure to perform optional or supererogatory acts of beneficence is not.

Throughout this chapter, I have argued that we have a *prima facie* obligation to provide (certain kinds) of enhancements to moral agents. Does this imply that a failure to enhance is *per definition* harmful, in the counterfactual sense which I have developed here?

Feinberg's description of a harmed condition as one which is "below the centreline" seems to suggest that this is not so. His contention seems to be that we only have a moral obligation to benefit moral agents when they are in such a harmed state. In other words, Feinberg, who

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<sup>94</sup> Note that I could be in a harmed condition as a result of my lack of R 1,000 if I were in a condition of extreme poverty – this would indeed be a condition in which I am impaired in a way which affects my whole network of interests. See footnote 87.

approaches the topic from an entirely different angle, seems to reinstate the moral distinction set up by the normal function model between acts of improvement which move a moral agent towards the centreline, or normality, and acts of benefit which go beyond this.

However, it is worth repeating Feinberg's definition of a harmed condition at this point. Such a condition is "a state in which a person is handicapped or impaired...that has adverse effects on his whole network of interests" (1992: 6). The handicap or impairment here is constructed relative to the idea of the centreline. In other words, the implication is that those of us whose *welfare interests* (which are the basis for our "whole network of interests") are considerably impaired in relation to others (by disease, disability, or possibly extreme negative divergences from the centreline in our socio-economic circumstances) are disadvantaged by this impairment, so that our fundamental interests are thwarted in a way that is harmful to us.

I must now return to the case which I made above for the moral obligation to enhance, and evaluate this moral obligation in these terms, to determine whether a failure to enhance might place the unenhanced in a "harmed condition".

### ***The harm of disadvantage***

The first case which I will make for the harm of non-enhancement is fairly simple, because it relies upon the contention, described above, that disease conditions are harmful to us, in that they constrict our range of opportunities (or welfare interests) in comparison to others. This seems to be exactly what Feinberg has in mind when he refers to "a state in which a person is handicapped or impaired...that has adverse effects on his whole network of interests" (1992: 6). Disease and disability can handicap us in comparison to others who are not so impaired. They affect our functioning in ways that limit the range of opportunities that we can enjoy. However, as I have argued above, some disease conditions may affect the functioning of individuals in ways that are comparable to the effect of an overall level of functioning that falls within the lower ranges of natural variation. It is not always the case (although it is generally the case) that disease conditions reduce our general capacity to flourish more than natural variation, and therefore, we might consider a state of disease or disability and a state of natural variation which have equivalent effects upon overall functioning to be equally harmful states which require restitution. In other words, both disadvantageous states of disease and disability and disadvantageous states within the lower ranges could be harmful conditions in which we are impaired in a way that affects our whole network of interests.

We can refer back to the case of low levels of impulse control to illustrate this. As the study described earlier in this chapter seems to show, the ability to delay gratification has a strong predictive value with regard to how well our lives go in general. Those with lower levels of this ability are therefore impaired in comparison to others who are better able to exercise impulse control, and this impairment affects their whole network of interests. In other words, the former group are *generally* less competent with regard to their ability to achieve their individual goals or to advance *all of* their ulterior interests. This seems to satisfy all the prerequisites for a state to be considered harmful, according to the counterfactual model of harm.

Therefore, it seems that we ought to regard a failure to intervene to correct such harmed conditions to be equivalently harmful (even if this harm is not equivalent to the harm which results from a failure to correct disease conditions which inhibit overall functioning to a greater extent), whether this harmed condition results from disease or natural variation. We therefore have a moral obligation not to bring about such harm by the omission or the non-provision of enhancement.

### ***The harm of species-typicality***

Can we also regard a failure to enhance beyond species-typicality to be harmful in a sense that it is a morally prohibited act of non-beneficence? My foregoing argument that enhancement beyond the normal ranges is also *prima facie* morally obligatory seems to suggest this. Let us consider this argument again with relation to the description of counterfactual harm.

Harm, as I have described, invokes the possible existence of two possible states of affairs – one which is worse, and one which is better for a moral agent. Where we are describing harms which result from non-benefit, these states of affairs differ in terms of the relative position of a moral agent's *welfare interests*, which are foundational to well-being and to the achievement of all ulterior interests. In other words, harmful non-benefit impairs moral agents by detrimentally affecting their whole network of interests. Non-benefit is only *prima facie* harmful when it concerns the failure to improve capacities which are the preconditions for any sort of human flourishing. We may think other sorts of non-benefit are harmful under particular circumstances (for example, in the context of special relationships), but these sort

of non-benefits do not belong to the category of non-benefits that are always *prima facie* harmful.

Does the case of non-enhancement belong to the category of conditionally optional non-benefits or harmful non-benefits? I want to argue that the failure to enhance, where enhancement is readily available, falls within the latter category. This is because an unenhanced condition, in the context where an enhanced condition is available, impairs the moral agent, in comparison to what otherwise could have been, in a way which affects their whole network of interests. Therefore, non-enhancement, where enhancement is available, is a harmed condition.

To illustrate this, let us consider the enhancement of cognitive functioning. Our level of cognitive functioning affects our whole network of interests, because an increased level of this sort of functioning generally improves our ability to achieve all of our ulterior interests. When we choose not to enhance this sort of functioning, we therefore bring about a worse state of affairs for the affected unenhanced moral agent than would pertain if we were to choose enhancement. In comparison to the enhanced state, the unenhanced person is impaired by their lower level of cognitive functioning in a way which affects their whole network of interests. This may not represent a disadvantage in comparison to others (unless others were enhanced in this way) but this is immaterial. Disadvantage can be harmful in ways which require correction, but this is an additional and independent motivation for moral action which is distinct from the motivation which considers that the promotion of our welfare interests is generally good for a person. If an unenhanced state diverges negatively from an enhanced state in a way which affects one's whole network of interests, and therefore affects one's ability to flourish, this seems to imply that this unenhanced state is, in comparison to the possible enhanced state, a harmed condition.

The motivation for enhancement, in this regard, is similar to and continuous with the motivation to provide medical therapies, the non-provision of which we regard to be harmful. This motivation is the imperative to promote human welfare in general by improving human capacities that are the precondition for flourishing beyond the sup-optimal level provided to us by evolution, and this motivation is not limited to the achievement of "normal functioning", as I have argued earlier in this chapter.



As Quigley and Harris point out, “the moral imperative, and the most usual moral motive, for medical interventions is not to return an individual to ‘normal’ functioning, but to change their condition where possible for the sake of the harms these changes will prevent or palliate and the goods that this will bring about” (2010: 124). We think that we harm people by not treating them when we are able to because this brings about a worse situation for them, in terms of their possibilities for flourishing, than would otherwise be the case. This is precisely the type of harm which results from the failure to provide (particular kinds of) enhancement.

The possible successful future development of enhancement technologies, in other words, provides us with an alternative to the level of functioning which we currently enjoy. It provides us with a conceivable state of affairs which is better for moral agents than the alternative, in terms of their possibilities for well-being. We are now obliged to “make a choice” between “the natural lottery [and] rational choice” (Savulescu 2005: 39), as we have previously had to make a choice when deciding whether to intervene via therapeutic and environmental enhancements. I do not believe that this is a choice of no moral significance. I believe that a failure to choose enhancement could be harmful to moral agents, as this would amount to the thwarting of our fundamental interest in the promotion of capacities which determine the extent to which we will flourish. Non-enhancement, in the context where enhancement is available, is a harmed condition, because we are handicapped or impaired in a way that has adverse effects on our whole network of interests, in comparison to the alternative of enhancement. We are therefore made “worse off than [we] otherwise *could have been*” in a way that has a fundamental effect on our welfare (Quigley & Harris 2010: 125). Failing to enhance is therefore always *prima facie* harmful.

## **Conclusion**

In this chapter, I have argued in favour of a general moral obligation to enhance. This moral obligation is derived from the same reasons that suggest that we are morally obligated to provide medical treatment, namely, the requirement that we should try to reduce unfair disadvantage, and the requirement that we ought to promote human well-being by advancing our welfare interests. When we reject available enhancements, we harm moral agents by putting their welfare interests in a worse state than they could otherwise have been in.

However, there is a great deal more to be said about this prima facie obligation, with regard to its application in a practical context. In the next chapter, I will consider what such a practical application might entail.

Firstly, I need to define the category of morally obligatory enhancements in greater detail. I will do so by attempting to make some suggestions as to which kinds of enhancement will be likely to promote our welfare interests. I will distinguish these enhancements from enhancements that are morally impermissible, and enhancements that are merely optional.

Secondly, as I have argued, the obligation to enhance is not of equal strength in every case, nor does it necessarily trump other ethical considerations which we might need to take into account. Therefore, I will try to imagine how we might balance the obligation to enhance against such considerations.

Finally, I will consider the role of special relationships in the provision of enhancement interventions, and in particular, the relationships between parent and child, and the state and its citizens.

## 5 What, How and Who?

### Introduction

My goal in this dissertation has been to make a case for a prima facie moral obligation to enhance. I have argued in the previous chapter that this obligation derives from two factors. Firstly, we may be obliged to enhance in order to counter for undeserved, and unfair, disadvantage which results from normal variation. Secondly, we may be obliged to enhance as a result of the general obligation which we have to promote well-being by advancing the welfare interests of moral agents. I have argued that it is precisely the imperative to promote human well-being in this way which has been the impetus for the development and application of medical technologies, as well as for the environmental enhancements which have characterised human civilisation from the outset. These interventions are motivated by the recognition that the species-typical functioning that we are endowed with by the process of evolution is not optimal functioning, from the perspective of human welfare, and that we ought to improve upon this functioning if we are able. As such, genetic and other forms of biotechnological enhancements are simply the latest additions to an overarching category of enhancements of species-typical functioning which have been undertaken in response to the moral obligation to promote the welfare interests, and the possibilities for flourishing, of moral agents.

However, the prima facie moral obligation to enhance which I have established here requires further qualification. Such qualification is necessary in order to provide some idea of how the moral obligation to enhance ought to be interpreted in practical terms. In this chapter, I will consider three questions that must be posed in this regard. First of all, *what* interventions are to be included under the category of morally obligatory enhancements? Secondly, *how* do we balance the moral obligation to enhance against other practical and ethical considerations? Thirdly, *who* are we obliged to enhance?

The first question requires me to define the category of morally obligatory enhancements in greater detail. I have argued that these are the sorts of enhancements which will tend to promote the welfare interests of moral agents. However, there are many interventions which we usually call enhancements which do not tend to promote these sorts of interests. I therefore need to clearly distinguish these types of interventions from the category of morally

obligatory enhancements. In doing so, I will acknowledge that some kinds of enhancements are indeed morally impermissible, while others are permissible but not required.

The second question arises due to the fact that the moral obligation to enhance is not necessarily our primary duty under all circumstances. Rather, it is *prima facie* in nature. *Prima facie* duties must be evaluated in context, and balanced against other considerations, in order to determine what the direction of our action ought to be. With regard to the *prima facie* duty to enhance, there are two distinct questions which we can ask. Firstly, and taking into account that our resources are limited, how do we balance the duty to enhance against other important moral duties which we have? Secondly, what other negative consequences might arise as a result of the fulfilment of the widespread obligation to enhance, and might the imperative to avoid these consequences negate this obligation?

The third question invokes the notion of special relationships, and asks who we are required to enhance. The obligation to enhance, when this obligation is directed towards all moral agents equally, seems to be so weakened by this latter condition that it ceases to be significant or meaningful. However, I will argue that our practical obligations in this regard ought to be modelled upon the way in which we conceive of the obligation to provide healthcare and environmental interventions such as education. My discussion here will focus on two sorts of special relationships – the relationship between parents (or caregivers) and children, and the relationship between the state and its citizens.

I will consider each of these three questions in turn.

### **What are morally obligatory enhancements?**

In the previous chapter, I argued that the provision of enhancements *that tend to promote welfare interests* is *prima facie* morally obligatory. I have suggested that these sorts of enhancements are those that improve capacities which serve as general-purpose means to our more ultimate ends. However, I now need to define this category of enhancements in greater detail. My main objective, in this regard, is to emphasise that this category does not include many interventions which we currently refer to as enhancements. In other words, not *all* enhancements are morally desirable to the extent that their provision constitutes a moral duty. In fact, some sorts of enhancements could very well be morally impermissible, while others

are morally permissible but not required. To show why this is so, we can begin by making a distinction between two principal ways in which enhancement is defined.

### ***Enhancement as augmentation and enhancement as improvement***

The concept of enhancement can be used to imply either *augmentation* or *improvement*<sup>95</sup>, although these two senses of enhancement are often conflated. To enhance in the first sense is to “raise in degree [or to] heighten” (Burchfield 1989), to “add to” (Hornby 1974), to “make higher or greater” (Mackwardt 1995), to “intensify or increase”, or to “augment” (Butterfield 2004). In this first sense, enhancement of a particular function or attribute simply denotes the *augmentation* of a particular function or attribute. However, because the augmentation enacted by enhancement is frequently also considered to be an increase in “quality”, “value” (Butterfield 2004, Robinson 1999), “desirability, or attractiveness” (Gay 1984), to enhance can also be taken to mean to “improve” (Butterfield 2004, Gay 1984, Robinson 1999). The first sense of enhancement is value-neutral, while the second sense encompasses the first in that it accords with the notion of enhancement as augmentation, but also implies a value judgement, in that the augmentation referred to as an enhancement is specifically regarded to be an improvement. Some dictionary definitions define enhancement only in the first sense (Burchfield 1989, Hornby 1974, Mackwardt 1995), while some conflate both meanings (Butterfield 2004, Gay 1984, Robinson 1999).

Defining enhancement in the second sense, without qualification, clearly denotes an element of normative force, and this is misleading (Shickle 2000: 342). John Harris, whose argument in favour of enhancement I considered in Chapter 3, seems to define enhancement in this sort of normative way by insisting that enhancement “is good for you!” (Harris & Chan 2008: 338). He claims that, where the term is used in connection with human functioning, “an enhancement is by definition an improvement on what went before. If it wasn’t good for you, it wouldn’t be an enhancement” (Harris 2007: 9). This claim is disingenuous. Defining an enhancement as an intervention which is self-evidently good for human persons, because it is an improvement, already suggests that such an intervention is (morally) desirable and ought to be pursued, without the need for further argument. However, as I shall show, this classification of enhancement is unreliable, as it does not capture the entire spectrum of

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<sup>95</sup> Chadwick refers to these two senses of enhancement respectively as “the additionality view”, under which enhancement is “understood quantitatively”, and “the improvement view”, under which enhancement is “understood qualitatively” (2008: 26). See also Kalokairinou (2011: 176) on this distinction.

interventions which we can call enhancements, and this needs to be made clear to avoid circularity.

This can be illustrated by referring back to a further distinction which I introduced in the previous chapter. This distinction is between the enhancement (as augmentation) of local functioning and the enhancement (as improvement) of overall functioning. Local enhancement is a necessary precondition for general enhancement to occur, but this does *not* imply that local enhancement *always* results in general enhancement. In other words, enhancement is, in the first place, always a “local affair”, which simply implies the augmentation “of a capacity or function, with no assumption that this means an improvement in well-being overall...for the individual who is enhanced” (Buchanan 2011: 57).

The distinction between local and general enhancement is also developed by Savulescu, Sandberg and Kahane (2011: 3-18). In their discussion of the various approaches which are taken to the topic of enhancement, they distinguish between “functional” and “welfarist” definitions of enhancement. The “functional approach” which they identify corresponds to what I have described as local enhancement. In other words, functional enhancement is simply the augmentation of the functioning of a particular (local) capacity (2011: 6). The “welfarist account of enhancement”, on the other hand, refers to “human enhancement” in a more general sense. An enhancement, by this account, is an intervention which brings about “[a]ny change in the biology or psychology of a person which increases [their] chances of leading a good life in the relevant set of circumstances”<sup>96</sup> (2011: 7). Enhancement in this latter sense therefore implies general improvement.

Again, we should note that not all instances of local (functional) enhancement lead to general (welfarist) enhancement. In other words, not all augmentation leads to improvement. This is most evident when we consider that we can describe the augmentation of local capacities or characteristics that we *do not value* as enhancement. For example, it makes conceptual sense to say that we can enhance the tendency towards alcoholism. This would imply that such a tendency is increased or augmented, although this sort of local enhancement would clearly not result in general improvement or contribute towards welfare. Because we do not value the tendency towards alcoholism (as this tendency does not contribute towards, and in fact detracts from, our chances of leading a good life), the enhancement of this characteristic will

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<sup>96</sup> As the authors point out, this is compatible with regarding medical treatment as a kind of enhancement, which corresponds with the argument that I advanced in Chapter 4 (Savulescu, Sandberg & Kahane 2011: 8).

never bring about general enhancement. Such an enhancement would be likely to make our lives worse, would harm us, and would therefore be morally impermissible in a fairly straightforward way.

The undesirable effect of enhancement in the above example derives from the fact that the enhanced local characteristic is not likely to increase our chances of leading a good life under *any circumstances*. However, there are other sorts of capacities and characteristics, the enhancement of which would contribute towards our chances of leading a good life only under some sets of circumstances and not others. These circumstances would include the particular social context<sup>97</sup>, but would also include relevant facts about the individual who is to be enhanced.

### ***Conditional welfarist enhancements***

The enhancement of local functionality only contributes towards welfare in situations where the relevant function or capability contributes towards overall functionality *for the individual concerned*. Some functions or capabilities are general-purpose, as I shall argue shortly, but others are useful only with regard to the advancement of particular ulterior interests. Therefore, the extent to which certain enhancements are likely to contribute towards our chances of leading a good life is conditional upon what our specific goals and life plans are.

To illustrate this, we can consider a purely aesthetic enhancement, which is already relatively common in society. Breast enhancement surgery (also referred to as breast augmentation surgery) results in the augmentation or increase of a particular local attribute. However, whether this local enhancement also results in a general *improvement* depends on the particular ulterior interests, and aesthetic values, which a particular individual holds. The British glamour model Jordan, who has undergone multiple breast enhancement surgeries, clearly experiences her increased breast size as a general improvement which contributes towards her level of well-being, but it is doubtful that this would be the case for many, if not for most, women. Her particular ulterior interests, aesthetic values and life plan imply that this is an improving enhancement for her. However, for others who have different ulterior interests, or different aesthetic values, this would not be the case. For some, it might have no impact on their general level of well-being at all. For others (for example, those who have

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<sup>97</sup> For example, and as noted in Chapter 4, the enhancement of local function which provides the basis for literacy would only increase our chances of having a good life in a literate society.



ulterior interests in being runway models), it would have an extremely negative impact upon their ulterior interests and chances of leading a good life (by their standard), and this would imply that such an enhancement would be to their detriment.

It is not only physical, aesthetic local enhancements which are conditionally beneficial, however. The value of other sorts of local functions or capabilities may also depend upon one's particular conception of the good. Let us imagine that it is possible, via genetic enhancement, to increase one's musicality to the level of a virtuoso. Such an enhancement would be valued by one who had a particular interest in performing and enjoying music, as in this case the intervention would be experienced as a great contribution towards overall functionality, but this would not be the case for everyone. For some, it would have no impact upon one's chances of leading a good life at all (Brock 1998: 55), and if enhanced musicality implied a reduction in some other valuable local functionality, it would have a negative impact. Even an enhancement which would contribute towards well-being for many people, for example, the enhancement of height, could have a negative impact upon overall functioning for someone who had an ulterior interest in being a jockey. I will call these kinds of interventions, where the contribution towards welfare is conditional upon specific facts about the individual, *conditional welfarist enhancements*.

### ***Universal welfarist enhancements***

Not all local enhancements are only conditionally beneficial, as I have implied in the previous chapter. In other words, there are some sorts of functional abilities and capabilities that contribute towards welfare under any circumstances. These sorts of capabilities are general-purpose, and function as "prerequisites to whatever mode of life [a] person may wish to achieve" (Von Hirsch 1986: 704-705), and which enhance "the capacity of the individual to make genuine choices among a meaningful range of life plans" (Fox 2007: 7). The local enhancement of functioning in these cases would, I have argued, always tend to result in general improvement, as this would constitute an improvement of our general ability to promote our individual ulterior interests, whatever these may be. I will refer to these sorts of enhancements as *universal welfarist enhancements*, as these enhancements would be likely to promote welfare in a way that is universal for all human beings. This category will correspond to those enhancements which will tend to promote our welfare interests. What kinds of enhancements might meet these conditions?

An initial objection to this question is that we cannot know which sorts of enhancement will contribute towards the chances of leading a good life, as we are not in a position to make judgements, from an objective perspective, as to what kinds of lives are “better” than others (Graham 2002: 171). Due to value pluralism, it is not clear that we could identify “any adequate grounds for basing such decisions on one set of values rather than another” (Glover 1984: 45). Because of this strong pluralism as to what constitutes a good life, it is not possible, under this view, to identify a particular set of characteristics that will always tend to contribute to our possibilities in this regard. Murphy makes this point as follows:

There are many ways with which to frame and pursue a good life, not all of which – perhaps not even most of which – require that people have the greatest intelligence they can have, the greatest memory they can have, the greatest athletic ability they can have, and so on...it is simply not true that human life is meaningful only to the extent that people have physical or psychological capacities that set them head and shoulders above everyone else (2009: 44).

We can illustrate this problem by referring to the “great prominence...given to intelligence” in “the literature written by scientists” (and, we could insert here, by academic philosophers) about the topic of genetic enhancement (Glover 1984: 46). Is this prominence due to the fact that intelligence is universally valuable with regard to the chances of leading a good life, or is this latter conviction in fact based upon a *particular* conception of the good life common to these kinds of professionals? Others with alternative conceptions of the good might well suppose that there are other sorts of characteristics that are far more generally valuable. A professional athlete or avid sports fan may be more inclined to value athleticism. A clergyman or social campaigner may be more inclined to value moral sensitivity or empathy. A businessman may be more inclined to value strength of character or confidence. In each case, these evaluations are made from a particular standpoint, and therefore cannot be generalised.

The problem with this objection is that it expresses considerable pessimism as to the possibility of making judgements about the value of certain capabilities, in a context where we already make these kinds of judgements all the time. We think it is universally good to eliminate disease via medical treatment, and we tend to place more moral emphasis on the eradication of diseases that place considerable limits upon overall functioning and therefore upon opportunity ranges, as I have discussed in the previous chapter. This indicates that we recognise that certain functions or capabilities are universally valuable, and that inhibition of

these functions impacts upon our ability to flourish regardless of our particular conception of the good. In addition, “we think that encouraging some qualities rather than others should be an aim of the upbringing and education we give our children” (Glover 1984: 52). We think that these sorts of qualities are universally valuable to the extent that state intervention is justified where the environmental inputs which are directed towards their promotion fall short of some decent minimum. As Steiner points out, “legal actions have already been brought or proposed, not only against parents or guardians for smoking or drug-taking during pregnancy, for child abuse, and for failing to curb truancy and aggression, but also against schools for educating badly” (1998: 140). These legal actions are deemed to be justified because the deprivation of certain kinds of environmental enhancements, and the resultant low capability levels in certain kinds of universally valuable functions, have a very general negative impact upon one’s chances of leading a good life. Universal welfarist enhancements will be those that improve upon capabilities that we *already* regard to be generally valuable in any conception of the good life. We can therefore once again turn to the question as to what these might be.

I have already speculated, on the basis of the evidence provided by empirical studies, that impulse control and intelligence may be two sorts of local capabilities which are very generally beneficial. The enhancement of these kinds of local functionality would seem to increase one’s chances of leading a good life in a very general way that would not depend upon one’s holding a particular conception of the good. Enhancement would increase the likelihood of human flourishing here, no matter what one’s ulterior interests are, and my contention here is also supported by others (Savulescu 2011: 11, Savulescu, Sandberg & Kahane 2011: 10). What other characteristics or abilities might be similarly general-purpose? Feinberg’s list of welfare interests (1984: 37) provides us with some possibilities here, which could include an increased resistance to disease, emotional stability and the ability to engage in meaningful social interactions. Other suggested characteristics are the ability to concentrate (Lewens 2009: 356), “memory, self-discipline, patience, empathy, a sense of humour, optimism, and...a sunny temperament” (Savulescu, Sandberg & Kahane 2011: 11), “physical mobility and coordination, visual and auditory perception,...reflectiveness, novelty seeking, and the capacity to abide adversity” (Fox 2007: 11). One could argue that all these traits seem to have a strong and relatively predictable impact upon how well our lives go, and that this impact does not depend upon particular facts about the individual. In other words, the functional enhancement of these kinds of local capabilities would be likely to bring about

general improvement, and would increase one's chances of leading a good life in a universal, non-conditional sense.

However, we should be careful of assuming *without qualification* that unbridled local enhancement of these general-purpose capabilities would always be morally obligatory, or, in other words, that such enhancement would always tend to promote our welfare interests and lead to general improvement. We need to take into account three possibilities here: firstly, that some sorts of general-purpose abilities might only increase our chances of having a good life up to some optimal level; secondly, that enhancement of general-purpose abilities might have simultaneous but opposite impacts upon our well-being; and thirdly, that enhancement of some general-purpose abilities might result in trade-offs with the functional level of other general-purpose (or conditionally beneficial) abilities.

### *Optimal levels of functioning*

The first point raised above can be illustrated by considering the enhancement of hearing. This is a generally beneficial<sup>98</sup> ability (Brock 1998: 57) that underlies our ability to communicate and to interact with others in society. These are abilities which we would usually regard to be very generally beneficial, and the enhancement of which would tend to promote one's chances of leading a good life no matter what our ulterior interests are. Does this imply that local enhancement of hearing is always good for us? This might be true up to some optimal level, but an enhanced ability to hear which goes beyond this level might have a *negative* effect upon overall functionality, by making it difficult to interact with others as we could experience aural stimuli as "too loud". This, for example, is why many patients who are hearing impaired complain that their hearing aids (which function as technological enhancements of hearing by amplifying noise) do not improve their functional ability overall (and therefore do not increase their chances of having a good life) as they make background noise "annoying, distracting, or unacceptable" (Kochkin 2000: 36). In this case, an improved functional ability *beyond an optimal level* would not result in an improved ability to communicate, and would therefore not be generally beneficial. While we can only speculate, it is possible that this might be the case for other valuable general-purpose abilities as well,

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<sup>98</sup> There is some evidence, however, that hearing ability is not universally valued. For example, some culturally Deaf parents have taken active steps to ensure that they have children who are also deaf. This desire arises from a perspective which "view[s] deafness from the cultural or sociological perspective" and maintains that "deafness is a condition to be...preserved" rather than a "pathology to be treated or cured" (Middleton, Hewison & Mueller 1998: 1175).

such as self-discipline, intelligence, empathy, or optimism<sup>99</sup>. The enhancement of these capabilities up to some optimal point might improve our chances of leading a good life, but enhancement beyond this point could negatively impact upon welfare.

### *Complicated effects upon welfare*

The second concern is that the improvement of a local (general-purpose) functional ability might constitute a general improvement in one sense, but might detract from overall functionality in another sense. We can refer back to an example from animal experimentation to illustrate this. As noted in Chapter 2, there is some evidence from such experimentation that suggests that the genetic enhancement of memory is possible, and we tend to think that increased memory is a general-purpose characteristic that is useful no matter what our ulterior interests are. However, we should recall what was revealed by the example of animal experimentation provided. The improvement of memory in this case *also* appeared to increase pain perception. Therefore, it might be the case that enhanced memory would improve our general functional ability in one way (by increasing our intelligence, or at least our capacity to learn and recall), but would reduce our level of general functioning in another way (by for example, increasing the intensity and duration of our recall of traumatic and painful experiences, thus heightening the impact of these experiences upon us and our aversion to future experiences which we associate with them). In this case, it would not be clear whether the balance here would imply an overall reduction or increase of the level of general functioning.

### *Questionable trade-offs*

The third possibility identified above questions whether the enhancement of some general-purpose abilities might reduce the functional level of other valued capacities. For example, imagine that one could genetically enhance the capacity for impulse control, which would be very generally beneficial, but only at the cost of reducing the capacity for creativity. This implies a trade-off between different local functional abilities (Chadwick 2008: 29), and it would not always be clear whether the balance would imply an overall increase, or overall reduction, of one's chances of leading a good life.

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<sup>99</sup> The idea that some characteristics or abilities may only be generally beneficial at some optimal level is reminiscent of Aristotle's description of virtues as the mean between two opposing vices (Urmson 1973), although this is not a relation that I can pursue here.

### *Three moral categories of enhancement interventions*

What are the implications of the foregoing discussion for the posited prima facie obligation to enhance? While these implications should be relatively clear in the context of the argument which I advanced in the previous chapter, this is worth stating explicitly. It seems that we can separate enhancement interventions which augment local functionality into three categories – morally impermissible enhancements, morally permissible but not required enhancements, and morally obligatory enhancements.

#### *Morally impermissible enhancements*

In the previous chapter, I argued that we are prima facie morally prohibited from harming moral agents, by putting them in a worse situation than they could otherwise have been in. The category of morally impermissible enhancements therefore includes any enhancement which is likely to make things worse for moral agents, by diminishing the possibility of leading a good life.

We can firstly point out that any enhancement which would pose unacceptable risks of harms to moral agents because of a high possibility of unintended side effects, regardless of which local functionality it is directed toward augmenting, would be morally impermissible, and that this impermissibility would remain in effect until these risks can be countered. This effectively implies that genetic enhancement of human beings is, currently, generally morally impermissible, as research into this topic is still in its infancy, and any attempt to genetically enhance human beings would be fraught with risk. As scientific knowledge advances, however, this general level of risk is likely to be reduced. However, I would like to argue that some sorts of enhancement will *always* be morally impermissible, even when their effect can be predicted with some certainty, and that this will be the case when this foreseen effect is likely to have a negative impact upon the welfare of moral agents. For example, it is uncontroversial to claim that the enhancement of negative characteristics which would decrease one's chances of having a good life ought to be morally prohibited. However, these are not the only sorts of enhancements that are morally impermissible. Some conditional welfarist enhancements might also decrease one's chances of having a good life, when they are not chosen by the enhanced person themselves.

As previously discussed, we do not all have the same ulterior interests, or the same conception of the good. Where the contribution towards welfare of a specific enhancement intervention is conditional upon specific facts about the individual, that intervention must be chosen by the individual themselves, or the given intervention could in fact reduce the possibility of leading a good life from the perspective of that individual. This is especially the case when such enhancements could constrict one's range of opportunities, by closing off some possible life plans. Therefore, enhancements which promote ulterior interests, or which are directed towards a particular life plan, are morally impermissible unless chosen by the person to be enhanced themselves.

This prohibition is especially relevant when it comes to parents who seek to enforce a particular conception of the good or a particular life plan upon their children, and who might seek enhancement to these ends. For example, parents who hope that their children will one day be professional basketball players might wish to enhance their height, but this would close off other life plans to their children, and if these children ultimately developed ulterior interests in being gymnasts or jockeys, this enhancement would have reduced their chances of leading a good life.

What about enhancements that are directed towards particular ulterior interests, but which do not close off or constrict one's available range of opportunities? For example, what if it is possible to enhance musicality, without thereby reducing functionality in other areas, so that children are able to choose whether to make use of the relevant enhanced function later in life? These enhancements may not be directly harmful, as they do not seem to put the moral agent in a worse position than they could otherwise have been in (and if such a person was to develop an ulterior interest in a musical career, they would, in fact, be in a better position). Whether such enhancements ought to be prohibited is a difficult question. However, we should note that their use would probably be morally problematic in the context of a parental attitude which seeks to enforce a particular plan of life upon their children via enhancement. Parents who choose an enhancement which is directed towards a particular life plan, even where this enhancement does not technically close off other life plans, are clearly expressing some level of expectation that their children will indeed ultimately choose the life plan which the enhancement is directed towards, and this seems overly deterministic. It is not clear whether the balance should fall in favour of prohibition or permissibility in this case, as parents already necessarily exert some influence upon their children's values and interests,



and therefore their life plans, via environmental means. This question is therefore open to further debate.

However, we can tentatively suggest that decision-making around this issue ought to be guided by the moral demand that parents should “respect their child[ren]’s autonomy” by “ensuring that [they] come...into existence able to lead a lifestyle founded on values opposed to those of [their] parents”. This implies that parents’ use of enhancement interventions should equip “their child[ren] for any choices [they] might make” (Agar 2004: 126), rather than being prejudiced towards particular choices. Enhancement interventions ought to be sought with a view to maximising the possibilities of “self-creation and independence” (Glover 2006: 71), and in order to provide “an open future” (Feinberg 1980: 124). Enhancements chosen by parents that are directed toward a very specific life plan seem to flout these moral principles, and one might therefore suggest that they should not be permissible.

The category of impermissible enhancements would also include the enhancement of general-purpose capabilities, where this enhancement does not in fact promote general welfare. This might be the case when enhancement interventions augment local functionality in a way which exceeds some optimal level, or when enhancement of local function increases overall functionality in one way, but decreases it another way, so that it is not clear whether one’s chances for a good life are increased or decreased. This latter situation may also result when the enhancement of a particular local function reduces functionality of some other valuable capability.

The category of morally impermissible enhancements which I have described here recognises that “[n]ot all enhancements will be ethical” (Savulescu 2005: 38). When evaluating the permissibility of enhancement interventions, we should keep in mind the impact which such interventions would be likely to have upon welfare. Where this impact is negative or contentious, enhancement is morally prohibited.

This implies that enhancements that do have a positive impact upon welfare, or which “constitute an improvement, all things considered”<sup>100</sup> (Chadwick 2008: 34) *are* morally permissible. However, we can qualify a further distinction within this category, between enhancements that are permissible but not required, and enhancements that are generally

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<sup>100</sup> Or at the very least, that do not make things any worse.

morally desirable and which ought to be provided. Both these sorts of enhancements “must be safe” and must proceed with “a reasonable expectation of improvement” (Savulescu 2005: 38). In the former case, this improvement is conditional upon facts about the individual, whereas in the latter case, this improvement will *always* result from the given enhancement in a way that is universal.

#### *Morally permissible enhancements that are not required*

The category of enhancements that are permissible but not required roughly corresponds to the category of conditional welfarist enhancements that are *autonomously chosen* by the enhanced individual. These are permissible, in other words, when they constitute an improvement, all things considered, *from the perspective of the moral agents who choose them*. This is likely to be the case when these enhancements promote the (established) ulterior interests of the individual concerned, and when they are therefore likely to increase the likelihood of a good life for that individual. In this case, the use of enhancement technologies would be an “exercise...of self-determination” (Brock 1998: 55). However, because we are not (always) obliged to promote the ulterior interests of other moral agents, as I have argued in the previous chapter, the provision of these sorts of enhancement, while desirable from the perspective of the relevant individual, is not *prima facie* morally obligatory.

#### *Morally obligatory enhancements*

Finally, then, the category of *prima facie* morally obligatory enhancements includes those interventions which I have called universal welfarist enhancements, when these enhancements will *in fact* be likely to increase our chances of having a good life under any circumstances. This *prima facie* obligation, as I have argued in the previous chapter, derives from the obligation which we have to promote well-being via the promotion of the welfare interests of moral agents. Where we ignore this moral obligation, we harm the affected moral agents.

Of course, the effect of these kinds of universal welfarist enhancements will always be “probabilistic” (Savulescu, Sandberg & Kahane 2011: 9). In other words, we can never be absolutely sure that they will indeed improve the life of the person so enhanced, for reasons discussed in Chapter 2. Genetic characteristics are only one contributing aspect towards an eventual phenotype. Environment, including upbringing, contingent events, and the personal

effort of the enhanced individual, will all have an impact on how well our lives ultimately turn out. Genetic alteration will always only be predictive, rather than determinative. It can only *increase our chances* of having a good life, and cannot ensure this result with certainty. For this reason, the moral obligation attached to the provision of universal welfarist enhancements is nonsensical without an equivalent moral obligation to provide environmental interventions which will have a parallel effect.

While I have speculated earlier in this chapter as to what kind of enhancements might promote welfare in a universal way, more research is required on this topic. We will need to determine, via empirical and scientific studies, what the effects of particular capability levels are upon our general tendency to flourish. We will also need to know a great deal more about the effects of genetic enhancement, both in order to determine whether some capabilities are most beneficial at some optimal level, and to exclude the possibility of an unexpected negative impact upon our overall level of functioning. We are currently a long way from being able to say with certainty that a particular enhancement of function will have a particular effect upon welfare. We are therefore a long way from a situation where the *prima facie* duty to enhance comes into effect. However, I have tried to provide, in this dissertation, a rough idea as to our obligations with regard to the provision of enhancement, so that we are ethically equipped to make moral judgements about these issues as our scientific knowledge advances. These judgements ought to take into account that “[a]ll techniques can be abused and there is no knowledge or information that is not susceptible to manipulation for an evil purpose” and that we therefore need to be “vigilant” as to the likely effects upon welfare of particular enhancements to “prevent such abuse” (Harris 1992: 235). However, we also need to recognise that some enhancements may result in significant increases in the possibilities for welfare for human beings, and take seriously the harmful consequences of rejecting these.

Even in cases where enhancement will have a significant, and universal, positive impact upon welfare, we will still need to determine *how* we should balance the resulting *prima facie* obligation to make use of these sorts of interventions against other morally significant considerations. I will therefore make some remarks about this question in the next section.

### **How do we balance the *prima facie* obligation to enhance against other considerations?**

I have argued throughout this dissertation that the obligation to enhance should be thought of as a *prima facie* duty. A *prima facie* duty to act implies that “there is a moral reason to do

[so]”, but that the obligation which therefore arises can be overridden by “other, weightier obligations, [whether] individual or in concert” (Brink 1994: 216). Such an obligation, in other words, does not necessarily “override all other sorts of moral considerations” (Simmons 1979: 7). In order to determine whether we are indeed required to act in a particular case, we need to consider the context in which the prima facie obligation arises. This context includes our entire spectrum of moral obligations, which we must “study...as fully [as possible]” in order to form a “considered opinion...that in the circumstances one [obligation] is more incumbent on [us] than any other” (Ross 1930: 19). The obligation which is most incumbent upon us in a particular set of circumstances becomes an “all-things-considered moral obligation”. An all things-considered moral obligation to do x entails that “on balance, or in view of all morally relevant factors, x is what one ought to do [because it is] supported by the strongest moral reasons” (Brink 1994: 216).

In other words, prima facie obligations are always “more or less incumbent on [us] according to the circumstances of the case” (Ross 1930: 19). What does this imply for the prima facie obligation to enhance? In this section, I will try to provide some idea as to how we might balance the duty to enhance against other important moral obligations. My aim in this regard is principally to determine whether the moral obligation to enhance is of such a nature, taking into account the strength of our other moral obligations, that implies that it would usually (or always) be nullified by competing morally significant considerations. In other words, is the prima facie duty to enhance ever a duty proper?

It is clearly not possible to embark upon an exhaustive study of every possible context in which the obligation to enhance will arise. However, I would like to consider this question in a more general way by identifying two sets of competing moral obligations which are related to the obligation to enhance in such a way that they will tend to arise in the same context.

Firstly, I will consider the duty to enhance in the context of other moral obligations that are similarly motivated, and specifically, in the context of the duty to provide medical treatment and environmentally enhancing interventions. My question here will be whether, in the context of resource constraints, and under circumstances where we are not even able to fulfil the latter obligations in more than a minimal way, we would ever be justified in thinking of genetic enhancement as an all-things-considered moral obligation.

Secondly, I will reconsider the possible negative consequences of genetic enhancement identified by critics which I discussed in Chapter 3. The question here is whether the duty to avoid these negative consequences would always tend to nullify the obligation to enhance.

### *Rating our moral obligations to promote welfare*

The requirement that we ought to consider our entire spectrum of prima facie moral obligations in order to determine which is (most) incumbent upon us at any given point is demanding, and it is impossible to determine with certainty, and in a theoretical way, which of these obligations is most important when we are considering this question out of context. However, in this section, I will consider how we might rate our moral obligation to enhance against other obligations which are similarly motivated. As I have argued, the provision of medical treatment, environmental enhancements, and some genetic enhancements, are all morally desirable because they increase the chances of moral agents leading a good life in a way that is universal for all human beings, and thereby promote well-being. However, because medical treatments, and, to a variable extent, environmental enhancements, are directed towards providing the basic conditions for leading a good life (where these are lacking or absent), whereas enhancement is directed towards improving those conditions beyond this basic point, it might seem that the latter sorts of interventions will always have more moral importance than the former. In other words, where our ability to act to promote the welfare interests of persons is limited due to resource constraints, it seems that it will always be most important to promote the welfare interests of moral agents where these interests are in a very bad state, and this might imply that our prima facie obligation to enhance will always be outweighed, and will therefore never be a duty proper, in this context. This is what seemed to be suggested by the contention, mentioned in the previous chapter, that the moral significance of the treatment-enhancement distinction is supported by the demands of “efficiency” (Buchanan et al. 2000: 132).

This also might seem to follow from the argument which I advanced in the previous chapter. I have suggested that there is a moral imperative to promote the general possibilities for welfare and to expand opportunity. I have also subscribed to the view that we ought to “judge the relative well-being of individuals or groups in order to assess the urgency or importance of claims they make on us” (Daniels 1985: 36). In the context of conflicting obligations, this implies that it will always be of greater moral importance to counter or to correct for extremely limited possibilities for well-being which result from extremely negative

divergences from the (statistical) norm, either in terms of severely limited overall functionality which results from disease or disability, or in terms of extreme socio-economic disadvantage, than to improve upon possibilities for well-being that are not limited to this extent. If we regard a greater range of opportunities to be morally desirable, it follows that some opportunity is better than none, and our primary obligation would then be to promote well-being in the latter case.

This is problematic for my argument because it might seem that the primacy of the obligation to correct for severely limited opportunity effectively reinstates the moral distinction, which I criticised in the previous chapter, between interventions directed towards the achievement of normal functioning and interventions which reach beyond this goal. Because we live in a world where a great many individuals have extremely limited opportunity for well-being in comparison to others, and because our resources are limited, it might seem that the moral obligation to enhance will always be outweighed by the moral obligation to correct for extremely limited possibilities for well-being, and this seems to deprive the duty to enhance of any concrete significance. In other words, the contention of the normal function model that the line between treatment and enhancement marks the limits of our moral obligations would seem to be valid in a practical sense. Can my argument withstand these objections?

#### *Normative normality revisited?*

There are three factors which could work against the objection described above.

Firstly, as I have argued in the previous chapter, it might be the case that some kinds of natural variation will greatly limit opportunity in a way which will be equal to or which will exceed the limitation imposed by some kinds of disease or disability (or socio-economic hardship), even when such limitation is significant. In other words, there will be circumstances under which the moral obligation to enhance will outweigh the moral obligation to treat.

Secondly, even when the obligation to enhance does not outweigh the obligation to treat, it will not necessarily be the case that we will always have to choose between these two duties. The *prima facie* moral obligation to enhance is only negated by the more important moral obligation to correct for severely limited opportunity when we have to make a choice (due to resource constraints) between these two sorts of interventions. We currently do not know

what resources will be required to provide genetic enhancement. If such enhancement is relatively easily available, the moral obligation to provide enhancement would still hold.

Thirdly, the provision of enhancement might also have an indirect tendency to counteract the effect of severely limited opportunity. Cognitive enhancements, for example, could speed up the rate of research into, and development of, therapeutic technologies. In a more general sense, enhancements would be likely to maximise productivity and contribute towards economic development, and this could have very positive consequences for society in general (Bostrom & Roache 2011: 141), which could include the lessening of severely limited opportunity. Buchanan makes this point as follows:

[I]n economically developed societies there is less serious mental illness, less disease, less premature death, less disability, and less violence and discrimination against women, and more opportunity for people to develop their talents and pursue their own conception of the good life (2011: 45).

In other words, enhancement could be very generally beneficial with regard to countering severely limited opportunity. We should therefore be wary of claiming that the *prima facie* duty to enhance will always be outweighed by more important moral considerations. Taking into account the entire spectrum of our obligations also requires us to take into account the consequences of failing to enhance, and these, in the long run, could have a negative impact upon our ability to correct for severely limited opportunity.

Julian Savulescu claims that one of the conditions which a particular enhancement must fulfil in order for such an intervention to be ethically permissible is that it should “not harm others directly through [the] excessive costs of making it freely available” (2005: 39). We could adapt this condition, with regard to obligatory enhancements, in order to stipulate that the *prima facie* morally obligatory provision of enhancement only becomes a duty proper when such provision does not harm others by depriving them of other interventions which they have a more significant claim to. However, as I have noted in this section, this does not imply that our in-context moral deliberations will never result in an all-things-considered obligation to enhance.



We must now turn to a second set of considerations which may negate the prima facie obligation to enhance. These have to do with the possible negative consequences which may result from the widespread use of enhancement technologies.

*When do negative consequences preclude enhancement?*

In Chapter 3, I discussed various concerns raised by critics as to the negative consequences which might result from the widespread use of enhancements, whereas in the previous chapter, I tried to make a case for the innate moral desirability of enhancements which promote welfare interests. I must now balance this moral desirability, which primarily considers the effect of enhancement upon the individual, against its possible negative consequences, which would accrue to society as a whole. As Buchanan argues, “it is appropriate to look both at the considerations in favour of enhancement and those against it and to strive for a judgement that reflects a proper appreciation of both” (2011: 59). This section will therefore make a preliminary attempt to determine whether the possible negative social consequences of enhancement identified by critics, and our obligation to avoid these, might negate its innate desirability.

I have previously identified three main concerns raised by critics as to the possible negative social consequences of enhancement. These were concerns about the exacerbation of inequality, concerns about the perpetuation of discrimination, and concerns about the effects of the widespread use of enhancement, where this is motivated by social pressure. I think that, provided the motivations which I have posited for the moral obligation to enhance are kept in mind, these concerns can, at least to some extent, be countered. I will deal with each of these concerns in turn.

*The exacerbation of inequality*

As described in Chapter 3, many are concerned that enhancements, particularly where these are purchased on the free market by those already economically advantaged, will exacerbate inequalities, both within and between societies. This is because many enhancements, even when motivated by the imperative to promote well-being, would also confer competitive advantages, and the corresponding disadvantages that would result for those who remained unenhanced would be unfair.

This is indeed a legitimate concern. As argued in the previous chapter, moral agents have a fundamental interest in not being unfairly disadvantaged in comparison to others, in terms of the opportunities that are available to them. Because enhancements (and particularly universal welfarist enhancements) do tend to expand opportunity, it would seem that enhancement, when unequally distributed, would result in precisely this sort of disadvantage.

However, the motivation which I have provided for the moral obligation to enhance implies that this moral obligation does not only apply to the provision of enhancement to *some* moral agents. Rather, it derives from a general imperative to promote human well-being. Where enhancement is sought for competitive advantage, and where its unequal distribution results in extreme disadvantage for the unenhanced, this would have a negative impact upon the well-being of these latter moral agents, and this might indeed provide us with a reason to place some restrictions on the availability of enhancements, when it is impossible for many persons in society to acquire them. My recognition and affirmation of the importance of the principle of fair equality of opportunity also suggests that this might be the case.

The problem here appears to be, however, as noted in Chapter 3, not with enhancement itself, but with its distribution. If we can agree upon some method of distributing enhancements which is not unfair, this would not negate the obligation to enhance. This raises the possibility that the state, or some central body, may have to take responsibility for making enhancement available (Agar 2004: 138) in order to “constrain inequalities in the distribution of enhancements” (Buchanan 2011: 51), and that such distribution could perhaps be modelled on the provision which is made for primary healthcare, and for environmental enhancements such as education<sup>101</sup>. We should therefore not assume, as some critics do (Frankel 2007: 31, Miller & Brody 2005: 16), that access to enhancements will necessarily be determined by a consumer’s access to resources. Again, in the context of limited resources, the state’s obligations in this regard would have to be balanced and rated in terms of their moral importance, as described in the previous section.

This suggestion does not provide a solution to the problem of global inequalities, however. If some wealthier states are able to provide enhancement interventions for their citizens, while other states in the developing world cannot, this would certainly exacerbate inequalities between countries along the lines of current patterns of advantage and disadvantage.

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<sup>101</sup> I will return to this suggestion in the next section.

These are complicated questions, which I cannot fully deal with here. The problems which they raise are not new, but are already evident with regard to unequal global access to a variety of resources. We should note again, however, that enhancements ought to be sought not to provide competitive advantage, but to promote general well-being. The imperative to promote well-being does not only apply to others in one's particular society, but is universal. More advantaged societies may have a general obligation to assist those who are less advantaged in making enhancement available, particularly if these enhancements have a strong tendency to promote well-being. This obligation, however, would not only apply with regard to enhancement, but also with regard to other interventions which are similarly beneficial. These are questions which I cannot consider here, but which deserve further attention within the context of a discussion of global distributive justice.

### *The perpetuation of discrimination*<sup>102</sup>

The next potential negative consequence of enhancement which critics identify is the possibility that enhancement will be used in a way which will be influenced by discriminatory attitudes already prevalent in society. This raises an interesting conundrum for the argument which I have advanced thus far, as in a society where prejudice is widespread, the absence of some characteristics which are the target of such prejudice may function to promote welfare interests by increasing the chances of an individual leading a good life (by decreasing the chances that they will be affected by discrimination), and this might seem to suggest that we are obligated to alter such characteristics via genetic manipulation. This might seem to be the case despite the fact that the presence or absence of characteristics which are often the target of prejudice would have no effect on overall functional competence.

Again, these are difficult problems to deal with. However, I tend to feel, with Agar, that there is something deeply morally troubling about making use of genetic interventions to promote welfare by eliminating diverse characteristics that are the target of discrimination (2004: 156). I would tentatively suggest that it is possible to make the argument that the general value of such diversity in society would militate against this kind of use of enhancement technologies. In addition, as Agar states, it is hard "to imagine a successful fight against prejudice in the

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<sup>102</sup> In Chapter 3, I also discussed the concern that enhancement may result in new forms of discrimination between the enhanced and the unenhanced. In the context of the argument I have made above, which suggests that concerns about equality would imply that some form of universal access to enhancement technologies ought to be promoted, and if this is not possible that accessibility to enhancement ought to be limited, these concerns are, at least partially, negated.

very society in which there is a widely exercised freedom on the part of parents to remove from their children the characteristics that would make them objects of prejudice” (2004: 157). I therefore think that a case could be made for the prohibition of enhancements which are very obviously motivated by discrimination, although again, I cannot pursue this argument further here.

### *Social pressure to enhance*

Some critics have raised the concern that, because enhancement may confer competitive advantage, individuals will be pressured to enhance, and that this will result in enhancements becoming self-defeating, or will bring about increased homogenization. In terms of the moral motivations for enhancement which I have recognised in the previous chapter, this seems to be the easiest objection to deal with of the three concerns discussed here.

I have argued that enhancement ought not to be motivated by the desire for competitive advantage. Rather, it should be sought because it promotes the welfare of the individual so enhanced in and of itself, by expanding their opportunities for the promotion of their welfare interests, and by increasing their chances of leading a good life. Competitive advantage may indeed be a by-product of this kind of enhancement, but this kind of possible advantage (and the converse, resulting disadvantage) provides us with a good reason to try to bring about a fair distribution of such enhancements, as I have argued above. By this standard, the possibility that enhancement might be self-defeating (because when the goods of enhancement are widely distributed, this will negate the competitive advantage conferred) is an effect to be hoped for, rather than to be avoided, as this would indicate that the principle of fair equality of opportunity would be satisfied.

What, though, about the possibility of homogenization which could result from a wide distribution of enhancement? Again, by the standards of the argument which I have advanced here, this is unlikely to be a problem. Morally obligatory enhancements, which, I have suggested, ought to be widely distributed, are those that promote welfare interests by augmenting local functionality of general-purpose capabilities. These capabilities are specifically targeted as desirable because they are useful no matter what one’s conception of the good is or what one’s ulterior interests are. The differences between us in terms of our conceptions of the good and our various ulterior interests will therefore not be eliminated by universal welfarist enhancements, which will instead tend to promote autonomy by widening

the range of life plans available to moral agents. Individuals will continue to choose between life plans, where this choice is based upon their individual values and characteristics, in the same way that they always have done. While they will be permitted to choose conditional welfarist enhancements for themselves, this choice will accord with their differing ulterior interests, and will be unlikely to result in homogenization<sup>103</sup>.

### *Concluding remarks*

Based on the foregoing discussion, it seems as though the possibility of negative consequences does not necessarily limit or negate our obligation to enhance, but may indeed indicate that we should control the way in which the goods of enhancement are distributed in order to promote fair equality of opportunity and to ensure that enhancement does not perpetuate discrimination. In other words, concerns about the possible negative consequences of enhancement “provide valuable guidance for *how* we should pursue the enhancement enterprise, but *not* good reasons for refraining from it” (Buchanan 2011: 36).

Savulescu, in this regard, provides a list of conditions which particular enhancements ought to meet in order to avoid possible negative social consequences. He stipulates, among other conditions, that enhancements should not “confer an unfair advantage” or “reinforce or increase unjust inequality and discrimination” (Savulescu 2005: 39). Introducing policies which would control and facilitate the distribution of enhancement, and which would promote equality by making universal welfarist enhancements widely available, would seem to fulfil these stipulations. As noted above, this implies that the state would need to take some responsibility for such a distribution<sup>104</sup>.

This brings me to the final question which I must consider in this chapter. In the previous chapter, I discussed the obligation to enhance in a very general sense. However, when considering how this obligation may be fulfilled in practice, we need to determine which parties will be responsible for providing enhancement in particular cases. I have already suggested that the state should have some involvement here. I now need to outline this

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<sup>103</sup> Of course, the societal context in which we find ourselves will necessarily have some impact upon our ulterior interests, but this is the case already, and within society, a great deal of variation will still exist as to conceptions of the good. The availability of enhancement will be unlikely to alter this.

<sup>104</sup> Again, the obligation to enhance would have to be balanced against other moral considerations, as discussed in the previous section.

involvement in greater details, and to make suggestions as to who else might be required to provide enhancement.

### **Who is obliged to provide enhancement?**

In this chapter, I have detailed what kinds of interventions the category of morally obligatory enhancements ought to include. I have also provided some rough idea as to how we might rate our moral obligation to enhance against other considerations. The last question to consider asks how we might practically conceive of the obligation to enhance. *Who* is responsible for providing, to particular individuals, the kind of universal welfarist enhancements that I have deemed to be morally obligatory? If each individual is equally responsible for providing enhancement to all other moral agents, this seems to weaken the obligation to enhance to such an extent that it becomes meaningless, both in terms of resource constraints, and in terms of practical impossibility.

However, we don't usually think of our moral obligations in this kind of general way. While we might regard the promotion of welfare to be generally morally *desirable*, we regard an *obligation* to be "owed by a specific person...to a specific person or persons" (Simmons 1979: 14). This conviction is related to the idea that we can only accuse parties of failing to perform some morally required duty when they had the "known ability and opportunity" to do so (Feinberg 1984: 162). Non-actions, in other words, can only become omissions when one was able to perform a particular action and refrained from doing so. In addition, we also think that there are some kinds of special relationships between people and groups that deserve special consideration. In other words, we think that "[d]ifferent people...have different [kinds of] claims on us" (Glover 2006: 44), and for this reason, we might have special (and stronger) obligations to promote the welfare of particular persons.

I would like to suggest that such special obligations arise in the context of the relationships between parents<sup>105</sup> and children, and between the state and its citizens, and that these obligations may provide a practical structure in terms of which we can understand and act upon the obligation to enhance. I will model this argument upon the way in which we commonly conceive of the obligations to provide healthcare and education. As I have argued, these practices are motivated by moral imperatives which are similar to those which weigh in favour of enhancement.

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<sup>105</sup> I will use "parents" in an inclusive way to refer to primary caregivers in general.

The obligation to provide interventions such as healthcare and education, in liberal democracies, is widely regarded to accrue partially to parents (or caregivers) of children, and partially to the state. This conviction is based partly upon the fact that it is these parties who are in a position to be able to provide these kinds of interventions to particular individuals, and partly upon the framing assumptions that parents have special obligations to promote the welfare of their children, and that the state has a special obligation to promote the welfare of its citizens. While I am not in a position to subject these assumptions to a thorough analysis here, they do seem to be relatively widely acknowledged (Feinberg 1984: 140, Hardimon 1994, Jeske 1998, Nortverdt, Hem & Skirbekk 2011). I will give a general description of how the obligations to provide healthcare and education accrue to these two parties, before going on to argue that extending these obligations to include the provision of enhancement is required as a matter of consistency (Fox 2007: 14).

The obligatory provision of healthcare and education (at least to some basic level) is usually governed by a system in which parents are expected to provide, or to facilitate access to, such interventions for their children. When they fail to do so, the state is required to intervene to prevent harm, and when they are unable to do so, the state is required to provide some level of universal access.

Parents are expected to provide or to facilitate access to these interventions because, as they have primary physical custody of their children, they are in a position to practically do so. Parents have a special responsibility for how their children's lives go "insofar as they *have the power* to leave things as they are or make them different" (Harris 2007: 142, my italics). While parents are given a great deal of leeway in deciding how to raise their children, we usually regard them to be morally required to provide certain interventions, where the absence of these interventions will (severely) limit their children's possibilities as adults. Where they fail to provide such interventions, children can therefore accuse their parents of "wrongly depriv[ing them] of the higher ability level [they] would have had on [their] arrival at the threshold of adulthood" (Steiner 1998: 140-141); in other words, of harming them, by putting their welfare interests in a worse position than they could otherwise have been in. Both the failure to provide (certain kinds of) healthcare and the failure to provide education result in these kinds of harm by omission.



Usually, state intervention (in the form of coercion) to force parents to fulfil their moral responsibilities in this regard is unnecessary because most “parents...want above all what will be best for their children” (Glover 2006: 50), and will therefore naturally seek out interventions which will promote their welfare. However, there are cases where this kind of intervention is required. In addition, there may be cases in which parents require help from the state to ensure that the things they ought to provide for their children are accessible. Parents cannot be accused of harming their children by omitting to provide welfare-promoting interventions when they are unable to do so because these interventions are inaccessible.

The state is therefore expected to play a role in the provision of healthcare and education, either through legal coercion, in the cases where parents fail to fulfil at least their basic obligations, or through making such interventions widely available. This expectation is based upon the conviction that the state has some form of duty towards its citizens which implies that it ought to promote their welfare, or at least ought to intervene in order to “prevent harm” to them (Mill 1956: 52). Because the non-provision of healthcare and education is harmful to moral agents in a fundamental way, the state is required to intervene to prevent this kind of harm.

Partially, the state’s duty to prevent harm in this regard is attributable to the obligation to prevent “large inequalities” with regard to the “distribution of social opportunities” (Føllesdal 1997: 145). Moral agents, as I have discussed extensively in the previous chapter, have a strong interest in avoiding being severely disadvantaged by their opportunity ranges in comparison to others. However, this cannot be the only kind of harm which the state ought to intervene to prevent, because inequality could be avoided equally well by “depriving *everyone* of an education” (Buchanan 2011: 51), or of other sorts of interventions which promote opportunity. Rather, the state also has “a legitimate interest in fostering economic prosperity and increasing welfare” (Buchanan 2011: 50), and this interest suggests that the provision of welfare-increasing interventions is required independently of the tendency of these sorts of interventions to promote equality.

If we regard the obligation to provide opportunity-expanding interventions such as healthcare and education to accrue partially to parents and partially to the state, it seems that we might regard these parties as being similarly obligated to provide enhancement, in a context where such enhancement is possible, and where its provision would not come into conflict with more important moral obligations. This obligation derives from the argument which I

advanced in the previous chapter, which suggests that the motivation for enhancement is continuous with the motivations for medical therapy and for environmental enhancements such as education, and that the failure to provide enhancing interventions could be harmful to moral agents.

Parents would therefore be obliged to seek out universal welfarist enhancements for their children<sup>106</sup>. This obligation would arise due to their practical opportunity to facilitate access to enhancement for their children, as well as their special obligation to promote their welfare. The state's duties in this regard would be twofold - to prevent harm to its citizens, and to ensure distributive justice with regard to enhancements (Savulescu, Sandberg & Kahane 2011: 15-16). On the one hand, this would require them to intervene to ensure that parents fulfil their obligations to enhance, so that children are not harmed by the non-provision of enhancement. The extent to which coercion would be justifiable here is arguable, particularly as I have suggested that the obligation to enhance is (usually) weaker than the obligation to provide medical care, for example. However, "coercion" needn't be construed in an active sense, but could take the form of encouragement, via the provision of "subsidies, tax credits, or other incentives" to those who enhance (Buchanan 2011: 50). On the other hand, the state should also ensure that parents are (universally) able to access enhancement interventions for their children. This is required not only as a result of the state's duty to prevent the harmful non-provision of enhancement, but also in order to minimise unjust equality (Buchanan 2011: 51). Making enhancement universally accessible in this way may also be motivated by the positive impact which enhancement could have for societal productivity, so that it might not only be morally required, but also "economically efficient to subsidize enhancements for the poor" (Bostrom & Roache 2011: 142-143). However, as I noted in a previous section of this chapter, where the universal provision of enhancement is not possible due to resource constraints, taking into account the balancing of obligations discussed earlier, this might provide some justification for limiting, to some extent, the availability of enhancements, if widely unequal access will greatly contribute towards unjust inequality.

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<sup>106</sup> It is not clear at this point whether genetic enhancements will be optimally applied at an embryonic or foetal level, or whether persons could make use of these interventions later in life. However, with regard to universal welfarist enhancements, one could argue that these *ought* to be made use of as early as possible in life, in order to maximise their beneficial effects upon welfare.

## Conclusion

In this chapter, I have attempted to place the prima facie obligation to enhance in a practical context. I have done so by considering three questions.

Firstly, in order to determine in greater detail *what* sorts of interventions ought to be prima facie morally obligatory, I have introduced distinctions between morally impermissible, morally permissible but not obligatory, and morally obligatory enhancements. The latter category includes those enhancements that I have referred to as universal welfarist enhancements. While I have made some speculative suggestions as to what kinds of general-purpose capabilities might tend to promote welfare in a universal way, further research is required here.

Secondly, I have attempted to provide some idea as to *how* we might balance the prima facie obligation to enhance against other important considerations. My focus in this regard was to determine whether this prima facie obligation would ever be a duty proper in context. I concluded that this could indeed be the case, although the imperative to balance this obligation against other morally important considerations may require us to place some limits upon the availability of genetic enhancements, where this could result in unfair inequality or perpetuate discrimination, or to make allowance for some sort of universal access to universal welfarist enhancements to be provided by the state.

Thirdly, I expanded on possible state involvement in the provision of genetic enhancements in my attempt to answer the question as to *who* would be responsible, in a practical context, for providing enhancements. I argued that we should model the obligation to enhance upon the obligation to provide medical treatment and education. This would require parents to facilitate access to enhancement for their children, with the state intervening where necessary to encourage the use of enhancement, and to ensure that enhancement interventions are (at least to some basic level) universally accessible.

I will now move on to the final chapter of this dissertation, in which I will summarise my recommendations and conclusions, and suggest areas for further research.

## 6 Conclusion

The aim of this dissertation has been to determine the moral status of the use of genetic enhancement technologies directed towards the improvement of the human genotype. What I have tried to argue is that the possible development of such technologies should not be perceived as an ethical watershed. The unease which many feel about genetic enhancement arises as a result of a fundamental misunderstanding of its nature, in that it is regarded as having revolutionary potential to transform and transcend a given standard of normal functioning. However, I have tried to show that this is an illusion. Rather, genetic enhancement is simply the latest in a long line of interventions, both biotechnological and environmental, which have sought to improve upon the species-typical human functioning provided by evolution.

I have suggested that what we think of as normal functioning cannot function as a normative goal which determines our moral obligations. Rather, the extent to which we value normal functioning, and the moral desirability that we attach to interventions which are directed toward achieving it, is based upon an indirect recognition that the achievement of this kind of functioning, in comparison with negative divergences from it, tends to promote human welfare. In other words, it is good for human persons to achieve normal levels of functioning because this increases their chances of leading a good life in general.

Normality is therefore not an ideal, naturally given standard of human functioning in accordance with species-typical design, the value of which suggests that we should pursue interventions which seek to correct deviations from this ideal. Rather, these interventions have partially constructed the ideal. This construction is undertaken by rejecting aspects of species-typical functioning which diminish the possibilities for human welfare (such as vulnerability to disease and disability) and attempting to develop and improve upon aspects of human functioning which promote the possibilities of human welfare (such as cognitive functioning and capacities for social interaction and organisation). It is the value that we attach to human welfare that implies that we ought to seek to achieve normal functioning, rather than the fact that normal functioning is simply what is good for us. Without reference to the moral desirability that we attach to the promotion of the possibilities for human welfare, the notion of normality can tell us nothing about why we ought to pursue it.

However, the moral desirability attached to the expansion of the possibilities for human well-being equally suggests that enhancement interventions which are directed towards the promotion of our welfare interests, and thus the improvement of our possibilities for leading a good life in general, are morally desirable in precisely the same way as interventions which are directed towards the achievement of normal functioning. The fact that genetic enhancement might go beyond what we currently conceive of as normality is irrelevant to this morally desirable status. To deny this is to construct an unreasonable dichotomy between the manner in which therapeutic and environmental interventions, on the one hand, and enhancement interventions, on the other, improve upon species-typical functioning. Indeed, all three of these sorts of interventions are in fact directed towards the improvement of the functioning that is typical of members of the species *Homo sapiens* in their natural state, in order to improve upon the possibilities for human welfare, and as such, all three bring about enhancement. We should therefore not understand enhancement as a radical departure from what has gone before, but within “the historical context of human development” (Buchanan 2011: 44).

This implies that we need to rethink our ethical conception of harmful non-benefits. As I have argued, we tend to think of non-benefit as harmful when such non-benefit amounts to the failure to promote our welfare interests. This is why we think of the non-provision of medical treatment and some environmental enhancements, such as education, as harmful to the extent that state intervention is merited to rectify this. We recognise that such non-provision, and the resultant failure to promote the welfare interests of moral agents, where such promotion is possible, harms persons by putting them in a worse position than they could have been in with regard to their chances for leading a good life.

The new technological possibilities offered by the prospect of genetic enhancement imply that we might soon have a better alternative, in terms of our chances of leading a good life, to the level of functioning that we have thus far been able to achieve. The existence of this alternative level of functioning constructs a new possible opposition between two states of affairs, one of which is better and one of which is worse for moral agents, with regard to *the position of their welfare interests*. Because, as I have argued, we tend to think of non-benefit as harmful when such non-benefit amounts to the failure to promote our welfare interests, the failure to make use of universal welfarist enhancements would harm moral agents by putting them, by this omission, into a worse position than they could have been in, with reference to their chances for leading a good life. Therefore, we should not think of the provision of such

enhancement interventions as an optional non-benefit, which is how we think of the failure to promote the ulterior interests of others. Because some forms of genetic enhancement could have the potential to promote our welfare interests, the non-provision of these enhancements would be harmful to the extent that intervention to bring about this provision would be justified. This means that we should not only regard harm as deriving from the non-provision of interventions which bring about normal functioning. The non-provision of any intervention which would promote welfare interests harms the affected moral agent by inhibiting their functioning, and therefore the associated possibilities for leading a good life, in comparison to the alternative. All the development of genetic enhancement does, under this view, is to introduce a new alternative for the possibilities of human welfare in terms of which we must evaluate the harmfulness of our omissions.

None of this suggests that we should not also take seriously the possibility that enhancement technologies could be put to uses which might detract from the possibilities of human welfare. Where enhancement interventions have this effect, they may have the potential, not to benefit, but to harm moral agents, and, as I have suggested in the previous chapter, such interventions should indeed be prohibited.

We also cannot consider the *prima facie* moral obligation to make use of universal welfarist enhancements in a vacuum. When we determine whether this *prima facie* obligation is a duty proper in a practical context, we must necessarily take into account competing moral obligations. As I have argued in the previous chapter, this not only requires us to rate the urgency of the moral demands made upon us with regard to a standard which considers the relative impact upon well-being of respective proposed interventions, but also to take into account the critique which has been levelled against enhancement by critics, as discussed in Chapter 3, particularly where this critique considers the possible negative social consequences of the widespread use of enhancement technologies. These possible consequences will require us to develop safeguards and policies, a rough outline of which I have provided in the previous chapter. These will need to be further refined and developed as the technology of genetic enhancement develops.

These cautionary remarks emphasise that, faced with the complexities of enhancement, it is our duty to “understand the phenomenon in all its complexity, to resist the tendency toward sweeping condemnation or praise, and, above all, to start thinking hard about practical responses that are ethically sensitive, true to the complexity of the phenomena, and realistic”

(Buchanan 2011: 12). This equally implies that while we should not ignore the possible negative consequences of enhancement, nor should we ignore the great potential for the improvement of human welfare which genetic enhancement holds, both for individuals and for society as a whole (Bostrom & Roache 2011: 141), and we should bear this in mind as we continue researching these technologies.

Such research into the development of genetic enhancement technologies must overcome the myriad obstacles posed to it by the nature of genetic functioning, as discussed in Chapter 2. These obstacles suggest that it will be some time before the enhancement of human beings is a practical possibility. However, the nature of genetic functioning, properly considered, also reminds us that the possibility of the successful development of genetic enhancement does not absolve of us our moral duties to promote the welfare of other moral agents in other ways. Genes undoubtedly play a role in determining who we become, and what our eventual chances of leading a good life are, but this role is inseparable from the mutual role played by exposure to particular environments and environmental interventions.

Scientific research into genetic enhancement technologies must also be accompanied by further research into its ethical implications. This should include studies of, and wide consultation with regard to, the impact upon the possibilities for welfare of particular characteristics. This is not only necessary in order to provide a more detailed conception of the category of universal welfarist enhancements, but also in order to determine research priorities with regard to the moral importance of the enhancement of various capacities.

Ultimately, a rejection of the possible development of technologies for genetic enhancement could very well harm human beings by putting their welfare interests in a worse condition than they could have been in, by reducing their possibilities, in comparison to the alternative, for leading good lives. In this regard, we should bear in mind the possible harm that would have resulted for a multitude of individuals as a result of a refusal to consider the development or use of medical therapies or environmentally enhancing interventions. Where better possibilities for welfare are available, it is harmful for human beings to be subject to the sub-optimal functioning given by natural evolution, and this is no less the case for genetic enhancement than for medicine, education, and other wide-ranging environmental interventions such as the development of agriculture, transport and sophisticated means of communication.



I have tried to show in this dissertation that, far from being a transformative, disruptive technology, which is likely to alter the world as we know it, the moral motivation for genetic enhancement is in fact continuous with the moral motivations for the provision of interventions which have shaped who we are as a species and which have been foundational to the development of civilisation. These interventions have partially determined our conception of normal, morally desirable modes of human functioning, and have thus shaped what we think of as our obligations in terms of the manipulation of human functioning. We now think of the non-provision of these interventions as harmful. However, we should keep in mind the moral standards in terms of which we make such judgements, as these suggest that a failure to enhance our possibilities for leading good lives by genetic means could perpetrate similar harms.

## Bibliography

- Agar, N. 2004. *Liberal Eugenics: In Defence of Human Enhancement*. Oxford: Blackwell Publishing.
- Allhoff, F. 2005. Germ-Line Genetic Enhancement and Rawlsian Primary Goods. *Kennedy Institute of Ethics Journal*, 15 (1): 39-56.
- America's Next Ethical War. 2001. *Economist*, 359 (8217): 21-34.
- Anderson, W.F. 1989. Human Gene Therapy: Why Draw a Line? *Bioethics*, 14 (6): 681-693.
- Annas, G.J. 2001. *Genism, Racism, and the Prospect of Genetic Genocide*. Paper presented at "The New Aspects of Racism in the Age of Globalization and the Gene Revolution, UNESCO 21st Century Talks, World Conference against Racism, Racial Discrimination, Xenophobia and Related Intolerance", Durban, South Africa. [Online]. Available: <http://www.bumc.bu.edu/www/sph/lw/pvl/genism.htm>. [10 August 2011].
- Annas, G.J., Andrews, L.M. & Isasi, R.M. 2002. Protecting the Endangered Human: Toward an International Treaty Prohibiting Cloning and Inheritable Alterations. *American Journal of Law and Medicine*, 28: 151-178.
- Arnold, F., Kishor, S. & Roy, T.K. 2002. Sex-Selective Abortions in India. *Population and Development Review*, 28 (4): 759-785.
- Atwood, M. 2003. *Oryx and Crake*. New York: Random House.
- Atwood, M. 2009. *The Year of the Flood*. London: Virago Press.
- Bayles, M.D. 1976. Harm to the Unconceived. *Philosophy and Public Affairs*, 5 (3): 292-304.
- Baylis, F. & Robert, J.S. 2004. The Inevitability of Genetic Enhancement Technologies. *Bioethics*, 18 (1): 1-26.
- Beauchamp, T.L. & Childress, J.F. 2009. *Principles of Biomedical Ethics*. Oxford: Oxford University Press.
- Bear, G. 1985. *Blood Music*. London: Gollancz.
- Begley, A. 1998. Acts, Omissions, Intentions and Motives: a Philosophical Examination of the Moral Distinction Between Killing and Letting Die. *Journal of Advanced Nursing*, 28 (4): 865-873.
- Benatar, D. 2006. *Better Never to Have Been*. Oxford: Oxford University Press.

- Benatar, S.R. 1998. A Perspective from Africa on Human Rights and Genetic Engineering. In Burley, J. (ed.). *The Genetic Revolution and Human Rights: The Oxford Amnesty Lectures 1998*. pp. 159-189. Oxford: Oxford University Press.
- Benatar, S.R. & Singer, P.A. 2000. A New Look at International Research Ethics. *British Medical Journal*, 321 (7264): 824-826.
- Bennett, R. 2009. The Fallacy of the Principle of Procreative Beneficence. *Bioethics*, 23 (5): 265-273.
- Berger, E. & Gert, B. 1991. Genetic Disorders and the Ethical Status of Germ-Line Gene Therapy. *The Journal of Medicine and Philosophy*, 16 (6): 667-683.
- Bhanoo, S.N. 2011. Altering a Mouse Gene Turns Up Aggression, Study Says. *New York Times*: D3, January 27.
- Billings, P, Hubbard, R. & Newman, S. 1999. Human Germline Gene Modification: A Dissent. *The Lancet*, 383 (9167): 1873-1875.
- Birch, K. 2005. Beneficence, Determinism and Justice: An Engagement with the Argument for the Genetic Selection of Intelligence. *Bioethics*, 19 (1): 12-28.
- Bognar, G. 2008. Well-Being and Health. *Health Care Anal*, 16 (2): 97-113.
- Boorse, C. 1975. On the Distinction between Disease and Illness. *Philosophy & Public Affairs*, 5 (1): 49-68.
- Boorse, C. 1977. Health as a Theoretical Concept. *Philosophy of Science*, 44 (4): 542-573.
- Bortolotti, L. & Harris, J. 2006. Disability, Enhancement and the Harm-Benefit Continuum. In Spencer, J.R. & Du Bois-Pedian, A. (eds.). *Freedom and Responsibility in Reproductive Choice*. Oxford: Hart Publishers. pp. 31-49.
- Borenstein, J. 2009. The Wisdom of Caution: Genetic Enhancement and Future Children. *Science and Engineering Ethics*, 15 (4): 517-530.
- Bostrom, N. 2004. Human Genetic Enhancements: A Transhumanist Perspective. *The Journal of Value Inquiry*, 37 (4): 493-506.
- Bostrom, N. & Sandberg, A. 2009a. The Wisdom of Nature: An Evolutionary Heuristic for Human Enhancement. In Savulescu, J. & Bostrom, N. (eds.). *Human Enhancement*. Oxford: Oxford University Press. pp. 375-416.
- Bostrom, N. & Sandberg, A. 2009b. Cognitive Enhancement: Methods, Ethics, Regulatory Challenges. *Science and Engineering Ethics*, 15 (3): 311-341.

- Bostrom, N. & Roache, R. 2011. Smart Policy: Cognitive Enhancement and the Public Interest. In Savulescu, J., ter Meulen, R. & Kahane, G. (eds.). *Enhancing Human Capacities*. pp. 138-149. Oxford: Wiley-Blackwell.
- Brink, D.O. 1994. Moral Conflict and Its Structure. *Philosophical Review*, 103 (2): 215-247.
- Brock, D.W. 1998. Enhancements of Human Function: Some Distinctions for Policymakers. In Parens, E. (ed.). *Enhancing Human Traits: Ethical and Social Implications*. pp. 48-69. Washington D.C.: Georgetown University Press.
- Brock, D.W. 2005. Shaping Future Children: Parental Rights and Societal Interests. *The Journal of Political Philosophy*, 13 (4): 377-398.
- Bruinius, H. 2006. *Better for All the World: The Secret History of Forced Sterilization and America's Quest for Racial Purity*. New York: Vintage Books.
- Buchanan, A., Brock, D., Daniels, N. & Wikler, D. (eds.). 2000. *From Chance to Choice: Genetics and Justice*. Cambridge: Cambridge University Press.
- Buchanan, A. 1984. The Right to a Decent Minimum of Health Care. *Philosophy and Public Affairs*, 13 (1): 55-78.
- Buchanan, A. 2008. Enhancement and the Ethics of Development. *Kennedy Institute of Ethics Journal*, 18 (1): 1-34.
- Buchanan, A. 2009. Human Nature and Enhancement. *Bioethics*, 23 (3): 141-150.
- Buchanan, A. 2011. *Beyond Humanity? The Ethics of Biomedical Enhancement*. Oxford: Oxford University Press.
- Burchfield, R.W. (ed.). 1989. *Oxford English Dictionary*. Oxford: Clarendon Press.
- Butterfield, J. (ed.). 2004. *Collins English Dictionary*. Glasgow: HarperCollins.
- Caplan, A.L. 2009. Good, Better, or Best? In Savulescu, J. & Bostrom, N. (eds.). *Human Enhancement*. Oxford: Oxford University Press. pp. 199-209.
- Carey, B. 2005. Timid Mice Made Daring by Removing One Gene. *New York Times*, November 18.
- Carey, B. 2010. Genes as Mirrors of Life Experiences. *New York Times*: D7, November 8.
- Chadwick, R. 2008. Therapy, Enhancement and Improvement. In Gordijn, B. & Chadwick, R. *Medical Enhancement and Posthumanity*. New York: Springer.
- Charlesworth, B. 2001. The Genetic Complexity of Life. *Nature*, 412 (6848): 682.
- *Child of Our Time - The Big Personality Test: Episode 1*. 2010. London: BBC.

- Colleton, L. 2008. The Elusive Line Between Enhancement and Therapy and Its Effects on Health Care in the U.S. *Journal of Evolution and Technology*, 18 (1): 70-78.
- Collins, F. 1999. Medical and Societal Consequences of the Human Genome Project. *New England Journal of Medicine*, 341 (1): 28-37.
- Collins, F. & McKusick, V. 2001. Implications of the Human Genome Project for Medical Science. *The Journal of the American Medical Association*, 285 (5): 540-544.
- Connor, S. 1995. Research Confirms 'Gay-Gene' Discovery. *The Independent*, 31 October.
- Cooke, E. 2003. Germ-line Engineering, Freedom and Future Generations. *Bioethics*, 17 (1): 33-58.
- Coors, M.E. & Hunter, L. 2005. Evaluation of Genetic Enhancement: Will Human Wisdom Properly Acknowledge the Value of Evolution? *The American Journal of Bioethics*, 5 (3): 21-22.
- Daniels, N. 1985. *Just Health Care*. Cambridge: Cambridge University Press.
- Daniels, N. 2000. Normal Functioning and the Treatment-Enhancement Distinction. *Cambridge Quarterly of Healthcare Ethics*, 9 (3): 309-322.
- Daniels, N. 2009. Can Anyone Really Be Talking About Ethically Modifying Human Nature? In Savulescu, J. & Bostrom, N. (eds.). *Human Enhancement*. Oxford: Oxford University Press. pp. 25-42.
- Davis, J. 2008. Selecting Potential Children and Unconditional Parental Love. *Bioethics*, 22 (5): 258-268.
- Davis, D.S. 2009. From YUCK to WOW and Back Again. *Religious Studies Review*, 35 (3): 147-150.
- Dawkins, R. 1976. *The Selfish Gene*. Oxford: Oxford University Press.
- Dawkins, R. 1986. *The Blind Watchmaker: Why the Evidence of Evolution Reveals a Universe Without Design*. New York: W.W. Norton & Company.
- De Melo-Martín, I. 2004. On Our Obligation to Select the Best Children: A Reply to Savulescu. *Bioethics*, 18 (1): 72-83.
- Dees, R.H. 2007. Better Brains, Better Selves? The Ethics of Neuroenhancements. *Kennedy Institute of Ethics Journal*, 17 (4): 371-395.
- DeGrazia, D. 2000. Prozac, Enhancement, and Self-Creation. *The Hastings Center Report*, 30 (2): 34-40.

- DeGrazia, D. 2005. Enhancement Technologies and Human Identity. *Journal of Medicine and Philosophy*, 30 (3): 261-283.
- Dekker, T.J. 2009. The Illiberality of Perfectionist Enhancement. *Medicine, Health Care and Philosophy*, 12 (1): 91-98.
- Diekema, D.S. 2004. Parental Refusals of Medical Treatment: The Harm Principle as Threshold for State Intervention. *Theoretical Medicine*, 25 (4): 243-264.
- DOE Human Genome Program. 1992. *Primer on Molecular Genetics*. Washington: U.S. Department of Energy.
- Ereshefsky, M. 2007. Where the Wild Things Are: Environmental Preservation and Human Nature. *Biology and Philosophy*, 22 (1): 57-72.
- Farrelly, C. 2002. Genes and Social Justice: A Reply to Moore. *Bioethics*, 16 (1): 72-83.
- Faust, H.S. 2008. Should We Select for Genetic Moral Enhancement? A Thought Experiment using the MoralKinder (MK+) Haplotype. *Theoretical Medicine and Bioethics*, 29 (6): 397-416.
- Feinberg, J. 1980. The Child's Right to an Open Future. In Aiken, W. & Follette, H.L. (eds.). *Whose Child? Children's Rights, Parental Authority, and State Power*. Totowa: Littlefield, Adams.
- Feinberg, J. 1984. *Harm to Others*. Oxford: Oxford University Press.
- Feinberg, J. 1992. *Freedom & Fulfilment: Philosophical Essays*. Princeton: Princeton University Press.
- Fenton, E. 2008. Genetic Enhancement – A Threat to Human Rights? *Bioethics*, 22 (2): 1-7.
- Fenton, E. 2010. The Perils of Failing to Enhance: A Response to Persson and Savulescu. *Journal of Medical Ethics*, 36 (3): 148-151.
- Fletcher, J. 1983. Moral Problems and Ethical Issues in Prospective Human Gene Therapy. *Virginia Law Review*, 69 (3): 515-546.
- Føllesdal, A. 1997. Do Welfare Obligations End at the Boundaries of the Nation State? In Føllesdal, A. & Koslowski, P. (eds.). *Restructuring the Welfare State: Theory and Reform of Social Policy*. Berlin: Springer. pp. 145-163.
- Foot, P. 2001. *Natural Goodness*. Oxford: Clarendon Press.
- Fox, D. 2007. The Illiberality of 'Liberal Eugenics'. *Ratio*, 20 (1): 1-25.
- Frankel, M.S. 2007. Inheritable Genetic Modification and a Brave New World: Did Huxley Have It Wrong? *The Hastings Center Report*, 33 (2): 31-36.

- Fukuyama, F. 2002. *Our Posthuman Future: Consequences of the Biotechnology Revolution*. New York: Farrar, Straus and Giroux.
- Gagné, F. & St Père, F. 2002. When IQ is Controlled, Does Motivation still Predict Achievement? *Intelligence*, 30 (1): 71-100.
- Gannett, L. 2010. The Human Genome Project. In Zalta, E.N. (ed.). *Stanford Encyclopaedia of Philosophy*. [Online]. Available: <http://plato.stanford.edu/archives/fall2010/entries/human-genome/>. [15 March 2011].
- Gardner, W. 1995. Can Human Genetic Enhancement Be Prohibited? *The Journal of Medicine and Philosophy*, 20(1): 65-84.
- *Gattaca*. 1997. California: Columbia Pictures Corporation.
- Gay, H. (ed.). 1984. *Longman Dictionary of the English Language*. Harlow: Longman.
- Gelles, R.J. & Schwartz, I. 1999. Children and the Child Welfare System. *Journal of Constitutional Law*, 2 (1): 95-111.
- Gifford, F. 2008. Ethical Issues in Enhancement Research. *Journal of Evolution and Technology*, 18 (1): 42-49.
- Gillam, L. 1999. Prenatal diagnosis and discrimination against the disabled. *Journal of Medical Ethics*, 25 (2): 163-171.
- Glannon, W. & Ross, L.F. 2002. Do Genetic Relationships Create Moral Obligations in Organ Transplantation? *Cambridge Quarterly of Healthcare Ethics*, 11 (2): 153-159.
- Glover, J. 1984. *What Sort of People Should There Be?* London: Penguin Books.
- Glover, J. 2006. *Choosing Children: The Ethical Dilemmas of Genetic Intervention*. Oxford: Oxford University Press.
- Gordon, J. 1999. Genetic Enhancement in Humans. *Science*, 283 (5410): 2023-2024.
- Graham, G. 2002. *Genes: A Philosophical Inquiry*. London and New York: Routledge.
- Greenhalgh, T. 2005. The Human Genome Project. *Journal of the Royal Society of Medicine*, 98 (12): 545.
- Gudbjartsson, D.F., Walters, G.B., Thorleifsson, G., Stefansson, H., Halldorsson, B.V., Zusmanovich, P., Sulern, P., Thorlacius, S., Gylfason, A., Steinberg, S., Helgadóttir, A., Ingason, A., Steinthrsdóttir, V., Olafsdóttir, E.J., Olafsdóttir, G.H., Jonsson, T., Borch-Johnsen, K., Hansen, T., Andersen, G., Jorgensen, T., Pederson, O., Aben, K.K., Witjes, J.A., Swinkels, D.W., den Heijer, M., Franke, B., Verbeek,



A.L., Becker, D.M., Yanek, L.R., Becker, L.C., Tryggvadottir, L., Rafnar, T., Gulcher, J., Kiemene, L.A., Kong, A., Thorsteindottir, U., & Stefansson, K. 2008. Many Sequence Variants Affecting Diversity of Adult Human Height. *Nature Genetics*, 40 (5): 609-615.

- Habermas, J. 2003. *The Future of Human Nature*. Cambridge: Polity Press.
- Hall, J. & Morton, I. 2002. *The Royal Society of Medicine: Medicines*. London: Bloomsbury Publishing Ltd. [Online]. Available: <http://www.credoreference.com.ez.sun.ac.za/entry/rsmeds/phenotype>. [23 March 2011].
- Hall, S. 2008. *Difference, Disability and Discrimination: A Philosophical Critique of Selective Abortion*. Unpublished master's thesis. Stellenbosch: University of Stellenbosch.
- Hardimon, M.O. 1994. Role Obligations. *Journal of Philosophy*, 91 (7): 333-363.
- Harris, J. 1992. *Wonderwoman and Superman: The Ethics of Human Biotechnology*. Oxford: Oxford University Press.
- Harris, J. 2000. Is There a Coherent Social Conception of Disability? *Journal of Medical Ethics*, 26: 95-100.
- Harris, J. 2001. One Principle and Three Fallacies of Disability Studies. *Journal of Medical Ethics*, 27 (6): 383-387.
- Harris, J. 2003. In Praise of Unprincipled Ethics. *Journal of Medical Ethics*, 29 (5): 303-306.
- Harris, J. 2007. *Enhancing Evolution: The Ethical Case for Making Better People*. Princeton: Princeton University Press.
- Harris, J. 2009. Enhancements Are a Moral Obligation. In Savulescu, J. & Bostrom, N. (eds.). *Human Enhancement*. Oxford: Oxford University Press. pp. 131-154.
- Harris, J. & Chan, S. 2008. Enhancement is Good for You! Understanding the Ethics of Genetic Enhancement. *Gene Therapy*, 15 (5): 338-339.
- Herissone-Kelly, P. 2006. Procreative Beneficence and the Prospective Parent. *Journal of Medical Ethics*, 32 (3): 166-169.
- Hobbes, T. [1651] 1985. *Leviathan*. London: Penguin Books.
- Holtug, N. 1999. Does Justice Require Genetic Enhancements? *Journal of Medical Ethics*, 25 (2): 137-143.
- Holtug, N. 2002. The Harm Principle. *Ethical Theory and Practice*, 5 (4): 357-389.

- Hope, T. 2000. Acts and Omissions Revisited. *Journal of Medical Ethics*, 26 (4): 227-228.
- Hornby, A.S. (ed.). 1974. *Oxford Advanced Learner's Dictionary*. London: Oxford University Press.
- Horowitz, F.D. 2010. It's Not So Simple: A More Complex Behavioural and Psychological Perspective on Genetic Enhancement (and Diminishment). *The American Journal of Bioethics*, 10 (4): 76-78.
- Hoyert, D.L. 2007. Maternal Mortality and Related Concepts. *Vital and Health Statistics*, 3 (33): 1-13.
- Huxley, A. 1932. *Brave New World*. London: HarperCollins Publishers.
- Imray, G. 2012. *Manmade vs. Natural: Oscar Pistorius Stokes Debate*. London: The Associated Press.
- International Human Genome Sequencing Consortium. 2004. Finishing the Euchromatic Sequence of the Human Genome. *Nature* 431 (7011): 931-945.
- Jeske, D. 1998. Families, Friends, and Special Obligations. *Canadian Journal of Philosophy*, 28 (4): 527-555.
- Johanson, R., Newburn, M. & Macfarlane, A. 2002. Has the Medicalisation of Childbirth Gone Too Far? *British Medical Journal*, 324 (7342): 892-895.
- Juengst, E. 1991. Germ-line Gene Therapy: Back to Basics. *The Journal of Medicine and Philosophy*, 16 (6): 587-592.
- Juengst, E. 1997. Can Enhancement Be Distinguished from Prevention in Modern Medicine? *The Journal of Medicine and Philosophy*, 22 (2): 125-142.
- Juengst, E. 1998. What Does *Enhancement* Mean? In E. Parens. (ed.). *Enhancing Human Traits: Ethical and Social Implications*. pp. 29-47. Washington D.C.: Georgetown University Press.
- Juengst, E. 2009. What's Taxonomy Got to Do with It? 'Species Integrity', Human Rights, and Science Policy. In Savulescu, J. & Bostrom, N. (eds.). *Human Enhancement*. Oxford: Oxford University Press. pp. 43-58.
- Junhong, C. 2001. Prenatal Sex Determination and Sex-Selective Abortion in Rural Central China. *Population and Development Review*, 27 (2): 259-281.
- Juth, N. 2011. Enhancement, Autonomy, and Authenticity. In Savulescu, J., ter Meulen, R. & Kahane, G. (eds.). *Enhancing Human Capacities*. pp. 34-48. Oxford: Wiley-Blackwell.

- Kalokairinou, E. 2011. Enhancing Technologies: *Transformatio Ad Quod Optimum?* *Journal International de Bioéthique* 23 (3-4): 175-200.
- Kamm, F. 2005. Is There a Problem with Enhancement? *The American Journal of Bioethics*, 5 (3): 5-14.
- Kamm, F. 2009. What Is and Is Not Wrong with Enhancement? In Savulescu, J. & Bostrom, N. (eds.). *Human Enhancement*. Oxford: Oxford University Press. pp. 91-130.
- Kass, L.R. 1997. The Wisdom of Repugnance. *The New Republic*, 216 (22): 17-26.
- Kass, L.R. 2001. L'Chaim and Its Limits: Why Not Immortality? *First Things*, 113: 17-24.
- Kass, L.R. 2003. Ageless Bodies, Happy Souls: Biotechnology and the Pursuit of Perfection. *The New Atlantis*, 1: 9-28.
- Kass, L.R. 2009. Forbidding Science: Some Beginning Reflections. *Science and Engineering Ethics*, 15 (3): 271-282.
- Kirby, D.A. 2000. The New Eugenics in Cinema: Genetic Determinism and Gene Therapy in "GATTACA". *Science Fiction Studies*, 27 (2): 193-215.
- Kiuru, M. & Crystal, R.G. 2008. Progress and Prospects: Gene Therapy for Performance and Appearance Enhancement. *Gene Therapy*, 15 (5): 329-337.
- Kline, A.D. 2007. Giftedness, Humility and Genetic Enhancement. *Human Reproduction and Genetic Enhancement*, 13 (2): 16-21.
- Kochkin, S. 2000. MarkeTrak V: "Why my Hearing Aids are in the Drawer": The Consumers' Perspective. *The Hearing Journal*, 53 (2): 34-41.
- Koenig, R. 2006. South Africa Bolsters HIV/AIDS Plan, but Obstacles Remain. *Science*, 314 (5804): 1378-1379.
- Lappé, M. 1991. Ethical Issues in Manipulating the Human Germ Line. *The Journal of Medicine and Philosophy*, 16 (6): 621-639.
- Ledley, F.D. 1994. Distinguishing Genetics and Eugenics on the Basis of Fairness. *Journal of Medical Ethics*, 20 (3): 157-164.
- Lee, S. 2004. Regulation of Muscle Mass by Myostatin. *Annual Review of Cell and Developmental Biology*, 20 (1): 61-86.
- Leutwyler, K. 1999. Making Smart Mice. *Scientific American*, September 7. [Online]. Available: <http://www.scientificamerican.com/article.cfm?id=making-smart-mice>. [26 March 2011].

- Lewens, T. 2009. Enhancement and Human Nature: The Case of Sandel. *Journal of Medical Ethics*, 35 (6): 354-356.
- Lim, M.M., Wang, Z., Olazábal, D.E., Ren, X., Terwilliger, E.F., & Young, L.J. 2004. Enhanced Partner Preference in a Promiscuous Species by Manipulating the Expression of a Single Gene. *Nature*, 429 (6993): 754-757.
- Lin, P. & Allhoff, F. 2008. Against Unrestricted Human Enhancement. *Journal of Evolution & Technology*, 18 (1): 35-41.
- Liu, Z., Richmond, B.A., Murray, E.A., Saunders, R.C., Steenrod, S., Stubblefield, B.K., Montague, D.M., & Ginns, E.I. 2004. DNA Targeting of Rhinal Cortex D2 Receptor Protein Reversibly Blocks Learning of Cues that Predict Reward. *Proceedings of the National Academy of Sciences of the USA*, 101 (33): 12336-12341.
- Little, M.O. 1998. Cosmetic Surgery, Suspect Norms, and the Ethics of Complicity. In E. Parens. (ed.). *Enhancing Human Traits: Ethical and Social Implications*. pp. 162-176. Washington D.C.: Georgetown University Press.
- Livingstone, T. 2005. *Child of Our Time*. London: Random House.
- Mackie, J.L. 1985. Rights, Utility, and Universalization. In: Frey, R.G. (ed.). *Utility and Rights*. Oxford: Blackwell.
- Mackwardt, A.H. (ed.). 1995. *Webster Comprehensive Dictionary*. Chicago: J.G. Ferguson Publishing Company.
- Mahowald, M.B. 2006. Drawing Lines between Extremes: Medical Enhancement and Eugenics. *The Pluralist*, 1 (2): 19-34.
- Mai, L., Young Owl, M. & Kersting, M. (eds.). 2005. *Cambridge Dictionary of Human Biology and Evolution*. Cambridge: Cambridge University Press. [Online]. Available: <http://www.credoreference.com.ez.sun.ac.za/entry/cuphbe/genome>. [23 March 2011].
- Martin, A.M. & Peerzada, J. 2005. The Expressive Meaning of Enhancement. *American Journal of Bioethics*, 5 (3): 25-27.
- McArdle, D. 2002. “Just One of the Challenges of 21st-Century Life”: Oscar Pistorius in the Court of Arbitration for Sport. *SCRIPTed* 5 (2): 404-413.
- McConnell, T. 2010. Genetic Enhancement, Human Nature, and Rights. *Journal of Medicine and Philosophy*, 35 (4): 415-428.
- McConnell, T. 2011a. Genetic Intervention and the Parent-Child Relationship. *Genomics, Society and Policy*, 6 (3): 1-14.

- McConnell, T. 2011b. Genetic Enhancement and Moral Attitudes Towards the Given. *Journal of Applied Philosophy*, 28 (4): 369-380.
- McInerney, J. & Rothstein, M. 2008. *Behavioural Genetics*. U.S. Department of Energy Genome Programs: Biological and Environmental Research Information System (BERIS). [Online]. Available: [http://www.ornl.gov/sci/techresources/Human\\_Genome/elsi/behavior.shtml](http://www.ornl.gov/sci/techresources/Human_Genome/elsi/behavior.shtml). [7 March 2011].
- McKenny, G.P. 1998. Enhancements and the Ethical Significance of Vulnerability. In Parens, E. (ed.). *Enhancing Human Traits: Ethical and Social Implications*. pp. 222-237. Washington D.C.: Georgetown University Press.
- McKibben, B. 2003. Designer Genes. *Orion Magazine*, 22 (3): 20-27.
- Mehlman, M. 2003. *Wondergenes: Genetic Enhancement and the Future of Society*. Bloomington: Indiana University Press.
- Mehlman, M. 2005. Genetic Enhancement: Plan Now to Act Later. *Kennedy Institute of Ethics Journal*, 15 (1): 77-82.
- Middleton, A, Hewison, J. & Mueller, R. 1998. Attitudes of Deaf Adults toward Genetic Testing for Hereditary Deafness. *American Journal of Human Genetics*, 63: 1175-1180.
- Mill, J.S. [1859] 1956. *On Liberty*. Indianapolis: Bobbs-Merrill Educational Publishing.
- Miller, F.G. & Brody, H. 2005. Enhancement Technologies and Professional Integrity. *The American Journal of Bioethics*, 5 (3): 15-17.
- Miller, H. 2005. Cat and Mouse in Regulating Genetic ‘Enhancement’. *Nature Biotechnology*, 23 (2): 171-2.
- Millodot, M. 2009. *Dictionary of Optometry and Visual Science*. Philadelphia: Elsevier Health Sciences. [Online]. Available: <http://www.credoreference.com.ez.sun.ac.za/entry/ehsvision>. [25 March 2011].
- Mischel, W., Shoda, Y. & Peake, P.K. 1988. The Nature of Adolescent Competencies Predicted by Preschool Delay of Gratification. *Journal of Personality and Social Psychology*, 54 (4): 687-696.
- Moore, A.D. 2000. Owning Genetic Information and Gene Enhancement Techniques: Why Privacy and Property Right May Undermine Social Control of the Human Genome. *Bioethics*, 14 (2): 97-119.

- Morton, O. 2005. Biology's New Forbidden Fruit. *New York Times*: A25, February 11.
- Moseley, R. 1991. Maintaining the Somatic/Germ-Line Distinction: Some Ethical Drawbacks. *The Journal of Medicine and Philosophy*, 16 (6): 641-647.
- Moss, L. 2003. *What Genes Can't Do*. Cambridge, Massachusetts: The MIT Press.
- Motulsky, A.G. 1983. Impact of Genetic Manipulation on Society and Medicine. *Science*, 219 (4581): 135-140.
- Murphy, T.F. 2009. Choosing Disabilities and Enhancements in Children: A Choice Too Far? *Ethics, Bioscience and Life*, 4 (1): 43-49.
- Murray, T.H. 1991. Ethical Issues in Human Genome Research. *Faseb Journal*, 5 (1): 55-60.
- Mwase, I.M.T. 2005. Genetic Enhancement and the Fate of the Worse Off. *Kennedy Institute of Ethic Journal*, 15 (1): 83-89.
- Newell, C. 1999. The social nature of disability, disease and genetics: a response to Gillam, Persson, Draper and Chadwick. *Journal of Medical Ethics*, 25(2): 172-175.
- Newson, A. & Williamson, R. 1999. Should We Undertake Genetic Research on Intelligence? *Bioethics*, 13 (3/4): 327-342.
- Nortvedt, P., Hem, M.H., & Skirbekk, H. 2011. The Ethics of Care: Role Obligations and Moderate Partiality in Health Care. *Nursing Ethics*, 18 (2): 192-200.
- Omoto, C.K. & Lurquin, P.F. 2004. *Genes and DNA: A Beginner's Guide to Genetics and its Applications*. New York: Columbia University Press.
- Ostrosky-Solís, F. 2004. Can Literacy Change Brain Anatomy? *International Journal of Psychology*, 39 (1): 1-4.
- Parens, E. 1995. The Goodness of Fragility: On the Prospect of Genetic Technologies Aimed at the Enhancement of Human Capacities. *Kennedy Institute of Ethics Journal*, 5 (2): 141-153.
- Parens, E. 1998a. Is Better Always Good? The Enhancement Project. *The Hastings Center Report*, 28 (1): S1-S17.
- Parens, E. 1998b. Introduction. In Parens, E. (ed.). *Enhancing Human Traits: Ethical and Social Implications*. pp. vii-x. Washington D.C.: Georgetown University Press.
- Parens, E. 2005. Authenticity and Ambivalence: Toward Understanding the Enhancement Debate. *The Hastings Center Report*, 35 (3): 34-41.
- Parfit, D. 1984. *Reasons and Persons*. Oxford: Clarendon Press.

- Parker, M. 2007. The Best Possible Child. *Journal of Medical Ethics*, 33 (5): 279-283.
- Permutt, M., Wasson, J., Love-Gregory, L., Ma, J., Skolnick, G., Suarez, B., Lin, J. & Glaser, B. Searching for Type 2 Diabetes Genes on Chromosome 20. *Diabetes*, 51 (3): S308-S315.
- Persson, I. & Savulescu, J. 2008. The Perils of Cognitive Enhancement and the Urgent Imperative to Enhance the Moral Character of Humanity. *Journal of Applied Philosophy*, 25 (3): 162 – 177.
- Persson, I. & Savulescu, J. 2011. Unfit for the Future? Human Nature, Scientific Progress, and the Need for Moral Enhancement. In Savulescu, J., ter Meulen, R. & Kahane, G. (eds.). *Enhancing Human Capacities*. pp. 486-500. Oxford: Wiley-Blackwell.
- Pharoah, P.D.P., Antoniou, A., Bobrow, M., Zimmern, R.L., Easton, D.F. & Ponder, B.A.J. 2002. Polygenic Susceptibility to Breast Cancer and Implications for Prevention. *Nature Genetics*, 31 (1): 33-36.
- Pinker, S. 2009. My Genome, My Self. *New York Times*: MM24, January 11.
- Pollack, A. 2010. Genetically Altered Salmon Get Closer to the Table. *New York Times*: A1, June 25.
- Powell, R. & Buchanan, A. 2011. Breaking Evolution's Chains: The Promise of Enhancement by Design. In Savulescu, J., ter Meulen, R. & Kahane, G. (eds.). *Enhancing Human Capacities*. pp. 49-67. Oxford: Wiley-Blackwell.
- Quigley, M. & Harris, J. 2010. To Fail to Enhance is to Disable. In Ralston, D.C. & Ho. J. (eds.). *Philosophical Reflections on Disability*. pp. 123-131. Dordrecht: Springer.
- Rawls, J. 1971. *A Theory of Justice*. Oxford: Oxford University Press.
- Recer, P. 2002. Gene May Cause Anti-Social Behaviour. *Fort Scott Tribune*: 3, August 1.
- Resnik, D. 1994. Debunking the Slippery Slope Argument Against Human Germ-Line Gene Therapy. *The Journal of Medicine and Philosophy*, 19 (1): 230-40.
- Resnik, D. 2000. The Moral Significance of the Therapy-Enhancement Distinction in Human Genetics. *Cambridge Quarterly of Healthcare Ethics*, 9 (3): 365-377.
- Robert, J.S. 2005. Human Dispossession and Human Enhancement. *The American Journal of Bioethics*, 5 (3): 27-29.



- Robertson, J.A. 1983. Procreative Liberty and the Control of Conception, Pregnancy and Childbirth. *Virginia Law Review*, 69 (3): 405-464.
- Robertson, J. A. 2003. Procreative Liberty in the Era of Genomics. *American Journal of Law and Medicine*, 29 (4): 439-487.
- Robinson, M. (ed.). 1999. *Chambers 21<sup>st</sup> Century Dictionary*. Edinburgh: Chambers Harrap Publishers.
- Robinson, G. 2004. The Behaviour of Genes. *New York Times*: A27, December 13.
- Robinson, G., Fernald, R. & Clayton, D. 2008. Genes and Social Behaviour. *Science*, 322 (5903): 896-900.
- Ross, W.D. 1930. *The Right and the Good*. Oxford: Clarendon Press.
- Rowe, D.C., Vesterdal, W.J. & Rodgers, J.L. 1999. Herstein's Syllogism: Genetic and Shared Environmental Influences on IQ, Education, and Income. *Intelligence*, 26 (4): 405-423.
- Sabin, J.E. & Daniels, N. 1994. Determining "Medical Necessity" in Mental Health Practice. *The Hastings Center Report*, 24 (6): 5-13.
- Sandberg, A. & Savulescu, J. 2011. The Social and Economic Impacts of Cognitive Enhancement. In Savulescu, J., ter Meulen, R. & Kahane, G. (eds.). *Enhancing Human Capacities*. pp. 93-112. Oxford: Wiley-Blackwell.
- Sandel, M. 2004. The Case Against Perfection: What's Wrong with Designer Children, Bionic Athletes, and Genetic Engineering. *The Atlantic Monthly*, 293 (3): 51-62.
- Sandel, M. 2007. *The Case Against Perfection*. Cambridge & London: The Belknap Press of Harvard University Press.
- Satava, R. 2003. Biomedical, Ethical and Moral Issues Being Forced by Advanced Medical Technologies. *Proceedings of the American Philosophical Society*, 147 (3): 246-258.
- Savulescu, J. 2001. Procreative Beneficence. *Bioethics*, 15 (5/6): 413-426.
- Savulescu, J. 2002. Deaf Lesbians, "Designer Disability", and the Future of Medicine. *British Medical Journal*, 325 (7367): 771-773.
- Savulescu, J. 2004. Why I Believe Parents are Morally Obligated to Genetically Modify Their Children. *Times Higher Education Supplement*: 16, 5 November.
- Savulescu, J. 2005. New Breeds of Humans: The Moral Obligation to Enhance. *Ethics, Law and Moral Philosophy of Reproductive Biomedicine*, 1 (1): 36-39.

- Savulescu, J. 2006. Justice, Fairness, and Enhancement. *Annals of the New York Academy of Sciences*, 1093: 321-338.
- Savulescu, J. 2007. In Defence of Procreative Beneficence. *Journal of Medical Ethics*, 33 (5): 284-288.
- Savulescu, J. & Kahane, G. 2009. The Moral Obligation to Create Children with the Best Chance of the Best Life. *Bioethics*, 23 (5): 274-290.
- Savulescu, J., Sandberg, A. & Kahane, G. 2011. Well-Being and Enhancement. In Savulescu, J., ter Meulen, R. & Kahane, G. (eds.). *Enhancing Human Capacities*. pp. 3-18. Oxford: Wiley-Blackwell.
- Schmidt, E.B. 2007. The Parental Obligation to Expand a Child's Range of Open Futures when Making Genetic Trait Selection for their Child. *Bioethics*, 21 (4): 191-197.
- Schwartz, P.H. 2005. Defending the Distinction between Treatment and Enhancement. *The American Journal of Bioethics*, 5 (3): 17-19.
- Sen, A. 2003. Missing Women – Revisited. *British Medical Journal*, 327 (7427): 1297-1298.
- Shapley, R. 2009. Gene Therapy in Colour. *Nature*, 461 (7265): 737-739.
- Shickle, D. 2000. Are “Genetic Enhancements” Really Enhancements? *Cambridge Quarterly of Healthcare Ethics*, 9 (3): 342-352.
- Shinn, S. 1996. *Archangel*. New York: Ace.
- Shriver, A. 2010. Not Grass-Fed, but at Least Pain Free. *New York Times*: A27, February 19.
- Silver, L. 1997. *Remaking Eden: How Genetic Engineering and Cloning Will Transform the American Family*. New York: Avon Books.
- Silvers, A. 1998. A Fatal Attraction to Normalizing: Treating Disability as Deviations from “Species-Typical” Functioning. In Parens, E. (ed.). *Enhancing Human Traits: Ethical and Social Implications*. pp. 95-123. Washington D.C.: Georgetown University Press.
- Simmons, A.J. 1979. *Moral Principles and Political Obligations*. Princeton: Princeton University Press.
- Singer, P. 1993. *Practical Ethics*. Cambridge: Cambridge University Press.
- Singer, P. 2009. Parental Choice and Human Improvement. In Savulescu, J. & Bostrom, N. (eds.). *Human Enhancement*. Oxford: Oxford University Press. pp. 277-289.

- Sober, E. 2000. The Meaning of Genetic Causation. *In* Buchanan, A., Brock, D., Daniels, N. & Wikler, D. (eds.). *From Chance to Choice: Genetics and Justice*. pp. 347-370. Cambridge: Cambridge University Press.
- Sparrow, R. 2011. A Not-So-New Eugenics. *The Hastings Center Report*, 41 (1): 32-42.
- Steiner, H. 1998. Silver Spoons and Golden Genes: Talent Differentials and Distributive Justice. *In* Burley, J. (ed.). *The Genetic Revolution and Human Rights: The Oxford Amnesty Lectures 1998*. pp. 133-150. Oxford: Oxford University Press.
- Stern, L. 1983. Opportunity and Health Care: Criticisms and Suggestions. *The Journal of Medicine and Philosophy*, 8 (4): 339-361.
- Sternberg, R.J., Grigorenko, E.L. & Bundy, D.A. 2001. The Predictive Value of IQ. *Merrill-Palmer Quarterly*, 47 (1): 1-41.
- Stull, D.L. 2001. Better Mouse Memory Comes at a Price. *The Scientist*, 15 (7): 21.
- Sudha, S. & Irudaya Rajan, S. 1999. Female Demographic Disadvantage in India 1981–1991: Sex Selective Abortions and Female Infanticide. *Development and Change*, 30 (3): 585-618.
- Tang, Y., Shimizu, E., Dube, G.R., Rampon, C., Kerchner, G.A., Zhuo, M., Guosong, L. & Tsien, J.Z. 1999. Genetic Enhancement of Learning and Memory in Mice. *Nature*, 401 (6748): 63-69.
- *The Genius Sperm Bank*. 2006. London: BBC Horizon.
- The Nature of the Number. *Nature Genetics*, 25 (2): 127-128.
- The President's Council on Bioethics. 2003. *Beyond Therapy: Biotechnology and the Pursuit of Happiness*. Washington D.C.: The President's Council on Bioethics.
- Thiroux, J.P. 1980. *Ethics: Theory and Practice*. California: Glencoe Publishing.
- Tonkens, R. 2011. Parental Wisdom, Empirical Blindness, and Normative Evaluation of Prenatal Genetic Enhancement. *Journal of Medicine and Philosophy*, 36 (3): 274-295.
- Turkheimer, E. 2000. Three Laws of Behaviour Genetics and What They Mean. *Current Directions in Psychological Science*, 9 (5): 160-164.
- UNESCO. 1997. *Universal Declaration on the Human Genome and Human Rights*. 29<sup>th</sup> Session of the General Conference. Paris. [Online]. Available: <http://unesdoc.unesco.org/images/0010/001096/109687eb.pdf>. [ 21/04/2010].
- Urmson, J.O. 1973. Aristotle's Doctrine of the Mean. *American Philosophical Quarterly*, 10 (3): 223-230.

- Von Hirsch, A. 1986. Injury and Exasperation: An Examination of Harm to Others and Offense to Others. *Michigan Law Review*, 84 (4/5): 700-714.
- Wade, N. 1998. First Gene to be Linked with High Intelligence is Reported Found. *New York Times*, May 14.
- Wade, N. 2009. With Genetic Gift, 2 Moneys Are Viewing a More Colourful World. *New York Times*: D3, September 22.
- Walters, L. & Palmer, J. 1997. *The Ethics of Human Gene Therapy*. Oxford: Oxford University Press.
- Wang, D., Cui, Z., Zeng, Q., Kuang, H., Wang, L.P., Tsien, J.Z. & Cao, X. 2009. Genetic Enhancement of Memory and Long-Term Potentiation but Not CA1 Long-Term Depression in NR2B Transgenic Rats. *PLoS One*, 4 (10): e7486. [Online]. Available: <http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0007486>. [27 March 2011].
- Weedon, M.N., Lango, H., Lindgren, C.M., Wallace, C., Evans, D.M., Mangino, M., Freathy, R.M., Perry, J.R.B., Stevens, S., Hall, A.S., Samani, N.J., Shields, B., Prokopenko, I., Farrall, M., Dominiczak, A., Diabetes Genetics Initiative, The Wellcome Trust Case Control Consortium, Johnson, T., Bergmann, S., Beckmann, J.S., Vollenweider, P., Waterworth, D.M., Mooser, V., Palmer, C.N.A., Morris, A.D., Ouwehand, W.H., Cambridge GEM Consortium, Caulfield, M., Munroe, P.B., Hattersley, A.T., McCarthy, M.I. & Frayling, T.M. Genome-wide Association Analysis Identifies 20 Loci that Influence Adult Height. *Nature Genetics*, 40 (5): 575-583.
- Wei, F., Wang, G., Kerchner, G.A., Kim, S.J., Xu, H., Chen, Z. & Zhuo, M. 2001. Genetic Enhancement of Inflammatory Pain by Forebrain NR2B Overexpression. *Nature Neuroscience*, 4 (2): 164-169.
- Weiss, R. 1999. Adding a Gene Creates Smarter Mice. *Washington Post*: A1, September 2.
- Weiss, R. 2001. Study: Rodents' Higher IQ May Come at a Painful Price. *Washington Post*: A2, January 29.
- Wikler, D. 2009. Paternalism in the Age of Cognitive Enhancement: Do Civil Liberties Presuppose Roughly Equal Mental Ability? In Savulescu, J. & Bostrom, N. (eds.). *Human Enhancement*. Oxford: Oxford University Press. pp. 341-356.

- Winkler, M.G. 1998. Devices and Desires of Our Own Hearts. *In* Parens, E. (ed.). *Enhancing Human Traits: Ethical and Social Implications*. pp. 95-123. Washington D.C.: Georgetown University Press.
- Withthøft Nielsen, L. 2011. The Concept of Nature and the Enhancement Technologies Debate. *In* Savulescu, J., ter Meulen, R. & Kahane, G. (eds.). *Enhancing Human Capacities*. pp. 19-33. Oxford: Wiley-Blackwell.
- Youngson, 2000. *The Royal Society of Medical Health Encyclopaedia*. London: Bloomsbury Publishing. [Online]. Available: [http://www.credoreference.com.ez.sun.ac.za/entry/rsmhealth/genome\\_human\\_mapping](http://www.credoreference.com.ez.sun.ac.za/entry/rsmhealth/genome_human_mapping). [25 March 2011].
- Zhu, W., Lu, L. & Hesketh, T. 2009. China's Excess Males, Sex Selective Abortion, and One Child Policy: Analysis of Data from 2005 National Intercensus Survey. *British Medical Journal*, 338 (b1211): 1-6.

