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GERMLINE GENETIC ENGINEERING FOR COGNITIVE ENHANCEMENT: AN ARGUMENT FOR BETTER PEOPLE AND A BETTER SOCIETY

By

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A DISSERTATION SUBMITTED TO THE FACULTY OF HEALTH SCIENCE, UNIVERSITY OF THE WITWATERSRAND IN FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

MASTERS OF SCIENCE IN MEDICINE SPECIALIZING IN BIOETHICS AND HEALTH LAW

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I hereby declare the following:

- This Dissertation is my own unaided work. It is being submitted for the Degree of Masters of Science in Medicine Specializing in Bioethics and Health Law at the University of the Witwatersrand, Johannesburg. It has not been submitted before any degree or examination at any other University.
- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
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Abstract

Molecular genetic engineering technologies such as CRISPR/Cas9 have made the accurate, safe and reliable genetic engineering of human embryos possible. Further advances in genomics have isolated genes that predict qualities and traits associated with intelligence. Given these advances, prospective parents could use these biotechnologies to genetically engineer future children for genes that promote their wellbeing. While Julian Savulescu's Principle of Procreative Beneficence (PPB) argued for the moral obligation of prospective parents to use in vitro fertilization (IVF) and preimplantation genetic diagnosis (PGD) to make eugenic selections of embryos for intelligence, in principle the PPB could imply obligations to genetically engineer selected embryos for intelligence as well. Given the constraints on IVF's ability to make eugenic selections that do not apply to genetic engineering, an extension of the PPB to include genetic engineering would serve as a normative justification for the further enhancement of the prospective child's intelligence.

I argue that Savulescu's Principle of Procreative Beneficence implies an additional moral obligation for prospective parents to genetically engineer the embryonic germline identity of selected embryos for genes that predict intelligence. Implications of and objections to my argument for the PPB's extension to include germline gene engineering for cognitive enhancement (GGECE) are discussed.

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Chapter 1 Introduction

1.1 Background

Recent advances in gene-editing technology and advances in genomics have made germline gene editing for cognitive enhancement (GGECE) a real possibility (1). Human germline gene editing is the process by which a human's genome is edited such that the change is heritable. This genetic change is achieved through the genetic manipulation of reproductive cells such as unfertilized eggs and sperm or fertilized eggs through molecular engineering techniques such as CRISPR-Cas9. Germline gene-editing is contrasted with somatic gene-editing in that somatic gene-editing is not heritable (2). According to Tan et al. (3), advances in CRISPR-Cas9 biotechnology have increased the targeting accuracy in the genome editing process. As such, high precision gene-editing is now firmly in the realm of possibility, ameliorating previous bioethical concerns about the potential harms gene-editing could have on embryos due to its lack of gene-editing specificity and reliability.

Advances in genomics have singled out genes responsible for mathematical ability (4). Mathematics is a dimension used to measure intelligence and is a skill closely correlated to socioeconomic success and quality of life (5). Genes have also been reported to correlate with working memory (6), which is highly correlated with intelligence (7). The potential scope for GGECE is vast, with studies showing a significant relationship between IQ and genetics in adults, with genes predicting up to86% of our intelligence (8). GGECE's potential to enhance future generations' intelligence and, with it, the social, physical and economic wellbeing of individuals and society at large cannot be understated (9–15). However, despite its potential to improve the human condition and produce societal benefits, there are several genuine ethical concerns surrounding the permissibility of this new technology on enhanced individuals and society as a whole.

1.2 Literature Analysis

In a broad sense, GGECE is a form of human enhancement, which according to Juengst and Moseley (16) , can be defined as "biomedical interventions that are used to improve human form or functioning beyond what is necessary to restore or sustain health". As such, GGECE is morally distinguished from medical therapeutic interventions in that it contravenes conventional standards of medical practice by enhancing 'normal' people beyond the species-typical range of capabilities and is not aimed at treating any specific ailment (17,18). When considering the genetic enhancement of future individuals, ethical issues concerning what constitutes an appropriate end or 'decent future' for enhanced individuals are often raised. Multiculturalism and its associated diversity of moral paradigms would make settling on a unified understanding of a 'decent future' for enhanced individuals highly contentious and inevitably paternalistic (19). Related to the aforementioned is an objection to biotechnology raised by Buchanan (20), wherein he asserts that just like any biotechnology, the ends of genetic engineering are intrinsically linked to the social milieu of the society from which it emerged. Consequently, the ends of genetic engineering will be shaped by the morality of those at the top of society's dominance hierarchy, conforming to their notions of 'right' or 'just' ends. Another ethical concern about human genetic engineering relates to the potentially unpredictable multivariance through which genes are expressed. That is to suggest that it is probably impossible to reliably predict what effect genome editing will have on the recipient in the long term (21). Other ethical concerns surrounding human genetic engineering relate to the irreversible impact such a technology has on an individual whose consent cannot be acquired, the pernicious potential genetic engineering has to create designer babies (22), or its potential of changing human nature (23–25).

In a narrower sense, GGECE is a form of cognitive neuroenhancement, which is the targeted enhancement and extension of cognitive and affective abilities based on an understanding of their neurobiology in healthy people, unafflicted by mental illness (26). In their critique of the potential dangers of cognitive enhancement Bostrom & Sandberg (27) point to the potential cognitive enhancement has at creating skilled rationalizers who are selfishly calculating. This view is shared by Savulescu & Persson (14), wherein they point to the potential cognitive enhancement has at improving a person's efficiency at pursuing their prudential ends at the expense of the prudential ends of unenhanced people. Another concern surrounding GGECE is its potential to infringe on and limit the autonomy of enhanced persons by changing their capabilities and aptitudes in life, morphing what people can or even want to do with their lives (28). Additionally, as a prohibitively expensive frontier technology that promotes economic well-being, cognitive enhancement can accentuate socioeconomic inequality by cognitively enhancing and therefore economically empowering the children of the incredibly wealthy beyond existing levels (29).

The aforementioned ethical concerns surrounding genetic enhancement have contributed to legal measures that prohibit the use of enhancements such as GGECE and widely held views concerning its impermissibility. The *Council of Europe's Convention on Human Rights and Biomedicine* indicates in Article 13 that "an intervention seeking to modify the human genome may only be undertaken for preventive, diagnostic or therapeutic purposes and only if its aim is not to introduce any modification in the genome of any descendants" (30). More than 40 countries worldwide have laws prohibiting the inheritable genetic modification of humans (31). According to a Harvard STAT poll (32), only 11 per cent of Americans support genetically engineering unborn children to improve intelligence or physical attributes, with 83 per cent in the same study being opposed to editing the genes of unborn children to improve their intelligence or physical attributes.

1.3 Research Question and Thesis Statement

Given the mostly negative perceptions concerning GGECE and many states' active attempts to prohibit its use, in my normative analysis, I consider the following research question - do prospective parents have a moral obligation to use GGECE on prospective children? My Thesis Statement is that prospective parents do have a moral obligation to use GGECE on prospective children.

1.4 Discussion on Intelligence

Before considering the ethics debate surrounding genetic intelligence enhancement, I want to discuss the concept of intelligence, what is and is not, and what role it plays in my dissertation. *Intelligence* is a cognitive and behaviour construct that has been defined in many ways. Lay views typically describe intelligence as the capacity for logic, understanding, self-awareness, learning, emotional knowledge, reasoning, planning, creativity, critical thinking, and problem-solving. Experts in the fields of psychology and learning have attempted to formulate definitions for Intelligence. They include Judgment, otherwise called 'good sense,' 'practical sense,' 'initiative,' the faculty of adapting one's self to circumstances, 'auto-critique'(Binet (1916) as cited by 33), 'The aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment (34)', and '…the resultant of the processes of acquiring, storing in memory, retrieving, combining, comparing, and using in new contexts information and conceptual skills (35).' Given the various conceptualizations and definitions that the concept of intelligence can take, settling on a plausible and uncontroversial definition of intelligence may be challenging.

1.4.1 Theory of Multiple Intelligences

In a bid to find a working definition for intelligence, I will now turn my attention to and consider theories of multiple intelligence. Multiple intelligence theories challenge conceptions that intelligence is a singular construct. The most renowned proponent of

multiple intelligence theories is Howard Gardner , who proposes the differentiation of human intelligence into eight discrete *intelligences* (36). In formulating his theory of multiple intelligences, Gardner and Hatch (37) argue that IQ tests only measure two of his proposed eight intelligences, linguistic and logical-mathematic abilities.

Gardner's theory is not without its critics however. According to Visser et al. (38), many of Gardner's 'intelligences' correlate with a singular *g-factor* (or general intelligence) which supports the idea of a single dominant type of intelligence. The *g-factor* generally accounts for 40-50% of the difference in performance on a given cognitive test. Additionally, various IQ testing instruments tend to correlate positively with one another, which can be interpreted as being indictive of an underlying *g-factor* (39). Deary et al. (40) use the terms *g-factor* and *intelligence* interchangeably to refer to the core metric measured by cognitive tests. Linda Gottfredson (41) argues that thousands of empirical studies support the predictive power of cognitive tests that measure *g-factor* (such as IQ tests). However, the same cannot be said for the empirical evidence for multiple intelligences, which is either scant or lacks predictive power. She argues that ideas of multiple intelligences persist (despite the lack of supporting evidence) because it is an attractive theory that suggests that everyone can be smart in their own way. A literature review conducted by Waterhouse (42) found that various attempts made by different researchers failed to find any validating evidence for multiple intelligence theories. Gardner ((2004) as cited by 43) is even on record with saying that he would be 'delighted were any such evidence to accrue' in support of multiple intelligence theories, and admitted that '[multiple intelligence] theory has few enthusiasts among psychometrists or others of a traditional psychological background' because they require 'psychometric or experimental evidence that allows one to prove the existence of several intelligences'(Waterhouse (2006) as cited by 43)

Contrarily, the same review by Waterhouse (42) presents evidence that demonstrates that cognitive neuroscience research does not support the theory of multiple intelligences. Her analysis of the literature suggests that the human brain is unlikely to function in a manner that supports multiple intelligences. When taken together, the evidence suggests that there is an intercorrelation of various skills and IQ measures; evidence to suggest shared genes for traits such as mathematics, reading, *g-factor*; and evidence to suggest that there are shared neural pathways for language, music, motor skills and emotions. The body of cognitive neuroscientific literature suggests that it is unlikely that each of Gardner's intelligences could function 'via a different set of neural mechanisms.'

1.4.2 Settling on a Working Definition of Intelligence

Settling on an acceptable definition of intelligence would be difficult, given how nebulous that concept is. However, what is much clearer is the high degree of test-retest reliability (44,45) that methods of intelligence testing (such as IQ questionnaires) have, the predictive power IQ testing has for predicting things that are of moral value, and the significant role that genetics play in predicting IQ scores (12). So, while a definition of intelligence remains elusive, sincere attempts at measuring it through established IQ testing methods has produced findings that are of scientific and ethical value. Therefore, for my dissertation, any reference to '*intelligence*' that I make is just a reference to that quality or trait that IQ tests measure (that which IQ tests measure is referred to as *g-factor* or *intelligence* by some authors). Moreover, any reference I make regarding 'genetic intelligence enhancement' can be equivalently phrased as 'genetic enhancement of those qualities and traits that IQ test scores measure. Given the lack of evidence in support of multiple intelligence theories and the mountain of evidence against it, I will not refer to intelligence pluralistically in this dissertation.

1.5 Outline

In chapter 2, titled ‘The Positive Argument for GGECE,’ I submit my argument for the moral obligation prospective parents have to genetically engineer prospective children for intelligence. In subsequent chapters, in a bid to make plausible the view that my positive argument holds, I consider objections of impermissibility and an objection for prohibition to the claim that prospective parents ought to genetically enhance prospective children for intelligence. Moral obligations imply moral permissibility. Therefore, an objection against the permissibility of GGECE necessarily serves as a defeater to the claim that there is an obligation to use GGECE.

In chapter 3, titled ‘Net Harms Objection,’ I consider the objection that GGECE is impermissible without the use of moral enhancers because GGECE has the potential to cause more harm to society than good if used without a moral enhancer. In chapter 4, called ‘Inequality Objection,’ I consider the objection that GGECE ought to be prohibited because its use would accentuate inequality. In chapter 5, termed ‘Autonomy Objection,’ I consider the objection that GGECE is impermissible because it limits or does not respect the autonomy of enhanced children. In chapter 6, designated ‘Human Nature Objection,’ I consider the objection that GGECE is impermissible because it is unnatural. In chapter 7, titled ‘Merit-Based Objection,’ I consider the objection that GGECE is impermissible because it is unfair or a form of cheating. To make more plausible the claim that my positive argument holds, I argue that all of the above objections fail to prove GGECE’s impermissibility or that GGECE should be prohibited.

Chapter 2 The Positive Argument for GGECE

2.1 Introduction

In this chapter, I advance an argument that the Principle of Procreative Beneficence (PPB) implies a pro tanto duty for prospective parents to enhance the genetic germline of their prospective children for intelligence.

Research into the genetic basis for complex traits such as intelligence has produced fruitful results, with genes predicting mathematical ability (4) and working memory (6) having been singled out. While it is broadly acceptable for prospective parents to use in vitro fertilization (IVF) and preimplantation genetic diagnosis (PGD) to select embryos for severe disease-causing genes, or even for non-medical reasons, Savulescu (46) argues that prospective parents should select embryos for non-medical traits. He argues that: (1) because some non-disease-causing genes affect the likelihood of us leading the best life; and (2) prospective parents have good reason to take those genes into consideration when making reproductive decisions; therefore (3) prospective parents ought to select embryos and/or foetuses which are most likely to live the best life, based on available genetic information, including information about non-disease genes. Savulescu calls this duty of prospective parents using PGD and IVF to make eugenic selections of embryos/foetuses for well-being promotion the Principle of Procreative Beneficence (PPB).

The PPB argues that prospective parents should use biotechnologies like IVF and PGD to make eugenic selections of embryos/foetuses for non-disease traits like intelligence. However, it remains to be seen what implication this has on the ethics debate for germline genetic engineering, namely those about the ethics of GGECE. As such, I consider the following question: do prospective parents have a moral obligation to genetically enhance the germline of their prospective children for intelligence? I argue that prospective parents do have a moral obligation to genetically enhance the germline of their prospective children for

intelligence. In support of this thesis, I advance the following: (1) because the PPB prescribes the use of IVF and PGD to select non-disease genes like intelligence; and (2) because there is nothing inherent to germline gene-editing that should exempt it from the PPB; then (3) the PPB ought to also prescribe the genetic modification of embryos for intelligence. While the Nuffield Council on Bioethics 2018 report 'Genome editing and human reproduction'(47) advances germline gene editing's permissibility, I argue that GGECE is obligatory for prospective parents. Additionally, while Gyngell et al. (48) argue that there is a moral imperative to use GGECE to advance egalitarian ends, I argue much more broadly that there is a moral obligation for prospective parents to use GGECE regardless of whether it produces egalitarian ends. The duty I argue for is a *pro tanto* obligation, and therefore should be considered in the context of and weighed against other competing moral obligations for as long as there are monetary costs associated with pursuing GGECE. A limitation worth pointing out from the onset is that this chapter will not give a technical description of GGECE.

In this chapter, my overarching claim is that because the PPB is justified, it creates a pro tanto obligation that extends to germline gene-editing for intelligence. In section 2, I describe Savulescu's PPB, highlighting key elements of his argument that prospective parents ought to use IVF and PGD to select embryos/foetuses for non-disease traits, such as intelligence. In section 3, I argue for the PPB's extension to include gene-editing. In section 4, I defend germline gene-editing against the person affective objection that there cannot be anything wrong with *not* genetically enhancing embryos. In section 5, I defend the genetic engineering of embryos from the treatment-enhancement distinction. In Section 6, I argue that the obligation to engineer against genes for disease conditions implies an identical obligation to engineer for non-disease genes, such as intelligence. In section 7, I consider what implications the PPB has on prospective parents' duty to select reproductive partners.

2.2 The Argument for the Principle of Procreative Beneficence (PPB)

In this section, I describe the concept of the PPB, on why prospective parents ought to use PGD to select the best possible child. The PPB was first coined by Julian Savulescu (46) and is an argument based on the following propositions: (1) some non-disease genes affect the likelihood of us leading the best life; (2) we have good reason to use information which is available about such genes in our reproductive decision making; therefore (C) couples (or single producers) should select embryos or foetuses which are most likely to have the best life, based on available genetic information about non-disease genes. In what follows, I will first give a detailed description of Savulescu's argument that prospective parents ought to use IVF and PGD to select against disease genes in the section titled *Simple Case of Selection for Disease Genes.* Following this, I give a detailed account of Savulescu's defence of the *Simple Case* against the non-identity problem in the section titled *Parfitian Defence of Voluntary Procreative Beneficence in the Simple Case*. I conclude that the PPB holds and survives the non-identity problem.

2.2.1 Simple Case of Selecting Against Disease Genes

In this section, I describe Julian Savulescu's argument for the PPB. In support of his argument for the PPB, Savulescu submits what he calls the *Simple Case of Selecting for Disease Genes.* Herein, he presents the reader with a scenario in which prospective parents are using IVF in an attempt to have a child. The process produces two embryos, A and B. Embryo A has no abnormalities on the PGD tests performed, while embryo B has no abnormalities on the PGD test performed, other than a predisposition for asthma. Embryo B has nothing in its favour over A and something against it. Embryo A should (on pain of irrationality) be implanted. We should pick A over B because what is relevant about asthma is that it reduces one's quality of life. Asthma attacks cause severe breathlessness which in extreme cases can prove fatal, the prevention and treatment of which requires the long-term

use of steroid inhalers, which are amongst the most deleterious to use over the long-term. In short, the morally relevant property of asthma is that it reduces the well-being of the person who has it. The simple case shows why prospective parents ought to select the least diseased embryo out of a selection of available embryos. Herein, the simple case illuminates the underlying rationale for the PPB.

2.2.2 Parfitian Defence of Voluntary Procreative Beneficence in the Simple Case

In this section, I give Savulescu's account of what he calls the *Parfitian defence of voluntary procreative beneficence in the simple case*, in which Savulescu defends the PPB against the *Non-Identity Problem*.

The Non-Identity Problem is the problem raised by the belief that an act may still be wrong even if it is not harmful for anyone. More precisely, the Non-Identity Problem is the inability to simultaneously hold a set of three intuitions (Parfit (1976) as cited by 46). (1) The first is the *person affecting view*, according to which, an act can be wrong *only if* that act makes things worse for some existing or future person.

(2) The second intuition is that an act that confers on a person an existence that is, though flawed, worth living in a case in which that same person *could never have existed at all in the absence of that act* does not make things worse for and is not "bad for" that person. If this intuition holds, then it *cannot* be wrong to abstain from subscribing to the PPB, because on this view favouring embryo B over A cannot be bad for B. This is because B's existence, though flawed by asthma, is still worth living in a case where it would never have existed at all if it were not selected.

(3) The third intuition is that existence-inducing acts under scrutiny in various non-identity cases are *wrong*. If scrutiny directed towards the PPB as a non-identity case were wrong, then the PPB would be right. This is because it is an existence inducing act that prescribes the

favouring of one embryo over another (in cases where one would have more well-being than the other and where both would have lives worth living). These three propositions constitute the Non-Identity Problem. Of which only two can be right with the remainder being wrong.

In Savulescu's Parfitian defence of voluntary procreative beneficence in the simple case, he defends the view that the Non-Identity Problem ought to be resolved by declaring propositions (2) and (3) as right and (1) as wrong (herein simply called the supporting solution). Savulescu submitted his Parfitian defence in response to a solution to the Non-Identity Problem that holds that premises (1) and (2) are right and that (3) is wrong (herein simply called the refuting solution). That because the person affective view is right, and because an act of conferring a flawed existence on a person whose life is still worth living cannot be bad for that person, particularly in cases where that person *could never have existed at all in the absence of that act*; therefore, an existence-inducing act under scrutiny in a Non-Identity Problem case is *right*. The existence-inducing act under scrutiny in this case is the *simple case* of prospective parents selecting embryo B or embryo A. If the prospective parents had selected embryo B (the one with a predisposition for asthma) over the otherwise healthy A, then that act cannot be wrong. This is because no existing or future person was left worse-off from selecting B over A; and B's life, while flawed by asthma, is still worth living and therefore cannot be *bad for* B. Therefore, the view prescribed by the PPB that A ought to be selected over B is wrong. The refuting solution to the Non-identity problem would suggest that the PPB is not obligatory, that non-adherence to the PPB cannot be morally objectionable.

In his *Parfitian defence of voluntary Procreative Beneficence in the simple case,* Savulescu, after Parfit (1976) argues in support of the view that the PPB is morally obligatory. He does this by arguing in favour of the supporting solution to the Non-Identity Problem. He argues by analogy to illustrate the absurd conclusions that the refuting solution to the Non-Identity

Problem can lead to while simultaneously showing why the supporting solution is less absurd and therefore preferable to the refuting solution. The first analogy he considers, 'the rubella analogy,' goes as follows: A woman has rubella. If she conceives now, she will have a blind and deaf child. If she waits three months, she will conceive a different but healthy child. She should choose to wait until after her rubella passes.

Alternatively, consider the second analogy he calls 'Nuclear Accident Analogy.' A developing country does not have enough power to provide electrical energy to its citizens during a freezing winter. The government decides to open an old and unsafe nuclear reactor. Ample lighting and heating are made available. Citizens stay up later and enjoy their lives much more. Several months later, the nuclear reactor melts down, and large amounts of radiation is released into the environment. The only effect is that a large number of children are subsequently born with predispositions to early childhood malignancy.

The activation of the reactor and subsequent societal changes that came with the greater availability of electricity to the people led to them living radically different lives and therefore conceiving different children. Thus, children born after the nuclear meltdown would not have existed if the old reactor was not activated. They would not have been harmed by the switch to nuclear power (unless their lives are so bad that they were better off dead). Suppose we object to the nuclear accident or to the women conceiving a child while sick with rubella (which most of us would). In that case, we must appeal to some form of harmless wrongdoing, that it would be wrong to bring certain people into existence even if such an existence inducing act is not bad for anyone. That is, we must reject the person affective view that an act is only bad if it is bad for someone and endorse the view that existence-inducing acts under scrutiny in various non-identity cases are *right*. As such, we must appeal to something like the PPB (an existence inducing act) that mandates that we ought to make the best child possible by selecting the best embryo for implantation. Non-adherence to the PPB

would constitute a harmless wrongdoing as absurd as a woman with rubella insisting on having a child while sick instead of just waiting for her illness to pass. As such, this paragraph has shown that non-adherence to the PPB is morally reprehensible; prospective parents ought to adhere to PPB. Not subscribing to the PPB would be wrong for the same reason that it would be wrong for the woman with rubella to conceive a child or for the same reason that it would be wrong to switch on the old reactor. Therefore, the PPB survives the non-identity problem.

2.3 The Argument for Procreative Beneficence's Extension to Germline Editing

In this section, I argue that the use of IVF and PGD in pursuit of the PPB implies that prospective parents ought to also germline edit selected embryos for genes that ameliorate disease. Firstly, I point to the limitations that PGD and IVF have in promoting the well-being of prospective children. Following this, I highlight the fact that PPB's mandated use of IVF and PGD is not relevant *per se*; it is those technologies ability to promote well-being that is relevant to the PPB. After this, I conclude that germline editing is not constrained in the same way that IVF and PGD are in promoting well-being. Therefore, germline editing should also be used to promote the well-being of prospective children.

As was previously discussed, the primary biotechnological mechanism through which the PPB is pursued is with PGD and IVF, which involves the genetic profiling of pre-implanted embryos for selection against disease genes. These biotechnologies would undoubtedly go a long way in improving the well-being of subsequent generations. However, they are limited in the extent to which they can improve on a prospective child's well-being. In what I call the *Simple Case for Genetic Engineering Against Disease Genes*, after Savulescu's *Simple Case of Selecting for Disease Genes*, I illustrate, by example, why germline editing ought to be used in pursuit of the PPB.

2.3.1 The Simple Case for Genetic Engineering Against Disease Genes

After their round of IVF, which produced two embryos A and B, the prospective parents used PGD to select embryo A over B because B had a predisposition for asthma. However, both embryos are genetically predisposed for rheumatoid arthritis. Given that both embryos are predisposed to develop rheumatoid arthritis, and only B is predisposed to develop asthma, then the prospective parents still ought to select A. However, if prospective parents ought to select A because A would live a better life than B, then for the same reason, the prospective parents ought to germline engineer A to correct its predisposition for rheumatoid arthritis. Rheumatoid arthritis (or disease) is not what is relevant concerning why we should germline edit A. We should germline edit A because what is relevant about rheumatoid arthritis is that it reduces one's quality of life. Rheumatoid arthritis causes debilitating pain in one's joints and predisposes victims to various life-threatening conditions, including; heart attack, atherosclerosis and stroke. Rheumatoid arthritis requires the long-term use of disease-modifying antirheumatic drugs, whose side effects can vary from liver damage to immunosuppression. In short, the morally relevant property of rheumatoid arthritis is that it is a state which reduces the well-being a person experiences.

Embryo A's predisposition for rheumatoid arthritis and IVF and PGD's inability to select against it highlights IVF and PGD's limitation in promoting the well-being of prospective children. This limitation does not apply to germline gene-editing, which can edit the genes of selected embryos in ways that ameliorate disease. If the genes that cause rheumatoid arthritis can be identified, then embryo A can be gene-edited in ways that can correct against it, which will promote A's well-being even more. There is no reason why PPB should be limited to the genetic material of prospective parents: why not make the best child that *can* be made. Germline gene-editing is one such technology that is not limited to the genes that prospective parents bring to the table; selected embryos can be genetically enhanced well beyond what

prospective parents could hope to create with their gametes.

Central to my claim that PPB ought to be extended to germline gene-editing is that the use of PGD and IVF to select against disease genes is not relevant *per se*. What is relevant about PGD and IVF is that they are effective and safe means which enable prospective parents to maximize the well-being of prospective children. Therefore, to the extent that germline gene-editing is also an effective and safe means which enable prospective parents to maximize the well-being of prospective children, it ought to also be used by prospective parents to maximize the well-being of their prospective children. Hence, the PPB also implies the use of germline gene editing to edit against disease genes.

2.4 Parfitian Defence of Voluntary *Germline* Editing in the Simple Case

In this section, I defend germline gene-editing against the person affective objection that there cannot be anything wrong with *not* genetically enhancing embryos. In the *Parfitian defence of voluntary Procreative Beneficence in the simple case,* Savulescu defended the PPB against the refuting solution to the non-identity problem, that there cannot be anything wrong with selecting worse-off embryos if their lives are still worth living. In my bid to extend the PPB to including GGECE, I have to also defend germline gene-editing against a similar non-identity objection. The Non-Identity Problem I will consider is: because embryos of different genetic profiles are *different* embryos (in the sense that they will grow to become *different* people), then there cannot be anything wrong with not editing an embryo if the life the emergent person will have is still worth living. As such, in a manner similar to Savulescu, after Parfit ((1976) as cited by 46), I will in this section provide the *Parfitian defence of voluntary germline gene-editing in the simple case.* Firstly, I describe the destruction hypothesis, the view that one's germline identity is tethered to their personal identity. Secondly, I give the person affective account that if the destruction hypothesis holds, then there cannot be anything wrong with not editing an embryo's germline. Thirdly, I give the

Parfitian defence for germline editing that because the PAV leads to absurd conclusions, one ought to instead endorse the supporting solution to the non-identity problem, that while an existence inducing act cannot be bad for someone whose life is worth living, non-identity cases such as the PPB survive scrutiny. Therefore we must endorse the view that non-adherence to the PPB constitutes a harmless wrongdoing. Following this, I consider an ethical implication of germline gene-editing: the destruction of unwanted pre-implanted embryos.

The *destruction hypothesis* (DH) is the view that an embryo cannot survive a change to its germline identity. The DH supposes that an embryo whose germline identity has been changed should not be thought of as the *same* embryo that has been enhanced but as a completely different embryo that has been created. Such that germline editing embryo A destroys A to create C. To highlight the intuitive basis for the DH, consider the following thought experiment. There are two embryos A and C, which have gene profiles A and C respectively. Embryo A will grow into person A who will have all the characteristics that gene profile A can endow if it is implanted. The same is true for embryo C. Now, remove all the genes from A and replace them with the genes of C such that embryo A now possesses C gene profile. Alternatively, one can simply edit A so extensively as to possess an identical gene profile to C. Following this, A is implanted. Suppose one holds the understandably intuitive view that the emergent person is C and not just A who has been extensively edited. In that case, personal identity is, *to some extent,* tethered to one's germline identity. Strict interpretations may hold that *any* change to a person's germline will result in a new person. My Parfitian defence for GGECE is to any interpretation that holds that personal identity is tethered to germline identity. My defence for GGECE is in response to the refuting solution to the Non-Identity Problem. Assuming that the DH is correct, it seems that there cannot be anything wrong with not gene-editing embryo A before its implantation. This is because A's

life, though flawed by rheumatoid arthritis, is still worth living in a case where it would not have existed at all had A been gene-edited into becoming C. That is, the refuting solution to the non-identity problem seems to hold in the case of the DH.

However, as was previously mentioned, after Savulescu's Rubella and Nuclear Accident analogies, the adoption of the refuting solution to the non-identity problem with its person affective view leads to absurd conclusions that most people would reject. If one believes that the woman with rubella should wait for her condition to pass, or if one objects to the nuclear reactor being activated, then one ought to instead endorse the supporting solution to the non-identity problem. The supporting solution asserts that while an existence inducing act cannot be bad for someone whose life is worth living, non-identity cases such as the PPB ought to survive scrutiny. Therefore, we must endorse the view that acts can be bad even if they are not bad for anyone and that non-adherence to the PPB constitutes a harmless wrongdoing. In this case, the PPB implies that prospective parents should rather bring C into existence instead of A, because C will have a better life than A. Non-adherence to this view is a harmless wrongdoing as absurd as the woman in the rubella analogy insisting on having a child while sick, instead of just waiting to have a child when she is healthy.

2.4.1 Germline Gene-Editing and the Ethical Implication of Destroying Unwanted Pre-Implanted Embryos

In the previous section, I defended the germline gene-editing against the refuting solution to the Non-Identity Problem. There is a crucial relevant distinction to be drawn between germline editing and embryo selection. This distinction arises from the fact that embryo selection does not necessarily involve the destruction of unwanted embryos. In contrast, unedited embryos are destroyed in the course germline editing (if the DH is assumed). Such a distinction raises the ethical question of whether or not it is permissible to destroy unwanted pre-implanted embryos.

The PPB argues for the obligation of prospective parents to use PGD to select the 'best' possible child. Objecting to the destruction of unwanted pre-implanted embryos warrants separate ethical enquiry. In Savulescu's (46) *simple case of selecting for disease genes,* he does not address the question of what ought to be done with embryos that do not get selected. As things currently stand: (1) it is standard practice to destroy unwanted embryos after PGD (49); (2) PGD is legal in many countries; (3) if it is permissible for prospective parents to destroy unwanted pre-implanted embryos for little or no reason, then it ought to be permissible for prospective parents to destroy embryos if they have good reason to do so, as would be the case for germline editing in the course of PPB.

In conclusion, because the refuting solution to the non-identity problem leads to absurd conclusions, it follows that prospective parents ought to appeal to the supporting solution to the non-identity problem with its endorsement of non-identity cases, such as the PPB and its endorsement of harmless wrongdoing. Prospective parents ought to select against disease genes in their selection of viable embryos because such a selection would promote the well-being of their prospective children. It follows that prospective parents ought to also edit the germline of selected embryos against disease genes because such editing would promote the well-being of their prospective children. This germline gene-editing ought to be undertaken even if embryos cannot survive such a change to their germline. This is because prospective parents ought to acknowledge that there are harmless wrongdoings, and doing so requires that they should endorse the PPB. If the endorsement of the PPB counts as a good reason to destroy embryos and if it is permissible to destroy unwanted pre-implanted embryos for little or no reason (as is currently the case for PGD), then it ought to be permissible for prospective parents to destroy embryos if they have good reason to do so, as would be the case for germline editing in the course of the PPB.

2.5 Gene-Editing and the Treatment-Enhancement Distinction

In this section, I defend the genetic engineering of embryos from the treatment-enhancement objection, that because genetic engineering embryos for intelligence (GGECE) is a form of enhancement and because enhancement falls outside of the professional bounds of clinical practice, then it is impermissible for clinicians to genetically engineer embryos for intelligence.

The *Parfitian defence of voluntary germline gene-editing in the simple case* is predicated on the assumption that the DH holds. The DH is the view that because genetic changes to an embryo lead to changes in the features and characteristics of emergent persons, and because persons are to some extent defined in terms of their characteristics, then on a plausible understanding of personhood genetic identity is tethered to personal identity. While this assumption is plausible in some cases, it is not entirely as plausible in all cases of germline editing. Consider a slightly different spin on the previous thought experiment: consider the same embryos A and C. Instead of replacing A's entire genetic profile with C's, let us now only replace a small portion of A's genetic profile with C's, say, only genes that code for height. The consequence being that embryo A will become a being embodying all of person A's characteristics except for height, which will be identical to C's. The DH does not seem quite as plausible in cases where only *part* of an embryo's germline is altered. That is, it seems plausible to think that the altered embryo (A) becomes person A who has been modified for height as opposed to him being a *completely different* person. This reveals that the DH seems implausible when only *some* of an embryo's genes are altered. As such, personal identity is plausibly preserved when only minor changes are made to an embryo's germline.

As such, *if* GGECE is not a sufficient enough genetic alteration to change the personal identity of emergent persons, then the PPB's extension to include it raises a unique *identity-*

related problem, namely the *treatment-enhancement objection.* In this section, I defend the genetic enhancement of selected embryos against the objection that genetic enhancements fall out of the bounds of legitimate clinical practice in ways that are morally impermissible or prohibited. I respond that if disease prevention is a legitimate goal of medicine, then genetic enhancements that prevent disease ought to be considered as a legitimate clinical practice. I show that GGECE prevents disease and therefore is contained within the bounds of legitimate clinical practice even though it is an enhancement.

The treatment-enhancement objection in clinical practice is usually used to argue that clinical or therapeutic uses of genetic engineering fall within (and are thereby protected by) the boundaries of medicine's traditional domain. In contrast, enhancement technologies (like GGECE) fall out of these boundaries and are, to that extent, more problematic as a professional medical practice or a legitimate medical need (18). W. French Anderson (17) articulates a clear case for the moral significance of genetic enhancement:

> On medical and ethical grounds, we should draw a line excluding any form of genetic engineering. We should not step over the line that delineates treatment from enhancement.

The challenge that the treatment-enhancement objection raises is not that GGECE is immoral as such, but that it is immoral for clinical practitioners to do it because doing so would be to act beyond the legitimate boundaries of acceptable clinical practice. If Anderson's argument holds, then the PPB's expansion to include duties of prospective parents to use GGECE on selected embryos may be rendered mute because *ought implies can*. There can be no legitimate moral duty for prospective parents to use GGECE if clinical practitioners cannot legitimately perform the procedure.

David Resnik (50) thinks that this argument makes at least two questionable assumptions: (1)

there is a clear and uncontroversial account of health and disease, and (2) the goal of treating disease is morally legitimate, while other goals are not. Concerning the first assumption, the bioethics literature is vast (Caplan(1997) & Khushf(1995) as cited by 50). Thus, I will not give a detailed description of all accounts that seek to distinguish between health and disease here. However, Resnik (50) describes two prominent accounts that attempt to distinguish disease from health: a value-neutral (descriptive) approach and a value-laden approach (normative) approach. In what follows, I consider both approaches to determine if there is a clear and uncontroversial account of health and disease. I conclude that given the contradictions that the value-laden and value-neutral approaches lead to an uncontroversial account of health and disease pertaining to GGECE is not possible. Following that, I set aside the controversy surrounding an account of health and disease and examine the soundness of his second assumption, of whether it is even true that non-curative goals of medicine are legitimate. I argue that non-curative goals of medicine, such as GGECE, are legitimate because they prevent disease. I conclude that the treatment-enhancement objection does not preclude GGECE as a legitimate goal of medicine therefore, it is not morally problematic for clinicians to do it.

2.5.1 The Value-Neutral Approach

According to the value-neutral approach, health and disease are descriptive concepts that have an empirical and factual basis in human biology. Boorse ((1977) as cited by 50) defends the most influential value-neutral account when he argues that a diseased organism lacks the normal functional abilities of its species. Daniels ((1985) as cited by 50) elaborates on this idea when he argues that natural selection can provide an account of species-typical functioning: functional abilities are traits that exist in a population because they contribute to the survival and reproductive fitness of the organism that possesses them. As such, a human with healthy lungs has specific respiratory capacities common to members of its species, and

these respiratory capabilities have been naturally selected. A human with a malfunction in respiratory capabilities (i.e., someone with cystic fibrosis, or emphysema) has a disease (50).

2.5.2 The Value-Laden Approach

According to the value-laden approach, our conception of health and disease are informed by our social, cultural and moral norms. A person is healthy if they exhibit characteristics and behaviours that fall within these norms. Conversely, a person is diseased if they deviate from them. A person can deviate from species-typical function (and be categorized as diseased on the value-neutral account) and still be considered healthy depending on the cultural context in which the diagnosis is being made. For example, while schizophrenia has a biological basis, it is not treated as an illness in some cultures, with those who have it being considered 'gifted' or 'sacred'. In contrast, other cultures may consider them 'mentally ill.' Likewise, views concerning homosexuality can range from pathological to benign depending on cultural context (Sigerist (1943), Pellagrino & Thomasma (1968) and Caplan (1995) as cited by 50).

Many other authors have made attempts to work out variants on these two views of health and disease, while some have attempted to develop compromise views (Culver & Gert (1982) and Lennox (1995) as cited by 50). However, in light of the contradiction that the value-laden and value-neutral accounts present on the distinction between health and disease, it seems unlikely that an uncontroversial distinction between them is possible. Resnik (50) also thinks we are not any closer to arriving at an uncontroversial account of health and disease, with such an assumption remaining dubious at best. If an uncontroversial account of health and disease is not possible, then there is no uncontroversial way of knowing that the use of GGECE is a treatment or an enhancement. The value-neutral approach might say that GGECE is an enhancement because there would have been nothing biologically wrong with the person being enhanced. Contrarily, the value-laden approach might say that as health has

social, psychological, physical dimensions (51), and on some value-laden judgement people generally operate at a level below their optimal level of social, psychological and physical health then GGECE is a treatment for suboptimal social, psychological and physical health. Therefore, if a moral theory supports different conclusions when applied consistently, then that theory is incoherent (Clarke (2005) as cited by 52) and should be set aside. One could end the objection against GGECE here by simply deeming the treatment-enhancement objection as incoherent.

2.5.3 Disease Treatment as the Sole Legitimate Goal of Medicine

Suppose *arguendo* that the value-laden, value-neutral, or some compromise view produced an uncontroversial account that distinguishes health from disease and that this uncontroversial account deemed GGECE as an enhancement. Then my response to the treatment-enhancement objection would continue on to consider the second assumption of whether disease treatment is the sole legitimate goal of medical practice. I argue that the second assumption would still be false.

The view that the goal of treating disease is morally legitimate, while other goals are not, is itself a dubious proposition. Some have argued that there is no essential domain of clinical practice, such that no coherent distinction can ever be drawn between medical and non-medical services (Engelhart (1986) as cited by 53). At the same time, others argue that for all practical intents and purposes – namely for psychological and economic reasons – any attempt at drawing a line between treatment and enhancement would be improbable to hold in practice (54). Others concede that a distinction can be drawn between treatment and enhancement however they challenge the traditional values of medicine by arguing that favouring treatment over enhancement is itself wrong (Silvers (1994) as cited by 53). Eric T. Juengst (53) takes another route, wherein he argues that to the extent that disease prevention is a proper goal of medicine, and the use of gene transfer techniques to enhance/strengthen

human health maintenance capabilities will help achieve that goal, then the treatment enhancement objection cannot confine or define the limits of proper medical use of gene transfer techniques. As such, so as long as gene-editing enhancement technologies prevent illness, and insofar as disease prevention is a legitimate goal of medicine, then the treatment-enhancement objection cannot legitimately preclude gene-editing enhancement technologies that *prevent* illness or disease. GGECE is an enhancement that prevents disease. Premorbid intelligence is linked with better physical health[1] at age 50 and lower risk for several chronic health conditions (55). As such, the extent to which the advancement of health (which includes the absence of disease) is a legitimate goal of medicine, then the treatment-enhancement objection cannot legitimately preclude the use of GGECE in clinical practice because GGECE is a genetic enhancement that *prevents* disease.

In summary, the treatment-enhancement objection to the use of GGECE by challenging the legitimate ends of medicine, not the moral obligations of prospective parents. It did so by attempting to argue that only therapeutic uses of gene engineering fall within the bounds of legitimate clinical practice, while non-therapeutic uses of gene engineering do not. This argument rests on two dubious assumptions: (1) there is an uncontroversial account of health and disease, and (2) legitimate clinical practice is limited to treatment and not enhancement. I argued that there is no uncontroversial account of health and disease, and even if there was, clinical practice cannot be legitimately confined to therapy only. That is, if the prevention of disease is a legitimate end of medicine, and if a gene-editing technology can enhance human health maintenance capabilities, then that gene enhancing technology cannot be precluded from the legitimate bounds of clinical practice. GGECE enhances the health maintaining capabilities of humans by enhancing their intelligence. Hence, GGECE cannot be precluded from the legitimate bounds of clinical practice. Even though GGECE is an enhancement

[1] According to the WHO (51) **Health** is a state of physical, mental and social well-being in which disease and infirmity are absent. On this view, advancing health necessarily implies ameliorating or preventing disease.

technology, it is an enhancement that prevents disease and therefore is a legitimate end of medicine. Therefore, it would not be morally problematic for clinicians to perform GGECE.

2.6 An Argument for the Use of Germline Editing for the Editing of Non-Disease Genes

In this section, I argue that the obligation to engineer against genes for disease implies an identical obligation to engineer for non-disease genes, including intelligence. As was previously mentioned in the *Simple Case for Selecting for Disease Genes,* it is not asthma (or disease) that is relevant in our decision to select embryo A over B, but disease's impact on life in ways that matter which is important. Non-disease genes may prevent us from living the best life. By 'best life,' what Savulescu means is the life with the most well-being. The argument here is that because embryo A will have more well-being than embryo B, prospective parents have good reason to select A over B. In this section, I argue that genes that predict intelligence are non-disease genes that count towards the well-being of prospective children. That is, prospective parents ought to select embryos for intelligence and, by extension, genetically enhance selected embryos for intelligence. Firstly, I will give a descriptive account of the three major theories of well-being and how non-disease genes can affect well-being. Following this, I argue that intelligence is one such non-disease gene that can promote well-being on any of the major accounts of well-being. I conclude that because intelligence promotes well-being, prospective parents ought to select embryos and enhance selected embryos for intelligence.

2.6.1 Major Theories of Well-Being

There are various theories of well-being, the main ones being: hedonistic, desire fulfilment and objective list theories (Parfit (1976) and Griffin (1986) as cited by 46). According to hedonistic theories, what matters is the quality of our experiences, that well-being consists of the greatest balance of pleasure over pain (56). On this account of well-being, a life full of pleasant sensations is the best life one could have. According to desire-fulfilment theories,

what matters is the degree to which our desires are fulfilled, that what constitutes well-being is not the positive affect we experience but the extent to which we can do what we want to do. On this account of well-being, if a man wants to become a novelist, so as long as he can be allowed to work towards becoming one, then he is in a state of well-being, regardless of whether the process of becoming a novelist produces pleasant sensations. According to objective list theories, well-being consists neither in pleasurable experience nor in desire satisfaction (56). Such items listed generally include things that are self-evidently good. On this account, well-being is a life that is virtuously lived, independent of pleasure or desire. There is debate on what sort of virtues advance well-being, how long the list of objective goods should be or whether or not objective list theories are coercive in their conception. These are objections to the objective list theory that Savulescu does not address, nor do I. I will only go so far as to say that 'some conception' of the objective good is necessary for well-being. Savulescu names: the achievement of worthwhile things with one's life, having dignity, having children and raising them, gaining knowledge of the world, developing one's talents and appreciating beautiful things as a non-exhaustive list of objective goods that advance well-being.

According to Savulescu, on any of these theories, some non-disease genes will affect the likelihood of us living the best life. As an example, imagine a gene that contributes significantly to a violent, explosive and uncontrollable temper, and that state contributes to significant suffering. Uncontrollable anger leads to run-ins with the law and deterioration of important social relations. The loss of independence, dignity and important social relations are bad on any of the three accounts of well-being and illuminate the ability genetics possesses in predicting how good a life a person will live.

2.6.2 Intelligence and Well-Being

After the above exposition on the three major theories of well-being, I am well positioned to

ask: Does being intelligent mean one is more likely to have a better life? To what extent is there a positive obligation to select genes responsible for intelligence? At a folk intuitive level, it seems plausible that intelligence would promote well-being on any of the major accounts of well-being.

According to Savulescu, on the hedonistic account, the capacity to imagine alternative pleasures and remember the salient features of past experiences is essential in choosing the best life path. On a desire-fulfilment theory, intelligence is vital for choosing means which will best satisfy ones ends. On an objective-list account, intelligence would be crucial in gaining knowledge of the world and developing rich social relations. Newson (15) has reviewed the empirical literature relating intelligence to quality of life. Her synthesis of the empirical literature points decisively to the fact that:

> Intelligence has a high instrumental value for persons in giving them a large amount of complexity with which to approach their everyday lives, and that it equips them with a tool, which can lead to the provision of many other personal and social goods.

On Newson's view, intelligence can be regarded as an 'all-purpose means' due to its high instrumental value to provide all manner of personal and social goods. Indeed, on their synthesis of the available literature Stenberg, Grigorenko and Bundy (57) found that IQ testing reliably predicted education achievement, employment prospects, wealth generation, career outcomes, and well-being.

In support of the view that intelligence promotes well-being, Socrates, in Plato's Philebus, concludes that the best life is a mixture of wisdom and pleasure. Wisdom includes thought (cognition), intelligence, knowledge and memory (as cited by 46).

> Without the power of calculation, you could not even calculate that you will get enjoyment in the future; your life would be that not of a man, but of a sea-lung or one

of those marine creatures whose bodies are confined by a shell.

This part of my argument has shown that on ancient as well as contemporary philosophical accounts of well-being, intelligence promotes well-being. If prospective parents ought to select embryos and germline edit selected embryos against disease, then it is because of disease's negative impact on well-being that is relevant to the PPB, not disease. Therefore, the PPB implies a duty to select embryos and germline edit selected embryos for intelligence.

In summary, the argument for the PPB's extension to including GGECE is that (1) as per the PPB, prospective parents ought to select embryos with the best chance to live the best life; (2) embryos with a higher likelihood for intelligence have a higher likelihood for the best life; (3) there are constraints on IVF and PGD's ability to select for intelligence that do not apply to genetic engineering; (4) IVF and PGD are not relevant, what is relevant is their ability to enhance intelligence; (C) therefore, the PPB ought to include the use of GGECE.

2.7 The Principle of Procreative Beneficence and its Implication for Partner Selection

In this section, I consider what implications the PPB has on prospective parents' duty to select reproductive partners. I argue that the PPB implies a moral duty on prospective parents to select prospective reproductive partners for traits that predict for well-being in prospective children, including intelligence. The PPB, as articulated by Savulescu (46), is concerned with the obligation of prospective parents to select embryos that are genetically predisposed to living the best life. Savulescu does not discuss the obligation prospective parents have to select reproductive partners with traits that are favourable for promoting the best life in prospective children. On Savulescu's interpretation of the PPB, he takes who the prospective parents will be as a given. He is only concerned with producing the best child for the prospective parents concerned.

On my extension of the PPB to include germline editing, I argued that prospective parents

ought to germline edit selected embryos to promote the well-being of their prospective children. This obligation to germline edit includes the deletion of native genes and the introduction of non-native genes into the germline identity of an embryo that would never have come to possess those genes. This is done in a bid to make the best child *possible,* not just the best child yours and your reproductive partner's genes can make.

The incorporation of outside genes into a child's germline highlights the fact that taking who the reproductive partners will be as a given puts practical limits on the well-being of one's prospective child. This is because the pursuit of the PPB will be limited by factors including the cost/availability of PGD or germline editing, or there may be practical limits in terms of which genes can be edited or prediagnosed. In such instances, who a prospective parent reproduces with can impact the well-being of their prospective child. There is no reason why the PPB should be limited to a given set of reproductive pairs, and there is good reason why the PPB should be applied to the selection of reproductive pairs to maximize the well-being of prospective children. Therefore, central to the PPB is the pursuit of making the *best possible* child that *you* as a prospective parent can make.

My argument for the PPB's inclusion of germline editing illuminates the fact that making the best possible child that would lead the best life is dependent on whose genes are being used to create embryos (if there are access barriers or practical limitations to germline gene-editing or PGD). This invokes the ethical question: who should be *your* reproductive partner? People generally do not think that they have an obligation to choose reproductive partners that will promote the most well-being for their prospective children. However, if one accepts the PPB, then this leads to the counterintuitive outcome that prospective parents actually do have a duty to select reproductive partners for well-being promoting genes – at least in cases where prospective parents cannot afford to pursue PPB via its traditional means (IVF, PGD and genetic engineering), or if there are constraints on which genes can be prediagnosed or edited.

My ethical inquiry into the PPB and its requirement for prospective parents to select reproductive partners will be limited to the pro tanto duty prospective parents have to select for intelligence in reproductive partners. My inquiry will be divided into two sections: an uncontroversial case for partner selection that examines the ethical implications that the PPB imposes on single producers and the controversial case for partner selection that examines the implications that the PPB imposes on romantic partners.

2.7.1 Uncontroversial Case for Partner Selection

'Single producers' are those prospective parents that do not have any other relationship with their reproductive partner. People who use sperm and egg donors to have children are single producers. At face value, there does not seem to be any other competing moral obligation that a single producer ought to appeal to other than the PPB in their selection of gametes. That is, single producers have a pro tanto duty to select the most intelligent reproductive partner available for selection.

2.7.2 Controversial Case for Partner Selection

The application of the PPB and its implication to select intelligent partners does not present the single producer with any overly demanding moral obligations. However, the PPB and its implication of prospective parents selecting reproductive partners for intelligence invokes issues of its demandingness when applied to people who want to have children with their romantic partners. The PPB in this regard may be viewed as being too demanding since it implies obligations to entirely neglect any kinds of self-interested concerns such as wanting your romantic partner to also be your reproductive partner when such a want conflicts with the potential well-being of one's prospective child.

Firstly, it must be said that romantic partners are not necessarily reproductive partners. Hence, in situations where the obligations of the PPB and the maintenance/creation of

romantic relationships are aligned or do not conflict, are, in principle, possible.

Secondly, romantic aspirations (at least sometimes) are not subject-specific. That is to say, that sometimes people want romantic relations but do not know whom they want romantic relations with. The world of internet dating broadens one's exposure to potential romantic partners enormously. Online platforms can be used to broaden one's choices on whom to initiate romantic relationships with to the extent that *both* the obligation of the PPB and the desire for one's romantic preference can be aligned, i.e. such as selecting the most intelligent potential romantic partner out of as many possible romantic partners.

On the question of whether the PPB outweighs self-interested romantic desires to want one's romantic partner to also be one's reproductive partner is controversial indeed. The PPB has proven itself to be persuasive in ways that obligate prospective parents to act in various ways that promote the well-being of prospective children. The PPB has shown, with argument, why prospective parents should use IVF, PGD and GGECE (at tremendous cost) to select and edit desirable embryos even if doing so destroys unwanted embryos. As such, given the normative force that the PPB has displayed thus far, and in the absence of any objection to the contrary, it would seem that the PPB implies that prospective parents ought to select reproductive partners for well-being promoting genes, including intelligence. The view that prospective parents ought to select reproductive partners in pursuit of the PPB stands to be a potential objection to the PPB from demandingness. However, because the source of this potential objection is an implication of the PPB and not so much the PPB itself, then there is room for research into ways that can resolve potential tensions between duties to select reproductive partners and freedom to select reproductive partners. This research would have to argue for a coherent or plausible limit to the applicability of the PPB that effectively precludes partner selection as a requirement for the PPB.

2.8 Conclusion

To summarise, in this chapter, I argued for the extension of the PPB to include GGECE, so that prospective parents could genetically engineer prospective children for intelligence in a bid to promote their well-being. Pursuant to this, I first gave a detailed account of the PPB, initially formulated by Julian Savulescu that prospective parents ought to select embryos that have the highest chance of living the best life. Following this, I argued that the PPB also implies the use of genetic engineering of selected embryos for non-disease genes that affect the likelihood of prospective children leading the best life. After my argument for the PPB's extension to including genetic engineering, I argued that genes that predict intelligence contribute towards well-being and therefore should be selected for and engineered into selected embryos.

After the argument for GGECE, I considered the implication that the PPB has on partner selection. I concede that while controversial, this implication holds. The PPB demands that prospective parents ought to consider the well-being promoting genes of prospective reproductive partners.

Chapter 3 The Net Harms Objection

3.1 Introduction

In this chapter, I consider the objection that it is impermissible to use GGECE without a moral enhancer because GGECE would produce more harms than benefits if used alone. GGECE has the potential to promote the well-being of the enhanced, it gives people expanded cognitive means to pursue their ends. However, because cognitive enhancement does not necessarily track moral enhancement, this raises two concerns. The first concern is that enhanced people may use their expanded intellects to pursue prudential goals at the expense or disregard of the prudential goals of others. The second concern is that enhanced people may use their expanded intellects to pursue nefarious ends, such as developing novel and deadly weapons of war. In response to this objection, Savulescu and Persson (58) argue in both cases that arriving at a hard and fast conclusion on whether cognitive enhancements like GGECE produced more harms than benefits (net harms) or more benefits than harms (net benefits) is very difficult, if not impossible. Unable to effectively rule against the use of cognitive enhancements like GGECE, they argue that if the use of cognitive enhancements like GGECE is permitted, then its use ought to be coupled with research/use of moral enhancements to offset the possibility of GGECE producing net harms. While Savulescu and Persson do not make the claim that cognitive enhancers used without moral enhancers are impermissible, they do leave room open for that objection to be made (58). Because GGECE is further ahead in its development (if it is not a viable technology already) than moral enhancement, then the mandated use of moral enhancements can serve as grounds for the impermissibility of GGECE for as long there is not an available moral enhancement (58).

While conceding that there is a prima facie case against the permissibility of GGECE if it does produce net harms (59), I differ from the potential assertion that the use of GGECE is impermissible if not used with a moral enhancer. In the first part, I argue that given what we

know about other cognitive enhancers' net benefits, it is unlikely that GGECE would produce net harms if used without a moral enhancer, thereby negating the need for mandatory use of a moral enhancer. In the second part, I argue that while it is true that increasing intelligence would increase the destructive power of weapons of war (and with that harms), it is generally the case that increases in intelligence lead to innovations that save more lives than they end (benefits). Moreover, I argue that it is unlikely that increases in intelligence would increase the probability of an evil genius developing a weapon capable of wiping out humanity, given our present-day and historical understanding of how weapons of mass destruction are made. I conclude that while conceivably possible, these two concerns run contrary to what can be deduced about the benefits and harms of existing cognitive enhancers, the benefits and harms of technological innovation or the risk that weapons of mass destruction pose. The objection that GGECE needs to be coupled with some moral enhancer to ensure that it produces net benefits can safely be cast aside in favour of permitting the use of GGECE without any moral enhancers because GGECE would very likely produce net benefits on its own.

3.2 Prudential Goals and Moral Goals

In this section, I consider the objection that GGECE ought to be coupled with a moral enhancer because GGECE would produce net harms if used alone. GGECE has a high degree of instrumental value because it would enable the enhanced to secure a wide variety of personal and social goods (15). Julian Savulescu and Ingmar Persson (58) argue that the possible ends that enhanced people may want to pursue include those that are *prudentially good* (those that produce benefits for one’s self) and those that are *morally good* (those that produce benefits for everyone). GGECE is prudentially good when it makes people more proficient in pursuing their various prudential ends and helps ensure that their ends are internally consistent in ways that maximize personal goods.

What is prudentially suitable for an enhanced person may be prudentially bad for the unenhanced. The success or advancement of the prudential ends of the enhanced may necessarily involve the deprivation of others from doing the same. If there is a clash of prudential goals, because to a greater or lesser degree, people are driven by immoral prudential ends, then GGECE would to a greater or lesser degree spell bad news for others. Likewise, another's enhancement with GGECE may likely be bad news for you. Fortunately, this does not have to be the case. It is a familiar idea that the harmonization of people's prudential goals such that their prudential goals are co-satiable is definitive of morality (58). If net benefits generally equate to a harmonization of peoples prudential goals, and if GGECE produces net benefits, then the permission would generally lead to the co-satiation of everyone's prudential goals, which would be in accordance with the demands of morality [2]. Generally speaking, according to Savulescu and Persson, amongst those that are enhanced with GGECE, the greater the ratio of those that use moral enhancement will increase the likelihood of GGECE producing net benefits (58).

In Savulescu and Persson's view, moral enhancement would help align moral goals with prudential goals, thereby ensuring that cognitive enhancement produced net benefits. However, the view that the prudential goals of the cognitively enhanced can be so misaligned from the prudential goals of the unenhanced as to lead to net harms, thereby warranting mandatory usage of moral enhancements, is alarmist given that it is only speculation driving this concern. There are already extant cognitive enhancement methods that are generally more accessible to society's wealthier quadrants, such as education (60). Education is well

[2] If prudential goals are pursuant to some personal benefit, then the harmonization of prudential goals implies the co-satiation of personal benefits. Then conceptually at least, the concept of moral goals is similar to the concept of net benefits, which is concerned with aggregate personal benefits outweighing aggregate personal harms. If something produces net benefits, then that thing generally provides people with more benefits than harms. As such, if prudential goals are pursuant to the acquisition of personal benefits then the use of things that produce net benefits ought to be somewhat aligned with everyone's prudential goals. If the co-satiation of prudential goals is definitive of morality, then net benefits should also be definitive of morality.

documented as a cognitive enhancer. A study has found that increases in the number of universities in countries (ostensibly in a bid to reduce access barriers to education attainment) are positively associated with subsequent growth in GDP per capita (61). In this regard, cognitive enhancers' proliferation has been shown to produce net benefits (if one assumes that GDP per capita growth is a net benefit).

Moreover, it is the enhancement of intelligence associated with education rather than mere educational attainment that predicts individual earrings and economic growth (62). This fact eliminates potential confounds in the analogy that I am drawing between education and GGECE as cognitive enhancers. It is not education *per se* that promotes individual earnings and economic growth (and with it net benefits), but the intelligence that education enhances that leads to these net benefits. Given that it is intelligence enhancement that leads to these net benefits and given that GGECE seeks to enhance intelligence, then one can expect net benefits from GGECE.

Taken together, if increases in GDP per capita and economic growth are taken to be net benefits, then cognitive enhancement through education (without moral enhancement) is a moral good. Given that education produces net benefits because it enhances intelligence and how intelligence enhancement through education does not produce net harms even though it is not coupled with moral enhancers, then one can argue with a convincing degree of cogency that GGECE (which also acts by enhancing intelligence) would not lead to net harms either if it were used without moral enhancers. Therefore, GGECE's permissibility need not be coupled with moral enhancers.

3.3 Cognitive Enhancement and Nefarious Ends

In this section, I consider the objection that the use of GGECE without moral enhancers will produce net harms due to it accelerating the proliferation and development of weapons of

mass destruction. If cognitive enhancers typically produced net benefits for society, there may be reason to believe that GGECE could still produce net harms if permitted without cognitive enhancers. By accelerating the rate of scientific progress and the scope of scientific innovation, cognitive enhancers such as GGECE run the risk of enabling morally unscrupulous yet intellectually enhanced individuals to produce more imaginative and effective weapons of war. Weapons that, on the balance of considerations, may still result in GGECE producing net harms even if cognitive enhancers typically produced net benefits for society.

In response, I first consider the concern that GGECE used without a moral enhancer would produce net harms through its ability to accelerate the proliferation of destructive weapons of war. Secondly, I consider the concern that GGECE used without a moral enhancer would produce net harms by increasing the probability of a lone-wolf terrorist capable of creating weapons capable of world destruction.

3.3.1 The Proliferation of Increasingly Destructive Weapons of War

Here, I address the concern that GGECE used without a moral enhancer would produce net negative externalities through its ability to accelerate the proliferation of destructive weapons of war. Julian Savulescu and Ingmar Persson (58) consider that through the use of cognitive enhancements, such as GGECE, it is likely that there will be an acceleration in the acquisition of knowledge. And while they think that this is generally a good thing, the authors put forward one reason why this sort of acceleration in technological acquisition may be problematic. They surmise that the expansion of scientific knowledge will put in an increasing number of people's hands conventional or even novel weapons of mass destruction or the ability to develop them. Through the use of GGECE, ever smaller terror groups, as opposed to rogue states, may come to acquire ever more devasting weapons of war. Moreover, because terror groups are more challenging to monitor than rogue states then even

if the use of GGECE also leads to advances in surveillance technologies that monitor the proliferation of weapons of mass destruction, this may not be enough to provide reassuring levels of security.

In response, I want to remind the reader that there is nothing new about cognitive enhancements. The Flynn effect is the linear, consistent and widespread increase in intelligence scores in many parts of the world over the 20th century (60). Given the Flynn effect, every generation has been 'cognitively enhanced' over previous generations. If Savulescu and Persson are correct in their view that increases in intelligence will increase the destructive power of weapons of war and an increase in the proliferation of weapons of mass destruction amongst ever-smaller terror groups, then this would be a perennial threat humanity has always faced. That is, it has always been the case that weapons are increasingly more destructive and available to ever smaller groups. Despite this, the benefits of emerging technologies bourne out of human increasing human ingenuity have historically always outweighed the harms of weapons development and proliferation bourne out of increasing human ingenuity.

According to the World Report on Violence and Health, 1.6 million people lose their lives to violence every year (63). In this context, 'Violence' includes armed conflict, which is generally where weapons of war are used. Even if one makes the reckless assumption that all violence is due to armed conflict in which weapons of war (and the cognitively enhanced people that invented them) are directly culpable, then lifesaving technologies developed by intellectually enhanced people would still be responsible for saving more lives. Oral rehydration therapy is a simple, inexpensive means of treating diarrheal dehydration and is widely lauded as the most significant medical advance of the century, with 500,000 lives saved every year through its use (64). At the same time, vaccines save 2-3 million lives per year (65). Taken together, technologies borne out of human ingenuity save up to twice as

many lives than they end. Additionally, when one considers that my assessment of the various ways in which technology saves lives is nowhere near exhaustive, then the picture becomes quite clear. Increases in intelligence lead to the development of new technologies that *generally* save more lives than they end. Technological advances accelerated by increases in intelligence have historically produced net benefits without the use of any moral enhancers in a world where people have generally been getting progressively more intelligent. Yes, weapons of war are becoming more devasting, but medical technologies are also becoming more efficacious. This exposition exposes the emptiness of Savulescu and Persson's concern surrounding GGECE's potential to produce net harms through the creation and proliferation of deadlier weapons of war. People have always been getting more intelligent, and our society is no worse for it. Therefore, it can safely be assumed that the cognitive enhancement that will come with GGECE and the technological advances that it will facilitate will not leave us worse off either.

Secondly, Savulescu and Persson argue (or rather assume) that the best way to attenuate the potential of cognitive enhancers to accelerate the development and proliferation of weapons of war is to make the use of moral enhancers mandatory. They make this assumption without defining what a moral enhancer would actually do. If the authors intended for moral enhancers to heighten one's sense of moral conviction for their beliefs, then moral enhancers would be just as likely to increase weapons development than decrease it. Given that moral conviction is usually submitted as a justification to engage in acts of violence (66), then it seems just as likely that a morally enhanced person would develop and proliferate weapons of mass destruction in pursuit of some moral end. A heightened sense of moral conviction does not necessarily imply a commitment to pacifism.

Alternatively, pacifism might have been what the authors intended moral enhancers to enhance. They may have intended for moral enhancers to commit the 'enhanced' to a set of

moral views (in this case, pacifism). If this is the case, enforcing the use of moral enhancers is not only problematic because pacifism is not without its controversies (67–70), but also because that moral enhancer would be a paternalistic intervention in the lives of the enhanced (71) and would limit the autonomy of the enhanced from acting without personal limitation (72). In summary, the objection that a moral enhancer is needed to attenuate the risk of GGECE producing net harms through the acceleration of technological advances and the proliferation of weapons of war is thrice debunked. Firstly, it is unlikely that GGECE will lead to net negative externalities because technological advances that save lives outweigh those that end them. Secondly, it is not obvious that a moral enhancer would reduce the likelihood of weapons proliferation. Thirdly, even if moral enhancers did reduce the likelihood of weapons development and proliferation, then it is not clear that such an enhancer is morally permissible given its threats to autonomy and its controversial subscription to pacifism. Hence, the concern that GGECE used without controversial moral enhancers would produce net harms through its ability to accelerate the proliferation of destructive weapons of war can be set aside for the more likely view that GGECE would still produce net benefits when used without controversial moral enhancers.

3.3.2 The Risk of Lone-Wolves Capable of World Destruction

In this section, I address another concern raised by Savulescu and Persson, that while we may not have reached the state where a lone-wolf evil genius can single-handedly create a weapon that could wipe out humanity, the chance of such a dastardly figure emerging, can only be higher in a world that permitted GGECE without some mandatory moral enhancer. Then the use of GGECE carries with it the unacceptably high risk of entire crops of people dying. This would offset any net benefits that GGECE would produce, thereby producing net harms. Therefore, the argument is that to eliminate this risk, cognitive enhancements such as

GGECE must be coupled with moral enhancements that extend to all potential users of GGECE to ensure that lone-wolves capable of world destruction do not emerge.

In response, I want to remind the reader that lone-wolf terrorism has always been a threat in a world where people have been becoming progressively more intelligent (60). While I admit that over the years, small terror groups and lone-wolves have employed increasingly more sophisticated means of inflicting harm (i.e., the Matsumoto sarin attack), this in no way suggests that intelligence increases the possibility of some evil genius clandestinely creating a weapon capable of destroying all life. What we currently know about weapons of mass destruction (nuclear, biological, and chemical) is that they require many person-hours, infrastructure and resources to develop. Generally speaking, the more resources and infrastructure needed to develop a weapon of mass destruction makes the development of such a weapon much harder to conceal. Moreover, if an evil genius wanted to stockpile enough of such a weapon to destroy humanity, concealing such an activity would be all the more difficult. There is simply no evidence to suggest that Savulescu and Persson's 'evil genius scenario' is even possible. Admittedly, if our knowledge of weapons of mass destruction expands to include some novel weapon that is so easy to develop clandestinely and so destructive as to be able to wipe out humanity, then that eventuality would breathe life into this objection[3]. However, until such a time arises, it should suffice to limit our concerns to our present and near-future understanding of mass destruction weapons.

The 'peril' that GGECE presents in the form of increasing the probability of an evil genius clandestinely creating weapons capable of wiping out humanity simply is not grounded in any fact or experience or evidence we have concerning how weapons of mass destruction are developed. While such a 'peril' remains a distant *conceivability,* it should be enough to say

[3] One would still need to resolve controversies surrounding the permissibility of moral enhancers and the controversies surrounding pacifism if such a weapon ever came into existence.

that for such a conceivability to be taken seriously, it should be grounded in some fact, experience or evidence concerning the nature of weapons development. The concern of a lone wolf terrorist wiping out humanity can be set aside for the more realistic view that such a terrorist plot is probably not possible given that the development of weapons of mass destruction is (and historically has been) a large scale endeavour that a single person cannot undertake, no less, conceal. It can be safely assumed that GGECE's use without a moral enhancer would not increase the probability of a lone-wolf terrorist clandestinely creating a weapon capable of wiping out humanity.

The argument for the mandatory use of moral enhancers sought to argue that the use of GGECE without moral enhancers would lead to the proliferation of increasingly destructive weapons and an increased risk of lone-wolf terrorists capable of destroying the world. Concerning the risk of increased weapons effectiveness and proliferation, I responded that (1) technologies borne out of human ingenuity generally save more lives than they end, (2) it is not clear how a moral enhancer would reduce the proliferation and development of weapons of war, (3) alternatively it would be morally controversial if moral enhancers could reduce the proliferation and development of weapons of war. Secondly, concerns surrounding GGECE's potential to increase the possibility for a lone-wolf evil genius developing a weapon capable of wiping out humanity is not grounded in any fact. Such speculation runs contrary to what we presently, and historically, know about the difficulties associated with making weapons of mass destruction and the difficulties that would come with concealing the quantities of weapons needed to eradicate humanity. Given that, this second concern can be set aside in favour of the more realistic view that technologies developed with the use of GGECE without a moral enhancer would not produce net harms through weapons development and proliferation. Nor is likely possible that a single person can clandestinely develop a weapon that can wipe out humanity clandestinely.

3.4 Conclusion

In summary, I considered the objection that it is impermissible to use GGECE without a moral enhancer because GGECE would produce net harms if used alone. I argued that mandating the use of moral enhancers for those enhanced with GGECE because doing so will ensure that GGECE will produce positive net benefits is a concern that lacks empirical grounding. Contrarily, there is good reason to believe that cognitive enhancers such as GGECE would produce net benefits without the use of a moral enhancer, given what we know about the net benefits produced by other cognitive enhancers.

Secondly, I considered the potential harms produced by weapons created by people enhanced with GGECE. I argued that technologies that arise from increasingly intelligently people generally save more lives than they end. Moreover, I argued that it is not clear whether a moral enhancer would even reduce weapons proliferation or if it would be morally permissible if they did. I conclude that the concern posed by weapons innovation producing net harms is unfounded and that the use of controversial moral enhancers is unnecessary to ensure GGECE's net benefits. Following this, I consider the objection that the use of GGECE would increase the risk of lone-wolf terrorists developing weapons capable of destroying the world and that moral enhancers are needed to attenuate that risk. After setting aside the moral controversy surrounding moral enhancers that could reduce this risk, I argued that the potential for a lone-wolf evil genius clandestinely developing a weapon that can wipe out humanity is baseless and runs contrary to our present-day and historic understanding of how industrious a task it would be to develop weapons of mass destruction in quantities needed to wipe out humanity.

The concern surrounding GGECE's use without a moral enhancer potentially leading to net harms is likely not possible given our understanding of cognitive enhancements benefits, innovations emanating from cognitive enhancement and our current understanding of

weapons of mass destruction. This objection fails to prove the impermissibility of GGECE's use without a moral enhancer because it is likely not the case that GGECE would produce net harms if used without controversial moral enhancers.

Chapter 4 The Inequality Objection

4.1 Introduction

The question that I will consider in this chapter is - does the accentuation of inequality that GGECE is likely to cause grounds for its prohibition? I argue that while GGECE has the potential to accentuate inequality, this is not grounds to warrant its prohibition. While authors such as Christopher Wareham (73) consider the inequality objection as it pertains to life-extending drugs, I consider it in relation to GGECE. Wareham's analysis provides a workable framework for the egalitarian concerns that emergent biotechnologies raise, and to that extent, there is much overlap between his analysis and my own. However, there are features unique to GGECE that invoke equality related questions that Wareham's analysis does not touch on. Particular amongst these features is GGECE's potential ability to indirectly promote the welfare of people that are not directly enhanced with it and how the banning of GGECE weighs against parental duties to advance the interests of prospective children. These features add novelty to and broaden the ethics debate on egalitarian concerns surrounding the emergence of new biotechnologies. Additionally, while Gyngell et al.(48) argues that there is a moral imperative to use GGECE for egalitarian reasons by ensuring that the costs and benefits of GGECE are equitably shared, I argue that egalitarian concerns cannot serve as just grounds for the prohibition of GGECE even if its costs and benefits are not equitably distributed.

Limitations worth noting is that my analysis of egalitarian objections aimed at GGECE is focused on the tension between GGECE and equality of *opportunity*, not *outcome*. Additionally, my analysis is singularly focused on egalitarian concerns and not with concepts closely related to it, such as the invocation of envy in reaction to only some having access to GGECE or unfair distributions in power that may emerge as a result of its use (74). Remedies to these social ills may include a ban on GGECE. Given that, my defence of GGECE's

permissibility is not all-things-considered but singularly concerned with its potential to accentuate inequality.

In this chapter, I respond to the objection that GGECE is an affront to equality of opportunity and therefore should be banned. Following a description of the concept of equality of opportunity and how GGECE would likely be an affront to it, my response to the inequality objection will be three-part. Firstly, I respond that banning GGECE constitutes ethically dubious 'levelling down' which counts against the moral legitimacy of a ban on GGECE. Secondly, I respond that banning GGECE is likely not possible and that any attempt will have the likely counterproductive consequence of accentuating inequality even more than if it were permitted. Because of this, I argue that egalitarians ought to favour the permission of GGECE. Thirdly, I respond that banning GGECE on purely egalitarian grounds unduly restricts the rights of parents to advance the interests of their children. I conclude that because the prohibition of GGECE represents ethically dubious levelling down, is likely counterproductive to egalitarian ends, and is outweighed by parental rights to use GGECE, the inequality objection fails to justify a ban on GGECE even if GGECE is likely to accentuate inequality.

4.1.1 Equality of Opportunity

Equality of opportunity is the concept that asserts that there should be fairness in the selection process of society's desirable roles, be it in: corporations, associations, non-profits, universities and elsewhere (75). Given that society is ordinarily or ideally stratified with a diverse range of roles, some of which are more desirable than others (76), the benefit of equality of opportunity is to make available to as many eligible applicants as possible access to these desirable roles. *Substantive* equality of opportunity requires that all have a *genuine* opportunity to become qualified, while *formal* equality of opportunity merely requires that all have access to apply for desirable roles. This distinction between substantive and formal

equality of opportunity is best illustrated by Bernard Williams' 'warrior example'((1962) as cited by 76):

> Imagine a society ruled by a hereditary warrior class. Reformers bring about a change. From now on, membership in the warrior class will not be drawn exclusively from the wealthy stratum of the society. Warriors will instead be selected on the basis of a competitive examination in military prowess administered to any young adult member of society who seeks admission into this elite class. However, it turns out that only scions of the wealthy stratum pass the exam and become warriors. Everyone in society except the wealthy is poorly nourished, and being well nourished is a prerequisite for developing the military skills needed to succeed on the competitive examination. In this setting, advocates for the non-wealthy strata of society might object that none but members of the traditional wealthy elite have a chance to satisfy the eligibility requirements for admission to the warrior class.

The warrior example highlights the hollowness that is at times used to describe formal equality of opportunity. That is, by confining notions of equality of opportunity to merely mean that everyone ought to have access to apply for particular desirable positions might do nothing to improve people's chances of actually attaining those desirable positions. Contesting the formal equality of opportunity that the warrior example illustrates is the dissatisfaction of the example's advocates for the non-wealthy strata of society. To them, equality of opportunity ought to imply something more *substantive*, that is, equality of opportunity should also mean that applicants for desirable positions ought also to have a genuine possibility of getting those desirable positions.

On this interpretation of equality of opportunity, GGECE can be thought of as accentuating substantive unfairness because it is a prohibitively expensive technology that enhances and

expands one's cognitive and intellectual abilities in ways that increase the chances of the enhanced being appointed to desirable positions. The enhanced in this case would ordinarily be individuals who hail from families that are wealthy and are therefore already advantaged in ways that make desirable positions more accessible. Hence, GGECE would accentuate the already existing substantive inequality in society. The intuition being, that because of this 'substantive unfairness' GGECE should be prohibited. Calls for formal equality of opportunity are relatively weak, uncontroversial and do not add much to the ethics debate surrounding GGECE. Formal equality of opportunity only requires that unenhanced people be allowed to apply for desirable positions (a view that few would be opposed to). While in contrast to this, substantive equality of opportunity might require the prohibition of GGECE if it cannot be made universally available.

4.2 Levelling Down Response to the Inequality Objection

In this section, I consider the levelling down response to the inequality objection that GGECE should be banned because it would accentuate inequality. The following extract best describes the levelling down response:

> Teleological egalitarians believe that inequality is intrinsically bad. Therefore, they believe that it is at least one in respect better, if inequality is reduced. It would be one respect better if the worse off were made better off, even if it involves making the better off worse. However, inequality can be reduced by other means than by making the worse off better off. It can be removed by reducing the level of the better off until they reach the worst off. Even though egalitarians do not need to claim that such reductions are improvements all things considered, following these reductions there will be equality. However, it seems implausible to claim that it is in any way better to secure equality, when doing so involves making some people worse off and no one better off, or even making everyone worse off. This is the 'Levelling Down' objection

(77).

The levelling down response is a typical response to egalitarianism. It seeks to highlight the ethical dubiousness of teleological egalitarianism that equality of opportunity ought to be pursued, if not for anything else (or despite anything else) then for its own sake[4]. In a parallel manner, Harris (78) illustrates the dubiousness of levelling down with a succinct example:

> If twins suffer from cancer and one is incurable and the other not, we do not conclude that we should not treat the curable cancer because this would in some sense be unjust to the incurable twin.

The inequality objection to GGECE is one such instance of levelling down because it seeks to prohibit the use of a technology that will improve the welfare of its recipient, whose prohibition does nothing to improve the welfare of those who do not have access to it[5]. On Harris'& Holtug's accounts, the objection to GGECE from teleological egalitarianism is similarly implausible and dubious. Teleological egalitarianism does not seem to be sufficient grounds to justify the impermissibility of GGECE, a technology that will increase the welfare of its recipient while reducing no one else's.

The levelling down response applies in the case of proposals to ban GGECE on egalitarian grounds. By itself, the levelling down response is a compelling refutation against the inequality objection (if GGECE produces net benefits).

[4] As previously discussed in the introduction to this chapter, one does not need to be a teleological egalitarian to think that inequality of opportunity is bad. Other things considered, it might be good to level down on GGECE. However, teleological egalitarianism, in itself, doesn't seem to be sufficient grounds for the prohibition of GGECE.

[5] As previously discussed in the 'Net Harms Objection', GGECE likely produces net benefits, but one cannot be sure. There might be a remote possibility that GGECE which is used without moral enhancers may produce net harms. In which case GGECE could make the better off better off while making the worse off worse off (or possibly leave everyone worse off!). If this were so, then there would be a prima facie case to prohibit the use of GGECE. However, if GGECE benefited only the enhanced, or everyone, (i.e. it produced net benefits) then the levelling down response holds. My argument from the levelling down response rests on the latter assumption.

The levelling down response in defence of the permissibility of GGECE is not only limited to the conventional case of its banning leaving the better off worse off while doing nothing to make the worse off better off. There is an even *more dubious* case of the levelling down response that the prohibition of GGECE may invoke. It is the view that the prohibition of GGECE would not only make the better off worse off, but also make the worse off *worse off*[6]. I consider the possibility that a ban on GGECE constitutes levelling down of the more dubious sort by showing that the enhancement of intelligence could produce broader societal benefits for everyone.

My argument in support of the claim that the prohibition of GGECE is levelling down of the more dubious sort is three-part. Firstly, I argue that intelligence can and in some cases does produce benefits for everyone by people in desirable positions. Secondly, I argue that GGECE could function as a gene drive and proliferate intelligence genes (and the benefits they produce) to everyone. Thirdly, I respond to the objection that intelligence only produces positional goods and therefore likely produces net harms. I argue from empirical data that intelligence also produces intrinsic goods. As such, it is at least plausible that GGECE could (from the front of intrinsic goods) produce net benefits. I conclude that if GGECE can function as a gene drive and produce net benefits for everyone, then there is a plausible case for the levelling down response of the more dubious sort because GGECE would benefit everyone, not just the enhanced.

4.2.1 Intelligence, Desirable Positions and Their Societal Impact

In this section, I will argue that the prohibition of GGECE will leave everyone worse off by showing that its use can potentially benefit *everyone*. In the first instance of GGECE

[6] Again, one cannot know for certain if GGECE produces net benefits. GGECE likely does, but it may produce net harms. If GGECE does produce net harms then there would be a prima facie case to prohibit GGECE. But if GGECE's produces net benefits then the levelling down response of the more dubious plausibly holds. My response rests on this assumption and describes some of the ways in which GGECE can produce net benefits. Not only by benefiting the enhanced, but by benefiting everyone.

benefiting everyone, it is important to appreciate the fact that GGECE, as the name suggests, will likely increase the intelligence of its recipient. This increase in intelligence would result in a higher likelihood that enhanced individuals will be appointed to desirable positions, thereby increasing their welfare. The increase in welfare borne from the appointment to a desirable position is self-evident, desirable positions are desirable because of the wealth or prestige attached to them.

However, if the existence of these limited and competitive desirable positions is justified, then what is it about intelligence that increases one's likelihood of acquiring desirable positions? It is the correct presumption that intelligence makes one better suited at fulfilling one's role in said desirable position. It seems plausible that selecting for intelligence in desirable position placement is justified in virtually all cases, with studies showing that intelligence correlates positively for job and academic performance (79–84). Universities train the next generation of physicians. Corporations produce wide ranges of products and services. Trade unions promote the interests of the proletariat. Non-profits such as charities improve the welfare of the downtrodden. On any of these examples, a higher workplace and academic performance would plausibly benefit *everyone*. If the intelligence of people in desirable positions in these organizations or universities were enhanced with GGECE, it could increase the net benefits felt by everyone. Studies show that intelligence, as measured by IQ testing in CEOs, positively correlates with company earnings persistence and operating cash flow (85). This study at least implies that shareholders and investors stand to benefit from more intelligent CEOs. Furthermore, to the extent that job performance and intelligence predict net benefits, then the intelligence of a desirable position holder positively correlates with the amount of welfare that reaches *all* other people.

In summary: (1) If GGECE predicts job performance in desirable positions; (2) and if job performance in desirable positions affects the welfare of *all* people; (3) and it is morally

dubious to ban things that reduce the welfare of *all* people; (C) then the banning of GGECE is a morally dubious proposition. Conversely, desirable positions ought to go to the most intelligent people, people who are genetically enhanced for intelligence. Doing so maximizes the welfare of the enhanced as well as the welfare of *all* other people. Again, this would be the case if GGECE produced net benefits. Arguing for the prohibition of GGECE by appealing to the inequality objection would be levelling down of the more dubious sort that leaves *everyone* worse off since less intelligent people will find themselves in desirable positions, with *everyone* losing out from having less intelligent people in those positions.

Harkening back to Bernard Williams'(1962) (as cited by 76) example of the 'substantive unfairness' of membership selection into the desirable warrior class, warriors from elite families have better diets than the common people and therefore perform better on the relevant set of exams. Levelling down in the warrior example would involve starving the elite applicants to even the playing field. This move would advance equality of opportunity *substantively* but at the expense of reducing the welfare of the warrior class as well as reducing the welfare of *everyone* by leaving the country more susceptible to conquest, due to having a weakened warrior class. Similarly, levelling down on the intelligence of people in desirable positions would leave the worse off worse off due to lower job performance in positions whose performance affects the welfare of everyone. The prohibition of GGECE would also leave the better off (those who could have benefited from being enhanced) worse off. This is not only because the would-be enhanced would have less chance of acquiring desirable positions, but also because the benefits of GGECE are intrinsic as well as positional. That is, GGECE has non-competitive benefits that enhanced people would reap even if they did not get appointed to desirable positions. I elaborate on positional and intrinsic goods in more detail in later sections.

4.2.2 GGECE as a Potential Gene Drive

In the second instance of GGECE possibly benefiting *everyone* (at least in the long term) is that GGECE could act as a gene drive technology. This is because GGECE is a genetic engineering technology that propagates a particular suite of genes throughout a population (86) by altering the probability that a specific allele will be transmitted to offspring from the natural 50% probability (87). GGECE would accomplish this through the adding, deleting, disrupting, or modifying of genes (88,89). Suppose GGECE were made widely available for prospective parents to use. In that case, drive-containing individuals in large enough numbers, say 1 in every 1000, can reach all living humans in as few as 12-15 generations (90). Whether a gene drive becomes successfully fixed in a population and how long it takes depends on its effect on individual fitness, on the rate of allele conversion, and the population structure. In a well-mixed population with realistic allele conversion frequencies (≈90%), population genetics predicts that gene drives get fixed for selection coefficients smaller than 0.3 (90). The selection coefficient for intelligence is not known. Therefore, no decisive conclusion can be drawn on whether GGECE could effectively function as a gene drive. However, suppose intelligence enhancement does not reduce reproductive success by more than 30%. In that case, GGECE could, if given enough time, propagate genes for intelligence throughout the entire human population increasing intelligence associated welfare in the process. If this is the case, then prohibiting the use of GGECE would constitute levelling down of the more dubious sort because prohibiting something that stands to benefit everyone would leave everyone worse off.

4.2.3 The Objection that Intelligence Only Produces Positional Goods

As was previously discussed, GGECE gives the enhanced a competitive advantage in their bid for desirable positions. Their competitive advantage arises from the fact that they would tend to be more intelligent than unenhanced people. Consequently, the enhanced would

generally perform better in desired positions as compared to the unenhanced. The benefit (in the form of welfare) that brings those who hold desirable positions is self-evident. Desirable positions are desirable because of the wealth or prestige associated with them. On this understanding, the benefits of intelligence arise from the competitive advantage they give the enhanced. It would seem then that possessing intelligence genes are only beneficial when they give the possessor of those genes a relative advantage for the attainment of desirable positions.

However, a possible objection arises in response to GGECE potentially acting as a gene drive technology. Suppose the benefits of GGECE come only in the form of increasing access to desirable (and competitive) positions. In that case, intelligence can be thought of as only conferring positional advantage, that the welfare promoting benefits of intelligence reside in the competitive advantages it gives one over others. If GGECE functions as a gene drive and if the benefits of GGECE are *only* positional, then the benefits of GGECE will diminish as a larger proportion of people inherent intelligence promoting genes. That is because the more ubiquitous high intelligence becomes the less positional good it can confer.

Nick Bostrom (59) argues that genetic enhancements aimed at the obtainment of goods that are desirable only in so far as they provide competitive advantage tend to produce net harms. He considers the positional good of tall stature, where he argues;

> There is evidence that being tall is statistically advantageous, at least for men in Western societies. Taller men earn more money, wield greater social influence, and are viewed as more sexually attractive. Parents wanting to give their child the best possible start in life may rationally choose a genetic enhancement that adds an inch or two to the expected length of their offspring. Yet for society as a whole, there seems to be no advantage whatsoever in people being taller. If everybody grew two inches,

> nobody would be better off than they were before. Money spent on a positional good like length has little or no net effect on social welfare and is therefore, from society's point of view, wasted (59).

As such, genetic enhancements that have positional and intrinsic benefits would tend to produce net positive externalities. In his analysis of intelligence enhancement, Bostrom (59) argues that if an intelligence enhancer produced net benefits, then a prima facie case exists not only for permitting it but a positive duty to encourage and subsidize its use. Whether such an endeavour is good *all things considered* is, in Bostrom's view, another matter. However, he does conclude that enhancements that have intrinsic and positional benefits and produce net benefits for the rest of society should be encouraged. The objection that the welfare promoting benefits that come with intelligence are *only* positional is not true. Intelligence genes also have *intrinsic* value. That is, intelligence genes benefit the intelligence gene possessor in non-competitive ways, ways that are not dependent on the intelligence of other people.

Intelligence, as it is measured in IQ testing, improves the welfare of people in numerous intrinsic ways: There is a negative correlation between IQ and incidence of common mental disorder (10), a negative correlation between childhood IQ and adulthood propensity to smoke cigarettes (91), low IQ individuals are at a higher risk of problem gambling (9), and lower IQ is associated with violence perpetration (92). On this empirical data (which is by no means exhaustive), it is clear that welfare gains from intelligence are not only positional but are also intrinsic, in ways that most probably produce net benefits. Increases in IQ reduces the incidence of mental illness, smoking, problem gambling and violence perpetration. Intelligence modifies one's behaviour in ways that are beneficial *irrespective* of anyone else's intelligence. If the intrinsic benefits of GGECE (intelligence) outweigh its costs, then GGECE produces intrinsic benefits for anyone enhanced with it. Therefore, If GGECE (as a

potential gene drive technology) produces net benefits, then it stands to benefit *everyone.*

My response to the objection that GGECE only produces positional benefits strengthens the claim that the prohibition of GGECE could constitute levelling down of the more morally dubious sort. My response in this section highlights that the prohibition of GGECE (as a gene drive technology) would not only leave those who stand to benefit from the positional goods of GGECE worse off. My response reveals that prohibition would leave *everyone* worse off because GGECE produces intrinsic goods as well. Admittedly, this second part of my levelling down response is much more speculative than the first. However, the unsubstantiated assumptions upon which this part of the levelling down response rests – the selection coefficient of intelligence being lower than 0.3 and the potential net benefits of GGECE – are well enough within the realm of possibility to warrant this sort of discourse.

This section has shown that the inequality objection is a case of levelling down, which counts against the moral legitimacy of a ban on GGECE. Moreover, I argued that the prohibition of GGECE is a case of the *more* ethically dubious levelling down (the sort that leaves everyone worse off). This is because it seeks to advance equality by prohibiting the use of GGECE, which is a technology that stands to potentially promote the welfare of everyone, and not just the wealthy. Conversely, the prohibition of GGECE would potentially reduce the welfare of everyone. Either by reducing the job performance of people in desirable positions or by potentially denying everyone from the intrinsic and positional benefits of possessing intelligence. If GGECE functioned as a gene drive and produced net benefits through the provision of positional and intrinsic goods, then it is implausible that the prohibition of GGECE is morally ideal when its prohibition leaves everyone worse off.

4.3 Prohibition of GGECE is not Possible and would only Accentuate Inequality

In this section, I argue that banning GGECE is likely not possible even it is morally

preferable. Additionally, I argue that egalitarians ought not to support prohibition because any attempt at prohibiting the use of GGECE would likely only accentuate inequality more than if it were legalized. After setting aside the levelling down objection and assuming that egalitarians ought to be concerned with not accentuating inequality, I will argue in two parts: (1) the prohibition of GGECE represents a tragedy-of-the-commons logic matrix. As such, global enforcement of a ban is highly unlikely. (2) I will show that any attempt at banning GGECE will produce the counterproductive effects of increasing the cost barriers and inflating the price of GGECE, thereby making it accentuate inequality more than it would if it were permitted. Following this, I conclude that because egalitarians ought to favour outcomes that accentuate inequality the least, then they ought to object to a ban on GGECE.

4.3.1 The Untenability of Prohibition

Teleological egalitarians are concerned with outcomes that produce equality; they believe that it is in one respect better that inequality is reduced (77). As such, it is the *outcome* of reduced levels of inequality that the egalitarian ought to be concerned with, not the action intended towards reducing inequality. Suppose that levelling down is not such an ethically doubtful proposition, such that making the better off worse without making the worse off better off (or making everyone worse off) is not morally problematic. In that case, because egalitarianism ought to be concerned with not accentuating existing inequality, then it seems plausible that banning GGECE is the right thing to do.

If the above reasoning holds, then the banning of GGECE can only be morally preferable if it *actually* halts the accentuation of inequality. For a ban to be effective, it would require international enforcement. This is because GGECE could be performed in potentially any country with adequate healthcare infrastructure. Moreover, GGECE is or will be prohibitively expensive, meaning it will only be accessible to the very wealthy, who are people with a great deal of geographic mobility. If one's home country bans GGECE, then a prospective parent

could just as easily travel to some other country where it is legal and acquire it. There is good reason to believe that international banning would be impossible. This is because there is no international authority with the capacity to enforce a ban. Therefore, a prohibition would require the cooperation of the world's countries to enforce the ban locally. Universal local enforcement is highly unlikely because such a scenario resembles the tragedy-of-the-commons logic matrix.

Banning GGECE presents countries with a similar scenario: all countries agree that they should ban GGECE because accentuating inequality is bad; banning involves incurring the cost of not taxing GGECE as a legitimate industry; there is a temptation to legalize GGECE while others ban it; there is a sucker cost associated with banning GGECE while others legalize it. The more countries that ban GGECE makes it more tempting for one country to legalize it because doing so would give that country a larger share of the gene-editing market. On this logic, there is little chance that an international ban would be successful because the temptation to break rank and legalize GGECE would be very significant if every country banned it. My assumption is supported empirically by the fact that other similar cases involving countries in tragedy-of-the-commons scenarios produce similarly uncooperative outcomes: According to Article 116 of the EU treaty (93), member states agree that tax havens are bad because they encourage capital flight and result in market distortions, however there are still tax havens like Ireland in the EU (94); or consider the fact that all countries agree that greenhouse gas emissions are harmful to the environment, however the USA signed the Kyoto protocol but never ratified it (95).

4.3.2 Counterproductivity of Prohibition

Not only is the banning of GGECE likely not possible, but any attempt at banning it would also probably have the counterproductive consequence of accentuating inequality more than would have been the case than if GGECE were permitted. The likely uncooperative local

banning of GGCECE described in the previous section foreshadows a scenario where banning GGECE in one's country would only encourage medical tourism to countries that have legalized it. The additional costs associated with travel would add barriers of access to the technology, thereby accentuating the inequality GGECE would cause to a greater degree. Moreover, banning GGECE in one's home country when it is legal elsewhere only serves to reduce the market supply of GGECE while doing nothing to reduce its demand. Simply economic theory tells us that if you reduce the supply of a good while demand remains constant, the effect is an inflation of prices. Hence, the prohibition of GGECE would have the effect of making GGECE more expensive and therefore less available for people to use, accentuating inequality even more.

In conclusion, if levelling down was not morally dubious (which it is) and if egalitarianism espoused the non-accentuation of inequality, then egalitarians ought *not* to endorse the prohibition of GGECE. This is because egalitarianism (on this interpretation) ought to promote interventions that *actually* halt the accentuation of inequality. Prohibition of GGECE is not only highly unlikely, but any attempt at prohibiting it would only hike the price of GGECE and its associated costs. These price increases would make GGECE more inaccessible and therefore accentuating inequality even more because fewer people would be able to use it. Therefore, (1) if egalitarians ought to prefer outcomes that accentuate inequality the least; (2) one can either permit GGECE or prohibit it; (3) prohibiting GGECE accentuates inequality more than permitting GGECE; (C) then, egalitarians ought to permit the use of GGECE.

4.4 Banning GGECE Unduly Restricts the Rights of Parents to Advance Their Children's Interests

In this section, I examine whether the banning of GGECE in the bid to advance equality of opportunity unduly restricts the rights *qua* parents to advance the interests of their children. I

argue that while it may be true that prospective parents have *good* reason to advance egalitarian impartiality (by, say, equally distributing the monies intended for GGECE), they have *better* reason to advance the interests of their children (by using GGECE), even if such advances accentuate inequality. The implication here is that a ban on GGECE on egalitarian grounds unduly restricts the liberty prospective parents ought to have to advance their prospective child's interests through the use of GGECE.

In the first part, I describe the conflicting moral obligations raised by parental partialism and equality of opportunity. In the second part, I describe an attempt to resolve this tension called the Brighouse-Swift Thesis (BST). Wherein, the BST seeks to resolve this tension by superseding equality to parental duties to enhance their children with GGECE. In the third part, I give Daniel Engster's response that the most plausible interpretation of the BST is actually to supersede parental duties to use GGECE to equality. I conclude that because GGECE is prescribed by the Principle of Procreative Beneficence (PPB), which is a familial concern, we have better reason to favour the use of GGECE than they do favouring advancing equality of opportunity. The implication being that a ban on the use of GGECE (assuming that ban is grounded in egalitarianism) would unduly restrict the rights parents ought to have to advance the interests of their children. This is because parental fiduciary duties (such as the PPB) outweigh duties to advance equality of opportunity in ways that render the banning of GGECE morally unjustifiable.

4.4.1 Equality of Opportunity and the Family

According to the Stanford McCoy Family Center for Ethics in Society (96), the family has long been recognized as a source of inequality of opportunity. Parents favour their children in ways that advance their interests at the deprivation of other children. While personality and natural talent certainly factor into the disparities that presently exist between people's differing chances at acquiring desirable positions, a sizable contributor to extant inequalities

lies in the moral duty parents typically take upon themselves to advance the interests of their children. These advances take many forms, including the provision of emotional support, the provision of housing, food and clothing. However, they are also expressed in terms of financial investments (such as GGECE) in ways that accentuate inequality of opportunity to desirable positions. As such, tension arises between the rights of parents and duties to advance equality of opportunity.

4.4.2 Brighouse-Swift Thesis (BST)

In their attempt to reconcile the pro tanto duty to exercise familial partiality with the pro tanto duty to advance egalitarianism, Harry Brighouse and Adam Swift (97) argued that the tension between equal opportunity and familial partiality is less severe than usually assumed. Starting from an analysis of the value of the family, they argue that parents have a right *qua* parents to benefit their children only in ways that support the development of intimate loving bonds between them. They identify the specific interests that the family facilitates and protects. Following this, they consider the forms of partiality needed for the promotion of those familial interests. These specific familial interests include the building of healthy familial relationships and the provision of goods relating to subsistence and medical care for children. It is the protection and promotion of these familial interests that lead most to think that it is better to raise children in families than in, say, state-run child-rearing facilities. The latter of which may be thought of as being more consistent with the promotion of equality of opportunity, but at the expense of depriving children and parents of those aspects of well-being that they derive from conventional parent-child relationships. The authors argue that it is these familial goods that supersede duties to advance equality. Therefore, parents do not enjoy entitlements to confer general advantages to their children such as elite education, private tutoring or setting up of trust funds, as these general advantages do not necessarily facilitate the promotion of familial goods. Therefore, since parents do not have rights *qua*

parents to benefit their children in most of the ways that unequal opportunities arise, Brighouse and Swift (97) argue that the conflict between the exercise of familial partiality and equality of opportunity is mostly resolved. This argument is the BST, and in its view:

> parents and children can enjoy healthy familial relationships, and parents can exercise all the rights needed for those relationships to make their distinctive contribution to well-being, without our having to tolerate anything like the kinds of inequalities of opportunity (for *anything*!) to which familial interactions currently give rise (98).

On the BST, parents do not have any rights *qua* parents to bestow general benefits to their children. As such, parental partialism ought only include supporting the development of intimate bonds between parent and child or in cases where inequality of opportunity is not accentuated. By implication, it would seem that proposals of banning GGECE are a justified restriction on the supposed rights prospective parents have to enrich/empower their prospective children because parents do not have rights *qua* parents to bestow general benefits to their children. The monies intended for GGECE might be better served by being equally distributed to other families in a bid to advance equality of opportunity.

4.4.3 Daniel Engster's Response to the BST

In Engster's response to the BST, he argues that it leads to some untenable solutions. The BST fills out its argument with a crucial additional principle, that of fiduciary duties (98):

> to guarantee the child's immediate well-being, including assuring to her the intrinsic goods of childhood, and to oversee her cognitive, emotional, physical, and moral development up to the point where she can act autonomously, function successfully in the economy and society, and to flourish in her life.

On the BST, fiduciary duties[7] ought to be included as part of familial goods that supersede duties to act towards promoting equal opportunity. According to Engster, the BST is unclear on whether parental fiduciary duties other than those relating to subsistence and medical care also outweigh distributive concerns. The BST, it would then seem, does not give any account as to whether the provision of GGECE (a biotechnology that enhances cognitive development and economic success in one's child) also outweigh distributive concerns.

Engster writes that the BST prescribes two prescripts. (1) Bestowing benefits on one's child that might potentially give them competitive advantage only when such benefit contributes to family relationship goods; (2) parental fiduciary duties to satisfy the child's need for subsistence, good health, enjoyment of childhood, and development into a relatively high functioning, autonomous, and flourishing adult. The BST never explains the relationship between prescripts 1 & 2. Prescript 1 superseding 2 seems implausible. If parents have rights *qua* parents to promote their children's physical, cognitive, emotional, moral development or childhood happiness only when their actions support familial relationships goods or do not lead to competitive advantage would lead to rights that are severely restricted. If parents could only rightfully bestow on their children benefits when they contribute to familial relationship goods or when other parents are bestowing similar benefits on their children, the lowest standard of parenting would prevail in all non-intimate areas of childrearing. If some parents (or even just one) did nothing for their child's development besides sit them in front of the television all day, then other parents would have no right to do anything more developmentally enriching for their child – aside from engaging in other activities necessary for bonding – lest they give their children competitive advantages over their tv watching peers.

[7] As a good that promotes the cognitive, emotional, physical, and moral development of the enhanced up to the point where they can act autonomously, function successfully in the economy and society, and to flourish in their lives, GGECE (and the intelligence it seeks to enhance) ought to be thought of as a fiduciary duty parents can bestow on their children.

Engster thinks that it is more sensible to supersede prescript 2 to 1. That parents should have the right to satisfy their child's need for subsistence, good health, enjoyment of childhood, and development into relatively high functioning, autonomous, flourishing adults. Parents ought to have these rights even if the goods they produce do not contribute to familial relationship goods and results in some distributive unfairness.

4.4.4 Parental Partialism and the Moral Legitimacy of Banning GGECE

The reality then is that the BST (on its most plausible interpretation) implies that parental partialism ought to crowd out all but the most tepid form of egalitarianism. The BST ought to only support levelling up the worst off and distributing money and other resources *only* when they are not intended for or do not fulfil fiducial duties. The PPB's prescribed use of GGECE promotes the health and development of prospective children into relatively high functioning, autonomous, flourishing adults. Therefore, prospective parents have a right to pursue the use of GGECE as a parental fiduciary duty even if its use does not contribute to familial relationship goods and results in some distributive unfairness. *If* egalitarians endorse the plausible view of the BST prescript 2 superseding 1, then they would have to concede that banning GGECE on egalitarian grounds (and, say, equally distributing the monies intended for GGECE out of egalitarian concerns) would unjustifiably restrict the rights *qua* prospective parents to fulfil fiduciary duties to advance the interests of their prospective children. Put differently, on a plausible understanding, parental rights to commit to fiduciary duties (which includes the obligation to use GGECE) outweighs egalitarian justifications for a ban on GGECE.

4.5 Conclusion

In this chapter, I responded to the inequality objection that GGECE accentuates inequality of opportunity and therefore should be banned. My first response is that banning GGECE constitutes ethically dubious levelling down. Worse still, I argued that banning GGECE may

constitute levelling down of the more questionable sort, that of leaving everyone worse off. In both cases, levelling down counts against the moral legitimacy of a ban on GGECE. In my second response, I argued that if levelling down was not so morally dubious, then egalitarians ought to permit the use of GGECE. This is because a successful global ban is highly unlikely, and any attempt at banning GGECE would only accentuate inequality more than permission would. Thirdly, I responded that a ban on GGECE on egalitarian grounds would be an illegitimate restriction on the rights of prospective parents to commit to fiduciary duties, duties that include the use of GGECE. As such, because the prohibition of GGECE represents ethically dubious levelling down, is likely counterproductive to egalitarian ends, and is outweighed by parental rights to use GGECE, the inequality objection fails to justify a ban on GGECE even if GGECE is likely to accentuate inequality.

Chapter 5 The Autonomy Objection

5.1 Introduction

In this chapter, I consider the objection that GGECE is impermissible because it limits or does not respect the autonomy of enhanced individuals. Autonomy is a key concept in philosophical discourse and denotes different things depending on what context it is used in. The word 'autonomy' is used in fields including psychology, ethics, metaphysics and political philosophy. In the context of bioethics, 'Autonomy' is, according to the *Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health*:

> Self-determination that is free from both controlling interferences by others and personal limitations preventing meaningful choice (such as inadequate understanding or faulty reasoning). Having the capacity to act with autonomy does not guarantee that a person will actually do so with full understanding and without external controlling influences (72).

In their ethics analysis of enhancement's impact on autonomy, Shaefer et al. (99) assert that it is sensible to interpret that reasoning and deliberation viz. intelligence contributes to autonomy. In contrast, others such as Jurgen Habermas (100,101) wager that enhancement via genetic manipulation subverts the process of autonomous self-directed formation of traits, or that it undermines a child's right to act without personal limitation.

Therefore, the use of GGECE invokes concerns of its potential to either restrict or undermine the autonomy of enhanced people. Firstly, by altering how a person reasons and deliberates carries the potential to restrict one's capability to think and act. This can consequently result in limiting their freedom from personal limitation. Secondly, because GGECE is used during the earliest stages of a person's life, it raises issues related to whether there has been an infringement on the right to refuse treatment, or in this case, enhancement.

I argue that GGECE does not meaningfully or understandably infringe on the enhanced child's autonomy-based based right to communicative involvement or their right from personal limitation. Shaefer et al. (99) consider the objection to human genetic enhancement on the grounds that it violates autonomy. Their research reveals that autonomy can be enhanced through the use of GGECE. While Shaefer et al. focus on giving a comprehensive response to the various autonomy-based objections to genetic enhancement technologies, such as GGECE, they do not consider the communicative issues of unconsented to harms, which I do. Nor does their response give a focussed defence of GGECE, while mine does. The principal limitation in my analysis is that I examine autonomy as a bioethical concept and not as a metaphysical one. Put differently, I am examining GGECE's impact on the autonomy rights of persons to act without personal limitation and be part of any medical decision-making process concerning them. I will not be considering if genetic enhancement erodes or affects the *free will* of enhanced persons, or whether genetic cognitive enhancements is evidence for a deterministic conception of free will.

In the first section, I respond to the objection that GGECE is morally impermissible because it impacts negatively on the autonomy of enhanced persons by changing and possibly limiting their ability to pursue authentic life projects (28). I respond that increases in intelligence only expand on one's capabilities and therefore cannot limit the pursuit of life projects. In the second section, I consider the objection that GGECE is impermissible because it is non-consensual due to the lack of communication and discourse on matters concerning a future person's authenticity (Habermas (2003) as cited by 99). I reply that prospective parents do not need to communicate their intention to promote the autonomy/intelligence of their children through the use of GGECE because such consent can either reasonable be ignored or assumed. I conclude that neither of these two objections successfully prove the impermissibility of GGECE.

5.2 The Open Futures Objection

In this section, I respond to the objection that GGECE is morally impermissible because it impacts negatively on the autonomy of enhanced persons to act without personal limitation or limiting their ability to pursue authentic life projects. My response is divided into two parts. In the first part, I consider the objection that because GGECE changes the cognitive capabilities of prospective children, it has the potential to limit the freedom of the enhanced from personal limitation. I respond that GGECE does not restrict a person's capabilities in any appreciable way. To the contrary, I show that increases in intelligence tend to expand on a person's capabilities and therefore relaxes the limitations imposed on them. Following this in the second part, I consider how GGECE can lead to the creation of parental expectations and entitlements that can limit the autonomy of enhanced children to pursue authentic life projects. I respond that GGECE would better equip enhanced children with the means to effectively resist over-bearing parenting if parents were even committed to being over-bearing. I conclude that the open futures objection fails to prove that GGECE changes or limits the autonomy of the enhanced either from personal limitation or to pursue authentic life projects.

5.2.1 GGECE's Potential to Limit Autonomy

In this section, I consider the objection that because GGECE changes the cognitive capabilities of prospective children, it has the potential to limit their freedom from personal limitation or, when equivalently phrased, their right to an open future. Initially coined by Joel Feinberg in 1980, *The Child's Right to an Open Future* encompasses the set of moral rights that children possess that are derived from the autonomy rights of adults (102). Feinberg distinguishes between rights enjoyed by adults and children, such as freedom from physical harm; rights enjoyed by adults exclusively, such as the freedom from religious persecution; and rights enjoyed exclusively by children, such as dependency-rights which include rights to

certain goods that are owed based on the child's dependence on adults for the necessities of life. Additionally, Feinberg identifies "rights-in-trust," which:

> Look like adult autonomy rights … except that the child cannot very well exercise his free choice until later when he is more fully formed and capable … [they are therefore] rights that are to be saved for the child until he is an adult, but which can be violated "in advance," so to speak, before the child is even in a position to exercise them… His right while he is still a child is to have these future options kept open until he is a fully formed self-determining adult capable of deciding among them (Feinberg (1980) as cited by 102).

Therefore, Feinberg argues that for every autonomy right that is exclusively held by an adult, there is a corresponding right-in-trust that is held by a child who is not a fully autonomous adult yet but is expected to become one soon. These autonomy rights are rights that depend on the bearer's capacity for autonomous action and therefore cannot be exercised by a child who, by definition, lacks said autonomous capacity. However, these autonomy rights can be violated before the bearer, in his case the child, can exercise them. In his discussion of the rights-in-trust, Feinberg provides a helpful analogy, he writes:

> In that general category [of rights-in-trust] it sits side by side with the right to walk freely down the public sidewalk as held by an infant of two months, still incapable of self-locomotion. One would violate that right in trust now, before it can even be exercised, by cutting off the child's legs (Feinberg (1980) as cited by 102).

It is these child's rights-in-trust that Feinberg calls 'the child's right to an open future.'

On this understanding, any genetic enhancement conducted on a child aimed at changing its physical or mental capabilities, such as GGECE, infringes on a child's right to an open future. Genetic enhancement does this by altering the future capabilities of that child when it

becomes an adult, thereby changing the authentic life projects available to that child and potentially obstructing the rights-in-trust specific to that child.

However, the notion that intelligence enhancement might *restrict* the rights-in-trust of children is a doubtful claim to make. Referring back to my positive argument for GGECE, Newson (15) had reviewed the empirical literature relating intelligence to quality of life. Her synthesis of the empirical literature points decisively to the fact that:

> intelligence has a high instrumental value for persons in giving them a large amount of complexity with which to approach their everyday lives, and that it equips them with a tool which can lead to the provision of many other personal and social goods.

In light of this, I described intelligence as an 'all-purpose means', or as an attribute that is useful in achieving any plan in life. If it is not enough that intelligence is considered to be an all purposes means, then Schaefer et al. (99) argue that 'reasoning and deliberation' contribute *towards* autonomy. The extent to which reasoning and deliberative abilities are genetically predeterminable features of intelligence is an upshot for the response that GGECE would contribute towards autonomy in worthwhile ways. Conversely, Schaefer et al. argue that any inhibition of one's capacity to reason and deliberate would inhibit one's ability to act autonomously. Additionally, the authors respond to the possible objection that enhancing reasoning ability only enhances autonomy if one's reasoning ability was originally below a minimum threshold necessary for someone to be an autonomous agent. With improvements beyond this threshold not enhancing autonomy. Where they respond that regardless of whether there is a threshold, what is important is that there is one. If there is a threshold, then enhancing autonomy by improving some beings' reasoning ability is in principle possible. It then seems that instead of being restrictive on one's autonomy, GGECE is actually enhancive.

According to Schaefer et al. (99), the open futures objection is particularly implausible in the case of autonomy enhancement. According to these authors, the life projects that may be shut off by having more autonomy include integration into a very manipulative community or one that disvalues reasonable thought. These potential life projects seem patently objectionable, even harmful, and could not provide serious reason against enhancing autonomy. This is to say that the options that are shut off by enhancing a person's autonomy are not particularly valuable because manipulative or unreasonable communities are generally not worth joining. Additionally, the authors add that having an expanded autonomy allows individuals to take advantage of various life options, directly promoting the number and value of options available to them. Even if autonomy enhancement removes a handful of options from the menu (which are not very valuable), many more open up (career opportunities, better resource management to obtain what one wants and greater ability to discern how to integrate into certain communities). As GGECE enhances intelligence and because intelligence tends to expand autonomy (potential life projects) in worthwhile ways, then the concern that GGECE is impermissible because it limits a prospective child's right to an open future can be reasonably set aside in favour of the view that GGECE is actually permissible because it expands the potential life projects available to enhanced persons.

5.2.2 GGECE and Hyper-Parenting

In this section, I consider how GGECE's potential effects on parent-child relations can limit a child's autonomy, and therefore undermine their right to an open future. Schaefer et al. (99) describe that enhancements, such as GGECE, can lead to the creation of parental expectations and entitlements. That because genetic manipulation, such as GGECE, is or would initially be very expensive, then this creates the potential conditions for parents not to allow their children to deviate from selected life projects (103,104). Consider my adaptation of the case put forward by Schaefer et al. (99) to show how the genetic enhancement of one's child can

be restrictive. Suppose that parents, at great expense, use GGECE on their child because they very much want a child that can replicate and expand on their family's wealth. The use of GGECE in this context would open up certain options (such as improving a child's ability to find success in a lucrative career). However, the child's parents may feel so invested in their child that they would not accept or tolerate their child going into some less lucrative career. GGECE could, in this context, create an environment in which options are limited, in what Sandel (103) calls "hyper-parenting."

Schaefer et al. (99) respond to the hyper-parenting objection by arguing that if parents are enhancing their children with GGECE for autonomy enhancement, then their commitment to using GGECE on their prospective child indicates a similar commitment to allow their children to exercise their cognitive faculties maximally by considering the various options available to them. If autonomy enhancement is the reason why parents are using GGECE, then this seems to minimize the risk of parents restricting their child's autonomy through hyper-parenting.

However, consider prospective parents who might enhance their child with GGECE for reasons unrelated to autonomy enhancement. It seems plausible that a parent might want to enhance their prospective child with GGECE precisely so they can limit their autonomy through hyper-parenting. Schaefer et al. (99) think that this case of inhibition of the child's right to an open future is still quite weak. According to them, such enhancements will generally have the effect of increasing a child's autonomy, even in cases where the child is faced with hyper-parenting. In general, inhibitions and violations of a child's autonomy by their parents *actually* restricts their autonomy. What this implies is that hyper-parenting generally leads to the child's unreflective adoption of certain paths, reducing the child's ability to consider different and perhaps better alternatives. By reducing such restrictions, the expected enhancement of autonomy through GGECE should open up options that were

previously unavailable to the child, which includes ways in which parental inhibitions and violations of autonomy can be effectively resisted. The autonomy enhancement that GGECE would provide would help in preventing hyper-parenting. A child whose autonomy is enhanced through GGECE would be better able to resist the efforts of his or her parent's expectations and would be more likely to pursue their authentic interests, despite any attempts at hyper-parenting (99).

As such, the concern that the use of GGECE will limit the prospective child's autonomy through hyper-parenting is unfounded and therefore fails to prove the impermissibility of GGECE. This is because it does not necessarily follow that parents will hyper-parent their enhanced children and because those enhanced with GGECE will generally be better equipped to resist attempts at hyper-parenting than if they were unenhanced.

In conclusion, the argument for the child's right to an open future asserts that children have rights-in-trust. That is, they have the rights to the capacity to act as a fully autonomous adult. The open futures objection asserted that GGECE violated the rights held in trust by children because it would limit their ability to act as fully autonomous adults, thereby limiting their right to an open future. In the first part, I responded that the cognitive enhancement provided by GGECE would only restrict autonomy in trivial ways. Furthermore, to the contrary, GGECE would tend to enhance the autonomy of prospective children in ways that increase their rights-in-trust. Therefore, in contrast to the objection, GGECE expands on children's right to an open future by increasing their rights-in-trust. It is implausible that expanding rights-in-trust is impermissible. Following this, in the second part, I responded to the 'hyper-parenting' objection, that because GGECE is, or would be, very expensive then this creates the potential unwillingness of parents to allow their children to deviate from selected life plans. In my two-pronged refutation, I argued that if parents are committed to using GGECE to enhance autonomy, then this at least implies that they will not infringe on their child's

expanded autonomy. Following this, I argued that even if autonomy enhancement is not the objective of prospective parents, then GGECE would make the hyper-parenting of enhanced children all the more difficult because their expanded autonomy would better enable them to resist attempts at coercion. Therefore, it is implausible that expanding autonomy in worthwhile ways and only limiting it in trivial ways can serve as a justification for GGECE's impermissibility from Feinberg's rights-in-trust. Furthermore, because autonomy enhanced children are better equipped to resist hyper-parenting, then attempts at coercion are less likely to succeed, that is assuming prospective parents would engage in hyper-parenting at all. Therefore, because GGECE expands the rights held in trust by enhanced children and better equips children to resist hyper-parenting, the open futures objection fails to prove the impermissibility of GGECE.

5.3 Communicative Objection

In this section, I address the objection that because GGECE is patently non-consensual, it infringes on one's autonomy to accept or refuse enhancement and therefore is impermissible. I refer to this section as the 'Communicative Objection' because it is the autonomy-based objection rooted in GGECE's lack of communicative engagement with the enhanced. In the first part, I respond that the theoretical basis for the communicative objection is implausible because GGECE stands to promote capabilities of communicative engagement. It seems more likely that the theory that underpins this objection would actually be permissive of the use of GGECE. In the second part, I consider the objection against hypothetical consent, that emergent children might actually decide against autonomy enhancement. If hypothetical consent cannot be assumed, then GGECE cannot be permissible because it risks transgressing the communicative autonomy of the enhanced. I respond that rejecting the autonomy enhancement that GGECE would provide implies a rejection of autonomous communication as a value worth protection. If an emergent child does not value the communicative process,

then they cannot object to not being communicated with. Therefore, hypothetical consent can be assumed amongst those people whose consent we ought to value, thereby negating the concern that GGECE is impermissible because hypothetical consent cannot be assumed. Following this in the third part, I consider the possible objection that it is precisely because GGECE lacks communicative involvement that makes it impermissible. I respond that the communicative objection is not, or at least should not be, concerned with the violation of an embryo's autonomy-based right to communication. The communicative objection should be concerned with how enhancement affects the autonomy of emergent enhanced persons; as such, this objection reverts to the open futures objection, which has already been debunked as being permissive of GGECE. Fourthly, I consider the objection from unconsented-to harms that GGECE is impermissible because it is a risky procedure that lacks consensual input. I respond that this objection achieves more than it intends because every life ever created leads to harms that were not consented to. Subscription to the view of unconsented to harms implies acceptance of an anti-natalist view. The endorsement of contra natalist views implies a rejection of the view that unconsented to harms are impermissible in the case where procedures and interventions, such as GGECE, are expected to be beneficial on the balance of considerations. Fifthly, I consider a response to the communicative objection that arguing for the protection of the communicative process at the expense of other goods is morally questionable. I conclude that the above five responses makes sufficiently plausible the claim that GGECE has survived the communicative objection that GGECE is impermissible because it lacks communicative input.

5.3.1 GGECE's Lack of Communicative Engagement

The theoretical basis for this objection rests on Jurgen Habermas' '*The Future of Human Nature*' (105). This objection is closely related to his more general moral and political philosophy that emphasizes communication and discourse. Habermas' thesis is rooted in

Kantian thought, which asserts that people must be treated as an end in themselves and never as a mere means. Habermas extends this logic to the process by which a person is created. He argues that the creation of a person must never be instrumentalized via the non-consensual process of genetic manipulation. This instrumentalization stands in stark opposition to the communicative process, which involves the options to accept or refuse whatever intervention is being proposed. For Habermas, then the inculcation of values and expectations in one's child is permissible so as long as the child has been given an adequate amount of space to reflect on such inculcation and guide the direction of her intellectual growth. Autonomy to consent or refuse is therefore crucial to a person's sense of self and identity (99). Genetic manipulation, such as GGECE would be seen as impermissible because it takes place before a child has communicative capacity. Habermas (105) says:

> Eugenic interventions aiming at enhancement reduce ethical freedom insofar as they tie down the person concerned to rejected, but irreversible intentions of their parties, barring him from the spontaneous self-perception of being the undivided author of his own life.

It is for the reason mentioned above that genetic manipulation technologies such as GGECE would be, in Habermas' view, a grave violation of a person's autonomy, primarily due to the enhanced child's inability to engage communicatively on matters that concern their identity. Habermas does however concede that genetic manipulation undertaken to prevent grave illness is permissible because it is reasonable to presume that the resultant child would have agreed to the procedure if they could have.

However, following from Schaefer et al. (99), genetic manipulation seems less problematic when it is undertaken to enhance autonomy. Moreover, to Habermas' own admission, autonomy is central to human agency. Additionally, enhancement of autonomy via GGECE

would improve the resultant child's ability to communicatively engage with the world. So, for instance, the enhanced intelligence that can be expected from GGECE would make people more self-aware and cognizant of the various factors that influence them, which would guide and direct their growth. While Habermas may be reluctant to endorse the enhancement of autonomy through the use of GGECE (due to its lack of communicative involvement), it is hard to see how he can object to its use when it is aimed at or results in reductions in autonomy violations. Indeed, the enhancement of autonomy that GGECE would promote would be an effective weapon against instrumentalization, insofar as it could prevent people from having a distorted view of potential life projects available to them or the scope of their own agency. Supposing that Habermas would have condoned genetic enhancements in cases of averting grave illness because it is plausible that emergent children *would have consented if they could have*. In that case, Habermas ought to condone GGECE because it seems equally plausible that emergent children would consent to having their autonomy enhanced in ways that avert future potential instrumentalization. As Habermas takes communicative involvement into factors that influence one's life to be of such central importance, it seems plausible that he would want to avert potential instrumentalization just as he would want to avert grave illness. GGECE would promote the capacity of persons to engage communicatively in matters relating to resisting potential instrumentalization. Given that he ought to endorse biotechnologies such as GGECE. Hence, even if resultant children cannot consent to GGECE's use, it seems safe to assume that resultant children would consent to not wanting to be instrumentalized. Moreover, it seems plausible to think that Habermas would support genetic interventions that prevent potential instrumentalization and enhance communicative capacity, given the primacy he places on the communicative process. Therefore, it seems more likely that Habermas's theory that emphasises communicative engagement would be permissive of GGECE.

5.3.2 On the Child's Potential Objection to Non-Communicative GGECE

In this part, I consider the objection against hypothetical consent, that emergent children might actually decide against autonomy enhancement. If a child can potentially object to being enhanced, then hypothetical consent cannot be assumed. If hypothetical consent cannot be assumed, then GGECE cannot be permissible because it risks transgressing the communicative autonomy of the enhanced. Habermas accepts the fact that some prenatal interventions, such as those that promote health, are acceptable because of hypothetical consent. That is, it is reasonable to assume that children would accept health improvements because such improvements would not interfere with any reasonable life projects. On this same logic then, the notion of hypothetical consent can be extended to GGECE, because it would enhance autonomy and it seems similarly plausible that the enhancement of one's autonomy will not interfere with the pursuit of any reasonable life projects and would actually increase the number of life projects available to enhanced children.

However, *arguendo*, if a resultant enhanced individual (for whatever reason) were to still have objected to the use of GGECE after the fact, then Habermas' general autonomy-based arguments that stress the need for consent would lose their force. After all, according to Schaefer et al. (99), if the resultant enhanced individual objected to the use of GGECE after the fact, then that means they would have been perfectly fine with having less autonomy throughout their lives. That person would, in effect, be rejecting the fundamental value that Habermas attributes to autonomous self-discovery. That person would be rejecting Habermas' view that holds that autonomous self-discovery is essential, making Habermas' other arguments that stress the need for communicative participation inapplicable to that particular individual. Put succinctly, if a resultant enhanced individual were to reject having been enhanced with GGECE, then that enhanced individual cannot object[8] when his

[8] Alternatively, his objection need not be taken into consideration.

autonomy was transgressed by being enhanced with GGECE. Therefore, hypothetical consent can be assumed amongst those people whose consent we ought to value, thereby negating the concern that GGECE is impermissible because hypothetical consent cannot be assumed. Following this, Schaefer et al. (99) consider the hypothetical scenario where a child might reject the notion that GGECE would improve autonomy. However, if the arguments previously discussed are correct, then, in general, such a rejection would not be reasonable.

5.3.3 GGECE as a Potential Contravention of Kant's Categorical Imperative

The authors (99) go on to consider the possibility that it might be impermissible for prospective parents to impose their judgements of what is reasonably in the best interests of future enhanced persons, including the imposition of GGECE. The authors respond that Habermas does precisely the same thing by allowing for prenatal treatments on the reasonable assumption that resultant children would have agreed to them. As such, objections against what can reasonably be presumed to be in a child's best interests fail, at least from a Habermasian perspective.

Schaefer et al. (99) go on to consider the Kantian undertones of Habermas' arguments that might warrant the following reply:

> one cannot justify violating someone's autonomy on the basis that the violation would overall promote the autonomy of that individual, just as one cannot justify lying to someone on the basis that the lying would (let us suppose) promote the ability of that individual to see through lies in the future. This reflects the idea that autonomy is, *first and foremost*, to be respected—even if such respect inhibits the promotion of autonomy.

This view asserts that people ought to *always* be treated as an end in themselves and *never* as a mere means. That because GGECE does not respect the autonomy of enhanced individuals,

then GGECE is impermissible even if it results in expanded autonomy. However, Schaefer et al. point to the disanalogy that while lying is a blatant violation of that person's autonomy, it is not clear that GGECE would count as a violation at all, even on Habermas' account. In the first instance, this is because Habermas is not (or the very least should not be) primarily concerned with present autonomy rights *as such,* but with the effect that a given genetic intervention would have on a resultant child's ability to shape their own life. This approach makes sense because the subject of GGECE, the embryo, is not yet autonomous but will only become autonomous in the future. The issues related to this autonomy-based objection are not or at least should not be about violating the autonomy of *an embryo* at the time of intervention but about limiting/expanding the autonomy of the resultant enhanced person in the future. Any discourse on the limiting or expanding of autonomy of an agent in the future (viz. violations of rights-in-trust) would revert this discussion to Feinberg's 'open future objection'. And as previously discussed, the open futures objection fails to prove the impermissibility of GGECE because it was argued that GGECE expands a future person's rights in trust while only limiting them in trivial ways. In Habermasian terms, autonomy is limited only when a certain communicative process is inhibited. Even if one were to impose a categorical rejection on any violation of autonomy, then autonomy enhancement by way of GGECE should still be considered permissible because, all things considered, it promotes and enables all future communicative processes.

5.3.4 The Objection from Unconsented to Harms

Robertson (106) challenges the view that GGECE is permissible without the communicative input of the resultant child by arguing from the intuition that any *unconsented-to* harm is impermissible, even if the procedure is beneficial on the balance of considerations. Consider for example, that a surgeon performs a risky surgery. It may be permissible to perform the surgery with the patient's consent, but performing the same surgery without their consent

may be impermissible (even if the surgeon's actions produce the same benefits). Similarly, GGECE may be construed as being unethical for the same reason. That because prospective enhanced individuals cannot consent to having their genes modified for intelligence, and because GGECE may be a risky procedure, then the act of genetic modification may be considered impermissible because it constitutes an unconsented to harm (even if GGECE would on the balance of considerations produce more benefit than harm).

There is a disanalogy to point out in the above-mentioned surgery example. It is that the above thought experiment stipulates that the surgery being performed is risky. It is this risk associated with the surgery that is possibly the reason why consent is needed. However, it is not necessarily the case that GGECE is a risky procedure, and to the extent that it is not risky *at all*, the objection from unconsented to harms seems less plausible. After all, if the surgery in the above thought experiment was perfectly safe to perform and aimed at saving someone's life, then it seems less likely to be impermissible to perform the surgery, even if the patient could not consent to it. The corollary being that if GGECE is perfectly safe to use, then using it seems equally less likely to be impermissible even if consent to its use cannot be given.

However, the issue might not be that GGECE is a dangerous procedure. It might be that GGECE leads people to do things that cause them harm which they would not have done had they not been enhanced. To illustrate how this might be possible, consider the following thought experiment: Two people are playing a game of Cheat, you against your friend. The stakes of the game are exceptionally high, with the loser dying. Your friend plays her final card, which she declares is an ace of spades. In one scenario, you are enhanced with GGECE. Consequently, you consider in equal parts the possibility that your friend's declaration was a double-bluff (the truth disguised as a lie) or a bluff (a lie). While in another scenario, you are not enhanced, consequently you only consider that her declaration is a bluff. Your friend

reveals her card, which is the king of hearts. The enhanced person is more likely to die than the unenhanced person. This thought experiment reveals that, in principle at least, there are harms borne *specifically* from being more intelligent. In this regard, GGECE can result in unconsented to harms. That is, GGECE is a procedure that can produce harmful outcomes that unenhanced people are not at risk of, the source of which enhanced people did not consent to. While it is sensible to think that GGECE is beneficial on the balance of considerations, the objection from unconsented to harms need only show that some act or procedure that was not consented to (such as GGECE) is potentially harmful (therefore impermissible) even if those harms do not materialize.

In response to the objection from unconsented to harms, Wareham (107) argues that while the banning of genetic engineering on the grounds advanced by unconsented to harms has understandable aspects, accepting them implies more than what opponents of germline gene-editing might intend. This is because *every life ever created* results in some harm to which the subject did not consent. Being alive involves living with the potential risk of enduring harm, risks that the living person did not consent to, and risks they would not have been exposed to had they not been created. If we accept that we should not include the potential benefits of existence in reproductive decisions, then it would be in *every case* morally impermissible to have children. This is because they will inevitably experience unconsented to harms throughout their lives; lives they did not consent to live. This view is endorsed by philosophers belonging to the "anti-natalist" camp who regard the act of procreation as unethical (108–110). While Wareham does not seek to refute the anti-natal view, he instead argues conditionally from the truism that if it is wrong to have children at all, then it is wrong to modify them through gene-editing technologies, such as GGECE. Conversely, he argues that if the widely accepted natalist view is endorsed:

> then it appears sensible to base a reproductive decision on a consideration of the

> overall balance of benefits and harms that future generations are likely to experience (107).

In parallel with Wareham, I too do not seek to challenge the anti-natalist view here. Where I agree with Wareham is on the view that *if* the broadly accepted natalist view is endorsed, then it would appear sensible to use GGECE on prospective children, even if they cannot consent to the potential harms that can arise from it. Because on the balance of considerations, it is a reproductive intervention that would produce more benefits than harms. If natalism is endorsed, then the objection from unconsented to harms cannot serve as grounds for GGECE's impermissibility.

5.3.5 The Absurdities Surrounding the Strict Primacy of Communicative Objections

Schaefer et al. (99) assert that arguing for the categorical importance of autonomy and by extension, the communicative process, reveals something fetishistic about this objection. Holding that GGECE is impermissible even if it stands to promote the autonomy capabilities of resultant enhanced individuals seems to undermine the notion that such communicative self-direction is really of such importance. Even if GGECE did violate some communication-based autonomy right, it does not follow that GGECE is impermissible. Consider the fact that few would argue that telling a toddler a white lie is wrong in *all* situations. This is due to the fact that while parents have good reason not lie to their children, they have better reason to promote their wellbeing. Given that, even if prospective parents have good reason to believe that GGECE is impermissible because it violates some communication-based autonomy right, then they may still have better reason to enhance their prospective children because GGECE would promote their wellbeing.

As an example, education is a form of cognitive enhancer that promotes autonomy, which to some degree is (or should be) imposed on children without communicative dialogue.

Habermas does not object to properly designed educational programs being imposed on children. Rightly so, education is crucial for the development of one's autonomy and secures many other life goods for children. Most would agree that it is acceptable to impose these goods on children even if they protest because children should have them even if they do not want them. It would seem odd, even objectionable, if a parent allows their child to play video games instead of going to school simply because that is what the child wanted to do. Therefore, reasoning by the same token, Habermas should not object to a genetic intervention like GGECE that would produce improved autonomy and many other life goods. If it is permissible to impose well-designed education on children, then GGECE ought to be permissibly imposed on embryos for the same reason, even if doing so obstructs some morally important communicative process.

I have considered several possible communicative objections to the permissibility of GGECE. First amongst them, I considered the Habermasian objection that because GGECE lacks the communicative input of enhanced children, it is impermissible. I respond that while GGECE does lack communicative input, it stands to enhance the communicative capabilities of enhanced children. It is implausible that even Habermas would object to interventions that stand to reduce violations of autonomy. Secondly, I considered the objection that GGECE is impermissible because hypothetical consent cannot be assumed because enhanced individuals might object to being enhanced after the fact. I responded that if enhanced children objected to the use of GGECE, then that implies a lack of value for the communicative process, in which case they would not have grounds to object to not being communicated with on matters related to them. Hence, hypothetical consent can be assumed amongst those people whose consent we ought to value (those that would not object to having been enhanced with GGECE), thereby negating the concern that GGECE is impermissible because hypothetical consent cannot be assumed. Thirdly, I considered the objection that it is categorically

impermissible to undermine the communicative process even if it enhances autonomy. I responded that Habermas is not or should not be concerned with violating the autonomy of an embryo, but what impact an intervention has on the future person's autonomy. On this interpretation, the discussion reverts to the already debunked objection from violations of rights-in-trust, where it was concluded that GGECE is permissible because it expands the autonomy of the enhanced. Fourthly, I considered the objection from unconsented to harms, that GGECE is impermissible because it is a procedure that can lead to harms to which the subject of enhancement did not consent. I respond that while this objection has plausible elements, it implies a controversial anti-natal view because *every life ever created* involves some degree of unconsented to harms. If a person endorses contra natalistic views, then they ought to endorse the view that procedures that carry the potential of producing unconsented to harms are permissible if they are beneficial on the balance of considerations, as would be the case with GGECE. Fifthly, I responded that arguing from the strict primacy of the communicative process is fetishistic and leads to absurd outcomes. Even if the enhancement of embryos obstructs some morally important communicative process, it would still be permissible for prospective parents to use it because it enhances autonomy and well-being. Given the successful defence of GGECE against these various communicative objections, I have made sufficiently plausible the claim that the communication objection fails to prove the impermissibility of GGECE.

5.4 Conclusion

In this chapter, I considered and refuted the autonomy-based 'open futures' and 'communicative' objections. Respect for a resultant child's autonomy to act without personal limitation or their right to participate in the decision to accept or decline enhancement cannot be used as grounds for arguing the impermissibility of GGECE. This is because GGECE is a biotechnology that not only increases the number of open futures available to resultant

children but also increases their ability to engage communicatively with others. The autonomy objection therefore fails to motivate for GGECE's impermissibility.

Chapter 6 The Human Nature Objection

6.1 Introduction

In this chapter, I consider the objection that GGECE is impermissible because it is unnatural. Appeals to the preservation of 'human nature' in ethical discourse are a prevailing theme in the ethics debate concerning the permissibility of human enhancement. The appeal to human nature has been levelled against virtually every form of human enhancement, including physical and cognitive enhancements (111).

At least since the times of Aristotle, the principle philosophical understanding of human nature is that of a set of characteristics that are common to all humans, and that distinguish humans from other kinds of beings. Suppose one adds the qualification that there are features that arise organically in humans. In that case, these features are thought of as essential for being human, rather than merely contingent characteristics that humans could possess. According to what can be called folk understanding, 'human nature' comprises all the qualities that most humans uniquely possess. From this, it follows that if any of these characteristics disappeared or were significantly altered, then we would no longer be human (111). Buchanan (111) concludes that an alteration of human nature would require at least:

> Large-scale changes to one or more of the characteristics that have been common to all or most humans. The qualifier 'large scale' is intended to indicate that if such changes occurred in only in some, but not most human beings, we would probably say that *they* have become something other than human, rather than that human nature has changed (112).

In this respect, GGECE can potentially alter human nature if it is used on a large scale and is successful in changing some characteristic common to all humans. Two primary concerns regarding the potential of GGECE to alter human nature can be raised. The first concern is

that GGECE may alter human nature (23,24). The second is that if GGECE alters or destroys human nature, then this will disrupt our ability to reach coherent moral judgements since the good for humans is derived from our nature (25,105). The first concern assumes that altering human nature is impermissible. While the second concern assumes that human nature provides a normative perspective without which we cannot make coherent, defensible moral judgements. Regarding the second concern, there seems to be a prima facie case against the permissibility of enhancements that threaten our ability to make coherent moral judgments. In this chapter, I will defend the obligation of prospective parents to use GGECE from these two objections. Following that, I will advance the view that the use of enhancements such as GGECE forms part of our nature and therefore (contrary to this objection) ought to be considered permissible on a plausible interpretation of a role that human nature plays in ethics. I will refer to the first two objections collectively as the 'human nature objection' or as the 'appeal to human nature.' While Buchanan (111) considers the human nature objection within the broader context of human enhancement, I give a more focused analysis of the human nature objection's role in the ethics debate surrounding GGECE's permissibility. Additionally, I consider how one plausible interpretation of a role of human nature in ethics can serve as an added justification for enhancements, including GGECE.

In section 2 below, I consider a prominent role that the appeal to human nature plays in the ethics debate surrounding GGECE. The role that I consider is human nature as a source of substantive moral rules that may ground the impermissibility of enhancements such as GGECE. I argue that this appeal to human nature is unpersuasive in its assertion that enhancements such as GGECE are impermissible. In section 3, I consider the objection that GGECE could, by altering our nature, undermine our ability to make coherent moral judgments. I argue that while altering our nature with GGECE carries the potential to imperil our ability to make sound moral judgements, this is not necessarily the case. I argue that even

if GGECE carries the potential of imperilling our ability to make sound moral judgements, such concerns have nothing to do with the concept of human nature and are better served through an appropriate application of the precautionary principle that is permissive of GGECE's use. In section 4, I consider the presupposition that the use of enhancements, including GGECE, are not an aspect of human nature. I argue that because enhancements, including GGECE, are used by most (if not all people), then the use of enhancements such as GGECE ought to count as being a part of human nature. As such, I advance the view that on a plausible role that the concept of human nature plays in ethics, the use of enhancements ought to be considered permissible.

6.2 Human Nature as a Source of Substantive Moral rules: Normative Essentialism

In this section, I consider a prominent role of human nature that asserts to be a source of substantive moral rules and explore its implications for the debate on GGECE's permissibility. Buchanan (111) gives an account of *Normative Essentialism*, the belief that it is possible to derive substantive moral rules from reflection on human nature. Normative Essentialism is endorsed by some of enhancement's staunchest opponents, including Leon Kass and the President's Council on Bioethics, which he chaired for a time. More specifically, Normative Essentialists think that we can derive moral rules that are nonpermissive of enhancement and cloning by reflecting on our nature. For example, the President's Council's *Report on Human Cloning and Human Dignity* states that 'human reproduction is sexual' (meaning that it involves combining genetic material from a male and a female). They assert that because this is how humans naturally reproduce, this gives strong and even conclusive reason against cloning, which is a form of asexual reproduction (113). It is important to remember that this statement is not offered as a mere descriptive statement, but as a normative one, that because human reproduction is naturally sexual, then it ought to remain sexual.

The President's Council's appeal to Normative Essentialism is perhaps most evident in its criticism of cloning, however it is also implied in their critique of enhancements, including GGECE. As Buchanan (111) asserts, this is to be expected because the President's Council explicitly links cloning to enhancement. They view it as the doorway to a 'new eugenics' that would alter the nature of human procreation (114). The Councils claim is not only that enhancement is impermissible because it somehow diverges from nature human reproduction, but that it would also change our nature by 'distorting [natural] human relationships'. According to this view, human nature is not only comprised of certain capabilities but also of certain kinds of relationships. The concern is that some kinds of relationships that might emerge due to enhancements would be unnatural and therefore morally impermissible (111).

As such, given the express declaration of impermissibility that Normative Essentialism makes, I will defend the obligation of prospective parents to use GGECE against the normative essentialist claims that (1) GGECE is an unnatural mode of reproduction and therefore is impermissible, and (2) the use of GGECE would lead to unnatural relationships and is therefore impermissible. I argue that Normative Essentialism is a flawed role of human nature that provides an unpersuasive account for why GGECE is impermissible.

6.2.1 GGECE as an unnatural mode of reproduction

The first normative essentialist claim is that GGECE is unnatural and therefore impermissible. The President's council suggests that genetically designing children is either equivalent to or will lead to the replacement of the 'natural' activity of procreating with a process of manufacturing children. They argue that because genetically designing children is a departure from the natural ways that humans procreate, then genetically designing children is wrong (111). In response, Buchanan (111) points out that the description of regular procreative activity does no argumentative work. This argument against GGECE resembles a typical fallacious appeal to nature that offers no compelling reason for why genetic

enhancements like GGECE are wrong or why the preservation of human nature at all is morally required of us (115). Reference to human nature or the naturalness of human procreation is irrelevant in the debate on GGECE's permissibility and can be eliminated without loss.

6.2.2 GGECE as leading to unnatural relationships

The second argument raised by Normative Essentialism is that GGECE is impermissible because it would lead to unnatural relationships. In its discussion on genetically engineering human embryos to enhance normal characteristics, the President's Council stated that 'salient fact about human procreation in its natural context is that children are *made* not *begotten*'. What the president's Council mean is that children are products of our love, not the products of our desires or wills. Buchanan points out that the descriptive claim upon which this normative essentialist claim is based is unsound. In many cases, children are not made out of love (they are often the result of careless sex or rape). Hence, it is not clear that producing children out of love would even count as a 'natural' relationship between parent and child. Moreover, in some cases, procreation is the product of willing, as would be the case where hyper-parenting takes place. Buchanan adds that if the President's Council's point is simply that the practice of genetically engineering our offspring would involve a new way in which prospective parents can hyper-parent – namely, through gene manipulation – then that is obviously true. However, adding that this or GGECE, for that matter, would be a departure from 'the natural context' is not true because it is commonplace (and therefore natural) for parents to impress their wills on their children. Moreover, even if GGECE did lead to a departure from the natural context, this still does not show why it is wrong (114) or why we should be committed to staying within the natural context (115).

In summary, Normative Essentialism could be employed to argue that GGECE is impermissible because it is an unnatural form of reproduction and because it would lead to

unnatural relationships. The type of argument that the President's Council uses to advance the above-mentioned charges relies on an unpersuasive fallacious appeal to nature in its attempt to argue GGECE's impermissibility. Additionally, attempts at arguing the unnaturalness of human relationships rely on unsound aspects of human nature, that when correctly interpreted, provide no argumentative leverage against the permissibility of GGECE. Human nature fails as a source of substantive moral rules and therefore is incapable of motivating for the impermissibility of GGECE.

6.3 Human Nature and the Ability to Judge What is Good

After having set aside and disproven the credibility of Normative Essentialism, I now come to the concern that GGECE could, by altering our nature, undermine our ability to make judgements about what is morally good for us. There is a prima facie case against the permissibility of enhancements that undermine our ability to make sound moral judgements. As such, in this section I defend the obligation of prospective parents to use GGECE against the view that GGECE is impermissible because it undermines our ability to make judgements about what is morally good.

In response, Buchanan (111) argues that on one plausible interpretation, Aristotle may have held that a being's nature determines what is morally good for it, but only in a limited sense; by constituting a constraint on what can count as a good life for that kind of being. For example, according to this view humans are naturally rational then the good life for humans, whatever else it may be like, must include significant scope for the exercise of reason.

So the idea is that that human nature is a constraint on what we ought to consider being morally good for humans. Buchanan (111) gives one reason why this view does not preclude the use of genetic enhancements such as GGECE. He argues that this role that an appeal to nature plays is merely a reminder that whatever we consider to be morally good ought to

align with our nature. Therefore, altering our nature need not result in an inability to judge what is morally good. Altering our nature may only result in a new set of constraints on what ought to be considered morally good for the enhanced. Suppose GGECE altered our nature to another (potentially better) set of natural constraints. In that case, it does not necessarily follow that GGECE would jeopardize our ability to make sound moral judgements. The enhanced would simply constrain their new concept of morality to their new set of natural constraints.

Moving on, suppose that our capacity to make moral judgments is part of human nature and that human nature is understood simply and uncontroversial as a set of species-specific characteristics shared by most members of humanity that are not possessed by any other creatures on earth. Depending on how coherently we define the capacity for judging what is good, it may be possible to say that this capacity is part of human nature in the metaphysically lean sense that it is just another characteristic that we possess. If GGECE has the potential of imperilling our capacity for making moral judgements, then there would be a prima facie case against GGECE's permissibility. However, this does not mean that an alteration of our nature necessarily leads to an imperilment of our capacity to make sound moral judgements because the capacity to judge the good is simply one of many characteristics supposedly unique to humans. Hence, we can eliminate the appeal to human nature and instead focus on the more relevant consideration of trying to avoid potentially harmful unintended consequences of GGECE due to complex interdependencies that intelligence might have with other characteristics whose imperilment we ought to avoid.

It is worth mentioning that while the concern of complex interdependencies is unrelated to the concept of human nature, addressing this concern is indeed a daunting task that needs to be done if GGECE is to be considered permissible. While I seek to give support for GGECE's permissibility, in principle, I do not doubt that as more information emerges

surrounding the effects that GGECE would have on our cognition and behaviour the conversation on its permissibility will continue to evolve. Given the uncertainties presented by GGECE's potential to imperil traits we ought to value through complex interdependencies, it may be best to adopt some version of the Precautionary Principle that would function to counterbalance tendencies to underestimate risks of GGECE in pursuit of benefits obtained by GGECE[9].

In summary, the charge that changing human nature through the use of GGECE is impermissible because it will imperil our ability to make moral judgements fails because it simply does not necessarily follow that changing our nature will make us incapable of making sound moral judgments. Changing our nature will only lead to a new set of constraints on what ought to be considered morally good for the enhanced without necessarily imperilling the enhanced's ability to reach sound moral conclusions for what is morally good for them. Additionally, even if GGECE does imperil our ability to make sound moral judgements (in the metaphysically lean sense), then it would be because of some complex interdependency that GGECE has with a human ability to make moral judgments, not with human nature. This appeal to human nature can be discarded without loss and replaced with the valid concern of the potential that GGECE has of inadvertently imperilling capacities that we ought to value. This concern can be more appropriated addressed through some application of a plausible version of the precautionary principle.

6.4 The Presupposition that the Use of Enhancements are not Part of Human Nature

Up until now, I have considered the objection that GGECE is impermissible because it changes human nature. In the first part, I considered the role that Normative Essentialism

[9]The potential risks associated with complex interdependencies is easily overstated. Powell and Buchanan (161) remark that there is actually a suprising degree of modularity and canalization in the phenotypic expression of genes, thereby potentially attenuating the risk of complex interdependencies in the face of gene modification. Regardless, authors have argued that there is actually no plausible interpretation of the precautionary principle that outright rejects the use of GGECE, while there are versions of the precautionary principle that actually endorse gene editing's use (52).

plays in the ethical debate surrounding GGECE's permissibility. I concluded that Normative Essentialism does not convincingly prove the impermissibility of GGECE. Following this in the second part, I considered whether GGECE is impermissible because it would, by altering our nature, imperil our ability to sound moral judgements. I concluded that not only does it not logically follow that altering our nature will imperil our ability to make sound moral judgements, but also that genuine concerns of GGECE imperilling our ability to make sound moral judgements can be expressed without recourse to the concept of human nature and are better addressed via different conceptual avenues.

The human nature objection against GGECE presupposes that the use of enhancements is not a part of human nature. In this section, I posit an additional defeater to the human nature objection against GGECE's permissibility. I challenge the presupposition that the use of GGECE (or enhancements) are not a part of human nature. I argue that given humanity's use of enhancements in all areas of their lives, it seems plausible *that the use of enhancements is in our nature*. Following this, I argue that because human nature ought to be a constraint on the good for us, appeals to human nature can justify GGECE's permissibility.

Following from Daniels (112), if one defines human nature as some quality or trait that is common to most people, then any number of qualities or traits can be defined as forming part of human nature if that trait can be coherently defined and is present in most people. Accordingly, as previously mentioned, Buchanan, Hume and contemporary practitioners of neuroethics (111) argue that a proper understanding of morality for humans must take into consideration our species-specific cognitive and motivational characteristics. If a being's nature ought to determine what is good for it, then any coherently defined characteristic shared by most people must be adequately accounted for in our formulation of what ought to be morally good for us. Buchanan mentioned 'the exercise of reason' as one such characteristic that humanities concept of humanity ought to make sufficient allowance for,

that whatever else our moral good might entail, it ought to also allow for the sufficient exercise of reason. So, if the use and development of enhancements are widespread, then like the exercise of reason, a proper understanding of morality for humans ought to consider our motivation and affinity for enhancements. In what follows I consider whether the use of enhancements form part of human nature.

According to Juengst and Mosely (16), human enhancement can be defined as 'biomedical interventions that are used to improve human form or functioning beyond what is necessary to restore or sustain health'. This broad definition for human enhancement includes GGECE as well as many other commonplace biomedical interventions, which collectively are used or endorsed by the vast majority of the worlds people. In addition to GGECE, cosmetic surgery and biosynthetic growth hormone for increased stature (116–118), nootropics in healthy individuals for improved memory, mood and cognition (119–126), and life-extending mimetics (73) all count as human enhancements that are commonly used or endorsed. While Parens' definition of enhancement is restricted to biomedical interventions, broader definitions of 'enhancement' include methods of improving normal human capacities that are not necessarily biomedical (16). In addition to caffeine, education and meditation (127), Juengst and Mosely (16) remark that enhancement also includes: Electronic and robotic tools that enable us to listen, observe, help or harm at a distance, lifestyles designed to maximize particular talents, and social practices that foster new forms of human relationship.

If one adopts a broad definition for enhancement, then it seems highly plausible that the various enhancement methods discussed are endorsed or pursued by the majority of people. If this view holds then like the 'exercise of reason', enhancement of our bodies and abilities is also a motivational aspect of human nature that our concept of morality must make allowance for. Therefore, in accordance with the view that human nature must be a constraint on what is good for us, then our concept of morality ought to be permissive of the use of enhancements.

Humans are a species whose nature can be defined in terms of widespread motivation to improve on our condition through the use of enhancements, as such, an appropriate application of the concept of human nature ought to advance the view that enhancements such as GGECE are permissible.

The human nature objection incorrectly presupposes that the use of enhancements, including GGECE, are not a part of our nature. As such, our concept of morality ought to be permissible of enhancements, including GGECE.

6.5 Conclusion

In this chapter, I have argued against the appeal to human nature from three different perspectives. Firstly, I considered the role that Normative Essentialism plays in the ethics debate surrounding GGECE's permissibility. I concluded that Normative Essentialism gives a flawed and unpersuasive account for why enhancements like GGECE are impermissible.

Secondly, I considered the objection that altering human nature would imperil our ability to make sound moral judgements. Wherein, I argued that it does not logically follow that an alteration of our nature will necessarily lead to an inability to make moral judgements. Additionally, I argued that genuine concerns regarding the potential of GGECE imperilling our ability to make sound moral judgements can be addressed with an application of a plausible version of the precautionary principle. Given that Normative Essentialism fails and that concerns surround potential complex interdependences are better expressed via other conceptual avenues, the permissibility of GGECE survives the human nature objection. Thirdly, I argued that the human nature objection against GGECE presupposes that GGECE changes human nature. I argued that because the use of enhancements, including GGECE, are so widespread, then the use of enhancements ought to be considered a part of human nature as well. As such, given that human nature ought to act as a constraint on what is morally good

for us, then our concept of morality ought to be permissive of the use of enhancements. Far from being an objection, the appeal to human nature can serve as an additional justification for GGECE's permissibility.

Chapter 7 The Merit-based Objection

7.1 Introduction

In this chapter, I consider the objection that GGECE is impermissible because it is unfair or a form of cheating. GGECE is an emerging biotechnological enhancement that seeks to enhance the intelligence of prospective children. Genetically enhancing intelligence gives enhanced people competitive advantages in acquiring desirable positions in education and employment and endows the enhanced with cognitive capabilities that could allow for more swift, effortless and spectacular achievements. Common objections that are typically levelled against enhancements like GGECE are that they constitute a form of cheating (25) or that the talents and abilities that enhancements like GGECE may endow the enhanced with are no longer their own, with the *President's Council on Bioethics* saying:

> [T]he naturalness of means matters. It lies not in the fact that the assisting drugs or devices are artifacts, but in danger of violating or deforming the nature of human agency…In most of our ordinary efforts at self-improvement…we sense the relation between our doings and the resulting improvement, between the means used and the ends sought…In contrast, biotechnical interventions act directly on the human body and mind to bring about their effects on a passive subject (114).

Relatedly, other philosophical rationales that motivate for the impermissibility of GGECE include rationales that focus on the *means* by which it is pursued (128). In contrast, other rationales focus on the *consequences* of pursuing it (114,128). Rebecca Roache (129) considers objections related to how pharmaceutical cognitive enhancements constitute '*Cheating*', while Resnik and Vorhaus (130) consider more broadly the claim that genetic modification has a strong deterministic effect on the *authenticity* of achievement. Faber et al. (131) give a more exhaustive description of the various arguments against pharmaceutical cognitive enhancement's permissibility. They settle on three objections that appeal to notions

of *Undeservingness, Unfairness,* and *Hollowness.* Given that these three objections are in response to achievements supposedly unjustly attained through the use of GGECE, I will be referring to them collectively as the 'Merit-based Objection'.

I make no claim that the Merit-based Objection is an exhaustive description of all the possible objections against GGECE rooted in unjustly acquired achievements. However, I do cover the most pertinent and well-researched objections. Given the above literature related to the objections against GGECE's permissibility, I hope to make sufficiently plausible the three questions that I am primarily concerned within this chapter: (1) Is the use of GGECE unfair? Are those enhanced with GGECE undeserving of their accomplishments? Alternatively, are achievements made with the assistance of GGECE hollow? Furthermore, (2) if true, are these claims sufficient grounds for GGECE's impermissibility? I argue that none of these three claims can successfully argue the impermissibility of GGECE. My analysis is based on arguments first put forward by Faber et al. (131). Those authors consider objections against pharmaceutical cognitive enhancers in a descriptive ethical analysis of people's perceptions of its permissibility. In contrast, I consider their arguments as normative objections to the impermissibility of GGECE.

In what follows in this chapter, my response is divided into three sections. In the first section, I consider whether GGECE is impermissible because it is a form of cheating. I respond that the use of GGECE would be cheating and therefore impermissible if it broke some established rule. Whether or not such a rule is justified would need further argument. Following this in the second section, I consider whether GGECE is impermissible because it makes those enhanced with it undeserving of their achievements. I respond that while GGECE might reduce the deservingness of achievements, parental obligations to use GGECE (thereby producing *Undeservingness)* outweigh parental duties to pursue equality of opportunity (thereby reducing *Undeservingness*). That is, although *Undeservingness* holds,

impermissibility does not. Finally, in the third section, I consider whether GGECE is impermissible because achievements realized with it are *hollow,* i.e. they lose some of their normal value. I respond that (1) contrary to the objection, there will be many instances of GGECE actually increasing the value of achievements, (2) not all instances of GGECE will devalue achievements, (3) arguing for impermissibility due to *Hollowness* from *Undeservingness* fail for the same reasons that *Undeservingness* fail to argue impermissibility.

7.2 GGECE and the Objection from Fairness

7.2.1 Procedural Unfairness of GGECE

The first concern I address in this section seeks to explain the impermissibility of GGECE by arguing that it is *unfair* or, when differently phrased, a form of cheating (25,114,132,133). One variant of the objection from fairness is that GGECE is *procedurally* unfair, that GGECE is an unfair means through which intelligence genes are acquired. The response to accusations of GGECE's procedural unfairness are rather straightforward, with David Resnik and Daniel Vorhaus (130) arguing that it makes no difference whether a person's genetic gifts come from chance genetic assortment or deliberate genetic manipulation. People do not normally object from procedural unfairness when morally examining how genetically gifted mathematicians have acquired their genes, despite the fact that GGECE would be producing identical outcomes. It is not even clear what a procedurally fair acquisition of genes ought to be. This sort of objection is a vacuous accusation, if not a blatant appeal to nature. Opponents from procedural unfairness must take up the burden of proving what makes the genetic lottery procedurally fairer than deterministic GGECE. It does not seem possible to acquire intelligence in a procedurally unfair manner.

Additionally, it is worth mentioning that this response to GGECE from procedural unfairness is being considered, having set aside the fact that GGECE is only one way parents can

enhance their children's intelligence. There are many means by which parents enhance their children's intelligence, which do not invoke the same objections from procedural fairness. Higher education, access to private tuition, developmental enhancements, better access to nutrition and health also contribute (albeit not genetically) in enhancing a child's intelligence. Suppose objections from procedural unfairness cannot be legitimately directed at any of the ways in which parents make their children more intelligent. In that case, there does not seem to be a place for this objection in the ethics debate concerning GGECE's permissibility.

7.2.2 Substantive Unfairness of GGECE

A second take on the objection that GGECE is unfair is that it is *substantively unfair* and therefore impermissible. The charge is that GGECE is unfair because it produces unfair outcomes. This objection is consequence based and will be the focus for the remainder of this section. For clarification, in my Inequality Objection I addressed the question of the substantive unfairness from equality of opportunity. In this section, I consider the objection that GGECE is unfair because it constitutes a form of cheating.

Faber et al. (131) think that two questions should be asked regarding this form of the objection from unfairness. The first question they raise is why should we think that *Unfairness* supports impermissibility? The second is 'why accept *Unfairness* in the first place?' The authors think the answer to the first question is straightforward, though it is typically not made with explicit reference to GGECE: unfairness is bad, with proponents from a wide array of moral theories agreeing that, all things remaining equal, producing bad outcomes is impermissible, either because unfairness produces bad outcomes (cf. 134,135), or because it violates someone's rights or breaks some terms of a contract (136) or because a virtuous person would not knowingly act unfairly (137). If it can be motivated that GGECE constitutes a form of cheating, then it can be motivated that GGECE would be impermissible on a broad philosophical interpretation. Why it should hold that *unfairness* implies

impermissibility is controversial in philosophical discourse. Some hold that it is bad in itself (138). While others think that that *unfairness* is only impermissible if it causes further bad consequences, such as the reduction of an individual's well-being (Bentahm (1789) & Sidgwick (1893) as cited by 131). Despite this disagreement, most would agree that *unfairness* is bad, or at least typically is so.

According to Faber et al. (131), the second question – why we should accept *unfairness* – is more controversial in the debate against GGECE. Some think that the unfairness of enhancements like GGECE is 'obvious' (114) or are at least intuitive (133). Conversely, doubts can be raised whether *all* forms of enhancement, including GGECE, are unfair (128,133,139–143). As such, the scope and application of objections from unfairness are contested. Faber et al. (131) also mention that there is disagreement on how to justify unfairness, that is, why think that enhancements like GGECE produce unfairness when it does. One view holds that enhancements like GGECE involve violating certain social rules and conventions, and it is unfair for individuals to acquire advantages over others through rule violation (cf. 133). Suppose the unfairness of GGECE was a simple matter of it being a case of rule-breaking. In that case, the question is more appropriately directed towards whether rules related to GGECE's prohibition are justified (129). If this were the case, then the discussion reverts to objections against the permissibility of GGECE. The take-home message is that if enhancements like GGECE are unfair, they can only be unfair if they are in contravention of some rule that is justified in its conception. To argue impermissibility merely from rule-breaking would constitute a fallacious appeal to the law that, that which is *unfair* (in a purely positivistic sense) is impermissible.

7.3 GGECE and the Objection from Undeservingness

In this section, I consider whether GGECE is impermissible because it makes those enhanced with it undeserving of their achievements. Those who raise the objection that enhancements

like GGECE are *unfair* can and often do so regardless of whether GGECE even violates any established rules (133,144). As an example, in the arena of sports competition, opponents of the use of performance-enhancing drugs invoke its unfairness – or cheating – as a justification for continued prohibition, as opposed to the seemingly more appropriate description of its unfairness as a consequence of it being a contravention of the rules of play (145,146). Many philosophers concerned about the fairness of enhancements like GGECE generally do not limit their objections against enhancements to instances where the enhancement in question contravenes some established rule or broadly accepted norm (25,114). Therefore, Faber et al. (131) think that it seems more appropriate to consider a more general rationale for the objection from fairness – one that holds that GGECE constitutes a form of cheating even if GGECE does not contravene any set rules. The authors suggest that the term *Undeservingness* can be used to denote the rationale that unfairness does not necessarily involve rule-breaking (cf. 133) to contrast it from the conventional rationale of unfairness that necessarily involves rule-breaking.

Undeservingness is the view that those enhanced with GGECE do not deserve their accolades or the material benefits that come with them. Numerous authors have explicitly advanced this view in the ethics debate of enhancements like GGECE(e.g. 133,147,148). Moreover, it has been suggested by another (149) that the view of *Undeservingness* is implied in the works of others (Harris (2012) and Sparrow (2014) according to 131). Additionally, opponents of GGECE often times advance views against its use in terms that support *Undeservingness.* For example, although disputed by others (149), it is frequently said that enhancements like GGECE make achievements ‘too easy’ or is a way of avoiding effort (150,151). Which, if taken as true, may give support to the *Undeservingness* thesis since the exertion of effort to overcome challenges is often thought to confer deservingness (152–154).

7.3.1 Unfairness Gives Rise to Undeservingness

The relationship between *Undeservingness* and *Unfairness* has not been examined in any great detail in the philosophical literature on GGECE (although cf. 110,137). However, Faber et al. (131) think that the two concepts might be normatively connected. One possibility is that *Unfairness* gives rise to *Undeservingness* – that because those enhanced with GGECE have benefited from an unfair practice, they do not deserve the rewards that come from their enhancement. Faber et al. (144) think that the intuition that people do not deserve unfairly acquired benefits holds. They provide the following example to describe this relationship better:

> For instance, when an athlete breaks the rules of a sport, as a result wins a competition, we would conclude that she won unfairly, and this may seem to support the view that she does not *deserve* the reward that come[s] with the victory. This sort of case might seem to suggest that *Unfairness* is normatively more fundamental than *Undeservingness.*

If *Unfairness* gives rise to *Undeservingness,* then a moral actor can only be thought not to deserve the rewards of her achievement if she acquired them unfairly – by unfair, I mean she cheated/broke the rules. As such, on this view, *Undeservingness* would then have to be argued from what it is that motivates for GGECE's *Unfairness* which would require further argument for why that rule is justified. As previously discussed, mere appeals to laws are not sufficient justifications for GGECE's impermissibility.

Some prominent theoretical accounts of fairness can be interpreted as holding that fairness, or some component thereof, requires that (material or non-material) rewards be distributed across individuals in proportion to the relative degree to which those individuals deserve those rewards (Broome (1991) as cited by 131,155,156). In line with this theoretical account

of fairness is the view that *Unfairness* occurs if rewards (material or non-material) are not distributed in proportion to relative effort across individuals. *Unfairness* (on this conception) can give rise to *Undeservingness* because people do not deserve unfairly apportioned rewards.

The reasoning mentioned above suggests that *Unfairness* can give rise to *Undeservingness.* In support of this thesis, consider a case adapted from Faber et al. (131) in which two scientists, *A* and *B,* make similar and highly significant scientific discoveries. Suppose that *A* has been enhanced by GGECE, which allowed her to arrive at her discovery more quickly and with less effort due to efficient and creative use of time and resources. In contrast, *B* made the same discovery without the benefit or luxury of having her genes doped for intelligence. As such, *B's* arrival at her discovery took more time and effort. It seems plausible that B deserves her rewards and accolades associated with her discovery in full, while A only deserves her rewards and accolades in part. However, despite this apparent difference in deservingness, it is probable that both scientist's, A and *B,* will receive identical praise and reward for these achievements, at least if *A's* enhancement with GGECE is kept secret (cf. 157). According to *Undeservingness, A* does not deserve the reward that comes with her discovery (to some extent) because GGECE made A's discovery easier than B's identical discovery. As such, in this scenario, rewards would not be distributed in proportion to efforts. This would be unfair, on the conception of fairness that asserts that similar efforts must produce similar rewards. Hence, if (1) *Unfairness* holds, and (2) those enhanced with GGECE are rewarded to a similar degree as the non-enhanced who achieve similar things, then enhancement with GGECE may lead to *Undeservingness*.

In support of the above argument, I concede that this sort of reasoning closely tracks our intuitions on how rewards should be distributed. However, what is of more interest for the ethics of GGECE debate is whether this brand of *Undeservingness* sufficiently motivates for

impermissibility. Is GGECE impermissible because it makes achievements easier for the enhanced while potentially rewarding them to a similar degree as the non-enhanced who achieve similar things?

It seems highly implausible that this type of claim of *Undeservingness* is sufficient grounds to support the impermissibility of GGECE. Fiduciary duties executed in the name of parental partialism is, according to Daniel Engster ((2019) according to 98), a right that parents can legitimately exercise even if doing so accentuates inequality of opportunity. The expression of fiduciary duties partly includes making the securing of the child's interests less effortful. That is, parents can exercise fiduciary duties by making the acquisition of rewards/achievements easier to attain for their children. For example, fiduciary duties include providing extra tuition lessons to get one’s child into medical school, the provision of improved nutrition to get into the first sports team, or the enhancement with GGECE as an all-purpose means (15). Fiduciary duties can, and often do, lead to *unfairness* in cases where children accomplish similar things. This is because parents differ widely in their capacity to express fiduciary duties, with some parents doing more for their children than others. Consequently, on the present understanding of *Undeservingness* parental partialism expressed through fiduciary duties can lead to *Undeservingness.*

The question remains, does *Undeservingness* support impermissibility? In the context of parental partialism, the rights *qua* parents to pursue fiduciary duties outweigh duties to advance equality of opportunity (Engster (2019) according to 98). Equality of opportunity (on its substantive definition) is the view that applicants for certain desirable positions should stand an equal chance of attaining those desirable positions. In this regard, desirable positions can be thought of as the reward being pursued. Moreover, the chance of gaining that reward is at least partly determined by the amount of fiduciary assistance applicants receive. As such, because substantive equality demands equal chances at getting rewards, then this implies that

fiduciary assistance and efforts should be equalized amongst applicants for those rewards. On this understanding, substantive equality of opportunity gives rise to reductions in *Undeservingness*. This is because applicants and candidates would be exerting similar efforts for certain rewards (assuming candidates have similar capabilities). After all, they would be receiving similar fiduciary assistance. As such, what my analysis shows is that fiduciary duties may give rise to *Undeservingness* and that equality of opportunity would lead to reductions in *Undeservingness.* Therefore, on Engster's analysis of parental partialism, the *Undeservingness* that fiduciary duties (which include the use of GGECE on one's child) produce morally outweigh duties to reduce *Undeservingness* by pursuing substantive equality of opportunity. That is, (at least as it pertains to fiduciary duties to use GGECE) *Undeservingness* does not support impermissibility because parents have rights[10] *qua* parents to cause *Undeservingness*, which outweigh duties to reduce it.

7.4 The Objection against GGECE from Hollow Achievements

In this section, I consider whether GGECE is impermissible because achievements realized with it are *hollow,* i.e. they lose some of their normal value. Faber et al. (131) consider another possible rationale for impermissibility from *Hollowness.* This claim asserts that achievements realized with the assistance of GGECE are 'hollow achievements' in that they lack (some of their normal) value and are therefore impermissible. This claim, or variants of it, have been endorsed by several moral theorists in the ethical debate on enhancements generally. Juengst ((2000) as cited by 131) raises the question of whether achievements realized through the use of enhancements might be thought of as 'hollow achievements'. While the President's Council on Bioethics (114) argued that enhancements would undermine the 'dignity' of human performance and perhaps even render achievements realized through their use as 'false'. According to Faber et al. (131), this literature review

[10] Recognized moral rights imply the permissibility to exercise those rights.

reveals two values that may be threatened if enhancements like GGECE are used in pursuit of achievements; they are dignity and truth. For the remainder of this section, in parallel with Faber et al., I will consider the question of whether GGECE might rob human achievement of *some* morally significant value without specifying what sort of value that might be. Faber et al. consider that like the objection from fairness, two questions should be asked concerning hollowness: (1) why think that *Hollowness* supports impermissibility? and (2) why accept *Hollowness*?

According to Faber et al. (144), there is very little literature concerning the first question – why think that hollowness supports impermissibility? They attempt to formulate an argument from *Hollowness* to impermissibility. According to *Hollowness*, achievements attained with the aid of GGECE lack some of their normal morally significant value. Consequently, this means that the use of GGECE has at least one bad outcome: it diminishes some of the value that a person's achievements might otherwise have had. Hence, because bad outcomes should be seen as worth avoiding, all-things-considered (136,137)(cf. 134,135), then on at least this view, *Hollowness* can be viewed as impermissible.

Faber et al. (131) say that there is more literature on the second question – why accept *Hollowness*? That is, why should we infer that achievements gained with the aid of GGECE are hollow? According to one view, the use of GGECE can reduce the value of achievements by corrupting the very purpose of the activity being pursued(e.g. 143). In this respect, to cite a commonly used example, the use of enhancements like GGECE would be like completing a marathon with the aid of roller skates (121). Faber et al. (144) correctly point to a critical disanalogy with this example that certain activities (including marathon running) can only be pursued when done in a certain way (i.e., by wearing running shoes as opposed to roller skates). As such, the use of 'enhancements' in some cases of goal pursuit is incompatible with the required manner of execution (you cannot run a marathon with roller skates, to do so

would be to engage in some *other* activity). This may be the case because the activity in question only has value when it is executed in a particular way and the use of 'enhancements' like roller blades in some way negates the particular manner in which the activity has to be executed for it to have any value (158).

In support of this view, many authors correctly point out that not all activities are such that their purpose is negated if the assistance of enhancements like GGECE are used (129,133,140,143,159,160). As an example, consider a lawyer representing a trade union trying to secure improved working conditions for union members. The purpose or value of this activity is in realizing a particular goal (improving working conditions of the proletariat), the realization of which need not be threatened if the lawyer is enhanced with GGECE. Moreover, to the contrary, the value of the litigation would be increased if the lawyer has been enhanced. This is because a more intelligent lawyer would presumably be able to extract more concessions than a less intelligent one.

Additionally, Faber et al. (131) note that activities that would be rendered hollow by very extensive enhancements would not be rendered hollow by very modest ones. Take for example, someone climbing up Mount Everest. If he climbed the mountain with the aid of a jet pack, then most would call that a hollow achievement. However, if he climbs the mountain with the aid of an oxygen tank or a regular morning cup of coffee, then most would not think that his achievement of climbing the mountain has lost any value. As such, the present argument from *Hollowness* cannot support the claim that, in all instances, achievements realized through the use of enhancements like GGECE are hollow, as some have suggested (e.g. 114). Put another way, there would be some activities for which intelligence contributes so negligibly to the desired outcome that the achievements of those enhanced with GGECE engaging in those activities will not lose any value. Concerning *Unfairness,* Faber et al. think it is preferable to find a more general rationale for *Hollowness.*

As they did for *Unfairness* from *Undeservingness*, it may be possible to do the same for *Hollowness.*

Faber et al. (131) consider that it is common to think that things that are normally valued loss value when they are not deserved. As an example, they consider feelings of pleasure, a sensation that is broadly considered as valuable (in a consequentialist sense, it makes the world a better place when people experience pleasure). However, some have argued that pleasure lacks some of its normal value when it is not deserved (Brentano (1969) and Feldman (1995) according to 131). Hence, on this view, all things remaining equal, the sadistic pleasure felt by a mass murderer is less valuable than when it felt by an innocent person; a similar argument can be extended to valuable achievements. It could be the case that when rewards are undeserved, they lose some of their value – that is, if a reward is acquired with less effort relative to what others had to do to get it then that achievement loses some of its normal value (131). If this is the case, and if GGECE leads to *Undeservingness*, then achievements realized with the help of GGECE lose some of the value that they usually have. One can assume that this argument holds and accede that achievements achieved through the use of GGECE are hollow because they are not deserved. However, does *Hollowness* from the *Undeservingness* of achievements produced by GGECE, support impermissibility.

As previously discussed, parental rights to execute fiduciary duties outweigh duties to correct inequality of opportunity. Consequently, it was argued that the *Undeservingness* that fiduciary duties may lead to outweighs the reductions in *Undeservingness* that equality of opportunity might lead to. Therefore, *Undeservingness* does not support impermissibility (at least in cases related to fiduciary duties, which include the use of GGECE). As such, assertions that seek to argue impermissibility from *Hollowness* must fail because *Undeservingness* fails to argue impermissibility. Even if achievements realized through

GGECE are undeserved and are therefore hollow, parents have rights *qua* parents to enhance their children with GGECE even if it leads to *Undeservingness*. Therefore, the *Hollowness* that follows from the *Undeservingness* is equally outweighed by rights *qua* parents to exercise fiduciary duties.

7.5 Conclusion

The objections of this chapter sought to justify the lay view that GGECE is morally impermissible because its use or achievements sought through its use are either unfair, undeserved or hollow. In the first section, after deliberating on *Unfairness* as a justification for impermissibility, I found that strict arguments of cheating only support impermissibility if the rules being broken are justified. Following this in the second section, I considered the broader rationale for *Unfairness* to *Undeservingness.* Therein, I concluded that parental obligations to enhance their prospective children with GGECE in a bid to advance their interests outweigh duties can lead to *Undeservingness*. However, after an analysis of the rights of *qua* parents that legitimise their use of GGECE, it was found that the *Undeservingness* that GGECE could produce does not support impermissibility. Finally, in the third section, I considered the objection from hollow achievements, that achievements realized through the use of GGECE are hollow and therefore unacceptable. In what followed, it was concluded that (1) not all instances of advantages gained through the use of GGECE would diminish the value of certain achievements, and contrary to this view, GGECE stands to expand the value of many achievements realized through its use. (2) Because modest enhancements don't lead to hollow achievements, then sweeping claims that GGECE would always lead to hollowness are unfounded, there can be cases where GGECE will not lead to hollowness. (3) Justifications for *Hollowness* from *Undeservingness* fail to support impermissibility because arguments from *Undeservingness* fail to support impermissibility. For these reasons, arguments against GGECE from *Unfairness, Undeservingness and*

Hollowness fail to argue for the impermissibility of GGECE. The Unpalatability objection fails to argue the impermissibility of GGECE.

Chapter 8 Summary and Conclusion

In this final chapter, I summarise the foregoing chapters and discuss some of the implications of this dissertation. I have argued for the pro tanto moral duty prospective parents have to genetically enhance the germline of their prospective children for intelligence. I provided a positive argument for this obligation on the basis of Julian Savulescu's PPB, that prospective parents ought to select embryos and/or foetuses which are most likely to live the best life, based on available genetic information, including information about non-disease genes. After providing a *Parfitian* defence for genetic engineering as Savulescu does, I considered and defended GGECE against the *Treatment-Enhancement Distinction*. Following this, I argued in parallel with Savulescu for why prospective parents ought to include intelligence as a trait that they ought to select embryos for and why it is implied in his arguments that the selection of embryos for intelligence genes includes genetically editing those embryos for intelligence as well.

Following my argument for prospective parents' moral obligation to use GGECE, I considered what implications the PPB has on duties to select reproductive partners for well-being promoting genes, including intelligence. I conceded that the PPB does imply a duty to select reproductive partners for well-being promoting genes, including intelligence.

Following my positive argument in favour of the parental obligation to genetically engineer selected embryos for intelligence genes, I considered possible objections to my claim. First amongst these is whether GGECE's use is impermissible without the use of a moral enhancer because GGECE has the potential to produce net harms without the joint use of a moral enhancer. While conceding that there is a prima facie case against the permissibility of intelligence enhancement if it produces net harms, there is simply no way of knowing if it does. I instead argue contrarily that there is good reason to believe that GGECE would

produce more benefit than harm, given what we know about the benefits and harms produced by other cognitive enhancers, the benefits and harms produced by innovations produced by increasingly intelligent individuals and what we know about the development of weapons of mass destruction. Moreover, I argued that moral enhancers either do not necessarily obtain net benefits or are conceptually controversial if they do. I concluded that this objection fails to prove the impermissibility of GGECE without the use of controversial moral enhancers. This is because it is highly implausible that GGECE would, by itself, produce net harms.

Following my net harms chapter, I considered the 'Inequality Objection', that because GGECE would accentuate inequality of opportunity, it should be prohibited. I first responded that the prohibition of GGECE not only constitutes ethically dubious levelling down in the conventional sense but could also constitute levelling down in the more dubious sense of being a prohibition that leaves everyone worse off. That because GGECE stands to benefit everyone through gene drive or broader societal benefits, its prohibition would leave everyone worse off.

In what followed in the inequality objection, I argued that the prohibition of GGECE is likely untenable and that any attempt at prohibition would only accentuate inequality more than permitting its use would. As such, I argued that contrary to what egalitarians might think to be preferable, egalitarians ought to endorse the use of GGECE, because endorsement accentuates inequality less than prohibition.

Following this, I considered the moral legitimacy of prohibiting GGECE, where I argued that the prohibition of GGECE would unduly restrict the rights *qua* parents to exercise fiduciary duties. Therefore, because the prohibition of GGECE represents ethically dubious levelling down, is likely counterproductive to egalitarian ends, and is outweighed by parental rights to

use GGECE, the inequality objection fails to justify a ban on GGECE even if GGECE is likely to accentuate inequality.

After the inequality objection, I then considered the autonomy objection that because GGECE changes the personal limitations of the enhanced and is a process that lacks communicative input, it is impermissible. I responded that respect for a resultant child's autonomy to act without personal limitation or their right to participate in the decision to accept or decline GGECE cannot be used as grounds for the impermissibility of GGECE.

Following my discussion of the autonomy objection, I considered the objection that because GGECE changes human nature, it is impermissible. In the first part, I argued that Normative Essentialism fails to convincingly prove the impermissibility of GGECE. In the second part, I considered the objection that GGECE could, by altering our nature, undermine our ability to make judgements about that which is morally good. I respond that it does not necessarily follow that altering our nature with GGECE would imperil our ability to make sound moral judgements.

I add that genuine concerns about GGECE's potential to imperil our ability to make sound moral judgements can be expressed in terms other than human nature, and are better served by focussing on the more relevant consideration of trying to avoid potentially harmful unintended consequences of GGECE through an appropriate application of the precautionary principle. I concluded that the appeal to human nature fails to prove the impermissibility of GGECE.

In the third part, contrary to the human nature objection, I argued that appeals to human nature can serve as an additional justification for GGECE's permissibility. If the use of enhancements are thought of as a motivational characteristic of human nature, then any sound

conception of morality for humans must be permissive of the use of enhancements according to a plausible role that human nature plays in ethics.

Finally, in the 'Merit-based Objection', I considered whether objections from *Unfairness*, *Undeservingness* or *Hollowness* supported the impermissibility of GGECE. My analysis found that while all three of these objections have plausible elements, none of them can, in and of themselves, support the impermissibility of GGECE.

In this dissertation, I have argued that prospective parents have a moral obligation to genetically enhance prospective child for intelligence. Through my analysis and consideration of the various objections to the argument for GGECE, I hope to have made more plausible the claim that prospective parents do have this moral obligation. That among the pro tanto obligations that prospective parents' ought to reasonably consider, there is an additional pro tanto obligation to use GGECE on prospective children. Given the high cost of such a procedure, I make no claim that such a duty to enhance is an all-things-considered obligation. However, if GGECE ever becomes freely or cheaply available, either due to government subsidy or innovation, then there would be a prima facie case to consider the use of GGECE as all-things-considered obligation. The pro tanto obligation to use GGECE places a duty on society to respect the obligation of prospective parents to enhance their children. If GGECE is deemed safe to use on prospective children, then the parental duty to use GGECE must reflect in the form of reviewing relevant legal documentation that seeks to prohibit parental prerogatives to use GGECE on prospective children.

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