

# Ethical Issues in Human Enhancement

Nick Bostrom  
Rebecca Roache  
(2007)

[Forthcoming in *New Waves in Applied Ethics*, ed. Jesper Ryberg (Palgrave Macmillan)]

[www.nickbostrom.com](http://www.nickbostrom.com)

## What is Human Enhancement?

Human enhancement has emerged in recent years as a blossoming topic in applied ethics. With continuing advances in science and technology, people are beginning to realize that some of the basic parameters of the human condition might be changed in the future. One important way in which the human condition could be changed is through the enhancement of basic human capacities. If this becomes feasible within the lifespan of many people alive today, then it is important now to consider the normative questions raised by such prospects. The answers to these questions might not only help us be better prepared when technology catches up with imagination, but they may be relevant to many decisions we make today, such as decisions about how much funding to give to various kinds of research.

Enhancement is typically contraposed to therapy. In broad terms, therapy aims to fix something that has gone wrong, by curing specific diseases or injuries, while enhancement interventions aim to improve the state of an organism beyond its normal healthy state. However, the distinction between therapy and enhancement is problematic, for several reasons.

First, we may note that the therapy-enhancement dichotomy does not map onto any corresponding dichotomy between standard-contemporary-medicine and medicine-as-it-could-be-practised-in-the-future. Standard contemporary medicine includes many practices that do not aim to cure diseases or injuries. It includes, for example, preventive medicine, palliative care, obstetrics, sports medicine, plastic surgery, contraceptive devices, fertility treatments, cosmetic dental procedures, and much else. At the same time, many enhancement interventions occur outside of the medical framework. Office workers enhance their performance by drinking coffee. Make-up and grooming are used to enhance appearance. Exercise, meditation, fish oil, and St John's Wort are used to enhance mood.

Second, it is unclear how to classify interventions that reduce the probability of disease and death. Vaccination can be seen as an immune system enhancement or, alternatively, as a preventative therapeutic intervention. Similarly, an intervention to slow the aging process could be regarded either as an enhancement of healthspan or as a preventative therapeutic intervention that reduces the risk of illness and disability.

Third, there is the question of how to define a normal healthy state. Many human attributes have a normal (bell curve) distribution. Take cognitive capacity. To define

abnormality as falling (say) two standard deviations below the population average is to introduce an arbitrary point that seems to lack any fundamental medical or normative significance. One person might have a recognizable neurological disease that reduces her cognitive capacity by one standard deviation ( $1\sigma$ ), yet she would remain above average if she started off  $2\sigma$  above the average. A therapeutic intervention that cured her of her disease might cause her intelligence to soar further above the average. We might say that *for her*, a normal healthy state is  $2\sigma$  above the average, while for most humans the healthy state is much lower. In contrast, for somebody whose “natural” cognitive capacity is  $2\sigma$  below the average, an intervention that increased it so that she reached a point merely  $1\sigma$  below the average would be an enhancement. As a result, an enhanced person may end up with lower capacity than even an unenhanced person with subnormal cognitive functioning; and therapeutic treatment may turn a merely gifted person into a genius. In cases like these, it is hard to see what ethical significance attaches to the classification of an intervention as therapeutic or enhancing. Moreover, in many cases it is unclear that there is a fact of the matter as to whether the complex set of factors determining a person’s cognitive capacity is pathological or normal. Does having a gene present in 20% of the population that correlates negatively with intelligence constitute a pathology? Having a large number of such genes might make an individual cognitively impaired or even retarded, but not necessarily through any distinctive pathological process. The concepts of “disease” or “abnormality” may not refer to any natural kind in this context. These concepts are arguably not useful ways of characterizing a constellation of factors that are normally distributed in a population, as are many of the factors influencing cognitive capacity or other candidate targets for enhancement. A concept that defined enhancement as an improvement achieved otherwise than by curing specific disease or injury would inherit these problems of defining pathology.

Fourth, capacities vary continuously not only within a population but also within the lifespan of a single individual. When we mature, our physical and mental capacities increase; as we grow old, they decline. If an intervention enables an 80-year-old person to have the same physical stamina, visual acuity, and reaction time as he had in his twenties, does that constitute therapy or enhancement? Either alternative seems as plausible or natural as the other, suggesting again that the concept of enhancement fails to pick out, in any clear or useful way, a scientifically significant category.

Fifth, we may wonder how “internal” an intervention has to be in order to count as an enhancement (or a therapy). Lasik surgery is a therapy for poor vision. What about contact lenses? Glasses? Computer software that presents text in an enlarged font? A personal assistant who handles all the paperwork? Without some requirement that an intervention be “internal”, *all* technologies and tools would constitute enhancements in that they give us capacities to achieve certain outcomes more easily or effectively than we could otherwise do. If we insist on an internality constraint, as we must if the concept of enhancement is not to collapse into the concept of technology generally, then we face the problem of how to define such a constraint. If we believe that enhancements raise any special ethical issues, we also face the challenge of showing why the particular way we have defined the internality constraint captures anything of normative significance.

Sixth, even if we could define a concept of enhancement that captured some sort of unified phenomenon in the world, there is the problem of justifying the claim that the

moral status of enhancements is different from that of other kinds of interventions that modify or increase human capacities to the same effect.

Defining the therapy-enhancement distinction is a problem only for those who maintain that this distinction has practical or normative significance. Those who hold that therapy is permissible, or worthy of support, or an appropriate target for public funding, but that enhancement is not, are affected by all the difficulties mentioned above. We can call subscribers to this anti-enhancement view *bioconservatives*. *Transhumanists* (advocates of human enhancement) are unaffected by the problems associated with maintaining that there are important differences between enhancement and therapy. Transhumanists hold that we should seek to develop and make available human enhancement options in the same way and for the same reasons that we try to develop and make available options for therapeutic medical treatments: in order to protect and expand life, health, cognition, emotional well-being, and other states or attributes that individuals may desire in order to improve their lives.

In the following five sections, we briefly consider several particular areas of potential human enhancement: life extension, physical enhancement, enhancement of mood or personality, cognitive enhancement, and pre- and perinatal interventions. Our aim is not to give an exhaustive assessment of these types of enhancement; rather, by considering one or two key issues for each type, we hope to provide some insight into why they have become topics of ethical debate in recent years, and some understanding of a few key ethical concerns surrounding enhancement.

## Life Extension

Human life expectancy in the Stone Age, and for present-day native “non-civilized” populations, is estimated at around 20-34 years. We might regard this as the natural life expectancy at birth for our species. Among those who survive infancy and childhood to reach the age of 15, life expectancy is about 54<sup>1</sup>. In recent times, Japan has consistently boasted the highest life expectancy. Those born in Japan in 2006 can expect to live 81 years (85 years for women)<sup>2</sup>. Thus, there has been roughly a tripling of life expectancy for humans in the last few thousand years. This gain is primarily due to social and technological developments rather than any evolutionary changes in human biology: improvements in sanitation, medicine, education and nutrition have all had a positive effect on life expectancy. This effect is significant and ongoing. Over the past 150 years, “best-practice” life expectancy (i.e. life expectancy in the country with the longest life expectancy) has increased at a remarkably steady rate of about 2.5 years per decade. If this trend were to continue, record life expectancy (for women) would reach 100 in six decades<sup>3</sup>.

To make further radical gains in human life expectancy, it will become necessary to slow or reverse aspects of human aging. If the processes of senescence are left unchecked, then there comes a point in each individual’s life where cellular damage accumulates to such a degree that pathology and death become inevitable. Preventing and

---

<sup>1</sup> H. Kaplan *et. al.*, “A Theory of Human Life History Evolution: Diet, Intelligence, and Longevity”, *Evolutionary Anthropology* (2000): 156-185; J. Godesky, “Thesis #25” (2005).

<sup>2</sup> The World Factbook 2006.

<sup>3</sup> J. Oeppen and J. W. Vaupel, “Broken Limits to Life Expectancy”, *Science*, 296 (2002): 1029-1031.

curing specific diseases can only have a limited impact on life expectancy in a population that already lives as long as people do in the industrialized world. If we cured *all* heart disease, life expectancy in the US would increase by only about 7 years. Curing *all* cancer would result in a gain of some 3 years<sup>4</sup>. Curing all heart disease *and* all cancer would result in a gain less than the sum of their individual contributions (perhaps 8 or 9 years). The reason for this is that older individuals become increasingly susceptible to a wide range of sickness. If it is not heart disease today, and not cancer tomorrow, then it will be stroke the day after, or pneumonia. The aging process itself is ultimately the cause of most deaths in industrialized nations, and, increasingly, in the developing world. While the proximate cause of death may be heart failure or cancer or some other specific pathology, it is senescence that is ultimately responsible, by making us gradually more vulnerable. Were it not for aging, our risk of dying in any given year might be like that of somebody in their late teens or early twenties. Life expectancy would then be around 1,000 years.

There is another reason why life extension enthusiasts particularly favour research into anti-aging and rejuvenation medicine. It is that a successful retardation of senescence would extend healthspan, not just lifespan. In other words, retarding senescence would enable us to grow older without aging. Instead of seeing our health peak within the first few decades of life before gradually declining, we could remain at our fittest and healthiest indefinitely. For many, this represents a wonderful opportunity to experience, learn, and achieve many things that are simply not possible given current human life expectancy.

Others, however, believe that dramatically increasing lifespan would deprive life of meaning and exacerbate the existing social problems associated with an aging population. These perceived drawbacks have been cited by bioconservatives like Leon Kass as reasons not to pursue life extension enhancement<sup>5</sup>. Let us consider whether this view is justified.

Bernard Williams, despite conceding that death is an evil and therefore an appropriate object of fear, held that an immortal life free from the prospect of death would be meaningless<sup>6</sup>. An immortal life, on his view, would be worse than a finite one because those projects that give one's life meaning and mark out one's life as one's own would eventually be completed or abandoned, leaving infinite years of life in which there are no remaining ambitions or desires to fulfil. Of course, one could create new projects and ambitions to replace the old; but in this case it is not clear that the pursuer of the new projects is, in the ordinary sense, the same *person* as the pursuer of the old ones: what we would end up with would not be a single, cohesive life but a series of separate but overlapping lives. Williams takes considerations like these to provide *prima facie* plausible reasons for opposing radical life extension<sup>7</sup>.

---

<sup>4</sup> T. Thom *et. al.*, "Heart Disease and Stroke Statistics—2006 Update: a Report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee", *Circulation* (February 14<sup>th</sup>, 2006), p. 4.

<sup>5</sup> Leon Kass, "Ageless Bodies, Happy Souls: Biotechnology and the Pursuit of Perfection", *The New Atlantis* (Spring 2003): 9-28.

<sup>6</sup> Bernard Williams, "The Makropulos Case: Reflections on the Tedium of Immortality", in his *Problems of the Self* (Cambridge: Cambridge University Press, 1973).

<sup>7</sup> Williams, writing in 1973, was considering a fictional elixir rather than the sort of treatments that some scientists now see as offering real possibilities for radical life extension in the foreseeable future.

Transhumanists can respond to these considerations in at least two ways. First, those who oppose radical life extension on the ground that an immortal or very long-lived life is not worthwhile may advocate abandoning research into life-extension technology, and may even advocate preventing people from using it once it becomes available. However, the question of whether an extremely long-lived life would be worth living is not obviously relevant to the question of whether a life is worth saving<sup>8</sup>, and that there may be reasons to consider a certain type of life not worthwhile does not in itself justify preventing those who wish to live such a life from doing so. There are plenty of lifestyles led by people today that many might consider not worthwhile; for example, lifestyles entirely devoted to apparently worthless pursuits such as playing computer games or watching daytime TV, or lifestyles devoid of intellectual, social, or cultural enrichment. However, our having this belief about them is not sufficient reason for preventing those who live them from going on living them—by, for example, restricting access to life-saving medicine. Providing they are not significantly harming others, people who live in a liberal, democratic society are free to pursue whatever lifestyle they choose. That there may be reasons to believe that an extremely long-lived life would not be worthwhile, then, does not in itself justify preventing those who wish radically to extend their lifespan from doing so, if the means of doing so and the resulting extended life do not significantly harm others.

Second, whilst Williams' claim that our lives derive meaning and a sense of cohesion from the projects that we pursue during our lifetimes is plausible, his argument does not support the conclusion that no immortal or extremely long life would be worth living. In devising the sort of projects that lend meaning and a sense of cohesion to our lives, we presuppose that we will live for a certain number of years; say, until we are eighty. Projects and ambitions such as mastering a musical instrument, learning a foreign language, meeting one's grandchildren, sailing around the world, and building one's own house all set challenges that can realistically be achieved within a lifetime. Projects and ambitions like mastering every musical instrument in the orchestra, writing a book in each of all the major languages, planting a new garden and seeing it mature, teaching one's great-great-grandchildren how to fish, travelling to Alpha Centauri, or just seeing history unfold over a few hundred years are not realistic: there is simply not enough time to achieve them given current life expectancy. If, like Elina Makropulos in the Karel Čapek play from whose English translation Williams' paper takes its name, one were to live for forty-two years fully expecting to die in a few decades' time and then take the elixir of life and look forward to infinite existence, one could expect one's projects eventually to expire, leaving one with a choice between eternal boredom and self-reinvention. (Elina eventually chooses to stop taking the elixir, and dies.) But this is because these projects reflect a belief about when one is likely to die. If we could reasonably expect from an early age to live indefinitely, we could embark on projects designed to keep us occupied for hundreds or thousands of years. Such projects could lend to the radically extended life the sort of cohesion that more ephemeral projects lend to current lives. Indefinite life extension, far from burdening people with a choice between boredom and a disjointed existence, could represent a great opportunity for those

---

<sup>8</sup> Or worth extending. For those who do not believe the distinction between therapy and enhancement to be morally significant, these amount to the same thing.

willing to embrace this new way of thinking about their lives and what they can reasonably hope to achieve within them.

A more practical objection to radical life extension is that keeping people alive indefinitely would lead to overpopulation, and that more old people would place an unacceptable financial burden on the young.

Let us address the latter part of this objection first. One response is that, whilst the idea of extending lifespan by directly addressing the mechanism that causes us to age may be fairly novel, attempts to prolong life are all around us. Medicine, seatbelts in cars, health warnings on cigarettes, and the fluorescent jackets that roadside labourers wear are all designed to prolong the life of those who use them. If prolonging life is to be discouraged, we should not only forego enhancement, but also rethink the way we live and commit to less cautious lifestyles.

Moreover, tackling the aging mechanism may actually alleviate many of the problems that we currently associate with an aging population: many aged people alive today, being too infirm to work, are reliant on state support, and so the years that modern medicine has bought them are ones in which their economic contribution to society is negative. Life extension by delaying or reversing the aging process, in contrast, would increase healthspan, enabling old people to contribute financially and otherwise to society well beyond the sixty-five or so years currently expected. And, when they do finally become ill and die, there is little reason to think that the cost of their care would be any more expensive than it is today. In fact, society could benefit from being able to amortise such costs over a greater number of years<sup>9</sup>.

That radical life extension could lead to overpopulation has its roots in two separate worries: that overpopulation would result from existing people living longer, and that overpopulation would result from longer-lived people having more children than people today. Regarding the first worry, we can note that population growth has slowed over the past fifty years, with less developed countries accounting for 99% of current growth<sup>10</sup>. Researchers have found that, in general, increasing the standard of living and education of people living in poverty leads to a decrease in birth rate. Working to improve the lives of the millions living in poverty worldwide would, therefore, be a far more effective and humane means of tackling the issue of overpopulation than impeding efforts to develop life extension technology—especially when we consider that this technology is likely to be available first in developed countries, many of which are seeing their population decline.

In response to the worry that longer-lived people will have more children, increasing lifespan would not increase the number of people being born unless there is also an increase in the number of years in which people—particularly women—can reproduce. If this happened, however, it is unclear whether the net effect would be to increase the size of the population. Since 1990, the number of US women under 30 to give birth to their first child has been declining, with birth rates increasing for those over 30<sup>11</sup>. The average age of first-time mothers is at an all-time high. There is, therefore, a

---

<sup>9</sup> John Harris made this point in the third of his Princeton Lectures, on 16<sup>th</sup> March 2006 at the University of Oxford's James Martin World Forum 2006.

<sup>10</sup> Population Reference Bureau, "2005 World Population Data Sheet".

<sup>11</sup> Joyce A. Martin *et al.*, "Births: Final Data for 2002", *CDC National Vital Statistics Reports*, 52/10 (2003, revised 2004), p. 2.

trend of postponing childbirth until later in life; a trend particularly evident among well-educated women, who choose to develop their careers before starting a family. However, since women's fertility begins to decrease after the age of 35, there is a pressure on women to have children before it is too late, and so there is a limit to how long childbirth can be postponed. Were it possible to widen the window of years in which women could conceive, this limit would be increased, and so we could expect the current trend of postponing childbirth to continue beyond the age at which fertility currently decreases for women. This might result in a reduction in the number of births per year. Along with the fact that, with enhanced people living longer, there would also be fewer deaths per year, the net effect of radical life extension on population size is far from obvious.

Whilst these considerations help to mitigate the worry that life-extension technology will inevitably lead to an overpopulated planet, it is difficult to foresee how life-extension might affect population in the long term. Even if we accept that increasing lifespan could lead to problems of overpopulation in the future, however, there are more humane ways of solving the problem than withholding life-saving medical treatments. We could, for example, consider a policy in which those who want to avail themselves of radical life-extension would have to agree to limit the rate at which they bring new people into the world.

We conclude that the arguments we have considered do not succeed in showing that radical life extension would cause any insuperable social problems, nor—as Williams believed—that it would reduce the quality of life of those who make use of it. Biogerontological research can help us prevent the diseases associated with old age, thereby increasing quality of life for everyone as our lives advance. The economist William Nordhaus has estimated that improvements in health status, and especially increased longevity, have made as large a contribution to the average standard of living in the U.S. in the twentieth century as all forms of consumption growth combined<sup>12</sup>. We may hope that research into the processes of aging will enable this trend to continue through the 21<sup>st</sup> century. On balance, then, we find little reason to object to enhancements that extend the healthy human lifespan, and great reason to accelerate their development.

## Physical Enhancement

There are various ways in which we can currently improve what we might call bodily capacities, which include stamina, strength, dexterity, flexibility, coordination, agility, and conditioning. We can exercise, eat healthily, take dietary supplements, avoid pollution, and visit physiotherapists, massage therapists, and personal trainers.

For many, especially those who enjoy participating in sports, pursuing activities that improve bodily capacities is enjoyable, and therefore worthwhile for its own sake. For others, pursuing such activities is a time-consuming burden reluctantly undertaken as a means to achieve certain ends, such as maintaining a minimal level of health and fitness and attempting to delay the physical deterioration associated with aging. For an unfortunate few who are struggling to recover from a serious injury or illness, improving bodily capacities can be a difficult and painful feat that must be accomplished slowly and with the help and support of others. Especially for the latter two groups of people, the

---

<sup>12</sup> William Nordhaus, "Irving Fisher and the Contribution of Improved Longevity to Living Standards", *The American Journal of Economics and Sociology*, 64/1 (2005): 367-392.

availability of medical interventions that could improve bodily capacities safely and conveniently would be beneficial. Increasing one's strength by taking a drug, for example, would dispense with the need to spend hours working out at the gym or exercising with a physiotherapist, freeing up time for other activities.

Those who fall into the first group mentioned, who enjoy physical activity for its own sake, could also benefit from such interventions, since improving one's bodily capacities could enhance one's enjoyment of partaking in sports. However, the issue of performance enhancement in professional sport, or "doping", is controversial. In fact, it is probably the most widely-publicised area of enhancement. In this section we shall consider some of the ethical issues raised by sports enhancement, and assess their relevance to physical enhancement generally.

The Canadian sprinter, Ben Johnson, was stripped of an Olympic gold medal following his disqualification for steroid use. Today, athletes are regularly tested for banned substances, with the chairman of the World Anti-Doping Agency (WADA) pledging to "level the playing field and protect the spirit of sport"<sup>13</sup>.

Despite the fact that athletes found guilty of doping are condemned as cheats and punished, however, the feats that drugs enable them to achieve are sometimes impressive. The journalist David Owen wrote

I have a guilty secret. I think Ben Johnson's "victory" in the men's 100m at the 1988 Seoul Olympics is just about the most exciting 10 seconds of sport I have ever witnessed. ... [W]hat stood out for me mainly was the sheer bullocking power of Johnson's sprinting.<sup>14</sup>

Owen's comments demonstrate that—for some—physical excellence can be impressive even when achieved with the help of drugs. It is therefore not surprising that some call for performance-enhancing drugs in sport to be permitted. Doing so would remove the problem of unfairness: allowing everyone the option of enhancing would be one way of creating the level playing field sought by WADA, thereby removing one of the main concerns about illicit doping<sup>15</sup>. Admittedly, this is not the method of levelling that WADA has in mind, but it is arguably a more effective method than weeding out drug users.

What about the concern expressed by WADA to "protect the spirit of sport"? WADA states that "[t]he spirit of sport is the celebration of the human spirit, the body and the mind"<sup>16</sup>. Julian Savulescu *et. al.* observe that, in ancient times, sport was about finding "the strongest, fastest, or most skilled man"<sup>17</sup>: sporting contests were a test of competitors' strength, speed, and skill. Like horse and dog racing today, sport in ancient times was "a test of biological potential". If this is what the spirit of sport is about, then performance-enhancing drugs certainly go against it, since athletes can achieve things with the aid of drugs that they would be unable to achieve based on their natural potential alone. However, Savulescu *et. al.* argue that this is not what sport today is about:

---

<sup>13</sup> <http://www.wada-ama.org/en/dynamic.ch2?pageCategory.id=254#>.

<sup>14</sup> "Chemically Enhanced", *Financial Times*, 10<sup>th</sup> February 2006.

<sup>15</sup> Savulescu, Foddy and Clayton make this point in "Why We Should Allow Performance Enhancing Drugs in Sport", *British Journal of Sports Medicine*, 38 (2004): 666-670.

<sup>16</sup> WADA Athlete Guide, third edition, p. 4.

<sup>17</sup> Savulescu *et. al.*, "Why We Should Allow Performance Enhancing Drugs in Sport", p. 666.

Humans are not horses or dogs. We make choices and exercise our own judgment. We choose what kind of training to use and how to run our race. We can display courage, determination, and wisdom. We are not flogged by a jockey on our back but drive ourselves. It is this judgment that competitors exercise when they choose diet, training, and whether to take drugs. We can choose what kind of competitor to be, not just through training, but through biological manipulation. . . . Far from being against the spirit of sport, biological manipulation embodies the human spirit—the capacity to improve ourselves on the basis of reason and judgment.<sup>18</sup>

Since, on their view, drugs do not compromise the spirit of sport, Savulescu *et. al.* argue that rather than focus on banning drugs that enhance performance, sporting authorities should focus on banning drugs that are unsafe, thus ensuring that professional sport is fair and acceptably safe for all.

Whilst human sports competitors can undoubtedly prepare for their contests using methods that are not available to horses or dogs, the biological constitution of competitors nevertheless plays a more central role in sport than Savulescu *et. al.* attribute to it. Sporting contests pit competitors against others judged to be biologically similar in ways considered relevant to the nature of the competition: female adults compete in sprinting races against other female adults but not against males or children, football teams are made up of adults of the same sex and compete against similar teams, and boxers compete against those of the same sex who fall into the same weight category. Why is this?

One answer is that the impressiveness of a sporting feat is relative to the expected biological potential of the competitor. Running 200 metres in under nineteen seconds is more impressive if it is accomplished by a man than by a cheetah because it is a more difficult feat for a man, given the typical biological constitution of men; and lifting 150 kilograms is more impressive if it is done by a female weightlifter than by a male weightlifter because such a feat is more difficult for a woman than for a man given their respective typical biological constitutions. In order for us effectively to compare competitors' performance in a sporting contest, then, they need to be drawn from a single biological category<sup>19</sup>.

Permitting the use of performance-enhancing drugs in sport would not necessarily undermine this practice of relativizing sporting achievements to biological categories. For example, permitting the use of a drug that enabled all competitors to improve their performance by 10% would not—if all competitors used such a drug—change the fact that men can generally lift heavier weights than women, or that adults can run faster than children. Nor would it by itself enable the second-best competitors to beat the best competitors. In addition, the use of such a drug would be compatible with the ancient ideal of using sport to identify “the strongest, fastest, or most skilled” competitor; it

---

<sup>18</sup> Savulescu *et. al.*, “Why We Should Allow Performance Enhancing Drugs in Sport”, pp. 666-667.

<sup>19</sup> The way in which such categories are defined may be arbitrary to some extent. For example, Savulescu *et. al.* tell us that “[b]lack Africans do better at short distance events because of biologically superior muscle type and bone structure”, yet athletes are not categorized according to their race. If we are serious about grouping competitors according to biological categories, perhaps we ought to have a separate category for black Africans. That the current way of categorizing sports competitors may not be the ideal one, however, does not undermine the general point that the expected biological potential of competitors is relevant to our evaluation of their achievements.

would simply be the case that the competitor in question is 10% stronger, faster, or more skilled than they would be without the use of the drug.

Whether we think that such enhancement would undermine sport depends upon exactly what role the expected biological potential of competitors plays in our evaluation of their achievements. If we are interested in testing the unenhanced biological potential of competitors, the use of drugs would indeed undermine sporting contests, though in this case we face the problem of explaining why drugs are relevantly different from other, permitted, means of improving performance, such as special training regimes and diet plans. If we are simply interested in revealing differentials—in finding the best, and in assessing competitors' performance relative to others—then a drug that gave all competitors a similar advantage would not undermine this quest. In this case, however, it is difficult to see what motivation there would be for sporting authorities to permit such enhancements, since the same differentials would exist whether or not the enhancement was used<sup>20</sup>. If, on the other hand, we are interested in seeing how fast, strong, or skilful we can make humans using whatever means become available, then we should actively promote performance-enhancing drugs, and expect to see competitors striving to become the first to discover the latest enhancements in order to beat their rivals.

For individual elite athletes, of course, the biggest motivation is likely none of these three; it is to win. Performance-enhancing drugs appeal to competitors for the same reason that the latest training regimes, psychological techniques, and clothing appeal to them: they hope to gain an edge over their competitors. We might say, then, that performance-enhancing drugs are attractive chiefly because they confer *positional goods*: goods whose value to those who have them depends upon others not having them. Many who oppose enhancement in sport, such as Michael Sandel, worry that permitting it would lead to an “arms race”, in which competitors who refuse to enhance, or who cannot afford to do so, are left behind while those with the willingness and money to enhance strive to be the first to find new and improved drugs<sup>21</sup>. This would allow money, medical support staff, a physique that takes well to high doses of certain drugs, and a willingness to sacrifice long-term health to play a far more central role in professional sport than many would wish.

Whether performance-enhancing drugs should be permitted in sport ultimately depends upon what one believes to be fundamentally valuable in sport. We will not attempt to argue here for any particular conception of sport, and so we will remain agnostic about the issue of whether performance-enhancing drugs should be permitted in sport. In practice, of course, a decision to ban a particular substance in a sport would also have to take into account factors such as enforcement costs, the health effects of the drug, spectator interest, whether one might instead create two versions of the sport—one where enhancement is allowed and one where it is banned—and other complicating considerations.

It is important to note, however, that even if it turns out that physical enhancement would be a bad thing for professional sport, it may be a good thing for people in other contexts. Many tools and techniques that we find useful or indispensable in everyday life are banned from sport. Bicycles are useful even though they are banned

---

<sup>20</sup> It might be deemed prudent to permit such drugs on other grounds. For example, if it would be difficult to detect whether an athlete has used a drug, it might be best to permit it so as to avoid rampant cheating.

<sup>21</sup> Michael Sandel, “The Case Against Perfection”, *The Atlantic Monthly* (April 2004): 1-11, p. 10.

from sprinting races. Similarly, whilst athletes are prohibited from using drugs to make them faster or stronger, improving our bodily capacities may be desirable outside the sporting arena.

The concept of positional goods can help illuminate other applications of enhancement. Generally speaking, the greater the extent to which some good is positional, the less reason there is for society to promote that good. Sports enhancements are at an extreme end where the benefits are almost purely positional. Height enhancements and cosmetic enhancements may similarly have mostly positional benefits. A taller man may gain certain social advantages from his impressive stature, but if everybody become three inches taller nobody is better off than before. Collectively, the money spent and the risks taken to effect such a change would produce no net good. This situation contrasts with some other types of enhancement. For example, health and intelligence have a positional good aspect: being healthy and smart enables a person to compete more effectively for high-status jobs and desirable mates. But health and intelligence also have important benefits aside from these competitive advantages. If we all became a little healthier or a little smarter, there would be a net benefit: we would suffer less illness and incapacity and we would be able to understand more of the world.

In practice, the benefits of many physical enhancements (except ones related to health and longevity) seem to have a very large positional component. A manual labourer might gain an important non-positional benefit from an enhancement that increases strength and stamina; but the value of such enhancement outside the sporting and cosmetic arenas is questionable. Typically, the most effective means of achieving super-human strength and stamina are through the use of “external” tools rather than physical enhancements: we increase our ability to perform hard physical jobs through the use of forklifts and jackhammers rather than anabolic steroids.

## Mood and Personality Enhancement

In *Listening To Prozac*, the psychiatrist Peter Kramer describes how some of his patients who had completed a course of Prozac to relieve their depression wished to resume taking it. This was not because their depression had returned: medically speaking, they were no longer mentally ill. Rather, whilst taking Prozac, the patients had felt “better than well”<sup>22</sup>. Prozac, as well as relieving their medical condition, had—in their view—improved various aspects of their personality which had never been classed as part of their illness: shy patients had become more outgoing and assertive, compulsive patients had become more relaxed and easy-going, and those with low self-esteem had become more confident. Is there anything wrong with prescribing a drug like Prozac for someone who is not suffering from any medically-recognized condition, but who simply wants to improve their mood or personality?

One difficulty complicating this area of enhancement is that in many cases it is not clear what would count as an improvement of mood or personality. We might think that those who are so shy that their choices in life are severely limited by the fact that they find simple social interactions highly distressing, or those who are so aggressive that they regularly come into violent conflict with others, ought to be offered personality-enhancing drugs if, on balance, these might improve their lives. However, traits like

---

<sup>22</sup> Peter Kramer, *Listening to Prozac* (New York: Penguin, 1993).

shyness and aggression are manifested in people to varying degrees, with correspondingly various effects on the way the person in question lives their life. The extent to which an intervention that, say, enabled someone who feels mild unease in unfamiliar social situations to become the life and soul of the party is an improvement or the reverse is difficult to assess, since there is no obvious sense in which a shy person is “better” than a confident one, or vice versa. This difficulty is compounded by the possibility that what the subject views—*qua* subject—as an improvement may not coincide with what those who interact with him judge to be an improvement: the sort of intervention described above may make the subject feel more confident and comfortable in certain situations, but others may find the resulting person less pleasant to interact with. (Alcohol can have the effect of making shy people more confident, yet most sober people interact with other sober people in preference to people in possession of Dutch courage.) Also complicating assessments about what counts as an improvement is the distinction between improvements in some particular dimension (happiness, confidence, and so on) and improvements in life generally. It is, other things equal, preferable to experience states like happiness, satisfaction, and love than states like sadness, frustration, and grief; yet experiencing undesirable states can improve our understanding of ourselves and others, and give our personalities a richness and depth that they might lack were we only ever to experience “positive” emotions.

In order to decide what changes in a person’s mood or personality count as improvements, then, we must confront questions like: By what standard do we assess improvements or the reverse in cases where a person’s mood or personality does not have a seriously adverse effect on their life? Is it even plausible to claim that there could be such a standard? If so, what is the best guide to what the standard is and how it applies in a particular case: the opinion of the subject, the opinions of those who interact with the subject, or something else? The importance of addressing such questions does not entail that mood and personality enhancement is impossible or inadvisable; but a certain amount of philosophical reflection and analysis is required if we are to gain genuine benefits from such technology. This need for philosophical reflection is not unique to questions relating to enhancement, but pervades everyday life. When making decisions like whether to change careers, end a long-term personal relationship, or have another cream cake, we must at least implicitly ask ourselves questions about how our decision will affect our lives, whether the benefits it brings are of the right sort given our ambitions and goals, and whether we can do without the benefits and opportunities that our decision would close off to us.

Despite these difficulties, there are many changes in mood or personality that seem, quite straightforwardly, to be improvements. Listening to a piece of inspiring music, discovering that one has an hour longer than expected in bed before the alarm sounds, and eating an excellent dinner can all lift one’s spirits. An unexpected act of kindness from a stranger can lead one to resolve to be more considerate to others. Or, one may spontaneously decide to forgive an old adversary and unburden oneself of long-held anger and resentment. Most would agree that such changes are improvements: they are enjoyable to experience, they make us more pleasant for others to interact with, and they are the sort of changes that, in their small ways, make one’s life go better. If we could bring about such changes using drugs, shouldn’t they uncontroversially count as enhancements of mood or personality?

Even those who agree that such changes are improvements may object to the use of drugs in order to achieve them. Leon Kass expresses such a line of thought:

In most of our ordinary efforts at self-improvement, either by practice or training or study, we sense the relation between our doings and the resulting improvement, between the means used and the end sought. There is an experiential and intelligible connection between means and ends; we can see how confronting fearful things might eventually enable us to cope with our fears. We can see how curbing our appetites produces self-command. . . . In contrast, biomedical interventions act directly on the human body and bring about their effects on a subject who is not merely passive but who plays no role at all. He can at best *feel* their effects *without understanding their meaning in human terms*.<sup>23</sup>

By improving oneself using drugs, then, one foregoes a valuable aspect of improving oneself via more conventional means. Is this a good reason to forego enhancement?

Well, even if we concede that certain means of achieving an improvement can add value to the end state, the end state may have value independently of the means by which it is achieved, meaning that bringing about the end state using less valuable means is better than not bringing it about at all. To use one of Kass's examples, whilst attaining an increased level of self-command may gain additional value if it is brought about by curbing one's appetites, the end state—a mastery of self-command—has value even if it is brought about using drugs. Moreover, we do not generally feel ourselves obliged always to wring as much value as possible from the process of achieving a valuable end state: we may catch a bus to get somewhere even though we recognise that there is additional value to be gained from jogging instead, or we may employ a gardener to cultivate a garden even though we recognise that there is additional value to be gained from doing it ourselves. Since, in general, we are often content to achieve a valuable end state without using the most value-adding means, additional argument is required to support the claim that the practice of improving our capacities using drugs should be subject to different standards.

One important complex of questions about the use of pharmaceutical means to influence mood and personality concerns the idea of authenticity. Kramer spent a large fraction of his book struggling with the reports of some of his patients, who claimed that Prozac had helped them to find their "true self", enabling them to be the person they really were. They identified with their on-drug persona and viewed their earlier "natural" state as a long-lasting aberration, an alien condition that they had never been able to escape. It seems possible that in some cases the use of drugs can help a person live *more* authentically. At the same time, however, we can conceive of cases in which drug-induced emotions would undermine authenticity. Sometimes it seems important that our emotions respond to life events in appropriate ways. We may want to be the kind of person who would feel deep sadness at the loss of a loved one; and if the loss should occur, we may want to experience grief. A person who used pills to disconnect her emotional life completely from what happened to her and to the people she cared about could plausibly be said to have disabled a very important part of her humanity.

Mood and personality enhancement technology, then, has the potential to make a considerable positive impact on our lives; but it is important that those who intend to

---

<sup>23</sup> Kass, "Ageless Bodies, Happy Souls", p. 22.

make use of such technology engage with the difficult philosophical questions that surround it.

## Cognitive Enhancement

There are many ways in which we try to enhance our cognitive capacities; that is, those capacities that we use for gaining, processing, storing, and retrieving information. Language, education, mastery of psychological techniques, drinking coffee or energy drinks, meditation, exercise, sleep, and taking herbal or vitamin supplements can all play a part in improving various aspects of our cognitive performance. Moreover, none of these methods of enhancement is controversial, and some—notably the acquisition of language, and education—are considered so central to living even a minimally successful life that to deny our children adequate access to them would be deemed seriously negligent.

In addition to these familiar methods, a number of novel possibilities for cognitive enhancement have emerged in recent years<sup>24</sup>. For example, Modafinil, a drug originally used to treat narcolepsy, has memory-enhancing as well as alertness-enhancing effects<sup>25</sup>. Ritalin, developed to treat attention-deficit hyperactivity disorder, can improve concentration in healthy adults<sup>26</sup>. Transcranial magnetic stimulation (TMS) may improve some forms of motor learning<sup>27</sup>. Variations in some genes in humans have been shown to account for up to 5% of memory performance<sup>28</sup>, raising the possibility of cognition-enhancing genetic interventions in the future. Supplementation of a mother's diet during late pregnancy and three months post-partum with long-chained fatty acids has been shown to improve cognitive performance in children<sup>29</sup>. Given the diverse means by which we try to improve our cognitive performance for various purposes today, we can expect many to be excited by the opportunities that such novel technologies offer to improve our lives in ways previously unavailable to us. What ethical issues surround the possibility of cognitive enhancement?

Many ethical issues are familiar from our discussion of other types of enhancement. For example, enhanced intelligence, attention, and so on are – to some extent – positional goods, since they give the enhanced an advantage over others when competing for such things as places at university and certain types of job. In this respect, cognitive enhancement raises the same concerns about “arms races” as physical

---

<sup>24</sup> For a more in-depth survey of cognitive enhancement and its ethical issues than is given here, see Nick Bostrom and Anders Sandberg, “Cognitive Enhancement: Methods, Ethics, Regulatory Challenges”, *Science and Engineering Ethics* (forthcoming, 2007).

<sup>25</sup> U. Muller, N. Steffenhagen, *et. al.*, “Effects of Modafinil on Working Memory Processes in Humans”, *Psychopharmacology* 177/1-2 (2004): 161-169.

<sup>26</sup> R. Elliott, *et. al.*, “Effects of Methylphenidate on Spatial Working Memory and Planning in Healthy Young Adults”, *Psychopharmacology* 131/2 (1997): 196-206.

<sup>27</sup> Cf. for example, A. Pascual-Leone, F. Tarazona, *et. al.*, “Transcranial Magnetic Stimulation and Neuroplasticity”, *Neuropsychologica* 37/2 (1999): 207-217.

<sup>28</sup> D. J. F. Quervain and A. Papassotiropoulos, “Identification of a Genetic Cluster Influencing Memory Performance and Hippocampal Activity in Humans”, *Proceedings of the National Academy of Sciences of the United States of America*, 103/11 (2006): 4270-4274.

<sup>29</sup> I. B. Helland, L. Smith, *et. al.*, “Maternal Supplementation with Very-Long-Chain N-3 Fatty Acids During Pregnancy and Lactation Augments Children's IQ at 4 Years of Age”, *Pediatrics*, 111/1 (2003): 39-44.

enhancement; and the ways of addressing these concerns are similar to those discussed earlier. However, improvements in cognitive capacities could have instrumental and intrinsic value that is far greater than that of improved physical capacities. Being able to think better would equip us to solve important political and social problems, make scientific breakthroughs, and so on; and various studies indicate that more intelligent people earn more<sup>30</sup>, are less likely to suffer a range of social and economic misfortunes<sup>31</sup>, and are healthier<sup>32</sup>. Moreover, being able to understand other people, appreciate great literature, make plans, be creative, and remember one's own past are non-instrumentally important for human flourishing.

Also familiar from our discussion of physical enhancement is the question of whether using such enhancement in certain contexts constitutes cheating. Just as using drugs to enhance one's strength is seen as cheating in professional sport, using drugs to improve one's memory in order to perform better in an examination could be seen as cheating. Analogous with the case of doping, whether cognitive enhancement is deemed unacceptable in the context of education depends on what we value about education, and what its "rules" are. For example, if education is primarily a competition for grades, then enhancement may be viewed as cheating if some people did not have access to it, or if its use contravened the rules. If, on the other hand, the value of education consists in equipping students with skills and knowledge that will improve their own lives and society generally, then cognitive enhancement could play an important role in education.

The medical forms of cognitive enhancement that are immediately on the horizon are likely to yield at best small to moderate improvements in memory, concentration, mental energy, and some other cognition-relevant attributes. We can speculate about radical improvements in cognitive ability that might become possible in the more distant future. Such extreme enhancements would raise some unique ethical issues that do not arise in the same way for other human enhancements. In particular, people with radically enhanced cognitive capacities might gain vast advantages in terms of income, strategic planning, and the ability to influence others; in other words, an enhanced cognitive elite may gain socially significant amounts of power.

This raises the worry, described by the geneticist Lee Silver<sup>33</sup>, that the enhanced, having gained cognitive abilities that far outstrip those of the unenhanced, could band together and use their superior skills to dominate and exploit the unenhanced. If the cognitive enhancements in question were brought about through germline genetic intervention, the resulting improvements could be inherited by the children of the enhanced, with successive improvements eventually resulting in the enhanced forming a new species which may prove a threat to unenhanced humans.

That enhancement might result in such a two-tier society may be rather far-fetched, however. First, biomedical cognitive enhancements tend to have the greatest

---

<sup>30</sup> D. S. Salkever, "Updated Estimates of Earnings Benefits from Reduced Exposure of Children to Environmental Lead", *Environmental Research*, 70/1 (1995): 1-6.

<sup>31</sup> L. S. Gottfredson, "Why G Matters: The Complexity of Everyday Life", *Intelligence*, 24/1 (1997): 79-132; and "Life, Death, and Intelligence", *Journal of Cognitive Education and Psychology*, 4/1 (2004): 23-46.

<sup>32</sup> L. J. Whalley and I. J. Deary, "Longitudinal Cohort Study of Childhood IQ and Survival up to Age 76", *British Medical Journal*, 322/7290 (2001): 819-822.

<sup>33</sup> Lee Silver, *Remaking Eden: Cloning and Beyond in a Brave New World* (New York: Avon, 1998).

benefits for those who start from a low level of cognitive functioning<sup>34</sup>. Intuitively this is unsurprising, since it is usually easier to correct some specific deficit that is impeding a brain's performance than to take a well-calibrated, highly-efficient neural system and boost its performance still further. As a result, far from being socially divisive, cognitive enhancement could potentially increase equality in society by enabling those with lower cognitive ability to function at a level that is closer to those with naturally high cognitive ability. Second, if people are free to pick and choose which enhancements they undergo, it is highly unlikely that society will split cleanly into two disjoint groups, the enhanced and the unenhanced. More likely, society will consist of a continuum of differently modified people, ranging from the unenhanced, through those who have undergone a small amount of enhancement, to those who have undergone major enhancement. This new spectrum of differences would be superimposed on the existing range of native capacities, educations, experiences, privileges, and unique situational advantages that already causes people to display widely varying cognitive skills. Third, we already live in a society that contains diverse groups of people who could potentially come into conflict, but often do not: short people and tall ones, males and females, healthy and sick, educated and uneducated, and so on. The existence of diverse groups in a well-functioning society does not entail that those who make up one side of the division have cause to unite and oppose everyone else. On the contrary, many believe that diversity in society can be enriching for all<sup>35</sup>.

Another worry is that the possibilities offered by cognitive enhancement might lead us to view those people with below-average cognitive ability as diseased, rather than as part of the normal human spectrum of abilities. In 2003, the Nobel Prize-winning biologist, James Watson, caused controversy when he suggested in a television documentary that there might come a time when we can “cure” stupidity:

If you really are stupid, I would call that a disease. The lower ten percent who really have difficulty, even in elementary school, what's the cause of it? A lot of people would like to say, “Well, poverty, things like that.” It probably isn't. So I'd like to get rid of that, to help the lower ten percent.<sup>36</sup>

Whilst abrasively formulated, Watson's claim raises some important issues about the treatment of people of very low intelligence. For example, whilst Watson's “lower ten percent” may have most to gain from cognitive enhancement—in that improved cognitive functioning could better equip them to participate fully in modern society—they may also be less likely than more intelligent, better informed people to pursue the possibilities that enhancement could offer them; unless, perhaps, the possibility of such enhancement is suggested to them by a doctor. This is much more likely to happen if their low intelligence is recognised as a medical disorder. In addition, included in this group of people will be those whose cognitive functioning falls so far below the average that society deems them incapable of making certain important life decisions—such as where

---

<sup>34</sup> Cf., for example, D. C. Randall, J. M. Shneerson, and S. E. File, “Cognitive Effects of Modafinil in Student Volunteers May Depend on IQ”, *Pharmacology Biochemistry & Behavior*, 82/1 (2005): 133-139 and Muller *et. al.* “Effects of Modafinil on Working Memory Processes in Humans”.

<sup>35</sup> The possibility of truly extreme forms of cognitive enhancement – such as ones involving the creation of vastly superhumanly intelligent machines – does raise special risks and ethical challenges, which we do not discuss in this chapter.

<sup>36</sup> *DNA*, Channel 4, March 8<sup>th</sup> 2003.

to live and what to do with their lives—which must instead be delegated to a carer. Cognitive enhancement could enable these people to gain autonomy over their own lives; however, given their impaired cognitive abilities, it is probable that they would be deemed incapable of consenting to receive enhancing treatment. Is it right that they should be forced to forego treatment that could give them the sort of independence that the majority of us enjoy?

That enhancing treatment should be withheld from severely cognitively-impaired people might be seen as a consequence of our current way of thinking about medicine. According to this way of thinking, it is acceptable to treat a severely cognitively-impaired person for conditions recognised as diseases or injuries, such as cancer or a broken leg, despite the fact that he is incapable of giving consent. Generally, we believe that such treatment is acceptable because it is in the person's best interests; whereas leaving him untreated would be contrary to his best interests. On the other hand, it is not clear that an avoidable enhancement, such as a facelift, would be in his best interests. Since very low intelligence, like having facial wrinkles, is not universally recognised as a disease state, it is questionable on the current medical model whether it serves the best interests of a cognitively-impaired person to undergo cognitive enhancement treatment.

This medical model, according to which treatment for disease is seen as necessary whereas enhancement is seen as gratuitous, is arguably outdated. To begin, we saw earlier that there are many problems associated with holding that the distinction between therapy and enhancement is practically or morally significant. In addition to this, it has been argued that decisions about what would make people's lives go best—and also, therefore, what is in their best interests—should be guided not by whether a treatment will cure a disease or heal an injury, but by whether it will increase well-being. Savulescu tells us that, “[i]t is not [disease] which is important. People often trade length of life for non-health related well-being. Non-disease [states] may prevent us from leading the best life”<sup>37</sup>. On this view, we might conclude that, since it is acceptable to treat diseases or injuries in those who are unable to give consent, it is also acceptable to treat non-disease states in such people if the treatment would increase well-being, provided that the level of well-being we expect them to achieve is not likely to be outweighed by any stress or risks associated with the treatment. Moving away from a model that associates medical treatment with disease would enable cognitively-impaired people to receive enhancing treatment without committing ourselves to the view that such people are diseased. (It could also give these people the cognitive capacities needed to make an autonomous decision about whether they want to retain these capacities or go back to their earlier impaired state.)

Despite this argument for shifting the focus of medicine away from the treatment of disease and towards the promotion of well-being, the current system of licensing medicines exerts a pull in the opposite direction. This system was created to deal with traditional medicine which aims to prevent, detect, cure, or mitigate diseases. In this framework, there is no room for enhancing medicine. For example, drug companies could find it difficult to get regulatory approval for a pharmaceutical whose sole use is to improve cognitive functioning in the healthy population. To date, every pharmaceutical on the market that offers some potential cognitive enhancement effect was developed to

---

<sup>37</sup> Julian Savulescu, “Procreative Beneficence: Why We Should Select the Best Children”, *Bioethics* 15/5/6 (2001): 413-426, p. 419.

treat some specific disease condition (such as ADHD, narcolepsy, and Alzheimer's disease). The enhancing effects of these drugs in healthy subjects is a serendipitous unintended effect. As a result, pharmaceutical companies, instead of aiming directly at enhancements for healthy people, must work indirectly by demonstrating that their drugs are effective in treating some recognised disease. One perverse effect of this incentive structure is the medicalization and "pathologization" of conditions that were previously regarded as part of the normal human spectrum. If a significant fraction of the population could obtain certain benefits from drugs that improve concentration, for example, it is currently necessary to categorize this segment of people as having some disease in order for the drug to be approved and prescribed to those who could benefit from it. It is not enough that people would like to be able to concentrate better when they work; they must be stamped as suffering from attention-deficit hyperactivity disorder: a condition now estimated to affect between 3 and 5 percent of school-age children (a higher proportion among boys) in the US<sup>38</sup>. This medicalization of arguably normal human characteristics not only stigmatizes enhancers, it also limits access to enhancing treatments: unless people are diagnosed with a condition whose treatment requires a certain enhancing drug, those who wish to use the drug for its enhancing effects are reliant on finding a sympathetic physician willing to prescribe it (or finding other means of procurement). This creates inequities in access, since those with high social capital and the relevant information are more likely to gain access to enhancement than others.

In conclusion, whilst cognitive enhancement offers real benefits, not least to those who currently lack sufficient cognitive skills to exert autonomy over their own lives, it also highlights aspects of our current medical model that need to be updated and revised. Doing so in the way that we have described would help ensure fair and equal access to enhancement, and would also help speed progress in enhancement technology by allowing pharmaceutical companies to focus on developing enhancements without also having to ensure that they can be used to treat a recognised pathogenic condition.

## Selecting the Best Children

As well as helping us to improve our existing capacities, enhancement technology could also help ensure that future generations are genetically disposed to be smarter, healthier, and happier than those who have come before.

There are several ways of doing this, many of which are familiar and accepted. Most obviously, we are free to choose our sexual partners, which plays a major role in determining the genetic composition of our children. Pregnant mothers can take folic acid supplements which, whilst not affecting the genetic composition of the child, can affect the epigenetic expression of their genes. Young girls receive inoculations against rubella in order to avoid the risk of later giving birth to a child with brain damage and other problems associated with congenital rubella syndrome.

On the other hand, there are some novel and ethically controversial methods of ensuring that a child will be born with a certain genetic composition. First, there is pre-

---

<sup>38</sup> American Psychological Association (<http://www.apa.org/monitor/jun01/ritalin.html>). We can also note that ADHD is the most frequently diagnosed psychiatric disorder of US children (<http://www.apa.org/ppo/issues/padhdtest902.html>), and the possibility that it is currently over-diagnosed is recognized by the American Psychological Association (<http://www.apa.org/ppo/issues/pconstest.html>).

implantation genetic diagnosis (PGD). This is a technique that allows doctors to determine the sex of an embryo and its genetic disposition to diseases such as cystic fibrosis and haemophilia. Current UK legislation allows individuals with a family history of an inherited disease to select for implantation embryos found not to possess the disease gene, as part of their *in vitro* fertilisation (IVF) treatment; and in Australia PGD has been used to enable couples without a history of sex-linked disorders to select the sex of their child<sup>39</sup>. In the future, it may become possible to use PGD to select for implantation embryos that are not only free from inherited disease, but which also contain genes likely to give rise to high intelligence, sporting prowess, musical ability, above-average height, and so on. Such selection, however, will have only weak enhancing effects, since typically there is a small number of embryos from one couple to choose from, and most desirable traits are highly polygenetic.

More effective in producing embryos with the right sort of genes would be ensuring that their biological parents have the appropriate high capacities. Human mating preferences have evolved to discriminate on the basis of traits that in our environment of evolutionary adaptation correlated with fitness. While few people are interested in overriding their natural romantic inclinations in order to achieve some conscious eugenic purpose, the issue does arise in a more plausible way for infertile couples who are reliant on donor gametes and who might have the option of selecting the source of these gametes. This opportunity has been exploited by eugenicists, without much success, as Sandel tells us:

The Repository for Germinal Choice, one of America's first sperm banks, was ... opened by Robert Graham, a philanthropist dedicated to improving the world's "germ plasm" and counteracting the rise of "retrograde humans". His plan was to collect the sperm of Nobel Prize-winning scientists and make it available to women of high intelligence, in hopes of breeding supersmart babies. But Graham had trouble persuading Nobel laureates to donate their sperm ... and so settled for sperm from young scientists of high promise. His sperm bank closed in 1999.<sup>40</sup>

Despite these difficulties, the practice of buying gametes from donors is fairly popular, most famously in the US, where there is no legal cap on the financial compensation that donors can receive<sup>41</sup>. Agencies that specialise in making donated gametes available to buyers typically target couples or single parents who wish to conceive by matching a donated gamete to one of their own, using either IVF followed by implantation of donated eggs into the female parent or a surrogate, or insemination at home or in a clinic<sup>42</sup>. Those wishing to buy gametes can expect to pay a premium if the donor has certain features, such as an Ivy League education<sup>43</sup>.

---

<sup>39</sup> Julian Savulescu, "Sex Selection—The Case For", *Medical Journal of Australia*, 171 (1999): 373-375.

<sup>40</sup> Sandel, "The Case Against Perfection", p. 8.

<sup>41</sup> In the UK, donors may only claim "reasonable expenses": cf. HFEA's "FAQs for Donors" (<http://www.hfea.gov.uk/cps/rde/xchg/SID-3F57D79B-0E626297/hfea/hs.xsl/1205.html>).

<sup>42</sup> Hundreds of such agencies exist. See, for example, <http://www.pacrepro.com/index.htm> and <http://www.tinytreasuresagency.com>.

<sup>43</sup> Many US student newspapers regularly run advertisements offering thousands of dollars for donated gametes. The market for donor eggs seems to be more lucrative than that for donor sperm, perhaps because the process of extracting eggs is lengthy, laborious, and invasive whilst donor sperm can be produced quickly and painlessly.

Another way of creating children of a certain genetic quality is to manipulate the genetic material of the embryo to attempt to ensure the presence or absence of certain traits in the resulting child. This sort of intervention is novel and risky, and it is currently permitted in the UK only to treat children or adults with life-threatening diseases or disorders, and by intervening only in their somatic cells (so-called “gene therapy”). In the future, it may become possible to use this technique on the germline cells of embryos, to affect a range of inheritable traits not associated with disease.

Is there anything wrong with using any of these techniques to produce children with desirable qualities? Well, we might worry that some of these techniques harm the embryos. In the case of PGD, for every embryo that is selected for implantation, at least one (or, more likely, several) will be discarded, never to be allowed to develop. For those who believe that the moral status of embryos is on a par with that of fully developed humans, this amounts to murder, or at least to letting-die. The moral status of the embryo is a hotly debated topic in bioethics, and one that we do not have the space to address here. However, it is worth mentioning that, even where PGD does not take place, IVF treatment involves discarding embryos. As a result, those who do not find IVF treatment morally objectionable cannot consistently raise this objection in relation to PGD. Those who do object to IVF treatment because it involves discarding embryos should note that over half of embryos produced by sexual intercourse fail to develop; so those who object to IVF must (in the absence of an argument to show why the two cases are relevantly different) also object to unmediated procreation.

The possibility of genetic manipulation of embryos raises different issues about harm. First, there is a risk that such manipulation will have unintended effects, resulting in a child who is worse off than he or she would have been had no such intervention occurred. For this reason, it may be wise to avoid using this technology until it is advanced enough for us to be sure that the expected benefits outweigh the risks. Second, even disregarding such risks, Jürgen Habermas argues that genetic manipulation infringes the freedom of the resulting child in a way that ordinary parenting does not. Parents currently exert control over their children via the communicative, linguistic “medium of reasons”, meaning that “the adolescents in principle still have the opportunity to respond to and retroactively break away from it”<sup>44</sup>. On the other hand,

in the case of a genetic determination carried out according to the parents’ own preferences, there is no such opportunity. With genetic enhancement, there is no communicative scope for the projected child to be addressed as a second person and to be involved in a communication process. From the adolescent’s perspective, an instrumental determination cannot, like a pathogenic socialisation process, be revised by “critical reappraisal.” It does not permit the adolescent looking back on the prenatal intervention to engage in a revisionary learning process.

Because of this, a child whose genetic traits have been selected by his parents is denied the opportunity of being “the undivided author or his own life”<sup>45</sup>.

Habermas’s objection to prenatal interventions that do not involve the child in a communicative process, however, also applies to many practices not generally considered controversial and often considered sensible or potentially beneficial, such as taking folic acid supplements, eating healthily, and abstaining from taking drugs during pregnancy.

---

<sup>44</sup> Jürgen Habermas, *The Future of Human Nature* (Cambridge: Polity, 2003), p. 62.

<sup>45</sup> Habermas, *The Future of Human Nature*, p. 63.

Moreover, it is impossible completely to avoid non-communicative interventions: the environment in which very young children are raised literally shapes their nervous system in ways that they cannot later undo. Language-learning is one such process that cannot be undone; and it is, in addition, a necessary condition for entering the “medium of reasons” that surrounds what Habermas takes to be more acceptable means of controlling children.

Habermas’s concern about autonomy is also misplaced. Genetic factors—along with many other influences—affect what we are able to achieve in life regardless of whether our genes have been specially selected for us. A child whose genes have been specially chosen is, therefore, no less free or autonomous than a child born with whatever genetic constitution happened to result from their conception. On the contrary, a child who, as a result of genetic manipulation, is born with improvements in capacities such as intelligence and general health is likely to enjoy more rather than less autonomy, in the sense that she will be better equipped to realize the plans and ambitions she devises for her life. As a last resort, however, we can note that a child who grows up to resent having had features like increased intelligence and better health selected for her by her parents is free to destroy their effects, for example by ingesting poisons. That it is difficult to conceive of a rational person wanting to do such a thing underlines how implausible it is to maintain that having such selected traits is unconditionally disadvantageous.

Disregarding the issue of harm to the embryo or the resulting child, some believe that there is something sinister about the very desire to create people of a certain genetic quality. Sandel, for example, believes that the desire to “remake nature, including human nature, to serve our purposes and satisfy our desires” fails to exemplify, “and may even destroy ... an appreciation of the gifted character of human powers and achievements”<sup>46</sup>. In the case of parents who wish to shape the genetic constitution of their child, Sandel believes that the desire for a child of a certain genetic quality is incompatible with the special type of love that parents have for their children. This is because “[t]o appreciate children as gifts is to accept them as they come, not as objects of our design or products of our will or instruments of our ambition”<sup>47</sup>.

Sandel’s critique of genetic engineering is not convincing, however. It is far from obvious that genetic engineering would destroy our appreciation of life or our sense of children as gifts. Sandel cites no data in support of his claim that parents would love their children less for failing to “accept them as they come”; and intuitively, as Nick Bostrom has commented, it seems plausible that “[s]ome mothers and fathers might find it easier to love a child who, thanks to enhancements, is bright, beautiful, healthy, and happy”<sup>48</sup>. In addition, we already attempt to influence the features of our children in many ways that are universally accepted to be compatible with good, loving parenting. We attempt to improve their literacy skills by encouraging them to read. We try to develop their team spirit and social skills by encouraging them to take part in games and sport. We instil discipline and shape their behaviour by using punishments and rewards. Between Sandel’s extremes of accepting children as they come and viewing them as objects of our design, then, there is plenty of room for affecting the sort of people our children will become without undermining our love for them. Ensuring that children have the genes to

---

<sup>46</sup> Sandel, “The Case Against Perfection”, p. 5.

<sup>47</sup> Sandel, “The Case Against Perfection”, p. 6.

<sup>48</sup> Nick Bostrom, “Human Genetic Enhancements: A Transhumanist Perspective”, *Journal of Value Enquiry*, 37/4 (2003): 493-506; p. 498.

help them do well in life, providing that we do so with their best interests at heart, plausibly falls within this acceptable middle ground.

That we need to keep the child's best interests in mind when selecting traits for him is an important point. On the one hand, people benefit from being more intelligent, healthier, having good social skills, and so on. It is plausible to suggest that, if we have the capability to ensure that our children are genetically disposed to have such traits, then it is desirable to make use of this capability, since doing so will benefit our children. Julian Savulescu defends a principle of "procreative beneficence", which states that IVF parents-to-be who are offered PGD to screen their multiple embryos for genetic predispositions to disease and non-disease states are morally obliged to select that child who can be expected to have the best life. For example, if they have a choice of implanting one of two embryos which are genetically identical except in that only one of them is genetically predisposed to high intelligence, the parents-to-be are morally obliged to select that embryo over the other, since a more intelligent child is likely to have a better life than a less intelligent one, other things being equal<sup>49</sup>.

When we use PGD to select between embryos, our choices determine which of several possible persons will come into existence. By contrast, when we genetically manipulate an embryo, we need not be determining which person will come into existence; instead our interventions affect what sort of person this embryo will develop into and what capacities she will have. This distinction may make an ethical difference. For example, one could hold that if an embryo with a genetic predisposition to a disability is selected for implantation, this is permissible because nobody is harmed. The embryo may grow into a person with a disability, but since this person would not otherwise have existed, she cannot be said to have been harmed by our action—at least if we assume that she will have a life worth living. If, however, we genetically manipulate a healthy embryo by inserting a disability-causing gene, say a gene causing blindness, then we could be accused of having harmed somebody. We have caused a particular person, who would otherwise have been able to see, to be blind. Arguably, such an act is as seriously wrong as it is to blind an infant. Even if one accepts Savulescu's principle of procreative beneficence, one might still hold (what may be termed a "person-affecting" moral principle) that the degree of moral wrongdoing is greater if we harm some person than if we merely fail to select for existence the possible child whom we expect would have the best life.

We also need to bear in mind that what may be an ethically innocuous choice for a person to make for herself—which career to pursue, whether to drink alcohol, whether to undergo a cosmetic surgery procedure—may not be ethically innocuous if a person chooses to impose it on someone else. That such choices may not be ethically innocuous has partly to do with our beliefs about personal autonomy and the having the freedom to make certain choices about one's own life; but these considerations do not apply in the case of an embryo, which does not yet have the capacity for autonomy or free choice. Instead, we can think of such choices in terms of the extent to which they are likely to improve one's life, or to be in one's best interests. A person can make a choice for himself which is likely to improve his life; but the same choice, imposed on someone

---

<sup>49</sup> Savulescu, "Procreative Beneficence". Whilst Savulescu discusses PGD specifically, we can imagine a more general principle that applies to other means of ensuring that one's children are born with those features likely to give them the best life, such as genetic manipulation of the embryo.

else, may not improve his life, and may even have a negative effect. This is because some choices, such as the decision to pursue a career as an investment banker, are desirable for a person only in the context of their background beliefs, desires, and values, and in the context of a certain culture. Becoming an investment banker may be desirable for someone who is interested in banking; who sees a high salary as sufficient compensation for long, stressful working hours; who values the prestige associated with rising through the ranks of a successful corporation; and so on. In the absence of the appropriate context, however, such a choice is not desirable: not everyone would enjoy a career as an investment banker, and becoming one would close off certain other, more desirable choices that could have been made instead.

We should bear this in mind when selecting traits for our children. Certain traits that we would find beneficial if we had them ourselves may not be beneficial for our children. In addition, certain traits that we value today may not be valuable in the cultural context of the future. Jonathan Glover comments that “John Mackie once said to me that if human genetic engineering had been available in Victorian times, people might have designed their children to be patriotic and pious”<sup>50</sup>. Patriotism and piety may have been valued traits in Victorian times, but they are much less valued today; at least in societies like the UK. Fluctuations in such values may be fickle, and just as we may judge it unfair of parents to push their children down a particular career path, we may also judge it unfair of them to impose their own values and preferences on their children. For this reason, when intervening in the genetic composition of a future child, the best interests of the child are more likely to be served if parents restrict themselves to shaping characteristics that are likely to benefit the child regardless of her eventual preferences and values, and regardless of her cultural context. Characteristics such as intelligence, happiness, and health are more likely to serve this end than characteristics like piety, competitiveness, and sporting prowess.

Another source of unease about genetic intervention are the perceived parallels between current discussions of enhancement and the coercive eugenics programmes of the last century, and the idea that enhancement may foster beliefs about some people being fundamentally inferior to others (this latter concern is sometimes expressed as the concern that enhancement would undermine human dignity). Advocating enhancement, however, has no necessary link with coercive eugenics, nor with the belief that some people are fundamentally inferior to others. To address the concern about coercive eugenics first, the state-sponsored eugenics programmes of the last century were objectionable because they harmed people, either by killing them or by curtailing their freedom to reproduce. Eugenics need not be coercive, exploitative, or harmful: in Cyprus, a non-coercive state-sponsored programme to eliminate thalassemia has been in operation for over twenty years, and is widely supported by Cypriots. Prospective parents are tested for the disease gene, but are free to reproduce if they wish; and state-funded abortions are available if prenatal testing reveals the foetus to be predisposed to the disease<sup>51</sup>. The sort of genetic enhancement that we have discussed in this section would be even further

---

<sup>50</sup> Jonathan Glover, *Choosing Children: The Ethical Dilemmas of Genetic Intervention* (Oxford: OUP, 2006), p. 98. He made the same point in his earlier *What Sort of People Should There Be?* (Harmondsworth: Penguin, 1984), in which he discussed ethical issues relating to genetic intervention before much of the technology and techniques we are familiar with today became possible.

<sup>51</sup> Lila Guterman, “Choosing Eugenics”, *The Chronicle of Higher Education*, 2<sup>nd</sup> May 2003.

removed from state intervention<sup>52</sup>, being available to people to make use of or not as they pleased<sup>53</sup>.

The concern that this sort of enhancement would undermine human dignity—by which we here mean the basis for the moral status of human beings<sup>54</sup>—can take more than one form. On the one hand, Fukuyama, following Silver, worries that enhancement could undermine the dignity of the unenhanced, since the enhanced could lay claim to more human rights than the unenhanced on account of their advanced capacities<sup>55</sup>. On the other hand, Kass worries that enhancement could rob the *enhanced* of dignity: he comments that “[t]o turn a man into a cockroach—as we don’t need Kafka to show us—would be dehumanizing. To try to turn a man into more than a man might be so as well”<sup>56</sup>. We could respond at length to concerns that enhancement raises about the issue of human dignity (indeed, one of us already has); but in brief, it is helpful to bear in mind that, whilst having certain traits—for example, rationality and a capacity for moral action—are often judged to be constitutive of what it is to be human, our moral status is not generally held to fluctuate with our capacities in the way that seems to worry some bioconservatives. Various individuals can possess very different capacities and yet be equal in moral status. For example, whilst those who are well-educated, athletic, musically gifted, or witty may have individual capacities that are superior to those who are uneducated, unfit, musically untalented, or dull, we should not infer that the moral status, or dignity, of the former group of people is thereby either superior or inferior to that of the latter. We might even say that the very idea of humans having equal dignity has its roots in a desire to prevent the stronger, more intelligent, and more powerful—that is, those with certain superior capacities—from dominating and exploiting the more vulnerable. Therefore, if we accept that all human persons who have not benefited from enhancements have the same moral status, despite their widely varying capacities, it is hard to see any justification for according a different moral status to enhanced individuals or for thinking that the existence of enhanced individuals could affect the moral status of the unenhanced.

In the light of these considerations, we conclude that there are no compelling reasons to resist the use of genetic intervention to select the best children. There are,

---

<sup>52</sup> Save perhaps for some state-imposed restrictions to prevent parents from severely compromising the best interests of their children in choosing their traits—for example, by choosing to have a child with a disability. Such a choice was made in 2002 by lesbian couple Sharon Duchesneau and Candy McCullough, who used donated sperm from a deaf friend to have a deaf baby. Jonathan Glover discusses the ethical implications of this in chapter 1 of *Choosing Children*, as do Julian Savulescu and Guy Kahane in “Procreative Beneficence and Disability: Is There a Moral Obligation to Create Children with the Best Chance of the Best Life?”, *Ethics*, forthcoming.

<sup>53</sup> For a defence of the right of parents to choose their children’s features, see Nicholas Agar, *Liberal Eugenics: In Defence of Human Enhancement* (London: Blackwell, 2004). For an argument against the selection of traits, and its historical link to coercive eugenics, see Daniel J. Kevles, *In the Name of Eugenics: Genetics and the Uses of Human Heredity* (Cambridge, Mass.: Harvard University Press, 2001).

<sup>54</sup> The definition of human dignity as the basis for moral status is not the only way to explicate the concept of dignity, but the only one we will consider here. For a more in-depth discussion of the concept of human dignity in relation to enhancement, see Nick Bostrom, “In Defence of Posthuman Dignity”, *Bioethics*, 19/3 (2005): 202-214 and “Dignity and Enhancement”, commissioned for The President’s Council on Bioethics (2007), forthcoming.

<sup>55</sup> Francis Fukuyama, *Our Posthuman Future* (New York: Farrar, Straus and Giroux, 2002), chapter 9.

<sup>56</sup> Kass, “Ageless Bodies, Happy Souls”, p. 20.

however, important issues relating to the fact that such intervention would involve the selection of traits of a person who has no say in the matter, and for this reason it is of paramount importance to consider at all times the best interests and future welfare of the resulting children.

## BIBLIOGRAPHY

- Agar, N., *Liberal Eugenics: In Defence of Human Enhancement* (London: Blackwell, 2004).
- American Psychological Association (<http://www.apa.org>).
- Bostrom, N., "Human Genetic Enhancements: A Transhumanist Perspective", *Journal of Value Enquiry*, 37/4 (2003): 493-506 (<http://www.nickbostrom.com/ethics/genetic.pdf>).
- \_\_\_\_\_, "In Defence of Posthuman Dignity", *Bioethics*, 19/3 (2005): 202-214 (<http://www.nickbostrom.com/ethics/dignity.pdf>).
- \_\_\_\_\_, "Dignity and Enhancement", commissioned for The President's Council on Bioethics (forthcoming, 2007) (<http://www.nickbostrom.com/ethics/dignity-enhancement.pdf>).
- Bostrom, N. and Sandberg, A., "Cognitive Enhancement: Methods, Ethics, Regulatory Challenges", *Science and Engineering Ethics* (forthcoming, 2007) (<http://www.nickbostrom.com/cognitive.pdf>).
- Elliott, R., Sahakian, B. J., Matthews, K., Bannerjea, A., Rimmer, J., Robbins, T. W., "Effects of Methylphenidate on Spatial Working Memory and Planning in Healthy Young Adults", *Psychopharmacology* 131/2 (1997): 196-206.
- Fukuyama, F., *Our Posthuman Future* (New York: Farrar, Straus and Giroux, 2002).
- Glover, J., *What Sort of People Should There Be?* (Harmondsworth: Penguin, 1984).
- \_\_\_\_\_, *Choosing Children: The Ethical Dilemmas of Genetic Intervention* (Oxford: OUP, 2006).
- Godesky, J., "Thesis #25" (2005) (<http://anthropik.com/2006/01/thesis-25-civilization-reduces-quality-of-life>).
- Gottfredson, L. S., "Why G Matters: The Complexity of Everyday Life", *Intelligence*, 24/1 (1997): 79-132.
- \_\_\_\_\_, "Life, Death, and Intelligence", *Journal of Cognitive Education and Psychology*, 4/1 (2004): 23-46.
- Guterman, L., "Choosing Eugenics", *The Chronicle of Higher Education*, 2<sup>nd</sup> May 2003.
- Habermas, J., *The Future of Human Nature* (Cambridge: Polity, 2003).
- Helland, I. B., Smith, L., *et al.*, "Maternal Supplementation with Very-Long-Chain N-3 Fatty Acids During Pregnancy and Lactation Augments Children's IQ at 4 Years of Age", *Pediatrics*, 111/1 (2003): 39-44.
- Human Fertilization and Embryology Authority (<http://hfea.gov.uk>).
- Kaplan, H. *et al.*, "A Theory of Human Life History Evolution: Diet, Intelligence, and Longevity", *Evolutionary Anthropology* (2000): 156-185.
- Kass, L. R., "Ageless Bodies, Happy Souls: Biotechnology and the Pursuit of Perfection", *The New Atlantis* (Spring 2003): 9-28.
- Kevles, D. J., *In the Name of Eugenics: Genetics and the Uses of Human Heredity* (Cambridge, Mass.: Harvard University Press, 2001).
- Kramer, P., *Listening to Prozac* (New York: Penguin, 1993).
- Martin, J. A. *et al.*, "Births: Final Data for 2002", *CDC National Vital Statistics Reports*, 52/10 (2003, revised 2004)
- Muller, U., Steffenhagen, N., *et al.*, "Effects of Modafinil on Working Memory Processes in Humans", *Psychopharmacology* 177/1-2 (2004): 161-169.

- Nordhaus, W. D., “Irving Fisher and the Contribution of Improved Longevity to Living Standards”, *The American Journal of Economics and Sociology*, 64/1 (2005): 367-392.
- Oeppen, J. and Vaupel, J. W., “Broken Limits to Life Expectancy”, *Science*, 296 (2002): 1029-1031.
- Owen, D., “Chemically Enhanced”, *Financial Times*, 10<sup>th</sup> February 2006.
- Pascual-Leone, A., Tarazona, F., *et. al.*, “Transcranial Magnetic Stimulation and Neuroplasticity”, *Neuropsychologica* 37/2 (1999): 207-217.
- Population Reference Bureau, “2005 World Population Data Sheet” ([http://www.prb.org/pdf05/05WorldDataSheet\\_Eng.pdf](http://www.prb.org/pdf05/05WorldDataSheet_Eng.pdf)).
- Quervain, D. J. F. and Papassotiropoulos, A., “Identification of a Genetic Cluster Influencing Memory Performance and Hippocampal Activity in Humans”, *Proceedings of the National Academy of Sciences of the United States of America*, 103/11 (2006): 4270-4274.
- Randall, D. C., Shneerson, J. M., and File, S. E., “Cognitive Effects of Modafinil in Student Volunteers May Depend on IQ”, *Pharmacology Biochemistry & Behavior*, 82/1 (2005): 133-139.
- Salkever, D. S., “Updated Estimates of Earnings Benefits from Reduced Exposure of Children to Environmental Lead”, *Environmental Research*, 70/1 (1995): 1-6.
- Sandel, M. J., “The Case Against Perfection”, *The Atlantic Monthly* (April 2004): 1-11.
- Savulescu, J., “Sex Selection—The Case For”, *Medical Journal of Australia*, 171 (1999): 373-375.
- \_\_\_\_\_ “Procreative Beneficence: Why We Should Select the Best Children”, *Bioethics* 15/5/6 (2001): 413-426.
- Savulescu, J., Foddy, B. and Clayton, M., “Why We Should Allow Performance Enhancing Drugs in Sport”, *British Journal of Sports Medicine*, 38 (2004): 666-670.
- Savulescu, J., and Kahane, G., “Procreative Beneficence and disability: Is there a moral obligation to create children with the best chance of the best life?”, *Ethics*, forthcoming.
- Silver, L. M., *Remaking Eden: Cloning and Beyond in a Brave New World* (New York: Avon, 1998).
- Thom, T. *et. al.*, “Heart Disease and Stroke Statistics—2006 Update: a Report from the American Heart Association Statistics Committee and Stroke Statistics Subcommittee”, *Circulation* (February 14<sup>th</sup>, 2006).
- WADA Athlete Guide, third edition ([http://www.wada-ama.org/rtecontent/document/WADA\\_Athlete-Guide\\_ENG.pdf](http://www.wada-ama.org/rtecontent/document/WADA_Athlete-Guide_ENG.pdf)).
- Whalley, L. J. and Deary, I. J., “Longitudinal Cohort Study of Childhood IQ and Survival up to Age 76”, *British Medical Journal*, 322/7290 (2001): 819-822.
- Williams, B., “The Makropulos Case: Reflections on the Tedium of Immortality”, in his *Problems of the Self* (Cambridge: Cambridge University Press, 1973).
- The World Factbook (2006) (<https://www.cia.gov/cia/publications/factbook/index.html>).

Ethical debates about human enhancements have taken place within various bodies of literature, including bioethics, animal ethics, environmental ethics, political science and the social scientific study of medicine. Each of these areas approach the significance of human enhancement from quite different perspectives. Generally speaking, one would discuss ethical issues in the context of a specific practice community, such as the ethical code underpinning medical practice. Alternatively, morality is concerned with broader questions of value for which there may be no formal codes that are broken. Another issue of concern regarding certain enhancement technologies, and the research into them, is the potential for deliberate misuse. This is called a "dual-use problem". It arises in the context of research in the biological and other sciences as a consequence of the fact that one and the same piece of scientific research sometimes has the potential to be used for harm as well as for good. It should also be kept in mind that the ethical issues mentioned above are by no means an exhaustive list of all the concerns raised by the use of human enhancement technologies for military purposes. This article seeks to draw attention to the fact that human enhancement is an issue of serious humanitarian concern.