



Emerging Medical Technologies: Ethical issues

By John Wyatt and Philippa Taylor

Oscar Pistorius made history at the London 2012 Olympic Games by becoming the first double amputee to compete against able-bodied athletes on the track, and make an Olympic final. For years Pistorius has been banned from all able-bodied competitions on the basis that his prosthetic limbs gave him an unfair advantage. He challenged the ban, had further tests and the ban was revoked in 2008. However some still consider that blade runners have an advantage, for both training and racing, and should not compete against able-bodied athletes.¹

- Should blade runners be banned from competing at the Olympics? Who should decide? Does the type of the prosthesis make a difference?
- Should golfers who have had enhancing laser eye surgery be banned from competing? Or someone who has a steel pin in their bone to aid recovery after a fracture?
- Should we insert chips in our children, so we can track where they are?
- Should we force violent criminals to have mood-controlling brain implants?
- Should we allow universal use of technology to improve memory? Or help us forget painful memories?
- Should students be banned from using memory enhancing 'mind pills' during exams? Is it even possible to ban their use with a largely unregulated internet?

Society has always had a desire for self-improvement, whether through using tools, education, work or adhering to religious or ethical codes. It can be argued that each of us seeks to become a 'better human' in a variety of ways.² Yet there is a limit to how much our level of functioning can be improved through 'low-tech' means such as education, philosophical contemplation, standard medical care or stimulants like caffeine.

Some new medical technologies which are being developed have the potential to change our bodies, our brains, our emotions and our longevity. Not only will they potentially improve the lives of those who are unwell or disabled, they will also be used to enhance those who are already healthy, making them 'better than well'.³

However there are challenging ethical and theological questions as well as practical concerns raised by the application of some new medical technologies, when used to enhance humans.⁴ We should not underestimate the exponential growth in human knowledge which will occur in the near future and the investment being poured into technologies that have the potential to change what it means to be human.

New technologies

The emerging technologies that can be used for enhancing humans include nanotechnology,⁵ information technology, genetics, robotics, synthetic biology, novel pharmaceuticals, regenerative medicine and neuroscience.⁶ There is on-going debate over the extent to which predicted applications will be feasible, and over what time period, however some of the emerging medical technologies are advancing at lightening speeds and many developments will undoubtedly become real in the next few years.

Nanotechnology, information technology and robotics are already leading to new treatment possibilities. The market for cochlear implants that restore hearing by wiring tiny computers directly to the nervous system is well established. Not content with glasses or

contact lenses, there are some who have had their vision enhanced with laser surgery,⁷ while treatment using retinal implants to restore sight is rapidly advancing,⁸ as is research on 'bionic' eyes using chips implanted in the brain.⁹ Recent research has been increasingly successful in implanting electrodes under the retina that convert light into signals sent to the brain.¹⁰ The development of robotics and implants is offering disabled people new abilities previously closed to them. For example, research with brain implants allows quadriplegics enough control over their limbs to feed themselves using their own hands and arms¹¹ or to gain some control over a wheelchair or computer by 'thought' alone.¹² Advances in body-machine interfaces, such as brain-computer communication for locked-in patients and deep brain stimulation to reduce tremors in people with Parkinson's disease, indicate the potential for technological control and modulation of our mental processes.¹³

Researchers are working out how to transmit speech and images directly into the brain, bypassing traditional sensory and perceptive routes.¹⁴ Some extreme views even predict that one day it will be difficult to distinguish if a person is blind, deaf or paraplegic because computers will be blended to the body and there will be no sharp division between the human and machine world.¹⁵ However we are still a long way from uploading people's minds, or understanding how the human brain really works.

Caffeine is widely used temporarily to improve performance. However some drugs are in widespread use now, such as Modafinil,¹⁶ Adderall and Ritalin,¹⁷ and over 60 drugs are in development, which are aimed at our mental (cognitive) improvement, to sharpen memory, attention, reasoning, mood, planning and even social skills.¹⁸ Although prescribed for medical purposes, such as ADHD, Alzheimers or narcolepsy, drugs like Modafinil are predominantly being used to improve performance, such as short-term gains in concentration and memory enhancement.¹⁹ Indeed, 90% of prescriptions for Modafinil

in the US are for off-label uses.²⁰

Using genetic technology, scientists can introduce, enhance, delete or manipulate specific biological characteristics. For example, researchers have developed genetic therapies on mice²¹ that could boost muscle strength and performance for those with muscular dystrophy, as well as fit, healthy people, including athletes,²² while germline engineering can be co-opted to modulate the genetic make-up of unborn children. Synthetic biology²³ offers many possibilities with the potential design and manufacture of new life or synthetic forms of existing organisms.²⁴ An artificial self-replicating ribosome has already been engineered, as has a synthetic copy of a bacterial genome.

As scientists learn to understand and control the biological process of aging, there has been speculation about the ability to slow biological deterioration and, controversially, radically extend human life expectancy.

The development of technological mastery

Prolongation of life, the pursuit of excellence and self-improvement for ourselves, our children and our society are good desires. Humans have always striven to tame or even transcend nature through technology, which has resulted in great improvements for humanity.

Whilst this desire for self-improvement has been a welcome part of human history, the ideal of human *perfectability*, of eliminating suffering and of maximising human choice has been shaped by the rise of the science of the 17th century.²⁵ Descartes foresaw humans becoming masters and owners of nature, believing that a time would come when science and medicine would allow men to become wiser and more capable than ever before, spared from many diseases of body and mind and *'perhaps also even from the debility of age'*.²⁶ He believed medicine might improve human bodies and minds beyond what nature has granted.

Theologian, Dr Robert Song suggests that present-day desires for ourselves and our children have been deeply influenced by the 'Baconian project' of relieving the human condition through control of nature. This 'project' can be traced back to Bacon's emphasis on the social use of scientific knowledge, to the radical utilitarianism of the 18th century and to the emphasis on fulfillment and individual autonomy of the early 19th century.²⁷

The Canadian philosopher George Grant argued that modern civilisation was distinguished from all previous civilisations because our activities of knowing and making had been brought together in a way which did not allow the once-clear distinguishing of them. Technology brought with it new ways of knowing, and the co-penetration of knowing and making in modern technological societies was orientated towards the mastery of nature.

The new technologies seem to offer fulfillment of the ancient dream that humans will ultimately achieve mastery and control over all nature, including over their own humanity. *'Science promises to succeed where religion and politics have failed - to heal the sick, end hunger and poverty, make the weak strong, and maybe even grant us "immortal life".'*²⁸

Advocates of unhindered access to new technologies generally support the right of individual autonomy. Many would argue beyond this, that we also have the right – or even duty – to choose to benefit future generations by changing the human germline.²⁹ James Watson similarly advocates fundamental hereditary changes to humans: *'No one really has the guts to say it, but if we could make better humans by knowing how to add genes, why shouldn't we?'*³⁰

New challenges

If emerging medical technologies with their enormous potential for therapeutic benefit are to be used wisely we need to pay attention both to the ends (ie goals) being pursued (for individuals and for society) and the means of obtaining those ends. The remainder of this paper will look at a number of issues and concerns which are raised by the introduction of new technologies which can be used to enhance humans.³¹

Safety concerns

All biomedical technologies carry the risk of permanent harm. Drugs and brain machine interfaces which alter cognitive function, may have unintended side effects, especially when used by children and adolescents with developing brains and nervous systems.³² The complexity and delicate fragility of the brain and nervous system requires that pharmacological and surgical interventions are undertaken with particular caution and care. There is a particular risk of unexpected adverse consequences when genetic and germline modification is proposed.

It is frequently argued that adults have the right to choose risky procedures on their own

bodies if the perceived benefits outweigh the risks. The popularity of invasive cosmetic surgery illustrates this trade-off well. For some bioethicists, autonomous choice is the predominant ethical issue, rendering other concerns irrelevant. The bioethicist, Julian Savulescu argues that: *'To prevent (people) making decisions is to judge that they are unable to make a decision about what is best for their own lives.'*³³

The liberal emphasis on individual autonomy supports the idea that 'I', the internal choosing self, has the right to determine what happens to my body, including its manipulation and enhancement. But this is a markedly dualistic way of thinking. The self is seen as different from and acting upon its body. But what is this 'I', the internal choosing self? Modern naturalistic neuroscience suggests that in reality there is no 'I'. The choosing self is simply an illusion created by the working of my brain. My choices are simply the outworkings of my neuronal machinery. There is nothing but 'brain stuff'. And if my choices are determined by my brain then they can be manipulated and directed by technology.

Justice concerns

The emergence of an enhanced 'elite' on top of an already unequal society is a worrying possibility. Several writers have warned of a 'technological divide', or widening gap, between the impoverished developing world and the 'wealthy fortresses' of North America and Europe.³⁴ Within countries, unequal access to genetic, cybernetic or cognitive enhancement could reinforce, perhaps exacerbate, existing social inequalities and exploitation, leading to worsening of the situation for those already vulnerable such as the economically disadvantaged, those who are deemed incompetent, disabled people and developing and embryonic humans.

Since there is already so much inequality in the world it seems difficult to justify making the situation more extreme. However often, over time, new technologies and therapies bring benefits to disadvantaged groups, as mass production improves availability and reduces cost.

Bioethicist and author, Professor John Harris, defends the use of enhancements as absolutes that are intrinsically good, despite the possibility that they confer advantages on some but not others.³⁵ However the world does not contain unlimited resources and so wise stewardship of limited resources is an

important ethical concern. Will the new technologies promote the foundational human values of justice, community, sharing, solidarity and interconnectedness which are surely of central importance to a humane society?

Pressures of social compliance

Once technologies are adopted they can give rise to social pressures to conform to new standards or 'norms'. This can be seen in the increasing use of pharmacological products by students, academics, and athletes to enhance performance, or even simply to 'remain in the game'. If increasing numbers use enhancement 'aids', those who do not take them will be disadvantaged. Of course it can be argued that traditional education also creates social pressures to conform.

Making humans better or making better humans

Dividing technologies into those which are enhancing versus those which are restorative is a traditional distinction. However this distinction is not always clear as many therapies whose primary purpose is curing diseases, also have a secondary potential of improving performance beyond the normal range. There are also ambiguities in the concept of 'enhancement'³⁶ and difficulties in defining 'normality' and 'health'.

Nevertheless, the distinction is useful and widely recognised. It is possible to state as a basic principle that medicine and biotechnology together have, in the past, addressed themselves to eliminating pathology, not enhancing normality. Even now, in cases where the line between the two is murky, regulatory agencies are generally able to make the distinction in practice.³⁷ The goal of traditional medicine has always been seen as restorative so the medical use of technology for human enhancement could be seen as fundamentally changing the nature, purpose and role of the medical profession.

Living meaningful lives

There is great interest from the sporting community for some of the new medical technologies, but will some technological enhancements render personal effort and achievements meaningless? Although humans want to be happy, reliance should not be on pharmaceuticals that give happy feelings without the relationships, longings and personal achievements that are essential for true human flourishing.³⁸

Suffering is more than just an immediate experience of physical pain. The experience of physical, psychological and emotional pain, deep longing and anxiety can aid our understanding of what and who we are as humans. One cannot gain courage without risk, deep compassion without personal experience of pain, or real gain without some sort of sacrifice, discipline or even failure.³⁹ A concern with the goal of enhancement is that such qualities are not only ignored but are potentially lost.

Biblical perspectives

From the earliest times human beings have always developed and used technology. In the biblical creation narrative found in Genesis 1, human beings are instructed by God, '*Be fruitful and increase in number; fill the earth and subdue it*'.⁴⁰ So the wise use of technology is to be supported and encouraged by Christians. In the early chapters of Genesis there are two contrasting examples of major technological enterprises. Noah builds an ark in obedience to God's instructions, and this technology becomes a means of saving both human and animal lives.⁴¹ But in Genesis 11, we see a darker side to technology: '*Come let us build ourselves a city and a tower with its top in the heavens, and let us make a name for ourselves, lest we be dispersed over the face of the whole earth*'.⁴²

The builders are driven by a two-fold desire: to 'make a name for ourselves' and to avoid being 'scattered over the face of the whole earth'.⁴³ Vinoth Ramachandra suggests that Babel is the marriage of three human dreams: the technological (to build a city that would be the envy of gods and nations), the religious (to divinise humankind by reaching up into the heavens) and the political (to build a totalitarian society based on technology).⁴⁴ Babel symbolises the use of human artifacts and technology, to celebrate human autonomy. The words 'Come, let us build...' in Genesis 11:4 echo the very words of God in making human beings: 'let us make man in our image...' in Genesis 1:26.

Babel symbolises the myth of technology that recognises no limits to human technical possibilities - technology that is used to seize God's rightful place as creator, and to overturn creation order. It is a story of human collective action, a unity that ends in confusion and dispersion. But the confusion created by God is both an act of judgment and an act of mercy. The unfinished tower stands as a monument to the folly of human arrogance, and a sign of the mercy of a God who intervenes to prevent

a technological dream (or nightmare) coming to fruition.

So Christian assessments of modern technology cannot be naïve. Technology can be used for good or evil and the underlying human motivation is of central importance.

Ultimately, the question of the nature of the human being is at the heart of concerns about the use of emerging technologies for enhancement purposes. This is the issue where there is perhaps the greatest divide, between the philosophies that drive technology as an enhancement tool, and the Christian view of technology and its use.

Christians believe that we have an ethical requirement to reach out and heal the sick and to embrace technology as aids to prevent or correct illness and restore health and fitness. Jesus himself healed *but* he only restored that lost by illness or the effects of sin. He did not make people more intelligent and stronger than they originally were, nor re-design them and encourage them to pursue life-extension. In the resurrection of Jesus as a recognisable physical human being, theologians have seen God's final vote of confidence in humanity's original design.⁴⁵

Transhumanism⁴⁶ is arguably the primary philosophy driving new technologies as enhancement tools.⁴⁷ It assumes inevitable progress through technology, as well as radical autonomy and the right of individuals to engineer and re-design their own humanity and destiny. In this respect, transhumanists encapsulate the outworkings of the Baconian project, noted above. Transhumanists reject any intrinsic value of the human form, advocating that humans should be free to change themselves however they desire. They argue that modification of one's genetic make-up, neurological composition, prosthetic augmentation and other cybernetic modifications should be encouraged, limited only by technology and one's own discretion. "*Human" – the very word is synonymous with suffering and failure...humanity is a disease state from which to be cured!*"⁴⁸

Whilst as Christians we can enjoy many benefits from new technologies, this must be within the context of understanding that our worth and value, our human dignity, stems from our creation in the image of God. The Christian understanding is of dependency upon God, and the recognition of the absolute, equal value, and intrinsic dignity that being made in God's image confers upon every human being.

Since human dignity and special worth

stems from our creation in the image of God, it is something that every human possesses. It cannot be gained through 'doing' anything but is gained by simply 'being' human. So all humans, from conception to natural death, are equal and deserve equal respect and value.

If human value ever became dependent on acquiring some particular level of enhanced biological, genetic or cognitive capacity we would create a society in which some people would be more valued than others. This is not only a serious danger to vulnerable humans, it could also lead to situations in which ethical restrictions on what we may do to change human life would become irrelevant. If there is nothing special about being human there is no 'essence of our human-ness' that we must hold on trust for future generations.

Like transhumanists, Christians believe that humans are morally and physically imperfect and require 'salvation'. Christians also believe that physical death will be overcome; it is not the end of the human story. However transhumanists think that humans can perfect themselves through technological transformation, whereas the biblical view of humanity teaches that only Christ can ultimately perfect us. We are saved in response to a divine gift and initiative, not through our own works. As Christians, we do not place our hope in somehow cheating death, or restoring the 'old creation', rather we believe that death, the 'final enemy', will be overcome by our resurrection into a new creation, a new body and to eternal life with God.

The ethics of art restoration illustrates how we might analyse, as Christians, controversial technological advances. Our bodies can be seen as original artistic masterpieces reflecting the design, creation and image of God, but marred by biological flaws. This original design is affirmed by the incarnation and resurrection of Christ as a *physical human being*.⁵⁰ Ethical intervention seeks to protect, maintain and restore the masterpiece to the original, whereas unethical intervention seeks to enhance, alter or improve the original design at a fundamental level. The challenge before us is constantly to query the impact technological progress might have on the inherent nature, value and equality of all human life.

Conclusion

We all benefit from research into therapies and from technologies that enable us to adapt to our environment and improve capacities in various ways. However, because the goals of

1. 'Oscar Pistorius shouldn't have run in the Olympics - blades are an advantage' *Guardian* 2012, 4 September. <http://bit.ly/TBwjb>
2. Miller P, Wilsdon J. (eds) *Better Humans? The Politics of Human Enhancement and Life Extension*. London: Demos, 2006:14
3. *Ibid*:14
4. The concept of enhancing humans refers to the idea of using medicine, surgery or other kinds of technology not just to cure or control illnesses but rather to improve humans.
5. Nanotechnology is engineering and technology development on a tiny molecular scale. One nanometre is one billionth of a metre.
6. The Development, Concepts and Doctrine Centre. *The DCDC Global Strategic Trends Programme 2007-2036*. Ministry of Defence, 3rd edition. 2007:58
7. At least 60 golf pros have had laser surgery to reshape their corneas. After Tiger Woods underwent this in 1999 he was quoted as saying that after surgery the hole looked bigger to him. Harris T. The Genetic Makeover. *Wired*, UK Edition, June 2009:96-97
8. <http://bit.ly/ND4JPg>
9. *Sunday Times* 2012, 29 April
10. Manning J. Health, humanity and justice: Emerging technologies and health policy in the 21st Century. 2020 *health.org*. October 2010. <http://bit.ly/T90pl6>
11. <http://bit.ly/OyP49A>
12. ie by reading the electrical activity of neural signals in the brain.
13. <http://bit.ly/MVEoON>
14. Garreau J. *Radical Evolution*. New York: Doubleday. 2005:37
15. Kurzweil R. 2001. *The Age of Spiritual Machines*. London: Texere Publishing. 2001:205, 224
16. Modafinil enhances wakefulness and alertness and is approved for the rare condition of narcolepsy but is widely used for dealing with various conditions of sleep deprivation, few of which could be considered medical. Office of Science and Technology. *Drugs Futures 2025? Perspective of the Pharmaceutical Industry*. 2005:25. Such drugs are widely used by students to improve their grades. <http://bit.ly/N3YNhO>
17. Ritalin is a cognition enhancer widely used to improve various aspects of cognition in adults and children. Harris J. *Enhancing Evolution: The Ethical Case for Making Better People*. Oxford: Princeton University Press 2007:26. It is claimed that both Modafinil and Ritalin are popular on campuses, even amongst professors and in one survey 1 in 5 respondents admitted to taking cognitive enhancers. Harkness T. Feed Your Mind. *Wired*. June 2009:98-99
18. Greenfield S. *Times* 2008; 10 June
19. Office of Science and Technology (OFT). *Drugs Futures 2025? Perspective of the Pharmaceutical Industry*. 2005:26
20. For reasons such as jet lag, depression, nonspecific symptoms of fatigue, tiredness, lack of energy or as an occasional substitute for sleep among busy professionals. Cheshire W. *Drugs for Enhancing Cognition and their Ethical Implications: a hot new cup of tea*. *Expert Review of Neurotherapeutics* 2006, 6, 3:263-266
21. <http://bit.ly/KEhRCK>
22. <http://bit.ly/NOSjYV>
23. Synthetic biology combines biology with engineering principles to design or create new types of viruses or bacteria, or modify naturally occurring structures such as genomes.
24. <http://bit.ly/NDcDI9>
25. Song R. *Human Genetics: Fabricating the Future*. London: DLT. 2002:115
26. Descartes 1637: VI
27. Song R. *Op cit*:116
28. Young S. *Designer Evolution: A Transhumanist Manifesto*. New

- York: Prometheus Books. Press Release. 2006
29. Harris J. *Enhancing Evolution: The Ethical Case for Making Better People*. Oxford: Princeton University Press. 2007:77
30. Cited in Garreau J. *Radical Evolution*. New York: Doubleday. 2005:115
31. The adoption of compelling new technologies often takes place rapidly with little pause for either precaution and regulation. We are aware of the difficulties - and yet need - for effective and transparent regulatory systems to be put in place but lack of space precludes discussion of this here.
32. Office of Science and Technology (OFT). *Drugs Futures 2025? Perspective of the Pharmaceutical Industry*. 2005:26. The body is a complex yet integrated whole, so in order for some capacities to develop, others may be lost. Enhancement may lead to unintended outcomes, for example, an enhanced memory may also enhance capacity to experience and remember pain. Cheshire W. *Art cit*:263-266
33. Savulescu J. Is the Sale of Body Parts Wrong? *J Med Ethics* 2003; 29:139
34. For example, Greenfield S. 2003:268, McKibben B. 2003:38
35. Harris J. *Op cit*:29
36. For example, does enhancing mean making more of a human function or making it better, or bringing out a function more fully, or altering it?
37. For example, the use of Ritalin for ADHD is often ambiguous and yet regulatory agencies, despite their faults, still manage to make and generally enforce the distinction between permitting it for therapy and not for enhancement.
38. Kass L. Beyond Therapy. *President's Council on Bioethics*. 2003:298-299
39. If healthy people could just use drugs to 'remedy' or pacify behaviour would they learn self-control? If life were free of suffering, pain and disease, would we have any appreciation of what real happiness or contentment is? Would there be any solidarity or heroism? If pills could block painful memories would we learn to deal with suffering or sorrow, losses or losing? Would any deviation from the 'norm' be medicalised? Would we really live well or simply stay alive if there was always a tomorrow? What does it mean to 'flourish' in our lives, and not just 'live'?
40. Genesis 1: 28
41. Genesis 6-8
42. Genesis 11:4
43. *Ibid*
44. Ramachandra V. *Gods that Fail*. Carlisle: Paternoster Press. 1996:131
45. Wyatt J. *Matters of Life and Death*. IVP, 1998:86
46. Transhuman is short for transitory human. Transhumanists believe that technology is the key to achieving the perfect society of perfect people on a perfect earth.
47. See *CMF File 31* on Transhumanism.
48. Young S. *Op cit*
49. Genesis 1:26-29. See *CMF File 46* on The Image of God
50. Wyatt J. *Op cit*:86-88
51. Song R. *Op cit*:118
52. Lewis CS. *The Abolition of Man*. Oxford University Press. 1943:34

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relieving suffering and exercising autonomy (within limits) are good, it is harder to recognise when they become distorted and morally problematic.⁵¹

Once technologies are directed towards making humans 'better than well', assuming the body is manipulable according to individual preferences, then real ethical and theological concerns arise. The abuse of technology threatens inherent human dignity and challenges the equal moral status of all human persons. The cost of such 'progress' would be high to existing and future vulnerable humans. As CS Lewis put it: '...

Man's power over Nature turns out to be a power by some men over other men'.⁵²

The challenge we are faced with is to assess each technological advance with the questions: 'What will these advances do to our sense of being human and to the equal value of all humans?' and 'By enhancing ourselves are we somehow "throwing away" humans or our humanity?'

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