

1. Introduction

Science and technology continue to provide more and more means to influence human bodily functions, both mental and physical. Such forms of “human enhancement”, in particular “human enhancement technologies” (HET), are being used or developed or are envisioned in several fields of applications as diverse as assistive technology for disabled people, pharmacology, military research, reproductive medicine, and sports. Human enhancement is thus a phenomenon linking a range of technologies that at first sight appear very different. There is also an ongoing political, social and ethical discussion of human enhancement. Such discussion has not only become a fashionable topic in certain circles, but the literature on it has reached a critical mass, qualifying it as a major topic of ethical research. The distinction between therapy and human enhancement is usually part of the arguments for or against allowing technological intervention in the human body or mind. Therapy is often defined as the attempt to restore a certain condition (e.g. normality, sanity, health), whereas human enhancement is regarded as transcending these boundaries. These issues have been discussed for some time now, mainly from the perspective of bioethics and with regard to doping, the non-therapeutic use of drugs and cosmetic surgery (cf. Parens 1998b).

Recently, however, advanced and visionary HET, based on new and emerging neurotechnologies, information and communication technologies (ICT) and other areas of research and development (R&D), have attracted strong public, political and academic attention. Some have even argued that with the emergence of so-called “second-stage” enhancement technologies (Khushf 2005; see Sect. 2.1.3) and the related visions we have entered a new era of global bioethics. In any case, the international discussion of human enhancement received a strong impetus from the release of the semi-official report “Converging Technologies for Improving Human Performance” (2002) on nanotechnology, biotechnology, information technology and cognitive science (NBIC) by the National Science Foundation and the Department of Commerce in the United States (Roco/Bainbridge 2002). In this debate on nanotechnology and “converging technologies” (CT), the enhancement of human performance was promoted as an aim of research, with particular regard to actual and visionary second-stage enhancements (e.g. by ICT implants) that may fundamentally alter human physical and cognitive functions (see for this debate: Andler et al. 2008; TAB 2008). Here we encounter the combination of a focus on the technological enhancement of individuals and somewhat technocratic ideas about how to steer societies and cultures.

Human Enhancement Technologies

A short look at several technoscientific developments and their social relevance can provide an impression of how HET may change our societies and challenge our established systems and political decision making.

The first concerns the illicit use of Ritalin by students, scientists, workers and others who wish to improve their concentration. Ritalin, a drug prescribed to treat attention-deficit hyperactivity disorder (ADHD), has been found to be able to promote concentration in both ADHD patients and in others. It has been labelled a “universal performance enhancer” because enhanced concentration is known to benefit any cognitive task. And there are also a number of other drugs apart from Ritalin that appear to have the potential to promote wakefulness, e.g. Modafinil, developed to treat narcolepsy. They promise to allow us to study, work and “party” much longer than usual, and possibly even to be more productive.

Secondly, it is widely known that many people use various anti-depressants to improve their mood. Around 3-5% of males and 8-10% of females are diagnosed with depression every year in North America, and one in eight adult Americans takes mood-brightening agents, regardless of whether they suffer from severe long-term depression or not. It is not clear how much of this trend is due to a rise in the incidence of depression and how much to an increased readiness of people to use medication. In the future, it might be possible to pursue “mood enhancement” not only by taking pills but also with the aid of devices. A brain implant technique called deep brain stimulation is already being used to treat the symptoms of Parkinson’s disease and has been used experimentally to alleviate severe depression. It could conceivably improve the mood of healthy people as well, and has already been presented as a spectacular case of “push-button happiness” in the mass media. Other, non-invasive devices such as transcranial magnetic stimulation that are currently being studied as treatment for depression and other psychiatric disorders might have beneficial effects on the mood of non-patients, too.

Other new technologies targeting the brain can be found in the field of brain-computer interfaces (BCIs). BCI devices are being tested in various applications, such as those intended to enable paraplegics to control computers. Other BCI technologies undergoing trials for use in computer games might lead to enhanced human abilities to interact with “virtual” surroundings. In the U.S., the developments in this field have led to far-reaching visions of pilots controlling their machines “by thought alone”. A number of different emerging BCI seem to offer real promise of merging “virtual worlds” and “real life” in the not too distant future. These and other potential HET are often studied or envisioned in the military context.

Genetic engineering can lead to genetic enhancement. Scientists have already succeeded in creating a genetically modified super mouse which is much stronger than other mice. Other examples are cosmetic plastic surgery, treatments claimed to be “anti-aging” and the illicit use of performance-enhancing drugs in sports (colloquially known as “doping”). Finally, limb prostheses and exoskeletons already under development offer the potential of improving human functioning beyond what is typical of our species. Lifting heavy objects will become much easier if we can improve our musculature or use an exoskeleton to help us. Some prostheses already let their users achieve performance (e.g. in mountaineering) that is impossible for humans with ordinary bodies (such as extending their legs to cross wide crevasses). And prostheses for daily use as well as new sport prostheses, such as those used by the South African sprinter Oscar Pistorius who tried to qualify for the 2008 Olympic Games with two artificial lower legs, are becoming increasingly sophisticated.

Human Enhancement – The Debate

The phenomenon of human enhancement is a highly contested issue. On the one hand, the participants of the debate assess the prospects of HET and even the actual state of R&D in such technologies very differently. On the other hand, their views on the acceptability and desirability of human enhancement widely diverge. These debates on HET and the visions of their impact raise fundamental questions concerning our views of the human condition and corporeality as well as of the future of our societies. Moreover, several ongoing R&D processes confront the boundaries between the grown and the made, the natural and the artificial. And broader changes concerning the societal role of medicine and the health system, such as the tendencies toward medicalisation and commercialisation, apparently further the trend toward human enhancement.

Arguably, the most ardent supporter of HET is the “transhumanist movement”, which has achieved a remarkable degree of influence in academic debates on ethics and also in political discussions in the course of this decade to the extent of being a driving force or avant-garde. The debate on human enhancement is still strongly influenced by extreme positions, which are sometimes denoted as transhumanism versus bioconservatism. It is important to notice that, in large parts, these lines of conflict and the related arguments date back at least to the first half of the twentieth century. What we are dealing with here is an often overlooked but influential and consistent ideology of extreme progress, whose ideas about the future culminate in visions of a posthumanist civilisation in outer space, and thereby advance the notion of the necessity of radical transformations of human biology. This ideology has triggered, also since the first half of the twentieth century, strong reactions by religious and secular conservatives and also by left-wing critics of scientism and some segments of our technological civilisation. The STOA project on CT concluded, in our view quite rightly, that there is a need to locate middle ground positions in this debate, as well as a need for a public arena in which the many normative issues involved can be discussed (STOA 2006). However, one must take into account that research funding and the public dialogue on these far-reaching visions ties up intellectual and material resources which might then not be available for assessing more urgent issues. A balance must thus be found between advancing a rational discussion through critical analysis of these visions and the further popularisation of the latter (Grunwald 2007; Nordmann 2007a, 2007b; Paschen et al. 2004).

There are two processes which have made human enhancement highly topical. On the one hand, there appear to be many people who want to improve their performance, their happiness, their beauty, or other features by technoscientific means. These desires and hopes are often related to broader societal tendencies and to structural features of our societies (such as the orientation toward competitiveness) that shape individual preferences in the direction of human enhancement. However, the scope of these tendencies is still unclear, and they might only be widespread in certain professions and sections of the population. On the other hand, there are numerous promoters of human enhancement who were able to create lobbying networks. Far from being restricted to transhumanist organisations, these promoters include members and key players of the research and technology policy establishment, in particular in the U.S. and in the Anglo-Saxon world in general. They often adhere to the above-mentioned ideology of extreme progress. The development of this ideology and the influence it currently exerts are not only of academic interest, but relevant when it comes to the interrelationships between European value systems and the hopes and fears concerning our societal and technological future.

Focus and Scope of the Report

Given the highly visionary and ideological notions, it is obvious that the discussion of human enhancement is not straightforward. Yet beyond competing worldviews, the debate about human enhancement is characterised by conceptual diffuseness and a lack of differentiation. For example, with respect to health practice, the question is whether the basic distinction between human enhancement and therapy is tenable enough for policy purposes. The boundary between therapy and enhancement has never been clear cut. Is there a need to reframe the discussion? Some of the apparent differences in the assessment of the state of the art in R&D in HET can be explained by the wide variety of definitions of human enhancement. Given the conceptual problems, there is a need for substantial efforts to develop a pragmatic notion of

human enhancement and a heuristic to identify the relevant HET, both of which must be viable for handling the issue and the ongoing developments in a policy context.

We define “human enhancement” as any “modification aimed at improving individual human performance and brought about by science-based or technology-based interventions in the human body”. We distinguish between restorative or preventive, non-enhancing interventions, therapeutic enhancements, and non-therapeutic enhancements. We therefore treat human enhancement mainly as a specific perspective on developments in science, technology, medicine, and society. The effects of HET can be either long term or even permanent (as in the case of genetic enhancements), or temporary (such as the improved concentration brought about by use of drugs). The aim may be to improve our natural abilities (for example by making us stronger or happier) or to give us characteristics or abilities that no human being has ever had before, such as full night vision or flying.

Much of the discussion about human enhancement revolves around highly visionary ideas which evidently shape the discourse on human enhancements and could thereby change societal views on science, technology, and their future. There are, however, developments which are of rather short-term interest, and some HET already exist and are here to stay. They are in the focus of our report and of the policy options we discuss. We discuss various developments in several fields of R&D which are related to human enhancement, the chances and challenges (individual, medical, cultural, political etc.) that are raised by HET, and how the ongoing discourse on human enhancement change the views on human corporeality, (dis)ability, tendencies toward medicalisation, and old and new visions of individual and societal perfectibility.

The present study provides both an overview and detailed analyses of HET and the pertinent political, academic and societal debates. The main question is what is relevant enough to be dealt with in policy making. The study develops recommendations and policy options for fostering an ethically reasonable political handling of HET-related issues and contributes to creating a strategy for stimulating a broader societal and academic discourse on the topic of human enhancement. For the European Parliament it is, as a matter of course, of major importance to learn about the reasons and options for addressing the issue of human enhancement on a European level. The role played by human enhancement in some individual strategic discussions about European R&D policies appears to be just a beginning. The ethical, societal, technological and innovative aspects of the topic are becoming increasingly important at all levels, including that of the member states.

The structure of the present report is a systematic overview of the various facets of human enhancement and human enhancement technology (HET).

We begin Chapter 2 by defining and explaining our understanding of human enhancement and related concepts (Sect. 2.1), aware that conceptual questions are of utmost importance when it comes to discussing the issue in a meaningful way, in particular in a policy context. We then present and discuss instances of existing or emerging technologies for human enhancement with a focus on non-therapeutic uses for cognitive and physical enhancement (Sect. 2.2.), and with the goal of separating the hype and far-flung visions from the actual state of the art and realistic expectations.

In Chapter 3, we return to several technoscientific developments, discussing them in more detail and with a view to their actual societal, political, and cultural significance (see Sects.

3.4 – 3.7). Moreover, we (i) present and analyse some major lines of reasoning on human enhancement (Sect. 3.1), including very visionary aspects, (ii) briefly discuss various broader societal tendencies and issues that provide the context of the debate on human enhancement (Sect. 3.2), and (iii) give some evidence of the existence of influential networks promoting human enhancement (Sect. 3.8), also pointing out features of their ideological background that appear to be relevant to adequately understanding the challenges which the discourse on human enhancement poses to European culture and value systems. These and other issues are also a topic in the last section of the chapter (Sect. 3.9), where we also discuss some of these challenges and relate them to other trends that are moving towards an “enhancement society”.

In Chapter 4, we first outline the major lines of the debate about human enhancement and HET at the EU level (Sect. 4.1). The focus here is on rather high-level EU statements and on EU-funded activities and research projects, in particular with regard to nanotechnology and converging technologies. It also includes pertinent opinions of the European Groups on Ethics in Science and New Technologies. In a section on EU-funded projects that conduct scientific research on or develop HET (Sect. 4.2), we concentrate on projects that were funded within the Framework Programmes (FP) for Research and Technological Development. The following section (Sect. 4.3) presents the results of the first expert meeting carried out for this study, focusing on diverse challenges to the social, (dis)ability, medical, and ethical frameworks raised by human enhancement. Specific legal and regulatory aspects of human enhancement are separately discussed in Section 4.4. The aim of this discussion is to point out some of the most relevant legal aspects and to identify a number of possible starting points for regulating HET in Europe. In the last part of this chapter, we discuss some possible first steps toward a governance of human enhancement (Sect. 4.5). This discussion is based on the results of the second expert meeting carried out for this study.

We start the final chapter of the report by discussing which political and societal domains appear to be most strongly affected by the trends towards an enhancement society (Sect. 6.1). Afterwards we outline and discuss possible general strategies of how to deal with the topic of human enhancement and with HET in a European context (Sect. 6.2). Finally, we present and explicate our proposal to establish a European body to oversee human enhancement technologies, and argue that the European Parliament should play a central role in establishing such a body (Sect. 6.3).