

“Enhancing Justice?”¹

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Introduction

Emerging technologies situated at the intersections of nanotechnology, biotechnology, information technology, cognitive science, computer science and robotics have the potential to significantly increase or augment human cognitive, psychological, and physical capabilities, e.g., learning speed, information retention, perception, endurance, strength, longevity, and emotional regulation. This article focuses on the following question: Are such human enhancement technologies likely to be justice impairing or justice promoting? We begin by defining the conception of human enhancement and the principle of distributive justice that are operative in this article. We then review the standard argument that development and dissemination of robust human enhancement technologies is likely to be social justice impairing, before presenting and critically evaluating several arguments that it is likely to be justice promoting (or, at least, not justice impairing). We conclude that these technologies may not be inherently just or unjust, but when situated within obtaining social contexts, they are likely to exacerbate rather than alleviate social injustices. Moreover, responding to the social justice challenges associated with human enhancement technologies cannot be accomplished by

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technological design and innovation alone. It requires addressing problematic features of social, political, and economic practices, policies, and institutions.

1. *Defining Human Enhancement*

It is difficult to provide a precise, exceptionless definition of human enhancement, just as it is difficult to do so for technology, natural, and therapeutic. However, a functional account, one adequate for present purposes, is possible.

Human enhancement technologies are technologies that improve or augment some core cognitive, physical, perceptual, or psychological human capacity, or enable some novel capacity not standardly among human capacities. Human enhancement through technology is ubiquitous. Education technologies, computational devices, nutritional supplements, steroids, pharmaceuticals, communication systems, and optical lenses are each a type of human enhancement technology. Several distinctions are needed to distinguish robust human enhancement from mundane human enhancement.

Some enhancement technologies are *episodic enhancements*—the enhancement persists only so long as the technological intervention is enabled. Computers are this sort of enhancement. When a person is interfacing with her computer, several of her cognitive and communication capacities are significantly augmented, as well as novel capacities enabled. But these enhancement effects do not persist when the computer is shut down. Other enhancement technologies are *sustained enhancements*—the enhancement persists some duration after the technological intervention is complete. The non-therapeutic use of anabolic steroids can be this sort of enhancement. Their enhancement effects—increased muscle mass—can last some time after they are used.

Another distinction among enhancements is between external and internal enhancements. *External enhancements* augment existing or enable novel human capacities without modifying core biological, psychological, or cognitive systems and without introducing some novel system. Again, computers are this sort of enhancement. They enable users to do many things that they would not otherwise be able to accomplish, but they do not do so by altering, for example, how their cognitive or perceptual systems function. *Internal enhancements* augment existing or enable novel human capacities by altering a particular aspect of some core biological, psychological, or cognitive system, or by introducing some novel system. Increasing longevity by altering the mechanism of cell division so that it occurs with less telomerase shortening would be an example of an internal enhancement.

The type of human enhancement under consideration in this article is internal, sustained enhancement, i.e., the technological alteration of some system/process or the introduction of some novel system/process that augments some core biological capability beyond the range of capacity attainable by technologically-unassisted human beings or introduces a capacity not had by technologically-unassisted human beings. Hereafter, “human enhancement” refers to this type of enhancement. This account of human enhancement is not without limitations. Some of the terms employed are vague, e.g., ‘core biological capability.’ It also leaves out several important distinctions within human enhancement, e.g., between permanent and reversible enhancement, germ line and somatic enhancement, and different methods and mechanisms of enhancement.

Nevertheless, it provides a clear sense of what is distinctive of the type of enhancement at issue: they alter *us* in a way that gets at *the kind of creature that we are*.²

2. *A Principle of Justice*

‘Justice’ is a complex and contested concept. There are multiple domains of justice that differ with respect to the activities over which principles are operative, e.g., economic justice, political justice, and criminal justice. There are multiple theories of justice that are distinguished by contrary conceptual frameworks, e.g., communitarian, utilitarian, liberal, and libertarian. And there is substantial diversity within each theory of justice with respect to, for example, who are appropriate subjects of justice (e.g., whether it is limited only to human beings), what are the appropriate objects of justice (e.g., distribution of goods, recognition, participation, or promotion of welfare), and the relationship between justice and other ethical concepts (e.g., whether it is one ethical concept among many, a central ethical concept, or the superordinate concept).

Rather than defend a particular instantiation of a particular theory of justice, we will proceed, following Peter Wenz, by endorsing a particular principle of distributive justice that most instantiations of most theories of justice would accept:

Justice increases when the benefits and burdens of social cooperation are born more equally, except when moral considerations or other values justify greater inequality. This principle is uncontroversial because it basically restates the principle of the equal consideration of interests...which rests on the uncontroversial claim that all human beings are of equal moral considerability. Unequal treatment of human beings (some reaping extra benefits or bearing extra burdens related to social cooperation) must therefore be justified, and such justification requires recourse to moral considerations or other values (2007: 58).

² This account of human enhancement is neutral with regard to evaluative judgments. It leaves as an open question whether enhancement of a particular capacity is beneficial/valuable or not. It is, however, worth exploring whether this should be the case, or whether enhancement should be conceptualized the same way as adaptation, i.e., as something that has a positive valence, indexed to particular environments/circumstances.

Theories and conceptions of justice differ substantially in their accounts of what justifies inequality, e.g., that it increases well-being overall or is the result of free and fair exchange of goods earned by non-coercive means (under appropriate conditions). However, they often converge on what does not justify inequality or unequal treatment. In fact, any theory of justice that would endorse considerations such as race, ethnicity, or class as a basis for unequal treatment would be unacceptable for that reason.

3. Formulating the Issue

Given the principle of justice endorsed above, if the implementation and dissemination of human enhancement technologies increases inequality or unequal treatment as a result of pre-existing, unjustified economic or social inequalities, those technologies would be justice impairing. If those inequalities are reduced, they would be justice promoting. The remainder of this article focuses on the following question: Are human enhancement technologies likely to be justice impairing or justice promoting, in this respect?³

4. Argument that Human Enhancement Technologies will be Justice Impairing

The standard argument that human enhancement technologies are likely to be justice impairing is as follows. Once a human enhancement technology is developed and made available to the public, initial access to it will be limited due to its high cost. Those

³ The ‘in this respect’ qualification is necessary because there are other domains or principles of justice that also are relevant to whether human enhancement technologies are likely to be justice promoting or justice impairing. For example, widespread dissemination of human enhancement technologies are likely to be socially transformative, so decisions regarding them (which to implement and how to do it) have a procedural justice dimension: To what extent should decision be made by “elite” actors in science and industry communities? To what extent (and how) should they be made more “democratic”? What is the appropriate role of the marketplace and of governmental bodies? Each of these has justice components that are distinct from the largely distributive justice issues that are the focus of this article.

who can afford the technology when it first becomes available will enjoy a compounding benefit: the increased capabilities that the technology provides (whether cognitive, psychological, and/or physical) will further advantage the individual (who is already advantaged in virtue of their position and resources, which provided them access to the technologies) in pursuit of competitive and positional goods that are relevant to one's quality of life (Tamburrini 2006). Those without resources to gain access to the technology will have a corresponding compounding disadvantage: the absence of enhanced capabilities is added to the initial resource shortage (material and/or social) that prevented them from acquiring the technology in the first place. In this way, initial social inequalities—which in most societies are not fully justified—are increased rather than diminished by human enhancement technologies.

Several variations of this general argument have been offered. For example, Maxwell Mehlman argues that due to the probable high cost associated with human enhancement technologies, particularly initially, only those with sufficient economic resources or whose health insurance covers them are likely to have access to them (Mehlman 2004). However, because enhancement technologies are, by definition, non-therapeutic, they are not likely to be covered by health insurance companies, which tend to cover only therapeutic (or, in some cases, preventative) care. As Mehlman points out, some health insurance companies already are refusing to cover minor enhancement drugs such as Viagra. Moreover, in cases such as *Doe vs. Mutual of Omaha* (1999), the courts have interpreted the law in ways that do not obligate health insurance companies to cover all disabilities under the Americans with Disabilities Act. If insurance companies are not even required to cover certain therapeutic procedures, it would be wildly optimistic to

assume that they will cover elective, non-therapeutic technologies. Even if higher-priced health insurances choose to cover non-therapeutic treatments, they will remain inaccessible to middle-income and low-income individuals who cannot afford such plans.

In addition, the number of uninsured U.S. residents grew by 2.2 million in 2006, raising the number to 47 million, up from 44.8 million in 2005. 73.2% of the uninsured were U.S. citizens; 11.7% of all children lacked health insurance (19.3% of children in families with annual incomes below the federal poverty level lacked health insurance); and the percentages of uninsured individuals differed by race (34.1% of Hispanics were uninsured in 2006; 20.5% of blacks; 10.8% of whites; 15.5% of Asian-Americans) (DeNavas-Walt et al. 2005). So, even assuming that health insurers will cover non-therapeutic procedures (an unlikely assumption), there will still be over 40 million individuals in the United States without access to human enhancement technologies, as well as significant racial disparities with respect to access to them.

Access to health care is not the only social context factor relevant to whether human enhancement technologies will promote or impair social justice. As Wenz (2005) argues, per capita, more resources are spent educating children from wealthy families than children from low-income families, when arguably the latter need more resources due to socio-economic disadvantages. An unjust distribution of educational resources leads to (further) unjust difference in socio-economic outcomes, which results in unjust disparities in technology access. Wenz (2005) also argues that the U.S taxation system is increasingly unjust. According to Walden Bellow (1999, cited in Wenz 2005), tax “reform” in the 1980s increased the tax share for those in the bottom 10 percent of income earners in the country by 28 percent, while reducing the share of those in the top

1 percent by 14 percent. This shifting of the relative tax burden from those who are wealthy to those who are low income has continued in this century with the 2001 U.S. federal tax cuts.

In a just society, human enhancement technologies may well not be justice impairing. However, according to Wenz and Melhman, the United States is not a just society with respect to factors that are crucial to access to emerging technologies. As a result, human enhancement technologies are likely to be justice impairing.

5. Arguments that Human Enhancement Technologies will not be Justice Impairing

An adequate response to the argument that human enhancement technologies are likely to be justice impairing would need to show one of the following: (1) pre-existing social and economic inequalities are not unjust; (2) pre-existing social and economic inequalities, while unjust, are not likely to result in disparities in access to human enhancement technologies; or (3) although pre-existing social and economic inequalities are unjust and likely to result in disparities in access to human enhancement technologies, the disparities themselves and their effects are not likely to be unjust. Most respondents to the argument that human enhancement technologies are likely to be justice impairing concede that there are significant unjust inequalities both within societies and between societies. Therefore, their responses are of types (2) or (3). In what follows we review several of these, some of which have been put forward by prominent proponents of human enhancement. Each of which, we argue, has significant shortcomings.

5.1 Argument from the Law of Accelerating Returns.

Ray Kurzweil, technologist and author of *The Singularity is Near*, defends what he calls the law of accelerating returns. The following quotation illustrates his view:

The ongoing acceleration of technology is the implication and inevitable result of what I call the law of accelerating returns, which describes the acceleration of the pace of and the exponential growth of the products of an evolutionary process. These products include, in particular, information bearing technologies such as computation, and their acceleration extends substantially beyond the predictions made by what has become known as Moore's Law (2005, 35-36).

Kurzweil believes that, as a consequence of the law of accelerating returns, enhancement technologies are likely to become very inexpensive—indeed, almost free—very quickly. Initially, information technologies are extremely expensive, do not work particularly well, and are available only to the economically well-off. However, as technologies improve, the price comes down and the result is technology that works well and is widely available.

Another concern expressed...is the “terrifying” possibility that through these technologies the rich may gain certain advantages and opportunities to which the rest of humankind does not have access. Such inequality, of course, would be nothing new, but with regard to this issue the law of accelerating returns has an important and beneficial impact. Because of the ongoing exponential growth of price-performance, all of these technologies quickly become so inexpensive as to become almost free (2005, 469).

Kurzweil claims that the amount of time that it currently takes for a technology to go from expensive to inexpensive is approximately ten years, but as the rate approximately doubles each decade (expressing the law of accelerating returns), the lag would be reduced to five years in one decade and only three years in two decades. The horizon for realizing human enhancement technologies appears to be at least a few decades away (even on Kurzweil's reckoning). By the time the technologies are in place, the duration between first appearance and widespread availability will be quite short. Therefore, they are not likely to be justice impairing.

5.2 Response to the Argument from the Law of Accelerating Returns

Let us assume that the law of accelerating returns is true. Even still, there will be a lag between the release of the initial technology and its subsequent widespread availability. The three year lag that he predicts in two decades is still three years—*at a time of rapid technological advancement*. In the time this technology becomes inexpensive enough for those of limited resources to acquire it, there will (according to the law of accelerating returns) be exponential advancement with the latest technologies available to those who can continually afford (or otherwise have access to) them. If the law holds, this will be true in each case, no matter how short the time lag. What matters is not the absolute duration of the time lag, but the absolute duration relative to the pace of technological change. If the lag decreases exponentially while the rate of change increases exponentially, those who are economically disadvantaged will remain a generation of technology (or more) behind.

Moreover, even given the cost reductions that would occur (if the law holds) over the next several decades, human enhancement technologies are likely to remain out of reach for many people. Certainly, computers and iPods that went on the market a few years ago cost less today, but this has not made them universally accessible. 2.7 billion people in the world live on less than \$2 ppp/day (World Bank 2008), with 1.1 billion on less than \$1 ppp/day (United Nations 2006). These individuals struggle to obtain even basic necessities of living. They have no marginal resources to spend on last decade's technologies. Even in the United States, whose poorest are better off than those in the least developed countries, many of those living below the poverty line—36.5 million people in 2006 (US Census Bureau 2007)—struggle to afford technology that has already been reduced in price. Even assuming the law of accelerating returns, human

enhancement technologies are likely to remain out of reach for many people long after those with access to them have accelerated off (relative to the rate of technological change) .

5.3 Argument from Marginal Enhancement

Like Kurzweil, Ramez Naam believes that, over time, the cost of enhancement technologies will significantly drop as newer, more efficient technologies are introduced. He recognizes that, at least at first, the latest technologies will only be affordable to a small minority, but he does not find this problematic because he believes the enhancement effect (per dollar) will diminish with each subsequent version of an enhancement technology. On his view, the basic enhancement technology will provide the most significant enhancement effect, so that when those who are economically well-off purchase the latest version of an enhancement technology, they will be paying exorbitantly for only minor refinements (see, also, Bostrom & Sandberg forthcoming). Thus, rather than accelerating off, they will be puttering along only marginally ahead of those who cannot afford (or lack access to) the latest version of the technology.

Consider automobiles. In most places in the United States, a few thousand dollars will purchase a fairly safe, comfortable vehicle for getting from point A to point B. Alternately, many tens of thousands of dollars will buy you a new luxury vehicle. A luxury car can cost ten times what the most affordable new economy car would cost, yet the luxury car isn't ten times as fast, or ten times as fuel-efficient, or ten times as safe. The extra money spent on it buys only incremental advantages. In terms of basic mobility, the inexpensive step between no car and a cheap car is larger than the very expensive step from a cheap car to a BMW (Naam 2005, 66-67).

Although low-income consumers may never afford the latest refinements in human enhancement technologies, this is, according to Naam, far less problematic than it seems, since the bulk of an enhancement effect will be available in low-cost versions.

5.4 Response to the Argument from Marginal Enhancement

Even if, as Naam supposes, the enhancement differential between a basic enhancement technology and the latest (luxury) version of the technology is much less than the enhancement effect associated with the basic enhancement, there will remain a difference in (enhanced) capabilities between those who have access only to the basic technology and those who have access to the latest version. The enhancement differential, even if small, will not be nil. The issue, then, is whether even reduced differentials in capabilities resulting from unequal access to enhancement technologies are likely to exacerbate or reduce unjustified inequalities.

There are reasons to believe that it likely would exacerbate them, or, at least, perpetuate them. First, minor differences in attributes—even when they are functionally irrelevant—often matter in the distribution of competitive and positional goods (Tamburrini 2006). Research from the University of Florida and the University of North Carolina has shown that tall people earn more than their shorter counterparts, at a rate of approximately \$789 a year per inch (Judge 2004). A survey of 11,000 thirty-three year olds done at London Guildhall University found that those deemed less attractive earn 10 to 15 percent less than their counterparts (Harper 2000). These results suggest that even minor enhancement differentials, on seemingly insignificant traits that appear unrelated to functionality, can increase or perpetuate inequality.

Moreover, most human enhancements are not targeted at functionally insignificant traits (relative to competitive and positional goods) but on relevant capabilities such as memory and problem solving (which, of course, have associated non-competitive, non-positional goods as well). In the case of human enhancement, then,

differences among people will be biologically real (since that is the nature of the intervention at issue), and the enhanced trait will have a positive evaluative valence, i.e., it will have been intentionally sought due to its perceived desirability. Concerns have been raised that advances in genomics that enable identifying genetic differences among populations (for therapeutic purposes) will invite discrimination, i.e., that some populations will be viewed as genetically inferior. If there is any merit to this concern at all, there is more so in the case of human enhancement, where the biological difference is not merely descriptive and unintended (as they are in the unenhanced genomics case), but desired and intended.

Returning to Naam's case of the economy automobile versus the luxury automobile, while it is true that both provide mobility, the luxury car exceeds the other in many other respects, both performance and aesthetic. This is precisely why most people, if given the option, would prefer the luxury automobile, all other things being equal. The fact that both are, at basic, transportation, and that is the most important thing about them, does not imply that their other differences are not going to be the basis for discrimination (justified or unjustified). The same is true of the enhancement differential between basic and luxury versions of an enhancement technology.

5.5 Argument from Cognitive and/or Virtue Enhancement

Another possible response to the social justice challenge is that those who are cognitively enhanced will be more capable of identifying and developing effective responses to the causes of unjust inequalities than those who are not enhanced, and those who are psychologically enhanced will be more disposed to addressing them than those

who are not enhanced. As a result, differential access to (at least some) enhancement technologies will ultimately be justice promoting, rather than justice impairing. Although this argument has not been made explicitly (that we are aware of), it is suggested by the claim, frequently made by proponents of human enhancement, that cognitive enhancement would have net good consequences for society overall (Bostrom 2006). The rationale for this is that cognitive abilities are relevant to identifying and analyzing complex problems, as well as devising and executing solutions to them—in general, increased cognitive functioning is associated with increased problem solving capacities.

One version of the argument from cognitive enhancement merely applies this rationale to the social justice problem: increased cognitive capacity should be associated with increased ability to understand and devise effective solutions for the causes of unjust social inequalities, including unjust disparities in access to human enhancement technologies. A second version of the argument appeals to the benefits that would accrue to those who are socially and economically worst off—through, for example, advances in agricultural, energy, communication, and environmental remediation technologies that would be made by cognitively enhanced individuals—even if social inequalities persist. So while pre-existing and access inequalities might remain or even increase, they would be justified by their benefiting even the economically worst off, and therefore would not remain unjust inequalities.

It also is often claimed that technological interventions to improve people's character, i.e., virtue enhancement, is desirable and may be possible. Here, for example, is Julian Savulescu:

Buchanan and colleagues [Buchanan et al. 2000] have discussed the value of “all purpose goods.” These are traits which are valuable regardless of which kind of life a person chooses to live. They give us greater all around capacities to live a vast array of lives. Examples include intelligence, memory, self-discipline, patience, empathy, a sense of humour, optimism and just having a sunny temperament. All of these characteristics—sometimes may include virtues—may have some biological and psychological basis capable of manipulation with technology.

Technology might even be used to improve our *moral character*. We certainly seek through good instruction and example, discipline and other methods to make better children. It may be possible to alter biology to make people predisposed to be more moral by promoting empathy, imagination, sympathy, fairness, honesty, etc.

In so far as these characteristics have some genetic basis, genetic manipulation could benefit us. There is reason to believe that complex virtues like fair-mindedness may have a biological basis. In one famous experiment, a monkey was trained to perform a task and rewarded either a grape or piece of cucumber. He preferred the grape. On one occasion, he performed the task successfully and was given a piece of cucumber. He watched as another monkey who had not performed the task was given a grape. He became very angry. This shows that even monkeys have a sense of fairness and desert—or at least self-interest! (2007, 7)

The argument from virtue enhancement merely applies this view to the social justice problem, i.e., that it would be desirable and may be possible to develop technologies and interventions that increase a person’s sense of and commitment to social justice.

Taken together, the arguments from cognitive enhancement and virtue enhancement imply that human enhancement technologies might result in individuals that are more capable of and committed to reducing social injustice than would exist if the technologies were not developed and disseminated. So even if there were a disparity in access to those technologies, the ultimate result would be a reduction in social injustice.

5.6 Response to the Argument from Cognitive and/or Virtue Enhancement

The argument from cognitive enhancement (in each of its formulations), when considered independently from the argument from virtue enhancement, has an obvious limitation: there is little reason to believe that those with greater cognitive capacities will, in virtue of those capacities, have increased concern for and commitment to social justice.

If a person who enjoys unjust advantages is inclined to protect and promote those advantages, when she gains access to cognitive enhancement technologies she will be more likely to use her additional capabilities to increase those advantages rather than to reduce them. As a result, disparities in access to cognitive enhancement technologies (of the sort under consideration) are as likely to perpetuate unjust social inequalities as to result in their reduction.

This would not be the case if the primary barrier to addressing the relevant social injustices were cognitive, i.e., that people did not know about the inequalities, did not recognize them as unjust, or there were no good strategies developed for addressing them. However, it is not so—substantial behavioral, institutional, and salience barriers exist as well. Often, people lack resources and commitment, have other priorities (often worthwhile ones), or exhibit moral weakness, i.e., they are aware of what they ought to do but are not particularly motivated to do it. Moral shortcomings are not normally the result of not knowing what one ought to do or how to go about doing it (particularly in a way likely to be remedied by cognitive enhancement). It is, of course, an empirical question whether there is a causal relationship between cognitive capacity and concern about and motivation to address social injustice. But in the absence of such empirical evidence, which would suggest that cognitive enhancement might enhance social justice commitment as well (and thereby belie the considerations raised above), the argument from cognitive enhancement is, at best, unjustified.

Kean Birch (2005) has suggested that cognitive enhancement not only will not increase concerns about social justice, but may in fact have a diminishing effect. He points out (as does Wenz 2005) that current educational resource distributions and

institutions favor a system that advantages children from middle and upper income families. There is no reason to believe cognitive enhancement (in itself) will change this. Indeed, when these families allocate resources for their children to receive some cognitive enhancement, they likely will expect certain outcomes, and may provide additional resources to promote them further. Birch worries that allocations of resources for enhancements, as well as allocations to ensure positive outcomes from them, could be accompanied by a concomitant decrease in resources for, and concerns about, the outcomes of those who are not enhanced. Moreover, even if such a decrease in concern and resources for those who are not enhanced does not occur, the resource gap between families that have access to the technologies and those that do not is widened and a capabilities gap between students who are enhanced and those that are not is initiated in virtue of the enhancement.

Another potential (though speculative) difficulty with the argument from cognitive enhancement suggested by Birch is that cognitively-enhanced individuals, rather than having an increased commitment to justice, may develop a sense of inherent (notmerely cognitive) superiority.

The preoccupations at the beginning of the twentieth century established certain traits as the preserve of specific individuals, dependent upon their class and race, which affect their role in society. Thus it would not be difficult to foresee a time when the intelligently 'enhanced' could assert a claim to superiority based upon their inherent sense of justness (2005, 25).

Birch's concern here builds off of one raised earlier—that a potential result of differential access to enhancement technologies will be intentional and value-laden biological (or bio-machine) differences among people. This might result in further discrimination and biases, beyond the already widespread discrimination and biases that have been predicated on unintended, undesigned biological differences.

The argument from virtue enhancement, either on its own or in combination with the argument from cognitive enhancement, is a better response to the social justice problem than is the argument from cognitive enhancement alone, in this sense: if virtue enhancement were realized, then it would result in increased concern about, and propensity to act to reduce, social injustice, and so it might result in reductions in social injustice. There are other difficulties with the argument, however.

First, it appears unlikely that virtue enhancement will be at the forefront of human enhancement. Technologies that increase healthful longevity and cognitive capacities may significantly precede it, for both technical and social reasons. The relevant underlying biological mechanisms and genetic components of physical health and cognitive functioning are better understood and are receiving more research attention than those associated with a sense of and commitment to fairness or justice. So even if, as Savulescu hypothesizes, there is a genetic or otherwise biological component, and even if effective technological intervention is possible, virtue enhancement technologies likely will not be developed as quickly as enhancement technologies associated with other capacities, leaving the social justice problem (at least temporarily) unaddressed. There also may be greater reluctance among people to engage in deep psychological interventions—as an intervention associated with a sense of justice would be—in comparison to cognitive and longevity enhancements. This is, of course, speculative, but the former might be implicated in people’s self-conception and self-identity more strongly than the latter, resulting in more reluctance to engage in virtue enhancement, again resulting (at least temporarily) in the social justice problem being unaddressed.

Second, the virtue enhancement approach to addressing the social justice challenge has obvious deficiencies when compared to addressing directly the social context factors in place prior to the widespread implementation of human enhancement technologies. Addressing the social context directly is more immediate—there would not be a lag between adopting human enhancement technologies and addressing the social justice problem. Addressing the social context directly also is more likely to be successful. As suggested above, it is far from certain that virtue enhancement will be effectively developed and widely implemented. Moreover, directly addressing the social context would address injustices that already exist, i.e., prior to the implementation of human enhancement technologies, and therefore merit concern and attention, even independent from their relationship to human enhancement technologies.⁴

So while virtue enhancement, either alone or in combination with cognitive enhancement, could promote rather than impair social justice, its realization and implementation is by no means assured and there is a readily available and preferable alternative (although not a contrary one).

The arguments against there being a social justice problem are not compelling. Bostrom, Naam, and Kurzweil are likely to be mistaken about how inexpensive and

⁴ A similar response is appropriate to the second formulation of the argument from cognitive enhancement, i.e., that even those who do not have access to the enhancements (including the world's socially and economically worst off) will be better off if the enhancements are developed and disseminated, since they will benefit from what those who are enhanced are able to accomplish (for example, improvements in agricultural, energy, and environmental remediation technologies). Human enhancement technologies are not necessary to develop these technologies. The lack of pro-poor technology research and dissemination is not due to a lack of technological capabilities, but to social and political factors (e.g., incentive structures, funding priorities, and governance). Moreover, addressing those factors is more immediate, likely to succeed, and addresses an already urgent social problem (independent of human enhancement technologies), and is therefore preferable to an approach mediated through the implementation of human enhancement technologies.

readily available the technologies will become, how much of an advantage even minor enhancement differentials are likely to provide, and how significant the time lag between initial adoption and widespread availability will be from a competitive and positional goods perspective. Moreover, there is no evidence (or other justification) to think that those who are cognitively enhanced will be ethically enhanced, i.e., more motivated to address social injustices, and virtue enhancement is likely to be more difficult, more controversial, and, therefore, later realized than cognitive enhancement. Finally, developing human enhancement technologies is neither necessary nor the most efficient route available for addressing social injustice and the needs of the socially and economically worst off.

6. Conclusions and Comments

Are human enhancement technologies likely to be social justice promoting or social justice impairing? Several conclusions and comments relevant to the issue are warranted:

1. Given the obtaining features of the social contexts into which they would emerge, human enhancement technologies are likely to be justice impairing. There are pre-existing unjust inequalities that are likely to result in unjust disparities in access to human enhancement technologies. Human enhancement technologies are likely to perpetuate or increase these inequalities, given the advantages they would provide with respect to competitive and positional goods. The reasons proffered

for why the resultant inequalities would not be justice impairing are not plausible.

2. Human enhancement technologies may not be inherently unjust. Human enhancement technologies are not responsible for the obtaining unjust social inequalities. Moreover, if they were introduced into a comprehensively just society there is no reason to believe (on the basis of arguments discussed in this paper) that they would result in unjust inequalities with respect to either access or outcomes (Buchanan et al. 2000). However, what matters to the social justice issue are the possible technologies that are likely to be created and distributed in actual societies, with their particular social arrangements and institutions. So even if human enhancement technologies are not inherently unjust, this does not alleviate the social justice challenges associated with them.

3. This social justice problem associated with human enhancement cannot be effectively addressed through technology development and design. The social justice challenge for human enhancement technologies could be reduced by addressing the problematic social, economic, and institutional features that contribute to them, e.g., health care, taxation, and education policies and institutions. For reasons discussed above, i.e., immediacy, plausibility, and effectiveness, addressing the

problematic features of the social context is far preferable to ‘virtue engineering’ approaches, which are the proffered techno-fix. We must fix social injustice; the technologies will not do it for us.

4. This social justice issue is only one ethical consideration relevant to the development and dissemination of human enhancement technologies.

The conclusion that human enhancement technologies are likely to be justice impairing unless the relevant features of the relevant social contexts are addressed is not an all-things-considered ethical evaluation of either human enhancement technologies as such or particular enhancements by particular means. (Different human enhancement technologies will have different ethical profiles.) As discussed earlier, there are other justice considerations that are relevant, e.g., participatory justice and autonomy. In addition, there are ethical considerations that fall outside the domain of justice (as it is often conceived), e.g., environmental values, individual flourishing, and aggregate welfare, that are crucial to any all-things-considered ethical assessment of any particular form or method of human enhancement.

There is a social justice problem associated with emerging human enhancement technologies. This does not (alone) imply that there should be a moratorium for research on technologies that have human enhancement potentials or even that public funding of it should be eliminated, for example. It implies that if the goal for the development and

dissemination of human enhancement technologies is to promote flourishing in sustainable and socially just ways, there is considerable and difficult social and political work to be done to accomplish the justice component. Proponents of ethical development of human enhancement technologies should be concerned as much about education and health care reform as they are about public funding for research on regenerative medicine or regulation of synthetic biology.

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