Proponents of using medical technology for enhancement sometimes misunderstand how the biology of enhancement works. Appreciation of biological diversity supports a program of enhancement. Acknowledging a liberty right to be biologically different addresses worries abut enhancement's being undemocratic. Doing so also suggests changes in emphasis to strengthen the case for enhancement.

Introduction

Enhancement is as American as apple pie, despite philosophical and political claims to the contrary that cast enhancement as alien or alienating. Attacks launched against enhancement aim at the idea of creating supermen, but the attitudes that animate these assaults cannot help but take out peripheral targets too. All biological outliers are within their scope because the arguments against using medical technology to alter people beyond the commonplace are structured to reject whoever appears not to be normal. Such reasoning valorizes populations of biologically "normal" individuals, making their homogeneity an important social goal. In contrast, the traditional American personal liberty value promotes diversity and so frees people to not be normal.

In an era that promises enormous expansion of control over our biological processes, liberal democratic theory should prize the right of citizens to be biologically different from one another, and to diverge from species typicality – from supposed biological norms – without restrictive social penalties being imposed. But what of the fear that permitting this sort of biological freedom to diverge from species-typicality through enhancement comes at the cost of social freedom? Prudence is advisable, because enhancement technologies being more readily available to some people than to others could impose burdens. Nevertheless, enhancement's basic nature is to nourish freedom, not to starve it.

It is as much within our power to reduce the political and social risks of using new biological technology for enhancement as to safeguard against the biological hazards to which therapeutic applications of the same technology may be susceptible. Worries about possible anti-democratic outcomes of applying biological technologies for enhancing, rather than just for curing, are not chimerical fears. But using applications of the technology to enhance is not inherently dangerous. We have, of course, a horrid tradition of unfairly punishing

people's biological differences while privileging other people for being species-typical or "normal" (Silvers 1998). Such differential treatment is traceable, however, to widely promulgated misconceptions about the naturalness and normality of biological homogeneity. So if the price of guarding against social or political harm occasioned by new biological technologies lies in improving how fairly we treat each other in spite of our biological differences, that price seems more than fair.

Biological Contingency

The liberty to be biologically different is grounded in an understanding of the truth of biological contingency. Disregard of biological contingency is a fault that distinguishes both virulent supporters and virulent opponents of applying our new biological technologies to enhance people. That opponents should ignore what the relevant biological technologies actually do is not so surprising, given their fear of the cultural changes they believe would ensue from biological alteration. But supporters doing so as well only fuels their antagonists' fears.

Biological contingency is true because biological properties – whether these be sex-related hormone secretion, skin pigmentation, or number of feet - generally are not intrinsic strengths nor weaknesses, nor are biological properties essentially functional nor dysfunctional. Whether a biological property enhances or reduces a person's capabilities is contingent on both the physical and social contexts in which the individual is situated. For example, generous testosterone secretion is a functional strength in environments rife with physical combat, where muscle bulk, speedy recovery from injuries, and hair trigger aggression are useful, but it is a functional weakness in a nonbelligerent environment where inducing trust and facilitating cooperation are crucial to productive functioning. Oxytocin secretion may be more functional in the latter context (Kosfield et. al. 2005). Secreting testosterone in precisely the species-typical amounts may be prudent for Tour de France competitors, but is not so important generally.

Vaccination exemplifies the relevance of context in assessing whether a biological enhancement helps or harms. Enhancing people's immune systems may seem equivalent to strengthening the persons, for increased ability to fight off infection initially appears to be an unequivocal benefit. Vaccination technology therefore is one of the therapeutic processes suited to effect benign enhancement. But even in this case, we must balance benefit against risk in relation to context, for we are applying a (prophylactic) therapy that can also enhance.

Vaccination was developed in the eighteenth century, despite religious and scientific opposition, to extend life expectancy and improve people's quality of life. Initially it was opposed as unnaturally against God's plan because it is a technique that permanently strengthens the human body beyond its naturally susceptible state. Concerns about the propriety of altering the bodies that God gave us, and fears about interrupting the familiar cycle of purges of the population by epidemic illnesses God visited on us, were reasons given for condemning vaccination technology (White 1895, 2006). Although vaccination is so commonplace today we do not identify it with being enhanced, this technology clearly improves immune systems so that people overcome inborn natural susceptibilities. Vaccination techniques have been refined, and vaccination targets multiplied, to give individuals better immunity than they could achieve absent medical intervention. Vaccination programs have brought about unprecedented levels of population healthiness as well.

Yet strengthening immune systems is not an unconditional benefit. The technology to do so holds some hazards, for agents that stimulate immunity may have unintended effects. Nor is heightened immunity dangerous only when artificially induced, for natural immune reactions can turn a person's body against itself. For example, the highest mortality in the 1918 influenza epidemic was suffered by young adults (15 to 34 year olds) because their bodies could not survive the vehemence of their immune systems' response to the virus (Billings 1997). The self-same immune process that helped them overcome other infections that were fatal to weaker individuals completely shut down their respiratory systems, while weaker individuals recovered.

Should we permit the use of therapies that also have the power to enhance, as Ritalin and Prozac do? Should we permit therapeutic uses but police these stringently to prevent the substances being used otherwise, as we do with opiates? For one thing, being enhanced is not always freely chosen. Enhancing a biological capability

sometimes is integral to mitigating a biological incapacity as, for instance, people who cannot walk sometimes develop enhanced arm and shoulder strength from swinging through on crutches or pushing on wheels attached to a chair.

The question also is difficult because often there is no clear division between enhancement and cure. Context also affects whether a medical intervention merely mitigates or enhances. Having two feet, or even one, foot, rather than having none, can be helpful in some situations, for example if a person oversleeps and must leap out of bed and into the shower. Having no feet rather than two, but protheses instead, may be more useful if moving very fast over a track is more important than leaping onto a floor, or if the floor leapt upon is sprinkled with glass. But there's no substitute for fleshly feet if a person craves a soothing foot massage. Prostheses that replace amputated extremities can enhance certain kinds of activities while making others more difficult. We thus should be enormously cautious in extrapolating the burdens or benefits of biological properties from individualized contexts to general principles.

The special prosthetic foot used by the bicycle racer Dory Selinger is preferable to a fleshly foot because it connects directly to the bicycle pedal and does not flex at the ankle, permitting more efficient transfer of energy from man to machine(Squatrighlia 2001). Yet if needing to escape a burning bedroom in the middle of the night, Selinger might be better off with his original flexibly but firmly attached at the ankle foot than with a prosthetic he has to pause to put on. On balance, of course, both before and after his amputation, bicycle racing was more important in Selinger's life than escaping from fires at night.

The South African track star Oscar Pistorius, whose congenitally anomalous feet were amputated in childhood (Philip 2005), uses modern alloy artificial feet that return almost as much energy as the runner's weight loads (Hood 2005). But this is only half as much thrust as the strongest, best trained human calf muscles can provide. So being a double amputee may seem disadvantageous for speedy running, until one realizes that Pistorius's prosthetic ankles can be lengthened well beyond the commonplace, consequently lengthening his stride. In his first race with the newest design racing feet, his time was just 1.22 seconds outside the current Olympic qualifying time, and he's widely expected to shave much more off his time after prosthetic adjustment to make his stride length optimal, and more practice.

Many contingencies individualize whether a prosthetic improves or reduces functionality. Optimal prosthetic design is contingent on progress in metallurgy to produce better alloys. Psychological (for instance, that the person desires to be a competitive athlete) and physical (for instance, that the person is otherwise physically suited to achieve speed) as well as social (for instance, that there are organized bicycle and track competitions that permit people with amputations to participate) factors are important.

These examples show why biological properties commonly thought of as essentially enhancing or essentially depriving, or essentially functional or dysfunctional, actually deserve neutral assessment until context is supplied. The means to enlarging a certain performance or experience may strike people who value such performance or experience as beneficial, but strike people who prefer other, incompatible performances or experiences as damaging. So whether strengthening a biological property is an improvement or loss is contingent on both the physical and the social contexts in which the individual is situated.

Superficial enhancement scenarios such as that medical technology will extend the human life span to many hundreds of years are unrealistic. Doing so would require correlating changes in many biological properties at the same time, as well as fortuitous coordination with the ever-evolving physical and environmental context. More likely, therapeutic interventions directed at alleles known to contribute to early mortality will raise life expectancy (not lengthen life-span) by addressing some of the causes of people's dying before advanced old age, just as improving sanitation and nutrition once did to increase life expectancy.

Optimizing alleles through technologies that manage genes may enable some people to deliver particular kinds of performances that excel. There are various combinations that might enable a body to run faster, or eyes to read faster, than anyone previously. But whether such enhanced performances ultimately count as benefits or

harms depends on context, so we should not preemptively either court or condemn them, anymore than we should view vaccination technology either as a guarantee of well-being or a categorical threat.

Progressives are likely to be more hopeful about the outcomes of biological change, while conservatives may be less optimistic about escaping its risks. But their debates about the propriety of enhancement technology, or more precisely about therapies with the power not only to heal but to enhance, do not address the intrinsic morality of either the aims or the means of enhancing. Their quarrel is about the most propitious formula for weighing likely benefits of potentially enhancing technologies realistically against risks.

Democratic Equality and the Antidote to Species Norming

Stripped of context, biological difference is biologically neutral, but should it be politically neutral as well? Equality of opportunity, as expressed in the familiar instruction to be "All you can be," calls for political and social structures that enable all of us to develop and exercise our strengths and talents, whatever these are, as long as doing so does not harm others. Applied to biological difference, equality of opportunity calls for participation in political and social practices to be equally open and inviting to individuals who differ from each other biologically.

Some critics worry that using bio-technology to bestow biological enhancements cannot help but exacerbate social inequality. Worrying that inequitable distribution of biological technology will make the rich richer is widespread. An interview about the value of the world's first manfactured equine, cloned from a cell of a champion racing mule, produced the following illustrative assessment: "If they were doing it on a large scale, we'd be against it," said Haw (a thoroughbred horse owner). "Then the best animals would be owned by the richest people. It wouldn't be right for only the billionaires to be able to afford it" (Johnson 2006). But it is mistaken to think that economic advantage achieved through biological technology this way damages equal opportunity.

We should not conflate equality of opportunity and equality of outcome. Consider why athletes with amputations were, and still may be in future, barred from Olympic track trials. They used to be barred – denied opportunity to compete – because old-fashioned prosthetics handicapped them. Clunky artificial feet were feared to take too much edge off their competing, even if their natural talent was great. Today enhancement technology creates superior prosthetic running feet, making it conceivable for amputees to run Olympic trial qualifying times, and even run much faster. But where once they were denied opportunity to compete for being too slow because of their artificial feet, they now may be denied for being too fast because of their artificial feet.

If so, equal opportunity will be closed to their talent and training by bias about the substance of people's feet. Far from victimizing equal opportunity, enhancement is similarly victimized. But if their participation depends on equality of outcome, and their matching – neither undershooting or overshooting – species typical outcomes, the biologically different always will suffer exclusion. This is evident from the nature of biological gifts.

Like disabilities, biological enhancements tend to diversify performance outcomes rather than homogenizing them. One reason is that to become biologically more efficiently or effectively functional in one way is not to become biologically more successful overall. Thus individuals who have biological talents do not necessarily enjoy competitive advantages over species-typical individuals. If their strengths and talents are not appropriate to the context, or are not appreciated and cultivated, they may be no more competitive, or even disadvantaged, instead.

The kinds of biological talents people have, and the contextual differences that make these beneficial or not, are so diverse as to render outcomes achieved through biological talent incommensurable and thereby to defy judging whether they are equal. We cannot clearly compare outcomes in contexts to which those with unusual talents are suited with outcomes in commonplace contexts. So equality of outcome appears to be a value appropriate for biologically homogeneous populations but not for biologically diverse ones.

Equality of opportunity is the democratic value crucial to a biologically diverse population. Biologically enhancing one or another talent won't lead to suppression of equality of opportunity, for people enhanced in different ways have an interest in maintaining multiple avenues of opportunity to ensure finding some suited to their special configurations of powers. Rather than increasing social inequality, the proliferation of enhancement technologies should discourage people from measuring their life's outcomes against each other and homogenizing conceptions of well-being, and thus should invite more kinds of opportunity.

Nevertheless, uneasiness about enhancement is understandable. Too many enhancement proponents adopt the discourse of biological strengths and weaknesses. Their opponents share this error. Both affiliate with a conceptualization pressed by eugenics theories, namely, that biological differences should be judged as weaknesses or strengths, and disposed of or promoted accordingly for the sake of biological homogeneity. Indeed, the best protection against eugenics is not to abandon enhancement but to reject thinking that does not appreciate biological diversity. Promoting biological diversity is the most powerful, pervasive, and persistent way to undermine the conceptual foundation of eugenics programs.

The fear that enhancement necessitates eugenics also confuses population enhancement, which may be harmful but is not diversifying, with individual enhancement, which is diversifying but harmless. Eugenics homogenizes populations with the aim of reducing the frequency of dysfunctions or weaknesses. In addition to population enhancement's wrongful targeting of minorities, such programs are alarming from anyone's viewpoint.

First, because different biological properties often are correlated, seeming weaknesses can be paired with sure strengths, complicating whether to sacrifice both or save both. Second, a functional property may become dysfunctional if the environment changes, or alternatively, as is famously illustrated by sickle cell trait, which conveys protection against malaria helpful in lowland climates but also causes debilitating symptoms at elevated altitudes. Thus programs to eliminate so-called "bad" properties to improve the population could in the long run have the opposite effect. Third, species that maintain diversity of talents within their populations are in principle more adaptable and perhaps more competitive. Proposals to improve the population by homogenizing people biologically also undemocratically impose ideas of what is biologically good that have no firm biological foundation. Political systems therefore should assign neither advantage nor disadvantage on the basis of biology, either explicitly, or as an unintended consequence of policy or practice.

The Right To Be Biologically Different

For biological difference to remain politically neutral, the political system should neither advance nor hinder people either because they are biologically typical rather than extraordinary, or biologically extraordinary rather than typical. It may seem odd to articulate this caveat, grounded in the fact of biological contingency, as a right, specifically the right to be biologically different. For often, although not always, people who are biologically different have not chosen to be.

So how can there be liberty claims to biological difference? What could it mean for people to have a right to be what they cannot help but be? Why are we obligated to respect biological difference rather than just to tolerate it?

Understanding the right to be biologically different, whether artificially or naturally so, and whether difference is adopted voluntarily or results accidentally or from inheritance, begins with recognizing that no bright line separates natural and artificially adopted biological differences. From tattooing (altering one's pigment to be more attractive and thereby more competitive) to training (altering one's muscle strength and ability to oxygenate to have more stamina and be more competitive), people voluntarily alter their biological properties to enhance themselves without anyone thinking the improvement is unnatural. Whether members of a biological minority chose to be so or not, social restriction should not delimit what their biology can enable them to do.

In principle, people might reasonably be denied liberty rights to two main types of biological properties: properties that directly cause their possessors to harm others and those that indirectly result in harm to others.

Beyond science fiction scenarios about biologically manufactured soldiers with enhanced aggressiveness launched directly at their designers' enemies, enhancement most often is thought to endanger indirectly by conferring unfair advantage on undeserving competitors.

Of course, technologically induced enhancement could be yet another means those who have much can deploy to maintain their advantage over those who have little. Would whoever objects on this ground to cloned racing mules also find Pistorius's racing on his manufactured feet to be unfair? So unfair as to deny him the liberty of competing? Surely a runner whose fleshly ankles afforded identically lengthy stride would not be similarly excluded. As both the lanky ankled runner and Pistorius achieve their speed through training and talent, and through lower extremities of the very same length, it's hard to find unfairness here. For enhancement technology, applied individually rather than delivered in a society-wide eugenics program, alters people incrementally rather than giving them capabilities of a different order. So even the costliest enhancements is unlikely to be effective without individual effort to make it work.

Further, such concern about making enhancement technology available for individual use assumes that human well-being is basically competitive rather than cooperative, and therefore that additional capabilities for some people cannot help but mean losses for others. But even if Pistorius's stride were considerably longer than any fleshly leg could ever deliver, it would be pernicious to hold the right to be biologically different hostage to a perverted model of human interaction. Competitive games provide entertaining thrills, but for at least two reasons they are poor models for productive societies.

Games are, first, unproductively arbitrary. A marathoner's having the resources or good fortune to increase his capability of oxygenating by training in Kenya as opposed to a sea-level site seems neither less nor more harmful to competitors than his increasing oxygenation by undergoing gene transfer. It is the terms set by the organization of the game that makes it seems so. Neither training site is available to all participants equally and this is arbitrarily accepted by the rules of the game, whereas gene transfer used by some competitors but not others arbitrarily is not.

Second, games are unproductively exclusionary. Games call upon narrow kinds of talent to the exclusion of other equally productive ones. It would be more useful to ask how individual enhancements could affect a society that values cooperation over competition.

How biological technology might expand the ways in which individuals contribute to each other's well-being is not well explored in transhumanist literature. Transhumanist writers commonly focus on how enhancement can elevate success in living longer, becoming smarter and even being happier, but how enhancing individuals might facilitate people working together often seems an afterthought for them. Yet everyone benefits from talented colleagues who can contribute something special to the work, and whose talents also leave room for other people's contributions.

Transhumanists' inattention to the prospect of enhancing human collaboration may be, in part, because empirical studies only now are illuminating the complex biological mechanisms that facilitate human cooperation. Of course, enlarging cooperative behavior is more complicated than altering individual genes. Doing so also is more sophisticated than administering transmitters such as oxytocin, for how conducive such a substance will be in effecting collaborative behavior is affected by whether each recipient's past experience of placing of trust in others has been reliable (Carey 2005). The prevailing social organization thus will influence the effectiveness of biological intervention to expand human capacity to be cooperative. In regard to enhancing productive cooperation, we should understand that promoting the right to be biologically different supports the development of multi-talented cooperative teams.

To counter understandable fears about dangerous privileging and dangerous homogenizing resulting from applications of enhancement technology, transhumanists should enhance their appreciation of biological diversity. As well, they should consider the implications of enhancing biological properties associated with the collaborative capabilities that make humans more productive than other animals. In focusing more on the social

goods that biological diversity brings, they will find it easier to make enhancement's strong connection to democratic values clear.

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