

# *Studies in Ethics, Law, and Technology*

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*Volume 2, Issue 1*

2008

*Article 5*

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## Engineering Greater Resilience or Radical Transhuman Enhancement?

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# Engineering Greater Resilience or Radical Transhuman Enhancement?\*

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## Abstract

This article investigates the conceptual distinctions between therapy and various forms of human enhancement. It begins by proposing a typology of human enhancements in order to make more rigorous and grounded discussions about the distinction between therapy and enhancement. Three types of human enhancement are proposed: 1) engineering traits of accepted value, 2) engineering traits of contested value and 3) radical transhuman enhancements. Subsequently, the paper explores the distinctions between the ethical justifications that are advanced for therapeutic interventions, comparing them with human enhancements, concluding that the salient characteristic of health-related suffering enables enhancement to gain legitimacy from the perspective of traditional medical ethics. Finally, the paper considers a number of practical obstructions to the realization of radical transhuman enhancements. Specifically, it discusses procedural obstacles to approving experimental medical research for human enhancements, the likely commercialization of human enhancements that would ensue from their development, and the need to develop experimental medical interventions via animal models.

**KEYWORDS:** human enhancement, transhumanism, therapy, slippery slope

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\*The author is grateful for the extensive comments of reviewers on the first submission of this article.

## Introduction

John Mackie once said to me that if human genetic engineering had been available in Victorian times, people might have designed their children to be patriotic and pious. (Glover 2006: 221).

Piety and patriotism are complex socio-cultural characteristics that are far removed from what is typically imagined as the kinds of traits that could or should be altered by genetic engineering.<sup>1</sup> Yet, this comment by Glover is of interest to this paper for reasons other than its feasibility. It captures one of the central moral concerns that is often discussed in the context of human enhancement, that of the mode through which they would transform the moral values we hold. Thus, rather than our gradually acquiring our sense of morality through a range of cultural interactions and confrontations with philosophical dilemmas, this form of human enhancement implies a generational transition of values that appears to omit the importance of individual scrutiny. As such, it corrupts the evaluative systems that structure societies, by removing the complex relationship between achievements and willed action. If one examines any performative culture, then the implications of this challenge become evident. For example, in the context of musical achievements, the much-discussed prospect of genetically selecting for perfect musical pitch (Robertson 2003), raises a question about how one would regard such abilities, if they were manufactured by science.

The dilemma is even more profound when considering the prospect of engineering characteristics that are broadly connected to our moral character, since the value of such traits is partly located in their having been acquired through socialization, as opposed to some innate biochemical configuration.<sup>2</sup> A considerable part of this concern is also closely tied to the radical nature of such modifications. Glover notes that ‘value change should be a slow, reflective process’ rather than something that should be engineered by technology, as if flicking a switch. On this basis, genetic engineering is often considered morally

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<sup>1</sup> This is not to deny that there are links between biochemical states and the likely demonstration of certain kinds of personality types, but it is also not to endorse a determinist view of such relationships, where environmental conditions play a significant part in the manifestation of these links through certain behaviours or conditions of wellness.

<sup>2</sup> I limit my claim to displays of character that could not be regarded as extreme or deviant. Thus, while we might discuss the merits of claims that genetic predispositions make certain behaviours more likely – examples include aggression as a parameter of criminal action – the assertion is offered here in the context of general quotidian moral character, for which the intervention of a legal judgement is not required. Examples might include acts of altruism, the nurturing of children, patience and so on. For such characteristics, we tend primarily to attribute the credit at the level of the individual, while acknowledging other social conditions that might have enabled such character to flourish (parenting, education and so on).

troublesome because of its capacity to radically transform value systems in the absence of wilful, individual action.

The quote from Glover also signals the difficulty with making claims about whether a specific modification has enhanced humanity or not, since our understanding of enhancement at any point in time will be informed by the culture we inhabit (Miah, 2008). Thus, the persuasive force of Glover's point is that, currently, we have dubious regard for the personality characteristics of piety and patriotism. His proposition invites the reader to consider how impoverished today's world would be, if these personality types were dominant features of people's identities. Yet, even if one accepts the feasibility of character engineering, the proposition is provocative rather than realistic, since it is unlikely that engineering such characteristics would be quite so precise. Indeed, if such precision were feasible, it would, nevertheless, be morally suspect to engineer such dominant characters into any future person, for fear of it leading to fanaticism or an unbalanced personality. Instead, any personality enhancement<sup>3</sup> is likely to involve selecting from a range of characteristics that could be optimised, some of which might even be oppositional. For instance, how would one engineer both the virtues of *patience* and *ambition*, which one might reasonably wish to hold in some measure, but which might be oppositional personality types. Moreover, if such a range of options were not available, then it would be morally suspect to support research that led to the exclusive pursuit of such highly precise and socially informed traits as piety and patriotism.

This ambiguous value of personality types raises questions about which types of modification could, unequivocally, be regarded as enhancements. Engineering 'piety' and 'patriotism' does not clarify what, specifically, would be improved as a result of enhancing such sentiments or, at least, any such evaluation of these terms cannot take place outside of a particular cultural context. In this case, it is not a biological characteristic that could enable certain superhuman traits or even improve of our resilience to disease. Rather, this kind of genetic engineering is proposed as an enhancement of human character.

These two types of question about enhancement – the capacity to claim whether an intervention is an enhancement and the specificity of interventions - inform the approach taken in this paper, which is concerned with the conceptual assumptions surrounding the ethics of human enhancement. I begin by proposing a typology of human enhancements, which endeavours to introduce more rigour into debates about the relationship between therapy and enhancement and the ethical expectations of each. Subsequently, I consider the justification for therapeutic interventions, before considering whether similar reasons also support

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<sup>3</sup> I note that there is often no recognition within debates about cognitive enhancement that such interventions would also likely alter broader personality characteristics and this relationship requires further exploration.

enhancement interventions. I conclude by proposing various procedural obstructions to human enhancement that are necessary to overcome to enable a positive evaluation of human enhancements.

## Therapy or Enhancement? A Typology

Discussions about therapy and enhancement often employ quite simplistic methods of distinguishing between different forms of intervention. The consequence of this is an ongoing lack of clarity over the subject of disagreement, when considering the prospect of human enhancements. Thus, it is unclear whether the different positions on the legitimacy of human enhancement are specifically related to the more radical forms of human enhancement, or whether they also apply to more modest forms, such as engineering greater resilience to infections or the capacity to tolerate a wider range of temperatures, for instance. The challenge this presents is exacerbated by the expectation within ethical inquiries to achieve general norms that might apply to all kinds of human enhancements. I argue elsewhere that the legitimacy of any human enhancements will require close scrutiny of the cultural context within which such claims are made (Miah, 2008), which limits the capacity to discern general principles that would apply to the ethics of human enhancements. In addition, to inform these discussions, I propose here a typology of human enhancements in part, to clarify the distinction between therapy and enhancement, but also to make more precise the subject of objections to human enhancement. This typology should be a precursor to establishing moral distinctions between different types of human enhancement.

### **Proposed Typology of Human Enhancements**

1. Engineering Traits of Accepted Value (eg. greater resilience to disease, such as the fluoridization of tap water or inoculations)
2. Engineering Traits of Contested Value (eg. engineering piety and patriotism)
3. Radical Transhuman Enhancements
  - a. Extending Human Capabilities (eg. height enhancement)
  - b. Engineering New Kinds of Human Function (eg. changing colour, flight).
    - i. Within the realm of biological possibility (eg. flight capability)
    - ii. Outside of biological possibility (eg. capacity to live in non-gravitational environments)

An initial category of human enhancement intervention can be broadly described as *engineering traits of accepted value*. This category is often discussed in the context of, say ‘pace makers, portable oxygen tanks and artificial limbs (Morenzo and Szafranzi 1998) along with the use of human growth hormone for children who have a deficiency. While these examples seem to correspond with what might be traditionally seen as therapeutic interventions, such examples are often invoked as a means of identifying our present cyborg status. The category also includes such interventions as childhood or travel-related inoculations or the fluoridization of tap water. A second category of human enhancements is the alteration of *traits of contested value*. This would include such interventions as cosmetic surgery and, indeed, the promotion of specific character traits, such as piety and patriotism. The contested status refers to the degree to which the value of the modification is relative, depending on one’s particular value system. For instance, the agonizing practice of leg-lengthening that is increasing within China might be valuable if you aspire to be a Chinese politician – which stipulates a minimum height of 5ft 7in for men and 5ft 3in for women (Watts, 2004), but has limited value if you want to be a jockey. It might also be undesirable if you reject the normalization of biological characteristics, but desirable if there is considerable social pressure and clear disadvantage that will ensue as a result of failing to normalize.

A third type of human enhancements can be described as *radical transhuman enhancements*. The label of *transhuman* is applied broadly and endeavours to engage with the range of contexts within which the language of human enhancements is visible. However, this final category encompasses two sub-divisions, each of which differs in the degree to which they can be described as either radical or transhuman. First, one can identify the alteration of traits that extend the limits of human characteristics. This corresponds to type 3a and encompasses uplifting people who are at the lower levels of the range of human normal functioning – though not within the range that would constitute illness or dysfunction, which would be category 1 – to the levels of people who are at the upper limit of this range. It also encompasses the extension of capabilities above this range of normal functioning, perhaps making people unusually tall.<sup>4</sup> Examples include using human growth hormone in people who are *not* medically deficient, though it also includes the use of substances such as caffeine, which might be used by people to stimulate energy levels beyond a normal range, either in beverages, pills or through injections. For instance, such substances might be utilized to create a state of being where nearly no sleep is required and so one’s productivity throughout life is extended by virtue of not needing to spend time sleeping. It should be emphasized that the enhancement potential of this type of

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<sup>4</sup> This type of human enhancements corresponds closely with ‘Erick’s Enhancement Distinction’ (Juengst 1998).

intervention will depend significantly on the context. Thus, in some activities, too much caffeine could diminish levels of efficiency, while in others it will enhance performance. This type of human enhancement also reveals why the modification of some characteristics are so fiercely contested, as forms of enhancement. For instance, if one considers the enhancement of intelligence, one of the difficulties arises from the lack of clarity over what constitutes the normal range of human functioning, which could function as a mechanism for knowing what would constitute enhancement. On this basis, if one considers the enhancement of memory retention, it seems reasonable to locate such a modification within the category of ‘contested value’, rather than to understand it as a form of extending human capacities, since such great retention of memories might be debilitating for some kinds of human functioning. The second type of radical transhuman enhancement (3b) also has additional divisions, but broadly encompasses modifications that furnish the individual with new kinds of capability, which might typically be described as non-human. Thus, the first of these is the engineering of capacities that are outside of the boundaries of human functioning but which might be visible within the realm of biological possibility, such as the capability of flight, or the ability to run at the speed of a cheetah. The second division includes conditions that are outside of all known biological possibility.

To explain the distinction between these sub-types of radical transhuman enhancement one might, again, consider *flight*. Thus, if one were able to engineer human wings that would enable flight, then this would fit into category 3b-i, as an enhancement that is biologically conceivable, but not a human facility. In contrast, examples of type 3b-ii could involve being able to exist in outer stellar environments or the capacity of teleportation. The legitimacy of this distinction requires further analysis, though it is initially relevant to note that it is an internal distinction within type 3 enhancements. As such, the typology conveys that there is some overlap among the sub-categories. Nevertheless, one might argue that there is little need to distinguish between that which is not humanly evident and that which is not biologically evident, since the former is simply an indication of a particular phase of the latter. In short, that which limits our human characteristics is merely a contingent indication of our current stage of human evolution. Nevertheless, the distinction is warranted, again, to limit the ethical debates, even if the precise determination of where any particular modification fits within the category could change over time, as evolution shifts our sense of what is possible and as our understanding of nature is enriched. So, if humans slowly developed into winged creatures, then the parameters of what is humanly possible would also shift. Equally, if it were discovered that certain species could live in alternate environments, then our parameters will shift. Indeed, certain scientists would dispute the claim that any capacities are, either, outside of all biological imagination, or even outside of human biology. For, one

might identify the ancestry of homo sapiens and claim that, say, the engineering of gills to allow our capacity to live underwater, reflects some form of origins to humanity.

Within each of these categories and sub-categories there is considerable ambiguity over where a specific intervention might fit. Moreover, any one example of human enhancement could correspond with more than one of these categories. For instance, the enhancement of memory retention could seem intuitively valuable when considering the recollection of facts. Thus, it might fit within category 3. However, its value is more dubious if, say, it were the modification of choice for an artist, who might require a different form of cognitive enhancement in order to claim that she has been enhanced as an artist. As such, it might fit more properly into category 2. This case also alerts us to the need for considerable precision when imagining the particular instance under debate. In this case, a condition like memory retention improvement might be too general a construct to allow us to speak sensibly about what might have been enhanced by the modification. Additionally, it will be necessary to further scrutinize the distinctions between these categories to establish whether they are mutually exclusive. For instance, an enhancement to height could fall within all three categories since it might 1) reduce certain risks of contracting illness 2) lead to a level of height that precludes certain life choices or conveniences, and 3) extend someone beyond the normal range of human functioning. This case is particularly rich to dissect, as there are various contested claims about the benefit of height, both medically and sociologically.

While I have not argued that this conceptual typology corresponds with some ethical hierarchy, one might conclude that the categorization shifts from interventions that are quite closely aligned with what is medically ethical to examples of modifications that are completely outside of such medical justifications. Thus, even if there are cases that seem to fit between categories, the typology could provide some initial clarification over whether one should have a different moral regard for each type of modification. Indeed, I would argue that there is a welcome degree of precision that this typology affords, though more work is necessary to fully explore this. Consider, for instance, how we might regard the following case: Anita is a 16 year old, exceptionally gifted basketball player, yet, at the age of 16, she has already peaked in terms of her height growth, which is approximately 15cm below the minimum height considered to be competitive at an elite level.<sup>5</sup> In this case, if Anita were to pursue a height enhancement, it would fit clearly within category 3a – a radical transhuman enhancement that extends human capabilities within the normal range of human

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<sup>5</sup> For arguments sake, we will assume that competitive height is essential to elite competitiveness in basketball, even though there are some exceptions to this rule.

functioning.<sup>6</sup> While this does not tell us much about whether it would, nevertheless, be considered ethically acceptable, identifying where the modification fits within the typology assists in eliminating objections that should more properly be raised in relation to other categories within the typology. For instance, this form of enhancement does not legitimize invoking claims about how the modification transforms Anita into a being that can be described in any meaningful way as monstrous or superhuman.

This proposed typology does not establish the moral distinctions between each type of human enhancement, though it offers a conceptual distinction that emerges from various kinds of examples used in discussions about the ethics of human enhancement. As such, it is a means through which claims about such prospects can be made less speculative and where general objections to human enhancements can be made more precise. It should also ensure that debates about the ethical issues arising from one category are not subsumed into broader discussions that relate to other categories. Specifically, the typology asks more from the distinction between therapy and enhancement than is previously evident within the literature. While such authors as Mehlman (2005) offer an effective analysis of why some categories of enhancement could equally be re-described as therapeutic, the present typology takes further the various ways in which one should consider a modification as an enhancement, as the radical transhuman alterations convey. Nevertheless, it is useful to explore this in more depth. For instance, if one sought enhancement to raise height or even intelligence to a level that corresponds with the upper sector of the normal human range, the consequence of this would be a shift in what is regarded as normal. This prospect is described in Brock et al. (2000: 105):

A highly idealized or perfectionist view of superior or normal traits would mean that a trait we ordinarily take to be normal would count as 'defective'. Elimination of these traits would then become the legitimate target of negative eugenics.<sup>7</sup>

Thus, the long term consequence of enabling such enhancements could be a translation of what is regarded as good/ill health, since individuals who are below the normal point of this enhanced range could find themselves subject to the medical diagnosis of needing enhancement. While this need not imply the kind of

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<sup>6</sup> I dismiss the dubious claims about whether height affects health, partly also because our case does not involve a person who is extremely short, but one who merely might require an extra 15 centimetres to be competitive. In this case, any health claim that might support its being categorised as 'engineering resilience' is not applicable.

<sup>7</sup> I note that Buchanan et al. (2000) indicate that the majority of abuses arising from eugenics were through negative eugenics (the elimination of traits), while our consideration is positive eugenics (the engineering of traits).

socially divisive consequences that some anti-enhancement scholars have suggested, it is important to take into account the affect of this on how people regard health status.

In sum, it is not at all obvious that one form of intervention leads to the possibility of embracing another category. For instance, there is no necessary link between engineering resilience and engineering contested traits. Yet, to the extent that such prospects are often presumed, the next section consider the legitimacy of therapeutic interventions in order to understand how such justifications differ from the various categories within the enhancements typology that I have offered.

## *From Therapy to Enhancement*

After establishing some initial distinctions between forms of enhancement, it will be useful to understand whether there are clear routes of transition from therapy to enhancement. While it might not seem necessary to explain the justification given to the general practice of medicine, it can be useful to explore this subject to more fully come to terms with medicine's ethical limits and whether, in particular, human enhancements transgress those limits. It seems unlikely that a single justification for medical intervention will satisfactorily address the many functions it performs. In short, there is no singular justification for all medical interventions. As such, I will adopt a threshold of what medical intervention minimally entails. Thus, the jurisdiction of medical concern involves its aspiration to treat health-related biological dysfunction – understood as an absence, reduction or excess of functionality – insofar as it contributes to the reduction of human suffering (van Hooft 1998). This seems an uncomplicated and conventional basis for justifying medical interventions and the sentiment is reflected in core principles within medical ethics. Thus, if medicine aspires to do anything – and it might also do more than this - then we must accept that this includes the interest to reduce the kind of suffering that derives from a range of health-related biological dysfunctions.<sup>8</sup> Such a rationale is clearly engaged when one considers various forms of illness. In each case, the medical intervention is justified on the basis that it could improve the quality of life by diminishing the suffering that arises from the biological dysfunction.

In comparison, the degree to which an individual who seeks medical intervention for enhancement purposes suffers from a health-related biological

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<sup>8</sup> The Hastings Center's four features of medical practice are helpful to explore here, though my minimum threshold reduces any vulnerability of the definition that might arise from their more elaborate conceptualization (Callahan 1996). In this early work, they also consider the prospective challenge of human enhancement interventions.

dysfunction is much less clear. To assist our clarifications, it will be useful to consider, again, our case of Anita the basketball player, where an appeal to enhancement might be made. It is tempting to argue that Anita *suffers*, due to the lack of genes that would enable her to reach the a height that is necessary to enable a reasonable chance of pursuing her life-long dream of playing elite level basketball. From here, one might then argue that she is entitled to seek the assistance of the medical profession to alleviate her suffering. Yet, while one might sympathize with her circumstances, the form of suffering she encounters is not the kind that usually gives rise to medical interventions. More specifically, it is a form of suffering that arises from relative, rather than absolute disadvantage. While one could envisage that medicine should intervene, if this experience of disadvantage were to lead to severe psychological trauma, even in this case, it does not follow that the mechanism of treatment should be enhancement, rather than, say, psychiatric counselling.

Of course, decisions about what are the most relevant means to treat specific medical problems are contested and one might argue that, in this case, an enhancement might be preferable to, say, years of counselling. Alternatively, one might envisage sociological interventions – such as changing the sport’s rules to provide competitive classes for shorter people – to address the injustice. However, the case of Anita indicates that there are crucial differences between suffering claims that result from illness compared with suffering claims that result from disadvantage. For Anita, the suffering is brought about by the disadvantage. In contrast, for someone who suffers from ill-health, the illness is constitutive of the suffering, irrespective of whether disadvantage occurs. This is not to deny that one outcome of medical interventions is its affect on relative equality, though its prior aim is to reduce health-related suffering that is incurred in a very direct sense by a specific condition itself.

Today, the challenge is that medicine is now in a stronger position to intervene through biological modifications, in order to alleviate the potential injustice arising from genetic variation. This state of affairs captures the ethical crisis within medicine over its social role in an era of sufficiently safe human enhancements and, the *loss of support*<sup>9</sup> argument notwithstanding, it is easy to sympathize with the claim that social change is a more appropriate mechanism for dealing with disadvantage arising from disability than medical intervention. Nevertheless, the crucial point seems to be that there is no obvious shift from therapy to enhancement, but that we must derive and accept different reasons for intervention than that which is required to support therapy.

However, presuming that the argument from suffering will still be advanced, due to the ambiguity over this term, one might still hold that not all

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<sup>9</sup> See Scott (2005) for an explanation of the various uses of this position.

kinds of suffering claims bear equal burdens upon medicine to intervene. So, the professional singer who claims to suffer by not having the same quality of pitch as another singer is in a qualitatively different position from the sufferer of cancer who faces the inability to pursue the most fundamental of life goals. Various scholars have sought to explain more about this distinction. For instance, Allhoff (2005) utilizes Rawls' notion of 'primary' goods to explain why enhancements are of limited concern to medicine. He argues that enhancement interventions would not contribute to the realization of primary goods, which are the sole interests that justify medical intervention. Similarly, Brock (1998) discusses the pursuit of *broad life goals* arguing that human enhancements are problematic when they do not lend themselves to the pursuit of a broad range of human pursuits, or where they limit the capacity to enjoy an 'open future', as Feinberg (1980) describes it. It is not difficult to imagine instances of enhancements that would violate such a principle – perhaps the engineering of piety and patriotism. However, it is more critical to dispel the suggestion that human enhancements would be utilized for a range of activities that are often discussed in these conversations. The engineering of athletic ability is one such example. While it is reasonable to consider the prospect of engineering general health enhancements that could also enable greater athletic achievements, it is less sensible to talk of engineering specific athletic skills directly, most of which are acquired through a combination of biological capacity and skill development. For instance, consider the events of high-jump or polevault. Undoubtedly, certain enhancements could have some bearing on probable success in such events. However, the conditions that would be modified to achieve this would be too specific so as to avoid violating the principles outlined by Allhoff, Brock or Feinberg. Thus, engineering greater height could be justified, though only up to a point and, most likely, not to the extent that would place an individual at the upper end of the range associated with competitiveness in such activities. This is because such extreme levels of height could limit the pursuit of a broad range of lifestyles beyond these very narrowly defined cultural pursuits.

These details are also important when coming to terms with the inadequacy of claims about the prospect of a *slippery slope* from therapy to enhancement. There is considerable lack of clarity over whether the terms through which certain kinds of *therapeutic* intervention might be permitted would apply similarly to *enhancements*, even when conceived as *engineering greater resilience*, the most moderate category of human enhancements. When imagining our other types of enhancement, the meaningfulness of comparisons between ethical standards is even more dubious. In short, we cannot compare the plight of the less-competent singer with that of the cancer sufferer, in the hope of resolving

whether there is merit in the pursuit of human enhancements at all.<sup>10</sup> Moreover, one cannot claim that it is necessary to, first, resolve the suffering of the cancer patient before considering whether we are free, also to pursue the claims of the singer. Indeed, history has shown that these processes are best addressed concurrently, rather than by moving from the successful alleviation of all forms of suffering to the pursuit of non-suffering interests, such as human enhancement.

On this basis, and bearing in mind the proposed typology of human enhancements, the progression from therapy to this range of non-therapies is more complex than is typically envisaged by proposing a slippery slope model. This is because the merit of the slippery slope argument relies on the presumption that each of these types of modification occur at different points on some imagined scale, where radical transhuman, non-biologic interventions perhaps represents the most remarkable types of enhancement. Alternatively, slippery slope arguments do not identify differences within forms of human enhancement, which limits their persuasiveness. In conclusion, the slippery slope model does not withstand close inspection where, at any one time, various types of enhancement are likely to be pursued. While there might be some slippage in respect of the first type of human enhancements – *engineering greater resilience* – the case is not easily advanced in relation to others.

## Obstructions to Human Enhancement

The discussion so far has identified that there are various types of enhancement that are the implied subject of concern within discussions about the ethics of human enhancement. Moreover, it has been argued as necessary to carefully conceptualize individual forms of human enhancements to come to terms with the precise objections arising from each. It has also been argued that the reasons for why one might justify medical interventions for therapeutic purposes have limited utility when arguing on behalf of human enhancements. While this does not imply that there are not good arguments to be found for such interventions, it indicates that other arguments should be advanced in order to gain legitimacy from within the sphere of medical ethics.

In extension to these arguments, there are also various other obstructions to human enhancements that require further elaboration. These obstructions differ from more general moral objections, which have been described elsewhere. For instance, one might discuss the argument from naturalness (Barilan 2001; Reiss and Straughan, 1996; Takala 2004), the tyranny of normality via cultural

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<sup>10</sup> Of course, the professional singer example is even more interesting because the appreciation of song does not easily correspond to some objective criteria.

complicity (Fiedler 1984; Little 1998) or criticisms of the pursuit of certainty (Brock et al. 2000; Parens 1995), as arguments that are generally sceptical of the values that underpin the pursuit of enhancement. These objections are certainly worthy of moral consideration, though they are not insurmountable, *practical* obstructions to the pursuit of enhancement, since each of these positions can be trumped by the pursuit of self-determination, a guiding principle within contemporary Western ethics. Consequently, rather than discuss the merit of this type of obstruction, I will focus on practical obstructions to human enhancement that are likely to inhibit the capacity to pursue, perhaps, all of the human enhancements discussed within the typology.

An initial obstruction arises from considering the mechanism through which approval for medical innovation is given. Specifically, it is evident that the rationale for investment into experimental medical innovations is governed by the therapeutic rationale, even when science remains experimental and, thus, where no specific therapy is identified. The basis for this prior value might vary and could include a strong conviction to utilizing medicine to help those who are most in need or, indeed, to facilitate a health care system that endeavours to promote the greatest amount of health equality across a population. In each case, the therapeutic rationale reflects a series of core values that deem therapy to be a larger social priority than enhancement. For this reason, a considerable obstruction is the capacity of certain forms of intervention to be given legitimacy as means towards human enhancement. To elaborate, one might consider the case of gene transfer. Currently, applications of gene transfer are restricted to therapeutic interventions and a common objection to the use of this science for human enhancement is to say that a) the procedures and science have not been developed for enhancement, so they cannot be deemed sufficiently safe, and b) that the techniques are still not effective as means of therapeutic intervention, so they cannot possibly be conceived as means of human enhancement.

These arguments indicate that gaining medical approval to apply therapeutic techniques to enhancement activities will need to achieve safety and efficacy at the level of therapy before enhancement applications could be approved. Moreover, they suggest a, potentially, insurmountable objection to enhancements, which involves the precise conditions in which medical interventions gain approval. Thus, if experimental medical innovations are persistently governed by an intention to treat a dysfunction, then the parameters of their license will always preclude the application of any specific product or technique to other uses, such as human enhancements. To this extent, the broader challenge of this objection is to obtain a general mechanism through which medical products and methods can be licensed for enhancement ends. The obstacle is, again, discernable via traditional principles of medical ethics. The

principle of *doing no harm* is likely to be violated in cases of utilizing experimental research with healthy subjects.

This is not to say that the science of enhancement should rely on therapeutic successes. Rather, it is to indicate that the development of experimental medical techniques is, at best, justified as a route towards therapy, simply because there is no alternative therapeutic option. In this sense, experimental medical research is justified as a necessity, rather than an unconditional desirable pursuit. In contrast, no such explanation can be advanced on behalf of the need to develop such techniques for human enhancement. On this basis, human enhancements will first find support for their capacity to make people well, before they can be judged as valuable for making people better than well.

My second obstruction concerns the likely commercial character of human enhancements. Thus, before their acceptance is likely, it will be required that suitable regulatory procedures are implemented to safeguard against the range of rogue practices that could emerge from a poorly regulated commercial market for human enhancements. While it is unreasonable to expect such systems to eradicate all forms of rogue science, this should be of limited concern since such practices are likely to be greater in an unregulated environment. Nevertheless, a reasonable threshold of anticipated bad practice should be clearly identified and accepted as an integral condition of any such system. Additionally, any such commercial system must adequately address the concern that commercial human enhancements would heighten social divisions in a way that is unacceptable. In response, it is necessary to recognize the limits of an appeal to social equality in an era of human enhancement. It cannot be assumed that all people will find the same value in all types of enhancement. As such, the aspiration to deliver human enhancements via a strict egalitarian model of distributing resources is unlikely to be desirable. At most, one might aspire to equal opportunity to pursue a range of enhancements that are available. Elsewhere, I argue why inequality should not concern us greatly, since the pursuit of difference through human enhancements is inextricable from our accumulation of 'biocultural capital' (Miah, 2008). This position outlines that our private consumption of human enhancements would vary considerably, thus making the appeal of achieving equality across society – perhaps in the way that one might more generally appeal to equality of being free from ill-health – is somewhat more complicated when considering instances of human enhancements. Also related to this obstruction is the concern that regulatory structures might never be capable of dealing satisfactorily with an era of pervasive human enhancement. However, it is also reasonable to anticipate that this inadequacy will not deter human enhancements from coming into existence. As such, the argument from regulatory inadequacy does not dissolve us from the task of having to address the implications of such technology.

A final obstruction concerns the required testing of enhancement interventions with animal models, where the justification for such utilization of animals is often considered weaker in the context of something that does not lead directly to a substantial reduction of identifiable human suffering. Notwithstanding the experimental research defence – that any research could, one day, lead to applications that can reduce human suffering – or, indeed, the view that no amount of human suffering justifies experimentation on animals, it will be crucial that any future technological development of human enhancements can find methods that avoid the need to test procedures within animals, in the same way that development of cosmetic products has been restricted. Of course, it is likely that human enhancement research will benefit indirectly from experimental research that aims towards therapeutic applications. For instance, the work on IGF-1 to address muscle wasting diseases, unavoidably informs knowledge of how one might delay age-related disease, enhancing mobility at the end of life. This form of ‘engineering resilience’ need not involve research that utilizes animals for enhancement reasons, but can benefit from the insights achieved via therapeutic science.

## Conclusion

Previous analyses of the distinction between therapy and enhancement interventions can be grouped into two types of encounter. The first group focuses on debates about whether certain forms of therapy lead to a range of possible enhancements. The form of these debates is of a ‘slippery slope’, of which there are various forms (Burg 1991; McNamee 2005; Resnik 1994). A second type of encounter focuses on whether we should be preoccupied at all with the distinction between the two and these debates are mostly responses to claims that therapeutic interventions, taken to their logical end, also embrace a commitment to what we currently imagine as enhancements (Daniels 2000; Resnik 2000). These tend to focus on holding the line on therapeutic interventions, even if there seems some flexibility for the concept to allow some forms of enhancement. Each of these debates draws from discussions about rule making or line drawing within medical law and ethics. Also for each, there is considerable lack of detail given to the various forms that either therapy or enhancement could take.

This paper proposes a typology of human enhancements in order to make more rigorous and grounded the discussions in this area. On this basis, I consider that there are certain forms of human enhancement that should not feature in applied bioethical debates, particularly those of the second and third type of radical transhuman enhancement (interventions that are outside of the range of human functions and outside of all biological functioning). This type of

enhancement often features in discussions about human enhancements, but they do not characterize instances of enhancement that bear much relation to the contemporary concerns of those who argue on behalf of human enhancements. Rather, they indicate broad philosophical problems associated with the limitless pursuit of good health, which are discussions that have concerned philosophers for centuries. Importantly, this conclusion calls for a restrictive use of science fiction narratives within bioethics, through which one might explain the immediate and probable implications of human enhancement. For instance, within the third category of human enhancements discussions about ‘immortality’ should be treated differently from contemporary debates about extending healthspan and lifespan. The argument that the end goal of extending life span will be immortality, is too great a stretch of contemporary bioethical imaginations, as are its derivative discussions about the importance of death to give meaning to life. This is not to reject the value of such philosophical investigations, which have a crucial place in or moral deliberations, as outlined in Campbell (2003). Indeed, one might argue that the level of debate about such profound matters has reinvigorated bioethics. However, such extrapolation from current biogerontology to discussions of immortality should be limited. The prospect of living to even 200 years old is considerably different from the prospect of immortality and it is the former bracket of probability that should concern us.

After proposing this typology, I explored the limits of ethical justifications for medical therapy to elucidate whether and how justifications for human enhancements might differ. I conclude that the core concern of relieving suffering that arises from health-related biological dysfunction enables similar arguments to be made on behalf of enhancement, as for therapy. However, even accepting this possibility, I have explained a number of obstructions that are necessary to overcome before such interventions can be considered feasible from a medical perspective. Perhaps the main obstacle is overcoming the challenge of developing enhancement interventions for use with healthy people. In this case, the objection that such actions would violate the traditional medical ethical principle of doing no harm remains robust at the point of innovation. Taken together, these obstructions are far from negligible. Moreover, one might advance the idea that a great majority of present-day forms of human enhancement reflect the more modest end of the typology, as forms of *engineering greater resilience*, rather than their being *radical transhuman enhancements*. For instance, providing beta blockers to students to assist revision for exams, falls into this category and this case is often used to appeal to the prevalence of human enhancements in society already. Alternatively, the often-cited case of cosmetic surgical intervention seems, at most, located within Category 2, as a contested modification (ie. somewhat subject to aesthetic appreciation).

Finally, it cannot be assumed that the moral justifications advanced to support one form of human enhancement will have the same persuasive force when applied to others. As I indicated at the outset of this paper, the arguments to support interventions that alter *contested traits* will find different substantive objections compared with *extending human capabilities* or even *engineering greater resilience*. In an era where these obstructions are met, the case for pursuing human enhancements generally and without limitation is considerably strengthened, though this does not negate the need for consideration of what precisely is improved by any given enhancement.

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