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Neuroethics beyond Normal

Performance Enablement and Self-Transformative Technologies

JOHN R. SHOOK and JAMES GIORDANO

Abstract: An integrated and principled neuroethics offers ethical guidelines able to transcend conventional and medical reliance on normality standards. Elsewhere we have proposed four principles for wise guidance on human transformations. Principles like these are already urgently needed, as bio- and cyberenhancements are rapidly emerging. Context matters. Neither "treatments" nor "enhancements" are objectively identifiable apart from performance expectations, social contexts, and civic orders. Lessons learned from disability studies about enablement and inclusion suggest a fresh way to categorize modifications to the body and its performance. The term "enhancement" should be broken apart to permit recognition of enablements and augmentations, and kinds of radical augmentation for specialized performance. Augmentations affecting the self, self-worth, and self-identity of persons require heightened ethical scrutiny. Reversibility becomes the core problem, not the easy answer, as augmented persons may not cooperate with either decommissioning or displacement into unaccommodating societies. We conclude by indicating how our four principles of self-creativity, nonobsolescence, empowerment, and citizenship establish a neuroethics beyond normal that is better prepared for a future in which humans and their societies are going so far beyond normal.

Keywords: neuroethics; principles of ethics; bioenhancement; performance; enablement; self-identity; autonomy

Entwined Projects and Four Principles

As a discipline, neuroethics encompasses two broad projects. It considers the implications of brain and behavioral research for understanding the cognitive processes and psychology involved in, and perhaps responsible for, moral judgments and conduct. Neuroethics also addresses and evaluates issues, questions, problems, and trajectories of proposed neuroscientific and neurotechnological interventions on subjects, by selecting and applying moral guidelines.[1,2,3] Those guidelines may be borrowed from older ethical resources largely untouched by current moral psychology and neurology. Alternatively, neuroethics could invest its dual-mode inheritance into the integration of up-to-date science for developing an improved ethics. We assert that neuroethics can and should formulate and defend a coherent set of moral priorities, including in its deliberations discoveries about ways that humanity practices morality and thinks about moral values and norms. Neuroethics won't be daunted by dichotomies of a logic untainted by science. Those isolating their "oughts"

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from what humanity "is" will be left behind, idolizing a humanity that was.

We propose that, in order to make distinctive ethical recommendations of its own, neuroethics must do more than endorse commonly encountered moral priorities or philosophically venerable ethical principles. Whereas any neuroethicist is quite at liberty to recommend local social morals, a culture's morality, or some philosophy's ethics for resolving moral concerns or deeper ethical conflicts, those recommendations wouldn't automatically be those of neuroethics itself. Genuinely neuroethical recommendations should be guided by authentically neuroethical deliberations. The need for those deliberations has become urgent. Essential matters on which familiar legal rules and ethical principles are predicated—the nature of the human "body," the "person" worthy of respect, and the "self" in its autonomy—are no longer fixed landmarks for drawing rigid baselines.

The field of neuroethics must assemble fresh resources for surveying and traversing such a dramatically changing landscape. An integrated and principled neuroethics would thoughtfully offer ethical guidelines not only to address those specific instances in which neuroscience and neurotechnology are directly involved but also, more generally, to approach and guide how scientific and technological progress is taking humanity to new frontiers that raise truly novel ethical concerns. Neuroethics in theory and practice has no choice but to go beyond normal.

In this light, we have recommended four guidelines to provoke the inauguration of a principled neuroethics.[4] They are enlargements on the bioethical principlism of Beauchamp and Childress.[5] They give more explicit regard to individual transformations prompted and achieved by the brain sciences, and to the civic contexts in which bioenhanced and neurotechnologically transformed people will reside. Our principles are as follows:

1) Self-creativity: The right of persons to re-create themselves to enrich their lives
2) Nonobsolescence: The duty to avoid the creation of obsolete people
3) Empowerment: The duty to increase the capabilities of people to live autonomous and fulfilling lives
4) Citizenship: The duty to promote free, equal, law-abiding, and participatory citizenship

These ethical guidelines are recommended not as maximum limits but only as minimum expectations. Societies should try to mutually adjust and exceed them, each in their own way. Respect for cultural diversity and global pluralism is embedded and reflected in these principles. The world's peoples pursue conceptions of the good life, guide their societies as best they can, and gradually experiment with novel ways of living. A society systematically violating any of these four principles does not respect those meaningful pursuits and deserves moral disapproval. To be relevant on an international scale, neuroethics must pay due heed to transcultural contexts, while offering more than moral relativism.[6]

A neuroethics fragmented by presumptive normalities, folk psychologies, social conventions, national laws, or dogmatic moral systems won't sufficiently enable preparation for what lies ahead. No single country or league of countries may be able to fully control the coming modifications to our species, as humanity embarks on experimental diversifications to the brain, body, and genome on an unprecedented scale.[7] If we expect global deliberations to be cohesive, then neuroethics must become integrated. The following sections discuss

limitations to medical models of normality and current framings of enhancement, followed by an improved schema for comprehending performance enhancements and potential enablements; finally, we connect the utility of that schema with emerging neuroethical issues and the four neuroethical principles to deal with them.

The Natural and the Normal

Arguments based on some established notion of what a human being "naturally" should be, what a human being "normally" should pursue, or what a human being "necessarily" should deserve shouldn't receive presumptive weight in a principled neuroethics. Neuroethics, unlike traditional medical ethics, is fundamentally *not* about health or medicine, nor is it essentially about making people normal or better. Rather, it must start from ample recognition of the ways that people can be similar and/or different from one another. Neuroethics must concern itself with any potential modification to and diversification of the body, brain, and embodied "self" that may become achievable. This due concern has been commonly characterized as the issue of "human enhancement" or "bioenhancement."[8,9,10]

Yet neuroethics is already moving beyond the social and legal framework that shaped medical ethics and preliminary conceptions of enhancement. Technically, translational and dual-use research extends possibilities for organic modification far beyond medicine's purview. On the ethical side, two features of traditional medical ethics must be transcended: presumptions about what constitutes the normal healthy body and the concept of a direct line from therapy on to enhancement engendered by those presumptions. The question of transhumanism points to a third ethical consideration: besides therapeutic restorations of health and enhancing human capacities above some normal level, bioengineering and cybernetics look ahead to exceeding standard human traits and capacities entirely. How transhumanism's apologetics, or posthumanist visions, can surpass simplistic notions about enhancement is a separate matter.[11,12] Still, neuroethics can—and arguably should—be valid and valuable to the discourse.[13,14]

Trans- and posthumanist speculations aside, a future-oriented and civic-minded neuroethics is urgently needed at present. Of course, the accomplishments of medical ethics are not to be lightly discarded. Medical ethics defended patients' rights and healthcare providers' duties and addressed issues from artificial conception and abortion to end-of-life care and euthanasia. However, medical ethics largely relies on the dominant cultural norms and prevailing legal principles of the home countries of leading medical ethicists. By demanding consistency with U.S. laws and constitutional rights, for example, American medical ethics developed guidelines for medical conduct in institutional settings such as clinics, hospitals, and research laboratories.[15]

Medical ethics has also enlarged its purview beyond domestic accountability, while remaining indebted to Western medicine's normative notions of the "moral individual," what counts as "standard health," and concerns for the "autonomous patient" (MISHAP).[16] Despite repeated warnings from numerous voices over past decades, much of the work in and of medical ethics, like that of medicine, has rather uncritically and univocally spoken of such things as "the human being," "the healthy body," "the normal capacities," "the person," and "the competent agent," as if these terms refer to readily identifiable and certifiable matters. Medicine has acquired knowledge about how the

human genetic code is supposed to construct the human body, how the human body normally works, and how the human body is afflicted by *de*formities, *dis*eases, and *de*mentias. At its core, medicine treats deviations from what is considered to be proper form, desirable ease, and right mentality and in so doing typically relies on its normative conceptions of what the normal, healthy human being is supposed to be.

Some may still presume that the "normal" human body treated by most of medicine is grounded in natural biology alone, outside of any sociocultural framework; but we need not again survey the demonstrable ways that medicine has been directed and misdirected by cultural contexts. Estimating species-typical organic functioning is one thing; judging proper human functioning is quite another. The "typical" human on the planet today, at the median among 7 billion plus inhabitants, does not necessarily correspond with who counts as a healthy patient in a local doctor's office.

The concept of enhancement illustrates how familiar framings leave inadequate categorizations in their wake. The presumption of medical categories and cultural norms by societies doing medical ethics explains how medicine and medical ethics generated the supposedly exhaustive division of therapies and enhancements. Medicine can depict health modifications on a linear continuum by consulting available ideas about the proper features and functions of what is construed to be a normal healthy body. Where a therapy is (roughly) taken to be the modification of physiological/psychological functioning toward some standard for normal health, an enhancement could then be regarded as improved functioning beyond that standard. From a naïve medical perspective, there can be a neat divide separating therapy from enhancement—an enhancement is whatever isn't needed as a therapy—so together they exhaust the possibilities across a continuously linear range. Achieving descriptive simplicity is thus matched by adoption of a conveniently simplistic normativity. Just as labeling an intervention as a "therapy" carries connotations of value and desirability, the label of "enhancement" sounds worthy unless and until proven otherwise. Who could be so heartless and impractical as to deny humanity an opportunity for real improvement?

The potential applications of new biotechnologies are exposing severe limitations to this simplistic continuum and its underlying congeniality with medical notions of normality and swift judgments of practicality. In the years and decades ahead, neuroscience and neurotechnology will enable doing things to bodies and brains that have little or nothing to do with common conceptions of normality. In this global age, as new technologies are developed and employed in pluralistic, international contexts, and as access to information accelerates on worldwide scales, we no longer have the luxury of conducting medical ethics or neuroethics as if it comes down to disagreements among ethical systems or political camps. The settled judgments of medical ethics from past decades will be of little casuistic utility for guiding radical new applications of biotechnology that do not conform to familiar ethical, cultural, or even biological paradigms.

Why Isn't Enhancement Enough?

Erik Parens expressed a verdict about "enhancement" that has been reached by many: "some participants think the term *enhancement* is so freighted with erroneous assumptions and so ripe for abuse that we ought not even to use it. My sense is that if we didn't use

enhancement, we would end up with another term with similar problems."[17] This sentiment has been shared by proponents, skeptics, and pessimists about enhancement, including those working in neuroethics.[18,19,20,21,22] Using terms laden with ambiguity is a problem. We believe that, instead of replacing one poor term by another problematic term, it would be better to develop an improved, more specifically accurate lexicon, at least to serve those fields involving scientific research.

Unlike the medical term "therapy," which has developed and survived as a useful concept with fairly well-understood applications, "enhancement" is routinely criticized for being unclear as to what interventions (should) properly count. What about those medical or nonmedical modifications that do not categorically fit well with either therapy or enhancement? Why should the positive value connotations attached to therapy also be attached to enhancement, especially when the full value of an enhancement is questionable? Furthermore, could an enhancement have intrinsic merit regardless of social context, and independent of societal judgment?

A primary difficulty is the fact that an identical treatment may be a therapy for one person and an enhancement for another, depending on each person's situation and context.[23] Impressive therapies can rehabilitate performance above the unmodified population's norms, lending them the appearance of being an enhancement.[24,25] Medical interventions ordinarily designed for effecting therapy can produce results looking like enhancements if given to healthy people.[26] Treatments for repairing injuries can indeed improve the functioning of uninjured people. For example, some baseball players perceive the "Tommy John" surgery (UCL elbow reconstruction), if performed before elbow problems arise, to be an acceptable performance enhancer.[27]

Engaging a standard that defines treatments as interventions rendered to (attempt to) return some aspect of individuals' biology or performance to normal, and that defines enhancements as any intervention rendered to individuals with normal biology and/or performance (so as to augment their structure or function), is one approach to creating and discerning categories of intervention.[28] But we opine that this, too, is not without issues. Letting the biological norm of the "healthy" person serve to demarcate therapies from enhancements hides ineradicable puzzles.

Consider a medical modification of the ear to improve the range and intensity of hearing. Before describing that modification done to someone as an enhancement, must we first ascertain its proper therapeutic use? An adult without hearing from birth could choose that modification to gain hearing. There is no need to first label that person unhealthy or disabled, so that receiving this modification can count as a therapy.[29,30] Classifying some people as disabled just so other people can appear enhanced cannot be acceptable. The term "enhancement" carries connotations of above-normal functioning, which is precisely the issue: who are the below-normal people? Letting enhancement be what isn't regarded as therapy isn't fully workable. Relying too heavily on medical diagnoses permits the unacceptable notion that an enhancement could be objectively assigned without considering either the recipient's specific situation or the wider social environment.

This is a narrative trap to be avoided. Yes, therapies are good, but that can't mean that enhancements are automatically good, or assuredly better than therapies. Enhancing something is not the same thing as improving it. The meaning of "enhance" can point to a simple

quantitative increase according to some measurable dimension. It also can indicate adding value where none had existed. Or it could indicate the improvement of an already present value. Does an enhancement add a capacity to a person? Would it simply strengthen a capacity already possessed? Or could some enhancements be achieved by diminishing or even eliminating capacities? If an enhancement doesn't reach toward an ideal of human excellence, can it still be an enhancement for some personally idiosyncratic dream? What about the addition of capacities that no other human has ever possessed? As a perusal of the literature will reveal, assigning such meaning(s) to the term "enhancement" is quite prevalent.

Questions have been raised through deeper analysis pointing to a third classification beyond therapy and enhancement.[31,32,33,34,35,36] Enhancements adding planned or unplanned capacities never acquired by the species need special recognition. The real-world consequences of extreme enhancements cannot be perfectly predicted. What about enhancements responsible for other anticipated, or unanticipated, changes to function? One valuable aspect of an enhancement may not outweigh other deleterious effects. Does "enhancement" refer to just the specific intended improvement, or should the overall impact be weighed? Furthermore, an enhancement for a certain capacity never guarantees that the envisioned activities are reliably achieved. Evaluations unavoidably contain risk assessments here. An enhancement may (help to) facilitate a desired activity, but it may not suffice depending on varying conditions. Is an unreliable, less-than-fully-effective, or useless enhancement actually an enhancement?

Judging enhancement may involve recognizing and appreciating wider social contexts, as well as individuals' personal situations. If enhancement should at least involve an above-normal capacity, does one's enhancement vanish if many other people acquire similar modifications, shifting the mean or median ever higher? Alternatively, if many people get different capacities enhanced, permitting them to exceed their own performance from a prior enhancement, does it remain an enhancement? Another scenario involves competitive circumstances, in which the enhancements of others could negate those advantages that one had once gained through an enhancement. The readiness of society to deal with enhanced persons appears to be a major variable determining the status of enhancements at large. (For musings on this theme, see Dan Williams's science fiction novel *Amped*).

Ultimately, social norms are powerful forces. The standards of normality by which enhancements are measured could also find a modification strangely deviant or just too weird. The social environment includes moral standards as well. Should the classification of enhancement be morality neutral, or must a genuine enhancement respect prevailing morals? What about higher-level principles, such as the welfare of society or political equality?

Performance Enhancement Options

Among philosophies informed by science, pragmatism stands out for its facility to address complex behavior-organism-environment systems. Pragmatism denies a rigid subject-object dichotomy and the Cartesian self, permitting continuities and integrations among mental processes, bodily control, tool use, conducting activities, and social interaction.[37,38] As neurophilosophy continues to absorb lessons from the cognitive and neural sciences, a pragmatist neurophilosophy has emerged at that convergence

of insights into the embodied, enactive, purposive, and cooperative nature of all cognition.[39,40]

In this view, neither treatments nor enhancements could be objectively identifiable apart from human interactions and social expectations. Additionally, the significance of human interactions cannot be separated from broader social expectations about those interactions. People use social cognition to manage dynamic interactions for group purposes. Isolating and insulating mental states from their generation and application in the course of dealing with local environs and social relations can lead to erroneous characterizations of consciousness and conduct. Isolating the self also allows the assignment of responsibility to this self alone. Forgetting that meaningful action always happens within (partially) cooperating environs has long distorted philosophical psychology and contorted modern ethics.

In short, thinking and doing are fused and co-responsive. By attending to conduct within its contexts, the proper field of inquiry may be captured by the term "performance." Bio-psychosocial dimensions of performance are essential. In this light, we offer the basic ABCs of performance. Five dimensions seem to be primary:

> performance (ABCDE) = accomplishing trained activity (A) by using bodily control (B) for enacting tooled capacities (C), within a environing domain (D) while coordinating with ensembles of others (E).

For example, the performance of driving a car equals operating the vehicle safely using rapid-response habits and enhanced visual information, on public roads surrounded by other drivers, cyclists, and, periodically, pedestrians. Therefore,

> nonperformance = poor accomplishment due any substandard A, B, C, D, and/or E.

A vehicular mishap may be due to lack of proper training, lack of bodily control to manage driving, lack of tools to convey enough information, bad roads, and other poor drivers and/or cyclists, and/or careless pedestrians.

The circumstances in which most people can expect their actual tooled capacities to permit the performance of "ordinary" living in society usually foster such capacities that are widely deemed to be normal. What feels normal, according to most people, appears to require no explanation. A person's nonperformance can usually be "explained" only by that person's poor bodily control or lack of trained capacities. If bodily control and training seem adequate, then the nonperformance is subsequently attributed to a lack of tooling. If those all seem to be adequate, and because social domains and ensembles are still available givens on this limited view, faulting the individual nonperformer now seems easiest, perhaps for failure of character or due to deviant impulses. This nonperformer is hence (personally) blamed for thwarting his or her bodily control B, disdaining activity A, or disliking domain D; ergo, this person must be BAD. However, so long as sufficient training, ensembles, and tooling (STET) would produce performance, the individual needn't have to change, and one's personal body and character aren't suspect.

If the nonperformer has bodily control difficulties, it may be that physiological adjustments, improvements in assistive technology, and/or revised training may bring about capacities permitting the desired activity.[41] Emerging technologies are eroding the distinction between upgraded tooling and

physiological adjustment. Bionic prosthetics supply a good example.[42] When a prosthetic hand is integrated with modified biomechanical and neurological structures of the arm so thoroughly that no clear line separates the biological from the artificial, the body-tool dichotomy breaks down. Brain-computer interfaces may reach the same degree of melded intimacy.[43] Neuropragmatism wouldn't endorse a firm dichotomy between tool and body under ordinary circumstances and couldn't invent one for such prosthetics. We've learned to apply voluntary control over body parts to affect our surroundings, and the brain readily extends that felt control through long-familiar tools. Tools that become a physical part of us will become a mental part of us.

However, prior to medicine's access to these emerging technologies, the body-tool distinction was upheld, and medicine focused on organic modifications alone to deal with illnesses and injuries. Supplemented by orthotics (retooling) and rehabilitation (retraining), medicine could stay attuned to adjustments of physical and psychological functioning to remedy impairments.[44] However, medicine required standards for physiological functioning to set treatment goals. The normal human body was systematically defined without explicit reference to any accessible tooling or training, or any hospitable environs or ensemble. That resulted in high-functioning and successful people tacitly presuming that their own physiological condition was entirely normal, and that this normality should be the standard of normality for all of humanity. What counted as the human body was determined by relatively abnormal individuals—specifically, privileged people who were not representative of the human population. Medical psychology was likewise prone to accepting the psychological traits of elites as the standard of normal cognition and character.

With such privileged normality in place, medical treatments could be characterized in isolation from considerations about the applied techniques of tooling or training, or changes to the social settings of places and persons. Candidates for treatment are therefore not merely nonperformers but instead are labeled as *dis*abled for everyday activities. So long as activity standards are set without regard for technique or society, disablement can remain an individual matter. Reductive medicine would permit all treatments producing results beyond population normality to be confusingly classified as enhancements. Worse, this reductivism obtains that identifying those with enhancements requires defining who is normal and, in so doing, who is disabled. We believe that surely there is another way. Identifying the enhancements of some mustn't depend on unfairly discriminating against others.[45,46] Judging the ethics of enhancement cannot—nor should not—be a neutral matter. Ethical systems supporting enhancement may themselves harbor biases favoring what counts as normal in society.[47]

Opponents to reductive disability have exposed common prejudices, identified structural obstacles, and faulted societal discrimination.[48,49,50,51,52] Better medical treatments ensuring performance capabilities are indeed desirable, and designing task responsibilities and supportive environs appropriate to those capabilities is civically justifiable.[53,54,55,56,57] What must be avoided is an ideological standoff due to a simplistic $x = y + z$ type formula, wherein performance equals individual practices in social settings. By assuming that one factor is static and treating the other as the variable, performance becomes either the entire responsibility of the individual or entirely the responsibility of society.

A pragmatist approach appreciates context more seriously, ensuring that all interactive factors are—and stay—involved.

Performance in Context: Considering Enablement

We may provisionally apply the term "therapy" to a restorative or even regenerative treatment administered to an individual to affect an impairment. A therapeutic plan should be as integrative and holistic as possible.[58,59] "Enhancement" cannot be defined simply as nontherapeutic or paratherapeutic treatment. Avoiding medical reductionism and reductive disability requires even greater attention to the surrounding medical and social context for evaluations of performance and nonperformance. Taking key factors into account, let us reconsider the factors of both technique (tools and training) and society (environs and ensembles) more fully.

Let "rehabilitation" stand for the restoration of the capacities needed for adequate performance through therapy plus added tools and training.[60,61] The goal of "enablement" additionally expects that the coordination of these three factors within rehabilitation should be modulated to produce the envisioned performances to be undertaken in society.[62,63,64] Enablement adjusts changeable physiology plus technique within the given situation of generic (socially common and constant) activities. Enablement doesn't demand alterations to the activity domain beyond basic accessibility, nor does it demand oversight of the ensemble of people sharing in the planned activities.

By taking the environs and ensembles as givens, enablement expects valuable techniques to help the individual conform to given social conditions to display capabilities. For example, enablement trains a student to use an electronic device for recording classroom lectures, but it doesn't require that instruction no longer be delivered in the form of spoken lectures. Majority convenience and traditional methods prevail. Such majority convenience is still the case with accommodation, which coordinates rehabilitation with modest changes to the local environs for generic activities, such as workplace positions. "Reasonable" accommodation typically leaves core activity functions unaltered, activity partners unaffected, and activity environs largely unchanged.[65]

More dramatic accommodation requires inclusion. The ideal of inclusion places heavy responsibility on environs and coparticipants to guarantee participatory activity and relies on rehabilitation as needed. The priority is joint participation, not just individual enablement.[66,67] Activities are planned that ensure each person's effective performance with coparticipants (who themselves may have performance adjustments), undertaken in redesigned environs that facilitate everyone's success. The ideal of inclusivity aims at full and equal participation to the level that each person can reach, without discriminatory barriers obstructing comprehensive integrated status. However, this venerable tradition, or issues of majority inconvenience, can no longer provide acceptable excuses for falling short of inclusivity.

What, then, would be the neuroethical position with respect to the goals of this type of inclusion theory? As a civic and political ideal, inclusion theory may seem distant from the purview of neuroethics. However, a principled neuroethics is relevant to considering the sorts of enhancements that involve self-transformative modifications. There are many reasons to try to restore some level of normality, and there will be reasons to attempt exceeding some standard or another

of normality. How should neuroethics handle attempts to go beyond normal?

Therapy, Enhancement, and Augmentation

Generic enablement restores performance of the common activities found across society. But not all activities are generic. Specialized activities, to be strenuously performed under unusual environing conditions with only certain coparticipants, are quite another matter. Many specialized activities are accomplished with extra tools and training alone. We may label preparation of any person for specialized activities that includes physiological and/or psychological modifications as the "specialized enablement" of that person.

In the future, radically novel technologies will permit specialized enablements to go beyond normal—in two different senses of "normal." In one sense, normality applies to human functioning commonly found in the human population. Is a person's functioning better or worse compared to the average functioning found in that population? Another sense of normality applies to functioning that is rarely or never found in the human population. Is a person's functioning quite different from what the human population can do? This distinction gives rise to two different senses of beyond-normal functioning: is something a person can do abnormal because most others do it less well, or is it abnormal because humans don't (yet) do it at all?

In the first sense of normality and abnormality, what may be normal for a certain population may be simply distributed in some fashion that permits measurements and averages. For example, the ability to run is a standard capacity for humanity. Running speed across a large population can be sampled, and an average running speed can be calculated. Restoring an individual from an impaired condition to a performance condition in the activity of running would aim at permitting this individual to run at a speed approaching an average running speed (adjusted for other variables, such as age and general health). In contrast, a specialized enablement for running could elevate an individual's near-average running speed to a speed far in excess of that average. A remarkable enablement like this would place a modified runner not just among the fastest of humans but as a runner who is far faster than any human has been before. Running is a typical human activity, but this specialized enablement would therefore exceed normal performance for this function. The ability to run at speeds of 50 or 60 miles an hour is no mere enablement or enhancement but is an *extraordinary* augmentation.

Next, consider a specialized enablement that modifies arms into effective wings, permitting flight. This is not an enhancement of any normal human functioning or activity. There is no typical or average performance level for unassisted human flight. Humans can fly by attaching themselves to a flying apparatus such as a hang glider or a jet airplane, but we are talking about physiological modifications to the body to permit flight. A specialized enablement like this isn't any sort of enhancement to a human ability. Although there is a kind of mechanical continuity between getting strapped tightly into a hang glider and getting wings directly integrated into one's upper body, waving one's arms up and down is different from moving one's wing to fly. Acquiring the ability to fly is not a simple enhancement but a way to transcend standard human capacities, through a *radical* augmentation.

Locating the proper place for such extraordinary and radical augmentations

is not simply a matter of drawing a straight line from therapies to enhancements and on to truly amazing enhancements. The point of truly radical modification is not about normality at all; it aims not at being average, or above average, but at being special or nearly unique. Furthermore, acknowledging the social context for fully classifying types of modifications and evaluating performance enhancement remains just as important. In the sixfold scheme that we present subsequently, a neutral term is followed by both a normative term for the modification and a civic classification for the modification. It is important to reiterate how many sorts of emerging alterations could be a treatment, supplement, or modification depending on the individual altered, the purpose for the alteration, and the standard against which functioning is compared.

1) A *treatment* aims at relief from an impairment, perhaps regeneration, and possibly restoration of structure or function as well. If relief and/or restoration are reliably effective, a treatment is a *therapy.* With supportive tools/training, a therapy contributes to rehabilitation. In the context of appropriate social accommodation, rehabilitation is also *generic enablement.*
2) A *supplement* to an individual's standard functioning aims at exceeding population norms. If that aim is reliably attained without deleterious side effects, a supplement is an *enhancement.* An enhancement that dramatically exceeds norms is an *extraordinary augmentation.* In the context of unusual performance expectations, an extraordinary augmentation can be a *specialized enablement.*
3) A *modification* adds a nonstandard capacity to an individual's structure and/or function in order to transcend human capacities. If reliably practical, a modification provides *radical augmentation.* In the context of unusual performance expectations, a radical augmentation can also be a *specialized enablement.*

Generic enablement, self-improvement, and specialized enablement are highly field-sensitive classifications. Whether someone remains enabled, in a generic or specialized way, or enjoys self-improvement always depends on a person's surrounding social conditions. If supportive assistance and a welcoming environment were absent or taken away, enablement would be eroded, and rehabilitation would suffer.

Enhancement will similarly be evaluated within social contexts. In a social atmosphere of bemused toleration, an enhancement may be about cosmetic vanity or lifestyle choice.[68] In contexts of social approval, an enhancement may amount to valuable capacity extensions or at least acceptable self-improvements. If social acceptance shifts to disapproval, however, enhancements might be regarded as self-indulgence or self-abuse. As for extraordinary or radical augmentation, after a person ceases special operations and returns to ordinary life, that augmentation may be classified as an unfair advantage requiring some countervailing disablement to permit social participation. Alternatively, such augmentation could be regarded as a regrettable impairment (what we call "postenablement distress syndrome") that necessitates rehabilitation, and uncivil behavior may require psychological readjustment.

Societal judgment is hardly the same as civic validity or social fairness. That's why enhancements and augmentations should be separately evaluated according to standards of civil order and security and principles of equality and justice.

What a society may value as a self-improvement could actually be driven by prejudices about desirable appearances, gender and sexuality, ethnic and minority status, ageism and ableism, and so on. What is regarded as becoming who one should be or attaining enhancement may, in practicality, have less to do with deviating from normality and more to do with approaching conformity.[69] Social opinions on certain augmentations may prove fickle, shifting from "love it" to "hate it" as rapidly as does the public appetite for fashion.

Historical context matters as well. An enhancement, for the generation that invents it and uses it, can become a therapy for the next generation, if this enhancement is later regarded as essential for conforming to normal health.[70] Societies constantly review and revise what counts as normal human functioning. Interventions that delay the effects of aging, for example, would be first applied as treatments for the elderly, but the next generation may use them to enjoy an unusually enhanced middle age. A subsequent generation may accelerate the use of that intervention into an extraordinary augmentation that can be utilized when still young.[71] Over generations, the extraordinary can become the familiar and expected. Modifications that had once counted as radical augmentations may recede to the status of ordinary self-improvements.

Neuroethical Concerns about Self-Augmentation

Perhaps no other anticipated augmentation has been a greater subject of speculation than so-called enhancements proposed to directly affect consciousness, personality, agency, and the self. A principled neuroethics, intent on assigning moral priorities, must appreciate the priority of maintaining a self that is capable of morality. The pragmatic framework that distinguishes rehabilitation, enhancement, and augmentation from applications in enablement permits a more nuanced analysis and pragmatic disentanglement of the ethical issues that arise in this most sensitive of matters.

Examples of cognitive alterations, whether accidental or deliberate, that could lead toward self-discontinuities or the creation of new self-identities include memory emendation or erasure; shifting of core interests and drives; intensifying focus, determination, perseverance, or self-preservation; modifications of affective processes involving optimism, self-confidence, attachment, trust, suspicion, aggression, loyalty, or bravery; enhancement of intellectual abilities far beyond standard performance; revision of core moral beliefs or reversal of key moral attitudes; changed weightings of moral considerations relative to other concerns; alterations to processes of social cognition; and changes to ways that social norms and duties are prioritized.

Some potent cognitive enhancers and augmentations may modify self-identity. Across a range of sensory, affective, motor, social, and intellectual neurocognitive functions there lies a potential for dramatic alterations to the ways that we experience and understand ourselves. The sense of a unified self and self-awareness, to the extent that any physiological sense can be given to the self, appears to derive from, and depend on, numerous contributions from cross-communicating components of the brain. Even modest alterations to some critical neural processes can have dramatic effects on personality and temperament, or even identity and authenticity.[72,73,74,75,76] Whether accomplished through pharmacological/nanoscale agents, deep-brain or transcranial stimulation, tissue and genetic implantation/grafting, brain-to-brain

interfacing, or computing implants/prosthetics (and so on), effective alterations can amount to radical self-transformation.[77,78,79,80,81,82,83]

Regardless of whether the sense of self has a substantial, constructed, or fictional basis, when contributory neurological processes are altered, there could be serious consequences for self-identity. No abstract argument from neuroessentialism is needed to suggest the genuine empirical possibility that dramatic alterations to brain and bodily functions can change not just personality or temperament but the continuity of the self that one recognizes oneself to be.[84,85,86,87] Furthermore, if self-identity becomes flexible or even fungible, additional, deeper questions about authenticity, autonomy, competence, responsibility, and culpability arise.[88,89,90,91,92] Legal implications fostered by any of these possibilities will have far-reaching social ramifications.[93,94,95]

Neurocognitive alterations to one's personality or even self-identity can generate particularly thorny issues and questions. For instance, suppose there were some neural modification to brain function that increases one's capacity to be courageous under anxiety-provoking conditions. As a treatment for something such as extreme shyness, this adjustment in courage could therapeutically restore normal functioning, by accommodating a society's preference for people enabled for some extroversion or boldness. However, in other societies unaccustomed to this forwardness and boldness, that same treatment could cause a disabling personality disorder. If administered to a person desiring greater courage than normal, the treatment would produce increased confidence, and a society may or may not judge that as an enhancing self-improvement. An extraordinary augmentation could permit a person to display maximal bravery despite fear and stress. A radical augmentation could even be envisioned, if the capacity to feel either fear or courage was overridden, producing a level or type of bravery that transcends human standards. What societies are able to judge about those extreme augmentations will be difficult to predict. It will, to a large extent, depend on the specialized purposes that such augmentations serve.

An illustrative case of a specialized enablement is the military use of radical self-augmentation to improve soldier performance in the field.[96] The perspectives of the soldier, the military, and society must be taken into account as ethical concerns are raised. Perhaps we are on the verge of a revolution in neural engineering that will allow technical modification of the brain to improve character and to enhance morality.[97,98,99] But here some skepticism—and even cynicism—has its place. Categorizing this matter as a question of moral enhancement just because it concerns a character trait associated with virtue and morals must be inadequate, for reasons outlined in previous sections and elsewhere.[100] Once again we must go beyond enhancement. Bravery augmentation for a career soldier might be regarded as consistent with self-improvement, at least during active service. If that specialized enablement were applied to a civilian, the case would be entirely different. When conditions of extreme personal risk are needed to make one feel challenged and fulfilled, life can't be quite the same anymore. The idea of an army of volunteers intending to pursue a military career who receive bravery augmentation raises some ethical concerns, but not as many concerns as an army of drafted conscripts given the same augmentation.

To provide another scenario, let us suppose a neurocognitive alteration originally designed as a treatment to alleviate guilt-related anxieties resulted in a

person's capacity to complacently kill enemy combatants in warfare without moral qualms or postbattle mental trauma.[101] Is this a case of preventative treatment or a form of moral enhancement of a soldier's character? Suppose this modification is done to a career soldier, enhancing battlefield performance so that she or he becomes the effective soldier she or he has wanted to be. This brain alteration could be classified as a self-improvement, if society approves of soldiers being all they can be. Yet this alteration is better classified as a specialized enablement, ensuring high performance during and after frontline operations. If a person's empathy-free and guilt-free capacity to kill becomes a stable part of who she or he is, a different self has become militarily enabled by getting morally impaired. What really counts as a character virtue is by no means an assured matter, and the field of military ethics must attend to these neuroethical concerns.[102]

Irreversible brain alterations to military conscripts that dramatically alter self-identity to the point at which an individual can only function as a soldier are the sort of manufacture of a "single-use human" that deserves the closest ethical scrutiny. By contrast, reversible brain modifications that only temporarily enhance a career soldier's capacities may be easier to ethically justify. If the enhanced warfighter is inevitable, a soldier specially enabled for battle shouldn't be psychologically damaged in the process or predisposed only for conflict engagement.[103,104]

Neither safe and effective alteration, voluntary alteration, nor reversible alteration can entirely ease concerns here. What will count as safe and effective when an alteration utilized as an enablement under extraordinary circumstances exerts an unpredictably unique influence on one's conception of oneself, one's self-worth, and one's self-identity? The performance expectations that society places on professionals in general, and rehabilitation expectations placed on criminals, already distort the practical meaning of making a voluntary choice. Would soldiers be allowed to have the safe and effective choice to decline augmentation?[105,106,107] Research testing of mental stimulants, brain-computer interfaces, and bionic prosthetics on military personnel[108,109,110,111] has already aroused cautionary questions and stances.[112,113,114,115]

Reversibility may reduce ethical worries, but because self-identities can be involved with extreme augmentations, applying only temporary alterations during specialized activities isn't going to be as reliably precautionary as one may imagine. If someone appreciates who he or she is while augmented far more than who he or she used to be, voluntary despecialization may be difficult to obtain. From the perspective of this person, loss of augmentation may represent a destructive harm to his or her own self and his or her sense of who he or she essentially is. De-enablement could be equivalent to self-impairment or self-erasure, and this is highly consequential to postenablement distress.

Postenablement: Accommodation or Inclusion?

When an enabled individual reenters a civil society that is unready to accommodate extreme augmentation, we must ask what society really owes this individual. The option of detainment, de-enablement, and rehabilitation can appear to be the right course to take. Perhaps this "deviant" new person might be deemed too abnormal and problematic for society. Alternatively, a duty of inclusion could dictate greater civic flexibility and an obligation to accommodate citizens regardless of

"disability" (inclusive of postenablement syndrome). Contemplate a society simultaneously pursuing the generic enablement of citizens trying to live productive lives while denying that same opportunity to those who have honorably served specialized duties. Ethics may not contort so far as to justify enabling some while de-enabling others.

Supposing that the "real" person prior to an augmentation is the genuine citizen or derogating the augmentation as an addiction or appendage won't stand up to scrutiny if and when the augmentation is truly essential to the person in question. Where persons are involved, rights to self-determination and autonomy suggest that a particular right to mental self-determination should apply.[116] The ideals of self-worth and full inclusion place an even greater obligation on society to ensure ample and equal participation in pursuing a livelihood and in enacting civic roles. The sorts of dramatic changes to society necessitated by full inclusion for many radically augmented persons exceed the imaginations of all but expert futurists and science fiction writers.

Societies would be wise to avoid a forced choice between regretfully de-enabling persons or struggling to accommodate radically augmented persons. If special-use persons are created for particular fields, their specialized enablement shouldn't later become the cause for their disablement in civil society. The ethical duty to ensure performance capabilities and social enablement covers each and every person, no matter the manner of their creation. Prevention avoids that forced choice, however. Modifications that do not create new identities, or rapidly reversible modifications that only transiently affect identity, should be preferred. If an integrated augmentation did alter personal identity, gradually diminishing that augmentation—with every effort to gently guide (yet another) personal transformation toward a stable and confident personal identity—would be preferable to abrupt cessation without follow-up care.

Decommissioning an augmentation won't be as easy as these proposals may make it sound. Nevertheless, although augmentation removal may leave an individual bewildered, it needn't leave him or her degraded. The same duty to ensure capacities for enablement still applies here—proper rehabilitation and accommodation should provide for this person's generic enablement. Devaluing the person as if that person shouldn't have existed is neither necessary nor warranted. After all, service with a specialized enablement was sought, and at one point, that augmented person was very much valued. The removal of a specialized enablement doesn't make that person any less special. This option, by contrast, demands the full dignity and equality of all persons by delivering generic enablement no matter the course of that person's life. There can be no repeat of the utilitarian argument favoring the prevention of "disabled" people by devaluing those living with an impairment.

Neuroethics Enabled with Augmented Principles

In summary, we have applied an integrated and pragmatic standpoint to sketch a schema for discerning the nature of therapy, enhancement, and/or enablement. This scheme, as our discussion of a handful of potential cases and concerns can illustrate, enables neuroethics to better perceive and address coming opportunities and concerns. Toward this end, we conclude with a brief enlargement of the four ethical principles of neuroethics mentioned in the first section in light of the analyses offered in

later sections. Elsewhere we defend this pragmatic principlism as the creation of flexible yet firm guidelines for evaluating emerging issues before they become overwhelming or intractable.[117] Here we point to the way that this neuroethics beyond normal can fulfill a primary responsibility of any ethics: to maintain focus on the centers of moral worth, so that moral persons can flourish and promote morality in their societies. The principles of autonomy, nonmaleficence, beneficence, and justice nobly serve this responsibility, and our ethical responsibilities are only growing as novel bio- and neurotechnologies are expanding human horizons. Augmentation is clearly in order.

Augmenting autonomy yields *self-creativity*. The right of persons to autonomously direct their lives should be extended to the right to re-create themselves to enrich their lives. Access to self-creative modifications, even to the point of making new selves, should be protected, so long as other principles are respected along the way. Self-creativity must not be conflated with individuality or peculiarity; people should also be allowed to re-create themselves to more closely conform to desired group standards (so long as those standards do not themselves involve loss of autonomy or violations of the other three principles). A modification is unethical if it contracts creativity—for example, by reducing responsible autonomy or the capacity for further creativity, reducing basic capabilities to support one's self, or limiting potential competencies to improve one's standard of living and well-being.

Augmenting nonmaleficence yields *nonobsolescence*. The duty to avoid unreasonably harming people should be extended to avoid the creation of obsolete people, especially single-use people that are so irreversibly specialized by radical body/brain modifications that career and lifestyle options become too limited. A modification is unethical if it unreasonably risks producing a person with peculiar or radical enhancements that excessively restrict future self-creativity, or if it reduces empowerment or citizenship.

Augmenting beneficence yields *empowerment*. The duty to advance the welfare of others should be extended to the duty to increase the capabilities of people to autonomously live independent and fulfilling lives. A modification would be considered to be unethical if it causes unreasonable harms to a person, makes a person more dependent on others (especially to the point of losing effective citizenship, the fourth principle), or reduces a person's capacity to pursue his or her own well-being.

Augmenting justice yields *citizenship*. The duty to fairly distribute scarce goods should be extended to the duty to guarantee everyone's ability to be a free, equal, law-abiding, and participatory citizen. A modification would be unethical if it risks debilitating a person's capacity for fulfilling the roles and responsibilities of engaged civic life or enjoying the rights and obligations of citizenship.

An unprincipled ethics, forgetting how to sustain the vitality of morality, only contradicts and destroys itself. Persons are enduring ends no matter how much they may also come to view their selves as transformable means. From the soundest medical treatment to the most radical augmentation, we may hope for enhancements and enablements, but we'd better ensure futures that we all can live in, and in which we can live well together. It is our hope that neuroethics—perhaps of the type proposed here—will be useful to these pursuits.

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117. See note 4, Shook, Giordano 2014.