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AGAINST PATERNALISTIC VIEWS ON
NEUROENHANCEMENT: A LIBERTARIAN
EVOLUTIONARY ACCOUNT

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SUMMARY

The term “enhancement” has come to represent a very precise form of improving individual skills. By means of pharmaceuticals, surgery, and reproductive technology, all originally intended for clinical use, healthy individuals may improve their cognitive and emotional capacities for many reasons, such as to gain a competitive edge. In today’s society, cognitive performance and mood assume a more relevant role than physical ability if one aspires to emerge above the average. In this paper, we present and discuss common views on “neuroenhancement,” a term often used to describe the use of artificial means that interfere with brain function to improve cognitive skills. Most philosophical arguments and beliefs on the topic are based on some inappropriate distinctions and definitions which favour unfruitful alarmist attitudes and may obscure the complexity of the issue. In particular, we point out that both radical prohibitionist and libertarian approaches are affected by paternalistic ideas which we refute. We also show that even though enhancement nowadays is occurring at an impressive rate, we cannot infer that it is a present-day phenomenon, because enhancement is a human disposition, shared between most species and has always existed. We argue against moralistic views on neuroenhancement and defend a reasoned libertarian perspective. We believe that case-by-case evolutionary-medical heuristics is the best approach to help individuals in their autonomous choices.

Introduction

There is perhaps no older human aspiration than improving one's capacities. This more or less conscious tendency, shared between most species, is mainly directed toward physical and reproductive performance, presumably to deceive others in territorial domination and to surpass competitors in mating¹. In today's society, where physical enhancement still has significant relevance (plastic surgery, cosmetic and anti-aging interventions, doping in sports, etc.), cognitive performance assumes a more relevant role than physical abilities if one aspires to win social competitions, and emerge above the average.

The term "enhancement" has come to represent a very precise form of increasing individual skills: the use of means, such as those from pharmacology, surgery, and genetics that were originally intended for clinical use by healthy individuals. These individuals use some of these means merely for competitive purposes such as succeeding at school or being more productive at work. Very often, the word "neuroenhancement" refers mainly to artificial means that interfere with brain function in order to improve cognitive skills. An interchangeable expression is "cognitive enhancement", which include non-artificial enhancers. As we shall see, these definitions and most distinctions, are biased and are unable to offer a coherent account on the topic. Therefore, we prefer to use the term in a generic form. Most philosophical arguments and beliefs on the topic are actually based on some kind of inappropriate distinction, which on the one hand risks to favour unfruitful alarmist attitudes while on the other, to obscure the complexity of the issue. In this paper we will show that both advocates and opponents of neuroenhancement share paternalistic assumptions. We argue against paternalism and defend a combination of two separated arguments: a libertarian and an evolutionary argument. We conclude that neuroenhancing should be an autonomous and free choice by the individual, who could benefit of tools provided by evolution-based medicine case-by-case.

Enhancement in Modern Times

In 2008, an informal survey launched by Nature among readers reported that 20 percent of participants admitted to use drugs as enhancers². Especially in the United States, the practice of physicians who prescribe stimulants, especially Ritalin, Adderall and Dexedrin, to healthy university students is increasing³.

So-called *lifestyle* drugs⁴, medications used to intervene on life non-medical conditions, debuted in Western countries at the end of the fifties, when tranquilizers became massively popular within the general population⁵. Currently, Ritalin (methylphenidate) and various derivatives of amphetamines, such as Adderall, developed to treat ADHD or narcolepsy, are being used to improve attention in adults. Methylphenidate, dextroamphetamine and mixed amphetamine salts (whose brand names are Ritalin, Dexedrine and Adderall) are widely used as “study drugs” by North-American college students: the percentage of users varies across campuses, usually between 0 and 25 percent⁶. In the ‘90s Ritalin was listed among the top ten most frequently stolen drugs for personal use in the United States⁷. Many other substances are taken to enhance motivational level to perform a task, impacting intelligence, in terms of effectiveness, and results. Among these, the latest generation of antidepressants, serotonin reuptake inhibitors (SSRIs), have reached levels of consumption that make them widely used “nootropics” or smart drugs in Western countries⁸. Apart from mood, they can improve concentration, reasoning abilities, learning, coordination and memory skills, and reduce mental fatigue. In addition, other compounds approved for prescriptive usage may be used with other purposes. For instance, there is modafinil (Provigil), used to reduce the need for sleep and to enhance working memory, donepezil (Aricept), prescribed for Alzheimer’s disease and used for memory⁹, and the antibiotic D-cycloserine, effective in reducing fear in patients undergoing psychotherapy to treat PTSD¹⁰. The web market has also recently given space to an oxytocin (OXT)

nasal spray. OXT is the so-called “hormone of sociality” that promises to overcome shyness and social reticence, especially in romantic relationships. Flunitrazepam (Rohypnol), a drug of the benzodiazepine family, is following suit. Its sedative, anxiolytic, and hypnotic properties have earned it the popular nickname, the “date rape drug”. In addition to drugs, neurotechnologies can also be used as neuroenhancers. There are growing expectations for the application of direct current polarization¹¹, deep brain stimulation (DBS)¹² and transcranial magnetic stimulation (TMS)¹³ both to treat dysfunctions and to improve cognitive performances. In the future, even genetic engineering modifications are likely to become powerful cognitive enhancers. Some neurotechnological research is funded by the military system, which has always been interested in producing high-performing soldiers¹⁴.

Radical Views on Neuroenhancement: from Prohibition to Libertarianism

Current views on neuroenhancement congregate at the opposite ends of the spectrum of all possible positions. For the radical opponents, enhancement is immoral, while for the strong supporters, it is desirable. Opponents generally appeal to the idea of nature and contest any action that contravenes what is considered one’s “destiny” by the will of nature, or sometimes, by God. Supporters argue that enhancement is not only permissible, but that making enhancing techniques available should be a moral obligation. Some even go so far as to say that everyone should be given access to these techniques. They consider the possibility that parents or the government may legally use enhancers on people that might require them for various reasons (i.e., for the individual’s or societal benefit), even if such use would be against these people’s consent – this approach is called paternalism. In short, paternalism is the view according to which a person, a social organization or the state limits person’s autonomy or group’s liberty pretending to know better what is their own good. As we shall see,

both supporters and opponents to neuroenhancement tend to endorse some version of paternalism.

On the prohibitionist side, Leon Kass¹⁵ offers an argument, which plays on intuitive emotions and on the ability to elicit disgust in his listeners. He argues that artificial manipulations of human life are immoral because they violate human nature. He perceives that biotechnological interventions treat human mental performances as mere neurochemical processes and thus could weaken our sense of responsibility and our roles as moral agents, thereby limiting our ability to choose and our genuine life options.

Kass' argument, which infers that human dignity and autonomy arise from the "naturalness" of improvements (intended as synonymous of "authenticity"), is an expression of the Judeo-Christian tradition and its moral values¹⁶. This religious view assumes that "natural" ways to practice or manage aspects of human existence such as sexuality, reproduction, birth, death, physical competitions, are also morally good, and that they would be the only ethically and legally acceptable ones. Religious ethics justifies this view with reference to a natural design and postulates that these experiences are dictated by the Creator or by a teleological evolution.

There are also non-religious opponents of enhancement who defend social and individual fundamental rights, even though they agree with the conservative view regarding conceptual distinctions on the properties of enhancers. Such distinctions are, however, disputable. Among the opponents of this kind are philosophers such as Jürgen Habermas and Michael Sandel. They argue that enhancement implies discrimination or risks the repetition of terrible past mistakes made by eugenicists. According to Habermas¹⁷, enhancement would favour forms of social inequality because the initial, natural conditions are the only ones that put people on the same moral level, providing them with freedom in a democratic context. Sandel¹⁸ claims that in particular the use of genetic manipulation would encourage unhealthy,

Promethean aspiration of parents who would want to “build” a child on the basis of their own personal desires, expectations or goals. Thus, they prevent their children from following probably a more favourable, competitive path that would be the result of an autonomous and individual choice. Steven Pinker¹⁹ noticed that the manipulations about which Habermas and Sandel express their concerns, primarily genetics and the complexity involved in improving cognitive processes, are at present, and will for a long time remain, unfeasible.

Most enhancement defenders make use of the same discourse of social rights, especially that of equality. Their argument is more or less the following: enhancement should be ethically allowed because everyone should have the best chances to succeed in life, so long as its use is not a threat or harm to the users or to society. This idea has already been analysed in the context of genetic modifications²⁰. Parents should be able not only to avoid the birth of children with serious genetic diseases but also to carry out genetic modifications and improvements on their children for competitive purposes, if these changes were safe and made with the purpose of promoting the well-being of the child.

John Harris is in favour of both genetic and cognitive enhancement²¹. He claims that it is easy to find good reasons to protect people from the pressures that push them to get hurt or do harm to others. But, he also adds, it is very difficult to find good reasons to justify the fact that we want to protect people from obtaining benefits or from providing benefits to others. Indeed, someone who refuses a manipulative enhancement should not be considered freer than someone who accepts it, probably as the result of social pressures or emulation. Moreover, according to Harris, parents who refuse to give their children smart drugs are not more moral than those parents that do, if we consider that in this case the result may actually penalize their children’s future. The bioethicist Arthur Caplan²² opposes prohibition as well, claiming that it goes against the interests of both the individual and soci-

ety. But he originally held that the argument that justifies prohibition on the basis of protection from discrimination is senseless. Of course this argument goes against inequality, but less obviously so, for it is not as strong as one might think against cognitive enhancement. There is no consequential link between social inequalities and access to existing enhancement techniques: the inequalities do not depend on the availability of such techniques, but pre-exist them. Nor can discrimination serve as an argument for enhancement, like for those who claim that spreading enhancement to the entire society will be able to prevent discrimination. Caplan's view suggests that people should be informed about the health risks that may result from the use of drugs or that of technologies that enhance cognitive functions and other aspects of behaviour. The final choice of whether or not to make use of these resources should be left to the individual.

In regard to choices that pertain legislators, the possibility of enhancing an individual's moral behaviour by enhancing his neurocognitive functions via drugs, genetic modifications, neural implants, etc. raised additional questions and concerns in the debate. This debate exploded publicly after the episodes known as the "London Riots" in Britain over the summer of 2011²³. Richard Thaler, who is a member of the Behavioural Insight Unit, established by David Cameron, is a defender of a common sense version of a theory called the "nudge theory". This view belongs to the broader concept of "libertarian paternalism", according to which private and public organizations should "nudge" people to direct their choices, which are usually determined by cognitive biases, towards the public good. So enhancement as well may be conceived as a form of social nudge.

Two papers in the journal *Bioethics* had previously faced the issue of "moral enhancement". Although they are both in favour of cognitive enhancement, they have opposite views. Ingmar Persson and Julian Savulescu²⁴ defend moral improvements through biological and genetic techniques (moral bioenhancement) not only as right,

but because it is preferable²⁵. Rational methods of moral education are, according to Persson and Savulescu, insufficient to achieve moral enhancement. In addition, they believe that scientific progress, thus implicitly also the scientific way of rationalizing that spreads through education, represent a threat to human welfare.

On the contrary, Harris²⁶ has defended a position against moral bio-enhancement in the framework of libertarianism. His argument, based on the assumption of self-determination and free will, is that ethical expertise is not a matter of “being better at being good” but of “being better at knowing the good and understanding what is likely to conduce to the good”²⁷. Between knowing what is right and doing it, a region often exists, and this is called freedom. For Harris, moral enhancement is redundant. Cognitive enhancement itself is enough to cultivate our skills in the best way, leaving us free to choose what to think about imposed social norms and how to behave in various contexts.

Apart from these radical positions, there are others which have recently been mentioned in a study by the European Parliament²⁸ and should be mentioned. This study points out that much of what you find in the ethical debate on neurocognitive enhancement is the result of exaggerations. The same study identifies five approaches to the problem. Two of them, like those we described earlier, go from radical prohibitionist ones to the so called *laissez-faire* views. But there are also three views in the middle, which are considered as viable options for the European Union. They are: a reasoned pro-enhancement approach, a reasoned restrictive approach and a case-by-case approach. The idea of the document is not to defend an alleged idea of human nature but to preserve social dimensions of a human condition, considered to be essential for cooperation and self-respect. Since we believe, as we will see, that there is no single solution to the issue of neuroenhancement, but that individual’s self-regulation and case-by-case analysis should be respected, we will argue for a case-by-case approach for evolutionary reasons. Before, contrary to

what could emerge from the debate, we would like to defend the analogy between neuro and other kinds of enhancement and point out that enhancement is not a recent practice.

Enhancement: an Ancient Practice

The fact that these days enhancement is occurring at an impressive rate does not allow us to infer that it is a presentday phenomenon. On the contrary, enhancement has always existed²⁹.

Religions and mythologies contain explicit references to enhancement, and in some cases, they explicitly prohibit it to facilitate the authoritarian control of power and a rigid, hierarchical social structure. In the Judeo-Christian tradition a crucial role is given to a symbolic enhancement event - Adam and Eve eating the forbidden fruit to acquire divine powers.

Before the ban on enhancement was systematized by later historic religions, primitive and archaic religions included the use of some psychoactive drug or psychotropic substance to facilitate experiences of transcendence, or of stimulants to enhance performances in various social activities. Another different case was that of warriors in civilizations all over the world, who have made wide use of stimulants to increase aggression or were fed certain body parts, such as testicles, brains, and hearts, believing that this could improve their vitality, intelligence and strength. Olympic athletes in ancient Greece augmented their abilities by eating special diets and different kinds of mushrooms, while gladiators in ancient Rome took stimulants mixed with alcohol not to feel the fatigue and the pain of their wounds. Mexican and Peruvian indigenous populations consumed coca and Peyote leaves to improve their physical endurance and to be protected against the effects of high altitude. In the modern age, the enhancement of military performance was achieved using *Amanita muscaria*, followed by morphine and heroin from the second half of the nineteenth century onwards, while during the Second World

War, amphetamine, ephedrine, testosterone were used to stimulate aggressiveness. In sports, doping became a rapidly expanding phenomenon in the second half of the twentieth century, as economic interests in sports grew.

Furthermore, one can suppose that the transition from a nomadic to an agrarian lifestyle and the corresponding increase in workload and stress and dietary changes has encouraged the search and use of methods for enhancing individuals physically and psychologically. The reduction in meat consumption was partially counterbalanced by novel foods such as cereals and milk products. The increased availability of glucose and the spread of new psychoactive products derived from alcoholic fermentation were likely to be added to the already known high-calorie and high-protein diets. The use of enhancers, however, tends to be located in a middle ground between the benefit to the individual and the possible harmful consequences caused by artificial alterations again for the individual.

The social history of the use of enhancing substances, especially of psychoactive substances, has faced a turning point in terms of prohibition only from the Middle Ages, and especially by theocratic governments, such as Islamic ones that prohibited alcohol consumption and progressively restrained hashish use. Nevertheless, only in the twentieth century prohibition has become the main strategy used by governments involved in the fight against abuse and addictions to psychoactive substances. Today, the use of tobacco, coffee and tea, in addition to alcohol, has stabilized, until the recent introduction of psychoactive substances mainly in recreational contexts.

In cycling, anyone who wants to have a chance in this sport is implicitly motivated to make use of enhancing means. This raising of performance standards is a concrete example of one of the outcomes feared by those who warn against authorizing its expansion. The anti-doping strategy, which aims to eradicate the phenomenon in different sports by using a prohibitionist approach inspired by a repres-

sive ideology, is a failure because it does not prevent from doping in sports but it tends to favour abuse in an illegal environment, it does not actually improve the athlete's health and diverts health-care resources from other pursuits like for example prevention and harm reduction from the sport activity itself³⁰.

Beyond Conceptual Ambiguities on Enhancement, for a Reasoned Libertarianism

Many people sympathize with prohibitionist ideas about enhancement because of a misunderstanding that leads them to identify what is "natural" with being "morally good". Of course the idea of "nature" is a cultural construct, and nature, or in the case of biological species, "biological evolution", is indifferent to individual health, happiness or pleasure, which have been, and can be, gained by struggling and by avoid predisposition to being sick, suffering and failing. The distinction between artificial enhancers such as chemical drugs and natural stimulants is not a justified distinction. From a physiological point of view there is no categorical difference between the two. The difference, if at all, is in the power of the effects. In some cases, the use of drugs is less harmful and safer than say the use of tobacco or coffee because drugs contain only the active ingredient while the later also contain carcinogenic substances. What is important is to have an awareness of the contents and the possible side effects of natural stimulants and to analyse their costs/benefits. For this reason, the crux of the matter is not whether or not to ban the development of enhancers, but what compels their use, for it should be the outcome of an individual choice and never the result of a command from others³¹. This of course, is provided that the need to use natural enhancers is the outcome of a free and informed choice.

It is also widely thought that there is a real, conceptual distinction between internal and external means, or between conventional means such as education and speech and unconventional ones such as drugs

and implants, making the former more morally acceptable than the latter. Yet, as with nutrition, an internal means may be much more effective and favour better health, even on a psychological level. Consider, for example, the effects of the imposition of educational activities on children by their parents. These manipulative interventions are just as external and not necessarily less invasive and conditioning, yet almost nobody usually claims to limit parents' actions (with very few exceptions).

As Caplan noted, people usually have nothing to say against those who make use of glasses, take insulin, get artificial heart valves or prostheses of various kind, or accept tissue and organ transplants. There is no valid argument to show a limit or a "natural boundary" to the contamination of our nature by technology.

The link between legality and safety is often wrongly understood. Prohibitionist ideas have emerged from public health concerns and moralistic prejudice, regardless of the harmfulness of enhancers and their ability to induce addictions. There is no justified relationship between the level of harm and the access to drugs. David Nutt found evidences that alcohol, a legal drug, causes more harm both individually and socially than heroin, crack and cocaine³². Similarly, tobacco is as harmful as cocaine and much more harmful than cannabis. The use of beta-blockers by musicians or speakers to control heart rhythm during performances, as well as the use of pharmaceuticals in many other professions, are much less risky, and even less damaging, than sedatives and other stimulants that have been used and abused by the same people when opioids and cocaine became illegal. Even the "culture of Prozac" (fluoxetine)³³ might turn out to be less harmful than abusing tranquillizers. Prozac was the first antidepressant based on the inhibition of serotonin re-uptake mechanism and entered the market in 1988. Within a decade, the use of this molecule and of the new-generation antidepressants quadrupled³⁴, and it is true that they have been widely prescribed for sadness or melancholy conditions

that have no pathological relevance. On the other hand, it is a well-known fact that the boundaries of diagnostic categories such as depression and anxiety disorders have expanded in recent decades. This phenomenon is often stigmatized in moralistic terms. People tend to blame drug companies for what has been called “disease mongering” according to which physiological conditions such as baldness and cellulite, though the two are not comparable to depression, or sadness has been treated pharmacologically even if they are not clinical entities. There is no doubt that economic interests and pressures play an important role, but within socially complex processes, they are not the only and perhaps not even the main determinants.

The fact that the effects of substances use and the resulting abuse on the body and particularly the brain are known does not mean that these substances are not dangerous. But harm is not necessarily proportional to legality, which is a choice that governments often make for reasons other than health and safety risks. This choice does not lead, as is believed, to a reduction in substance use and a consequent reduction in harm.

Even the idea of non-discrimination is misleading. Human beings are not biologically equal. So our normative expectations in terms of equality should avoid ascribing moral value to certain characteristics and biological behaviour, which by definition are characterized by diversity. Moral concepts such as fairness or political equality have proved to be useful on a cultural level, but they are illusions that serve to incite people that there may be improvements in the quality of social life.

One should not risk endorsing questionable paternalistic views. Persson and Savulescu, and even Harris, make this mistake³⁵. Harris believes that governments would be allowed to invest in cognitive enhancers as they do with education, because the former are also more effective in achieving the intended purpose³⁶. For Persson and Savulescu, this applies to the enhancement of moral capacities as well. However, we

wonder whether government programs to enhance the population cognitively would actually promote individual welfare, or whether this would be a form of coercion designed to meet the interests of society. Both views risk to justify the manipulative intervention through a form of self-deception, namely by motivating it as if it were an interest of the individual himself. On the contrary, governments should promote the most egalitarian conditions possible, within which the individual would make a choices about where to direct and how to conduct his own path in life. This could be done by perhaps providing adequate incentives and opportunities to make better use of the information in addressing educational interventions, and then by understanding the extent to which enhancers are really necessary.

Pro-enhancement arguments move from the assumption that improving a proximate cause will necessarily provide benefits. But this is not true. Not only are the proximate causes sometimes a source of behavioural problems, but also remote causes; namely, our congenital physiology, which is being triggered by confused or unexpected stimuli if compared to expectations. A comparison between enhancement and education is incorrect, because the use of education is basically to give us counterintuitive abilities to live in environments and social systems that are completely distant from an evolutionary viewpoint. As consequence, contemporary environments and social systems are potential causes of dysfunctions or maladaptive phenotypes in individuals. Thus, education and culture can and should have a much greater role in encouraging those essential changes in the ability of individual adaptation.

It is also true that there is no a recognized definition of what a lifestyle drug actually is, apart from the mild and equivocal (often moralistic) terms of a medicine whose purposes are not related to health³⁷. Nor is it clear what the actual impact of the enhancement “run-up” on society will be. The use of drugs can cause side effects in consumers, they can increase accidents and accentuate social aggression. For

the moment, the only consequence will be to medicalize conditions that are not actually diseases. However this is not so worrying if we consider that in recent decades something similar has happened to several metabolic parameters that are used indicators of health or disease risk (levels of cholesterol, blood pressure or body mass index, etc.). Can we really refer to some natural, biological standard for deciding what one can and cannot do in terms of enhancement?

An Evolutionary Perspective on Enhancement

A recent view is that enhancement might be used as a strategy for promoting social welfare. In particular, it can serve as a concrete response to mismatches caused by evolution³⁸. Evolution has selected mechanisms for a different environment from today. Consider sexuality and sexual relationships, say authors like Earp, Sandberg and Savulescu: according to them, our neural mechanisms were designed for reproduction and able to form pair bonds but not for marital success, while modern Western society requires monogamy and marriage stability for various reasons. Earp, Sandberg and Savulescu claim that it should be good to promote pharmacological interventions that maintain the serenity of married couples, though without any coercion. In particular, in order to protect their children from harm and from a broken marriage, especially from outright divorce, parents have an obligation to preserve and enhance their relationships and “in many cases” the authors claim, “the only way to do this is through pharmacological intervention”.

We defend a different evolutionary account that is more reasoned and consistent with the theory of evolution and with evolution-based medicine (EBM)³⁹, that is the idea that our bodies and their mechanisms are imperfect product of evolution by natural selection as their functioning (or mal-functioning) is to be understood as an adaptation to the evolutionary environment they formed in. But also that evolutionary biology does not define conditions under which

justifying enhancement under all circumstances and according to social needs, but only theoretical tools for case-by-case solutions to help the individual make autonomous choices. Evolution-based medicine may help the individual evaluate costs and benefits of enhancement on his health, given the particular evolutionary features of the mechanism where the intervention is supposed to have an effect. First of all, we agree with other evolutionary accounts⁴⁰ that functional traits of biological organisms are the result of evolution and evolutionary heuristics. In order to change biological systems for therapeutic purposes or for enhancing them, one should know their nature and physiological organization. But one should also understand whether their dysfunctions are maladaptive manifestations. Experimental and mechanistic model inspiring scientific medicine is only one components of the explanation of our body. This model assumes that the body is a well-designed machine and that we can intervene by repairing its impairments and breakdowns, or increasing its performances. But what should be taken into account is why the system functioning has developed evolutionarily in a certain way, what its presumed malfunctions and functional limitations imply.

Evolutionary process is far from favouring health or welfare, and any phenotypic trait is a trade-off. A medical implication is that diseases are an inevitable consequences of the “normal” imperfection of biological organization and of the “normal” interfering processes of spontaneous variation. Moreover, disorders, illnesses and sicknesses are a products of environmental mismatches, so they may be phenomena that have resisted natural selection but were adaptive in an ancestral environment, which is very different from the current one. The human body is still the phenotypic landscape of a genome assembled during the Pleistocene and Pliocene and which has remained virtually unchanged. After the transition to agriculture, the environment of evolutionary adaptedness has changed, and traits

that were functional for surviving in the Paleolithic era have proven to be maladaptive in the most recent age.

In the modern world, new problems arise ultimately because our psychology and social dynamics evolved in an ancestral environment. Given those mismatches, we produce irreducible value disagreements. Performance standards and goals have changed alongside social requirements. Social requirements determine choices in social relations and include reproductive, dietary, and hygiene practices, as well as intellectual skills. We need these skills to integrate into complex societies and to prevent the health risks associated with new lifestyles. In other words, many interventions such as contraceptives, vaccinations, functional foods and even school education are already existing forms of enhancement that respond to individuals' needs for better controlling their destinies and meeting social demands⁴¹. These enhancers usually do not raise concerns in those cultural groups that intend explicitly to limit individual freedom.

Enhancement can of course, in some cases, better match mismatched traits. But traits acquired by organisms in the course of evolution through the process of natural selection or genetic drift are trade-offs. They represent some reproductive benefits or at least they do not reduce reproductive chances in those environments. Thus although phenotypic traits provide protection against some risk factor for survival, they are not shaped by natural selection according to any preconceived design. On the contrary, they can sometimes be associated with functional handicaps in a statistically standard population. From a biological point of view, there is no project to which to refer or to pursue, there are no typical performance or capacity values that are definitely, functionally optimal. In this, our account differs from other evolutionary accounts that pose as a starting point an Evolutionary Optimality Challenge⁴², which is in short the question about why we have not already evolved in the way that would result by the enhancement intervention and it is also the suggestion

that we are justified in the use of enhancements inasmuch as we improve on evolution's work and pursue an optimality goal – so, according to these accounts, the proposed enhancement needs “to yield a net benefit”, otherwise it cannot be accepted. We disagree both with the idea of optimality in evolution and with the idea that the search for optimality should be a tool to assess the acceptability of some enhancement.

Selective pressures select physical or intellectual traits that provide a benefit but can also be disadvantageous. For example, sickle-cell anaemia and thalassemia protect heterozygotes from malaria, or Gaucher's disease Type I, especially prevalent among Ashkenazi Jews, in which acquired mutations favour the accumulation of sphingolipids is potentially associated with a higher IQ in heterozygotes. This is useful to understand that evolution cannot be used as a conclusive argument in favour of enhancement, just as a certain idea of “nature,” which expresses the sense of “familiarity,” cannot be used to ban it.

There are no valid ethical arguments against the idea of possible future screening that promotes genes that might increase intelligence, for example. Similarly, there are none against generally accepted screening that monitors genes causing serious inherited diseases. Nevertheless enhancement cannot always be classified as desirable, or optimally beneficial, insofar as it can be also seen as an interference with the result of the evolutionary process, or better with human adaptations to the environment. While working on isolated elements, it may negatively intervene with the functional system structure as a whole, interacting with those epigenetic processes favoured by evolution to balance the system at the level of individual performance. These evolutionary considerations are key elements that should be included in the decision-making process of an individual, or even of society, when considering whether to provide forms of enhancement by evaluating each case-by-case.

Evolutionary heuristics may help to understand evolutionary constraints we are equipped with from birth. Not only at the level of metabolism and biomechanics, but also in terms of psychology and emotions. This may allow us to identify promising enhancements and evaluate their risk/benefit ratio. This may provide us with a strategy for framing bioethical controversies, and avoid both the drifts of prohibitionist perspectives and of paternalistic views, libertarian or not, that defend enhancement as a political solution to social contradictions.

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