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Implications of the Inverted U Phenomenon for the Bioethical Principle of Justice in the Context of Pharmacological Cognitive Enhancement

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Abstract

At the present time there is a boom in the use of pharmacological cognitive enhancers (PCEs) particularly within an academic and labor context. Numerous objections to the use of these medicines arise in the context of Neuroethics, being one of the most important, the principle of justice. Among the most prevalent arguments put forward it is noted the disturbance of distributive justice and competitive fairness. Succinctly it is established that hypothetical PCEs without adverse effects could promote the social fragmentation by favoring economically dominant classes. However, it has been experimentally observed that PCEs present benefits ruled by the inverted U phenomenon, where cognitive benefits given by these medicines are not dose-dependent and have dependence on the baseline performance. Producing bigger benefits in individuals that initially had a worst performance. In this way the use of PCEs, assuming a context of open-access, could contribute to social equity and distributive justice.

Keywords

Cognitive Enhancement, Inverted U Phenomenon, Justice Principle, Neuroethics

Introduction

We are currently in a boom in the use of pharmacological cognitive enhancers (PCEs) such as modafinil, methylphenidate and acetylcholinesterase inhibitors. This boom has occurred mainly in academic and labor contexts, although the interest of the general public has in turn increased significantly. It has been pointed out by several authors the possibility that this trend continues in the future (Teter et al. 2005; Smith and Farah 2011). It should be noted that this trend remains despite the contrasting evidence on the benefits of these types of drugs, it can be said that in general the expectations of users of these types of drugs are far greater than their real-life cognitive benefits (Advokat 2010). The important prevalence of the use of PCEs has produced numerous bioethical objections even assuming that cognitive benefits may actually occur, such as increased concentration or improved working memory. The use of PCEs is clearly questionable when there is no concrete idea about the security of their use in the first term and secondly, when the vast majority of users do not know the adverse effects analogous to

the use of these types of drugs. There is an important absence of longitudinal studies that evaluate this particular topic. Before this, it is paramount to exercise the precautionary principle (Lewens 2010; Mohamed 2014).

In addition to the doubts about beneficence and non-maleficence that PCE stands for as intervention, the principle of justice is one of the most prominent. In any intervention that involves cognitive enhancement (CE) or human enhancement (HE), there is always a concern that such intervention may contribute to promote social inequality. Since economically dominant classes could abuse the availability of PCEs, in the first place by acquiring them in excess and secondly, by limiting the access of economically lower classes through their economic preponderance, contributing in a bipartite way to maintain the social gap (Farah 2010).

Initially it should be noted that although on a smaller scale, humanity has already had strategies or technology that could contribute to CE. We can name the diet, education, use of mnemonics, or even the use of the internet, among some that have prevailed for centuries in humanity. In general, the use of these forms of cognitive behavioral enhancement (CBE) have not been subject to greater ethical scrutiny, since they were for a long time considered to lack effects large enough to contribute to the existing social gap, and it is only recently that they enter to the neuroethical debate. It can be said that, in many cases, the benefits of CBE outweigh the benefits of PCE. Although by their very modifiable and reproducible nature, it is assumed that in the future, with more effective and safer PCEs, they can in fact contribute to promote social inequality (Reiner 2013). The debate on the use of PCEs has produced diverse viewpoints that have enriched the debate. It is difficult to dismiss the biopolitical and philosophical implications that this supposes. Reasons why it is necessary to examine them before continuing towards what the “phenomenon of the inverted U” contributes to the debate.

Bioethical Postures Toward the Use of PCE in a Biopolitical Context

Biopolitical positions around the use of PCE should be considered, in which at least three preponderant currents of thought can be identified: transhumanism, bioconservatism and thinkers who are ascribed in the “view of reasonableness.” This spectrum of philosophical thinking embraces the free and indiscriminate use of PCEs, passing through the intermediate point that is to make of these an object of conscious study without scientific or social prejudices, to the point of view dominated by the “precautionary principle” that sees the use of PCEs with disapproval.

Bioconservatism

This order of thought bases some of its arguments in human dignity and the loss of humanity through the abuse of current technology. The precautionary principle assumes that precautionary measures should be taken before the introduction of technologies that do not have scientific basis to support or oppose their use. This is an argument that is generally welcomed by segments of less radical transhumanism, although there are other arguments in this position. According to McKibben (2004), the modern world has distanced itself from nature, and producing CE beyond what is established as “normal” is the last and most important symptom of this distancing. Another perspective is given by Leon Kass (2003), who served as presidential advisor on bioethics during George Bush’s administration. His argument revolves around the fact that the CE presupposes an affront to human dignity. Previously Leon Kass (1998) wielded a different argument against CE, in particular speaking of the genetic modification although extrapolable to CE, in an article entitled “The wisdom of repugnance.” He argues that there is something disturbing about CE and this is repugnance, therefore paying attention to what produces repugnance is a way of arriving at morally acceptable conclusions, because disgust is the first evidence of foulness and violation.

There are numerous objections to disgust as a source of wisdom, even pointing out that this principle has been the basis of prejudices throughout a large part of human history. Although it cannot be denied that in the view of evolutionary psychology, disgust evolved as an adaptation to pollution, preventing various organisms from consuming contaminated food and subsequently fading, perhaps the most crucial point is that while there is “wisdom” in disgust, it is difficult to sustain in it as a moral compass (Nussbaum 2006).

Transhumanism

The transhumanist stance sees the free use of PCE with enthusiasm. In fact it goes further, extending the argument to the adoption of more radical and invasive technologies like implants or permanent devices. The aspiration for a program that promotes CE has been a prominent concern of the transhumanist side since its inception. There are several viewpoints of transhumanism around the use of PCE, but we will stick to the “libertarian” point of view that states that the autonomy of the patient is paramount, because the benefits or damages concern him mainly. It should, from an inclusive perspective in the use of CE, integrate the rights of the individual as well as the responsibility of society as a whole (Schneider 2009).

According to Savulescu (2006), justice can be achieved by bringing as many people as possible to the level of minimum IQ needed to have an acceptable level of possibilities of achieving a decent live. If the method to achieve such equality is the PCE, then justice and equality require the use of CE. The way to level the clearly biased balance towards the rich would be the use of PCE.

Point of View of Reasonableness

Between the previous positions we find the point of view of reasonableness, to which some scientists ascribe. This perspective has a more recent origin and it is noteworthy that it can be assumed as a light transhumanism rather than as a literally intermediate point between transhumanism and bioconservatism (Outram 2012). Greely is one of the main exponents of this position, recognizing some of the concerns inherent in the use of PCE such as: security, real benefit of its use and the limited information available to the general public. As solutions to these concerns, the application of an evidence-based approach prior to the use of these drugs, and the enactment of policies that seek to favor this research in order to make decisions based on standardized studies and not, based on the information currently available, which tends to have discordant methodological designs and to suffer from small samples with little uniformity. It is also important to include research with healthy individuals as opposed to individuals with neuropsychiatric pathologies such as attention deficit hyperactivity disorder.

This view calls on health professionals, bioethics and philosophy in general to participate in the design of these policies, in order to integrate a legislative apparatus that favors scientific advancement instead of hindering it. This point of view exposes the lack of evidence to make an informed opinion regarding the CE and under this precept, seeks the adoption of a new paradigm for research (Greely et al. 2008).

The Inverted U Phenomenon

After examining some of the positions relevant to the use of MCF, it is necessary to explain the relevance of the inverted U phenomenon and what it can add to the debate about its use.

The inverted U phenomenon is a nonlinear relationship that has been frequently reported when studying positive or negative effects of pharmacological and non-pharmacological treatments on cognitive functions and memory. This relationship was initially between cognitive function and other neuromodulatory influences such as arousal, dopamine, acetylcholine and noradrenaline levels, particularly in the context of

stress. Among the results it was found that the beneficial effects for a given cognitive domain, for example memory, tend to increase to a maximum point and subsequently this effect decreases. Graphically this is represented as an inverted U letter, having limited benefits that increase as it approaches to the optimum dose, and then decreasing until disappearing as this dose increases. It has been observed that this phenomenon is neither dose-dependent nor via-dependent (Baldi and Bucherelli 2005). In addition to the observations made in relation to the dose, the relation with the baseline performance has been highlighted. That is, the individuals who at the beginning presented a worse performance in a certain activity, presented a greater benefit than those with a better baseline performance. In this way it can be summarized that PCEs work best at moderate doses and with individuals with low baseline performance (Mehta et al. 2004; Husain and Mehta 2011; Kelley et al. 2012).

Although the mechanisms that explain this phenomenon are still not well understood, it has been speculated that there may be a relationship with acetylcholinesterase inhibitors among other enzymatic mechanisms. On the other hand, at least speaking of memory, it has theorized the role that arousal would have as a causal agent in this phenomenon. It has been observed in several experiments with PCEs and more recently, was hypothesized as one of the mechanisms of action that could produce cognitive benefits when using modafinil (Battleday and Brem 2015).

Implications of the Inverted U Phenomenon on the Principle of Justice

Since the emergence of the first technological advances with HE potential, the bioethical principle of justice has been one of the most debated, assuming that they could contribute to promoting the socio-economic gap between countries, besides contributing to social inequality by promoting "cheating" and, among other questions in the order of authenticity, ontologically promoting the questioning: How authentic is an achievement when using PCE? It is also argued about the violation of equal opportunities between individuals who decide not to use PCE versus those who do. And policies on their use would have to take into account the principle of autonomy under consideration, at least economically limiting access to PCE through economic restrictions as a mean of reducing inequality (BMA 2007; Cakic 2009).

Some authors like Savulescu (2006) have argued the inverse idea. Since the use of technology and advances such as education, caffeine and access to computers has turned the balance in favor of economically dominant classes, a way of solving this social

inequality would be the use of PCEs. Calculations have been made about the “suboptimal intelligence cost”, with some estimates suggesting that an increase of 3 IQ points could reduce poverty rates by as much as 25% (Schwartz 1994).

By contrasting both positions we can say that for some time there had been technological and cultural advances that promote social inequality. For example, access to higher education, without producing too much of a bioethical debate. The way to confront this progress was to make policies that promote access to education in a mandatory way. Although there are other factors that contribute to the absence of distributive justice and to a greater or lesser extent, they promote social inequality. It is difficult to dismiss the role that education, diet (in the context of neurodevelopment) and access to the internet have played and currently play.

Thus the inverted U phenomenon dictates that benefits would be greater for individuals with low baseline performance, and under this assumption it could be argued that it could contribute to creating a level playing field when assuming free access to these types of drugs. Populations that have less access to some CE means such as those mentioned above, could benefit from the distribution of hypothetical PCEs with few adverse effects and a reproducible and verifiable benefit. Notably, it would be considerably questionable to promote, for example, free access to modafinil with the argument of distributive justice insofar as it is not a harmless intervention and its beneficence is questionable.

Some authors go so far as to assert that it is a moral obligation on grounds of equality, to allow free access to these drugs to populations with low and normal intelligence. By examining the issue from a utilitarian perspective, it could contribute to improving the quality of life of a significant portion of the population by enhancing their employment and academic potential (Dunlop and Savulescu 2014). Another view is that the use of public funds should only be used for curative rather than improvement purposes, as well as emphasizing the importance that the use of CE should not be used to promote asymmetrical relationships between individuals and groups, namely, socioeconomic levels (Shook and Giordano 2014).

In the opinion of the author, and particularly speaking of the bioethical principle of justice, consideration should be given to both ideas and to the discussion of legislation in the use and access to CE, particularly of existing technologies such as PCE or use of transcranial magnetic stimulation. The guiding principle of the usefulness of this “speculative ethics” lies in foreseeing implications that may have certain scientific advances with CE potential, and in this way address problems such as contributing to the socioeconomical gap or promoting inequality in a prophylactic manner, as opposed

to recoiling when the enhancement is producing a certain undesirable effect for society (Schlag 2013). Free access to PCEs should be one of the drivers to consider when beginning to implement public policies that regulate the use of PCE. Without demeaning the importance that beneficence and non-maleficence have, considerations that we can affirm, are much more current because although the benefit is still questionable, adverse effects analogous to PCE use are currently happening.

Conclusions

One of the most important concerns about the use of CE in general and PCE in particular is based on the implications this has for the principle of justice. Will its use contribute to social inequality? Will it increase inequality in the academic world? Assuming that the benefits of PCE are unlimited or dose dependent, it can be argued that in effect, economically dominant classes could have greater access to these drugs and thus, promote social, academic and labor inequality. However, the fact that clinical trials have found that the benefits of PCE are compatible with the inverted U phenomenon clarifies two things to us. One, there is no dose-dependent relationship. And two, the benefit is proportional to baseline performance, greater for the worse and smaller for the best, producing a kind of balance. Obviously, it may be too reductionistic, since like any other drug, its use depends on a restriction of distribution access and primarily economic cost. However, if there is no free access to these drugs the benefit would be more theoretical than practical. Thus, speaking in terms of policies regarding the use of MCF, it is important that the debate analyzes the potential that PCE could be used to reduce the socioeconomic gap rather than expanding it, being essential to consider free access to them as one of the most important topics. It should be noted that this type of argument can be characterized as part of “speculative ethics” since PCE is assumed with reproducible, constant benefits that can “affect performance in daily life”, qualities that the present PCE debatably does not present. The importance relies therefore in the potential of preventive policies rather than “interventional” when there is an undesirable effect such as the promotion of social inequality.

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