

Smart Policy: Cognitive Enhancement in the Public Interest

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Introduction

Cognitive enhancement may be defined as the amplification or extension of core capacities of the mind through improvement or augmentation of internal or external information processing systems. Cognition refers to the processes an organism uses to organize information. These include acquiring information (perception), selecting (attention), representing (understanding) and retaining (memory) information, and using it to guide behavior (reasoning and coordination of motor outputs). Interventions to improve cognitive function may be directed at any of these core faculties.

Many methods for enhancing cognition are of a quite mundane nature, and some have been practiced for thousands of years. The prime example is education and training, where the goal is often not only to impart specific skills or information but also to improve general mental faculties such as concentration, memory, and critical thinking. Other forms of mental training, such as yoga, martial arts, meditation, and creativity courses are also in common use. Caffeine is widely used to improve alertness. Herbal extracts reputed to improve memory are popular, with sales of Ginko biloba alone on the order of several hundred million dollars per year in the U.S.¹ In an ordinary supermarket or health food store we can find a veritable cornucopia of energy drinks and similar preparations, vying for consumers hoping to turbo-charge their brains.

As cognitive neuroscience has advanced, the list of prospective biomedical enhancements has steadily expanded.² Yet to date, the most dramatic advances in our

¹ (van Beek 2002)

² For a recent review of various cognitive enhancement methods, see (Bostrom & Sandberg 2007), (Farah, Illes et al. 2004).

effective cognitive performance have been achieved through non-biomedical means. Progress in computing and information technology has vastly increased our ability to accumulate, store, analyze, and communicate information. External hardware and software supports now routinely give humans beings effective cognitive abilities that in many respects far outstrip those of our biological brains. Another important area of progress has been in “collective cognition” – cognition distributed across many minds. Collective cognition has been enhanced through the development and use of more efficient tools and methods for intellectual collaboration. The World Wide Web and e-mail are among the most powerful kinds of cognitive enhancement developed to date. Non-technological approaches to enhancing collective cognition have also made important advances: it is possible to view institutions such as academic peer-reviewed journals, and social conventions such as limitations on the use of *ad hominem* arguments in discussions, as part of the cognitive enhancement spectrum.

It is useful to bear in mind this wider perspective on the various forms that cognitive enhancement can take. Such a wide perspective helps us see just how important advances in cognitive and epistemic functioning are to individuals and to modern societies. It also helps us avoid a myopic fixation on biological paths to enhancement to the exclusion of other ways of achieving similar goals, which in many cases may be more feasible. Nevertheless, biomedical forms of cognitive enhancement are worthy of serious consideration, not only because of their novelty but because they could eventually offer enormous leverage. Consider the cost-benefit ratio of a cheap pill that safely enhances cognition compared to years of extra education.

Assessment

“Conventional” means of cognitive enhancement (such as education, mental techniques, neurological health, external information technology, and epistemic institutions) are quite uncontroversial, while “unconventional” means (such as drugs, implants, and direct brain-computer interfaces) are more likely to evoke moral concerns. However, the boundary between these two categories will become increasingly blurred. It seems plausible that the controversy surrounding unconventional means of cognitive enhancement is largely due to the fact that they are currently novel and experimental, rather than to any intrinsic problem with the technologies themselves. As, through scientific research and practical experience of their use, we learn more about the strengths and weaknesses of these unconventional methods for improving cognitive performance, they are likely to become normalized. Enhancement discourse might become absorbed into the ordinary discourse of tools, technologies, medicine, and practices.

At present, biomedical enhancement techniques produce at most modest gains in cognitive performance. Improvements of 10-20% in some test task is typical. More

dramatic results can be achieved through training and human-machine collaboration. Mental techniques (e.g. mnemonic tricks) can achieve upwards of 1,000% improvement in narrow domains such as specific memorization tasks³. However, while pharmacological enhancements do not produce dramatic improvements on specific tasks, their effects are often broad. A drug might, for instance, enhance performance on all tasks that rely heavily on working memory, or on long term memory. External tools and cognitive techniques such as mnemonics, by contrast, are usually task-specific, producing potentially huge improvements in relatively narrow abilities. A combination of different methods can be expected to achieve greater results than individual methods used in isolation, especially in everyday or workplace settings where a wide variety of cognitive challenges have to be met.

Even small improvements in general cognitive capacities can have important positive effects. Individual cognitive capacity (imperfectly measured by IQ scores) is positively correlated with income. One typical study estimates the increase in income from one additional IQ point to 2.1% for men and 3.6% for women⁴. Higher cognitive abilities are associated with avoidance of a wide array of social and economic misfortunes⁵ and appear to promote health⁶. At a societal level, the sum of many individual enhancements may have an even more profound effect. Economic models of the loss caused by small intelligence decrements due to lead in drinking water predict significant effects of even a few points change⁷. Correspondingly significant *benefits* can be expected if a similarly small amount of intelligence were gained instead of lost.⁸

Policy implications

Many forms of extant regulation are intended to protect and improve cognitive function. Regulation of lead in paints and in tap water; requirements of boxing, bicycle, and motorcycle helmets; bans on alcohol for minors; mandatory education; folic acid fortification of cereals; legal sanctions against mothers taking drugs during pregnancy: these all serve to safeguard or promote cognition. To some extent, these efforts may be motivated by a concern to promote general health; yet greater efforts appear to be made when cognitive function is at risk. One may also observe that mandated information duties, such as labelling of food products, were introduced to give consumers access to more accurate information in order to enable them to make better choices. Given that sound decision-making requires both reliable information and the cognitive ability to

³ (Ericsson, Chase, and Faloon 1980)

⁴ (Salkever 1995)

⁵ (Gottfredson 1997; Gottfredson 2004)

⁶ (Whalley and Deary 2001)

⁷ (Salkever 1995) (Muir and Zegarac 2001)

⁸ See (Bostrom and Ord 2006)

retain, evaluate, and use this information, one would expect that enhancements of cognition will also promote rational consumer choice. By contrast, there exists no public policy that is intended to limit or reduce cognitive capacity. Insofar as patterns of regulation reflect social preferences, therefore, it seems that there is at least an implicit commitment to promote better cognition.

There are, however, a number of obstacles to the development and use of cognitive enhancements. One major obstacle is the present system for licensing drugs and medical treatments. This system was created to deal with traditional medicine which aims to prevent, detect, cure, or mitigate diseases. In this framework, there is no room for enhancing medicine. Drug companies would find it difficult to get regulatory approval for a pharmaceutical whose sole use was to improve cognitive functioning in the healthy population. To date, every pharmaceutical on the market that offers some potential cognitive enhancement effect was developed to treat some specific disease condition, such as attention-deficit hyperactivity disorder (ADHD), narcolepsy, or Alzheimer's disease. The enhancing effect of these drugs in healthy subjects is a serendipitous unintended benefit. Progress would almost certainly be accelerated if pharmaceutical corporations could focus directly on developing nootropics for use in non-diseased populations rather than having to work indirectly by demonstrating that the drugs are also efficacious in treating some recognized disease.

One of the perverse effects of the failure of the current medical framework to recognize the legitimacy and potential of enhancement medicine is the trend towards medicalization and "pathologization" of an increasing range of conditions that were previously regarded as part of the normal human spectrum. If, for example, a significant fraction of the population could obtain certain benefits from drugs that improve concentration, it is currently necessary to categorize this segment of people as having some disease (in this case ADHD) in order to get the drug approved and prescribed to those who could benefit from it. This disease-focused medical model is increasingly inadequate for an era in which many people will be using medical treatments for enhancement purposes. Academic research is also hampered by the disease framework in that researchers find it difficult or impossible to secure funding to study potential cognitive enhancers except in contexts where the study can be linked to some recognized pathology.⁹

The medicine-as-treatment-for-disease framework creates problems not only for pharmaceutical companies, but also for individual users ("patients") whose access to enhancers is often dependent on being able to find an open-minded physician who will prescribe the drug. This creates inequities in access. People with high social capital and good information get access while others are excluded.

⁹ Danielle Turner and Barbara J Sahakian, personal communication.

Given that all medical interventions carry some risk, and that the benefits of enhancements may often be more subjective and value-dependent than the benefits of being cured of a disease, it is important to allow individuals to determine their own preferences for tradeoffs between risks and benefits. It is highly unlikely that one size will fit all. At the same time, many will feel the need for a limited degree of paternalism that would protect individuals from at least the worst risks. One option would be to establish some baseline level of acceptable risk in approved interventions. This could be done through comparison with other risks that society allows individuals to take, such as risks from smoking, mountain climbing, or horseback riding. Enhancements that could be shown to be no more risky than these activities would be allowed, with appropriate information and warning labels when necessary. Another possibility would be “enhancement licenses”. People willing to undergo potentially risky but rewarding enhancements could be required to demonstrate sufficient understanding of the risks and the ability to handle them responsibly. This would both ensure informed consent and enable better monitoring. A downside with enhancement licenses is that people with low cognitive capacity, who may have the most to gain from enhancements, could find it hard to gain access if the license requirements were too demanding.

Public funding for research does not yet reflect the potential personal and social benefits of many forms of cognitive enhancement. There is public funding (albeit, arguably, at inadequate levels) for research into new education methods and information technology, but not for pharmacological cognitive enhancers. In view of the potentially enormous gains from even moderately effective general cognitive enhancements, the field deserves large-scale public funding. It is clear that much research and development is needed to make cognitive enhancement medicine practical and efficient. As discussed above, this requires – in addition to funding – a change of the paradigm according to which medicine is only about restoring, but not enhancing; and a concomitant change in the regulatory framework for medical trials and drug approval.

There are also regulatory changes could be useful without being complicated or disruptive. The evidence on prenatal and perinatal nutrition suggests that infant formulas containing suitable nutrients may have a significant, positive, life-long impact on cognition. Because of the low cost and extremely large potential impact of enriched infant formula if applied at a population level, it should be a priority to conduct more research to establish the optimal composition of infant formula. Regulation could then be used to ensure that commercially available formula contains these nutrients. Public health information campaigns could further promote the use of enriched formula (or breast feeding practices) that promote mental development. This would be a simple extension of current regulatory practice, but a potentially important one.

While access to medicine is regarded as a human right constrained by cost concerns, it is less clear whether access to all enhancements should be regarded as a

positive right. The case for at least a negative right to cognitive enhancement based on cognitive liberty, privacy interests, and the important interest of persons in protecting and developing their own minds and capacity for autonomy, seems very strong¹⁰. Proponents of a positive right to (publicly subsidized) enhancements could argue for their position on grounds of fairness or equality, or on grounds of a public interest in the promotion of the capacities required for autonomous agency. The societal benefits of effective cognitive enhancement may turn out to be so large and unequivocal that it would be economically efficient to subsidize enhancement for the poor, just as the state now subsidizes education.¹¹

Recommendations

- Conceptualize pharmacological cognitive enhancers as part of a wider spectrum of ways of enhancing the cognitive performance of groups and individuals.
- Expand the disease-focused regulatory framework for drug approval into a health- or wellbeing-focused framework in order to facilitate the development and use of pharmaceutical cognitive enhancement of healthy adult individuals.
- Provide public funding for academic research into the safety and efficacy of cognitive enhancers, for the development of improved enhancers, and for epidemiological studies of the broader effects of long-term use.
- Increase public funding for research aimed at determining optimal nutrition for pregnant women and newborns to promote brain development.
- Disseminate information to the public about optimal pre- and perinatal nutrition.

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¹⁰ It can certainly be argued as a negative right, cf. (Sandberg 2003; Boire 2001)

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