Cognitive Diversity and Moral Enhancement

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Abstract: One debate in contemporary bioethics centers on whether the development of cognitive enhancement technologies (CETs) will hasten the need for moral enhancement. In this article we provide a new argument in favor of pursuing these enhancement technologies together. The widespread availability of CETs will likely increase population-level cognitive diversity. Different people will choose to enhance different aspects of their cognition, and some won't enhance themselves at all. Although this has the potential to be beneficial for society, it could also result in harms as people become more different from one another. Aspects of our moral psychology make it difficult for people to cooperate and coordinate actions with those who are very different from themselves. These moral failings could be targeted by moral enhancement technologies, which may improve cooperation among individuals. Moral enhancement technologies will therefore help society maximize the benefits, and reduce the costs, associated with widespread access to cognitive enhancements.

Keywords: moral enhancement; cognitive enhancement; cognitive diversity; collective problem solving; empathy gap

Introduction

One debate in contemporary bioethics centers on whether the development of cognitive enhancement technologies will hasten the need for moral enhancement. Savulescu and Persson argue that one of the dangers of cognitive enhancement technologies (CETs) is their capacity to increase the destructive power of malicious individuals.[1,2] Armed with greatly enhanced cognitive capacities and powerful technologies whose discovery was made possible by cognitive enhancement, immoral individuals bent on destruction will be able to cause catastrophic levels of harm. In theory, moral enhancement technologies will enable us to prevent individuals from having these destructive desires. Hence, the development of powerful cognitive enhancement technologies will be dangerous unless we also pursue moral enhancement.

One problem with motivating the need for moral enhancements in these terms is scope. Savulescu and Persson state: "Even if only a tiny fraction of humanity is immoral enough to want to cause large-scale harm by weapons of mass destruction in their possession, there are bound to be some such people in a huge human population, as on Earth, unless humanity is extensively morally enhanced."[3] However, as John Harris points out, in order to protect us from the destructive desires of a "tiny fraction" of humanity, we would need to ensure that every single individual is morally enhanced.[4] But this may be an unachievable goal. The history of vaccines and other medical interventions has shown that universal implementation of a treatment is nearly impossible to achieve. It is therefore unlikely we will be able to ensure that every single individual is morally enhanced to erase the threat posed by just a small number of malicious individuals.

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However, there may be other reasons why cognitive enhancement technologies will drive the need for moral enhancement. According to some theories of human evolution, human populations have evolved to be cognitively diverse. Cognitive enhancement technologies may exacerbate these natural differences among individuals. We may expect different people to use different cognitive enhancements (or none at all) and individuals to respond differentially to particular enhancements. This could increase the level of cognitive diversity in our populations.

If the availability of CETs does increase cognitive diversity, this could be beneficial for society for several reasons. Work in economics, and other social sciences, has shown that diverse groups are potentially more productive and better at solving complex problems than less diverse groups. Similarly, we may expect cognitively diverse populations to reap the benefits associated with the division of cognitive labor and task specialization.

However, cognitive diversity is only beneficial when group members are able to effectively cooperate with one another. Cooperation in diverse groups can be problematic because of difficulties with communication and coordination. In the future, people with differently enhanced cognitive traits who think in contrasting ways and have diverse values and preferences may have trouble effectively cooperating with one another.

These difficulties may arise partly from limitations in our moral psychology. For example, because we evolved in relatively homogeneous groups, individuals can find it difficult to empathize with those who are very different from themselves. This can lead to difficulties with communication and coordination. Enhancements that increase empathy, therefore, could help improve cooperation among diverse individuals. This may provide another reason why research into moral enhancement technologies should be pursued in conjunction with research into cognitive enhancement technologies. Moral enhancements could allow us to improve the expected benefit of cognitive enhancement technologies, and to reduce the costs associated with difficulties in group cohesion.

In this article, we investigate the relationship among cognitive enhancement technologies, cognitive diversity, and the need for moral enhancement. We first discuss the likely effect the development of CETs will have on population-level cognitive diversity. We argue that a plausible consequence of the development of CETs is an increase in cognitive diversity. Next, we look at the possible beneficial consequences associated with increasing population-level cognitive diversity. We argue that diverse populations are likely to be more economically productive and better at solving complex problems than less diverse populations. We then look at some of the costs associated with cognitive diversity and argue that moral enhancement technologies could minimize these costs. In our final section we discuss the significance of our claims. We argue that, as moral enhancements can improve cooperation, which improves our collective ability to solve problems, they can be seen as a collective cognitive enhancement. Looked at from a population's perspective, moral and cognitive enhancements may be desirable for the exact same reason—they improve our collective ability to solve problems. Hence the difference between these two enhancement technologies may be less significant than is often portrayed in the literature.

How Will Cognitive Enhancement Technologies Influence Cognitive Diversity?

According to some theories of human evolution, human populations have evolved to be naturally cognitively diverse.[5] Early groups of humans benefited from having some individuals who were genetically predisposed to be good at working alone, some who were good at communicating with others, some who were good at perceiving fine details, some who were good at dealing with abstract ideas, and so on. This natural diversity allows different individuals to specialize in different tasks, and this makes human groups as a whole better off. However, this also means that few, if any, individuals have all the cognitive capacities they need to live their life in an optimal way. We depend on others in order to survive and thrive.

One question that has been largely overlooked in the cognitive enhancement debate is how the development of cognitive enhancement technologies will affect this standing level of cognitive diversity. Although some argue that enhancements in general threaten "the good that is the diversity of human forms",[6] this argument hasn't been developed for the specific case of cognitive enhancements.

One way in which cognitive enhancements may be expected to reduce cognitive diversity is if they are used as part of a coercive state-based program, such as the early eugenics programs of the United States and Germany. These eugenic programs aimed to rid populations of traits the state deemed undesirable. Similarly, if new coercive state-based cognitive enhancement programs are implemented, this might reduce cognitive diversity as the frequency of cognitive traits that the state labels "undesirable" are eliminated.

However, eugenics, and the idea of coercive state-based enhancement programs more generally, is now widely considered to be immoral and incompatible with basic human rights.[7,8] It is more likely that CETs will be available through a liberal regulatory regime, with individuals generally free to make their own decisions about whether or not to use particular enhancements as they are developed.

If this is the case, the development of CETs may be expected to increase rather than decrease cognitive diversity. We would expect different people to use CETs in different ways, and some not to use any at all. We already see this with traditional forms of cognitive enhancement like education. Some people are drawn to forms of education that enhance their musical ability, whereas others are drawn to forms that enhance their reasoning ability. We can therefore see the availability of different types of education as increasing population-level cognitive diversity. Similarly, we may expect the availability of different CETs to further increase cognitive diversity.

However, there may be some reasons to believe that CETs will decrease cognitive diversity even in a liberal society. We consider two such reasons now: the differential effects of enhancements on individuals and the existence of optimal cognitive types. We argue that neither provides a decisive reason to believe that enhancements will decrease rather than increase cognitive diversity at the population level.

Differential Responses to Enhancement

Many drugs and enhancements have different effects in different individuals. If a specific CET has its greatest effect in those who are at a lower end of the spectrum of the trait it enhances and has its smallest effects in those at the higher end of the

spectrum, it will naturally lower diversity in that trait. For example, individuals with low working memory improve markedly when administered drugs that mimic dopamine, whereas high-performing individuals show much lower effects when given the same medications.[9,10] This phenomenon is known as an inverted U-shaped dose-effect curve. Enhancements that demonstrate this type of effect naturally lower the variance in the traits they target. Therefore, if the majority of CETs have inverted U-shaped effects, then a general result of their development could be a lowering of diversity across a range of cognitive traits.

However, it is unlikely that the majority of cognitive enhancements will have inverted U-shaped effects. Some enhancements will have differential effects that will act to increase, rather than decrease, diversity in the traits they target. For example, caffeine is known to be an enhancer of reaction time.[11] However, various genes that commonly vary among individuals influence how caffeine is metabolized and how strongly it affects people.[12] If we were to measure a set of individuals' performances in reaction speed tests before and after they had a strong dose of caffeine, we would find that the variance of their performance would increase. This is because some of the best-performing individuals would improve significantly as a result of the caffeine and some of the worst-performing individuals would get little or no boost.

Therefore, unless it turns out that most of the cognitive enhancements that are developed have an inverted U-shaped effect curve, the fact that cognitive enhancements are likely to have differential effects does not provide a clear reason to suppose they will lower cognitive diversity. Some will have differential effects that increase, rather than decrease, diversity.

Universally Desirable Cognitive Types

Another way that the development of CETs might lower cognitive diversity is by allowing individuals to achieve universally desirable cognitive types. For some cognitive traits (e.g., processing speed), it may be optimal to simply have as high a value as possible. Others may be most desirable at intermediate values. If particular cognitive traits have specific values at which they are clearly optimal, then when CETs are developed that target these traits, they may cause our populations to cluster around the optimal values. This would result in a reduction in cognitive diversity.

It is unclear how many cognitive traits have values that are universally desirable. As noted previously, today there is already a wide variance in the cognitive traits that individuals choose to develop through traditional forms of enhancement. Although it is possible that the vast majority of individuals will want enhancements that maximize their memory, for example, this is not certain and would depend on the precise nature of the enhancement. This question would need to be looked at more closely as specific enhancements are developed.

Furthermore, some cognitive traits fit a trade-off model, in which gains in some valuable abilities necessarily lead to losses in others.[13] That is, some cognitive traits exist on a spectrum, with each end of the spectrum being valuable in some way. We would expect the development of CETs that target these traits to increase cognitive diversity. For example, a trade-off is thought to exist between creativity and attention span. Studies have indicated that individuals who perform badly on tests that measure latent inhibition (an ability to block out irrelevant stimuli) do

well on tests of creativity, and vice versa.[14] It has been hypothesized that these traits may be somewhat mutually exclusive—people are creative precisely because their mind wanders and they cannot block out seemingly irrelevant information. Hence, enhancements that increase focus and attention span are likely to move individuals further down that end of the spectrum, and in effect to make them less creative. If enhancements targeting these traits are available, we may expect some individuals to enhance their creative ability and others to enhance the ability to concentrate. This will increase, rather than decrease, diversity at a population level.

Therefore, although CETs may reduce some types of cognitive diversity, by allowing individuals to cluster around clearly optimal values, others will increase diversity by allowing individuals to enhance two ends of a spectrum that are both valuable.

Overall, it is an open question whether the development of CETs will increase or decrease population-level cognitive diversity. Much will depend on the exact properties of the particular enhancements that are developed. For the rest of this article we set this issue aside and assume that it is at least a plausible consequence of CETs that they will increase population-level cognitive diversity for the reason that different individuals will choose to enhance different aspects of their cognition, and some will not enhance themselves at all. We will now look at some of the potential benefits of increasing cognitive diversity.

The Benefits of Increasing Cognitive Diversity

Collective Problem Solving

Recent work in social science has demonstrated that when groups of people are solving complex problems, cognitive diversity can matter more than individual ability. Diverse groups can outperform less diverse groups that consist of higher-ability problem solvers. This is because diverse cognitive types bring diverse perspectives and heuristics to problems that can combine to produce synergistic effects.[15,16]

This fact can be best understood through reference to the concept of an *epistemic landscape*, which is modeled on the idea of an adaptive landscape in evolutionary biology. An epistemic landscape is a topographic representation of the relationship between perspectives and heuristics, and their problem-solving utility. Peaks in the landscape represent perspectives and heuristics that have a high problem-solving utility. For many complex problems—such as, "What is the most efficient way to build an electricity network?"—there are often many peaks in the epistemic landscape. Most of these peaks represent *local optima*: reasonably good solutions to the problem that are not the best solution. The highest peak in the landscape, the best solution, is the global optimum.

When individuals are trying to solve problems by themselves, they are prone to get stuck on local optima in the epistemic landscape. When they find a solution to a problem that is reasonably good, they may mistakenly conclude that the solution is the best one, despite the fact that better solutions exist. This is because their way of approaching the problem prevents them from seeing what is deficient about the solution they have found. Individuals who have similar perspectives and use similar problem-solving heuristics are likely to get stuck on similar local optima in

epistemic space. In contrast, individuals with different perspectives and heuristics will likely be drawn to different local optima. Therefore, when groups are formed that consist of individuals with similar perspectives and heuristics, the group as a whole is also likely to get stuck on a local optimum. Because each individual thinks about the problem in a similar way, if one finds a solution that is a local optimum, others in the group will be unlikely to be able to see what is deficient about it, and the group may wrongly conclude that it has found the best solution to the problem. Cognitively diverse groups, on the other hand, are more likely only to agree on solutions that are global optima. As members in the group are individually drawn to different solutions, they are more likely to be able to see what is deficient about solutions found by other group members that are local optima. This model is supported by data that show that cognitively diverse teams outperform less diverse teams on measures of problem solving.[17]

In the future, CETs may enable individuals to access a greater range of perspectives and heuristics than is possible now. This may make our populations as a whole better at solving complex problems. When individuals come together to solve problems, be they in companies, science labs, government committees, and so on, these groups may be more efficient problem solvers because individuals have enhanced different aspects of their cognition. Therefore, society has an interest in promoting CETs in a way that increases cognitive diversity.

Economic Efficiency

Increasing cognitive diversity may also improve economic efficiency. It has long been recognized that nations are more productive when labor is divided and workers specialize in different tasks.[18] The division of labor drives populations as a whole to be more productive, as each member gets better at his or her particular tasks. This is part of the reason that larger cities have been shown to be, on average, more productive than smaller cities.[19] The division of labor, coupled with specialization, also drives innovation in groups—as individuals who specialize in particular roles are more likely to be innovators in those roles.[20]

In modern societies, a key component of the division of labor is the division of cognitive labor. We do not just want people in society to do different things; we also want them to have different cognitive skills. For example, we want our air traffic controllers to have a different set of cognitive skills than our mathematics professors; we want our artists to have different skills than our politicians. This makes society as a whole more productive.

CETs may help drive the cognitive division of labor by increasing the power and range of our cognitive abilities. This is already happening through traditional cognitive enhancements. Specialist schools and training centers encourage individuals to develop role-specific thinking skills. Schools in the creative arts will ask children to undertake thinking exercises that teach them to think creatively, and training programs for pilots will try to improve their ability to make decisions under pressure, and so on. In the future, pharmaceuticals, or other forms of enhancements, may be used in conjunction with specialized training to help individuals develop role-specific cognitive skills. This may improve economic efficiency by allowing individuals to operate more productively.

This would provide one reason for states to promote some specific CETs. Some role-specific CETs are already encouraged by the state. Fighter pilots, for example,

are given access to attention-span enhancements like modafinil to help them stay alert.[21]

In sum, another plausible benefit of cognitive diversity is improved economic efficiency. If CETs increase population-level cognitive diversity, this will drive the division of labor, which may help states operate more productively.

The Costs of Increased Cognitive Diversity and Moral Enhancement

In addition to the benefits described previously, increasing population-level cognitive diversity is also likely to have costs. One of the problems that cognitively diverse groups face is difficulties with cooperation and group cohesion. If members of a group think in very different ways, it can be difficult for them to communicate with one another and coordinate their actions. This is reflected in studies of organizational performance that suggest that although cognitive diversity is beneficial under perfect conditions, it often leads to problems with group cohesion.[22] On a larger scale, difficulties with group cohesion may also explain why some, including UK prime minister David Cameron, have labeled state multiculturalism a failure.[23] This is in spite of the fact that multiculturalism is widely expected to have benefits for states—benefits that relate to the advantages of cognitive diversity.

One reason why it may be difficult for individuals to cooperate effectively with those who are very different from themselves is because of limitations in our moral psychology. Trout talks about an "empathy gap" that is experienced by many individuals living in modern societies.[24] Although most individuals find it easy to empathize with those they are close to, such as members of their family, community, and so on, they find it difficult to empathize with those who are very different from them, such as those who come from different cultures and practice different religions. If individuals find it difficult to empathize with those from different cultural backgrounds, then effectively communicating and coordinating actions with them is also likely to be difficult.

In the future, widespread use of cognitive enhancement technologies may lead to similar problems with cooperation. If people use CETs in ways that increase cognitive diversity and in the process begin to acquire diverse values and preferences, it may be difficult for them to cooperate. Moral enhancement technologies may help mitigate these problems by increasing our ability to cooperate effectively with those who are very different from us.

For example, moral enhancements that target empathy may be one way of bridging the empathy gap and may make it easier for people to empathize with others who have different values and are from different backgrounds. For example, intranasal administration of oxytocin can increase empathy and makes it easier for individuals to infer the mental states of others.[25] This helps individuals within groups communicate and coordinate actions with one another. These types of enhancements may be especially useful in the future, if cognitive diversity increases as a result of CETs.

In sum, one potentially negative consequence of increasing cognitive diversity is that it would lead to problems with cooperation and group cohesion. In a future world where we are even more different from one another than we are now, it may be even more difficult for individuals to coordinate their actions. Moral enhancement technologies may make it easier for individuals to cooperate with one another and

hence may help mitigate this potential negative consequence of CETs. This provides another reason why research into moral enhancement should be conducted in conjunction with research into cognitive enhancement.

Collective Cognitive Enhancement

The preceding discussion suggests that the line between cognitive and moral enhancements may not be as clear as it sometimes appears. Nearly all of the most important problems that society faces today are solved by people working together in groups. Because of this, enhancing our collective ability to solve problems can be seen as more important for society than enhancing our individual cognitive capacities. A group's collective ability to solve problems is in turn determined by the cognitive ability of its individual members, the diversity of their cognitive styles, and their ability to work together. As moral enhancement technologies may improve cooperation among individuals, they provide one mechanism of increasing our collective ability to solve problems. In this sense they can be described as "collective" cognitive enhancements.

This also suggests that if cognitive enhancements are pursued without efforts to enhance cognitive diversity and improve cooperation, they may be collectively self-defeating. For example, imagine a cognitive enhancement that increases IQ in each individual it is given to but in the process causes all such individuals to think about problems in similar ways. If this enhancement were widely used in a population, it could actually make the population worse at solving problems because it lowers cognitive diversity. Similarly, imagine that a population has access to a wide range of cognitive enhancements, which both improve individual cognitive abilities and increase population-level cognitive diversity. If this process makes it more difficult for individuals to cooperate with one another, it could also make the population as a whole worse at solving problems. Both of these cases show the need for a collective approach to cognitive enhancement, which embraces cognitive diversity and moral enhancement technologies.

Conclusion

In this article we have provided a new argument in favor of pursuing cognitive and moral enhancement technologies together. We have shown that a plausible consequence of the development of cognitive enhancement technologies is that they will increase cognitive diversity. Although this has the potential to be beneficial for society, it may make cooperation among individuals more difficult. Moral enhancement technologies may help improve cooperation among individuals and hence provide one way of mitigating the cost of increased cognitive diversity. This suggests that the development of cognitive enhancement technologies will drive the need for moral enhancement.

We further suggested that if cognitive enhancement is pursued in a manner that decreases population-level cognitive diversity, or makes it more difficult for individuals to work together, then it may be collectively self-defeating. It is possible to improve the cognitive abilities of all individuals in a group and make the group as a whole worse at solving problems. This provides further reasons why research into moral enhancement should be pursued in conjunction with research into cognitive enhancement.

Notes

1. Persson I, Savulescu J. The perils of cognitive enhancement and the urgent imperative to enhance the moral character of humanity. *Journal of Applied Philosophy* 2008;25(3):162–77.
2. Persson I, Savulescu J. *Unfit for the Future: The Need for Moral Enhancement*. Oxford: Oxford University Press; 2012.
3. See note 1, Persson, Savulescu 2008, at 174.
4. Harris J. Moral progress and moral enhancement. *Bioethics* 2013;27(5):285–90.
5. Pagel M. *Wired for Culture: The Natural History of Human Cooperation*. New York: W. W. Norton; 2013, at 101–103.
6. Parens E. The goodness of fragility: On the prospect of genetic technologies aimed at the enhancement of human capacities. *Kennedy Institute of Ethics Journal* 1995;5:141–53, at 149.
7. Selgelid MJ. Moderate eugenics and human enhancement. *Medicine, Health Care and Philosophy* 2014;17(1):3–12.
8. Agar N. Liberal eugenics. *Public Affairs Quarterly* 1998;12(2):137–55.
9. Mehta MA, Swainson R, Ogilvie AD, Sahakian J, Robbins TW. Improved short-term spatial memory but impaired reversal learning following the dopamine D(2) agonist bromocriptine in human volunteers. *Psychopharmacology (Berl)* 2001;159(1):10–20.
10. Housden C, Morein-Zamir S, Sahakian B. Cognitive enhancing drugs: Neuroscience and society. In: Savulescu J, ter Meulen R, Kahane G, eds. *Enhancing Human Capacities*. West Sussex: Wiley-Blackwell; 2011.
11. Nehlig A. Is caffeine a cognitive enhancer? *Journal of Alzheimer's Disease* 2010;20(1 Suppl):S85–94.
12. Yang A, Palmer AA, de Wit H. Genetics of caffeine consumption and responses to caffeine. *Psychopharmacology (Berl)* 2010;211(3):245–57.
13. Hills T, Hertwig R. Why aren't we smarter already: Evolutionary trade-offs and cognitive enhancements. *Current Directions in Psychological Science* 2011;20(6):373–7.
14. Carson SH, Peterson JB, Higgins DM. Decreased latent inhibition is associated with increased creative achievement in high-functioning individuals. *Journal of Personality and Social Psychology* 2003;85(3):499–506.
15. Page SE. *The Difference: How the Power of Diversity Creates Better Groups, Firms, Schools, and Societies*. Princeton, NJ: Princeton University Press; 2008.
16. Hong L, Page SE. Groups of diverse problem solvers can outperform groups of high-ability problem solvers. *Proceedings of the National Academy of Sciences of the United States of America* 2004;101(46): 16385–9.
17. See note 15, Page 2008, at 322–323.
18. Smith A. *An Inquiry into the Nature and Causes of the Wealth of Nations*. London: W. Strahan; 1776.
19. Quigley JM. Urban diversity and economic growth. *Journal of Economic Perspectives* 1998;12(2): 127–38.
20. Sterelny K. *The Evolved Apprentice: How Evolution Made Humans Unique*. Cambridge, MA: MIT Press; 2012, at 18.
21. Szalavitz M. Popping smart pills: The case for cognitive enhancement. *Time* 2009 Jan 6; available at http://content.time.com/time/health/article/0,8599,1869435,00.html (last accessed 15 Sep 2014).
22. Williams K, O'Reilly C. Demography and diversity in organizations: A review of 40 years of research. *Research in Organizational Behavior* 1998;20:77–140.
23. Wright O, Taylor J. Cameron: My war on multiculturalism. *The Independent* 2011 Feb 5; available at http://www.independent.co.uk/news/uk/politics/cameron-my-war-on-multiculturalism-2205074.html (last accessed 15 Sep 2014).
24. Trout J. *The Empathy Gap: Building Bridges to the Good Life and the Good Society*. New York: Penguin; 2009.
25. Dziobek I, Rogers K, Fleck S, Bahnemann M, Heekeren HR, Wolf OT, et al. Dissociation of cognitive and emotional empathy in adults with Asperger syndrome using the Multifaceted Empathy Test (MET). *Journal of Autism and Developmental Disorders* 2008;38(3):464–73.