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Article abstract

Psychopharmacological cognitive enhancements could lead to a higher quality of life of healthy individuals with lower cognitive capacities, but the current regulatory framework does not seem to enable access to this group. This article discusses why Sen's Capability Approach could open up such access, while two other modern social justice theories – utilitarianism and Rawls' Justice as Fairness – could not. In short, the utilitarian approach is proven to be inadequate, due to practical reasons and having a low chance of real-world success. Rawls' Justice as Fairness seems to be problematic because of conflicting stances that follow from his First Principle of Justice. The Capability Approach has the greatest chance of success in the context of these substances, because of arguments that can be identified under the banners of agency/self-respect and the way the public views those who take the capability path out of their poor situation. The article also discusses general and practical problems with psychopharmacological cognitive enhancement that should be addressed when writing new policy on this topic.

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ARTICLE (ÉVALUÉ PAR LES PAIRS / PEER-REVIEWED)

Social Justice Theories as the Basis for Public Policy on Psychopharmacological Cognitive Enhancement

Astrid M. Elfferich[a]

Résumé
Les améliorations cognitives psychopharmacologiques pourraient permettre d'améliorer la qualité de vie des personnes en bonne santé dont les capacités cognitives sont moindres, mais le cadre réglementaire actuel ne semble pas en permettre l'accès à ce groupe. Cet article explique pourquoi l'approche par les capacités de Sen pourrait permettre un tel accès, alors que deux autres théories modernes de justice sociale – l'utilitarisme et la justice en tant qu'équité de Rawls – ne le pourraient pas. En bref, l'approche utilitariste s'avère inadéquate, pour des raisons pratiques, et a peu de chances de réussir dans le monde réel. La justice équitable de Rawls semble problématique en raison des positions contradictoires qui découlent de son premier principe de justice. L'approche par les capacités a les plus grandes chances de succès dans le contexte de ces substances, en raison des arguments qui peuvent être identifiés sous les bannières de l'agence/du respect de soi et de la façon dont le public considère ceux qui prennent la voie des capacités pour sortir de leur mauvaise situation. L'article aborde également les problèmes généraux et pratiques liés à l'amélioration cognitive psychopharmacologique qui devraient être pris en compte lors de la rédaction d'une nouvelle politique sur ce sujet.

Abstract
Psychopharmacological cognitive enhancements could lead to a higher quality of life of healthy individuals with lower cognitive capacities, but the current regulatory framework does not seem to enable access to this group. This article discusses why Sen's Capability Approach could open up such access, while two other modern social justice theories – utilitarianism and Rawls' Justice as Fairness – could not. In short, the utilitarian approach is proven to be inadequate, due to practical reasons and having a low chance of real-world success. Rawls' Justice as Fairness seems to be problematic because of conflicting stances that follow from his First Principle of Justice. The Capability Approach has the greatest chance of success in the context of these substances, because of arguments that can be identified under the banners of agency/self-respect and the way the public views those who take the capability path out of their poor situation. The article also discusses general and practical problems with psychopharmacological cognitive enhancement that should be addressed when writing new policy on this topic.

Mots-clés
drogues intelligentes, amélioration cognitive, psychopharmacologique, neuroéthique, utilitarisme, justice comme équité, égalitarisme, approche par les capacités

Keywords
smart drugs, psychopharmacological, cognitive enhancement, neuroethics, utilitarianism, justice as fairness, egalitarianism, capability approach

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INTRODUCTION

The use of substances which can extend or amplify the core capacities[1] of the mind, such as modafinil, methylphenidate, and piracetam – known as *nootropics*, psychopharmacological cognitive enhancements (PCE), brain-doping substances, or 'smart drugs'[2] – are increasingly being used by individuals who live unhindered by cognitive impairments (2-5). Until recently, these types of stimulants only provided modest improvements in cognitive performance and caused substantial side effects and produced risks which made them pertinent only as a treatment for an illness or a mental disorder (2). However, there is a growing body of recent research which shows that it is possible to pharmacologically improve cognitive capacities with relatively small side effects in healthy participants (2), with memory, attention and executive functions being the most susceptible to improvement (6,7).

The use of PCE is also rising worldwide, according to one of the largest studies on this trend by Maier *et al.* (8). In a 2017 international survey (across fifteen countries) of more than 100,000 respondents without Attention Deficit/Hyperactivity Disorder (ADHD), 13.7 percent reported using these enhancements at least once in the previous 12 months; this was an average increase of 180 percent compared to 2015 (8). There was a rise in use reported in all reported countries, but the US respondents reported the highest rate of use (nearly 30 percent in 2017), whereas the largest increases were in Europe (e.g.,

[1] Cognition includes the series of actions an individual uses to systematize new information, including "(…) acquiring information (perception), selecting (attention), representing (understanding), and retaining (memory) information, and using it to guide behaviour (reasoning and coordination of motor outputs)" (1, p.32). The use of PCE can be directed at any of these core capacities.
[2] Even though cognitive enhancing drugs and smart drugs are the most commonly used terms in the literature on this topic, I will rather use the term psychopharmacological cognitive enhancement (PCE).

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in France, use of PCE increased from 3 percent to 16 percent in this period) (8).[3] And as enhancement technology moves forward, the effectiveness of the substances will increase and a further rise in the use of PCE could be expected.

A major challenge to national and international regulatory bodies is how to regulate this ever-increasing use of psychopharmacological means used for the purpose of cognitive enhancement. For instance, the current system of licensing drugs only aims to detect, prevent, treat, or mitigate illnesses by traditional medical treatments. Enhancing stimulants do not fall within this system. As stated by Bostrom & Roache, "Drug companies seeking regulatory approval for a pharmaceutical useful solely for improving functioning in the healthy population would face an uphill struggle without major changes to the current licensing framework" (1, p.75). The cognitive enhancing result of these substances in healthy individuals is thus a coincidental and unintended benefit; the development and regulatory approval of new biomedical enhancements depends on the ability of manufacturers to demonstrate that the stimulants are effective in treating a recognized illness (1).

Even though there have been several appeals from organisations such as the British Medical Association (9) for a broader (policy) debate on developments in PCE, to date, only a few specific recommendations have been produced (10). Moreover, existing recommendations often fail to align with social justice theories (11), or mainly focus on the downsides of the use of PCE and thus recommend economic disincentives (3,12,13).

This article analyses the suitability – in both a political and ethical sense – of three modern social justice theories as a philosophical foundation for a just public policy on PCE. It contributes to the existing literature by specifically focussing on the potential beneficial effects of PCE for individuals with lower cognitive capacities. The focus on this specific group follows from the promising ability of cognitive enhancement to correct restrictive natural variation and inequalities in these capacities (memory and attention in particular), which could lead to a broad range of positive social outcomes (15). The increase of the cognitive capacities of this group, could mean the difference between work and unemployment, dropping out or finishing elementary and higher education, etc. The theories that will be discussed here are as follows: Bentham and Mill's utilitarianism, Rawls' Justice as Fairness, and Sen's 'egalitarianism' (or to be more specific: The Capability Approach, which is technically speaking a theoretical framework and not a theory). These modern social justice theories give a broad range and a balanced outlook on the just distribution of (cognitive) resources, as their main focus is on different features of justice (respectively: utility, fairness, and equality).

The first section of the article examines the preliminary issue of the placement of PCE in Walzer's spheres of justice. Section 2 discusses the different kinds of PCE and baseline dependency. Section 3 elaborates on the three theories of social justice and section 4 will focus on the suitability of these theories on PCE. Section 5 explores a number of important more general and practical problems with the use of these substances. The final section will provide a conclusion and discussion on future government policies on PCE.

1. PLACEMENT OF PCE IN WALZER'S SPHERES OF JUSTICE

Before analysing the three theories of social justice, it is relevant to place the use of PCE in Michael Walzer's communitarian framework of 'spheres of justice', which institutionalizes different moral ideas about equality. Walzer calls his theory of justice one of *complex equality* and contrasts it with 'simple' egalitarian conceptions (e.g., that of John Rawls), by arguing that such universalist ambitions should be abandoned and that one should rather draw upon a particularistic norm formation with moral walls between social practices and institutions (16,17). This follows from his central thesis that subjects of values are first and foremost political communities, and not the individuals who comprise those communities (17). As a result, one should, according to Walzer, maintain different 'distribution criteria' in the different spheres of justice (18).

But to which sphere of justice do PCE belong? The medical sphere would seem a logical choice, because 1) PCE are developed as a medicine for regular diseases, 2) a doctor usually prescribes them, 3) individuals can buy them at a pharmacy, and 4) a doctor might control for the (adverse) effects of the use of the stimulants. Yet, as was argued above, the goal of cognitive enhancing substances does not directly relate to the health of individuals (in terms of detecting, preventing, curing and/or mitigating diseases), which is the aim of the current system for traditional medical treatments and drug licensing (1). Accordingly, Trappenburg writes that the distributive reasoning of a distinct medical sphere is that: "Doctors ought to treat patients (…) to make them better when they are ill, and because they are ill. That is what they have pledged to do, it is their proper job, and it seems to be a widely shared understanding that they should stick to it" (16, p.15). Since the use of PCE does not have the characteristics of such a regular medical intervention, the current disease-focused medical sphere and its general 'rules', norms and justice-based distribution criteria cannot be directly applied to the context of PCE. The answer to the preliminary issue concerning the placement of PCE in Walzer's spheres of justice is thus that (the use of) these substances do not properly fit in the current medical sphere of justice.

This means that one cannot simply apply the distribution criteria and norms of the medical sphere to the context of PCE. Rather, the use of PCE should be seen as an entirely new sphere of justice outside the medical realm. This also entails the need for different distribution criteria that are based on the improvement of well-being rather than the treatment of diseases.

[3] Although this cross-cultural study seems to be of high quality, according to Partridge (13) several studies that try to prove the prevalence and rise of PCE have a number of weaknesses, and thus one needs to be cautious when "whipping up hype" about PCE.

Using the term psychopharmacological cognitive enhancements – rather than terms such as cognitive enhancing drugs or smart drugs – endorses this separation between the traditional medical sphere and this new sphere of justice.

2. DIFFERENT KINDS OF PSYCHOPHARMACOLOGICAL COGNITIVE ENHANCEMENT AND BASELINE DEPENDENCY

Types and effects of psychopharmacological cognitive enhancers

To get a good grasp of this topic and its potential policy implications, it is important to first have a general idea of the current situation in terms of the potential, the mechanisms, and the effects of (different types of) PCE. Psychopharmacological cognitive enhancements "(…) target the chemical pathways that determine specific cognitive capacities, such as memory and concentration" (15, p.190). And since numerous aspects of psychological function are possible targets for psychopharmacological cognitive enhancement in healthy individuals, PCE have a widespread potential: from the treatment of addictions (19) and the unlearning of traumas and phobias (20,21), to advancing long-term memory, problem-solving, reaction time, logical reasoning and needing less sleep to function well (22,23).[4]

Even though the exact mechanism of many PCE is not yet fully understood, it has been shown that some stimulants can "(…) enhance memory by increasing neuronal activation or by releasing neuromodulators, facilitating the synaptic[5] changes that underlie learning" (25, p.316). Current interest in the context of memory enhancement is focused on developing substances that not only facilitate the brain to rapidly absorb information but that also allows selective retention, by "(…) intervening in the process of permanent encoding in the synapses" (25, p.317). This process is seen as a promising target for PCE development, and numerous experimental studies have already demonstrated the potential to increase the results in certain memory tests (25). In addition, other kinds of substances can affect the way in which the cerebral cortex reorganizes after injury. Substances such as amphetamine have proven to be (somewhat) successful in enhancing the recovery of function in the subacute phase after a brain damage, when it is combined with rehabilitation (26,27). "A likely explanation [for this enhanced recovery] is that higher excitability increases cortical plasticity, in turn leading to synaptic sprouting and remodelling" (25, p.318).

One has to keep in mind, however, that even though the effectiveness of substances will increase with the evolution of enhancement technology, the current efficacy of many PCE on healthy individuals seems to be modest, with the expectations towards these substances often exceeding their real effects, as has been shown by controlled and randomised trials (28). The main significant effects that were found in a meta-analysis were an improvement of memory[6] for the central nervous system stimulant methylphenidate (e.g., Ritalin, used in the treatment of ADHD), and improved attention for well-rested individuals using Modafinil (originally developed as a treatment of illnesses such as narcolepsy), "(…) while maintaining wakefulness, memory and executive functions to a significantly higher degree in sleep deprived individuals than did a placebo" (30, p.187; see also 29). De Jongh (29) also argues that there is evidence of amphetamine improving the consolidation of declarative memory, but he adds that the evidence of effects on executive functioning (cognitive control and working memory) is mixed or even contradictory. There are studies that show improvement, but other studies report no effects or even impairment, depending on the individuals and the context of the tasks (31).

As noted in the Introduction, the fact that the effects of (most of the other) PCE are currently modest – or in the case of donepezil, for example, not well understood due to the small number of studies (29) – does not imply that future enhancers will not have more powerful effects (32).

Baseline dependency

The effects of different types of PCE seem to be correlated with the cognitive performance levels of an individual at the starting point of an experiment (the baseline). "Individuals with a low working memory capacity improve on dopamine receptor agonists, while high-performing subjects are either not affected or get worse" (29, p.50). Those who are low performing might thus benefit more than the subjects who already performed well and are now 'overdosed' (32). In this respect, De Jongh (29) names, amongst others, the studies of Gibbs and D'Esposito (33), and Mattay *et al.* (34), where this pattern was found for the D2 receptor agonist bromocriptine, and for amphetamine, respectively. Moreover, Ilieva *et al.* (35) found that mixed amphetamine salts (brand name: Adderall) enhanced convergent creativity of subjects who performed below median, while the enhancer slightly reduced the performance of subjects who performed above average at the start of the experiment. This dependence on baseline performance has also been reported for methylphenidate and modafinil (29). De Jongh concludes that this phenomenon could lead to a level playing field, and thus greater equality (29), when PCE are used only by people at a lower baseline. This finding is also the basis for further claims and my examination of justice in this article. Still, De Jongh states that there is a risk that the cognitive enhancers are only affordable for rich low-performing individuals, while poor low-performers are left out (29).

[4] For a list with (the most common) currently available enhancers and their effects, see: De Jongh *et al.* (24).
[5] A synapse is a connection between two nerve cells.
[6] The enhancements were mainly found in spatial working memory. Recall and recognition of verbal materials were possibly also improved when the test intervals were longer (29).

In the next section, three theories of social justice are discussed that aim to give a balanced outlook on the distribution of (cognitive) resources: Bentham and Mill's utilitarianism, Rawls' Justice as Fairness, and Sen's Capability Approach.

3. THEORIES OF SOCIAL JUSTICE

Utilitarianism

Utilitarianism occupies a principal place in contemporary moral philosophy. According to this ethical theory, society should distribute goods (resources) in such a way that a maximum good or increase in well-being is provided, i.e., the greatest amount of good for the greatest number of people. The founder of modern utilitarianism, Jeremy Bentham (1748-1832), proposed the principle of utility, which "(…) approves or disapproves of every action whatsoever, according to the tendency it appears to have to augment or diminish the happiness of the party whose interest is in question: or, what is the same thing in other words, to promote or to oppose that happiness" (36, p.11-12).

Utilitarians would arguably be proponents of the use of PCE, since the development and its use have the potential to create benefits (such as leading healthier, happier, longer, and better lives) for more people. Moreover, according to this aggregative theory, an allocation of PCE would only be just if these substances are distributed to maximally increase well-being, relative to the other ways in which those substances could be made available (disregarding existing status, wealth, and social privilege) (15).[7] For example, Savulescu makes the controversial claim that there might be instances where it is justified to use public resources for this type of stimulant instead of medical therapies for the treatment of diseases. His rationale behind this, is that: "If certain enhancements provide significant increments in well-being, for example, by providing greater impulse control or significantly better memory, and these are equivalent to or greater than the benefits of certain medical treatments or other uses of community resources, then they should have priority" (39, p.331-332). Savulescu and Sandberg have further developed this position, arguing that not providing such cognitive enhancements would be equally unjust as not providing health care or primary education (40). Further, according to Dunlop and Savulescu (15), the use of PCE in people with lower cognitive capacities[8] will probably result in a rise in absolute welfare and, when compared to conventional methods, it might be a more cost-efficient way of maximizing well-being. The authors state that under utilitarian principles, two factors can justify a targeted distribution of PCE to the group with lower cognitive capacities.

First, due to the effect of PCE being dependent on baseline performance, individuals in the subgroup with lower cognitive capacities will respond more strongly to enhancement than persons with higher levels of these capacities: "The enhancement of this [former] subgroup will present the same cost per person as a more broad distribution, yet has the potential to yield substantially higher utility" (15, p.197).

Second, even small positive effects resulting from the use of PCE could lead to significant improvements in the quality of life and well-being for the subgroup with lower cognitive capacities. It has been found that the level of social disadvantages rises exponentially with the approaching of the lower end of the IQ range (41). Intelligence and cognitive capacities (such as memory and attention) are not the same, but since they are related and intertwined, I assume here that individuals with lower intelligence can also benefit more from PCE than individuals with above average intelligence. So, the same increase in cognitive capacities would result in substantially greater advancements in well-being for those people with lower cognitive capacities (intelligence) than with people who have average cognitive capacities. Since utilitarianism is aggregative, it mainly focuses on the total result the distribution of resources has on the welfare of an entire society rather than on the individual. Dunlop and Savulescu argue that the use of PCE within the group with lower cognitive capacities would improve their capability to add to the society's net wealth, which would simultaneously decrease their dependence on social welfare, and it would also "(…) reduce unnecessary expenditure within resource-intense social institutions such as the medical, legal and penal systems" (15, p.198).

Paradoxically, utilitarians might also favour the allocation of resources away from individuals with lower cognitive capacities towards those who have above average cognitive capacities. This is because it follows from this aggregative theory that assets should be allocated to those who can "(…) put them to their most socially productive use" (15, p.198). This would be the case if the use of PCE in the subgroups with higher cognitive capacities leads to breakthroughs and innovations that benefit large numbers of individuals in society. This would still increase the absolute position of the group with lower cognitive capacities, because, according to Dunlop and Savulescu, the use of PCE in the above average groups would in the end increase the well-being of everybody in society (15, p.198).

Rawls' Justice as Fairness

In *Justice as Fairness* (42), John Rawls describes his concept of justice, in which two Principles of Justice are proposed and function as guidelines for how institutions could achieve equality and liberty values. These principles provide a viewpoint from

[7] As one reviewer pointed out, an important distinction to mention in this ethical debate is that between health and disease, respectively wants and needs. Whereas this distinction does not matter for utilitarians (as both could result in a better life and a reduction of unhappiness), this difference is a decisive argument for libertarian-egalitarian scholars not to fund access to enhancement technologies such as PCE. According to Buchanan *et al.* (37), there is no obligation to fund PCE as they only meet individual preferences (e.g., performing better in exams) and do not restore human functioning, as seen from Boorse's theory of health (38).

[8] Note that in their articles, Dunlop and Savulescu (15) use intelligence as the key metric instead of cognitive capacities. However, as a peer reviewer noted, there is no evidence that any of the cognitive enhancers affect IQ. Since the same logic can be applied with cognitive capacities as with intelligence in this context – and to avoid confusion – I have replaced the latter term with the former in this section.

which they could be considered as more appropriate than alternative principles of justice (e.g., the principle of utility) in terms of democratic citizens regarded as equal and free individuals (43). Rawls' two Principles of Justice are as follows:

1. Each person has an equal right to a fully adequate scheme of equal basic rights and liberties, which scheme is compatible with a similar scheme for all.
2. Social and economic inequalities are to satisfy two conditions: first, they must be attached to offices and positions open to all under conditions of fair equality of opportunity; and second, they must be to the greatest benefit of the least advantaged members of society [which is the difference principle] (43, p.227).

It would follow from this theory that the legal regulation and distribution of PCE would only be just if it satisfies the following three conditions: 1) every individual should be able to use PCE or abstain from its use, 2) its use must lead to a greater equality of opportunity, and 3) economic and social inequalities which follow from the use of PCE have to lead to the greatest benefit for those who are the least privileged.

These conditions lead, however, to contradictory interpretations of Rawls' theory of justice in the context of PCE. On the one hand, Veljko Dubljevic argues that, for two reasons, Rawls' principles of justice require that the use of PCE should be discouraged by imposing economic disincentives such as fees, taxes, and requirements of additional insurance. First, Dubljevic expects that the use of the stimulants by the healthy would either retain or enhance rather than lessen social inequality (which is in conflict with the difference principle) (12). He bases this on Glannon's argument that universal access to PCE is not a likely scenario, since "states would be reluctant to take on what would be an exorbitant cost" (44, p.45-46). As a result, access to these substances would, according to Glannon, be based on the ability to pay for them. And since some people are, not by their own fault, worse off than others in financial terms, this would be unfair to those who are not able to pay for the stimulants (44). Second, Dubljevic states that the status of free and equal citizens could be undermined if the unregulated use of PCE influences their choices through market forces. For instance, if such a force makes it economically rational to pursue only one or a few choices (e.g., enhancing), then citizens no longer have equal opportunity to devise and alter their life plans (12). Dubljevic (45) gives the example of a hypothetical situation of truck companies in a market economy without government control where, in order to stay competitive, all companies give their employees the following choice: either they will decide to use modafinil (a medical treatment for narcolepsy) or they will be fired. In such a situation, employees do not have the possibility to abstain from the use of PCE and still work as a truck driver, because colleagues who do not have a problem with using modafinil can stay alert and make the same run in less time, which is of course more profitable.

On the other hand, it is possible to draw a different conclusion when one does not assume that it will always be the case that only the wealthy will be able to afford PCE, and when one focuses more on the possibility that the use of these substances could correct for the inequalities of the "natural lottery", which gives the less endowed more opportunities and liberty to pursue a favoured life plan.

It is true that under current conditions, the allocation of PCE is not just by the equal liberty principle. Presently, access to PCE among healthy individuals is generally limited to a privileged group who can obtain the substances through their own financial, social and/or personal resources. However, governmental policy directed at moderating the access for this privileged group and a regulated PCE distribution which benefits the worst off could pass the Rawlsian difference principle (46). This is because such a regulation would increase the freedom of the least advantaged groups. Generally, the use of PCE could be regarded as an application of the Rawlsian "resource redress principle" which aims to correct for social and natural inequalities that endanger fair equality of opportunity. According to Rawls, "Undeserved inequalities call for redress; and since inequalities of birth and natural endowment are undeserved, these inequalities are to be somehow compensated for" (47, p.100). The use of PCE has the potential to create greater equality of opportunity because it can help correct the inequalities of the genetic lottery, i.e., individuals with lower cognitive capacities might, for instance, with the aid of PCE be able to get more advanced training and thus have better job prospects (37).

Sen's Egalitarianism (The Capability Approach)

In *The Idea of Justice* (48), economist and social philosopher Amartya Sen criticizes abstract theories of justice, such as that of John Rawls. Sen argues that it is doubtful whether one can actually choose principles of justice for a perfectly just society, which are universal and can be applied everywhere. Instead, the aim of his theory of justice "(…) is to clarify how we can proceed to address questions of enhancing justice and removing injustice" (48, p.ix). Sen also pioneered the egalitarian Capability Approach, which is a "(…) broad normative framework for the evaluation and assessment of individual well-being and social arrangements, the design of policies, and proposals about social change in society" (49, p.93). Its core focus is on the effective ability of what people can do and can be, i.e., the capability to exercise substantive positive freedoms. The Capability Approach contrasts with philosophical theories that focus on the happiness of individuals, desire-fulfilment and the resources people have (e.g., owning objects of convenience and income) (48,49). Sen argues that these measures of welfare (in particular when looking at incomes) mask the diversity of individuals and the complicatedness of people's actions (50). In contrast, his approach proposes that a society should sustain basic capability equality.[9]

[9] One's capabilities at a time consists of all the packages of basic functionings (i.e., doing or being something that are essential for human flourishing) that an individual is really free to choose, all at once (51).

'Basic capabilities' can be interpreted as the capabilities necessary for a minimally decent life. Hence, to reach the goal of this approach – i.e., getting equal basic capability for everyone – each person should be at or above this threshold level for all capacities that are necessary for a minimally decent life (52). Martha Nussbaum, who further developed the Capability Approach, states that "If people are systematically falling below the threshold in any of these core areas, this should be seen as a situation both unjust and tragic, in need of urgent attention – even if in other respects things are going well" (52, p.71).

Even though Sen and his adherents do not elaborate much on whether individuals and, if so, which groups should use PCE, it is still possible to deduce from his framework what would be 'just' from this perspective. The use of cognitive enhancers can increase the functionings of individuals with lower cognitive capacities, which partly corrects disabling natural variation and inequalities in cognitive capacities. This would give this group more opportunities to finish their education and to earn an income (or a higher income). Since the Capability Approach defends the view that a society should sustain basic capability equality and that it has to give urgency to the elimination of manifest injustice (48), it can be argued that this approach favours policies which provide individuals with lower cognitive capacities the ability to buy (or receive) cognitive enhancers. Such policies wound ensure that everyone gets the opportunity to meet threshold levels that are considered 'good enough' to give an individual basic knowledge capabilities. Furthermore, in line with this framework, it would not necessarily be the moral obligation of the government to distribute PCE to people who already meet this threshold, because they already enjoy basic capabilities.

4. SUITABILITY OF THE THREE THEORIES WITH RESPECT TO PCE

This section examines the three theories presented in the previous section and addresses the question of which theory is the most suitable (e.g., being able to form a coherent interpretation, high changes of real-world success and support from the public) in the context of PCE. I am aware that political arguments (e.g., real-world success) cannot replace the ethical debate in this context, but since this analysis is about the suitability of these theories in general, to be judged a 'success' a theory must hold up both politically and ethically.

First of all, the utilitarian political position is not likely to be accepted by all or even the majority of citizens in a democracy. This is because the theory easily sacrifices civil rights (e.g., freedom and equality) in order to achieve a higher net balance of well-being or happiness, which puts minority groups in a very weak position (13).[10] For instance, as mentioned earlier, the theory might defend taking resources away of the least advantaged (subgroups with lower cognitive capacities) towards those with above average capacities, if the latter can translate them in the most socially beneficial outcome. This reallocation would in all probability lead to greater social inequalities.

Moreover, it is not likely that the majority of citizens would accept the situation proposed by Sandberg and Savulescu (40) where public resources are used for the purchase of PCE (which does not improve the health of individuals in a direct way), while individuals with impairments or diseases are left untreated. As a consequence, utilitarianism – as proposed by Sandberg and Savulescu – seems to be inadequate for moral reasoning in this context, since it refuses to take into account what the majority would regard as ordinary moral considerations.

Lastly, utilitarianism relies on an optimization model that assumes that moral agents are able to "(…) consider all alternative responses, to calculate all consequences of all identified options, to predict and develop contingency plans for all unintended consequences, and to calculate the probability that a certain response sets a precedent for other circumstances where the information may be less reliable" (45, p.181). However, individuals do not tend to solve moral problems on the basis of this model and the current knowledge of the side effects of PCE is insufficient to predict all the possible consequences. Hence, the utilitarian position is not likely to be accepted as a philosophical underpinning of a just public policy on the use of PCE by the healthy members of society.

Whereas utilitarianism seems to be unsuitable as a philosophical foundation because of practical reasons and a low chance of success in the real world, Rawls' Justice as Fairness seems to be problematic for a different reason. Specifically, it does not seem possible to formulate an unambiguous interpretation and incontestable advice with this theory. As mentioned in section 3, Rawls' Principles of Justice could be interpreted in such a way that the use of PCE should either be discouraged *or* required as a matter of justice.

The first contradictory interpretation concerns the difference principle (the second Principle of Justice) and (current) access to and affordability of PCE. One position is that the use of these substances by the healthy would perpetuate or increase social inequality, because universal access is not likely from their viewpoint. This implies that only the wealthy would get access to PCE. Opponents of this position could argue that governmental policy controlling access for this privileged group and the introduction of a regulated PCE distribution which benefits the worst off could still pass the Rawlsian difference principle. In my analysis, this conflicting interpretation is not necessarily insurmountable, because it concerns the distribution of PCE, which could be altered by new policies on this subject. In other words, this concern is not necessarily inherent to the use of PCE.

[10] This does not mean that any utilitarian approach should be excluded, but rather that the most prominent arguments (39,53) that reduce justice to utility might, if they are not reformulated in a way that takes rights of citizens and justice into account (13).

In contrast, it hardly seems possible to formulate policy advice that satisfies Rawls' first Principle of Justice (equal rights and liberties). On the one hand, the status of free and equal citizens could be undermined if the unregulated use of PCE leads to a imposition of certain choices due to market forces. Such problems with direct and indirect coercion (e.g., see the truck drivers' example in section 3) should not be underestimated and concerns on this matter have already been raised in the literature. According to Greely *et al.,* questions of (freedom of) direct coercion are specifically acute for military and medical personnel: "Soldiers in the United States and elsewhere have long been offered stimulant medications including amphetamine and modafinil to enhance alertness, and in the United States [soldiers] are legally required to take medications if ordered to for the sake of their military performance" (11, p.703; see also 54). It is plausible that, in the future, soldiers will be coerced to also use other forms of PCE in order to boost their memory, attention and perception. Similarly, one could also imagine that for medical professions cognitive enhancement could be viewed as justifiably required. Greely *et al.* (11) ask whether it would be justifiable to require an (apparently) extremely safe substance that enables surgeons to treat patients more successfully in risky operations.[11] In terms of indirect coercion, parents might, for instance, feel pressured to let their children use PCE in order to compete with others who already use these stimulants.

On the other hand, as was remarked in section 3, there is evidence to assume that Rawls would be a proponent of the use of PCE, because greater natural assets could give members of society greater liberty to pursue a preferred plan of life (e.g., by finding a dream job or by finishing higher education). A new finding is thus that there is a major problem with this application of Rawls' first Principle of Justice: having more liberty to pursue a preferred plan of life by means of a larger distribution of PCE will always be accompanied by more risks in terms of a market forces influencing people's choices, which will jeopardize the liberty of individuals who prefer to abstain from the use of PCE. In other words, "you cannot have your cake and eat it too".

In contrast to the other two theories of justice, Sen's Capability Approach does not aim to solve questions about the nature of a perfectly just society, but rather addresses questions of removing injustice and enhancing justice. By focusing on capabilities, this method is more tractable and more comprehensible than the previously discussed theories. Additionally, the distribution and use of PCE from the perspective of the Capability Approach gives advantages that can be identified under the banners of 1) agency/self-respect, and 2) the way the public views those who take the capability path out of their poor situation (50). First, as Jeesoo Nam notes, "While traditional welfare treats individuals as patients sitting idly for the ride, aiding capabilities treats the recipients as agents firmly in the saddle" (50, p.127). Receivers of capability aid in the form of PCE have the ability to regain (or get more) control of their situation via their own conduct. For instance, currently unemployed individuals who lack basic knowledge capabilities could, with the help of PCE, find a (better/more rewarding) job and, as a result, gain more agency and other benefits (e.g., self-respect, a better social life, suffer less from gender asymmetries) that traditional income support lacks (50). The emphasis on this potential of giving people more assurance that they are in control of their turbulent lives could be a vital argument in persuading the public that the use of PCE is in some cases justified. This argument could be seen as more intelligible than abstract reasoning such as obtaining greater liberty to pursue a preferred life plan.

Second, the use of public resources by distributing PCE to those individuals with lower cognitive capacities is expected to receive broad support from the public if it is framed as a capability path out of poverty. Nam argues that members of the political right in countries such as the US are increasingly hostile to receivers of welfare, which is illustrated by the derogatory term *welfare queen* that has entrenched itself in the American vocabulary. Individuals who receive income support have often been shamed both in the public and private sphere (50), while people who choose the capability route out of poverty are generally praised. Few people would disapprove of a manual worker who decides to take night classes in order to apply for a management position: "Even when the capability route is funded by the government, as it is in public education or a public works project, the recipients of capability aid do not draw fire" (50, p.128).

Of these three theories, Sen's Capability Approach has, in my analysis, the most successful argument that access to PCE should be opened up for (certain groups of) individuals. Nevertheless, one still has to take into account other problems with PCE, and these are dealt with in the next section.

5. GENERAL AND PRACTICAL PROBLEMS WITH PCE

If access to PCE were to be opened up under a theory of justice (for instance, Sen's), one should at least consider, and if possible, try to solve the following general and practical problems, in addition to the ethical and practical issues already mentioned in the previous section.

First of all, since PCE affect our brains – crucial and complex organs – the risks of inadvertent side effects are both high and consequential (11). Even though some PCE seem to have minimal side effects (6) there are many risks related to the use of other forms of PCE, such as methylphenidate. "Common adverse effects of chronic [methylphenidate] use include insomnia, nervousness, irritability, anxiety, jitteriness, increased heart rate, dizziness, drowsiness, headache, stomach ache, anorexia and appetite suppression" (56, p.972). Large doses of methylphenidate can even cause cardiovascular diseases, seizures, and psychosis (57). Furthermore, a recent study by Grant *et al.* (58) found that the non-medical use of PCE is associated with impulsive behaviours, such as risky sexual practices.

[11] One needs to note here that Modafinil could keep surgeons awake for a longer period of time, but that it has been found to lead to overconfidence, and thus to increased risk. For example, a sleep-deprived surgeon might think that he/she is able to consider all the possible diagnoses of a new patient, because of the use of Modafinil, when in reality his/her cognitive abilities have decreased dramatically (55).

Second, there is evidence from research in both human subjects and animals which suggests that "(…) even at more modest levels of improvement, the use of cognition enhancing drugs could potentially lead to (…) 'trade-offs', where pharmacological enhancement of one task is associated with impairment in another area" (24, p.769). For example, enhancing long-term memory (LTM) could impair working memory, due to the opposite 'chemical needs' of the hippocampus, which is critical for LTM, and the prefrontal cortex, which is involved in working memory (24). Another trade-off that could arise concerns stability versus flexibility of LTM: improving the consolidation of LTM could disrupt the capacity for modifying memories with new information. The last and related trade-off entails that an increase of cognitive stability (which enhances the maintenance of working memory) could lead to a reduced ability to flexibly change one's behaviour (24).

Third, a concern from the Rawlsian perspective, formulated by Andrea Lavazza, regarding the baseline dependency, is that PCE do not play a role in the increase of motivational features, i.e., these substances can increase the cognitive capacities of someone, but not make them interested or passionate about a subject that they did not consider as important before the use of PCE (59). PCE could therefore only partially fill the educational gap, because even if it is "(…) prescribed to all those who find themselves in a disadvantageous situation, it would mainly be helpful for the students who are already committed (be it for genetic reasons or for the way they were brought up) but not for all those who are not interested in learning or are unwilling to study" (59, p.50).

According to Lavazza, the real problem is that badly educated students in inadequate institutions might benefit from PCE in the short run (e.g., passing exams), but they will still lack the social stimuli to comprehend the relevance of education, with the result that they will not work sufficiently hard to succeed at school. Furthermore, if only a few students use PCE in an inadequate school, the average results of tests will improve at this school, which might lead to less investment or further neglect by the state, while these students need the opposite: more funds and attention (60). As Lavazza states, "[t]he overall effect would be negative and thus, paradoxically, the use of PCEs by some or the majority of students would further damage those who did not have the opportunity to take them (their families do not go to the doctor, or their doctor will not prescribe stimulants to healthy individuals)" (59, p.51).

The last significant risk that might arise when implementing PCE policy based on one of the three theories of justice is a possible displacement on the labour market by the subgroup of individuals with average cognitive capacities. Utilitarianism, Rawls' Justice as Fairness and the Capability Approach are all mainly focused on aiding the group with lower cognitive capacities when it comes to the use of PCE.[12] Individuals with average cognitive capacities might now find themselves competing for the same jobs as those people who were previously unemployed or who used to have a less challenging profession. In fact, members of society with average cognitive capacities could feel threatened by the labour force entrants and might therefore not be supportive of these policy plans.

CONCLUSION

Although most PCE do not yet have an enormous impact, the effectiveness of these stimulants is expected to increase, and side effects will likely diminish as enhancement technology moves forward. This will, in all likelihood, lead to an increase in the already rising demand for PCE in the grey area that is between treatment and cognitive enhancement. Yet, public policy has thus far not responded adequately to these developments, which do not fit in the current disease-focused regulatory framework of traditional medical treatments. It has been argued in this article that (the use of) PCE should be regarded as a new sphere of justice outside the medical realm, with distribution criteria and norms that are based on the improvement of well-being rather than the treatment of diseases.

Future policy on this subject should, in my view, be based on a moral framework centred around Sen's Capability Approach, because the argument that follows from this approach is the 'most successful' (in both a political and ethical sense) with regard to access to PCE. Specifically, such capability-based policy could lead to more flourishing of individuals with lower cognitive capacities.

Evidently, the safety of PCE and the health of the citizens using these substances should have a high priority in any policy-making process. This could be achieved by providing public funding for both scientific research into the efficiency and safety of PCE, and epidemiological studies that investigate the broader effects of prolonged use (1). In addition, obligatory annual tests should be provided, which check for health problems of PCE users (12). These regulations would make the use of PCE safer and ensure better monitoring and control. Furthermore, governments should make sure that inadequately resourced schools – who have artificially high average results due to the use of PCE by some of the students – do not lose funds and attention, which are needed to improve the quality of these schools. Lastly, a just government has the responsibility of ensuring that individuals who want to abstain from the use of these substances not feel directly or indirectly coerced to take PCE.

[12] To be more specific, for utilitarians, it is the group that can gain the most with PCE (due to the effect being dependent on baseline performance), in Rawls' theory it concerns the least advantaged members of society, and for Sen it would be the ones with lower capacities.

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