Eric Kandel, pioneer investigator of the molecular mechanisms of memory, once commented, "We are who we are in good measure because of what we have learned and what we remember.\(^1\) If grey matter forms the warp and woof of personal biography, individuality, rationality and creative capacity, does it then follow that whatever we can do to augment cognitive function would make us better persons?

The gradual decline of memory during normal aging and the devastating effects of dementias such as Alzheimer’s disease\(^2\) are highlighting the pressing need for research into the pathological basis of cognitive disorders\(^3\) and the development of drugs to preserve and improve memory function.\(^4\) The question of whether such drugs, as they become available, should also be used for purposes of enhancing cognition in healthy people has risen to the forefront of neuroethical discussion.\(^5,6\) While developing therapies to improve cognitive capacity in patients with amnesia or dementia is indisputably a worthy goal, it is less clear whether society or individuals would benefit from a new pharmaceutical orientation promising enhanced mental performance for the healthy.

Part of what we learn we encounter in fiction. Readers of Sir Arthur Conan Doyle’s short stories will remember the famous detective whose name is synonymous with perspicacity. "I am a brain, Watson," declared Sherlock Holmes.\(^7\) Fewer, perhaps, will recall that Holmes occasionally turned to cocaine, which he found "stimulating and clarifying to the mind."\(^8\) In Sir Arthur’s era, cocaine had not yet been classified as an illicit substance, for the seriousness of its addictive potential
was not yet widely appreciated. It had, in fact, attracted considerable medical interest as a tonic in the treatment of various ailments.  

Surveys and sales figures suggest that increasing numbers of students and professionals today are using nonaddictive stimulant medications beyond their defined therapeutic indications for the purpose of enhancing mental performance. In coming years, pharmaceutical advances may offer even more potent "nootropics," or drugs designed to boost brain power. As available drugs increase in potency, their ethical implications intensify. Enhancing the cerebral grey matter inevitably leads to ethical grey matters. The following terminology is proposed as a way of classifying nootropics into four categories of potency, each of which carries particular ethical implications.

In the *fizzle* category are various substances and over-the-counter supplements claimed to enhance cognition yet without definitive objective evidence. Examples include ginkgo biloba and piracetam, which have been shown to have at most an equivocal effect on cognitive function. The relevant ethical questions for fizzle drugs concern truthfulness in advertising and the need for regulations to deter exploitation of vulnerable patients. A guiding principle is *caveat emptor*.

In the *perk* category are mild dietary stimulants such as caffeine. If imbibed in moderation, coffee and tea are for most people safe, pleasant, and beneficial. If taken in excess, caffeine can cause insomnia, anxiety, palpitations, and headaches. Caffeine has a fascinating history across many cultures. European coffee houses, for example, replaced the earlier tradition of ale houses and became centers of scientific, literary, philosophical, and political discussion in which people from diverse social classes participated. The elegant custom of afternoon tea traces to ancient China.

In the *jolt* category are prescription drugs exerting a moderate stimulant effect. Examples include methylphenidate, modafinil, and amphetamine. Each has its medical indications substantiated by research and approved by the Food and Drug Administration. Occasionally prescriptions may be written for less clear medical indications, or partakers may obtain supplies of drugs through offshore pharmacies advertising on the Internet or through diverted prescriptions. Medical evaluation of stimulants focuses on issues of safety, as no drug is without potential side effects and health hazards.

In the *shock* category are stronger stimulants still. An example would be intravenous cocaine, the legitimate use of which is restricted by law because of its destructive social and chronic cognitive effects. Cocaine is also a local anesthetic, and just as research has provided more selective local anesthetics for use in medical procedures, future research may yield targeted cognitive stimulants highly selective for specific brain functions. Would the creation of designer drugs that could deliver cognitive stimulation within reasonable margins of cost and safety satisfy remaining ethical concerns?

Aside from important questions of practical safety, the *jolt* and *shock* categories raise more profound ethical questions. It is necessary to consider what is meant by the goal of better brain performance, by what means it would be sought, and why it might be desired.

The brain circuits that medication can artificially stimulate encompass only a narrow segment of the many facets of intelligence. Might drugs that rouse one aspect of thought also diminish or
suppress other aspects of thought and feeling that we would value as integral to being human? Might drugs that preserve good memories also reinforce distressing memories or enhance the awareness and reminiscence of pain?

Further ethical concerns are more subtle, yet have the potential to transform society. Reliance on drugs to augment mental performance could undermine the virtues of discipline, study, personal effort, and commitment. The tainted history of steroids and other drugs to enhance physical performance in athletes is instructive in regard to the importance of principles of fairness in all forms of human competition. At the heart of the enhancement choice is the question of whether the guiding aspiration is the flourishing of human communities or a quest for individual perfection.

What would it mean for society if unequal use or access to such drugs were to divide people into the "enhanced" and the "unenhanced"? If one's academic or business competitors were to attain a performance advantage through pharmacology, or if stimulant drugs were shown to improve measurable categories of learning or to reduce mistakes in the workplace, would we be truly free to choose not to "enhance" our brains? How far should mental enhancement be pushed?

In an age that esteems computational power, there is a temptation to reduce human thought to instrumental value. The brain is, however, not simply an engine; it is an enigma. Paradigms of the brain that emphasize cognitive performance, although in some ways practically useful, cannot supply an understanding of the purpose of the human mind or the dignity of the person.

Sherlock Holmes chose wisely – not in his use of cocaine – but in his preference to engage the more exhilarating challenges of the real world. "My mind," said Holmes, "reels at stagnation. Give me problems, give me work, give me the most abstruse cryptogram, or the most intricate analysis, and I am in my own proper atmosphere. I can dispense then with artificial stimulants. But I abhor the dull routine of existence. I crave for mental exaltation." The astute reader will observe that Holmes resorted to cocaine, not to enhance his mental acumen as a detective, but to escape the dreariness of the ordinary moments in life. Despite its potent stimulant effect, cocaine ultimately proved unsatisfying.

Although pharmacologic progress in cognitive neuroscience may map the brain, harness the flow of neurotransmitters, and measure success by boosting mental performance, additional resources are needed to discern the value of human thought and the purposes to which it is best applied. True wisdom recognizes that human problems are not primarily due to cognitive finitude but to flawed and fallen minds. Enhancing cognitive power would magnify both human accomplishment and human error. No amount of restructuring nootropics at the molecular level can separate this double-edged effect of biotechnology. Our greatest needs ultimately can be met not by stronger stimulants but by the redeeming grace of the Savior.
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