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Neurocognitive Enhancement

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Introduction:

‘‘Neurocognitive enhancement’’ denominates the usage of drugs and other brain interventions to improve cognition in healthy individuals[1]. It is 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 and this includes acquiring (perception), selecting (attention), representing (understanding) and retaining (memory) information, and using this information to guide one’sbehavior (reasoning and coordination of motor outputs). Interventions to improve the cognitive function may be directed at any of the above mentioned core faculties.[2]

Recent years have witnessed a rising interest in the potential for therapies that are developed to help patients with cognitive deficits to enhance the abilities of healthy individuals with normal cognition. While this emerging field of cosmetic neurology has offered the promise of changing the way we think and feel in ways that will make us more efficient in the workplace, more attentive in school, or more happier in our personal lives, it has also fueled serious ethical concerns.[3]-[5]

Mental Training:

Mental training and visualization techniques are widely practiced in sport [6] and rehabilitation[7], with apparently good effects. They vividly imagine themselves performing a task (running a race, going to a store ,jogging in the park), imagining every movement and how they feel. A likely explanation for the efficacy of such exercises is that they activate the neural networks involved in executing a skill. The classic form of cognitive enhancement is learned strategies to memorize information. Such methods have been used since antiquity[8]&[9]. One such classic strategy is “the method of loci.” The user imagines a building, either real or imaginary, and in her imagination she walks from room to room, and places imaginary objects that evoke natural associations to the subject matter that she is memorizing. During retrieval, the user retraces her steps and the sequence of memorized information is recalled when she “sees” the objects she has placed along the route. This technique harnesses the brain’s spatial navigation system to help remember objects. Use of mnemonics and pictures improve memory.

Pharmacological Neuroenhancement:

Also known as ‘‘cosmetic neuropharmacology/psychopharmacology”[10] or simply Brain Doping refers to administration of drugs that are developed for patients with attention disorders (eg of the drug: methylphenidate) , dementia (eg: donepezil) , depression (eg: fluoxetine) or narcolepsy (eg: modafinil) when not medically indicated.[1]

The desirable effects that these drugs produce are they make one feel better than good, they reduce the sleep requirement which proves useful in the military field as well as in the educational and professional field[11].

Pharmaceutical Biotechnology:

Stimulant drugs like nicotine and caffeine are traditionally and widely used to improve cognition. In the case of nicotine a complex interaction with attention and memory occurs[12]-[14]while caffeine reduces tiredness[15]-[17]

Even common, traditional, and unregulated herbs and spices, such as sage, can improve memory and mood through chemical effects [18].Chewing gums may also affect memory probably by heightening arousal or increasing blood sugar level.[19]

Neurotechnical Enhancement:

Involves application of neurotechnical procedures for enhancement of cognition. The two methods are Deep Brain Stimulation and transcranial stimulation. Deep Brain Stimulation involves Implantation of electrodes into certain parts of the brain could strengthen desired behaviors and also break undesired aspects of the patient's personality. Transcranial magnetic stimulation is a non-invasive technology that stimulates specific regions of the brain with the aid of strong magnetic fields.[20]Transcranial magnetic stimulation (TMS) stimulates neurons in the cerebralcortex by a changing magnetic field induced from a coil held to the head. It can increase or decrease the excitability of the cortex, thereby changing its level of plasticity[21].While TMS appears to be highly versatile and noninvasive, there are risks of triggering epileptic seizures and the effects of long-term use are not known.Increased amounts of brain growth factors [22] and the signal transduction protein adenylylcyclase[23]have also produced memory improvements.

Conclusion:

In ancient Greece, it is said that students would entwine rosemary sprigs into their hair in the belief that it wouldimprove their memory. Although the desire to enhance one's cognitive abilities has not abated since then, modern advances in psychopharmacology now offer the possibility of one day realizing this ancient dream.Cognitive enhancement raises many ethical and social issues but also many practical challenges. Enhancements do have a price. In some cases it is a monetary price tag, but often it is a tradeoff between different abilities. Keeping awake using stimulants prevents the memory consolidation that would have taken place during sleep, and enhanced concentration ability may impair the ability to notice things in peripheral awareness. Enhancement users must decide when the benefits outweigh the potential risk.

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