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THE ANOMIE OF "SMART DRUGS": ETHICAL CONTROVERSIES AND RESPONSES TO COGNITIVE ENHANCERS

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Abstract: Cognitive Enhancers (CEs) have attracted considerable attention due to their capacity to enhance cognitive performance. These agents are classified into two categories: prescription drugs and non-prescription supplements. Despite their efficacy, the potential for addiction and associated risks have given rise to numerous ethical controversies. This article explores the ethical issues of using CEs, including fairness and equality, coercion and autonomy, health and safety risks, and social norms. It proposes that the ethical issues surrounding CEs should be addressed by implementing strict supervision, promoting informed consent, improving research transparency, and encouraging multi-stakeholder collaboration. These approaches aim to achieve a balance between bio-innovation and ethical responsibility.

Keywords: cognitive enhancers, psychostimulants, addiction, drug ethics

La anomia de las "drogas inteligentes": controversias éticas y respuestas a los potenciadores cognitivos

Resumen: Los Potenciadores Cognitivos (PC) han atraído considerable atención debido a su capacidad para mejorar el rendimiento cognitivo. Estos agentes se clasifican en dos categorías: medicamentos con receta y suplementos sin receta. A pesar de su eficacia, el potencial de adicción y los riesgos asociados han dado lugar a numerosas controversias éticas. Este artículo explora las cuestiones éticas del uso de PC, incluyendo la equidad y la igualdad, la coerción y la autonomía, los riesgos para la salud y la seguridad, y las normas sociales. Propone que las cuestiones éticas en torno a los PC se aborden mediante la implementación de una supervisión estricta, la promoción del consentimiento informado, la mejora de la transparencia de la investigación y el fomento de la colaboración entre múltiples partes interesadas. Estos enfoques buscan lograr un equilibrio entre la bioinnovación y la responsabilidad ética.

Palabras clave: potenciadores cognitivos, psicoestimulantes, adicción, ética de los fármacos

A anomia das "drogas inteigentes: controvérsias éticas e respostas a intensificadores cognitivos

Resumo: Intensificadores Cognitivos têm atraído atenção considerável por sua capacidade de melhorar o desempenho cognitivo. Esses agentes são classificados em duas categorias: medicamentos que requerem prescrição e suplementos que não necessitam de receita. Apesar de sua eficácia, seu potencial para dependência e riscos associados deram lugar a numerosas controvérsias éticas. Esse artigo explora as questões éticas de usar os ICs, incluindo justiça e igualdade, coerção e autonomia, riscos à saúde e segurança, e normas sociais. Ele propões que questões éticas envolvendo Ics devem ser consideradas pela implementando uma supervisão rigorosa, promovendo o consentimento informado, melhorando a transparência das pesquisas e encorajando a colaboração de partes interessadas. Essas abordagens objetivam alcançar um melhor equilíbrio entre bio-inovação e responsabilidade ética.

Palavras-chave: intensificadores cognitivos, psico-estimulantes, dependência, ética em medicamentos

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1. Introduction

Cognitive enhancers (known as 'Smart Drugs') are medications designed to improve cognitive functions such as memory, attention, creativity, and motivation*(1)*. In the medical field, CEs are used to treat various conditions that impair cognitive function. Drugs such as Donepezil and Memantine are used in the treatment of Alzheimer's disease to help improve memory and cognitive function. In addition, CEs have great potential in the treatment of other neurological disorders, such as Parkinson's and schizophrenia*(2,3,4)*. In the real-life sphere, CEs are widely used by students and specific groups of people to boost cognitive abilities and ensure better performance in the face of stiff competition. Students commonly use these substances to improve concentration and memory in preparation for exams; specific populations use them to increase cognitive efficiency at work*(5)*. CEs currently in widespread use include Adderall, Ritalin, and Modafinil, which are prescribed for the treatment of ADHD*(6,7)*. Modafinil, methylphenidate, and amphetamine are used as stimulants to treat symptoms such as extreme daytime sleepiness, convulsions, and nighttime sleep disruptions. These stimulants can enhance consciousness, improve perception and thinking, and help maintain wakefulness*(8)*. While often overlooked, supplements such as caffeine and certain herbal extracts are widely used CEs that can improve alertness and focus.

The widespread use of CEs raises a few significant ethical challenges regarding equity, autonomy, health, and social norms, which interact with concepts such as authenticity, the good life, and the role of medicine in our lives*(9)*. To address these ethical issues, multiple parties need to be involved, which includes specific measures such as legal regulation, informed consent, transparency in research and development, and community initiatives. By promoting responsible research and use and ensuring that individuals are fully informed about their potential risks and benefits, the complexity of CEs can ultimately be better addressed.

2. Classification and application of CEs

CEs are widely used in different fields, such as medicine, academia, specific environments, and daily life. Depending on the production process and specific efficacy, CEs can be categorized into three main types: natural CEs, synthetic CEs, and prescription CEs. Relevant medical studies have shown that various types of CEs exhibit different mechanisms of action in different scenarios of use, with the four main ones being the regulation of neurotransmitters, the protection of cognitive nerves, the improvement of synaptic plasticity, and the enhancement of energy metabolism.

2.1 Class characteristics

Natural CEs are derived from natural substances such as plants, herbs, and foods; these enhancers have been used in traditional medicine for centuries and are safer with fewer side effects*(10,11)*. Synthetic CEs are artificial compounds designed to improve cognitive performance; these enhancers typically have more potent effects than natural supplements and must be subject to more rigorous research and regulation. Prescription CEs are medications prescribed by a healthcare professional for treating specific medical conditions, but are often used over the counter for cognitive enhancement. In addition to the CEs already in widespread use, there is a quiet rise in certain novel compounds that are often not approved for medical use and are used primarily in laboratory settings.

2.2 Mechanisms of action

CEs can improve cognitive function through various mechanisms, including modulation of neurotransmitters. Many CEs work by modulating the levels of neurotransmitters in the brain. Neurotransmitters such as dopamine, norepinephrine, acetylcholine, and serotonin play a key role in regulating mood, attention, memory, and learning. For example, stimulants like Adderall work by boosting dopamine and norepinephrine levels, which in turn improve attention and concentration. Similarly, donepezil, used to treat Alzheimer's disease, improves memory and cognitive function by boosting acetylcholine levels. Second, it protects cognitive nerves. Some CEs help maintain cognitive function and prevent cognitive decline by protecting neurons from damage caused by oxidative stress, excitotoxicity, and inflammation. For example, antioxidants in ginkgo biloba protect

brain cells from oxidative damage, while memantine, used to treat Alzheimer's disease, prevents excitotoxicity by blocking NMDA receptors*(12)*. Third, improving synaptic plasticity. Enhancers that improve synaptic plasticity can strengthen connections between neurons, promoting better communication and enhancing learning and memory. For example, racetams such as piracetam enhance cognitive function by improving synaptic plasticity. Fourth, it enhances energy metabolism. CEs that improve the brain's energy metabolism can increase mental energy and endurance, enhancing cognitive performance. For example, modafinil enhances energy metabolism to improve attentional alertness and cognitive function.

2.3 Status of application

Global applications of CEs vary depending on cultural, economic, regulatory, and medical factors. Overall, the current application scenarios for CEs are in three main areas: specialized medical diagnostics, academic and specific occupational needs, and daily life needs.

CEs are essential in treating various cognitive and neurological disorders in specialized medical diagnostics. In North America and Europe, Alzheimer's patients often use prescription drugs such as donepezil and memantine to improve cognitive function and quality of life. These medications help patients maintain cognitive abilities and slow the assault of the disease by increasing acetylcholine levels in the brain or blocking NMDA receptors. CEs are also being explored for the treatment of other neurological disorders, such as Parkinson's disease, schizophrenia, and traumatic brain injury, with donepezil and memantine showing great potential for alleviating cognitive deficits associated with Parkinson's disease. In addition, college students at risk for eating disorders (ED) are more likely to use CEs and psychostimulants to improve cognitive function and lose weight*(13)*. Research also suggests that certain cognitive enhancement medications may also improve cognitive function in patients with schizophrenia, although the exact mechanisms need to be further investigated.

In terms of academic and specific vocational needs, students in some areas often use CEs to improve their academic performance, and these substances help them to improve their memory, concentration, and study efficiency during exam periods*(14)*. In a survey of UK university students' use of CEs to aid their studies, participants reported a variety of motivations for using CEs, the most common being to fulfill class requirements, improve concentration, or stay awake*(15)*. For example, prescription stimulants such as Adderall and Ritalin are widely used among college students in the United States, and these drugs improve learning by increasing levels of dopamine and norepinephrine in the brain, which improves attention and concentration. However, one study showed that methylphenidate, dextroamphetamine, and modafinil resulted in a significant reduction in the knapsack value (note: a combinatorially optimized NP-complete problem) obtained in the task, even though the odds of finding the best solution (about 50%) were not significantly reduced*(16)*. CEs are equally popular in specific occupational settings, especially in high-pressure finance, technology, and law industries. Some population segments use these substances to improve concentration and cognitive acuity to cope with long work hours and high-intensity tasks. For example, caffeine products, a widely used cognitive enhancer, can be found in workplaces across the globe.

In terms of everyday needs, in addition to academic and medical uses, CEs are also used by the general population to enhance daily cognitive performance. In countries where coffee culture is prevalent, such as Brazil and Italy, consuming caffeine products is essential to daily life and work. Natural supplements, such as ginkgo biloba, Brahmi, and ginseng, are also widely used for cognitive enhancement. Ginkgo biloba improves memory and cognitive function through improved blood flow to the brain and antioxidant effects. On the other hand, Brahmi and ginseng help improve memory and reduce anxiety by supporting neurotransmitter production and reducing oxidative stress.

Finally, CEs present very different application scenarios in different cultural contexts. In Western societies, using CEs is usually for competitive advantage and self-improvement. The high-pressure academic and work environments create a need for enhanced cognitive performance. As the trend of "biohacking" grows, people are trying

all kinds of smart drugs to optimize their mental and physical abilities. In Eastern societies, CEs are deeply rooted in traditional medicine and cultural practices, and herbs and natural supplements are widely accepted and used for cognitive enhancement. In China, for example, traditional Chinese medicine contains a variety of herbs believed to enhance cognitive function. Cultural acceptance has contributed to the widespread use of natural CEs.

3. Ethical controversies over CEs

Whether natural supplements, prescription drugs, or experimental drugs such as racetams, these enhancers are highly sought after for their ability to enhance mental performance. However, their ethical implications are complex and multifaceted, especially with the proliferation of new CEs. As their popularity increases, so does the urgency of addressing these ethical issues.

3.1 Fairness and equality

Fairness and equality are fundamental principles in many societies and ideals that shape policies, laws, and social norms. Although often used interchangeably, equity and equality have different meanings and implications. Equity usually refers to justice and fairness, emphasizing the equal treatment of everyone according to their circumstances, while equality focuses on providing everyone with the same opportunities and resources.

Access to CEs often depends on socioeconomic status, which creates inequality in academic and professional settings. In a statistical survey of students at three public medical schools in Riyadh, Saudi Arabia, it was found that illegal access to these (cognitive) stimulants has become easier since the level of diagnosis and treatment of ADHD has increased*(17,18)*. The fact that wealthy individuals can afford high-quality CEs and thus gain an advantage over those who cannot afford these substances exacerbates existing inequalities, as success is increasingly dependent on access to these substances rather than individual effort and ability. It has also been argued that, given that unfair advantages have become ubiquitous and generally tolerated by society, this view seems questionable*(19)*. The use of CEs in educational institutions and the workplace can create an uneven playing field, where students and professionals who use these substances may outperform their peers, not just because of higher skills or effort, but because of the help of the drugs.

3.2 Compulsory vs. autonomous

Compulsory is defined by a law, regulation, or authority that requires individuals to comply. Some social actions are obligatory, and non-compliance usually results in penalties or legal consequences. Coercive measures are usually imposed to ensure social order, safety, and public welfare. Examples include compulsory education, mandatory vaccination policies, and requirements to pay taxes. Autonomy is the voluntary choice of an individual to take actions without external coercion. These actions are driven by an individual's free will, preference, or self-interest, altruism, and are not compelled by law. Voluntary measures are often associated with personal freedom and autonomy, such as charitable donations, volunteerism, and free lifestyle choices such as diet and exercise.

In highly competitive environments, there may be implicit or explicit pressure to use CEs to perform well, as individuals may feel compelled to use these substances to keep up with their peers, even if they would not want to, shaping a coercive environment for use on the one hand, and diminishing individual autonomy on the other. For groups that have taken smart drugs, hedonic effects may be perceived as favorable when at work, whereas increased physical strength may be preferred when recreationally, suggesting that the context of intended use is essential when examining abuse liability*(20)*. Another research supports the notion that the decision to use CEs is not just an autonomous choice that occurs in isolation*(21)*. Drug manufacturers may exaggerate the efficacy of a drug based on profit considerations, thus compromising the autonomy of choice of the user, who must be fully aware of the potential risks and benefits of a particular cognitive enhancer to make an informed decision; this is difficult for the average consumer. The complexity surrounding these substances, including their short- versus long-term effects, may make it difficult for individuals to fully understand what they are consenting to, raising ethical concerns about the adequacy of the

informed consent process. It has been suggested that the use of smart drugs is significantly linked to individual attitudes, with the results of an online survey of UK university students suggesting that attitudes were more favorable among those who thought smart drugs were harmless and those who thought they knew enough about how to use them safely. In contrast, perceptions of unfairness were associated with negative attitudes*(22)*.

3.3 Health and safety risks

Health and safety risks can lead to immediate injuries, chronic illnesses, and long-term health effects, affecting society's overall quality of life and increasing healthcare costs. Health and safety risks also have significant economic impacts: injuries and illnesses in the workplace can lead to reduced productivity, increased medical costs, and disputes over workers' compensation claims; environmental contamination can lead to costly cleanups, legal liabilities, and medical expenses; and accidents and injuries in the home and public places can lead to significant medical costs and loss of income.

While some CEs, such as caffeine and certain smart drug supplements, have been widely used and are considered relatively safe for short-term use, the long-term health effects of many CEs are unclear. In a survey of 1,865 college students on the prevalence of smart drug use, it was revealed that more than 300 students who expressed a desire to use some smart drug did not do so, primarily because of fear of side effects*(23)*. Prescription-type enhancers such as Adderall and Modafinil can cause insomnia, anxiety, and cardiovascular problems. Many CEs, especially stimulants, carry the risk of addiction and dependence, and the consequences of drug abuse and dependence, such as withdrawal symptoms and changes in brain chemistry, present serious ethical challenges for healthy individuals and society and require rigorous and careful ethical scrutiny to balance the risks of cognitive enhancement and addiction.

3.4 Social norms

Widespread use of CEs may lead to changes in social norms and expectations that will redefine the criteria for what is considered "normal" cognitive functioning and may marginalize those who choose not to use or are unable to use these substances. The use of CEs raises questions about human identity and authenticity, and if CEs significantly alter a person's mental abilities, this will challenge notions of self and personal achievement. There is widespread ethical debate about whether achievements achieved with CEs are as valuable or authentic as those achieved without using these substances, and there is a risk of disrupting existing norms of evaluation in society. At the level of educational epistemology, CEs may alter students' moods and behaviors, thereby distorting students', educators', and policymakers' interpretations of educational contexts*(24)*.

The legal status and regulation of CEs also vary considerably across jurisdictions, with some CEs available over the counter and others requiring a prescription or being banned altogether. Ethical issues regarding the research and development of new CEs have also been questioned, including issues related to clinical trials, the marketing of pharmaceutical agents, and the allocation of responsibilities to pharmaceutical companies, ensuring that such research is conducted on an ethical and transparent basis, which is essential for the safety and efficacy of the products, as well as for existing social norms.

4. Response to ethical controversies on CEs

Although CEs promise to improve human cognitive performance, their use raises several ethical issues. To ensure that their use is fair, equitable, and safe, it is essential to improve society's understanding of CEs and ensure that these enhancers have a positive effect on the individual and the collective through measures such as stringent regulation, equitable access, informed consent, reduction of health risks, public participation in the discussion, and transparent research practices—positive effects of these enhancers on individuals and collectives.

4.1 Promotion of legal regulation and industry self-regulation

In the United States and Canada, CEs such as Adderall, Ritalin, and Modafinil are heavily regulated, classified as controlled substances, and require

a prescription from a healthcare professional. Regulation of CEs varies in European countries. In the United Kingdom, prescription stimulants are tightly controlled, but over-the-counter agents such as ginkgo biloba and Omega-3 supplements are readily available. In Germany, modafinil is used to treat episodic sleeping sickness but is also used over the counter for cognitive enhancement. The European Union is working to harmonize regulations to ensure that CEs are used safely and effectively in member states. In Asia, CEs are also regulated in very different ways. Japan and South Korea have strict regulations for prescription drugs with a focus on preventing abuse. However, using over-the-counter CEs, including traditional herbs and modern supplements, is equally prevalent. In India and China, there is a long tradition of using herbal CEs such as Brahmi and ginseng, which are widely accepted and integrated into traditional cultural practices.

Developing and promoting ethical guidelines and policies for using CEs is crucial to address ethical challenges. These guidelines should specify the circumstances under which the use of CEs is ethical and provide relevant codes of practice to prevent abuse and coercive use. Specialized ethics committees could be established in schools and workplaces to oversee the use of CEs and ensure that they meet ethical standards.

In addition, industry associations and academic groups should be actively involved in developing harmonized industry standards to promote the healthy development of the industry. Promoting legal regulation and industry self-regulation is critical to maintaining compliance, ensuring ethical standards, and fostering a sustainable and trustworthy business environment. Legal regulation provides a set of rules and standards with which the industry must comply. In contrast, industry self-regulation involves voluntary adherence to ethical guidelines and best practices that go beyond legal requirements. Governments must ensure that regulations are consistently enforced and penalties are imposed for non-compliance.

Similarly, industry associations should establish mechanisms to monitor compliance with voluntary codes of conduct, including peer review and certification programs. Overly stringent regulations can stifle innovation and impose compliance costs on the industry, while inadequate regulation can lead to unethical behavior. The balanced approach is to set clear regulatory standards while encouraging industry-led initiatives for ethical behavior, creating a dynamic regulation system by balancing regulation with flexibility, encouraging voluntary compliance, and fostering collaboration. For example, academics assess psychologists' forums to uncover the use of CEs in the online world using web crawler technology. As part of an early-warning system, NPSfinder is helpful to provide clinicians with up-to-date information on the use of nootropics in the increasingly difficult-to-track Internet world. Nootropics medications are increasing in number and type*(25)*.

4.2 Increased sensitization to safeguard informed consent

Informed consent is rooted in the ethical principles of autonomy, respect for the individual, and justice*(26)*. It gives individuals the right to make decisions about their health and participation in research based on a clear understanding of the risks, benefits, and alternatives. Ensuring informed consent is a sign of respect for individual autonomy and self-determination, and informed consent is also a legal requirement in many jurisdictions. For example, healthcare providers and researchers must obtain informed consent before administering treatment or enrolling individuals in research, and failure to do so can lead to legal consequences, including medical malpractice claims and revocation of research authorization. Transparent and effective communication through informed consent builds trust between the patient, the participant, and the medical or research organization. When individuals feel well-informed and respected, they are more likely to have confidence in the medical or research process, which promotes better compliance and cooperation.

A robust informed consent process is essential to ensure that individuals are fully aware of the potential risks and benefits of CEs, including detailed information on short- and long-term effects, addictiveness, and ethical considerations for using these substances. Public education campaigns play an important role in enhancing the public's right to informed consent, and these cam-

paigns can be conducted through various channels, including television, radio, social media, and community events. They should aim to educate the public about their rights and the importance of informed consent in medical and research settings. At the same time, training medical providers and researchers in practical communication skills and cultural competence can also improve the informed consent process, and training programs should emphasize the importance of ensuring that individuals fully understand the information and feel comfortable asking questions. Of course, modern science and technology can also play an essential role in enhancing the informed consent process. For example, interactive digital platforms and mobile applications can provide information in multiple languages, offer detailed explanations through multimedia, and allow individuals to view information as they see fit. Electronic consent systems can facilitate documentation and tracking.

4.3 Promoting transparency in research and development

Transparency involves open communication of research methods, data, results, funding sources, and potential conflicts of interest. Promoting transparency in R&D is essential to maintaining scientific integrity, fostering public trust, and ensuring the reliability of research results*(27,28)*. It is important to ensure that research methods and results can be reviewed promptly and that other researchers are allowed to validate results, repeat experiments, and conduct further research based on previous work. Such openness helps to identify and correct errors, thereby advancing scientific knowledge.

Public trust in scientific research is equally critical to accepting and applying discoveries. When researchers are open about their methods, data, and funding sources, they demonstrate accountability and honesty, which fosters trust among the public, policymakers, and funding agencies. Transparent research practices help to dispel doubts and skepticism, especially in areas of public interest such as healthcare, environmental science, and technology, where transparency in R&D fosters collaboration among researchers, institutions, and industry. Open sharing of data and methods enables broader collaboration and collective problem-solving to bring about more robust and innovative solutions.

In developing CEs, it is essential to ensure that all research meets the highest standards of ethics and transparency, with full disclosure of funding sources and potential conflicts of interest. Promote open access to research results and ensure that all stakeholders, including the public, have access to up-to-date research information. Collaboration between researchers, developers, and regulators can ensure that the development and use of CEs meet public health goals and ethical standards. This collaborative approach can help create a comprehensive regulatory framework that balances innovation, safety, and ethics.

4.4 Participation of multiple actors and community initiatives

Multi-stakeholder engagement and community initiatives are essential for solving complex social, economic, and environmental problems through a collaborative approach that includes the active participation of multiple groups, such as government agencies, non-profit organizations, businesses, academic institutions, and local communities*(29,30)*. Community initiatives can create more comprehensive and practical solutions by utilizing these stakeholders' unique strengths and perspectives. Specifically, they can be categorized as follows:

First, customized solutions. Local knowledge and insights help enhance cultural resilience and advance sustainable and effective interventions, so community-based initiatives involving local stakeholders can develop solutions tailored to specific community needs and contexts. This bottom-up approach ensures that initiatives resonate with the community, increasing the likelihood of success. Second, inclusive planning. An inclusive planning process actively seeks input from all relevant stakeholders, which includes creating opportunities for participation through public consultations, workshops, and advisory committees to ensure that marginalized and underrepresented groups are included. In addressing the ethics of CEs, public debates about their ethical implications should be actively encouraged to foster a more informed and participatory society. These debates should involve stakeholders, including ethicists, scientists,

policymakers, and the public, exploring different perspectives and reaching a consensus on ethical guidelines. Third, empowerment and capacity building. Participation in community initiatives empowers individuals and organizations to have a voice and a role in shaping their environments, and this empowerment enhances capacity building, whereby stakeholders can be equipped with the required skills and knowledge through training, workshops, and technical assistance. Community discussions on CEs can raise awareness and promote the normalization of relevant ethical issues while providing the necessary educational support and fostering a sense of collective responsibility for the responsible use of CEs. Fourth, partnership frameworks. Establishing a partnership framework can formalize collaboration and clarify roles, responsibilities, and expectations. Memoranda of understanding (MOUs), partnership agreements, and joint action plans can all help stakeholders align and effectively coordinate efforts. Fifth, transparent communication and testing, and evaluation. Transparent communication is vital to building trust and fostering collaboration. Regular updates, open dialog, and accessible information help keep stakeholders informed and engaged, whereas transparency also includes clarity of objectives, processes, and decision-making criteria. Ethics committees and panels should be established to review and address emerging issues related to CEs and provide ongoing guidance in addressing the ethics of CEs. Meanwhile, robust monitoring and evaluation mechanisms ensure that community initiatives remain accountable and adaptable, with regular assessments of progress, feedback loops, and impact evaluations helping to identify areas for improvement and success.

5. Conclusion

Through promoting legal regulation and industry self-regulation, increased publicity to ensure informed consent, transparency in research and development, and the participation of multiple actors and community initiatives, society can better manage and use CEs to a certain extent while ensuring ethics and safety. This will not only help protect the health of individuals and maintain social justice but also promote the sustainable development of cognitive science and drug technology. Only with concerted efforts can the potential benefits of CEs be realized while at the same time effectively addressing the ethical and health challenges they pose.

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