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Circulation of information on drugs and other substances to increase cognitive performance: a study of a Brazilian blog (2015-2017)

Circulación de información sobre medicamentos y otras sustancias para aumentar el rendimiento cognitivo: un estudio de un blog brasileño (2015-2017)

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ABSTRACT By observing the processes of (bio)medicalization and pharmaceuticalization of society, this article addresses drugs that have been used by healthy individuals to increase cognitive dimensions such as alertness, memory, and concentration. The use of so-called "smart drugs" or "nootropics" has spread among young people, aided by the internet. The circulation of information about such drugs are analyzed using a Brazilian blog called "Cérebro Turbinado," through publications available for public access between 2015 and 2017. The study adopts theoretical and methodological frameworks of the social sciences, including an anthropological perspective. Documental research was conducted on the internet, specifically with scientific dissemination materials and the material available from the aforementioned blog. The results show that the blog acts as a medium for spreading biomedical knowledge among the lay public and indicates the production of new forms of subjectivity by revealing the meanings attributed to these substances in socialization processes.

KEY WORDS Medicalization; Internet; Nootropic Agents; Biomedical Enhancement; Brazil.

RESUMEN Al observar los procesos de (bio)medicalización y farmacologización de la sociedad, este artículo aborda los medicamentos que han sido utilizados por individuos sanos para aumentar sus dimensiones cognitivas, como el estado de alerta, la memoria y la concentración. Las llamadas "drogas inteligentes" o "drogas nootrópicas" se han extendido entre los jóvenes a través de Internet. La circulación de información sobre tales drogas se analiza desde un blog brasileño llamado Cérebro Turbinado, sobre el que se realizó una investigación documental basada en el material publicado en el blog entre 2015 y 2017, de acceso público. La investigación adopta marcos teóricos y metodológicos de las ciencias sociales, junto a una perspectiva antropológica. Los resultados muestran que el blog actúa como un medio para la difusión del conocimiento biomédico entre el público lego y muestra la producción de nuevas formas de subjetividad al revelar los significados que se atribuyen a tales sustancias en los procesos de socialización.

PALABRAS CLAVES Medicalización; Internet; Nootrópicos; Refuerzo Biomédico; Brasil.

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INTRODUCTION

The goal of this paper is to address cognitive enhancement by resorting to substances, especially those within the category of the so-called "nootropic" drugs. Such compounds have spread over the Internet – on websites, blogs, and social networks – as affordable and safe substances to increase cognitive performance, as opposed to psychotropic drugs, commonly used for that purpose, like methylphenidate and amphetamine derivatives. Our aim is to discuss contemporary uses of these substances and the meanings attributed to them, through a documentary research based on the material available on a blog called *Cérebro Turbinado* [Enhanced Brain].[1] Such objective will be developed on two theoretical pivots: "interfaces of processes of medicalization" and "cognitive enhancement and use of substances."

Interfaces of processes of medicalization

Various social sciences authors addressed the issue of medicalization, commencing mainly in the 1970s. Michel Foucault approaches this topic in several works: on the one hand, Foucault intertwines a historic fabric between social control, medicine and politics, whereas, on the other hand, he articulates illnesses with a subject's ethical mandate. In this way, the scope of action of medicine goes beyond health policies, tracking diseases within the population, and issues related to health and well-being.[2] Sociologist Peter Conrad[3] defines medicalization as the process by which non-medical problems become identified and treated as medical problems, usually in terms of illnesses or disorders. Conrad suggests that the concept should be treated in each specific case in its social context, considering the active role of individuals in the processes of medicalization. Even in his first works developed in the 1970s, Conrad already referred to the role of social actors outside the medical field. One important point in his work is that he explores phenomena that are not diseases, such as wrinkles, baldness and short stature, as medicalization objects. Conrad highlights improvement aspects linked to body or performance enhancement like chances of expanding the scope of medicalization within society. These could include strategies, techniques or formulas to make human beings more intelligent, stronger, faster, with a longer lifespan or with more intensified senses. From that perspective, "biomedical enhancement" is a particular type, which includes the use of drugs, surgeries and other medical interventions aimed at improving a person's body or mental performance. Unlike therapy interventions that seek to reestablish or maintain health, enhancement interventions would optimize human forms or functions, beyond the need to "reestablish the normal."[3] In this sense, uses linked to performance and enhancement comprise different goals, in which technologies traditionally used for therapeutic purposes now serve for non-therapy purposes.[4] The biomedical field expands into life quality and lifestyle.[5]

Other experts in this discussion focus on the increasing expansion of the use of drugs in contemporary Western societies[6] and show that the conceptualization of medicalization analyzed above would not be sufficient to describe the transformation of human conditions, capabilities and potentialities regarding opportunities for pharmacological interventions. Hence, it is necessary to think about a "pharmaceuticalization" of society, which denotes the increasing significance of pharmaceutical products in the processes of medicalization. Drugs, in terms of industrial pharmaceutical products, play a crucial role in biomedicine as an area of knowledge, in therapeutic relations and in the relationship of individuals with a healthy or ill body.[7]

Just like pharmaceuticalization was a concept originated from the concept of medicalization, Adele Clarke et al[8] contributed another derivation, which they name biomedicalization. According to these researchers, the great technoscientific changes in biomedicine – like the development of

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molecular biology, biotechnology, genomics and the new medical technologies –, which are undergoing a dynamic process of political, economic and socio-cultural expansion within the biomedical sector, deserve an updated concept of medicalization and an expansion of the phenomena involved. Clarke et al.[8] consider the creation of new biomedicalized subjectivities and identities to demonstrate how such technologies are increasingly present in everyday life and in health and illness experiences. The production of subjectivity modes, using truth discourses based on biomedical knowledge, reinforces the idea of making individuals accountable for their health and the adoption of identities according to objectives that may be manipulated, which relate to access to certain resources of biomedical technology.[8,9] Due to the interest in the use of drugs and other substances to boost memory, concentration and learning skills, among other effects, it is necessary to understand the modes of action of pharmacological technologies available for the application of the purposes being sought.

Finally, the issues related to medicalization, biomedicalization and pharmaceuticalization of society have been the focus of a systematic and growing interest among researchers in Latin America. Various research studies have addressed the extensive investigation agenda, as well as theoretical, methodological and epistemological challenges that were developed in the debates presented in Anglo-Saxon academic productions and the specificities of the region. Some authors have reviewed sociological studies conducted in Latin America, which are focused on the processes of medicalization,[10] placing special emphasis on epistemological aspects of the debate.[11] The analysis about epistemological obstacles concerning the concept of medicalization and its uses in the region has already been carried out,[12] as well as its links with biomedicalization and life policies, with regard to childhood and the aging process as extreme points in life upon which risks and optimization have an impact.[13] Furthermore, other theoretical, methodological reviews and analyses about pharmaceuticalization of society create a space for conversation and debate among Anglo-Saxon productions and the ones developed in the region, leading to convergences, limitations and analytical specificities.[14]

Cognitive enhancement and use of substances

The use of drugs to improve professional and academic performance has been widely spread, mainly over the Internet. In the past few years, we saw the popularization of this topic in the mass media.[15,16,17,18,19,20,21] In Brazil, scientific publications about the use of drugs for that purpose were focused on methylphenidate,[22,23,24,25,26,27] although references were made to the use of other substances.[28]

Methylphenidate, prescribed for the treatment of the attention deficit hyperactivity disorder (ADHD), is one of the main drugs used to this end, and one of the most popular in Brazil. It gained popularity due to its link with the ADHD diagnosis and due to broader inclusion diagnostic criteria for ADHD.[23] The impossibility of separating ADHD from methylphenidate and the broader diagnostic criteria for inclusion within that category, over the last decades, resulted in an increase in the use of this drug.[23,29] In 2012, the Brazilian Health Regulatory Agency (ANVISA) [*Agência Nacional de Vigilância Sanitária*] released a bulletin on the substantial increase in the use of methylphenidate across Brazil, on basis of the quantitative increase of medical prescriptions to obtain the drug.[30] Even without considering the illegal sale of the drug, ANVISA warned about the increase in the spreading of information about methylphenidate as a "drug of obedience" and as a tool to enhance performance, as much in childhood, adolescence and adulthood.[30] In a report published in 2019, the United Nations Office on Drugs and Crime (UNODC) stated that non-prescribed use of stimulants had the highest prevalence rates regarding the use of amphetamine-type stimulants in countries of South America and Central America.[31]

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Despite the dissemination of methylphenidate, a research study published in 2016 by the Federal University of São Paulo (UNIFESP) affirmed that the drug did not increase cognitive capacity in healthy individuals.[32] Such statement is in line with other studies that argue that there is no scientific evidence showing any clinical benefits resulting from the use of methylphenidate and other drugs for that purpose in healthy individuals.[33,34,35] Certain scientific investigations that documented the use of substances – mainly psychotropic pharmaceuticals – were able to confirm the observation of the phenomenon in secondary and university students, some of which estimated the prevalence rates of these uses within those populations.[4,33,34,35,36,37,38,39] The prevalence rates in the use of controlled stimulants, such as methylphenidate and amphetamine derivatives, specifically to enhance cognitive performance, on the part of university students, range from 1% to 11%, for instance, in seven research studies conducted in universities located in the USA, the United Kingdom, Ireland and Germany, with samples varying from 150 to 4,580 students.[35,40] Prevalence rates of 25.3% should be highlighted, in a sample of 1,483 individuals participating in the survey about the use of "pharmaceuticals for concentration" in young adults (18 to 29 years of age) from Portugal, including university students and workers, who already used or often use these pharmaceuticals.[4] Some studies analyzed specific populations, such as doctors and university professors.[41,42,43,44] One of those studies estimated that about 20% out of the German surgeons had used drugs to enhance their cognitive performance at least once in their lifetimes.[42] Despite the significant number of studies, scarce consistency is observed with respect to evidence regarding the efficacy of the use of pharmaceuticals to improve cognitive performance. Potential clinical benefits for healthy individuals are not sufficiently evidenced in current scientific literature.[33,34,35] Scientific studies have failed to deliver convincing findings to show, for instance, that "more efficacy has been observed in the workplace or at school," or "better grades have been obtained," which are the expected goals in the real world, outside a laboratory environment.[35]

Despite these controversies, this topic has aroused a great deal of public attention at a global level. The mass media may play a fundamental role when it comes to the dissemination of information, stimulating interest and reinforcing distorted evidence.[45] If we consider the important role of the Internet as "media technology," we have an open field for spreading information and building knowledge on drugs, where the contents created by users, on social networks and blogs, for instance, are likely to create new types of sociability and social interactions.[46] New opportunities constantly show up to spread and produce information, and the Internet, seen as a research field, represents a differential sphere for a sociological understanding of the behaviors of individuals and groups.[47] Understood as a "cultural artifact,"[48] it is configured like the introduction of technology into everyday life and a cultural element integrating online and offline spheres.[46] Furthermore, cultural dissemination of performance-related uses, mainly among young people, amount to a phenomenon whose borders exceed use practices, considering that the effect of visibility and public familiarity with these therapeutic means and the performance-related uses does not turn into an adhesion to the use of drugs by the mere action of social dissemination mechanisms. Such conversion comes from the combination of other social mechanisms, which reveal the significance of the individuals' own contexts in their daily lives.[4,49]

Various authors, like Conrad et al,[3] have described the Internet as an important tool for the expansion and transformation of the contemporary processes of medicalization at a global level. Furthermore, new forms of sociability have emerged from virtual interaction spaces that, to a large extent, enable anonymity of all participants and occasional exchange of information and knowledge, quite often about health issues that, in other traditional sociability contexts, may be avoided for bashfulness reasons. Nonetheless, such

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information can supplement or even rival the information obtained from friends and relatives in other sociability spheres.[50] A recent publication that discusses medicalization on a global scale has shown that the emergence of the Internet, as well as the various on-line dissemination channels, provides the processes of medicalization with vastness and permeability that will inevitably influence the local sphere.[51]

In addition to amphetamine-type stimulants, other substances became popular to increase cognitive performance. Some examples include pharmaceuticals used to treat neurological conditions – such as donepezil for Alzheimer's disease, and modafinil for narcolepsy – used by healthy people to enhance their cognitive performance.[6] A striking promise is that various substances, from psychotropic drugs to vitamin and dietary supplements, and compounds without registration with official control agencies, will change and improve mental processes, like alertness, concentration, memory and other aspects related to cognitive dimensions.[4,52] Assuming that we can enhance our cognition, companies selling all types of nutritional supplements are commercializing, over the Internet, products guaranteeing such results.[29] International sales of supplements for cognitive functions exceeded a yearly thousand million dollars in 2015 and their growth is still on the increase.[53]

Under the expression "smart drugs," various substances, like the so-called nootropic drugs, have spread over the Internet, as cognitive enhancers.[28] The concept of "nootropic pharmaceuticals" was suggested in the 1960s, after the word "psychotropic."[54] Corneliu E. Giurgea, then Chief of the Department of Neuropharmacology at the multinational pharmaceutical company Belgian Union Chimique Belgue (UCB), joined the Greek words *noos* – meaning "mind" or "intellect"– and *tropein* – meaning turning or swerving – to designate a type of psychoactive pharmaceutical that "would act upon your mind" based on the characteristics of a new molecule: piracetam.[54] Such molecule was presented as a prototype of that new class of psychotropic drugs.[54,55,56,57] Using the properties that were attributed to piracetam, Giurgea listed the main characteristics of a nootropic drug: (a) enhancement of learning and memory; (b) greater resistance to conditions impairing learning skills (such as electroconvulsive shocks and cerebral hypoxia); (c) protection of the brain against harmful chemical or physical agents; (d) increased efficacy of control mechanisms involved in the brain tone, at a cortical and subcortical level; (e) larger flow of information between the two brain hemispheres; (f) absence of pharmacological effects typical of other psychotropic drugs, as well as a low incidence of side effects and extremely low toxicity.[55,56,58]

That way, the use of piracetam was considered to treat memory loss, and mild and moderate dementia, both related to ageing.[55,56,58] As the effects of piracetam and of the structural analogues as of today synthesized have not yet been accepted and explained with clarity by contemporary pharmacology, that substance and the group of nootropic drugs are hardly found in pharmacology manuals. When they are included, they are described with little credibility as to their verified effects in humans.[55,59] Nonetheless, the term "nootropic" has been largely incorporated into the common sense during the last decade.[55]

As noted by sociologists Nick J. Fox and Katie J. Ward[60]: "The success of a pharmaceutical resides not only in its capability of producing an effect, but also in its interaction with cultural and social forces that define a condition as having good reasons for pharmacologic solutions." The very socio-cultural context in which those practices are developed describes how the phenomenon shows up under a competitive ethics, which is a characteristic of contemporary Western societies. Furthermore, the whole understanding on human embodiment based on physicalism[5,61] helps to understand our nervous system as neurochemical circuits, captured for the development of a psychopharmacology that is capable of facilitating the emergence of biochemical technologies aimed at optimizing cerebral functions.

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METHODOLOGY

This is an anthropological, documentary research study conducted in cyberspace/cyberculture fields,[62.63] which takes drugs or substances as a socio-technical object, coproduced on social networks where it circulates.[64,65,66] The study was based on public domain materials available for scientific popularization that are spread over the Internet, in order to perceive conceptions and practices on the use of drugs and other substances for cognitive enhancement.[28] Empiric material includes, in the first place, the contents disseminated on the Brazilian blog called *Cérebro Turbinado*, created in 2015 by a Medicine student from a state-run university, to address the issue in Brazil, which includes the ebook "*Turbine seu cérebro – o guia completo de nootrópicos*" [Enhance your brain: a complete guide about nootropic drugs], written and sold by the author. From 2015 to 2017, a period in which it was active and for public access, the blog had 63 posts, where its editor shared information about drugs and substances, apart from narrating personal experiences about their use, with a description of the effects suffered by him. Starting in 2018, the author gave a new direction to his blog.[67] The object of this research was addressed through the observation of the blog. The researcher's access to the users of these substances, together with their opinions, narratives and practices about their experiences, was indirectly examined, through the website. At no time did the researcher have any participation or interaction on the blog; that is why there was no contact with the editor or his readers. The adopted perspective helped to perceive, through remote observation, social dynamics in cyberspace concerning the dissemination of nootropic drugs.

Although there are other websites that discuss the issue of cognitive enhancement, by carrying out a search on Google, the blog *Cérebro Turbinado* was chosen because it offered updated posts and interaction spaces through comments and discussions among readers/prospective drug users and the editor. A systematic follow-up of the posts was conducted and digital files were collected for individual analysis. The narratives of the multiple experiences about the use of nootropic drugs, made public by the editor of the blog and by its readers, were used to analyze the relational character of this collective way of learning about the use of new substances to enhance cognitive performance, as a result of virtual exchanges.

Documentary research[68,69] favors the observation of individuals and groups behaviors as to concepts, knowledge, thoughts, practices, among others. At present, Internet constitutes an open space where you can gain access to documents to be studied and analyzed. The endless information and active attitude of individuals are recent actions in Brazil and all over the world.[47,70] There is an increasing number of people who surf the Internet to obtain information about their health status. Those transformations reconfigured socio-cultural, political and economic practices, they had an impact and continue modifying various fields in society, including health and science. Apart from being one of the most investigated topics, health is one of the areas in which there is a growing and diversified amount of information readily available on the Internet.[70,71,72] The scope and diversity of contents being searched on the Internet may be directly proportional to the scope and diversity of experiences that each person has regarding technical, scientific knowledge in connection with medicine and the management capability that they wish to have concerning their health status.[73]

For analysis purposes, the material collected was read in a systematic way, which included 63 posts and all the comments generated by each post. The material was classified in themed categories, according to the following criteria: presentation and dissemination of nootropic drugs as safe drugs to boost brain activity; initial use of nootropic drugs and exchanged experiences; and healthy habits. In this way, it was possible not only to elucidate the emergence of the nootropic drugs as a category, but also to perceive social uses of these substances by their users that, in general, are

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young. The contents of the posts on the blog were categorized according to the theme discussed in each post (Table 1).

Although all the posts served as empiric material for this investigation, special attention was paid to the more regularly discussed topics on the blog: nootropic drugs. The decision not to analyze each post separately was useful to recover the most relevant data for the proposal put forward, taking into account the objectives sought here.

Table 1. Categorization of the posts on the blog.

POSTS	2015	2016	2017	TOTAL
Introduction to nootropic drugs	1	1	1	3
Blog advertising	2	3	2	7
Neurotransmitters	-	1	1	2
Drugs	11	5	5	21
Dietary supplements	3	4	4	11
Unregistered substances in Brazil	6	4	2	12
Combination of nootropic drugs	2	1	-	3
Nutrition/healthy habits	1	1	2	4

Source: Own elaboration based on material from the blog *Cérebro Turbinado*.

RESULTS AND DISCUSSION

The blog *Cérebro Turbinado* as a medium for spreading nootropic drugs

The blog *Cérebro Turbinado* was examined in terms of the dissemination of information on the use of drugs to enhance cognitive performance and as to the ways of socialization of such substances by reading narratives and comments written by the users and the interaction among the blog readers, who wanted to complete their knowledge. In words of the author of the blog, the inspiration for his initiative was "the scarce scientific information available in Portuguese on nootropic drugs, 'smart drugs' and mechanisms to enhance brain performance." The author's goal was to "facilitate access to information about nootropic drugs and to broaden the debate on such substances."

Nootropic substances are hardly found in pharmacology manuals and, when they do appear, it is specifically explained that there is a need for a more convincing verification of the effects in human beings.[55,59] Therefore, in the reconstruction of biomedical knowledge, it is important to take into account the role of channels for scientific popularization where information is disseminated. And, in this sense, the blog *Cérebro Turbinado* represents a medium for spreading such knowledge and for the socialization of those substances among interested people in the general public:

> *Amid increasingly competitive academic environments – with entrance examinations and contests – apart from exhausting work periods, the use of nootropic drugs has become popular. Nonetheless, there isn't enough information in Portuguese with regard to this matter on the Internet. I have vast experience with a lot of nootropic substances (the most affordable in Brazil, at least). That's why I decided to share what I felt with each one of them* [...] (Mateus Pereira, July 24, 2015).

The editor of the blog writes about safety and efficacy of those pharmacologic interventions, highlighting the strengths of nootropic drugs against amphetamine-type stimulants, for the sake of telling them apart. From that conception, the author presents himself, at the same time, as a user (positioning himself at the same level as the readers of his blog), and as a specialist (an expert),[70.72] given that he uses the tests of substances in himself and from narratives told by third parties that also tried them, in order to identify and translate the categorization on chemical modulation with the aim of improving cognitive performance.

> Nootropic drugs are, then, drugs (and I include here from synthetic drugs to plant extracts) that have affinity with the brain. Except that more than that: for a drug to be considered nootropic, *it should meet*

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some criteria. According to Dr. Giurgea, a nootropic drug should improve memory and learning skills, but without having significant side effects or causing dependence. That means that smart drugs such as Ritalin [methylphenidate], Vyvanse [lisdexanfetamine] *and Provigile* [modafinil] *are excluded from the list of nootropic drugs* (M. Pereira, July 24, 2015)

After using piracetam for the very first time, [...] *I was in class and I recall that, in a few minutes, after taking it, I felt a state of mental clarity that I had never experienced before*. [...] *For mental clarity I mean: an interesting increase in consciousness and in the perception of the environment itself where I was. No, it was not a placebo effect, I promise. And I say this because I noticed something incredible: colors were more lively, vibrating, and pure*. (M. Pereira, July 24, 2015)

Sharing experiences on substances

The viability offered by the Internet for the construction of knowledge on the use of those substances reifies the power relations between the actors that articulate such knowledge.[74] Readers see the author of the blog as an influencing authority in the topic, capable of directing them for the reconstruction of biomedical knowledge so as to obtain the best risk-effectiveness relationship, if this could be a name for pondering efficacy and safety to obtain the best results.

In healthy people, piracetam has a very high "optimal dosage" (the best dose-effect relationship). More than one scientific study concluded that, for an individual who seeks to enhance cognitive functions, the best dose is 4,800 milligrams per day [...]. *This can be even higher for therapeutic uses, mainly when treating cognitive dysfunctions*. (M. Pereira, July 24, 2015)

...I want to put on record my admiration for your incredible work. You are actually rendering a great service which is useful to the public in general who look for life quality enhancement. In the future, I would like to repay the enormous help I got from the contributions of your work. (Anonymous Comment, November 16, 2015)

...congratulations on the best blog on nootropic drugs in Brazil. Really, your posts help a great deal of people. (Anonymous Comment, March 15, 2017)

Great job, dude. I carried out an endless search of nootropic drugs, and yours was the best work that I could find. Let's go, then, for nootropil [piracetam]. *Let's see what I feel. Thanks and best regards*. (Albert, July 28, 2017)

Sharing practices and narratives claiming to be true based on biomedical knowledge is aimed at the production of forms of subjectivity that defy the medical and legal instances of hegemonic control, which represent the current rules in force. As to the complexity involved in the use of substances for which certain psychopharmacological properties are claimed, the knowledge shared in the posted information reflect a re-definition of those uses.

Nootropic drugs and smart drugs have therapeutic applications and clinical official indications, acknowledged by health care agencies. However, in healthy people, nootropic drugs are increasingly used only to improve performance in individuals who already have a healthy and normal cognitive performance. [...] (M. Pereira, June 5, 2016)

... Today I started to take 800 mg nootropil (piracetam)... I took it once, what do you think?... Do I have to take it more times? [...] I am studying for an academic competition and my levels of assimilation and concentration are terrible. (Anonymous Comment, October 1, 2015)

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> I am about to use Piracetam, 3 400-mg tablets three times a day... I feel a stronger interest in studying and a greater understanding in terms of logical reasoning. (Gustavo, October 6, 2016)

Among the doubts expressed by the readers on posology adjustments and pondering the real effects of those substances, "symbolic efficacy"[75] should be specially considered, which is the process starting from the blind spot represented by the placebo effect – and what represents in the drug general efficacy – together with the chemical effect of the substance.[76] Furthermore, in the dynamic relation typical of the contexts in which they are inserted, the construction of efficacy of those drugs is also based on the constant reinterpretation and socialization by the individuals using them, beyond the molecules that form part of such compounds.[77,78]

Socialization of uses and breakup of borders between treatment/enhancement and legal/illegal

The types of socialization of non-therapeutic use of pharmaceuticals prescribed for the treatment of certain conditions related to the central nervous system are characterized by the off-label use, that is to say, outside the conditions for which drugs were intended and registered, without disregarding the fact that the border becomes blurred when deciding what can be considered treatment or enhancement, while the limits become more flexible when telling apart what is normal or pathological, health or disease. It has become increasingly difficult to determine what is "normal," "deficient," what is "better" and what should be "corrected."[29,78,79] Hence, the mutation of those borders between "normal" and "pathological," as well as "normal" and "deficient," and also the very notion of health as a medicalized process result from biomedicalization, where the technological component plays a central role,[8,13] in the same way that pharmaceuticalization impacts on everyday life.[14]

The following narratives show certain flexibility in those borders, since individuals seem to look for the medicalization of a health status that should justify the use of pharmacological solutions:

> ...by accident I came across your blog and everything that I read was quite interesting [...]. I find it quite difficult to read and attend long lectures; I don't feel much interest and pay little attention even when the theme is important to me. (Eduardo, March 7, 2017)

> Look, I have some doubts as to the efficacy of Piracetam; I would be grateful if you could give me some advice. I would like to know what time is considered to be the peak (maximum effect) of that drug [...]. I have been studying for quite a long time and I am having a lot of difficulty in memorizing a topic and focusing on my studies, I find it hard to concentrate. (Thiago, June 5, 2016)

With respect to such substances and their uses, various ethical, legal, and social paradigms have come into question.[80] A number of reports and papers addressed those developments, discussing the implications of the use of drugs to enhance cognitive performance and the extent to which they should be regulated with rules.[6] One of those issues deals with social equality. Unequal access to such drugs would be another element for increasing the gap between those who can obtain them and the ones that would have some restrictions to get them. To some authors, even certain modest types of human improvement, sought on a large scale, could have serious consequences.[46,81] Following this view, the notion of device contributed by Foucault[82] helps understand the knowledge produced about those practices, their respective actors and the generated power relations. When considering the ambiguous relationships that contemporary societies maintain with drugs – in the broadest sense of the term –, marked by restrictions and encouragement to use them, what we get is a

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type of device of drugs.[83] Contemporary expansion of the development of pharmaceuticals facilitated the moral division between legal drugs and uses as opposed to illegal and/or criminalized drugs uses.[83] Not-therapeutic use of drugs approved for the treatment of certain clinical conditions/diagnostic categories is mistaken for the medicinal use of substances perceived to be illegal – due to the illegal methods to obtain amphetamine-type stimulating psychotropic drugs or due to their way of socialization – and the device of drugs crystallizes the tension existing between drugs for legal and illegal uses. The same psychoactive substances can, therefore, be available in varied contexts of use, albeit the existing moral division.

> ...The fact is that modafinil, according to users, guarantees an extraordinary level of concentration, a state of "super-concentration," which makes it possible to work or study, without tiredness, for several consecutive hours. In lands in love with productivity, performance results and being ranked first in everything: modafinil is gold. (M. Pereira, July 24, 2015)

> ...It was like a miracle. I was sleeping only four hours. I got up at six in the morning, without feeling sleepy and determined to do everything. It was excited all day long, with no mental fatigue. With Provigile (modafinil), I felt like interacting with people. It increased my self-confidence. Provigile helps me to keep concentration during lessons [...]. I get good grades even without studying too much. (Messias, July 24, 2015)

Despite the recent discussion in connection with pharmacological cognitive enhancement, the use of substances to improve academic and professional performance is not novelty at all. At least in the late 1950s, the use of amphetamine-type stimulants as cognitive enhancers was socially acceptable. Brazilian newspapers highlighted the use of Pervitin, a drug that had methamphetamine as its active ingredient.[84] Before 1963, a prescription was not required to buy them in pharmacies, and at that time the substance became controlled and at a later time prohibited in Brazil. Although methamphetamine is still registered as a drug in the USA, and is sold for the treatment of ADHD and to lose weight, the substance was more related to illegal purposes, more popularly known as *crystal meth*.[85] This is an example of how the mandate of legality and social disapproval of substances, like psychotropic stimulants, can vary over time, although the purpose of use as a "cognitive enhancer" has stuck out over decades.

Understanding psychopharmacology and new forms of subjectivity

The notion of device[82] is also useful to address how substances catalyze new forms of sociability and subjectivity, both for non-medical or illegal uses (as is the case of pharmaceuticals to improve cognitive performance), and for treating clinical conditions with psychotropic drugs. The construction of knowledge on the use of substances – even among the lay public – and the dynamic existing in the transmission of such knowledge and practices "tend to spread like an epidemic system or device,"[83] in which sharing experiences is fundamental for initial users. In this case, it is possible to draw some similarities between the use of drugs to enhance cognitive performance and the use of illegal drugs. In both situations, intersubjectivity sets out the forms of use: "Experience originates from examples taken from others; [...] improvisation, adaptations and variations while experimenting are part of the operating method itself."[83] The dissemination systems for therapeutic or non-medical uses are not exclusive.[83] Intersubjective practices have consolidated a knowledge basis which is aimed at users obtaining the expected effects.[86] The possibility of an open channel to share narratives and practices in relation to certain substances is born out of the need for a space to be occupied by those subjects interested in getting

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information through digital media, such as the blog studied here.

When talking about nootropics, whose etymological root refers an action of the intellect, the metaphoric use of language, common artifice in scientific popularization, to represent the form of action of those pharmaceuticals on the brain cannot be set aside. Starting in the 1990s, known as the "decade of the brain," the metaphors used to popularize the findings by neurosciences show a trend toward overestimation, ignoring the limitations of scientific investigation.[87] The images and expressions used – in materials of scientific popularization, such as the blog analyzed here – to describe the brain and the way in which certain drugs work on the brain, refer to an objectivity that, in a certain way, simplifies the whole complexity involved in understanding the functioning of such an organ.[5]

Figure 1 and Figure 2 were included in a post to explain the mechanism of action of modafinil, controlled by the Brazilian Health Regulatory Agency (ANVISA) as a psychotropic drug. Figure 1 is preceded by the question: "The Drug of Intelligence?" In the caption below the image, M. Pereira informs that "Studies confirm that modafinil improves memory and concentration." The image represents the very "memory and concentration capsules." Figure 2 is preceded by the phrase: "How modafinil remodels your brain."

> Modafinil increases synaptic dopamine levels. And it is there where we find both its magic and its dangers: dopamine is associated with motivation, and its increase turns tedious activities into amusing. However, when used in excess in certain regions of the brain it is related to a vice. (M. Pereira, July 24, 2015)

The objectivity based on neurochemistry that is used to highlight the positive characteristic of modafinil on motivation is taken as an opportunity to emphasize the difference between controlled drugs and nootropic drugs, noting its likelihood of causing physical or psychic dependence, a characteristic associated with pharmaceuticals with "black label"

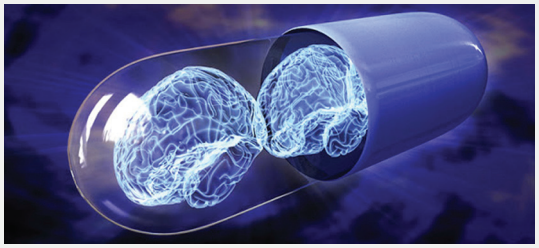

Figure 1. Representation associated with modafinil.

Source: Blog *Cérebro Turbinado.*

Figure 2. Representation of the effects of modafinil on motivation.

Source: Blog *Cérebro Turbinado*.

warnings. In that reification, an apprehension of knowledge and theories can be observed that refer to our brains and bodies, resulting from facts received and perceived as scientific and medical objects.[87,88] Anthropologist Joseph Dumit[88] calls "objective selves" to the relationship between what we are to ourselves and to society based on what becomes an object for medicine and for scientific popularization. The socio-cultural impact of neurosciences emphasizes individual choices and conquests that somebody can have when deciding to act like a person taking actions with freedom through a chemical modulation

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of neurotransmitters.[89] Biomedical knowledge, through scientific articles, medical consultation, drug leaflets, for instance, constitutes a central reference to put any considerations in order that may be necessary to manage off-label purposes.

> Many nootropic drugs will draw your brain from the status of "biochemical and physiological normal conditions." This occurs because many cholinergic nootropic drugs increase the use of acetylcholine. (M. Pereira, August 28, 2015)

> Piracetam increases the liberation of acetylcholine in synaptic clefts, especially in the hippocampus. (M. Pereira, August 29, 2015)

With respect to acetylcholine, presented as the "neurotransmitter in memory and learning," some remarks should be made. To the editor of the blog, some benefits of piracetam and its two unregistered derivatives in Brazil – phenylpiracetam and oxiracetam –would be explained due to the effect of increasing the activity of that neurotransmitter in the brain. In the same sense, by adopting a similar reasoning, the deficiency in acetylcholine neurotransmission is related, in certain brain regions, to neurodegenerative diseases, such as progressive dementia in Alzheimer's disease. In this way, it is not difficult to understand that users link these substances that promise an increase in brain levels of acetylcholine with "cognitive enhancers." This observation implies a person's representation, which becomes evident in contemporary Western cultures, where thinking processes are conceived to be a direct consequence of neuronal activity.[5] Among the drugs and substances that were more frequently discussed on the blog, the acetylcholine neurotransmitter is presented as relevant to explain the mechanism of action of most of these compounds and to justify the effects on cognitive performance enhancement.

Similarly, the relevance of the dopamine neurotransmitter is taken into consideration because of the motivation effects of modafinil and its derivative, fluoromodafinil, which is not registered in Brazil:

> Some studies show that modafinil leads to a greater liberation of dopamine in certain regions of the brain [...]. The great action, however, has to do with the inhibition of dopamine reuptake. [...] With the fluoromodafinil, more dopamine would bathe the postsynaptic nerve cell, stimulating said nerve cell with modafinil. At the same time, "cognitive power" of the molecule could be increased [...] (fluoromodafinil increases concentration, motivation and self-control); it could also increase the chances of dependence. (M. Pereira, December 15, 2015)

It is interesting to note the risk caused by the increase in dopamine, which could potentially lead to drug dependence. Similarly, an increase in the levels of dopamine, in certain brain regions, is the reason for gratifying and rewarding properties of human behavior, and has been associated with the abuse of certain substances, such as cocaine and amphetamines.[85]

The "objective selves," described by Dumit,[88] are represented here by the central role of neurochemistry in the manipulation of body states that produce new subjectivities. What Nikolas Rose[29] named the "neurochemical self" encounters the notion of the "brain subject," to explain the possibility of "remodeling" the brain to "remodel" oneself by resorting to pharmacological mechanisms.[89] The substances associated with those objectives, as elements alien to the body, carry a chemical modulation and all issues concerning risks and the efficacy underlying their use, as well as ethical issues related to the dissemination of those practices.

Over the last decades, there was a greater dissemination of knowledge on the neuromolecular vision of the brain on the part of neurosciences and psychopharmacology, which influenced the way in which individuals reconstruct biomedical knowledge and the perception of their own bodies. The way in which those individuals understand

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the interaction of certain substances with their bodies favors the production of new forms of subjectivity. Spreading such knowledge and its popularization on the Internet fostered the presence of "specialists," in such areas as psychopharmacology, who share their knowledge in a free way on the Web and defy hegemonic ways of controlling such knowledge and practices, despite the widely spread knowledge of common sense.

The demand for the use of substances to enhance cognitive performance tends to spread more like a potential tool for "human capital" subjectivation, under competitive ethics which characterize contemporary Western societies, in an underlying pharmaceuticalization process of society, in which the pressure to be more productive is quite often considered to be a means to attain a successful life. We do not know yet how that race to "be better" will affect social connections among individuals compelled to live in pretty unequal and hierarchical conditions, in terms of marks regarding class, gender, race/ethnic groups, regions and age.

CONCLUSIONS

In the practices related to pharmacological cognitive enhancement, various substances have been identified by those that seek to increase the performance of certain features of cognitive functioning such as concentration, attention, memory and alertness. In Brazil, the most disseminated substances to this end are amphetamine derivatives. Methylphenidate, as such, is the leading substance addressed in several studies discussing the use of drugs for that purpose. In addition, other pharmaceuticals of the same class have been historically associated with stimulants. In Brazil, such compounds are subject to a specific control, and that is why they are known as "controlled drugs" or drugs with "black label" warnings. This group of drugs is also linked with physical and/or psychic dependence, apart from the risks related to their continuous use, such as cardiovascular diseases. In this context, a new group of substances started to be spread over the Internet. The recent expansion of nootropic drugs is supported by the original definition in the 1970s, a decade when these compounds were suggested as a new type of psychotropic drugs. In order to popularize nootropic drugs as safe and affordable alternatives, the emphasis was placed on the absence of pharmacological effects, which are typical of the classical psychotropic drugs, as well as the low incidence of side effects, against "black label" drugs used as smart drugs. Although the current way of disseminating nootropic drugs seeks to demonstrate issues linked with safety when using those substances, and despite the lack of evidence on the efficacy of those pharmacological interventions, the category has expanded beyond strict pharmacological characteristics of certain compounds, to represent forms of use related to cognitive enhancement and substances that may be used for that purpose. Knowing the specificities inherent in such forms of use, as well as the debate in the field of collective health, can help us to face the challenges posed by an increasingly disseminated use of those substances, in societies in which getting a job in the labor market becomes extremely competitive and exclusive.

When disseminating said knowledge and practices, the observed evidence indicates analogies that should be discussed in future studies, which should go beyond the moral division between legal and illegal substances. Furthermore, the rationalities that direct the management of those uses still have a lot more to explain on the phenomena underlying the process of pharmaceuticalization of society. Conducting a debate that involves the use the drugs from a broader perspective, which includes medication, will depend on the views contributed by the users, while considering the understanding of those substances and the senses attributed to them in socialization processes.

Although ethical arguments on these practices have been resumed in public debates, the demand for those uses should not encounter obstacles to their dissemination, apart from the morality itself brought about

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by such arguments. In this sense, it is necessary to keep on observing the senses attributed to such practices in contexts of great social inequalities and high competitiveness for formal work employability, as is the case of a lot of countries in Latin America.

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