SEVEN
publicações acadêmicas

COGNITIVE DOPING IN MEDICAL STUDENTS: IMPACTS ON CONCENTRATION AND ACADEMIC PERFORMANCE

DOPING COGNITIVO EM ESTUDANTES DE MEDICINA: IMPACTOS NA CONCENTRAÇÃO E DESEMPENHO ACADÊMICO

DOPAJE COGNITIVO EN ESTUDIANTES DE MEDICINA: IMPACTOS EN LA CONCENTRACIÓN Y EL RENDIMIENTO ACADÉMICO

https://doi.org/10.56238/sevened2025.037-015

Maria Júlia D. Duarte[1], Mayara D. T. Silva[2], Leandro Vairo[3]

ABSTRACT

Introduction: The use of psychoactive stimulants by medical students has become a growing concern due to increasing academic pressures and the pursuit of enhanced cognitive performance. While studies show varying prevalence rates and potential health risks, there remains a lack of comprehensive analyses of their actual impact.

Aim: This study aimed to evaluate the effects of cognitive doping on academic performance and mental health among medical students.

Methods: We conducted an integrative review of 16 scientific articles (2015-2025) examining usage patterns, motivations, and consequences of stimulant consumption among medical students across different countries.

Results: Prevalence rates ranged from 2.9% (non-prescribed methylphenidate) to 57.4% (including caffeine and energy drinks). The main motivations for use were improved concentration, reduced need for sleep, and academic pressure. However, the analysis revealed no consistent academic improvement, with users actually showing lower average grades (7.92) compared to non-users (8.80). Significant adverse effects included tachycardia, insomnia, worsening of anxiety/depression symptoms, and frequent concurrent use with alcohol.

Conclusion: The findings indicate that psychoactive stimulant use does not reliably enhance academic performance while posing substantial health risks. The study highlights the urgent need for alternative approaches including sleep management programs, psychological support services, and curriculum reforms to reduce dependence on these substances among medical students.

Keywords: Central Nervous System Stimulants. Methylphenidate. Substance-Related Disorders.

[1] Medical Student. Centro Universitário Serra dos Órgãos (UNIFESO).
E-mail: mariajuliadiasduarte@gmail.com Lattes: http://lattes.cnpq.br/4110783803606405
[2] Professor of Medicine. Centro Universitário Serra dos Órgãos (UNIFESO).
E-mail: mayara_dts@hotmail.com http://lattes.cnpq.br/3977718838999079
[3] Professor of Medicine. Centro Universitário Serra dos Órgãos (UNIFESO).
E-mail: leandrovairo@unifeso.edu.br http://lattes.cnpq.br/5729902624270773

RESUMO

Introdução: O uso de psicoestimulantes por estudantes de medicina tem ganhado atenção devido às pressões acadêmicas e à busca por melhor desempenho cognitivo. Estudos indicam prevalências variáveis e potenciais riscos à saúde, mas faltam sínteses abrangentes sobre seu impacto real.

Objetivo: Avaliar o impacto do doping cognitivo no desempenho acadêmico e na saúde mental dos estudantes de medicina.

Método: Revisão integrativa utilizando 16 artigos científicos (2015–2025), selecionados por abordarem padrões de uso, motivações e consequências do consumo de psicoestimulantes em estudantes de medicina de diversos países.

Resultados: A prevalência variou de 2,9% (metilfenidato não prescrito) a 57,4% (incluindo cafeína e energéticos). As principais motivações para o uso foram: melhora da concentração, redução do sono e pressão acadêmica. No entanto, nem sempre há melhora objetiva, pois se constatou médias de notas menores entre usuários: 7,92 vs. 8,80 em não usuários. Também se verificou a presença de efeitos adversos (taquicardia, insônia), agravamento de ansiedade/depressão e uso combinado com álcool.

Conclusão: O uso de psicoestimulantes não melhora o desempenho acadêmico de forma consistente, mas apresenta riscos significativos. Estratégias como gestão do sono, suporte psicológico e revisão curricular são alternativas urgentes para reduzir a dependência dessas substâncias.

Palavras-chave: Estimulantes do Sistema Nervoso Central. Metilfenidato. Transtornos Relacionados ao Uso de Substâncias.

RESUMEN

Introducción: El uso de psicoestimulantes por parte de estudiantes de medicina ha cobrado relevancia debido a la presión académica y la búsqueda de un mejor rendimiento cognitivo. Los estudios indican prevalencias variables y riesgos potenciales para la salud, pero faltan síntesis exhaustivas sobre su impacto real.

Objetivo: Evaluar el impacto del dopaje cognitivo en el rendimiento académico y la salud mental de los estudiantes de medicina.

Método: Revisión integrativa de 16 artículos científicos (2015-2025), seleccionados por abordar los patrones de uso, las motivaciones y las consecuencias del consumo de psicoestimulantes entre estudiantes de medicina de diversos países.

Resultados: La prevalencia osciló entre el 2,9 % (metilfenidato sin receta) y el 57,4 % (incluyendo cafeína y bebidas energéticas). Las principales motivaciones para su uso fueron: mayor concentración, reducción del sueño y presión académica. Sin embargo, no siempre se observa una mejora objetiva, ya que se encontraron calificaciones promedio más bajas entre los usuarios: 7,92 frente a 8,80 en los no usuarios. También se observó la presencia de efectos adversos (taquicardia, insomnio), empeoramiento de la ansiedad/depresión y consumo concomitante con alcohol.

Conclusión: El uso de psicoestimulantes no mejora de forma consistente el rendimiento académico, sino que presenta riesgos significativos. Estrategias como la gestión del sueño, el apoyo psicológico y la revisión del currículo son alternativas urgentes para reducir la dependencia de estas sustancias.

Palabras clave: Estimulantes del Sistema Nervioso Central. Metilfenidato. Trastornos por Consumo de Sustancias.

1 INTRODUCTION

The transition of young people to the university environment represents a remarkable period of significant changes in their environment and behaviors, becoming a phase highly prone to the use of psychoactive substances. Research indicates that young people who start attending university demonstrate a remarkable incidence of consumption of these substances, as evidenced by several studies.[1]

The pursuit of high performance and increased competition create an environment conducive to what is called *cognitive doping*, which refers to the use of substances that improve cognitive abilities, such as concentration and memory. Among medical students, this demand for stimulants is often motivated by the need to improve mental performance, compensate for sleep deprivation, and increase concentration. The pharmacological classes most used for this practice are psychostimulants. However, it is important to note that there are effective non-pharmacological strategies, such as time management, regular physical exercise, a balanced diet, and ensuring adequate sleep, which can help students improve their academic performance in a healthy and sustainable way.[2-4 Edit]

Additionally, developing self-control skills, relaxation techniques, and participating in extracurricular activities are considered important for promoting healthy and effective learning. These strategies aim to provide viable and effective alternatives to the use of stimulant substances, contributing to promote a sustainable academic culture and collaborating to reduce the consumption of psychostimulants among students who do not have a diagnosis, such as Attention Deficit Hyperactivity Disorder (ADHD).[4.5]

ADHD is a developmental condition that affects self-control, manifesting itself in difficulties in maintaining attention, controlling impulses, and regulating the level of physical and mental activity. The diagnosis of ADHD is essentially clinical, using the symptomatological criteria outlined in the Diagnostic and Statistical Manual of Mental Disorders DSM-5, of the *American Psychiatric Association*, and is classified by a combination of symptoms of inattention and hyperactivity/impulsivity.[3.5]

This classification allows us to identify three subtypes of the disorder: predominantly inattentive, predominantly hyperactive, or mixed. In addition, the diagnosis considers the impact of these symptoms on the school environment and on the individual's interpersonal relationships.[5]

The treatment of ADHD is done with psychostimulants, such as methylphenidate (Ritalin) and lisdexamfetamine (Venvanse), which help improve concentration, focus and

impulse control. Psychoactive substances aim to replicate the effects of natural or endogenous neurotransmitters in the brain. Commercially marketed stimulant medications usually directly (or indirectly) influence dopamine, a neurotransmitter that is related to the feeling of reward, motivation, attention, and arousal, resulting in stimulation of the central nervous system (CNS).[3.4]

Finally, it should be noted that in the short term, these medications can cause insomnia, emotional uncontrollability, increased blood pressure, headaches, changes in appetite, rapid heartbeat, and increased stress, which can have a negative impact on quality of life. In the long term, the three main side effects include the development of dependence, cardiovascular problems and a potential reduction in stature.[3.5]

In view of the above, this study is justified by the growing relevance of *cognitive doping* among medical students, a practice that can compromise both the academic integrity and the physical and mental health of these future professionals. The pressure for high performance, added to the scarcity of evidence on the real impacts of these substances, demands investigations that guide educational and health policies. By evaluating the effects on academic performance and concentration, in addition to exploring the reasons for their use, this research provides subsidies for ethical debates, prevention strategies, and student support, benefiting not only the scientific community, but also society, which depends on trained and mentally healthy physicians.

2 GOALS

Primary objective:

- To assess the impact of *cognitive doping* on academic performance and mental health of medical students.

Secondary objectives:

- To analyze the reasons why students resort to the use of psychostimulants;
- Describe the effects perceived by students on concentration after the consumption of psychostimulants.

3 METHODS

This is an integrative qualitative literature review on the use of psychostimulants by medical students, exploring the impacts on concentration and academic performance. To this end, the electronic databases SciELO, Virtual Health Library (VHL) and PubMed/Medline

were used for the search. The descriptors used were: "cognitive doping"; "psychostimulant"; "medical students". The research used the association of these descriptors with the Boolean operator AND.

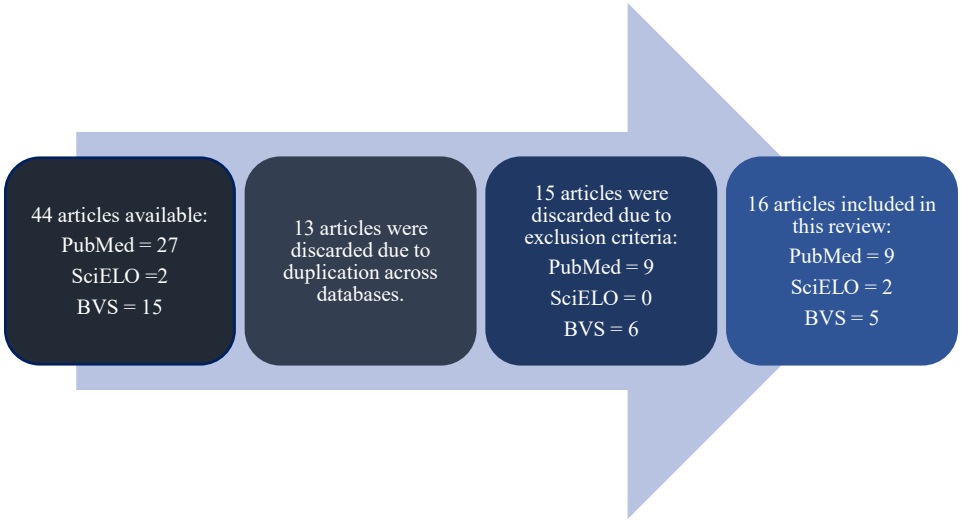
The following inclusion criteria were used: publication between the years 2015-2025, Portuguese, Spanish and English, use of psychostimulants among medical students not diagnosed with ADHD. Articles that dealt with the use of psychostimulants by populations other than medical students or because they were not within the context addressed, escaping the objective of the theme, were excluded. For this pre-selection, the titles and abstracts of the articles made available by the databases were read to check the inclusion and exclusion criteria. The selected articles were submitted to content analysis and their data of interest were organized in a table of results for further discussion.

4 RESULTS AND DISCUSSION

A total of 27 articles were found in PubMed, of which 9 were selected; 2 articles in SciELO and both were selected; and 15 in the VHL, with 5 more being selected, totaling 16 articles (Figure 1).

Figure 1

Steps taken to select the articles



Source: Prepared by the authors.

Table 1 below summarizes the information of the 16 articles selected to compose this integrative review, according to their year of publication, authors, study method, objective, and results found.

Table 1

List of selected articles addressing the use of psychostimulants by medical students

Authors and Year	Goals	Sample	Findings
Nasário; Matos, 2022 [3]	To investigate the relationship between the non-prescribed use of methylphenidate and the academic performance of medical students at a university in the south of Santa Catarina.	243 medical students	The study revealed that 2.9% of the students used methylphenidate without a prescription, while 17.3% reported using it at some point in their lives. The main motivations were to improve cognitive performance (10%) and to stay awake longer (4.1%), with obtaining the medication from friends (56.5%) being the most common way. The use of psychostimulants was not associated with better academic performance: non-users had an average of 8.80, against 7.92 (current users) and 8.01 (former users).
Rodrigues et al., 2021 [4]	OBJECTIVE: To investigate the knowledge, motivations, perceptions and profile of non-prescribed use of methylphenidate by health students at a Federal University of Minas Gerais.	696 students (222 of them from Medicine)	Of the total number of participants, 96.7% knew about the drug and 4.3% reported non-prescribed use. The main reason was cognitive improvement, with the university being the most common place to start using it. Most users noticed an increase in concentration, but 50% reported unwanted effects. Non-prescribed use was more frequent in men, over 21 years of age, medical students and those involved in extracurricular activities, while nursing students were less likely to use.
Santana et al., 2020 [5]	To analyze the use of psychoactive substances by undergraduate students and pre-university students in Montes Claros-MG.	348 students (68 of them in Medicine)	Of the students interviewed, 53.7% used some psychostimulant, with a higher prevalence in the pre-university entrance exam group (75%) compared to higher education (50%). The students of the pre-university entrance exam consumed mainly caffeine (63.5%) and guarana powder (11.5%), while the university students reported the use of ecstasy (1.7%) and methylphenidate (1.9%). Among university students, the main effects perceived were reduced sleep (64.9%), improved concentration (48%), well-being (45.3%), reasoning (38.5%),

			reduced fatigue (33.1%), memory (23.6%) and stress (23%). In the pre-university entrance exam, only improvement in reasoning (43.6%) and stress reduction (23%) were significantly relevant.
Babicki, 2022 [6]	To assess the impact of the pandemic on the use of alcohol, psychostimulants, cannabinoids, and sedatives among students in European countries.	17,594 students (4,089 of them in Medicine)	Among the students, 89.6% had consumed alcohol, 14.1% cannabinoids, 3.6% psychostimulants, and 12.5% sedatives in the last 3 months. Women used less alcohol, psychostimulants, and cannabinoids, but more sedatives than men. During COVID-19, the consumption of alcohol and psychostimulants decreased, while sedatives increased. Regional differences showed higher use of alcohol/sedatives in Eastern Europe versus psychostimulants and cannabinoids in Southern Europe, reflecting the impact of social restrictions on consumption patterns.
Fond et al., 2016 [7]	To estimate the prevalence of psychostimulant use in the French medical community and its reasons.	1,718 medical students and physicians	Of the interviewees, 33% reported the use of psychostimulants at some point in their lives, 29.7% of which were over-the-counter, 6.7% prescribed and 5.2% illicit. Over-the-counter prescriptions were used primarily to improve academic performance and wakefulness during exams, and their early use predicted later consumption of prescriptions. Among those prescribed, corticosteroids (4.5%) led the way, followed by methylphenidate and modafinil, aiming to improve concentration, memory, and performance. The study confirms that the use of these substances is frequent among the French medical community.
Hajduk et al., 2024 [8]	To determine the prevalence of neuroenhancement (NE) and alcohol and tobacco use among college students, as well as to investigate the	1,010 students (503 of them from Medicine)	Of these, 12.4% indicated the use of EN for the period studied. EN has been used in particular during exam preparations, to improve performance and/or regulate emotions, most commonly through caffeine, cannabis, and methylphenidate tablets. EN was associated with risky alcohol or tobacco use and, to a lesser

	associations between EN and ADHD, anxiety, depression, and stress experience.		extent, ADHD symptoms and the experience of stress.
Majori et al., 2017 [9]	To examine the misuse of stimulants by students in a geographical area of northern Italy, identifying possible developments of the phenomenon in the country.	899 students (210 of them in Medicine)	Of the respondents, 11.3% of students reported non-medical use of prescription stimulants (UNMEP), with a higher prevalence in the 18-22 age group (73.5%), with no significant difference between genders. The majority (57.8%) used these substances a maximum of five times in six months. The main reasons were academic (improving concentration during studies - 51.0%) and extra-academic (increasing sports performance - 25.5%). The UNMEP was significantly higher among working students ($p < 0.05$), suggesting that use may be associated with the management of stress related to multiple demands.
Martins et al., 2020 [10]	To determine the prevalence of psychostimulant (SP) use as cognitive enhancers by medical students at the National University of Córdoba (UNC).	590 medical students	Almost all students (99.15%) consumed psychostimulants, mainly coffee (93.05%) and mate (91.02%). The use of modafinil or methylphenidate was reported by 8.3%, with 45% of these users reporting improvement in academic performance. Consumption was significantly associated with: male gender, advanced age, absence of religion, more advanced courses, academic difficulties, mental health problems (anxiety, depression) and high caffeine consumption. There was no relationship with work, sports practice or living with family members.
Moreira et al., 2024 [11]	OBJECTIVE: To evaluate the use of psychostimulants among health students at a higher education institution in Minas Gerais, Brazil.	389 students in health areas (277 of them in Medicine)	Of the students, 21% used psychostimulants, mainly men (23.07%) and medical (19.70%) and psychology (18.91%) students. Methylphenidate was the most consumed (57%), obtained without a prescription in 77% of the cases. Common adverse effects included poor appetite (68%), tachycardia (58%), and insomnia (43.5%). Among them, 75% used it to

			improve academic performance, with 52% considering their performance good and 75.8% believing that it would get worse without the drugs. In addition, 70% combined with alcohol/illicit drugs and had diagnoses of depression/anxiety, contraindicating their use.
Nowrouzi; Richelle, 2024 [12]	To investigate the misuse of prescription psychostimulants among medical students in Belgium to identify risk factors for misuse.	853 medical students	The use of prescribed psychostimulants showed an increasing trend, with 12.6% of the students in the last year reporting previous use for cognitive improvement and 3.6% currently using them. Multiple risk factors associated with misuse were identified: lack of knowledge of the risks, search for new experiences, consumption of other substances, high academic stress, social pressure, excessive curricular requirements and low ethical concern with pharmacological use. The findings reinforce the need for preventive strategies aimed at this specific group.
Oliveira et al., 2023 [13]	OBJECTIVE: To analyze the use of psychostimulants by medical students at a private university center in Minas Gerais, Brazil.	244 medical students	Of the students, 57.4% reported the use of psychostimulants, with a higher prevalence in the 2nd year. The most consumed substances were caffeine (85%), energy drinks (65%) and methylphenidate (60%). The main effects perceived were improved concentration (97%), reduced sleep (83%) and improved reasoning (80%). Despite associating stimulants with improved academic performance, the students recognized that these compounds can compromise sleep quality and increase vulnerability to other diseases.
Onal et al., 2024 [14]	To investigate the prevalence of methylphenidate misuse among Turkish medical students and contributing factors.	418 medical students	Older students demonstrated greater awareness, but also early onset of methylphenidate (MP) misuse compared to younger students. Living in student dormitories was shown to be a significant factor for exposure and non-medical use of PM. Both users and non-users recognized the addictive potential of the substance. Social influence was

			the main motivator for the first experiences with PM. While academic improvement is the most common justification for use, its effectiveness in students without an ADHD diagnosis remains questionable.
Pighi et al., 2018 [15]	To explore the use of and attitudes towards the use of cognitive enhancers (CE) in Italian medical students.	363 medical students	Most students (74.7%; n=271) reported using substances for cognitive enhancement, but only 0.6% (n=2) had used prescription drugs in the last 30 days. The main reasons for avoiding these medications were safety concerns and side effects (83.3%; n=295). Despite this, 60.3% (n=219) maintained a positive attitude towards use. The study revealed that Italian students experimented with several cognitive stimulants, but with low adherence to controlled psychostimulants. The multivariate analysis identified factors associated with the predisposition to the use of CS: male gender, memory complaints, concern about cognitive decline, history of illicit substance use, and recent consumption of any substance (licit or illicit).
Retief; Verster, 2016 [16]	To determine the prevalence and correlates of non-medical stimulant use, as well as subjective opinion on the number of peers using stimulants and the university's attitude towards stimulant use among a sample of South African undergraduate medical students.	252 medical students	Of the sample, 44 (18%) reported use of stimulants in life for non-medical purposes and 33 (85%) of this group reported use in the last year. A total of six (2%) students reported a diagnosis of ADHD. In the group without a diagnosis of ADHD, the use of non-medical stimulants was associated with the year of study and the use of illicit substances. The majority of students in this group (31.32%) reported using stimulants to improve concentration.
Roa et al., 2016 [17]	To determine the quality of sleep in medical students at the Universidad San Sebastián, Concepción, Chile, as well as to	65 medical students	Of the students, 83% had poor sleep quality (mild dysfunction), with 53.8% sleeping less than 6 hours a day. The consumption of psychostimulants/energy drinks in the last month was reported by 41.5% of the

	determine the prevalence of sleep disorders and psychostimulant consumption in this population.		participants, being more prevalent among those who slept poorly. Daily coffee consumption (≥1 cup) reached 64.6% and was significantly associated with poor sleep quality, as well as smoking (27.7% smoked ≥1 cigarette/day). The data reveal a high prevalence of sleep disorders correlated with the use of stimulant substances, with potential negative impacts on academic performance and overall health.
Sümbül-Şekerci et al., 2021 [18]	To investigate the prevalence, attitudes, knowledge and ethical evaluations of Pharmacological Cognitive Enhancement (ACF) – use of psychostimulant drugs – in university students.	1,148 students in health areas (458 of them in Medicine)	The prevalence of ACF was 7.4%, being higher among residents (15.5%) and medical students (8.4%), with no significant difference between courses. Factors associated with the ACF included: schooling, smoking, dissatisfaction with academic performance, and higher level of knowledge. About 40% of users started ACF through a referral from friends. These students underestimated the risks and considered the use more acceptable and normal. The ACF was used mainly by well-informed but academically dissatisfied young people, aiming to improve their performance during exam periods.

Source: Prepared by the authors.

All 16 selected studies used the questionnaire-based cross-sectional study method. Its results reveal a complex picture of the use of psychostimulants among medical students, with consistent patterns and important variations between different contexts. The prevalence of use varies significantly (from 2.9% to 99.15%), depending on the type of substance considered, being notably higher when over-the-counter stimulants such as caffeine and energy drinks are included.[10.13]

It was found that there are regional differences in some places, with distinct patterns between Eastern Europe (predominance of alcohol and sedatives) and Southern Europe (greater use of psychostimulants and cannabinoids),[6] highlighting the importance of cultural factors and availability of substances.

Methylphenidate emerges as the most widely used prescription psychostimulant, with a prevalence of non-prescription use ranging from 1.9% to 17.3%.[3,5] This pattern remains consistent in different countries, from Brazil3-5,11 to Turkey[14], suggesting a globalized culture

of use among medical students. The predominant acquisition through friends (56.5%)[3] and the influence of peers as the main factor of initiation9,12,14,18 highlight the social component of this phenomenon.

4.1 REASONS WHY STUDENTS RESORT TO THE USE OF PSYCHOSTIMULANTS

The reasons for use focus on improving academic performance, with an emphasis on increasing concentration, reducing sleep, and improving reasoning.[3-5,7-16,18] Contradictorily, some studies3,14 have not found an association between the use of psychostimulants and better objective academic performance, suggesting that the perceived benefits may be more subjective than real.

In addition to the search for academic improvement, the studies reveal nuances in the reasons that lead medical students to adopt *cognitive doping*. The pressure to perform in competitive environments is a central factor, with reports that students use psychostimulants to "stay awake" during long study days3, to compensate for the overload of extracurricular activities, including sports performance9 or even to search for new experiences[12]. This practice is often normalized in academia, as evidenced by the literature, which highlights that 56.5% of students obtain methylphenidate through friends3, reflecting a culture of sharing and tacit acceptance.

Another relevant aspect is the subjective perception of efficacy. While researchers report that students associate stimulants with improvements in concentration (97%) and reasoning (80%)[13], others show that current users had lower academic averages (7.92) compared to non-users (8.80)[3]. This disparity suggests that the positive effects may be more linked to expectancy biases or a temporary relief of anxiety, as seen in students who combine psychostimulants with alcohol or illicit drugs to cope with stress.[6,8,11]

4.2 EFFECTS PERCEIVED BY STUDENTS ON CONCENTRATION AFTER THE CONSUMPTION OF PSYCHOSTIMULANTS

Most of the studies analyzed report that medical students perceive significant improvement in concentration after the use of psychostimulants, especially with substances such as methylphenidate, modafinil, and caffeine.[4,5,10,13] One of these studies found that 97% of users associated consumption with an increase in the ability to focus during studies13, while other researchers observed that most students described greater ease in maintaining

attention in complex tasks, even though 50% had suffered concomitant adverse effects, such as tachycardia and insomnia.[4]

However, this perception of cognitive improvement may be illusory or contextually limited. Researchers[5,7,12,18] point out that positive effects are more reported in short-term situations (on the eve of exams), but are not supported by long-term evaluations of academic performance.[3] In addition, another study demonstrated a contradictory relationship: while students believe that psychostimulants improve concentration, their use is associated with sleep disorders (53.8% slept less than 6 hours) and poorer quality of life, factors that can chronically compromise cognition.[17]

Differences between substances are also evident. While caffeine and energy drinks are seen as "safe" and have a moderate effect[5,7,10,15], drugs such as methylphenidate generate more extreme reports: on the one hand, there are students who consider them "indispensable" for academic success11,15; on the other hand, there is evidence that their use without medical indication can lead to dependence and worsening of mental health.[4,11,17]

The contradiction between perceived benefits and objective results raises ethical and pedagogical questions. If, on the one hand, students believe that these substances are "necessary" to survive the course requirement11,14, on the other hand, the lack of robust evidence on real gains3,14 indicates that the problem may lie in educational structures, such as overloaded curricula and punitive evaluations, which naturalize the use of substances as cognitive "shortcuts". In addition, the trivialization of adverse effects (tachycardia, insomnia, and dependence)[4,11,17] reveals a flaw in medical education about pharmacological risks, since future physicians are replicating irresponsible self-medication behaviors.

The dissonance between perceived benefits and actual risks suggests that the use of psychostimulants may be more symptomatic than effective. If, on the one hand, students use them as tools to deal with the excessive load of studies[9,11,12,14,16,18], on the other hand, the literature does not confirm consistent academic gains.[3,17] This indicates that the subjective improvement in concentration may be linked to: placebo effect, due to the temporary reduction of fatigue and stress management5,9; Symptoms masked as undiagnosed disorders, such as ADHD, or the presence of depression and anxiety10,11, which would require specific therapeutic approaches.

In addition, the lack of guidance on risks is alarming. One of the studies showed that 75.8% of users believe that their performance would worsen without the drugs, but ignore effects such as dependence and psychiatric comorbidities.[11] This reflects a gap in medical

education, which should include discussions on ethical pharmacology and health self-management.

4.3 IMPACT OF COGNITIVE *DOPING* ON THE MENTAL HEALTH OF MEDICAL STUDENTS

The profile of the typical user shows consistency among some studies: predominantly male,[4,10,11,15] in exam periods,[5,7-9,18] with a high level of academic stress and frequently involved in multiple activities.[4,8,9,12] The association with mental health problems, particularly anxiety and depression,[10,11] is especially worrisome, given the potential for aggravation of these conditions by psychostimulants.

The studies analyzed reveal a complex and often negative relationship between the use of psychostimulants and the mental health of medical students. Although these substances are often used as a strategy to deal with academic pressure, their medium and long-term effects can exacerbate pre-existing psychiatric disorders or even trigger new conditions of anxiety, depression, and chemical dependence.[10,11,14,17]

According to researchers, 70% of users combined psychostimulants with alcohol or illicit drugs, and many already had diagnoses of mental disorders, suggesting a dangerous pattern of self-medication.[11] Another group of researchers highlighted that the use of neurostimulants (such as methylphenidate) was associated with risky behaviors, including alcohol and tobacco abuse, as well as greater vulnerability to stress.[8] In addition, the literature warns of the addictive potential of methylphenidate, even among students who recognize its risks, indicating that the justification of "academic improvement" may mask compulsive use.[14]

The COVID-19 pandemic introduced significant changes in usage patterns, with a reduction in the consumption of alcohol and psychostimulants, but an increase in the use of sedatives,[6] possibly reflecting changes in academic demands and the social environment during this period.

Sleep quality emerges as a critical factor, with most students presenting sleep disorders and deprivation patterns,[4,11,17] creating a vicious cycle where stimulants are used to compensate for fatigue resulting from poor sleep quality, which in turn is aggravated by the use of these substances. One of the studies showed that the consumption of psychostimulants was strongly associated with poor sleep quality, with 83% of users experiencing mild to moderate disturbances, aggravating symptoms such as chronic fatigue and irritability.[17]

Attitudes toward use show a controversial combination: while many students express concerns about safety and side effects,[13,15] a significant portion (60.3% in one of the studies)[15] maintain a positive attitude toward use, underestimating the risks.[13,14,15,18] This dissonance suggests that educational interventions should address not only the facts about risks, but also the perceptions and social norms among medical students.

The persistence in the use of psychostimulants, even in the face of evidence of damage to mental health, can be explained by several interrelated factors. First, the toxic academic culture, marked by extreme pressure for performance and competitiveness in medical courses, normalizes the use of these substances as something "necessary" to survive the intense pace of studies.[9,12] This perception is reinforced by the lack of open discussions about mental health in the university environment, leading many students to see psychostimulants as a quick solution to their academic demands.

In addition, the lack of institutional support emerges as another important factor. As many students do not have adequate information about the risks of these substances or access to adequate psychological support, this leads them to resort to self-medication.[12] This situation is aggravated by the scarcity of effective prevention programs, which, when they exist, are often not properly disseminated or accessible to the academic community.

Finally, short-term bias plays a significant role in this scenario. The immediate effects provided by psychostimulants, such as increased concentration, are more visible and immediately gratifying than their cumulative damages, which include anxiety, depression, and insomnia.[10,11,13,17] This asymmetry of perception causes many students to underestimate long-term risks, prioritizing momentary benefits over their future mental health.

5 FINAL CONSIDERATIONS

Cognitive *doping* among medical students reflects a multifactorial problem, driven by academic, cultural, and individual pressures. Regarding the primary objective, although users report subjective benefits in concentration, the data do not support improvements in academic performance, while risks to physical and mental health are evident.

As for the secondary objectives, the data revealed that the main reasons for use include improved concentration and academic performance, reduced sleep to cope with curricular demands and social pressure, with users starting to consume due to the influence of friends. However, the perceived effects are accompanied by adverse consequences, such as tachycardia, insomnia, lack of appetite, and worsening sleep quality. In addition, combined

use with alcohol and other drugs and obtaining them without a prescription increase health risks.

Strategies to reduce addiction should include structural changes in educational institutions, mental health support, and non-pharmacological alternatives for stress management and productivity. Implementing these measures can help break the cycle of inappropriate use, promoting a healthier and more sustainable academic environment.

REFERENCES

Zuanetti, P. A., Pontes-Fernandes, A. C., Moraes, N. M., Hamad, A. P. A., & Fukuda, M. T. H. (2023). Attention-deficit hyperactivity disorder (ADHD) versus specific learning disorder-reading subtype (dyslexia): Performance in writing tasks. Revista CEFAC, 25(6), e7723.

Conceição, G. (2019). Doping mental no meio acadêmico: Uma revisão de escopo [Monografia]. Universidade Federal de Santa Catarina, Florianópolis, Brazil.

Nasário, B. R., & Matos, M. P. P. (2022). Uso não prescrito de metilfenidato e desempenho acadêmico de estudantes de medicina. Psicologia: Ciência e Profissão, 42, e235853.

Rodrigues, L. A., Viana, N. A. O., Belo, V. S., Gama, C. A. P., & Guimarães, D. A. (2021). Uso não prescrito de metilfenidato por estudantes de uma universidade brasileira: Fatores associados, conhecimentos, motivações e percepções. Cadernos de Saúde Coletiva, 29(4), 463–473.

Santana, L. C., Ramos, A. N., Azevedo, B. L., Neves, I. L. M., Lima, M. M., & Oliveira, M. V. M. (2020). Consumo de estimulantes cerebrais por estudantes em instituições de ensino de Montes Claros/MG. Revista Brasileira de Educação Médica, 44(1), e036.

Babicki, M. (2022). Use of alcohol, cannabinoids, psychostimulants, and sedatives before and during the COVID-19 pandemic among students in 40 European countries. International Journal of Environmental Research and Public Health, 19(22), Article 14879.

Fond, G., Gavaret, M., Vidal, C., Brunel, L., Riveline, J. P., Micoulaud-Franchi, J. A., & Domenech, P. (2016). (Mis)use of prescribed stimulants in the medical student community: Motives and behaviors: A population-based cross-sectional study. Medicine, 95(16), e3366.

Hajduk, M., Tiedemann, E., Romanos, M., & Simmenroth, A. (2024). Neuroenhancement and mental health in students from four faculties - a cross-sectional questionnaire study. GMS Journal for Medical Education, 41(1), Doc9.

Majori, S., Gazzani, D., Pilati, S., Paiano, J., Sannino, A., Ferrari, S., & Checchin, E. (2017). Brain doping: Stimulants use and misuse among a sample of Italian college students. Journal of Preventive Medicine and Hygiene, 58(2), E130–E140.

Martins, M. F., Vanoni, S., & Carlini, V. P. (2020). Consumo de psicoestimulantes como potenciadores cognitivos por estudiantes de Medicina de Universidad Nacional de Córdoba. Revista de la Facultad de Ciencias Médicas (Córdoba), 77(4), 254–259.

Moreira, J. E., Rodrigues, M. C. L.-C., Palhares, C. V. T., Oliveira, T. H. C. de, & Gonçalves, G. K. N. (2024). Adverse events and safety concerns among university students who misused stimulants to increase academic performance. Einstein (São Paulo), 22, eAO0895.

Nowrouzi, S., & Richelle, L. (2024). The misuse of cognitive enhancers by medical students: A cross-sectional study using questionnaires. British Journal of General Practice, 74(suppl 1), bjgp24X737625.

Oliveira, F. S., Dutra, H. F., & Fófano, G. A. (2023). Consumo de psicoestimulantes por estudantes de medicina em um centro universitário privado. Revista Científica da Escola Estadual de Saúde Pública de Goiás "Cândido Santiago", 9(9f7), 1–15.

Onal, B., Bayindir, M. Y., Topkarci, Y. B., Dogan, A. S., Oktan, B., & Yunusoglu, O. (2024). The awareness of methylphenidate and its use: Experiences and perceptions of medical students. Cureus, 16(11), e74317.

Pighi, M., Pontoni, G., Sinisi, A., Ferrari, S., Mattei, G., Pingani, L., Simoni, E., & Galeazzi, G. M. (2018). Use and propensity to use substances as cognitive enhancers in Italian medical students. Brain Sciences, 8(11), 197.

Retief, M., & Verster, C. (2016). Prevalence and correlates of non-medical stimulants and related drug use in a sample of South African undergraduate medical students. South African Journal of Psychiatry, 22(1), 795.

Roa, M. C., Parada, F., Vargas, V., & López, P. (2016). Calidad del sueño y consumo de inhibidores del sueño en estudiantes de medicina. Revista ANACEM, 10(1), 4–9.

Sümbül-Şekerci, B., Bildik, Ö., Bektay, M. Y., & İzzettin, F. V. (2021). Attitudes of medicine, pharmacy, and dentistry students about psychostimulant use to enhance cognition. International Journal of Clinical Practice, 75(10), e14608.