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(Mis)use of Prescribed Stimulants in the Medical Student Community: Motives and Behaviors

A Population-Based Cross-Sectional Study

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Abstract: The aim of this study was to estimate the prevalence of psychostimulant use in the French medical community and their motives.

A population-based cross-sectional study using a self-administered online survey was done.

A total of 1718 French students and physicians (mean age, 26.84±7.19 years, 37.1% men) were included. Self-reported lifetime use, motives, socio-demographic and academic features for over the counter (OTC), medically prescribed (MPP), and illicit (IP) psychostimulant users were reported. Lifetime prevalence of psychostimulant use was 33% (29.7% for OTC, 6.7% for MPP, and 5.2% for IP). OTC consumption mainly aimed at increasing academic performance and wakefulness during competitive exams preparation. OTC consumption started early and was predictive of later MPP use. Corticoids were the most frequently consumed MPP (4.5%) before methylphenidate and modafinil. Motives for MPP consumption were increased academic performance, concentration, memory, and wakefulness.

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Psychostimulant use is common among French medical community. Our results suggest that restrictions on methylphenidate and modafinil prescriptions are effective at limiting their use. However, these restrictions may explain the observed rates of corticoids consumption, which raise a new public health problem, given that corticoids may have severe side effects.

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Abbreviations: IP = illicit psychostimulants, MPP = medically prescribed psychostimulants, OTC = over the counter.

INTRODUCTION

The term “pharmaceutical cognitive enhancement” refers to the consumption of drugs by healthy individuals to improve their cognitive functions. Cognitive enhancement is a popular topic, attracting the attention of the general public and the scientific community (Eickenhorst et al, 2012). Medically prescribed psychostimulants (MPP) such as methylphenidate are the most frequently consumed smart drugs, especially in US college campuses (Franke et al, 2014; Franke et al, 2011; McCabe and Westand West, 2013; Teter et al, 2010; Wilens et al, 2008).¹ Use of MPP seems to be more prevalent among college undergraduate students than among their same-age peers not attending college.^{2,3} Students may not only consider the stimulants advantageous for enhancing academic performance, but also for leading an active life style, balancing studies and time off.⁴ Previous study also reported other motives such as recreational purposes.⁵ Given the increasing demand for enhanced cognitive performance, pharmaceutical cognitive enhancement could become a major public health concern (Farah et al, 2004).⁶ A clear and comprehensive picture of the psychostimulants used by college students, in the light of available international data on their prevalence, is of great importance for informing policy makers and healthcare professionals about psychostimulant consumption.⁷ However, 85% of the world’s research within the field of drug abuse and dependence is carried out in the United States, and little is known about psychostimulant use in other countries.⁸

Medical school in France has one of the longest study paths within French higher education. French medical studies are divided into three cycles. First cycle/premedical school (2 years) is only theoretical. The first year ends with a very selective examination called *numerus clausus* (in 2014 in France: 58,733 candidates for 7492 received in 2nd year medical i.e., 12.8%).⁹ Second cycle (4 years) is both theoretical and practical, and all of the medical students must pass a “classifying national examination” at the end of 6th year, which determines the specialization of each student according to his/her rank. Third cycle/internship

(4–5 years according to medical specialties) is mostly practical. Interns can manage patients, do shifts, and prescribe drugs under the supervision of senior physicians. Students are required to submit and defend a thesis at the end of their internship to receive their MD. In summary, medical studies require sustained memory and attention abilities for at least a decade. At the same time, long periods of shifts and exam preparations may induce deep sleep deprivation, impacting cognitive performances.

The objective of the present work was (i) to determine the prevalence and characteristics of psychostimulant (mis)use in a large sample of medical students and postgraduate physicians and (ii) to identify their motives.

METHODS

Our methodology was inspired from previous studies on psychostimulant use.^{10,11} We sent an email to undergraduate and postgraduate medical students using the database of French medicine student associations, as well as professional mailing lists and posted its content on specialized Internet forums. This email invited potential subjects to participate. It described and explained the rationale of the study, as well as its goals. More specifically, potential participants were told that the aim of the study was to determine whether the use of neuroenhancing substances was common in French medical students and physicians. They were invited to self-administer a confidential Web survey by clicking on a URL link: the study was absolutely voluntary and the message specified that the results of the survey would be reported in scientific publications. Personal data were anonymized and stored on a secure server. On average, the survey took between 3 and 7 minutes to be completed. It contained 7 questions for the individuals who had previously used psychostimulants and 5 questions for the nonusers. The survey was conducted between April and July 2015.

Data Collected

Our survey did not record any identifiable data to protect subject anonymity. Care was taken to delete IP addresses from the dataset. Data were stored in an offline database for later analyses. No informed consent form was required. Participants were informed that by accepting to send back their anonymous questionnaires, they gave their informed consent to participate. Questionnaires were collected and analyzed anonymously. This study was conducted in accordance with the Declaration of Helsinki and French Good Clinical Practices. The study was approved by the local Ethic Committee (*CPP La Pitié-Salpêtrière*, Paris, France).

We recorded the age, sex, present academic level, and academic level when first consuming psychostimulant and medical specialty. Present academic level was graduated from 1 (first year of premed school) to last year (10 or 11 according to the variable number of years of internship across specialties). We also recorded the type and the number of psychostimulant use as well as the motives sustaining these consumptions.

Definitions

Psychostimulant use. Psychostimulant use was defined as taking a drug in a purpose of enhancing cognitive functioning, independently of its proper effect and not as a legitimate treatment for a known disease with a medical prescription. The following molecules were considered as psychostimulants and systematically assessed: (i) over the counter (OTC) drugs

such as caffeine tablets and energy drinks containing caffeine, (ii) medically prescribed psychostimulants (MPP) (corticoids, methylphenidate, modafinil, and piracetam), (iii) illicit psychostimulants (IP) (cocaine, amphetamines and its derivatives, methamphetamine, and 3,4-methylenedioxy-methamphetamine (MDMA)). Since the 1970s, amphetamines and derivatives (including Adderall[®]) are not allowed for medical prescription in France because of their common recreational use at the time. Vitamin C intake and coffee drinking were not considered as psychostimulants, but were also assessed. Psychostimulant users further reported their own estimate of number of psychostimulant intakes over lifetime for their main MPP or IP. For the sake of clarity, our survey items included both generic and brand names. However, we chose to use generic names exclusively in the description of our findings.

Motives. Survey questions about motives for use of psychostimulants were not mutually exclusive (i.e., students could report more than one reason) and specifically focused on the main MPP or IP used: (i) increasing academic performance/concentration/attention/memory, (ii) increasing vigilance/wakefulness, (iii) euphoria, (iv) to balance the effects of other drugs, (v) to loose weight, (vi) for experiment purpose/novelty seeking, (vii) because it is more safe than illicit drugs sold in the street, and (viii) because of biological or psychological dependence.

Statistical Analysis

Data were analyzed using Statistica 8.0 (www.statsoft.fr). Effects were considered significant if the *P* value was $\leq 5\%$. All tests were two-sided. We estimated logistic regression models of the probability of using IP and MPP, which tested the effect of the sex, age, medical specialty, co-consumption of OTC, motives, academic level, and academic level at first psychostimulant consumption. We also estimated a general linear model of the number of psychostimulant uses over lifetime, testing the effect of the same variables and of the type of stimulant used.

Overall, 1718 questionnaires were collected between April and June 2014. Twenty-six questionnaires lacked important data (age, sex, or present education level) or declared using psychostimulants under medical supervision with a prescription for medical purposes ($n=11$). They were excluded from further analysis (1.45% of the data set, $n=1681$ remaining questionnaires).

RESULTS

In our sample, the age was 26.84 ± 7.19 years on average, and 624 participants were male (37.1%). Among total participants, 807 (48%) were students, 413 (24.6%) were psychiatrists, 169 (10%) were GPs, 158 (9.4%) were medical specialists, 46 (2.7%) were surgeons, and 20 (1.2%) were anesthetists.

Psychostimulant consumption behaviors and motives according to their present stage of education in medical studies are reported in Table 1. Socio-demographic characteristics, consumption behaviors, and motives per type of psychostimulant are reported in Table 2.

Overall, 1110 (66%) subjects never used psychostimulant (aside vitamin C tablets and coffee drinks), 499 (29.7%) used OTC at least once (caffeine tablets and/or energy drinks containing high dosage of caffeine), 113 (6.7%) consumed MPP at least once (corticoids, methylphenidate, modafinil, or piracetam), and 88 (5.2%) consumed IP (cocaine or amphetamine derivatives).

TABLE 1. Lifetime History of Psychostimulant Consumption and Motives in the 1681 French Undergraduate and Postgraduate Medical Students According to their Present Stage of Education in Medical Studies (Mean or Frequency, SD)

Variables	First Cycle*	Second Cycle*	Third Cycle*	Postdoc*
	N = 409	N = 398	N = 709	N = 165
Sex (men) (N, %)	0.356 (0.48)	0.396 (0.49)	0.324 (0.47)	0.545 (0.5)
Age (years), mean (SD)	20.86 (2.34)	22.98 (1.98)	28.91 (3.7)	42.06 (8.38)
No history of psychostimulant consumption (N, %)**	0.713 (0.45)	0.650 (0.48)	0.638 (0.48)	0.642 (0.48)
Psychostimulant consumption by class (N, %)				
OTC	0.261 (0.44)	0.296 (0.46)	0.318 (0.46)	0.290 (0.46)
MPP	0.034 (0.18)	0.032 (0.18)	0.097 (0.3)	0.103 (0.3)
Corticoids	0.024 (0.15)	0.012 (0.11)	0.076 (0.27)	0.042 (0.2)
Methylphenidate	0.002 (0.05)	0.015 (0.12)	0.018 (0.13)	0.036 (0.19)
Modafinil	0.002 (0.05)	0 (0)	0.012 (0.11)	0.018 (0.13)
Piracetam	0.007 (0.09)	0.007 (0.09)	0.004 (0.06)	0.024 (0.15)
IP	0.044 (0.2)	0.057 (0.23)	0.047 (0.21)	0.078 (0.27)
Cocaine	0.024 (0.15)	0.042 (0.2)	0.045 (0.21)	0.05 (0.23)
Amphetamine	0.017 (0.13)	0.015 (0.12)	0.004 (0.06)	0.042 (0.2)
Metamphetamine	0.002 (0.05)	0.017 (0.13)	0.002 (0.05)	0.018 (0.13)
MDMA = ecstasy	0.007 (0.09)	0.005 (0.07)	0 (0)	0 (0)
MPP and/or IP	0.066 (0.25)	0.082 (0.28)	0.119 (0.33)	0.133 (0.34)
Motives (N, %)				
Increasing academic performance/memory concentration	0.188 (0.39)	0.178 (0.38)	0.163 (0.37)	0.157 (0.37)
Increasing wakefulness	0.222 (0.42)	0.278 (0.45)	0.280 (0.45)	0.260 (0.44)
Euphoria	0.041 (0.2)	0.035 (0.18)	0.026 (0.16)	0.036 (0.19)
Novelty	0.066 (0.25)	0.070 (0.26)	0.064 (0.25)	0.078 (0.27)

IP = illicit psychostimulants, MDMA = 3,4-methylenedioxy-methamphetamine, MPP = medically prescribed psychostimulants, OTC = over the counter (caffeine tablets ± energy drinks), SD = standard deviations.

*First cycle: 2 first years (premed school). Second cycle: 4 years (both theoretical and practical). Third cycle: 3 to 5 years, mostly practical (internship).

**Including caffeine tablets and energy drinks with caffeine.

Corticoids (N = 76, 4.5%) and cocaine (N = 68, 4.0%) were the most frequently consumed MPP and IP. Corticoids were the most frequently consumed psychostimulant among MPP users (N = 76, 67% of MPP users) followed by methylphenidate (N = 26, 23%) and modafinil (N = 13, 11%). Twenty-five subjects (22%) consumed both MPP and IP. Consuming MPP was associated with a twofold increased probability of consuming caffeine tablets or caffeinated energy drinks (60.2% vs. 29.7%, $T = -7.46$, $P < 10^{-6}$). MPP were mostly consumed by interns and postgraduate physicians (respectively 73.1% of methylphenidate, 92.3% of modafinil, and 80.3% of corticoids consumers were third cycle/interns or postgraduate physicians).

Within the IP group, 68 (77.2%) were cocaine users, 36 (40.8%) consumed amphetamines and derivatives, 88 also consumed OTC (63.6%), and 25 (28.4%) were both IP and MPP consumers. On the contrary to MPP and in spite of its high prevalence, OTC use was not found to be associated with an increased risk of IP use, when adjusted for sex, age, medical specialty, and academic level at first psychostimulant consumption ($P = 0.2$). No medical specialty was associated with an increased risk of psychostimulant use.

Sex Differences

There were no significant differences between males and females for caffeine tablets/energy drinks or MPP uses

(Tables 1–3). Males as likely as females consume psychostimulant for increasing academic performance, attention, concentration, or wakefulness. Compared with females, males consumed more frequently IP (21.9% vs. 11.1%, t test, $P = 4 \times 10^{-4}$). More specifically, 80% of MDMA users were males (vs. 40% for caffeine tablets and corticoids). Males consumed more frequently psychostimulants for novelty seeking (21.9% vs. 12.5%, $P = 2.8 \times 10^{-4}$), euphoria (13.6% vs. 5.2%, $P = 4.6 \times 10^{-5}$), and “because it is more safe than drugs sold in the street” (4.4% vs. 0.9%, $P = 6 \times 10^{-3}$). These results were independent of age and present education level (all $P > 0.05$ among IP and MPP users).

Motives

Overall, 84.6% of piracetam consumers, 57.7% of methylphenidate consumers, and 53.8% of modafinil consumers sought increased academic performance and concentration/attention (Tables 1–3). Around 76.9% of modafinil and 65.8% of corticoids consumers sought increased wakefulness. A total of 80% of MDMA consumers sought euphoria and 72% of cocaine consumers sought experiment/novelty. Other motives (losing weight, safety compared with drugs sold in the street, and balancing the effect of other drugs) were not specific of the type psychostimulant.

Consumers preparing for their first competitive exam (1st year) and those preparing for the national classifying exam (6th year), both sought vigilance/wakefulness (68.9% and

TABLE 2. Sociodemographic Characteristics, Behaviors and Motives According to Each Psychostimulant

Variables	MPP					IP		
	OTC	Corticoids	Methylphenidate	Modafinil	Piracetam	Cocaine	AMPHET	METAMPHET
Sex (men), (N,%)	0.402 (0.49)	0.407 (0.49)	0.538 (0.51)	0.538 (0.52)	0.538 (0.52)	0.558 (0.50)	0.652 (0.49)	0.769 (0.44)
Age (years) (mean, SD)	26.93 (6.11)	28.64 (5.58)	30.15 (6.99)	31.53 (7.38)	27.23 (6.13)	28.80 (6.11)	30.73 (12.11)	29.07 (10.28)
Education level (years) (mean, SD)*	6.79 (3.29)	7.94 (2.85)	8.53 (3.13)	8.76 (2.74)	7.07 (3.84)	7.29 (3.11)	6.39 (4.25)	6.69 (3.83)
Interns and physicians (N,%)	0.549 (0.50)	0.802 (0.40)	0.730 (0.45)	0.923 (0.28)	0.538 (0.52)	0.602 (0.49)	0.434 (0.51)	0.384 (0.51)
OTC consumption (N,%)	-	0.618 (0.49)	0.538 (0.51)	0.692 (0.48)	0.615 (0.51)	0.676 (0.47)	0.565 (0.51)	0.461 (0.52)
Lifetime number of consumptions (mean, SD)	10.36 (26.38)	16.80 (30.51)	32.40 (47.92)	37.11 (53.88)	24.80 (30.32)	18.67 (28.84)	26.73 (38.19)	32.88 (42.88)
Education level at first consumption (years) (mean, SD)*	2.01 (1.41)	3.04 (1.37)	3.36 (1.47)	2.61 (1.71)	2.07 (1.38)	2.38 (1.33)	2.29 (1.53)	1.80 (1.55)
Motives (N,%)								
Increased academic performance/ memory concentration	0.334 (0.47)	0.315 (0.47)	0.576 (0.50)	0.538 (0.52)	0.846 (0.38)	0.191 (0.40)	0.434 (0.51)	0.308 (0.48)
Increased wakefulness	0.490 (0.50)	0.657 (0.48)	0.461 (0.51)	0.769 (0.43853)	0.461 (0.52)	0.279 (0.45)	0.434 (0.51)	0.230 (0.44)
Euphoria	0.064 (0.25)	0.197 (0.40)	0.230 (0.43)	0.076 (0.28)	0.153 (0.38)	0.397 (0.49)	0.260 (0.45)	0.461 (0.52)
Novelty	0.140 (0.35)	0.223 (0.42)	0.384 (0.50)	0.384 (0.51)	0.384 (0.51)	0.720 (0.45)	0.391 (0.50)	0.461 (0.52)
Education level at first use (N,%)**	(n = 246)	(n = 68)	(n = 25)	(n = 13)	(n = 13)	(n = 62)	(n = 17)	(n = 10)
High school	0.080	0.030	0.040	-	-	0.060	-	-
First cycle	0.430	0.180	0.120	-	-	0.190	-	-
Second cycle	0.130	0.130	0.120	-	-	0.370	-	-
Second cycle: final selective examination	0.130	0.100	0.080	-	-	0.060	-	-
Third cycle	0.190	0.050	0.440	-	-	0.270	-	-
Postdoc	0.040	0.060	0.200	-	-	0.030	-	-

AMPHET = amphetamine, IP = illicit psychostimulants, METAMPHET = metamphetamine, MPP = medically prescribed psychostimulants, OTC = over the counter (caffeine tablets ± energy drinks), SD = standard deviations.

*From 1 (first year) to 16 (postdoc+5 years).

**For psychostimulant users only amphetamine derivatives were not described in this table as the samples were very small for relevant descriptive analysis (n < 20).

TABLE 3. Logistic Regressions of Factors Associated with MPP and IP consumption of medical students and former medical students**MPP–Logistic Regression**

	Beta Estimate	Wald Statistic	Significance
Intercept	1.79	0.00001	0.99
Sex	0.13	0.71	0.39
Age (years)	0.049	1.31	0.25
Education level at first consumption (years)*	−0.53	22.31	0.000002
Education level (years)	0.063	0.26	0.6
Medical specialty	#	12.75	0.047
OTC*	−0.92	23.54	0.000001
Motives			
Increased academic performance/memory concentration	0.20	1.60	0.20
Increased wakefulness	0.14	0.72	0.39
Euphoria	0.098	0.21	0.64
Novelty	0.02	0.21	0.64

IP–Logistic regression

Intercept	6.66	0.00016	0.99
Sex	0.19	1.2	0.27
Age (years)	−0.088	3.44	0.06
Education level at first consumption (years)	−0.086	0.41	0.52
Education level (years)	−0.12	0.59	0.44
Medical specialty	#	5.68	0.46
OTC	−0.26	1.60	0.20
Motives			
Increased academic performance/memory concentration	−0.32	2.54	0.11
Increased wakefulness	−0.19	0.89	0.34
Euphoria*	1.10	22.72	0.000002
Novelty*	1.06	29.41	<0.0000001

*Significant ($P < 0.05$).

#no Beta estimate.

IP = illicit psychostimulants, MPP = medically prescribed psychostimulants, OTC = over the counter (caffeine tablets ± energy drinks), SD = standard deviations.

63.2%, respectively, for 1st and 6th years) and increased academic performance/memory/concentration (47.1% and 55.2%, respectively). Finally, 74.2% of third cycle/interns consumers sought wakefulness. By contrast, 36.0% of the second cycle psychostimulant consumers sought euphoria and 52.3% novelty.

Education Level at First Use

Overall, 39.6% the OTC consumers began their consumption in the first year of premed school (during the preparation of the first selective exam) versus 21.4% during the third cycle of medicine and 12.3% during the preparation of the 6th year national exam.

Risk Factors for Higher Psychostimulant Use Frequency

Self-reported lifetime mean intake was higher in methylphenidate consumers ($F = 4.69$, $P = 0.03$). The mean number of psychostimulant uses over lifetime was also found to be associated with motivation for increasing exam performance ($F = 4.29$, $P = 0.04$) and with self-reported biological or psychological dependency ($F = 8.32$, $P = 0.004$). Lifetime biological and psychological dependency was only reported for OTC, with a very low rate ($n = 4$, 0.08%).

DISCUSSION

The present study yields important data on the prevalence of the nonmedical use of cognitive enhancers, such as OTC, MPP, and IP, in undergraduate and postgraduate medical students in France. Our findings may be summarized as follows: (i) one third of French medical students and physicians consumed psychostimulants at least once in their life, excluding vitamin C and coffee drinks. (ii) 29.7% consumed OTC. Most of them began during their first cycle (probably while preparing the competitive exam in their first year) and sought increased wakefulness. Students consuming OTC were mostly seeking wakefulness. OTC use was twice as more frequent in IP and MPP users compared with nonusers. (iii) Overall, 6.7% of the participants consumed MPP at least once. They consumed mostly corticoids, but also methylphenidate and modafinil during their internship, a time when students receive intensive theoretical and practical training and when these drugs become available to them. The most frequent motives associated with MPP use were increased academic performance/concentration, and wakefulness. (iv) Overall, 5.2% of the subjects consumed IP at least once, mostly cocaine, during the second cycle. Males consumed more frequently IP compared with females, seeking euphoria and/or new experiment. No other sex differences were reported.

We found a high prevalence of psychostimulant use in our study (33%), mostly OTC. This high prevalence of OTC use was also found in German students population (39% of caffeinated drinks and 10.5% of caffeine tablets).¹² Moreover, users of prescription drugs for cognitive enhancement reported more often the use of OTC than nonusers in our sample. This polydrug use is consistent with previous reports.^{10,13–15} OTC were generally experimented during the first cycle of medical studies (see Tables 1 and 2). Caffeine tablets (and energy drinks) appeared as a risk factor for MPP use in our sample.

Methylphenidate and modafinil are the most frequently consumed MPP in the United States. They are also the most studied psychostimulants. In our sample, they were only consumed by respectively 1.5% and 0.8% of the participants in our sample. This is much lower than what has been reported in Switzerland (5.8%)¹⁶ ($P < 0.001$), Iran (4.9%–8.7%),^{17,18} Australia (7.7%),¹⁴ or United States (11.3%–18%).^{19,20}

By contrast, we found high rates of corticoid use (4.5%). This appears to be a French specificity.^{13,14,18–23} (...) Several explanations may be suggested. A plausible explanation is the strong restrictions on prescription and delivery of methylphenidate and modafinil in France.²⁴ Because of its high potential of misuse, methylphenidate can only be prescribed by psychiatrists working in a specialized department of a teaching hospital. This initial prescription follows strict rules and must be confirmed, every 28 days, by a general practitioner (double prescription system). The modalities of prescription for modafinil are even stricter.²⁵ Our results may suggest that the French government's laws for controlling psychostimulant prescriptions may be effective to limit their use in medical populations. If this is true, one "collateral" effect of these restrictions may be an increased use of corticoids that have no special restriction on prescription. We found that the sum of methylphenidate, modafinil, and corticoid rates in our sample (around 6%) is close to the prevalence of methylphenidate and modafinil use reported in other countries. This finding is consistent with the view that corticoids in France may be used as an alternative for methylphenidate or modafinil, mostly in interns and postdoc seeking wakefulness. However, corticoids have potential severe side effects including sleep and psychiatric disorders, immunologic suppression, and metabolic disturbances. The benefit/risk balance of each psychostimulant use should be considered, in the light of these new results, to motivate further studies on psychostimulant use and reappraise French policies.^{26,27}

The use of illicit psychostimulants in our sample (5.2%) was lower than what has been previously reported in the general French population (7.1% for cocaine and 7.0% for MDMA in the 18–25 years, and 10.2% for cocaine and 5.3% for MDMA in the 26–34 years)²⁸ ($P < 0.001$). This suggests that medical students and physicians are more aware of the potential risks of cocaine/MDMA use than same-aged French from the general population. Most of the IP consumers of our sample began their use during their second cycle. They mainly used cocaine and were motivated by euphoria and novelty. Compared with other countries, cocaine prevalence use in our sample was lower than in the United States (13%),²⁹ Australia (14.3%),¹⁴ and Switzerland (7.8%)¹⁶ but higher than in the Netherlands (1.3%),¹⁵ Iran (2.9%),¹⁸ and Germany (2.9%–3.5%).^{21,30} As mentioned by the authors of these studies, the low self-reported rates of use may be because of stigmas associated with the use of drugs for cognitive enhancement. This may lead to an underestimated prevalence rate in these countries.^{31,32}

OTC consumers preparing exams mainly sought increased wakefulness before increased academic performance. This

suggests that psychostimulant use in French medical students is driven by sleep deprivation rather than by academic performance. Most of the corticoids consumers began their use during third cycle/internship. This suggests that psychostimulant use behaviors may be influenced by the availability of the product. The participants seeking wakefulness consumed MPP as soon as they had the ability to prescribe them.

Perspectives

Our results suggest that psychostimulant prescription restriction policies are effective in limiting the use of these drugs. However, it did not reduce the global rate of psychostimulant use in our sample. Targeting the motives of psychostimulant use may be suggested as more effective. We found that increasing academic performance and improving wakefulness were two major motives of MPP use in our study. Limiting the amount of knowledge and the psychological pressure because of competition during the first year of premed school may improve the use of psychostimulants in this population. Limiting sleep deprivation because of shifts during internship may lessen psychostimulant use in interns and trained physicians.

Limits and Strengths

Our sample is one of the largest studies assessing psychostimulant use in college students. It included 37% of males, which is representative of the sex ratio of medical students in France in 2015.^{33,34} However, because of the study design, it was not possible to calculate a response rate. Furthermore, our questionnaire did not include side effects of psychostimulant use, as well as the way to obtain psychostimulant (e.g., by higher grade interns, friends, Internet, and by a physician in the family).

In a comprehensive report published in 2012 on cocaine use in the French population,³⁵ cocaine has been mostly described by users as a self-confidence enhancing drug. In this study, the main motive for first consumptions was increased wakefulness. Moreover, the main motives to keep using this drug were conviviality and sexual enhancement. As the primary aim of our study was to focus on the use of psychostimulant for academic/cognitive/vigilance enhancement purposes, conviviality/peer influence/interpersonal relationships/sexual enhancement have not been included in our questionnaire. Consistent with this finding, participants declared in our study that the main motives for using cocaine were novelty seeking, euphoria, and increased wakefulness. Our questionnaire has been validated⁹ and translated to French in a previous exploratory study.³⁶ We chose to limit the number of questions/items to maximize response rate.³⁷ Participants had the possibility to freely write an "other" motive in our questionnaire; however, none of them spontaneously reported these motives for psychostimulant use. This might be because of the fact that we presented the questionnaire as a study on psychostimulant uses among medical students and physicians in academic/professional contexts (as opposed to the general population).

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CONCLUSION

This large national study confirmed high rates of psychostimulant use in French medical undergraduate students and postgraduate physicians. The corticoid use, mostly by interns seeking wakefulness, appears as a French specificity in regard of the results in other countries. French governmental policies limiting methylphenidate and modafinil use appear to be effective. However, our results suggest that politic restrictions do not impact the global rate of psychostimulant use, but rather the choice of the product. Corticoids were found to be the most consumed MPP in our sample. As corticoids may have potential severe side effects, the restriction of prescription of other MPP (methylphenidate and modafinil) may be questionable in a benefit/risk public health point of view.

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