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ORIGINAL ARTICLE

Exploring changes in non-medical prescription use of pharmaceutical stimulants among Italian adolescents from 2008 to 2023

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Abstract

Aim The use of pharmaceutical stimulants without a medical prescription (PSWMP) is an important public health issue, especially among adolescents. Given the important negative consequences on youth health and well-being, continuous monitoring and analysis of the phenomenon through representative and reliable data is critical. The purpose of this study is to provide national estimates of the prevalence of PSWMP use among students aged 15–19 years and to analyse gender differences.

Subject and methods Data were collected from 16 consecutive waves of the ESPAD® Italia study (from 2008 to 2023), and all the samples were representative of the Italian student population.

Results Fluctuations were observed in the lifetime prevalence trend (male: from 1.4% to 5.8%; female: from 2.9% to 8.0%) as well as use in the last year (male, 0.9–3.3%; female, 1.5–4.1%), last month (male, 0.7–2.2%; female, 0.7–2.4%), and frequent use (male, 0.1–0.9%; female, 0.1–0.6%).

Conclusion The prevalence trend showed fluctuations, and clear gender differences were found in the prevalence of consumption. Over the past 17 years, PSWMP consumption has not increased.

Keywords Pharmaceutical stimulants · ESPAD school survey · Trends · Italian high school students

Introduction

Consumption of pharmaceutical stimulants without a medical prescription (PSWMP) is a significant public health concern in Europe, impacting both the younger population and adults (Gualano et al. 2015; ESPAD Group 2020; EMCDDA 2021). Literature findings have highlighted the importance of investigating the use of PSWMP, given its potential negative consequences, such as acute health harms, chronic diseases, and addiction (Gualano et al. 2015; ESPAD Group 2020; EMCDDA 2021). To date, several definitions of this phenomenon have been proposed. Specifically, the National Survey on Drug Use and Health (NSDUH) defines it as "use without a prescription belonging to the respondent, or use that occurred simply for the experience or feeling the drug caused" (SAMHSA 2008), while the European Monitoring Centre for Drugs and Drug addiction (EMCDDA) describes it as "the use of a psychoactive medicine for self-medication, recreational, or enhancement purposes, with or without a medical prescription but outside of accepted medical guidelines" (EMCDDA 2021; p. 5).

Regarding young people, 9.2% of 16-year-old European students reported lifetime use of PSWMP in 2019, with a higher prevalence among females, and also reported different reasons for use (ESPAD Group 2020).

Over the past 20 years, numerous studies have explored the non-medical use of pain relievers, sedatives, tranquilizers, and stimulants among adolescents. With respect to stimulants (e.g., methylphenidate), they are usually prescribed in order to treat attention-deficit/hyperactivity disorder (ADHD) symptoms and obesity (EMCDDA 2021; Kroutil et al. 2006; Rubia et al. 2014; Manos et al. 2017; Bocarsly 2018; Wilens and Kaminski 2019).

A growing number of studies have investigated the prevalence of PSWMP consumption, considering the increase in both medical prescription of stimulant drugs and their availability (EMCDDA 2021; Kroutil et al. 2006; Manos et al. 2017; Smith and Farah 2011; Weyandt et al. 2016). For example, in Italy, methylphenidate was prescribed to 7.2 per 1000 of those under 18 years of age in 2022 (last year available), with

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an increase of 14.8% from 2021 to 2022 and 24.3% from 2020 to 2021.

Regarding the use of PSWMP, previous studies among youth reported that last-year prevalence ranged from 1.7% to 3.0% (Young et al. 2012), while other research also documented that PSWMP are widely available on college campuses for non-medical use, owing in part to their pharmacological properties as stimulant drugs (Arria et al. 2008; Rabiner et al. 2009; Wilens et al. 2008).

To our knowledge, most studies on this topic have been conducted among college students (Faraone et al. 2020; Carolan 2022), and the use of PSWMP among adolescents is largely unknown. Moreover, the majority of studies have been conducted in a US context, thus highlighting a lack of information on the use of PSWMP among European adolescents (Perlmutter et al. 2018). Since adolescents may be more vulnerable to the use of PSWMP, dedicated prevention programs could be helpful in discouraging the consumption of this pharmaceutical drug category (LaBossier and Hadland 2022). According to what has been discussed above, collecting representative and statistically reliable data regarding the prevalence of consumption may aid in the development of effective interventions and prevention programs (Kaye and Darke 2012).

To date, no data have been reported regarding the trend in PSWMP consumption among adolescents, and the use of population surveys could be considered a reliable means for addressing this gap in research (EMCDDA 2021). In keeping with this, school surveys may provide a valuable instrument to monitor and estimate changes occurring in the school population, especially considering how adolescence is considered a sensitive period for engagement in risky behaviours (Hurrelmann and Richter 2006; Blakemore and Mills 2014; Pozuelo et al. 2022). Notably, school survey data may represent a fundamental source of information with important public policy implications for needs assessment and agenda-setting, as well as for policy and prevention strategy formulation and evaluation (United Nations Publication 2003).

In light of all the above, based on 17 consecutive years of a national school survey in Italy (ESPAD® Italia project), the main purpose of this study is to provide national estimates of the prevalence of PSWMP use among school-aged adolescents, as well as to assess whether the prevalence has changed significantly between 2007 and 2023. For a better description of trends, a secondary objective is to examine the differences in the prevalence of PSWMP consumption by gender.

Methods

Procedure and participants

Data reported in this study are drawn from the ongoing national monitoring system ESPAD® Italia, a cross-sectional study carried out by the Institute of Clinical Physiology of the Italian National Research Council among Italian secondary high school students each year since 1999. In Italy, ESPAD® Italia is the only nationally representative survey that collects comparable data among 15- to 19-year-old students to monitor trends in psychoactive substance use and other risk behaviours. A multistage stratified random sampling is used, with school classes as the last sampling unit. Data are collected through an anonymous questionnaire in the classroom setting using a mixed administration mode (paper-and-pencil or computer-based) under the same conditions as an exam. Participation is voluntary, and pupils can decide not to take part or to withdraw at any time. More detailed information about the sample, data collection, and questionnaire is provided elsewhere (ESPAD Group 2021). The study respects the European and national ethics rules and received ethical approval (no. 0027159/2019) by the CNR Research Ethics and Integrity Committee.

For the present analysis, we used data from 16 consecutive data collection waves (2007–2023). The prevalence of substance use was measured every year using the same methodology. Conducting these cross-sectional studies repeatedly over time enables the evaluation of changes that have occurred within the same student population segment across different years. The 2020 data required an exception due to the severe disruption caused by COVID-19, which made it impossible to reach all sampled schools. As a result, the selected schools were asked to participate on a voluntary basis, and 78 schools agreed to take part. The questionnaire was administered online and the students responded from their homes during an hour of remote teaching. Despite the restrictions, the methodological adaptations (web-based questionnaire and distance learning setting for administration) have made it possible to obtain a large number of respondents, although, given these changes, the data collected with ESPAD#iorestoacasa2020 cannot be considered completely representative of the Italian high school student population and they are not directly comparable with ESPAD® Italia data collected in previous waves. Sample characteristics are reported in Table 1.

Measures

Indicators of PSWMP consumption patterns were identified using the question from the ESPAD® Italia questionnaire: "On how many occasions have you used pharmaceuticals for attention and/or hyperactivity without a medical prescription?" Since treatment with psychostimulants is still the standard pharmacological therapy for attention and hyperactivity deficits (NICE 2019; CADDRA 2020; and based on previous research (Colaneri et al. 2017; Faraone et al. 2020), we considered its use out of medical prescription as an indicator of PSWMP. The use of PSWMP can be measured in

Table 1 Samples characteristics

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020[c]	2021	2022	2023
No.	38,681	32,461	25,555	33,739	31,696	32,564	30,091	30,588	15,114	15,189	15,732	26,606	6027	12,237	12,406	12,225
Age (mean ± SD)	17.2 ± 1.6	17.1 ± 1.6	17.1 ± 1.4	17.1 ± 1.4	17.1 ± 1.4	17.1 ± 1.4	17.1 ± 1.4	17.1 ± 1.4	17.0 ± 1.4	17.0 ± 1.4	17.0 ± 1.4	17.0 ± 1.4	16.9 ± 1.4	17.0 ± 1.4	16.9 ± 1.4	16.9 ± 1.4
Gender (male)	49.0%	49.2%	47.9%	50.0%	50.1%	51.3%	50.9%	51.5%	50.8%	53.0%	49.1%	53.3%	52.4%	51.0%	50.9%	50.1%
No. of Schools[a]	497	422	337	435	410	416	405	408	203	205	204	348	78	136	142	146
Response rate[b]	85.8%	85.7%	86.2%	89.0%	92.0%	85.0%	85.0%	87.7%	85.0%	85.0%	85.0%	85.0%	35.0%	85.2%	85.0%	85.0%

[a]Total number of participating schools

[b]Response rate of schools participating in the survey

[c]Cannot be considered completely representative

terms of prevalence (the proportion of a defined population who have consumed them once or more in a given time interval) or in terms of frequency (how many times they have consumed them in a defined time interval). In this study, both of these important aspects of substance use are addressed in relation to each of the three time frames considered in the ESPAD study—lifetime (LT), past 12 months (LY), and past 30 days (LM)—and current frequent use (F). We also examined how the prevalence of use varies between gender groups. To analyse PSWMP prevalence of use among adolescents, information about lifetime, last-year, and last-month use variables were obtained through the questions ''On how many occasions (if any) have you used …?'' in the lifetime, last year, and last month, respectively, with response categories: ''never, once or twice, 3–9 times, 10–19 times, and 20 times or more''. Following the definition proposed by the Monitoring the Future study (Johnston et al. 2010), respondents were considered current frequent users if they indicated that they had consumed PSWMP on 10 or more occasions in the previous 30 days.

Statistical analysis

Prevalence rates, with a 95% confidence interval, for lifetime, last year, last month, and frequent use were computed using Stata version 13 for Windows (StataCorp 2001). Chi-square analyses were used to test the prevalence for gender differences. Statistical significance was set at $p = 0.05$ (two-tailed). Tests for linear trend in proportion were performed using the Royston ptrend test in the Stata module for trend analysis.

Results

The prevalence of PSWMP use for boys and girls is reported in Table 2. From 2007 to 2023, the prevalence of lifetime consumption of PSWMP showed a fluctuating trend among both male and female participants. The prevalence among males ranged between 4.2% and 4.9% until 2016; in 2017 they rose to 5.8% (maximum prevalence) and then dropped steadily until 2021, the year in which the minimum prevalence (1.4%) was observed, and in 2022 a strong increase was detected compared to the previous year (4.2%). A similar trend, but with higher prevalence, was observed among females.

A fluctuating trend was also observed in last-year prevalence for both genders, with maximum and minimum prevalence observed in 2017 and 2021, respectively (male: 3.3% and 0.9%; female: 4.1% and 1.5%). Among males, the prevalence of last-month consumption increased until 2010, then ranged from 1.9% to 2.2% until 2017, with the lowest values (from 0.7% to 1.2%) recorded between 2018 and 2022.

Table 2 Prevalence (95% CI) of PSWMP use (lifetime, last year, last month, and frequent use) in Italian students aged 15–19 years (%)

		2007	2008	2009	2010	2011	2012	2013	2014		
Male	Lifetime	4.2 (3.9–4.5)	4.9 (4.6–5.2)	4.5 (4.1–4.8)	4.8 (4.4–5.2)	4.5 (4.1–5.0)	4.3 (4.0–4.7)	4.7 (4.4–5.1)	4.2 (3.9–4.5)		
	Last year	2.2 (2.0–2.4)	2.7 (2.4–2.9)	2.4 (2.1–2.6)	2.9 (2.6–3.3)	2.6 (2.3–3.0)	2.8 (2.5–3.0)	2.8 (2.5–3.0)	2.5 (2.3–2.8)		
	Last month	1.4 (1.3–1.6)	1.6 (1.5–1.8)	1.7 (1.5–1.9)	2.1 (1.9–2.4)	1.9 (1.6–2.2)	2.0 (1.8–2.2)	1.9 (1.7–2.1)	1.8 (1.6–2.0)		
	Frequent	0.4 (0.3–0.5)	0.5 (0.4–0.6)	0.7 (0.6–0.8)	0.8 (0.6–1.0)	0.8 (0.6–1.1)	0.9 (0.7–1.0)	0.8 (0.6–0.9)	0.7 (0.6–0.8)		
Female	Lifetime	5.9 (5.6–6.3)	6.2 (5.8–6.5)	6.8 (6.5–7.2)	6.2 (5.8–6.6)	6.3 (5.7–6.9)	5.4 (5.1–5.8)	5.9 (5.6–6.3)	5.9 (5.5–6.3)		
	Last year	2.9 (2.7–3.2)	3.0 (2.8–3.3)	3.5 (3.2–3.8)	2.9 (2.6–3.1)	3.3 (2.9–3.8)	2.9 (2.7–3.2)	3.2 (2.9–3.5)	3.2 (2.9–3.5)		
	Last month	1.6 (1.4–1.7)	1.7 (1.5–1.9)	1.9 (1.7–2.1)	1.6 (1.4–1.9)	2.0 (1.7–2.3)	1.8 (1.6–2.0)	2.0 (1.8–2.2)	1.9 (1.7–2.1)		
	Frequent	0.3 (0.3–0.4)	0.3 (0.3–0.4)	0.4 (0.3–0.5)	0.4 (0.3–0.5)	0.5 (0.4–0.7)	0.5 (0.4–0.6)	0.6 (0.5–0.7)	0.5 (0.4–0.6)		
		2015	2016	2017	2018	2019	2020[a]	2021	2022	2023	ptrend
Male	Lifetime	4.9 (4.4–5.4)	4.4 (3.8–5.0)	5.8 (5.3–6.3)	4.3 (3.9–4.8)	2.5 (2.1–2.8)	2.7 (2.2–3.4)	1.4 (1.1–1.8)	4.2 (3.7–4.8)	4.6 (4.1–5.2)	< 0.001
	Last year	2.9 (2.5–3.4)	2.5 (2.0–2.9)	3.3 (2.9–3.7)	2.4 (2.1–2.8)	1.4 (1.2–1.7)	1.4 (1.0–1.9)	0.9 (0.6–1.2)	2.0 (1.7–2.4)	2.8 (2.4–3.3	< 0.001
	Last month	2.2 (1.8–2.5)	1.8 (1.4–2.2)	1.9 (1.6–2.2)	1.2 (1.0–1.5)	0.8 (0.6–1.0)	0.7 (0.4–1.0)	0.7 (0.5–0.9)	1.1 (0.9–1.4)	1.6 (1.3–1.9)	< 0.001
	Frequent	0.9 (0.7–1.2)	0.7 (0.5–1.0)	0.6 (0.4–0.8)	0.3 (0.2–0.4)	0.3 (0.2–0.4)	0.1 (0.0–0.3)	0.3 (0.2–0.5)	0.4 (0.3–0.6)	0.6 (0.4–0.9)	0.024
Female	Lifetime	6.8 (6.3–7.5)	6.3 (5.7–7.0)	8.0 (7.4–8.7)	6.1 (5.6–6.7)	5.5 (5.0–6.1)	3.6 (2.9–4.3)	2.9 (2.4–3.4)	7.8 (7.1–8.5)	6.8 (6.1–7.4)	0.575
	Last year	3.5 (3.1–4.0)	3.4 (2.9–3.9)	4.1 (3.7–4.6)	3.9 (3.5–4.4)	3.0 (2.6–3.4)	2.0 (1.6–2.7)	1.5 (1.2–2.0)	4.0 (3.5–4.6)	4.2 (3.7–4.7)	0.001
	Last month	1.8 (1.5–2.1)	2.0 (1.7–2.5)	2.4 (2.1–2.8)	1.9 (1.6–2.2)	1.7 (1.4–2.1)	0.7 (0.4–1.1)	0.9 (0.7–1.3)	2.3 (1.9–2.8)	2.7 (2.3–3.2)	0.001
	Frequent	0.4 (0.3–0.6)	0.6 (0.4–0.8)	0.6 (0.4–0.8)	0.4 (0.3–0.6)	0.5 (0.4–0.7)	0.1 (0.0–0.2)	0.1 (0.1–0.3)	0.4 (0.2–0.6)	0.9 (0.7–1.2)	0.002

[a]Cannot be considered completely representative

p-value for departure from linear trend: all < 0

Among females, last-month prevalence ranged from 1.6% to 2.0% until 2019, with the exception of 2017, the year in which the prevalence was highest (2.4%); the lowest values were observed in 2020 and 2021 (0.7% and 0.9%, respectively). Finally, frequent use showed a fluctuating trend, particularly among males; among females, the prevalence ranged from 0.3% to 0.6% with the exception of 2020 and 2021, years in which the prevalence was very low (0.1%) (Table 2).

A noticeable disparity between genders is apparent in terms of the prevalence of PSWMP across the years considered. Considering lifetime usage and last-year usage, a clear gender gap exists, except for the years 2010 and 2012. Specifically, females consistently exhibited significantly higher levels of PSWMP consumption during their lifetime than males throughout the examined years (e.g., 2019: males 2.5%; females 5.5%, $p < 0.001$).

Although gender differences in last-month prevalence were less pronounced, they varied across years, with higher rates observed in males in some years and in females in others. Notably, from 2017 to 2023, the disparities became more prominent, particularly in 2019 and 2022, where the prevalence of PSWMP in females was double that of males.

Males exhibited a higher prevalence of frequent PSWMP usage in all the years considered except for the 2017, 2018, 2019, and 2023 waves, when the differences varied depending on the surveys. During those years, the disparities in the prevalence of frequent usage were either evident or negligible. In particular, in 2010, the prevalence of frequent PSWMP usage among males was double that of females.

Discussion

The present study provides detailed insight into temporal trends in the yearly national prevalence of PSWMP consumption among adolescent students over a period of 17 years. The findings suggest that PSWMP use is rather widespread among Italian high school students. Over the past 17 years, there have been several changes, even if it does not seem to be a growing phenomenon.

A summary of major findings on past-year prevalence of PSWMP among US adolescents (aged 12–17) shows a range of 1.7–3.0% (Young et al. 2012). The review includes articles published from 2006 to 2010; in these years the Italian prevalence (aged 15–19) varied between 2.6% and 3.0%. The increase in consumption from 2021 to 2022 observed in this study is consistent with the growth in methylphenidate prescriptions in those under 18 years of age documented by the AIFA report. That report highlights potential associations between the use of PSWMP and the use of prescribed pharmaceutical stimulants with medical use (Boyd et al. 2006). Furthermore, empirical evidence suggests that an increase in the medical use of prescription medications will lead to increases in misuse and/or the non-medical use of these drugs (Dasgupta et al. 2006; Zacny et al. 2003; Francis et al. 2022; Baroni et al. 2023). In light of this expected growth, close surveillance of PSWMP consumption by researchers and public health professionals in the coming years is warranted. As reported by Arria and DuPont (2010), who summarized various research findings on the non-medical use of prescribed stimulants, consumption among adolescents is particularly relevant. This behaviour often leads to over-consumption of alcohol, including binge drinking and meeting the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (DSM-IV) criteria for alcohol abuse and dependence. Furthermore, it is associated with illicit drug use in the past year, such as marijuana, cocaine, ecstasy, and non-heroin opiates (Arria and DuPont 2010). A recent publication on Italian students also showed an association with other risk behaviours such as psychoactive substance use, gambling, and Internet involvement (e.g., cyberbullying) (Baroni et al. 2023).

Finally, our results confirm previous findings about gender differences (ESPAD Group 2020), showing a higher prevalence of use among female adolescents. However, concerns remain valid for both genders, as the male prevalence of consumption is nonetheless significant, and women who consume PSWMP appear to present greater associations with negative consequences and other unhealthy behaviours (McHugh et al. 2018). Gender differences in the non-medical use of pharmaceuticals for attention are complex and multifaceted, influenced by psychological, social, and cultural factors. Patterns of alcohol or other drug use (Baroni et al. 2023), which can differ by gender, may also play a role in the misuse of pharmaceutical stimulants. Women are more likely to obtain prescription medications from healthcare professionals, which could influence their non-medical use patterns (Milani et al. 2020). Furthermore, this access may lead to a higher availability of medications for non-medical use. Women are more likely to experience mood disturbances and have higher rates of anxiety and depression, which might increase their likelihood of using medications for attention without a prescription (Crouch et al. 2022). Regarding the current use of PSWMP, to our knowledge, this is the first study that provides data on long-term prevalence among a representative sample. Moreover, the prevalence of frequent last-month use ranged from 0.8% to 2.1% over the 17-year period, highlighting the importance of ongoing surveillance of this consumption behaviour.

Among further measures that might be considered to minimize this identified risk, it is also important to study the non-medical use of other prescription drugs. Policymakers should consider the development of information and educational programs aimed at increasing public awareness, i.e., developing educational programs that inform adolescents about the risks associated with stimulant misuse.

Intensifying and expanding awareness campaigns, particularly in schools where the actual risk groups can be reached, holds the potential for a more effective impact in addressing this issue. It would also be desirable to conduct regular evaluations of prevention programs to ensure they are effective and tailored to the needs of adolescents.

Study limitations

As in all similar surveys, percentages must be interpreted with caution, as these are self-reported values. Survey measurements of such highly sensitive or stigmatized behaviours may generate inaccurate reporting and bias in survey estimates. A discussion of potential biases in self-reporting substance use is provided elsewhere (Harrison 1997). School-based surveys provide prevalence estimates of substance use among a very broad population but do not capture youth who have already dropped out of school, which may presumably be at higher risk (Bauman and Phongsavan 1999).

Study strengths

The strengths of our survey include the representativeness of the Italian student population throughout 17 data collection waves, the ESPAD questionnaire agreed upon by a core of national and international experts, and the standardized measures of use. Finally, the large sample size enabled us to analyse endpoints with relatively low frequency, like the prevalence and patterns of PSWMP frequent users.

Conclusions

Over the past 17 years, the prevalence of pharmaceutical stimulant consumption without medical prescription among Italian high school students, while widespread, has not displayed significant growth. However, a notable gender gap exists in terms of usage prevalence, emphasizing the need for further research to better comprehend and explain these gender differences. The utilization of PSWMP among adolescents carries various consequences, underscoring its significance as an area of concern. Therefore, continuous monitoring of consumption is essential to effectively track the phenomenon and continually inform and update preventive interventions.

Author contributions Marco Scalese conceived and designed the study, conducted the statistical analyses, created key tables, and drafted the first version of the manuscript. Sabrina Molinaro developed the design and coordinated the study, and supervised analysis. Marina Baroni, Silvia Biagioni, Luca Bastiani, Francesca Denoth, and Sabrina Molinaro reviewed the first version of the manuscript for important intellectual content. All authors contributed intellectually to data interpretation, and finalized and approved the manuscript for publication.

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Data availability Data are unavailable.

Declarations

Institutional review board The study respects the European and national ethics rules and received ethical approval (no. 0027159/2019) by the CNR Research Ethics and Integrity Committee.

Informed consent Informed consent was obtained from all participants involved in the study.

Conflicts of interest The authors declare no conflict of interest.

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