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Emerging trends in consuming behaviours for non-controlled substances by Italian urban youth: a cross sectional study

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Abstract

Introduction. We investigated emerging trends in consuming behaviours for non-controlled substances in a cross sectional study on urban Italian adolescents and young adults, the reasons for consumption and risk perception as function of age, the relation with lifestyles and finally risk factors associated.

Methods. The survey methodology involved the administration of an anonymous questionnaire. It consisted of 68 questions, divided into five sections: personal details, socio-economic characteristics, family and peer group, free time and lifestyles, and substances use.

Results. A total of 2621 adolescents and young adults (14-35 years old) from seven different Italian cities answered the questionnaire. The substances examined were mainly used recreationally (alcohol, energy drinks and smart-drugs) or to improve physical and sexual performance (physical performance-enhancing drugs, anabolic steroids and male sexual enhancement). The knowledge of the health related harm arising from the use of these products was very high for alcohol (> 90%), high for smart-drugs (> 70%), but significantly lower for anabolic steroids, drugs for sexual enhancement (~ 60%), physical performance-enhancing drugs or energy drinks (~ 55%). The principal risks factors for consumption were: the influence of friends (OR: 8.8), attending recreational places (OR: 5.4) aged between 25-35 years (OR: 3.0), be male (OR: 2.5) and having a bad relationship with the mother (OR: 2.1).

Conclusions. These results have implication for prevention and early intervention programs of "physically and psychologically enhancing" non controlled substances use, which similarly to what is frequently advised for classical illicit drugs should focus on information campaigns and awareness initiatives especially addressed to young male adults who go clubbing, live outside the family and showed closed links with peers.

Key words

- emerging trends
- population based study
- behaviour
- Italy

INTRODUCTION

The most recent national survey conducted on 19000 Italians from 15 to 64 years old in 2012, estimated that the percentage of occasional or daily users of illegal psychotropic drugs at least once in the last 12 months showed a decreasing trend with respect to 2010. This slight decrease was observed also in 2014 for the specific case of secondary school students (from 15 to 19 years of age) for all the above-reported substances with the exception of cannabis whose consumption at least once in the last 12 months increased from 21.56 to 23.46% [1].

Unlike the decreasing use of illegal psychotropic drugs, legal addictive substances such as tobacco and alcohol together with non controlled substances such as energy drinks, smart-drugs, physical performance-enhancing drugs (anabolic steroids and male sexual enhancement products, are widespread between adolescents and young adults in western countries including Italy [2, 3].

In this concern, official reports informed that, in 2014, 19.7% from 15 to 24 years old people were tobacco smokers with 1.3% youngsters smoking more than 25 cigarettes/day, with the percentage of young smokers

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stable around 19% since the previous five years [4].

Likewise, in 2014, 21.5% adolescents and 74.3% young adults drunk at least one alcoholic beverage during the year with a decreasing trend since the previous 10 years (32.1 and 82.1% respectively), with 15.5% risk behaviors (*e.g*, binge drinking) prevailing in 18-24 years old youngsters [5].

In contrast from the detailed information on tobacco and alcohol consumption, few data are available concerning the consumption of energy drinks [6, 7], smart-drugs [8-10] and physical and sexual [11] performance enhancers by Italian adolescents and young adults.

In particular, a first recent study showed that nearly 68% of 616 interviewed Italian adolescents drunk at least a whole can of energy drink during their life, and about 55% reported consuming energy drinks during the previous 30 days before the survey [6]. Moreover, a study conducted during the 2011-2012 in the Veneto Region (northeastern Italy), demonstrated that the energy drinks use increased significantly with age, going from 17.8% among sixth graders to 56.2% among eighth graders [7]. Similarly, in 2013 smart-drugs (defined as club drugs and novel psychoactive substances) misuse was monitored through a self-administered questionnaire proposed to subjects 18-30 years old at the entrance of 5 nightclubs in Rome proving that 78% of respondents had a lifetime history of use of new psychoactive drugs such as amyl nitrite (45%), synthetic cannabinoids (35%), lysergic acid diethylamide (LSD) (24%), mephedrone (18.8%), ketamine (18%), Gamma-hydroxybutyrate (GHB) (10.2%), psilocybin (4%), and *Salvia divinorum* (3.2%), with 39% having used them in the 12 hours preceding questionnaire administration [8]. Unfortunately, there is no information about the "recreational" use of sildenafil or other sexual enhancement products in young men in Italy. However, an American study reported that about 21.5% of 321 healthy men between 18 and 30 years old interviewed from August to November 2009, used a phosphodiesterase type 5 inhibitors recreationally [11].

What it is known is that the majority of these products can be bought from internet web sites anonymously, with the risk of buying something different, counterfeit or completely fake; caffeinated energy drinks are often mixed with alcoholic beverages with increased risk of binge drinking, impaired driving, risky sexual behavior, and decreased perceived intoxication [12]; and male sexual enhancement products (*e.g.* sildenafil) have been used concomitantly with cocaine with severe cardiovascular effect [13, 14].

Finally, whereas the socio-familiar factors related to the initiation to tobacco smoke or to the alcohol drinking are well known and proved to be supported by peers and friends [15, 16], nothing is known about predictors of non controlled substances use.

At the end of 2011, the Italian Youth Department funded the National Institute of Health (Istituto Superiore di Sanità, ISS) to perform a population-based survey. The aim of the study was to fill the gaps in knowledge of a phenomenon that lies somewhere between a new trend of substance consumption to generally improve performance and new forms of addiction to psychoactive substances and misuse of physical and sexual enhancers potentially harmful to the health of youngsters.

In this paper we present the results of the survey concerning the emerging trends in consuming behaviours for non-controlled "physically and psychologically enhancing" substances in adolescents and young adults, the reasons for consumption and the perception of the risk as function of age, the relation with lifestyles and finally associated risk factors to these new trends of consumption.

METHODS

Sampling and subjects

The project was a multidisciplinary, multicentric, cross-sectional study carried out in 6 Italian cities during August 2013-March 2014: Turin (Northern peninsula), Pistoia, Ascoli Piceno and Rieti (central peninsula), Olbia (Sardinia Island) and Lecce (Southern peninsula). The choice of the above-reported cities was carried out considering the capillary knowledge of the area by the interviewers. In each city, well known recreational premises (discos or other recreational sites, *e.g.* pubs, night bars, etc.) and schools which accepted to participate were included. The total sample size was set at 2500 subjects of both sexes, and a sampling design proportionally stratified by sex, age group and area of investigation was selected. Apart from the above reported characteristics, no other inclusion or exclusion criteria were considered.

The indicator chosen to define the number of subjects to be interviewed in each city was detected in the percentage of subjects consuming at least one of the substances under investigation. For each city (where estimated population from 14 to 35 years of age was around 10 000 persons) the sample size, established in 417 subjects stratified by gender and age group allowed with a probability of 95% estimates of consumers [17, 18].

Questionnaire

Eligible individuals were briefed about the purposes of the study and subsequently received a sealed envelope containing an informed consent form and a questionnaire. Participants signed the informed consent and a parental written informed consent was necessary for the subjects under 18 years of age. The study was approved by the Institutional Ethical Committee and conducted in accordance with the Declaration of Helsinki. The questionnaire was prepared *ad hoc* modifying in some points the one in the previous survey carried out in 2009 (the questionnaire is available as Supplementary Material in Italian at www.iss.it/anna, authors can provide an English translation if necessary).

For individuals older than 18 years of age, questionnaires were administered at recreational premises such as discos or other recreational sites (*e.g.* pubs, night bars, etc.).

The questionnaire consisted of 68 questions divided into five different sections:

1. personal details: gender, place and date of birth and educational level;

2. socioeconomic characteristics as occupational status or eventual job type;

3. family and peer group. The respondents were asked with whom they live at the moment (*e.g.* mother, father, friends. In this section they were also asked about their relationship with each of the parents or the partner, their relationship with the friends (complicity, enjoyment, affection, safeness);

4. typical free-time (meaning in the recent years, depending on the age of responder). In this section respondents were asked how they spent their free time (*e.g.* watching television, with friends, with family, going to the bar or the discotheque or any recreational place, going to gym;

5. typical Lifestyle and substances use at least once in the lifetime. This was the main section of the questionnaire. Respondents were asked about their possible drinking pattern (frequency of alcohol drinking, type of alcoholic beverage, reasons to drink alcohol, with who and where they drink alcohol, their knowledge about the associated risks). Similar questions were asked for energy drinks, smart-drugs, physical performance-enhancing drugs, anabolic steroids and male sexual enhancement products. For all these last substances, the source of supply was also investigated. The eventual substances consumption was referred to once in a lifetime.

It has to be specified that the questions regarding substances were general, just the class of substances was mentioned and not the specific compounds, which were listed by the interviewer only if required.

In order to investigate the risk perception associated to substances consumption, responders were asked to assert their knowledge regarding health related harm for all the considered substances.

Questions with multiple answers were formulated by an expert team which included psychologists, sociologists, statisticians and pharmacologists coordinated by the study group of National Institute of Health.

Substances under investigation

The substances under investigation were the following: alcohol, caffeinated energy drinks (beverages that contain from 80 to 500 mg caffeine per drink plus taurine, guarana, amino acids, vitamins and sugar, promoted as being beneficial in increasing stamina and improving physical performance, endurance and concentration), physical performance enhancers (proteins powders, carnitine, creatine, branched-chain amino acids), smart-drugs (*e.g.* herbal products with psychoactive principles, new designer drugs, legal highs typically freely sold on internet web sites and not in the list of prohibited substances under law control in Italy at the time of the study) drugs for sexual enhancement (*e.g.* sildenafil, vardenafil, tadalafil and drugs sold in smart or sex shops as sexual enhancers), and finally anabolic steroids (possibly obtained by prescription or directly by internet web sites).

We chose the above reported groups of substances that seem to have in common the notion that they are legal "physically and psychologically enhancing" substances and the fact they are declared as the most commonly used by adolescents and young adults.

In this concern, it has to be said that they are legal in a deeply different sense.

In the case of fosfodiesterase-5-inhibitors (as sexual enhancers) and anabolic steroids (as physical enhancers), they are therapeutics and their use is subordinated to medical prescription; moreover, being scheduled as doping drugs, the use of anabolic steroids as "physical enhancers" is strictly forbidden. Nonetheless, they are freely sold on internet web sites and easily available for purchase.

The definition "Smart-drugs" was the one reported in the technical books published by the Italian National Institute of Health and at the time of interviews [19, 20] and the best known by interviewed population to define herbal products with psychoactive principles (*e.g. Salvia Divinorum* or "Spices") and new psychoactive substances (*e.g.* synthetic cathinones or new designer drugs) legal in a transient sense since they are quickly scheduled as soon as are seized or when their health risk is disclosed. Nonetheless, also in this case they are freely sold on internet web sites and easily available for purchase.

Finally, physical performance enhancers enlisted in the study are in fact dietetic commodities and are usually defined as "non-banned performance-enhancing products" to distinguish them from anabolic steroids and the other "banned performance-enhancing products". However, since used without medical prescription they can present health risks, especially in the eventual association with anabolic steroids.

Data analysis

Statistical analyses were carried out using the SPSS software package release 18.0 [21] the R software package release 2.8.1 [22] the Confidence Interval Analysis software package release 2.0.0 [23] and the StatsDirect software, release 2.8.0 [23]. Frequencies and percentages (%) were calculated for all the categorical variables. Associations between the prevalence of substances consumption and habits/behaviour (sport, disco, friendship, parental relationship, etc.) of respondents were performed using the Pearson Chi-Square test ($\chi 2$) or the Fisher's exact test, as appropriate. The estimation of the risk factors of substance consumption was assessed using a logistic regression model. The covariates included in this model were selected using a bivariate analysis using the Pearson Chi-Square test ($\chi 2$). The odds ratio were used to determine whether a particular exposure was a risk factor for a particular outcome, and to compare the magnitude of various risk factors for that outcome [25]. A p-value < 0.05 was used to establish statistical significance.

Furthermore, the associations between substances and lifestyles were investigated. The respondents were divided into groups and subgroups: 1) performing sports (regularly, irregularly or not performing); 2) going to disco or other recreational places (yes or no); 3) browsing Internet to know about and/or to purchase the substances (yes or no); 4) being influenced by friends in the knowledge and consumption of these substances (yes or no); 5) parents' status (married/partnership,

separated, deceased); 6) relationship with the parents (excellent/good or bad with the mother, with the father or both). Associations between the prevalence of substance consumption and habits/behaviour (sport, disco, friendship, parental relationship, etc.) of respondents were performed using the Pearson Chi-Square test ($\chi 2$) or the Fisher's exact test, as appropriate. A p-value < 0.05 was used to establish statistical significance.

Finally, the prevalence of polyconsumption with respect to the different associations with the analyzed substances, alcoholic beverages, energy drinks, smart-drugs, dietary supplements and anabolic steroids was performed using the Chi-Square Test (χ^2) for the analysis of independent proportions. If it was not applicable, the analogous non-parametric Fisher's Exact Test was used. A p-value < 0.05 was used to establish statistical significance.

RESULTS

Prevalence in "physically and psychologically enhancing" non controlled substances use and perceived risk

A total of 2621 participants aged 14-35 years completed the questionnaire with 100% response rate (*Table 1*).

The most consumed "physically and psychologically enhancing" non controlled substance was alcohol followed by energy drinks, physical performance enhancers, smart-drugs, sexual enhancers and finally anabolic androgenic steroids (*Table 2*). Age influenced alcohol use, being minimum during adolescence and maximum in young adults (18-24 years of age) with a prevalence of male consumption after adolescence (*Table 2*). Conversely, in case of energy drinks, the consumption trend was maximum during the adolescence, but it was still a prevailing male use. Surprisingly, physical performance enhancers were similarly used by both males and females with a significant decrease in the percentage of consumers just in young male adults. Whereas smart-drugs were similarly consumed by males of any age group, adolescent females use was significantly higher than that by older peers. Drugs for sexual enhancement were exclusively used by males with a statistical increase in the oldest age group. Finally, anabolic androgenic steroids were used by around 2% of the male responders with no difference between the age groups, while in case of females the greatest consumers were the adolescents compared to older peers (*Table 2*).

Multiple reasons were proposed for the use of legal recreational substances (*Table 3*).

Table 1
Number of individuals participating in the survey as for each age group

Class age	Males	Females	Total
14-17	216	188	404
18-24	387	394	781
25-29	292	292	584
30-35	420	432	852
Total	**1315**	**1306**	**2621**

In case of alcohol, the main reason for drinking and far superior to the others was "to have fun without overdoing" in case of all age groups. Just in case of the older age group the reason of having fun overlapped with the tendency to accompany the meals Similarly, the main reason to consume energy drinks was the nice taste, especially in case of adolescents (81.9%). Physical performance enhancers were considered products to both, replace physiological and nutritional shortcomings and to improve physical performance with highest and lowest percentage in the oldest age group, respectively. Smart-drugs were principally employed to feel emotions and energy, while drugs for sexual enhancement were clearly used for their medical indication. Surprisingly, in this latter case with the exception of 25-29 years age group, all the other males declared not only a self-administration but also a medical prescription from a doctor. Finally, respondents declared the use of androgenic anabolic steroids first to enhance their physical performance and second to supplement for nutritional or physiological deficiency Alcohol was correctly perceived as a most dangerous legal recreation substance by more than 90% males and females of the all age groups, followed by smart-drugs, androgenic anabolic steroids and drugs for sexual enhancement, energy drinks and physical performance enhancers (*Table 4*). Adolescents generally showed a trend toward lower perception of health related harm for all the considered substances compared to older peers.

Associations between consumption of legal recreational substances, lifestyles and relationships

The consumption of alcoholic beverages was associated (with p-value < 0.001): with going to disco or to other recreational places (95.5% clubbers *vs* 63.2% responders who did not attend any place), with browsing Internet to know about and/or to purchase the substances (76.7% users *vs* 68.6% non users) and with the influence of informed friends and users of these substances (88.0% influenced by peers *vs* 19.4% responders not influenced by friends).

The use of energy drinks was associated (with p-value < 0.001): with going to disco or to other recreational places (31.8% clubbers *vs* 16.6% responders who did not attend any place) and with the influence of informed friends and users of these substances (22.6% influenced by peers *vs* 12.9% respondents not influenced by friends).

Conversely, the intake of physical performance enhancers was related (p-value < 0.001) only with sport performing (20.8% regular performers *vs* 10.0% irregular performers and 8.1% not performing any sport).

The consumption of smart-drugs was associated (p-value < 0.001) with: going to disco or to other recreational places (6.3% clubbers *vs* 2.1% of respondents who did not attend any place), with browsing Internet to know about and/or to purchase the substances (5.1% users *vs* 2.3% non users), with the influence of friends with the knowledge and users of substances (those affected by the friends had a higher prevalence of being consumers of smart-drugs - 3.9% compared with 0.8% of the respondents who claimed not to be affected), and with the relationship with parents (those with a bad relationship with

Table 2
Prevalence of "at least once in the lifetime" use of legal recreational substances as age function

	Age (years)				
Alcoholic beverages	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
Males	58.3	85.8	82.9	83.1	79.8
P-value (14-17 *vs* others)	-	**< 0.001**	**< 0.001**	**< 0.001**	
Females	56.4	65.0	66.4	58.3	61.9
P-value (14-17 *vs* others)	-	**0.046**	**0.026**	**0.651**	
Total	57.4	75.3	74.7	70.5	70.9
P-value (14-17 *vs* others)	-	**< 0.001**	**< 0.001**	**< 0.001**	
Energy drinks	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
Males	40.7	30.5	27.4	22.1	28.8
P-value (14-17 *vs* others)	-	**0.011**	**0.002**	**< 0.001**	
Females	20.7	12.4	12.3	5.8	11.4
P-value (14-17 *vs* others)	-	**0.009**	**0.013**	**< 0.001**	
Total	31.4	21.4	19.9	13.8	20.1
P-value (14-17 *vs* others)	-	**< 0.001**	**< 0.001**	**< 0.001**	
Physical performance enhancers	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
Males	19.9	12.1	15.1	16.0	15.3
P-value (14-17 *vs* others)	-	**0.010**	**0.152**	**0.212**	
Females	12.2	12.2	11.6	16.0	13.3
P-value (14-17 *vs* others)	-	**0.986**	**0.845**	**0.229**	
Total	16.3	12.2	13.4	16.0	14.3
P-value (14-17 *vs* others)	-	**0.047**	**0.192**	**0.866**	
Smart drugs	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
Males	4.6	6.5	3.1	3.6	4.5
P-value (14-17 *vs* others)	-	**0.357**	**0.364**	**0.516**	
Females	6.9	1.0	1.4	0.2	1.7
P-value (14-17 *vs* others)	-	**< 0.001**	**0.001**	**< 0.001**	
Total	5.7	3.7	2.2	1.9	3.1
P-value (14-17 *vs* others)	-	**0.115**	**0.004**	**< 0.001**	
Drugs for sexual enhancement	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
Males	2.3	1.0	1.7	6.9	3.3
P-value (14-17 *vs* others)	-	**0.214**	**0.629**	**0.015**	
Anabolic androgenic steroids	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
Males	1.4	2.3	1.4	2.1	1.9
P-value (14-17 *vs* others)	-	**0.430**	**0.986**	**0.508**	
Female	1.6	0.0	1.0	0.2	0.5
P-value (14-17 *vs* others)	-	**0.012**	**0.584**	**0.051**	
Total	1.5	1.2	1.2	1.2	1.2
P-value (14-17 *vs* others)	-	**0.627**	**0.698**	**0.646**	

Table 3
Reasons for consumption of legal recreational substances as age function (multiple answers) expressed as percentage of chosen answers

	Age (years)				
Alcoholic beverages	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	
To have with meals	19.0	27.2	39.2	56.7	38.6
To have fun without overdoing	76.7	82.1	78.9	60.7	73.8
To get high	10.3	6.3	5.0	3.5	5.6
To forget problems	8.6	2.6	1.4	3.0	3.2
Energy drinks	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
I like them. They are tasty	81.9	68.3	62.9	63.6	69.3
I like them. They give me emotions	6.3	4.2	9.5	9.3	7.0
I need them to feel myself alive	3.9	10.8	10.3	15.3	10.0
My friends pushed me to consume	0.8	1.8	1.7	0.0	1.1
Physical performance enhancers	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
To replace physiological and for nutritional shortcomings	54.5	66.3	64.1	73.5	66.4
To improve my performances	36.4	30.5	37.2	22.1	29.9
To improve my physical appearance	9.1	9.5	7.7	8.8	8.8
Smart-drugs	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
I like them. They give me energy	39.1	17.2	15.4	12.5	22.2
I like them. They give me emotions	39.1	44.8	69.2	43.8	46.9
I need them to face my problems	17.4	0.0	7.7	18.8	9.9
They help me in socializing	0.0	10.3	7.7	12.5	7.4
My friends pushed me to consume	4.3	24.1	7.7	18.8	14.8
Drugs for sexual enhancement	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
They were prescribed by the doctor	20.0	25.0	0.0	24.1	20.9
To enhance my sexual performances	80.0	75.0	80.0	72.4	74.4
No answer	0.0	0.0	20.0	3.4	4.7
Androgenic anabolic steroids	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
To replace physiological and for nutritional shortcomings	16.7	44.4	42.9	20.0	31.3
To improve my performances	100.0	44.4	14.3	50.0	50.0
To improve my physical appearance	0.0	11.1	57.1	40.0	28.1

their mother had a higher prevalence of being consumers of smart-drugs - 6.4% compared to 4.4% of those with a bad relationship with the father and 2.1% of those who have a good/excellent relationship with both parents).

Unlike other investigated substances, the consumption of drugs for sexual enhancement was not associated with a specific lifestyle or relation to peers.

Finally, similar to what was observed for physical performance enhancers, the use of androgenic anabolic steroids was only related (p-value < 0.001) with sport performing (2.3% regular performers *vs* 0.1% irregular performers and 0.5% not performing any sport).

Polyconsumption

There was a significant association (p-value < 0.001) between consumption of alcoholic beverages, and that of energy drinks and of smart-drugs. Also, there was a significant association (p < 0.001) between the intake of anabolic steroids and consumption of alcoholic beverages, energy drinks and smart-drugs.

Table 4
Perceived risk* for the different legal recreational substances

	Age (years)				
Alcoholic beverages	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
Males	89.8	94.1	91.1	92.1	92.1
Females	94.1	95.4	94.2	91.9	93.8
Total	91.8	94.8	92.6	92.0	92.9
Energy drinks	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
Males	48.3	58.1	59.3	57.5	56.7
Females	60.9	60.1	57.1	56.0	58.2
Total	54.3	59.1	58.2	56.7	57.4
Physical performance enhancers	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
Males	46.8	57.4	55.1	55.5	54.5
Females	51.6	58.1	58.9	59.3	57.7
Total	49.0	57.7	57.0	57.4	56.1
Smart-drugs	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
Males	56.4	65.8	75.5	67.9	67.7
Females	70.7	72.0	76.6	82.4	76.1
Total	63.8	68.5	76.0	74.1	71.4
Drugs for sexual enhancement	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
Males	50.2	63.1	65.4	65.0	62.2
Females	50.6	61.6	65.6	66.3	62.6
Total	50.4	62.3	65.5	65.7	62.4
Androgenic anabolic steroids	**14-17**	**18-24**	**25-29**	**30-35**	**Total**
	%	**%**	**%**	**%**	**%**
Males	52.3	63.6	67.5	64.3	62.8
Females	54.3	59.1	60.3	63.9	60.3
Total	53.2	61.3	63.9	64.1	61.5

*Perceived risk expressed as percentage of positive answers to the question: "are you aware about the health related harm of considered substance?".

Risk factors in legal recreational substances use

The main risk factor influencing the use of legal recreational substances was the peer pressure from informed and user friends (OR: 8.8), followed by the attendance to discos or other recreational places (OR: 5.4), being aged between 25 and 35 years (OR: 3.0), browsing Internet to know about and/or to purchase the substances, be male (OR: 2.1 and 2.5 respectively), have a bad relationship with the mother (OR: 2.1) and finally living outside the family (OR: 1.4).

DISCUSSION

The first obvious result of the present survey is that the most consumed legal recreational substance among adolescents and young adults is still alcohol, although other legal compounds are spreading [26, 27].

The first ones are certainly energy drinks and interestingly the highest percentage of use was observed in the youngest respondents (14-17 years old) characterised by the lowest consumption of alcoholic beverages [28-30]. This is probably related to the fact that alcoholic beverages are considered dangerous by the majority of young responders which replace them with non alcoholic drinks considered only slightly harmful to the health.

Furthermore, it has to be reminded that the current law on alcohol prohibits its use under the age of 18, so that its limited use in adolescence is justified by legal restriction. By the way, it has to be also noted that legal prohibition fails in making consumption in adolescence at zero value.

Nonetheless, as already demonstrated, there is a significant association between consumption of alcoholic beverages and of energy drinks [31, 32]. Thus, it is likely that with the passing of the years the two beverages are

Table 5
Risk factors in legal recreational substances use

	Odds Ratio	95% Confidence Interval		p-value
Gender				
Male	2.5	1.9	3.3	< 0.001
Age				
18-24 years old	1.8	1.2	2.6	0.002
25-35 years old	3.0	2.1	4.4	< 0.001
Family				
Living outside the family	1.4	1.1	1.9	0.015
Relationship with parents				
Bad relationship with the mother	2.1	1.4	3.2	< 0.001
Lifestyles				
Going to the disco or other recreational places	5.4	3.2	9.0	< 0.001
Browsing Internet to know about and/or to purchase the substances	2.1	1.6	3.0	< 0.001
Being influenced by friends in the knowledge and consumption of these substances	8.8	6.8	11.5	< 0.001

increasingly used simultaneously to have fun, although the Mediterranean habit of consuming alcohol with meals persists especially in the older peers [33]. A third class of legal recreation substances whose intake is associated with that of alcohol and energy drinks are smart-drugs prevalent in younger males [34, 35].

Another sizable emerging consumption is that of physical performance enhancers, which is recognized as unsafe by half of the responders and are consumed to replace "perceived" nutritional deficiency and to improve performance [36, 37]. The reason of performance increase is shared with anabolic androgenic steroids, taken by a minority of responders and with drugs for sexual enhancement, used exclusively by males with a prevalence of older peers [38-40]. Surprisingly, physical performance enhancers which are dietary supplements and both, steroids and drugs for sexual enhancement, which are medicinal are similarly perceived as harmful to the health. In addition steroids consumers are more likely to use also alcohol, smart-drugs and energy drinks.

Whereas recreational substances such as alcohol, energy drinks and smart-drugs were mainly consumed for fun, related to nightlife and associated to influence by peers and the use of internet, compounds enhancing physical performance were associated with training.

Considering all the above reported results and similar to what was already reported for illicit psychotropic drugs, the risk factors associated with consumption of above-reported substances are the influence of friends and the attendance to recreational places together with lack of consideration for family ties [41-43].

Although the present study has the important limitation of participants who cannot be perfectly representative of the Italian population (Italian cities to be investigated and related premises were established as a function of the capillary knowledge of the area by the interviewers) the huge sample size and its diffusion throughout the national territory support the study validity. In addition, it has to be reminded that results are based on self-reported answers to questionnaire with no objective assessment (*e.g.* consumption biomarkers in biological fluids) of personal statements.

Nonetheless, the most important message of this study is that together with alcohol, for centuries the most used legal recreational substance, other legal compounds of different nature and health related harm are of emergent use among adolescents and young adults. A typical trend of the 21st century is that these substances can be anonymously supplied by internet, where they are sold with alleged effects on mental, physical and sexual performance without any real evidence-based research. This is true for energy drinks, smart-drugs and physical performance enhancers whose advantages/disadvantages ratio is not systematically established and for androgenic anabolic steroids and drugs for sexual enhances administered without any real hormonal or sexual dysfunction [37].

Whereas some features of these new legal substances are typical of the 21st century, the risk factors associated to their use – nightlife, influence of peers and poor family ties – are common with those of classic illicit drugs and alcohol. Specifically, the bad relationship with the mother influencing the consumption is a conventional Italian (or Mediterranean) characteristic.

These results have implications for prevention and early intervention programs of new legal recreational substance use, which, similar to what is frequently advised for classical illicit drugs, should focus on information campaigns and awareness initiatives especially addressed to young male adults who go clubbing, live outside the family and show close links with peers.

Contributions of authorship

Roberta Pacifici, contributed mainly to the conception and design of the work, the analysis and interpretation of the data, the writing of the article and the approval of the final version for its publications. Ilaria Palmi, contributed to the analysis and interpretation of the data,

the writing of the article and the approval of the final version for its publications. Paolo Vian, contributed to the data collection, the interpretation of the data, the writing of the article and the approval of the final version for its publications. Alessandra Andreotti, contributed to the data collection, the interpretation of the data, the writing of the article and the approval of the final version for its publications. Claudia Mortali, contributed to the analysis and interpretation of the data, the writing of the article and the approval of the final version for its publications. Paolo Berretta, contributed to the critical review with important intellectual contributions and the approval of the final version for its publications.

Luisa Mastrobattista, contributed to the analysis of the data, the critical review with important intellectual contributions and the approval of the final version for its publications.

Simona Pichini, contributed to the conception and design of the work, the interpretation of the data, the writing of the article and the approval of the final version for its publications.

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Conflict of interest of statement

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REFERENCES

1. Dipartimento delle Politiche Antidroga (DPA). *National Italian report on drug use and drug dependence, year 2014*. Rome: DPA; 2014. p. 133 Available from: www.dronet.org/pubblicazioni_new/pubb_det.php?id=696
2. United Nation Office of Drugs and Crime (UNODC). *World drug report 2014*. Vienna: UNODC; 2014; p. 127. Available from: www.unodc.org/documents/wdr2014/World_Drug_Report_2014_web.pdf
3. European Monitoring Centre for Drugs and Drug Addiction (EMCDDA). *European Drug Report: Trends and Developments 2013*. Luxembourg: Publications Office of the European Union; 2013. p. 80. Available from: www.emcdda.europa.eu/publications/edr/trends-developments/2013
4. DOXA-Market research and analysis. *National Italian Report on tobacco smoke, year 2014*. Milan: DOXA; 2014. Available from: www.iss.it/fumo/index.php?lang=1&id=345&tipo=18
5. Istituto Nazionale di Statistica (ISTAT). *National Italian Report on Use and abuse of alcohol in Italy*. Rome: ISTAT; 2014. Available from: www.istat.it/it/archivio/156223
6. Flotta D, Micò R, Nobile CG, Pileggi C, Bianco A, Pavia M. Consumption of energy drinks, alcohol, and alcohol-mixed energy drinks among Italian adolescents. *Alcohol Clin Exp Res* 2014;38(6):1654-61. DOI: 10.1111/acer.12394.
7. Gallimberti L, Buja A, Chindamo S, Vinelli A, Lazzarin G, Terraneo A, Scafato E, Baldo V. Energy drink consumption in children and early adolescents. *Eur J Pediatr* 2013;172(10):1335-40. DOI: 10.1007/s00431-013-2036-1.
8. Vento AE, Martinotti G, Cinosi E, Lupi M, Acciavatti T, Carrus D, Santacroce R, Chillemi E, Bonifaci L, di Giannantonio M, Corazza O, Schifano F. Substance use in the club scene of Rome: a pilot study. *Biomed Res Int* 2014;2014:617546. DOI: 10.1155/2014/617546.
9. Simonato P, Corazza O, Santonastaso P, Corkery J, Deluca P, Davey Z, Blaszko U, Schifano F. Novel psychoactive substances as a novel challenge for health professionals: results from an Italian survey. *Hum Psychopharmacol* 2013;28(4):324-31. DOI: 10.1002/hup.2300.
10. Deluca P, Davey Z, Corazza O, Di Furia L, Farre M, Flesland LH, Mannonen M, Majava A, Peltoniemi T, Pasinetti M, Pezzolesi C, Scherbaum N, Siemann H, Skutle A, Torrens M, van der Kreeft P, Iversen E, Schifano F. Identifying emerging trends in recreational drug use; outcomes from the Psychonaut Web Mapping Project. *Prog Neuropsychopharmacol Biol Psychiatry* 2012;39(2):221-6. DOI: 10.1016/j.pnpbp.2012.07.011.
11. Bechara A, Casabé A, De Bonis W, Helien A, Bertolino MV. Recreational use of phosphodiesterase type 5 inhibitors by healthy young men. *J Sex Med* 2010;7(11):3736-42. doi: 10.1111/j.1743-6109.2010.01965.x.
12. Marczinski CA, Fillmore MT. Energy drinks mixed with alcohol: what are the risks? *Nutr Rev* 2014;(Suppl. 1):98-107. DOI: 10.1111/nure.12127.
13. Famularo G, Polchi S, Di Bona G Manzara C. Acute aortic dissection after cocaine and sildenafil abuse. *J Emerg Med* 2001;21(1):78-9.
14. Megalla S, Shaqra H, Bhalodkar NC. Non-ST-segment elevation myocardial infarction in the setting of sexual intercourse following the use of cocaine and sildenafil. *Rev Cardiovasc Med* 2011;12(2):e113-7.
15. Griesler PC, Kandel DB, Davies M. Ethnic differences in predictors of initiation and persistence of adolescent cigarette smoking in the National Longitudinal Survey of Youth. *Nicotine Tob Res* 2002;4(1):79-93.
16. Altobelli E, Rapacchietta L, Tiberti S, Petrocelli R, Cicioni L, di Orio F, Profeta FV. Association between drug, alcohol and tobacco use in adolescents and socio-familiar factors. *Ann Ig* 2005;17(1):57-65.
17. Colton T. Statistics in medicine. Boston: Little Brown and Company Brown & Co; 1974. p. 372.
18. Feinstein AR. *Principles of medical statistics*. New York: Chapman & Hall/CRC; 2002. p.712.
19. Istituto Superiore di Sanità. *SmartDrugs*. 1ed. Roma: ISS; 2010. p. 74. Available from: www.iss.it/binary/drog4/cont/smart_drugs_definitivo.pdf
20. Istituto Superiore di Sanità. *SmartDrugs*. 2ed. Roma: ISS; 2010. p. 88. Available from: www.iss.it/binary/drog/cont/SD_COMPLETO_ridotto.pdf
21. SPSS Inc. *PASW Statistics for Windows, Version 18.0*. Chicago: SPSS Inc; 2009.
22. R Development Core Team. *R: A language and environ-*

ment for statistical computing. Vienna: R Foundation for Statistical Computing; 2008. p. 3604. Available from: www.R-project.org

23. Altman D, Machin D, Bryant TN, Gardner MJ (Eds). *Statistics with confidence. Confidence intervals and statistical guidelines*. 2ed. London: BMJ Book; 2000. p. 254.
24. StatsDirect Ltd. *StatsDirect statistical software*. England: StatsDirect Ltd; 2014. Available from: www.statsdirect.com
25. Szumilas M. Explaining Odds Ratios. *J Can Acad Child Adolesc Psychiatry* 2010;19(3):227-9.
26. Zulli C, Federico A, Gaeta L, Del Prete A, Iadevaia M, Gravina AG, Romano M, Loguercio C. A facebook survey to obtain alcohol-related information by young people and adolescents. *Acta Gastroenterol Belg* 2014;77(1):18-24.
27. Stubbs S, Bennett D. Young people and alcohol use: contextualizing and responding to the challenge of problematic drinking. *Adolesc Med State Art Rev* 2014;25(1):50-69.
28. Oteri A, Salvo F, Caputi AP, Calapai G. Intake of energy drinks in association with alcoholic beverages in a cohort of students of the School of Medicine of the University of Messina. *Alcohol Clin Exp Res* 2007;31(10):1677-80.
29. Reissig CJ, Strain EC, Griffiths RR. Caffeinated energy drinks-A growing problem. *Drug Alcohol Depend* 2009;99(1-3):1-10. DOI: 10.1016/j.drugalcdep.2008.08.001.
30. Trapp GS, Allen KL, O'Sullivan T, Robinson M, Jacoby P, Oddy WH. Energy drink consumption among young Australian adults: Associations with alcohol and illicit drug use. *Drug Alcohol Depend* 2014;134:30-7. DOI: 10.1016/j.drugalcdep.2013.09.006.
31. Bonar EE, Cunningham RM, Polshkova S, Chermack ST, Blow FC, Walton MA. Alcohol and energy drink use among adolescents seeking emergency department care. *Addict Behav* 2015;43:11-7. DOI: 10.1016/j.addbeh.2014.
32. Velazquez CE, Poulos NS, Latimer, LA, Pasch KE. Associations between energy drink consumption and alcohol use behaviors among college students. *Drug Alcohol Depend* 2012;123(1-3):167-72. DOI: 10.1016/j.drugalcdep.2011.11.006.
33. Beccaria F, Rolando S, Ascani P. Alcohol consumption and quality of life among young adults: a comparison among three European countries. *Subst Use Misuse* 2012;47(11):1214-23. DOI: 10.3109/10826084.2012.698689.
34. Papaseit E, Farré M, Schifano F, Torrens M. Emerging drugs in Europe. *Curr Opin Psychiatry* 2014;27(4):243-50. DOI: 10.1097/YCO.0000000000000071.
35. Appendino G, Minassi A, Taglialatela-Scafati O. Recreational drug discovery: natural products as lead structures for the synthesis of smart-drugs. *Nat Prod Rep* 2014;31(7):880-904. DOI: 10.1039/c4np00010b.
36. Fernandez MM, Hosey RG. Performance-enhancing drugs snare nonathletes, too. *J Fam Pract* 2009;58(1):16-23.
37. Yager Z, O'Dea JA. Relationships between body image, nutritional supplement use, and attitudes towards doping in sport among adolescent boys: implications for prevention programs. *J Int Soc Sports Nutr* 2014;11(1):13. DOI: 10.1186/1550-2783-11-13.
38. Pantalone DW, Bimbi DS, Parsons JT. Motivations for the recreational use of erectile enhancing medications in urban gay and bisexual men. *Sex Transm Infect* 2008;84(6):458-62. DOI: 10.1136/sti.2008.031476.
39. Kanayama G, Hudson GI, Pope HG. Features of men with anabolic-androgenic steroid dependence: A comparison with nondependent AAS users and with AAS nonusers. *Drug Alcohol Depend* 2009;102(1-3):130-7. DOI: 10.1016/j.drugalcdep.2009.02.008.
40. Harte CB, Meston CM. Recreational use of erectile dysfunction medications in undergraduate men in the United States: characteristics and associated risk factors. *Arch Sex Behav* 2011;40(3):597-606. DOI: 10.1007/s10508-010-9619-y.
41. Pacifici R, Pierantozzi A, Di Giovannandrea, Palmi I, Mastrobattista L, Mortali C, Pichini S. The NASO-ROSSO (Rednose) project: an Italian study on alcohol consumption in recreational places. *Int J Environ Res Public Health* 2013;10(5):1665-80. DOI: 10.3390/ijerph10051665.
42. Stone AL, Becker LG, Huber AM, Catalano, RF. Review of risk and protective factors of substance use and problem use in emerging adulthood. *Addict Behav* 2012;37:(7):747-75. DOI: 10.1016/j.addbeh.2012.02.014.
43. Gerra G, Angioni L, Zaimovic A, Moi G, Bussandri M, Bertacca S, Santoro G, Gardini S, Caccavari R, Nicoli MA. Substance use among high-school students: relationships with temperament, personality traits, and parental care perception. *Subst Use Misuse* 2004;39(2):345-67