

**Consuming energy drinks at the age of 14 predicted legal and illegal
substance use at 16**

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ABSTRACT

Aim. This study examined whether consuming energy drinks at the age of 14 predicted substance use at 16.

Methods. We followed 621 youths from an area of Switzerland who completed a longitudinal online survey in both 2012 and 2014 when they were 14 and 16 years of age. At 14, participants, who were divided into non-energy drink users (n=262), occasional users (n=183) and regular users (n=176), reported demographic, health-related and substance use data. Substance use at 16 was assessed through logistic regression using non-users as the reference group and controlling for significant variables at 14.

Results. At the bivariate level, energy drink consumption was associated with substance use at both 14 and 16. Energy drink consumers were also more likely to be male, older, less academic, sleep less on schooldays and live in an urban area. In the multivariate analysis, smokers, alcohol misusers and cannabis users at the age of 16 were significantly more likely to have been regular energy drink users at the age of 14.

Conclusion. Consuming energy drinks at 14 years of age predicted using legal and illegal substances at 16. Health providers should screen young adolescents for energy drink use and closely monitor weekly users.

Keywords. Adolescents; Alcohol; Cannabis; Energy drinks; Tobacco.

Key notes.

- This online survey of 621 youths from 2012-2014 examined whether consuming energy drinks at the age of 14 predicted substance use at 16.
- We found that 16-year-old smokers, alcohol misusers and cannabis users were significantly more likely to have consumed regular energy drinks at 14.

- Energy drink consumers were also more likely to be male, older, less academic, sleep less on schooldays and live in an urban area.

INTRODUCTION

Since their introduction in the 1980s and the 1990s (1), energy drinks have become very popular, mainly for their alleged capacity to increase energy, physical performance and intellectual prowess (1-4). While there is still controversy about the potential benefits of this kind of beverage, there is a consensus on the possible adverse effects of excessive consumption, because of the considerable quantity of caffeine and the presence of other controversial ingredients such as Taurine (2). Indeed, an energy drink can contain from about 50 to 500mg of caffeine, which is equivalent to about five cups of coffee (1,5). Regular consumption of energy drinks have been reported to lead to the development of anxiety, nervousness, cardiovascular and gastrointestinal problems, insomnia and overweight (1,2,6). In addition to these health problems, energy drink consumption seems to be associated with a larger spectrum of risk behaviours, such as substance use and violence (7-9).

These health concerns are more likely to affect adolescents because they are the main target of energy drink marketing. Advertisements for the products promote themes that emphasise rebellion, risks and adventures in order to reach young consumers (1,3,10). In Switzerland, the 2010 Health Behaviour in School Children study of 15 year-olds indicated that 60% of boys and 39% of girls consumed energy drinks at least once a week and 23% and 14%, respectively, consumed them on almost a daily basis (11).

Despite the potential risks of excessive energy drink consumption, they are weakly regulated on a worldwide basis and only a few countries have adopted policies restricting their sale (1,12). For example, Swedish law states that consumers need to be 15 to buy energy drinks and Denmark has banned sales of this kind of beverage (7). In the rest of Europe, unless the country has

adopted specific legislation, the law only requests warning labels that mention that the drink contains a high level of caffeine and specifying the amount (13).

Previous research, mostly cross-sectional and American studies, have examined the possible negative effects of energy drink consumption among adolescents, including associations with the use of other substances, mainly alcohol (3-5, 7, 8, 10, 14-18). On the one hand, energy drinks may act as a gateway for other addictive and risky behaviours and studies have shown that energy drinks may be the first experience in the substance use hierarchy (3, 7, 14). On the other hand, energy drink consumption may co-occur and share common factors with substance use, such as sensation seeking (3, 5, 7, 8, 10, 18). Therefore, this habit may be included in the Problem-Behaviour Theory (19) and be a part of a polyconsumption trend. In addition to a lack of longitudinal studies and causalities, the relation between energy drink consumption and substance use has not been sufficiently studied among early adolescents, while their energy drink consumption has become more and more common (18).

The present study aimed to assess the characteristics of regular energy drink users and whether using energy drinks at the age of 14 predicted substance use at the age of 16. We hypothesised that regular consumption of energy drinks would predict alcohol misuse, smoking, and cannabis use two years later (16) and that its regular consumption would act as a potential warning for the use of other substances.

METHODS

Data were obtained from the *ado@internet.ch* survey, a longitudinal online study based on five six-monthly data collection waves between spring 2012 and spring 2014 (20). Its overall aim was to assess the impact that using the Internet had on possible associated health problems among adolescents. For this paper we were only interested in the first wave, when the participants were 14 years of age, and the last wave, when they were 16. A representative sample of 35 schools in the Canton of Vaud, the largest French-speaking Canton in Switzerland, was obtained and 3,367 eighth grade mandatory school students were invited to participate.

After data cleaning, 3,064 youths were included. At the end of the first questionnaire, participants were asked whether they agreed to be contacted again for future waves of the study. Out of the 2,055 (67%) students who allowed us to contact them again, 621 (30%) - 20% of the original sample - also completed the last wave and were included in the present study.

At baseline, data were weighted according to the known characteristics of the population being studied, namely gender and academic track. Longitudinal weights were then computed for the last wave by combining the baseline weights with the probability of answering at the last wave such as estimated through a logistic regression approach. The resulting weighted subsample that was available had a structure that was mainly similar to the original population sample that was being studied.

This study was approved by the Ethics Committee of the Canton of Vaud.

Variables

Energy drink consumption was only measured at the age of 14, by asking how many times per week participants drank this kind of beverage. The 621 participants were then divided into three groups: the 262 (42.2%), who did not consume energy drinks, the 183 (29.5%) occasional users who consume energy drinks less than weekly and the 176 regular users (28.3%) who consumed energy drinks weekly or more often. Given the possible effects of caffeine cited above, we also assessed coffee consumption to determine if this more traditional way of consuming caffeine differed from energy drink consumption (18).

Socio-demographic variables included gender, place of birth, place of residence, family structure, socio-economic status and academic track. In Switzerland, pupils are divided into three different tracks depending on their grades, from the age of 12. Upper and middle tracks (pre high-school and extended requirements) enable students to pursue studies beyond compulsory school, while the lower track (basic requirements) focuses on apprenticeship. To assess socioeconomic status, we used the European School Project on Alcohol and other Drugs

project measure, asking the participants how they perceived their family financial situation compared to other families in Switzerland (21) and dichotomised the seven possible answers into below average and average or more. Urban residence was defined as living in a town or a suburb, whereas a rural residence was defined as living in the mountains, in the countryside or in a village (22).

Advertisements for energy drinks claim that they help people to perform sports by increasing and lengthening physical performance (2,4). As a result, we decided to assess physical activity using the mean number of days per week when participants took part in sporting activities for at least 60 minutes.

Sleep deprivation is the main reason why energy drinks are consumed (4,6,23) and the energy properties of such beverages compensate for the effects of insufficient sleep. However, the regular use of caffeine may also induce sleep problems. In order to investigate this vicious cycle, we were interested in the mean hours of sleep that participants had on schooldays and weekends. Finally, because of potential psychological effects of energy drinks and their impact on well-being and quality of life (23), we also measured emotional well-being by using the World Health Organization's Five Well-Being Index (WHO-5) with poor well-being defined as a score of below 13 out of a maximum of 25 (24).

We also assessed current alcohol misuse, tobacco and cannabis use (22). Alcohol misuse was measured by asking how many times they had been drunk in the past 30 days and dichotomised into none and at least once. Cannabis use was dichotomised between no consumption during the last 30 days and at least once. Tobacco consumption was dichotomised between current smokers, defined as smoking at least one cigarette a week, and non-smokers, which included former smokers.

Data analyses

We performed the analyses in three steps. First, we assessed the level of consumption of the different substances at the ages of 14 and 16, when available, overall and by gender. Secondly,

we assessed the characteristics of energy drink consumers at the age of 14 by comparing them with potential explanatory factors that were also measured at this age. We used chi-square tests for categorical variables and t-tests and ANOVAs for continuous variables. Statistically significant variables were then entered into a multinomial regression to predict what category the energy drink consumer fell into. Finally, energy drink consumption was used as an independent explanatory variable to assess its predictive value and possible influence on substance use two years later. Other potential explanatory factors measured at the age of 14 were also assessed as well and all the statistically significant factors were entered into three logistic regressions to independently predict the risk of consuming tobacco, alcohol and cannabis at the age of 16. The data presented in this paper on the 14-year-old students only relates to the 621 participants who completed the two waves at 14 and 16 years of age, not to the original sample. A significance level of $p < 0.05$ was used for all the analyses and all the calculations were performed using STATA version 13.0 (StataCorp, College Station, Texas, USA).

RESULTS

Consumption levels

We first assessed the prevalence, overall and by gender, of consumption for energy drinks, coffee, alcohol, tobacco and cannabis at the age of 14 and, as energy drinks and coffee were only assessed at the age of 14, alcohol, tobacco and cannabis at the age of 16 (Table 1). At 14 years old, 262 (42.2%) of the 621 participants said that they had never consumed energy drinks, 183 (29.5%) said less than weekly and were categorised as occasional consumers and 176 (28.3%) said they consumed them weekly or more often and were categorised as regular consumers. Significantly more males (64.8%) than females fell in to the regular consumer category. Just over half of the participants (50.1%) said that they did not drink coffee, 16.6% were occasional consumers and 33.3% were regular consumers. Males were also more likely to be regular coffee consumers (56.5%) than females, but the gender difference was not significant.

Overall, there were significant increases for episodes of drunkenness (9.8% to 34.6%), tobacco use (15.2% to 21.3%) and cannabis 10.1% to 19.9%). between the ages of 14 and 16.

Characteristics of energy drink consumers

Secondly, we determined the characteristics of energy drink consumers by using explanatory variables measured at the age of 14. At the bivariate level (Table 2), adolescents identified as occasional or regular consumers of energy drinks were significantly more likely to be male, older, in the lower academic track, live in an urban area, sleep less during schooldays, misuse alcohol and to have smoked at the age of 14 . Cannabis use was also used more frequently by regular energy drink consumers than by occasional ones. The multivariate analysis (Table 3) showed that regular energy drink users were significantly more likely to be male than non-users, with a relative risk ratio (RRR) of 3.73 (range 2.08-6.78), to be in one of the two lower academic tracks (RRR 2.01, range 1.08-3.76 for middle track and RRR 4.27, range 1.81-10.10 for lower track), to sleep less (RRR 0.68, range 0.53-0.88), to smoke (RRR 7.65, range 2.22-26.24) and to misuse alcohol (RRR 8.82, range 2.0-28.95). Occasional energy drink users followed a similar explanatory model, except for insufficient sleep, which was not significant.

Characteristics of substance users

To assess the explanatory variables of substance use two years later, we first performed bivariate analyses between each substance at the age of 16 and independent variables at the age of 14 (Table 4). The three substances followed a similar trajectory. Indeed, alcohol misusers, smokers and cannabis users at the age of 16 were more likely to sleep less during schooldays, to misuse alcohol, to smoke and to use cannabis at the age of 14. Energy drink consumption at the age of 14 was positively associated with the use of all three substances at the age of 16, whereas coffee consumption was only associated with smoking.

At the multivariate level (Table 5), the use of a substance at the age of 14 was significantly associated with its use at the age of 16. Indeed, compared to non-users, student misusing alcohol at the age of 14 were more likely to misuse alcohol at the age of 16, with an adjusted odds ratio

(aOR) of 3.17 (range 1.03-9.69), smokers at the age of 14 were more likely to smoke (aOR 7.22, range 3.10-16.81) and to use cannabis at the age of 16 (aOR 3.44, range 1.21-9.78) and cannabis consumers at the age of 14 were more likely to smoke (aOR 2.49, range 1.07-5.84) and use cannabis at the age of 16 (aOR 4.21, range 1.52-11.62). Moreover, regular energy drink consumption at the age of 14 predicted alcohol misuse (aOR 2.00, range 1.06-3.77), smoking (aOR 4.44, range 2.13-9.26) and cannabis use (aOR 2.45, range 1.26-4.75) at the age of 16. No difference was found for occasional consumption and it was interestingly that coffee consumption was no longer significant for tobacco use.

DISCUSSION

The aim of our study was to determine the characteristics of energy drink users and longitudinally examine the predictive value of energy drink consumption on substance use among adolescents.

Our results showed that regular energy drink consumption at the age of 14 was associated with substance use at the ages 14 and 16 and these results were in line with a previous longitudinal study (16). At baseline, energy drinks seemed to already be part of a pattern of risky behaviour and share the initiation path with other substances. Even after controlling for other potential explanatory factors, regular energy drink consumption remained a strong predictive factor for subsequent alcohol misuse, smoking and cannabis use two years later and co-occurred with initial substance use at the age of 14.

A first explanation could be based on the gateway theory, which suggests that there are temporal developmental stages in substance use, ranging from legal to illicit drugs (3,7,14,25). Thus, energy drinks could be a facilitator to alcohol use and smoking, which could, in turn, be gateway substances for illicit drugs such as cannabis. Along the same lines, Temple (5) used the concept of the cross-sensitisation process to explain that excessive caffeine use prepares the brain for

other addictive substances and increases tolerance, which enables good experiences and perpetuation.

Another interpretation of our results could be that energy drinks and other substances are associated with common characteristics, such as sensation seeking, and have a similar place in adolescents' social life (3,5,8,18). Consequently, risky behaviour, especially substance use, may be concomitant and should be tested together. According to this hypothesis, energy drink consumption is intrinsically linked to other substances and is part of a wider problem behaviour syndrome (7,10). Our results seem to confirm this latter explanation, because, firstly, energy drinks and substances were associated in each wave, and, secondly, each substance was also linked to other substances in each wave and longitudinally between the two years. This finding tends to demonstrate a coexistence of all the studied substances.

Although we did not assess the consumption of energy drinks mixed with alcohol, this habit could be another possible explanation. Indeed, a sweetened drink, especially with added caffeine, decreases the sedative effect and hides the taste of alcohol (6,8,26). This could explain the association between energy drinks and alcohol at the age of 14, as adolescents could use this gateway for their substance initiation. Moreover, caffeine also has biological properties that accelerate the self-assimilation of alcohol in the blood but reduce the subjective sensation of being drunk (6,8). With regarding to the low cost of energy drinks, we could also imagine that adolescents mix them with alcohol to get drunk faster and cheaper.

In contrast to a longitudinal study that found a trend between coffee drinking and substance use (18), our results demonstrated that this beverage was less risky than energy drinks for substance use. There can be several explanations for this: coffee is not a party drink, it is rarely mixed with alcohol and its flavour is very strong for young people, unlike the sweetness of energy drinks. Moreover, the way that some energy drinks are packaged makes them look like alcohol and gives them a more adult feel than conventional soda drinks on the market (18). On the other

hand, some energy drinks look like conventional sodas, giving the impression that they are harmless beverages.

Research has shown that males are more likely to drink energy drinks and marketing strategies could explain this gender difference. For example, sponsorship typically uses male-dominated pastimes such as extreme sports (2,26). Moreover, most of the time, advertising promotes physical, or even sexual, performances, which are more typically male preoccupations (27). On the other hand, manufacturers can also identify males as being the most common energy drink users and consequently adapt their advertising messages, demonstrating a bi-directional relationship. The marketing of energy drinks also suggests benefits for academic performances (2,14), but our results did not confirm this suggestion. Indeed, participants who were in the lowest academic track were more likely to report regular energy drink consumption and regular energy drink use could disturb concentration and thus academic performance. Another hypothesis is that adolescents who already have school difficulties could start consuming this kind of beverage because they believe in the advertising messages.

Insufficient sleep is the first reason for energy drink consumption (4,6,23) and it is known that adolescents sleep less than they should (5). Our results confirm that regular energy drink users slept less than occasional users and non-users. Thus energy drinks could enable adolescents to stay awake in spite of insufficient sleep, but they could also be the source of sleep disturbance. Differences in the number of sleep hours between groups were only significant for schooldays, demonstrating that the first hypothesis is more probable: they drink energy drinks to compensate for the effects of a short night's sleep.

Finally, the regular use of energy drinks by students in urban areas could simply be explained by the fact that they are more available in these areas because of the larger offer in terms of stores (26).

The main strength of this study is that it was based on longitudinal data and that we assessed energy drinks, alcohol, tobacco and cannabis use simultaneously. A second strength is that the

data were collected among early adolescents, an understudied age group with regard to the relation between energy drink consumption and substance use (18). Given that most studies in this field are American, our Swiss sample can help to obtain trends on energy drink consumption in a European context.

However, some limitations need to be mentioned. First, the attrition rate was high because only participants who allowed us to contact them again at the end of the first questionnaire could be included in the next waves. Thus, the relatively small sample of 621 participants could moderate our findings. We regard to this limitation, we decided to compare participants who were only present at the age of 14 with those who gave answers at both the ages of 14 and 16 to determine whether or not they were similar when it came to the main socio-demographic and energy drink data. We observed that these two groups showed different for age, gender, academic track, family structure, residence and energy drink consumption. Nevertheless, the differences were clearly limited with the weightings. Indeed, except for the difference in the energy drink variable, which remained after weighting, our final sample, taken at 14 and 16, did not differ from the initial sample at just 14. If we take residence as an example, the group that took part at both ages included 42.3% participants living in an urban area before the weightings and 47.6% when the data were weighted, which is very similar to the initial sample (47.2%) (Table S1). Another limitation was that the data were self-reported. For example, alcohol misuse was not clearly defined and, consequently, we took the risk of having a relatively subjective representation of the episodes of drunkenness when we asked “*How many episodes of drunkenness have you experienced in the past 30 days?*”. Moreover, we did not assess the exact amount of caffeine and alcohol consumed (18), the kind of alcohol - beer, wine, spirits - and whether they mixed them with energy drinks. Besides, coffee and energy drink consumptions were only assessed at the age of 14 which did not enable us to compare changes in these measures between the two waves, at 14 and 16. Finally, a two-year follow-up is certainly not

sufficient to assess whether or not adolescents' experimentation with substance use is time-limited.

The use of energy drinks at the age of 14 predicted using both legal and illegal substances two years later. Health providers dealing with young adolescents should screen them for energy drinks and closely monitor those using them on a weekly basis. Regularly using energy drinks could provide a potential warning sign for subsequent substance consumption and potential health problems. Males with lower academic performance living in urban areas should be particularly targeted.

CONFLICT OF INTEREST STATEMENT

The authors have no conflicts of interest to declare.

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Table 1. Evolution of substance use between 14 and 16, overall and by gender

	Boys (n=308)		Girls (n=313)		Total (n=621)	
	14	16	14	16	14	16
Energy drink (regular)	36.3%*		20.1%*		28.3%	
Coffee (regular)	37.5%		29.1%		33.3%	
Alcohol misuse (yes)	11.5%	35.3% ⁺	8.2%	33.9% ⁺	9.8%	34.6% ⁺
Tobacco (smoker)	12.6%	18.8% ⁺⁺	17.9%	23.9% ⁺⁺	15.2%	21.3% ⁺
Cannabis (yes)	12.6%	20.8% ⁺⁺	7.5%	19% ⁺	10.1%	19.9% ⁺

* Significant difference between boys and girls

⁺ Significant increase between 14 and 16 ($p \leq 0.01$)

⁺⁺ Significant increase between 14 and 16 ($p \leq 0.05$)

Table 2. Bivariate analyses comparing the three groups of energy drink consumers, with variables measured at the age of 14

14	Non-users (n=262)	Occasional users (n=183)	Regular users (n=176)	p value
Mean age (years±SE*)	14.16±0.05	14.30±0.13	14.41±0.09	0.016
Gender (male)	38.6%	53.7%	64.7%	0.0003
Place of birth (Switzerland)	86.1%	81.3%	89.5%	0.2914
Residence (urban)	47.3%	38.4%	57.6%	0.0287
Family structure (together)	71.5%	76.3%	64.0%	0.1903
Socio-economic status (below average)	4.9%	4.9%	6.1%	0.8738
Academic track				<0.001
Upper track	54.7%	29.1%	24.0%	
Middle track	30.2%	33.6%	34.6%	
Lower track	15.1%	37.3%	41.4%	
Mean physical activity (days±SE)	3.06±0.12	3.16±0.20	3.26±0.21	0.404

Emotional wellbeing (poor)	10.8%	10.1%	19.8%	0.0767
Mean sleep on schooldays (hours±SE)	8.27±0.07	8.05±0.13	7.52±0.18	<0.001
Mean sleep on weekends (hours± SE)	9.84±0.11	9.69±0.21	9.31±0.31	0.097
Tobacco (yes)	3.2%	13.6%	34.8%	<0.001
Alcohol misuse (yes)	1.4%	8.2%	24.3%	<0.001
Cannabis (yes)	4.1%	3.9%	25.4%	<0.001

* SE:standard error

Table 3. Multinomial regression analysis for energy drink consumption at the age of 14 with non-users as the reference category

Variables at the age of 14	Occasional users		Regular users	
	RRR (95%CI)*	p-value	RRR (95%CI)*	p-value
Age	0.90 (0.52-1.53)	0.688	1.07 (0.67-1.72)	0.765
Gender (boys)	2.06 (1.25-3.39)	0.004	3.73 (2.08-6.78)	<0.001
Residence area (urban)	0.75 (0.46-1.23)	0.253	1.39 (0.77-2.53)	0.275
Academic track (middle track)	1.96 (1.19-3.23)	0.009	2.01 (1.08-3.76)	0.028
Academic track (lower track)	4.30 (2.04-9.06)	<0.001	4.27 (1.81-10.10)	0.001
Sleep on schooldays	0.84 (0.67-1.07)	0.164	0.68 (0.52-0.88)	0.004
Alcohol misuse 30 days (yes)	6.07 (1.32-27.85)	0.02	8.82 (2.00-38.96)	0.004
Tobacco smoking (smoker)	4.13 (1.23-13.83)	0.021	7.65 (2.23-26.24)	0.001
Cannabis use 30 days (yes)	0.22 (0.03-1.86)	0.166	0.77 (0.09-6.34)	0.809

*RRR (95%CI): relative risk ratio with 95% confidence interval

Table 4. Bivariate analyses comparing separately the use of each substance at the age of 16 with explanatory variables measured at the age of 14

14 \ 16	Alcohol non misusers (n=406)	Alcohol misusers (n=215)	p-value	Non smokers (n=489)	Smokers (n=132)	p-value	Non cannabis users (n=497)	Cannabis users (n=123)	p-value
Mean age (years±SE*)	14.28±0.07	14.25±0.07	0.726	14.25±0.06	14.32±0.09	0.544	14.27±0.06	14.26±0.10	0.887
Gender (male)	49.9%	51.4%	0.7861	52.1%	44.4%	0.2955	49.9%	52.7%	0.6924
Place of birth (Switzerland)	84.1%	88.4%	0.2644	85.0%	87.9%	0.5078	85.6%	85.7%	0.9908
Residence (urban)	50.8%	41.5%	0.1005	45.0%	57.0%	0.086	45.4%	56.4%	0.1212
Family structure (together)	71.3%	69.8%	0.7661	72.5%	64.2%	0.1983	71.4%	68.0%	0.5963
Socio-economic status (below average)	5.0%	5.6%	0.7992	4.8%	6.6%	0.6225	3.9%	10.4%	0.0406
Academic track			0.2912			0.2245			0.8109
Upper track	36.7%	41.9%		41.0%	29.2%		39.1%	36.2%	
Middle track	31.3%	34.6%		31.4%	36.1%		32.6%	31.7%	
Lower track	32.0%	23.5%		27.6%	34.6%		28.3%	32.1%	
Mean physical activity (days±SE*)	3.10±0.12	3.24±0.17	0.474	3.13±0.11	3.21±0.22	0.766	3.13±0.11	3.20±0.24	0.794
Emotional wellbeing (poor)	11.3%	16.6%	0.18	11.2%	20.2%	0.0563	12.6%	15.3%	0.5867

Mean sleep on schooldays (hours±SE*)	8.18±0.07	7.64±0.15	<0.001	8.13±0.07	7.49±0.20	0.003	8.10±0.07	7.57±0.22	0.022
Mean sleep on weekends (hours± SE*)	9.66±0.14	9.63±0.21	0.894	9.74±0.12	9.30±0.33	0.207	9.70±0.12	9.42±0.33	0.429
Alcohol misuse 30 days (yes)	3.4%	22.1%	<0.001	4.4%	30.0%	<0.001	5.2%	28.7%	<0.001
Tobacco smoking (smoker)	7.3%	30.2%	<0.001	5.3%	51.7%	<0.001	8.7%	41.1%	<0.001
Cannabis use 30 days (yes)	3.7%	22.1%	0.0001	3.8%	33.2%	<0.001	4.3%	33.4%	<0.001
Energy drink			0.001			<0.001			<0.001
Non-users	48.8%	29.7%		48.7%	18.5%		47.0%	23.0%	
Occasional users	31.1%	26.5%		31.8%	21.2%		30.7%	24.6%	
Regular users	20.1%	43.8%		19.6%	60.3%		22.3%	52.4%	
Coffee			0.2987			0.0137			0.3029
Non-users	53.2%	44.2%		54.4%	33.9%		52.0%	42.2%	
Occasional users	15.6%	18.6%		16.2%	18.1%		16.9%	15.5%	
Regular users	31.2%	37.2%		29.4%	47.9%		31.1%	42.3%	

* SE: standard error

Table 5 Logistic regression analyses computed independently for the use of each substance measured at the age of 16

14 \ 16	Alcohol misuse		Tobacco use		Cannabis use	
	aOR (95%CI)*	p-value	aOR (95%CI)*	p-value	aOR (95%CI)*	p-value
Age	0.82 (0.50-1.33)	0.417	0.89 (0.54-1.46)	0.641	0.75 (0.45-1.27)	0.285
Gender (boys)	0.96 (0.60-1.51)	0.848	0.47 (0.24-0.91)	0.024	0.95 (0.54-1.66)	0.862
Sleep on schooldays	0.86 (0.69-1.06)	0.152	1.05 (0.75-1.48)	0.761	0.99 (0.75-1.31)	0.973
Alcohol misuse 30 days (yes)	3.17 (1.03-9.69)	0.044	1.42 (0.40-5.06)	0.589	1.77 (0.60-5.26)	0.301
Tobacco smoking (smoker)	1.98 (0.84-4.64)	0.117	7.22 (3.10-16.81)	<0.001	2.40 (1.02-5.66)	0.045
Cannabis use 30 days (yes)	2.32 (0.79-6.84)	0.126	3.44 (1.21-9.78)	0.021	4.36 (1.58-12.07)	0.005
Energy drink (occasional users)	1.21 (0.73-1.98)	0.455	1.28 (0.64-2.56)	0.485	1.45 (0.77-2.74)	0.251
Energy drink (regular users)	2.00 (1.06-3.77)	0.033	4.44 (2.13-9.26)	<0.001	2.50 (1.28-4.88)	0.008
Coffee (occasional users)			0.98 (0.40-2.37)	0.960		
Coffee (regular users)			1.75 (0.95-3.22)	0.073		
Socio-economic status (below average)					2.63 (0.91-7.61)	0.075

*aOR (95%CI): adjusted odds ratio with 95% confidence interval