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**Cannabis use and patterns of substance use
among French sport sciences students**

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ABSTRACT

Background. Sport participation has been found to be positively associated with alcohol use, especially among students, but negatively associated with illicit drug use, with inconsistent results regarding cannabis use. **Objectives.** We investigated cannabis use among French sports science students. We studied factors associated to cannabis use, especially sporting characteristics, then we identified various kinds of polydrug use among cannabis users. **Methods.** We used a questionnaire to survey sports science students from southern France in 2013-2016 (n=1,244). We performed a logistic regression to investigate the correlates of repeated cannabis use (several times in lifetime *versus* never/just once), and a cluster analysis to identify profiles of substance use among repeated users (n=415). **Results.** Overall, 33% of participants reported repeated cannabis use. This prevalence was higher among students practicing a team sport other than soccer or a sliding sport, and lower among those practicing at national/international level. Among repeated users, we found various kinds of polydrug use (combining regular or 'light' cannabis use, cannabis use for enhancing sportive or non-sportive performances, regular heavy drinking, and consumption of illicit stimulants). These combinations were correlated to respondents' sporting characteristics and sex. **Conclusions/importance.** Considering various kind of polydrug use, instead of each use separately, is a promising avenue of research to better understand correlations between sports participation and drugs use. In this article, cannabis use was frequent only among males who also exhibited high levels of alcohol use, and taking into account users' motives and sporting characteristics fueled our understanding of drugs use in this specific population.

KEYWORDS: cannabis, alcohol, sport, students, polydrug use.

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INTRODUCTION

Participating in sports is supposed to be a health enhancing activity which also provides social and human capital, develops many important abilities (such as self-esteem and self-efficacy) and may even improve academic performances (Eitle et al., 2003; Trudeau & Shepard, 2010). This is why studying licit and illicit drug use among sport sciences students may seem ‘incongruous’ (Musselman & Rutledge, 2010). Nevertheless, many studies consistently found that students participating in sport consume alcohol more frequently, in greater quantities, and report being intoxicated more often, than students who do not engage in sporting activities (Martens et al., 2006; Yusko et al., 2008; Partington et al., 2012; Zhou & Heim, 2014).

Regarding illicit drug use, results are inverse but less consistent. In a systematic review of 17 longitudinal studies, Kwan et al. (2014) reported that only half of the studies found a negative association between sports participation and cannabis use, while most of them found a negative association for other illicit drugs. Similarly, in a review of 15 quantitative studies investigating the relationship between sports participation and illicit drug uses, Lisha & Sussman (2010) reported that the most common relationship found was an inverse one, but some studies found a positive relationship (Ewing, 1998; Green et al., 2001; Peretti-Watel et al., 2002; Ford, 2007).

Such inconsistencies are probably due to methodological differences across studies, for example regarding the population sampled (high-school students or college students; samples gathering athletes and non-athletes or samples of athletes only), the kind of sport participation considered (either formal: in an organized setting, with a coach or a teacher, in school or in a club; or informal: unsupervised practice with friends and peers) or the indicator used for cannabis consumption (from lifetime use to consumption the day before). Beyond these differences, most of these surveys did not take into account the characteristics of sports

participation (e.g. main sport practiced and competitive level) and they studied males and females jointly. On the contrary, the studies which found a positive relationship between sports participation and cannabis use took into account the characteristics of sport practice and/or conducted analyses stratified by gender. For example, Ewing (1998) observed that high-school male athletes had higher marijuana use than non-athletes, while the reverse was true for females; Green et al. (2001) found that cannabis use was more frequent at lower competitive level, with wide variations according to sport, among a sample of college students; Ford (2007) found that cannabis use was more prevalent among male hockey and female soccer athletes when compared to other college athletes. These results highlight particularly the importance of considering the context and the content of sports participation, especially which sport is practiced and at which competitive level (Peretti-Watel et al., 2016). In the present study, we studied cannabis use among sport sciences students recruited in French universities. Of course, addictive behaviors in youth are a major public health issue, in France as in many other countries. But investigating this issue among sport sciences students is especially important because many of them will become coaches or physical education teachers, and they will play a key role in educating young people. Moreover, as we wanted to investigate the relationship between sporting characteristics and cannabis use, focusing on a sample of athletes seemed more appropriate than comparing athletes to non-athletes. Finally, cannabis may be used for multiple purposes including recreative, medicinal but also performance enhancing (Huestis et al., 2011), thus it's especially relevant to investigate its use among a sample of people who have to perform in both sports and academics (Yusko et al., 2008).

First, we assessed cannabis use and we studied its correlates, and especially sporting characteristics. Based on previous studies (Green et al., 2001; Ford, 2007; Peretti-Watel et al., 2016), we assumed that athletes involved in team sports would be more likely to consume cannabis, as well as those practicing at lower competitive level (Hypothesis 1). Secondly,

contrary to most previous studies, instead of analyzing different drug uses separately, we investigated patterns of substance use (as in Peretti-Watel et al., 2006) among cannabis users, taking into account various aspects of cannabis use, including performance-enhancing use, as well as other substance use, and especially alcohol use and abuse (alcohol use was measured by frequency of consumption during the last month, alcohol abuse refers to binge drinking and drunkenness, see *infra* in the Measure subsection). We expected to find contrasted patterns of drug use. More specifically, we expected some cannabis users to combine regular use of both cannabis and alcohol (which may correspond to recreative drug use), and others to report regular use of cannabis only, combined with performance-enhancing use of it (Hypothesis 2). Finally, as some previous studies found gender-dependent relationships between sport participation and cannabis use (Ewing, 1998; Ford, 2007), we also expected these patterns to be contrasted in terms of sex-ratio (Hypothesis 3).

MATERIAL AND METHODS

Data collection

The survey was carried out among sport sciences students from southern France. In order to obtain a sample large enough for multivariate statistical analysis, we targeted three universities (Perpignan-Font-Romeu, Gap & Marseilles universities) and we planned to conduct an exhaustive survey in each of them. We knew there were about 1,300 sport sciences students registered in these universities, and we expected a final sample of at least 1,000 participants. These students have ten mandatory hours of sport a week, and generally they do more. Several sessions of data collection were organized during tutorials between the fall 2013 and the fall 2016 semesters. At each session, a professional investigator presented the survey, made clear to students that they were free to refuse to participate and that the survey was anonymous and strictly confidential. Participants answered a self-administered

questionnaire in the presence of the investigator, who ensure that they did not communicate between them and directly collected questionnaires in a ballot box. The closed-ended questionnaire included 88 items. It characterized participants in terms of demographics, sport practice, alcohol consumption and intoxication, and others substance use and abuse. This procedure was performed according to the French law on Human Care Guidelines, and it was approved by the Human Care Committee at Aix-Marseille University.

Measures

The whole questionnaire has been already used in a previous survey conducted in 2002 among a similar population (Lorente et al., 2005). It characterized participants in terms of demographics (gender and age) and sport practice: main sport practiced, main context of practice and highest competitive level achieved for this sport. Sports were grouped into six categories (football/soccer; other team sports: mainly rugby, handball, basketball; athletics: track and field, including running, jumping and throwing); sliding sport: sports involving sliding or gliding such as skiing, surfing and windsurfing; combat sports: boxing, judo, jujitsu, etc.; other individual sports: tennis, swimming, cycling, etc.), the main context of practice into three categories (informal, i.e. with friends, family or alone; formal, i.e. in a club or an institution; both formal and informal), and the competition levels were merged into a ternary outcome (departmental/regional, versus national, international).

Participants were asked whether they had already used cannabis, with the proposed answers ‘never’, ‘just once to try it out’ and ‘yes, several times’. We used this question to build a binary indicator of cannabis use. We merged the first two answers in order to obtain a binary outcome, and we labelled ‘repeated users’ those who answered ‘yes, several times’. We studied repeated use of cannabis instead of lifetime use, because a number of young people usually try it out once and never do it again (Beck et al., 2016). Moreover, as repeated use of

cannabis has been already assessed in 2002 within the same population (Lorente et al., 2005), we wanted to compare its prevalence over time.

Other questions dealing with cannabis use included frequency of use during the last month (no use, 1 or 2, 3 to 9, 10 to 19, almost daily), average number of “joints” smoked at each session (1, 2 to 3, 4 and more), age at first use, cannabis use to enhance sportive performance as well as cannabis use to enhance non-sportive performance (e.g. before an examination). For these two questions, there were three items that we merged into binary outcomes: ‘never’ versus ‘once or twice’, ‘more often’. We also computed duration since initiation (age at first use subtracted to current age).

Regarding alcohol and other illicit drugs, the questionnaire also included the following items: frequencies of alcohol consumption during the last month (never, less than once per month, 1 to 4 per month, 2 to 6 per week, every day; items merged into a binary outcome: ≥ 2 per week versus less, for beer, wine and spirits respectively); binge drinking (consuming at least five drinks at one time) and drunkenness during the previous 12 months (never, 1 or 2, 3 to 5, 6 to 10, more than 10 times, items merged into a binary outcome: ≥ 10 per year versus less, for both drunkenness and binge drinking) and, finally, use of illicit stimulant (cocaine, ecstasy, metamphetamine) during the last year.

Data analysis

In order to compare repeated cannabis users and other participants in terms of age, gender and sporting characteristics, we first conducted bivariate analyses, using Pearson’s χ^2 tests (and a Student’s t-test for age), and we computed a multivariate logistic regression with a stepwise selection method (entry threshold $p=0.1$: the most significant covariates were introduced into the model step by step, but the corresponding parameters had to be statistically significant at $p=0.1$).

Then, we performed a cluster analysis to summarize in some contrasted and synthetic profiles the variety of substance use behaviors (for cannabis, alcohol and illicit stimulants, see items detailed above) among cannabis users. Cluster analysis is a descriptive statistical tool used to group observations (in this case, participants) based on their responses to several variables. Among each cluster, the combination of variables can be specific. In other words, two variables can be uncorrelated in the whole sample, but positively correlated in one cluster, and negatively correlated in an another one. In the present case, for example, it is possible to obtain a profile of participants reporting both heavy cannabis and alcohol use, and another one gathering heavy cannabis users who did not drink alcohol. The cluster analysis was based on the agglomerative hierarchical procedure (Anderberg, 1973): each observation began in a cluster by itself, then the two closest clusters were merged to form a new one, and this procedure was repeated until only one cluster was left. The distance between two clusters was computed using the Euclidian distance and Ward's method (1963). At every step, clusters were less homogeneous but easier to interpret. We selected a four-cluster partition, and we characterized it in terms of substance use behaviors, as well as demographics and sporting characteristics (using Pearson's χ^2 tests and a Student's t-test for age).

RESULTS

Data collected

All students who were present during the tutorials (n=1,268) agreed to participate, but 24 questionnaires were excluded from analysis because of missing answers for either age, gender or main sport practiced. Thus, analysis was based on 1,244 questionnaires corresponding to 842 (68%) males and 402 (32%) females. The mean age of respondents was 19.8±1.6 (mean ± SD) years. Regarding lifetime use of cannabis, 519 subjects (42% of the sample) stated that

they had never used it, 307 answered ‘just once to try it out’ (25%) and 415 answered ‘yes, several times’ (33%).

Factors associated to repeated use of cannabis

Table 1 compares repeated users of cannabis to other participants. Repeated users were slightly older, but there was no difference regarding gender: 33% of both male and female sport sciences students reported that they had already used cannabis several times during their lifetime.

Regarding the main sport practiced, the prevalence of repeated use of cannabis was the highest among students practicing a team sport other than soccer (41%) or a sliding sport (39%), and the lowest among those practicing athletics (21%) or a martial art (25%). Once the effects of other covariates were controlled for, these differences across type of sport remained statistically significant.

On the contrary, there was no significant difference regarding the main context of practice (informal, formal or both informal and formal), even in bivariate analysis. Finally, the participants’ competitive level was negatively correlated to occasional use of cannabis: 35% of those competing at departmental or regional level had already used cannabis several times, versus 30% for those competing at national level (adjusted odds ratio=0.72) and 27% at international level (aOR=0.59).

Combinations of substance use among repeated users of cannabis

The four-cluster partition summarizing the kinds of polydrug use associated to repeated use of cannabis is described in Table 2.

Among participants gathered in Cluster 1 (n=214, 52% of the sample), 40% have not used cannabis during the last month and 31% did it only once or twice; most of them (71%) reported that they consume only one joint per session; they were also the least experienced cannabis users as they reported the lowest duration since initiation (3.7 years); they never

used cannabis to enhance sportive performance and only 12% did it to enhance a non-sportive performance. Thus their cannabis use can be labelled as 'light'. Regarding alcohol use, they consumed more frequently beer, 99% reported at least 10 sessions of binge drinking and 58% at least 10 episodes of drunkenness during the last year, which can be considered as regular heavy drinking. Finally, they have not consumed illicit stimulant during the last year. To put it briefly, Cluster 1 combines a rather 'light' cannabis use and regular heavy drinking.

Participants gathered in Cluster 2 (n=112, 27%) also reported a 'light' cannabis use: 56% have not used cannabis during the last month and 25% did it only once or twice; most of them (77%) reported that they consume only one joint per session. Regarding alcohol use, none of them reported at least 10 episodes of binge drinking or drunkenness during the last year, and only 13% reported consuming beer at least twice a week.

Cluster 3 (n=67, 16%) is characterized by regular use of cannabis combined with regular heavy drinking: corresponding respondents were the most experienced cannabis users (with the highest duration since initiation: 5.3 years), 87% of them consumed cannabis during the last month, 49% did it at least 10 times and 26% almost every day, and 60% reported that they consumed at least 2 joints per session. These respondents drank frequently beer, spirits and wine, with regular episodes of binge drinking and drunkenness (at least 10 during the last year: respectively 93% and 75%). Moreover, 85% consumed an illicit stimulant during the last year.

Finally, Cluster 4 (n=22, 5%) is also characterized by regular use of cannabis and regular heavy drinking, with high frequencies of alcohol use, binge drinking and drunkenness. Corresponding participants consumed larger quantities of cannabis (46% stated that they smoked 2 to 3 joints at each session, and 36% at least 4). More specifically, most of them reported an instrumental use of cannabis: they all already used it to enhance a sportive performance, and 82% already used it to enhance a non-sportive performance. These results

supported Hypothesis 2, as participants in Cluster 3 combined regular use of both cannabis and alcohol, while those in Cluster 4 combined regular cannabis use and instrumental use of this substance.

Profiles of substance use, demographics and sporting characteristics

The demographic and sporting profile of each cluster is detailed in Table 3. Regarding gender, female sport sciences students were overrepresented among Cluster 2 ('light' cannabis use, no regular heavy drinking), with 47% of female students (versus 9% to 29% in other clusters). Thus, in reference to Hypothesis 3, we found indeed contrasted sex-ratios across our Clusters. Conversely, most sport sciences students exhibiting regular and instrumental use of cannabis and regular heavy drinking (Cluster 4) were males (91%). Moreover, participants gathered in Cluster 1 ('light' cannabis use and regular heavy drinking) were younger (mean age 19.8 years, versus 20.2 to 20.4 in other clusters).

Regarding sporting characteristics, the main sport practiced varied across the four clusters, but this relationship was hardly statistically significant. Team sports were overrepresented in the two clusters characterized by the highest frequencies for binge drinking and drunkenness (clusters 1 & 3: 40% and 37% for football or other team sports, versus 28% and 27% in clusters 2 & 4). Moreover, students practicing a sliding sport were overrepresented in cluster 4 (32%, versus 9% to 16% in other clusters). The main context of practice and the competitive level were not significantly correlated to the four-cluster partition. Nevertheless, practicing mainly in an informal context (alone, with friends, relatives) was more frequent among sport sciences students who combined regular and instrumental use of cannabis with regular heavy drinking (Cluster 4: 41%, versus 21% to 23% in other clusters).

DISCUSSION

Main results

Among a sample of French sport sciences students, 33% reported that they had already consumed cannabis several times. Such repeated cannabis use reached the same prevalence among male and female students, but it was significantly more frequent among those practicing mainly a team sport other than soccer or a sliding sport, and it was also negatively correlated to the competitive level (Hypothesis 1 partially confirmed). Among repeated cannabis users, we found various kinds of polydrug use combining regular or 'light' cannabis use, cannabis use for enhancing sportive or non-sportive performances, regular heavy drinking, and consumption of illicit stimulants. Hypothesis 2 was also partially confirmed: we did find a group of students combining heavy use of both cannabis and alcohol, and another one characterized by heavy cannabis use and performance-enhancing use, but the latter one was also associated to heavy alcohol use. Finally, these Clusters were contrasted in terms of sex-ratio (Hypothesis 3 confirmed).

Limitations of the present study

Before discussing our results, some limitations of this study have to be acknowledged. First, we studied a sample of French sport sciences students: they were not representative of French students or French young people in general. Secondly, we used a self-reported questionnaire, which may induce various responses biases, such as social desirability bias or recall bias. Nevertheless, previous methodological studies concluded that adolescents and young adults' self-reported alcohol and illicit drug use can be considered quite reliable (Johnson & Mott, 2001; Lintonen et al., 2004; van der Pol et al., 2013). More specifically, as several previous studies found that the relationship between sports participation and substance use differed across gender (Lisha & Sussman, 2010; Kwan et al., 2014; Zhou & Heim, 2014), it may have been more appropriate to analyze our data for each gender separately. However, the cluster analysis allowed us to exhibit contrasted and gendered patterns of substance use.

Comparisons with the general population and the 2002 survey

It's difficult to compare our sample to young adults in general, or even university students, as in France most surveys on drug use target either the general population or high-school students. Nevertheless, we can compare our results to those from a survey conducted among the general population in 2016, given that a previous study found that the prevalence of cannabis use was very similar for students and non-students aged 18-25 (Beck et al., 2008). In the 2016 survey, among participants aged 18-25, 53% reported lifetime use of cannabis, 17% used cannabis during the last month, and 8% did it at least 10 times (Beck et al., 2016, 2017). In our sample, these three proportions were quite similar, as they reached respectively 58%, 20% and 7%.

Nevertheless, we can compare our results to those from a previous study conducted in 2002 among sport sciences students in the same universities. (n=1,152, the 2002 sample was slightly older, i.e. mean age 20.7 vs 20.0 years). In the present study, the prevalence of repeated use of cannabis was identical for males and females (i.e. 33%), while in 2002 46% of males and 37% of females reported having already used cannabis several times (Lorente et al., 2005). This evolution illustrates the general decrease of the gender gap observed in France in the general population and among the youth, for cannabis as well as for alcohol and tobacco use (Legleye et al., 2014; Beck et al., 2016). This decreasing gender gap has been described as a common feature of a diffusion process (Legleye et al., 2014), or as the consequence of the blurring boundaries in gender-related social roles (Beck et al., 2016).

However, our results also illustrate the persistence of the gender gap for more frequent or heavier use, as males were largely overrepresented in the clusters 3 and 4 characterized by regular use of cannabis and regular heavy drinking. As sport is frequently considered one of the last strongholds for masculine values such as confrontation, physical strength and endurance (Dunning, 1986), cannabis and alcohol intoxication may still provide a way to express commitment to these values, by showing one's ability to 'hold his liquor' or 'hold his

weed' (Peretti-Watel et al., 2016). In other words, the gender gap in cannabis use is decreasing but tends to persist for frequent/heavy cannabis use.

Sporting characteristics and patterns of substance use

Repeated cannabis use was positively associated to team sports other than soccer and sliding sports, student practicing team sports were overrepresented in the cluster characterized by high frequencies for binge drinking and drunkenness (cluster 3), while those involved in sliding sports were overrepresented in the cluster 4 characterized by regular and instrumental use of cannabis, as well as those practicing mainly in an informal context. The relationship between team sports and heavy alcohol use and drunkenness is a well-documented one (Ford, 2007; Martha et al., 2009; Lisha & Sussman, 2010; Zhou & Heim, 2014), as drinking alcohol can be considered a multipurpose behavior shaped by specific motives, such as socializing team members and proving one's commitment to the group (Zhou & Heim, 2016).

Regarding the positive relationship between the practice of sliding sports and cannabis use, both activities may be impelled by sensation-seeking (to search for exhilaration, thrill or flow) and express attachment to the same subculture (Peretti-Watel et al., 2016). Moreover, sport practice in an informal context is likely to loosen social control and to provide opportunities for drug use (Lorente et al., 2002). However, the relationship between sporting characteristics and substance use was strongly significant when considering repeated use of cannabis, but hardly significant when considering heavier uses of cannabis. Sport participation activities may provide differential opportunities to engage in repeated use of cannabis for both male and female sport sciences students, while transition to higher levels of use may depend on other factors, including gender, and in return such transition may also influence sport participation (Peretti-Watel & Lorente, 2004).

Polydrug use among sport sciences students

The kinds of polydrug use found among sport sciences students were characterized by various combinations of drug uses. Such uses can be either concurrent (several substances have been consumed separately within a given time period) or simultaneous (the substances have been used at the same time, on a single occasion). We did not collect data about simultaneous polydrug use, which is more complicated and time consuming to measure than concurrent use (Schensul et al., 2005). Nevertheless, previous studies have consistently shown that the majority of concurrent polydrug users are also simultaneous users, especially among university students (Martin et al., 1992; Martin, 2008).

Such simultaneous use is usually intentional, as simultaneous users have already experienced the pharmacological effects of various drugs and may try to produce additive or interactive subjective drug effects (Wibberley & Price, 2000; Martin, 2008). According to a review of previous studies, the combined use of alcohol and illicit drugs has increased during the last decades, simultaneous use is more frequent among males and young adults, and cannabis is the most common illicit drug combined with alcohol, far ahead of illicit stimulants (Martin, 2008; Oliveira et al., 2013).

Our study echoes these results, as participants gathered in Clusters 3 & 4 were mainly males, who were also older and more experienced cannabis users (in terms of duration since initiation), characterized by heavy use of both alcohol and cannabis, and (at least for Cluster 3) a high prevalence of illicit stimulant use during the previous year. We can assume that these participants were prone to combine the psychoactive effects of alcohol and cannabis (or, to a lesser extent, illicit stimulants) in recreational settings, in order to optimise their leisure time (Parker et al., 1998).

Conclusions

Contrary to the image that athletes do not use psychoactive drugs (Brisola-Santos et al., 2016), this study on French sport sciences students suggests that a number of athletic

subgroups are at increased risk for cannabis use. In order to design preventive action programs adapted to sport sciences students as well as to other populations engaged in sporting activities, further research is needed to better understand how various aspects of sports participation interact with different levels of drug use, and we believe that considering different kind of polydrug use, instead of considering each substance use separately, is a promising avenue of research.

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Table 1. Factors associated with repeated cannabis use, logistic regression (sport sciences students, South-Eastern France, n=1,242).

<i>Lifetime cannabis use: several times</i>	Row%	aOR [#]
Gender:		
-females (n=402)	33%	ns
-males (n=842) (ref.)	33% ns	-1-
Mean age		
-occasional cannabis user (n=418)	20.0	1.12***
-other participants (n=834)	19.7 **	
Main sport practiced:		
-football/soccer (n=165)	28%	0.70 #
-other team sports (n=249)	41%	1.37 **
-athletics (n=110)	21%	0.53 ***
-sliding sport (n=149)	39%	1.39 *
-combat sports (n=87)	25%	0.65 *
-other individual sports (n=484) (ref.)	34% **	-1-
Main context of practice:		
-informal context (n=263) (ref.)	37%	-1-
-formal context (n=687)	32%	ns
-both in a formal and informal context (n=294)	34% ns	ns
Competitive level:		
-departmental, regional (n=827) (ref.)	35%	-1-
-national (n=326)	30%	0.72 **
-international (n=91)	27% *	0.59 **

ns: non-significant; * p<0.10; ** p<0.05; *** p<0.01, testing either the independence hypothesis between cannabis use and each row variable (Row% column) or the null hypothesis for the aOR (column aOR).
#: adjusted odds ratio.
ref.: reference value for the logistic model.

Table 2. Patterns of substance use among cannabis repeated users, four-cluster partition (sport sciences students, South-Eastern France, n=415).

	Cluster 1: 52% (n=214)	Cluster 2: 27% (n=112)	Cluster 3: 16% (n=67)	Cluster 4: 5% (n=22)
	<i>Column %</i>			
<i>Cannabis use:</i>				
Frequency of use (last month):				
- no use (n=162)	40%	56%	13%	18%
- 1 to 2 (n=109)	31%	25%	16%	18%
- 3 to 9 (n=62)	15%	11%	22%	18%
- 10 to 19 (n=44)	9%	5%	23%	14%
- almost every day (n=38)	5%	3%	26%	32%
Quantities consumed per session:				
- 1 joint (n=268)	71%	77%	40%	18%
- 2 to 3 joints (n=109)	25%	20%	33%	46%
- 4 or more (n=38)	4%	3%	27%	36%
Mean duration since initiation (in years)	3.7	4.3	5.3	4.6
Already used cannabis to enhance sportive performance (n=22)	0%	0%	0%	100%
Already used cannabis to enhance non-sportive performance (n=78)	12%	13%	31%	82%
<i>Alcohol use:</i>				
- ≥ 2 times per week: beer (n=176)	47%	13%	67%	68%
- ≥ 2 times per week: wine (n=64)	16%	6%	30%	14%
- ≥ 2 times per week: spirits (n=81)	17%	2%	51%	36%
Binge drinking: ≥ 10 during the previous 12 months (n=290)	99%	0%	93%	77%
Drunkenness: ≥ 10 during the previous 12 months (n=188)	58%	0%	75%	68%
<i>Illicit stimulant use:</i>				
ecstasy, cocaine or metamphetamine during the previous 12 months (n=72)	0%	7%	85%	27%

We tested the independence hypothesis between the four-cluster partition and each row variable with the χ^2 statistic. In all cases, the independence hypothesis was rejected at $p < 0.001$. Cluster analysis summarized in a few contrasted profiles the variety of substance use behaviors (for cannabis, alcohol and illicit stimulants) among cannabis users. Reading example: 52% of participants were gathered in Cluster 1 (n=214). Among them, 5% consumed cannabis almost every day during the last month, versus 32% in Cluster 4 (5% of participants, n=22).

Table 3. Demographics and sporting characteristics of patterns of substance use among cannabis repeated users (sport sciences students, South-Eastern France, n=415).

	Cluster 1: 52% (n=214)	Cluster 2: 27% (n=112)	Cluster 3: 16% (n=67)	Cluster 4: 5% (n=22)
	<i>Column %</i>			
Gender:				
-females (n=134)	29%	47%	25%	9%
-males (n=281)	71%	53%	75%	91% ***
Mean age (in years)	19.8	20.2	20.4	20.4 **
Main sport practiced:				
-football/soccer (n=46)	12%	12%	7%	9%
-other team sports (n=102)	28%	16%	30%	18%
-athletics (n=23)	3%	10%	4%	9%
-sliding sport (n=58)	16%	11%	9%	32%
-combat sports (n=22)	4%	6%	8%	5%
-other individual sports (n=164)	37%	45%	42%	27% *
Main context of practice:				
-informal context (n=97)	23%	21%	22%	41%
-formal context (n=217)	52%	57%	51%	41%
-both in a formal and informal context (n=101)	25%	22%	27%	18% ns
Competitive level:				
-departmental, regional (n=293)	74%	72%	61%	64%
-national (n=97)	21%	21%	33%	32%
-international (n=25)	5%	7%	6%	4% ns

ns: non-significant; * p<0.10; ** p<0.05; *** p<0.01, testing the independence hypothesis between the four-cluster partition and each row variable.

Cluster analysis summarized in a few contrasted profiles the variety of substance use behaviors (for cannabis, alcohol and illicit stimulants) among cannabis users. Reading example: 52% of participants were gathered in Cluster 1 (n=214). Among them, 29% were female, versus 47% in Cluster 2 (27% of participants, n=112).