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# Cannabis use to enhance sportive and non-sportive performances among French sport students

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## Abstract

*Purpose:* Despite a large public health interest in substance use among athletes, only a few works have addressed illicit drug use in relation with sport practice. We have studied cannabis use to enhance both sportive and non-sportive performance among French sport university students.

*Methods:* An anonymous self-reported questionnaire was administered to a sample of students from six Sport Science Universities from Southern France. Information on sport practice and cannabis use (frequency, quantity, motives) was collected.

*Results:* Males were more prone to have already used cannabis to enhance non-sportive performance as well as sportive performance. The simultaneous equation model indicated that both kinds of enhancing-substance use were endogenous: cannabis use to enhance sportive performance leads to cannabis use to enhance non-sportive performance and reciprocally. Moreover, the relaxing properties of cannabis may be frequently used to enhance performance. Cannabis use to enhance sportive performance was positively related to the competitive level and to sliding sports.

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*Conclusions:* The present study helps to improve understanding on an empirical paradox about the relationship between doping agents use and so-called 'recreational' drug use among athletes. Indeed, people who use doping agents may also use 'recreational' drugs for a 'non-recreational' purpose.
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## 1. Introduction

For the last decade, a new concern has arisen about potential adverse consequences of sporting practice, which is suspected to be connected with several so-called 'risky behaviors', especially drug use, including enhancing-substance use as well as recreational drug use. In the latter case, the scientific literature remains controversial: at adolescence and young adulthood, drug use was found to be common among sport participants (Spence & Gauvin, 1996), and even more frequent among them than among non sport participants (Gonzalez, Field, Yando, Gonzalez, Lasko, & Bendell, 1994; Kokotailo, Henry, Koscik, Fleming, & Landry, 1996), while other studies concluded that sport practice was a protective factor for drug use (Forman, Dekker, Javors, & Davison, 1995; Naylor, Gardner, & Zaichkowsky, 2001; Pate, Trost, Levin, & Dowda, 2000). Some studies also suggested that the drug–sport relationship depends on which drugs and which sport practices are considered (Peretti-Watel, Beck, & Legleye, 2002; Wechsler, Davenport, Dowdall, Grossman, & Zanakos, 1997). Moreover, several interpretations have been proposed for this relationship: sport practice may provide opportunities to use recreational drugs; both activities may reveal the same sensation-seeking (exhilaration); recreational drugs may also be consumed for alleviating the anxiety generated by competition (Peretti-Watel, Guagliardo, Verger, Pruvost, Mignon, & Obadia, 2003).

A high incidence of positive cases for cannabinoids, in analyses for doping control in sports, has been observed since the International Olympic Committee (IOC) included them in the 1989 list of prohibited drugs under the title of 'classes of prohibited substances in certain circumstances' (Campos, Yonamine, De Moraes, & Moreau, 2003). For instance, in France, positive tests for cannabis reached 25% of all positive results in 2002. In the present study, we focused on cannabis use among French sport university students characterized by their regular involvement in sport activity. We aimed to test the following hypothesis: cannabis could be used for managing anxiety before a competition or another stressing event (e.g. an examination), in order to increase efficiency. In this case, cannabis use should be no longer viewed as recreational, but should be considered as a doping agent. A previous study conducted among French adolescent general population already found that cannabis use was quite widespread in non-recreational contexts (alone, in the morning). Some respondents of that survey spontaneously reported a cannabis use for enhancing academic performance (Beck, Legleye, & Peretti-Watel, 2002). Another survey suggested that among French medical students, more than half the population reported enhancing-substance use in their first year of studies, especially marijuana use during preparation for their examinations (Laure, 2000).

The aim of the article was threefold. First, we assessed the prevalence of cannabis use to enhance sportive and non-sportive performance among French sport university students. Second, we investigated factors associated with both enhancing-substance use. Finally, we aimed to improve the understanding about the relationship between these two kinds of cannabis use. Precisely, they may be either independent or correlated, and if correlated the causal direction has to be determined. Indeed, cannabis users may first consume this substance in order to relax before a stressing event (e.g. an examination), and then, if they find it efficient, they may reiterate this use before a sporting competition; but the inverse chronological and causal order is also to be considered. Finally, the two processes may be reciprocal.

## 2. Methods

### 2.1. The survey

Procedures were performed according to the French law on Human Care Guidelines, using protocols approved by the Human Care Committee at Aix-Marseille II University. The present study was based on a self-reported questionnaire which we envisaged to administer to a sample of 1856 students from six Sport Science Universities from Southern France: Marseilles ($n=651$), Montpellier ($n=420$), Nice ($n=190$), Toulouse ($n=260$), Perpignan ($n=185$) and Avignon ($n=150$). Only second and third-year students were surveyed. First-year students were excluded because they are not really representative of the sport sciences population, as two thirds of them fail end-of-year exams and stop studying sport Sciences. Fourth-year students were also excluded because some of them followed a course on addiction, which could change their attitude towards cannabis and other drug uses.

As students were questioned about an illicit consumption (in France), it was made clear that the survey was strictly anonymous and confidential. Students were free to refuse to participate. About 30 subjects participated in each session, which lasted about 20 min. Subjects were sat one per table, each table separated from the others by at least 6 ft in all directions. An investigator was present to ensure that there was no communication between subjects. At the end of the session, the subjects placed their questionnaire into a common ballot box.

### 2.2. The questionnaire

The questionnaire included 87 items characterizing the population in terms of demographics (3 items), sport practice (5 items), alcohol consumption and intoxication (13 items), and others substance use and abuse (66 items). In the present study, we used the following items: gender, age, main sport practiced, competitive level, cannabis use during the whole lifetime, main motive to cannabis use, frequency of cannabis use during the prior 30 days, average number of "joints" smoked in a consumption session, and cannabis use to enhance sportive or non-sportive performance (e.g. before an examination). All these items

were closed-ended questions, except for the main motives to cannabis use. Answers to this open question were postcoded in four categories using the following procedure: two senior social scientists coded answers separately. When their coding diverged, a third one made the decision. Respondents who reported several cannabis use during their whole lifetime were labeled "cannabis users" in the present study.

## 2.3. Statistical analysis

We used Pearson's $\chi^2$ to compare male and female for age, sport characteristics and cannabis use. Then, we restricted the analysis to cannabis users and we built a structural model to investigate simultaneously the factors associated with two depending variables: cannabis use to enhance respectively non-sportive performance ($Y_1$) or sportive performance ($Y_2$). We used gender, age, sporting characteristics and cannabis use (frequency of use, main motive, number of "joints" smoked in a consumption session) as exogenous factors ($X$).

We considered that each depending variable was influenced by the other one and by a specific subset of exogenous factors. In order to define these specific subsets, we estimated a single equation model, with two dichotomous logistic regressions, one for each depending variable. Explanatory variables included the other depending variable and exogenous factors $X$. Gender and age were forced into both models, and other factors were selected with a stepwise procedure (entry threshold: $p=0.10$). Gender, age, and other exogenous factors selected in the regression modeling $Y_1$ (respectively $Y_2$) defined a specific subset $X_1$ (resp. $X_2$).

Then, to obtain a simultaneous equation model, we used a standard two-stage estimation method (see Hsieh, Yen, Liu, & Jeng Lin, 1996). First, $Y_1$ (respectively $Y_2$) was regressed only on $X$, for computing a predicted value $\hat{Y}_1$ (resp. $\hat{Y}_2$) independent of $Y_2$ (resp. $Y_1$). Secondly, we substituted the predicted values computed from the first-stage estimation as explanatory variables in the single equation model, and estimated again the model ($Y_1$ regressed on $\hat{Y}_2$ and $X_1$; $Y_2$ regressed on $\hat{Y}_1$ and $X_2$). Standard errors were adjusted using the methodology suggested by Maddala (1983). The exogeneity of each depending variable was tested using the contrast between the single equation model and the simultaneous model (Hausman, 1978). For example, if $Y_1$ is exogenous (i.e. no caused by $Y_2$), then $\hat{Y}_1$ and $Y_1$ are comparable predictors of $Y_2$, and the corresponding models are statistically equivalent. On the contrary, if $Y_1$ is endogenous (i.e. caused by $Y_2$), then $Y_1$ is a better predictor of $Y_2$ than $\hat{Y}_1$, and the model with $Y_1$ is statistically superior to the model with $\hat{Y}_1$. The whole data analysis was performed with LIMDEP (version 8).

## 3. Results

### 3.1. Characteristics of sport sciences subjects

Overall, 551 students (29.7%) were absent on the day of the survey. All students who were present ($n=1305$) agreed to participate, but incomplete questionnaires ($n=109$) were not

included in the analysis: 1196 questionnaires were fully completed by the students of Marseilles (*n*=374), Montpellier (*n*=336), Nice (*n*=165), Toulouse (*n*=127), Perpignan (*n*=113) and Avignon (*n*=81). We also excluded respondents aged over 24 (*n*=44), so that the final sample is composed by 1152 subjects.

Table 1 indicates that males were slightly older than females and also more prone to practice mainly a team sport (soccer, volleyball, basketball, handball, rugby). There was no gender difference on the level of sport practice: one third of the respondents went in for competitive sport at a national level, and a minority (4.8%) was involved in international competitions.

### 3.2. Cannabis use among sport sciences subjects

Overall, two thirds of the respondents (66.8%) had already used cannabis, and 4 out of 10 did it several times (see Table 2). Among the latter category, which we labeled "cannabis users", most of the respondents reported having used cannabis at least once during the previous 30 days, and one third reported a regular use (at least 10 uses) during the same period. Half of those cannabis users smoked one "joint" or less by consumption session. Males were more prone to be cannabis users, regular users, and to smoke 2 joints or more by consumption session.

Table 1
Age, competitive level and main sport practiced by gender

|  | Females (%) | Males (%) | Total (%) |
|---|---|---|---|
|  | *n*=487 | *n*=665 | *n*=1152 |
| Age |  |  |  |
| 18–19 (*n*=209) | 21.1 | 15.9 | 18.1 |
| 20 (*n*=366) | 32.6 | 31.1 | 31.8 |
| 21 (*n*=294) | 25.3 | 25.7 | 25.5 |
| 22–24 (*n*=283) | 20.9 | 27.2** | 24.6 |
| (Mean) | (20.5) | (20.8) | (20.7) |
| Competitive level |  |  |  |
| Departmental (*n*=173) | 14.5 | 17.2 | 16.0 |
| Regional (*n*=484) | 45.4 | 44.5 | 44.9 |
| National (*n*=369) | 34.3 | 34.2 | 34.2 |
| International (*n*=52) | 5.8 | 4.1ns | 4.8 |
| Main sport practiced |  |  |  |
| Team sport (*n*=463) | 26.7 | 50.1 | 40.2 |
| Racket sport (*n*=136) | 10.3 | 12.9 | 11.8 |
| Athletics (*n*=98) | 11.5 | 6.3 | 8.5 |
| Martial art (*n*=79) | 6.0 | 7.5 | 6.9 |
| Sliding sport[a] (*n*=80) | 7.0 | 6.9 | 6.9 |
| Gymnastics, dance (*n*=92) | 16.0 | 2.1 | 8.0 |
| Swimming (*n*=76) | 9.2 | 4.7 | 6.6 |
| Other sports (*n*=128) | 13.3 | 9.5*** | 11.1 |

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

[a] Sliding sport: windsurfing, skiing, snowboarding, surfing, sailing.

Table 2
Cannabis use by gender, sport sciences subjects

| | Females (%) | Males (%) | Total (%) |
|---|---|---|---|
| | $n$=487 | $n$=665 | $n$=1152 |
| Cannabis use during the whole lifetime | | | |
|   Never ($n$=383) | 37.4 | 30.2 | 33.2 |
|   Just one try ($n$=281) | 25.7 | 23.5 | 24.4 |
|   Several times ($n$=488) | 37.0 | 46.3*** | 42.4 |
| Age of initiation (mean) ($n$=767) | (16.7) | (16.8) | (16.7) |
| Frequency of cannabis use during the previous 30 days[a] | | | |
|   No use ($n$=111) | 31.7 | 17.5 | 22.7 |
|   1–2 ($n$=125) | 28.3 | 24.0 | 25.6 |
|   3–9 ($n$=97) | 22.2 | 18.5 | 19.9 |
|   ≥10 ($n$=155) | 17.8 | 39.9*** | 31.8 |
| Average number of "joints" smoked in a consumption session[a] | | | |
|   ≤1 ($n$=269) | 67.8 | 47.7 | 55.1 |
|   2–3 ($n$=152) | 24.4 | 35.1 | 31.1 |
|   ≥4 ($n$=67) | 7.8 | 17.2*** | 13.7 |
| Main motives to cannabis use[a] | | | |
|   To relax, to forget problems ($n$=176) | 35.0 | 36.7 | 36.1 |
|   For pleasure, to enjoy its psychoactive effects ($n$=118) | 21.7 | 25.6 | 24.2 |
|   To spend good time with friends ($n$=102) | 22.2 | 20.1 | 20.9 |
|   Other ($n$=92) | 21.1 | 17.5ns | 18.9 |
| Cannabis use to enhance non-sportive performance[a] | | | |
|   Never ($n$=312) | 68.3 | 61.6 | 64.1 |
|   Yes, once or twice ($n$=124) | 25.0 | 25.7 | 25.5 |
|   Yes, more often ($n$=51) | 6.7 | 12.7* | 10.5 |
| Cannabis use to enhance sportive performance[a] | | | |
|   Never ($n$=427) | 92.8 | 84.4 | 87.5 |
|   Yes, once or twice ($n$=52) | 6.1 | 13.3 | 10.7 |
|   Yes, more often ($n$=9) | 1.1 | 2.3** | 1.8 |

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

[a] Among subjects who had used cannabis several times in the whole lifetime.

The main motives to use cannabis were (1) to relax, to forget problems, to alleviate stress, to sleep better (36.1%); (2) for pleasure, to enjoy its psychoactive effects (24.2%); (3) to spend good time with friends, to have fun in parties (20.9%). The first set of motives corresponds to an instrumental, non-recreational use, while the third one is more likely associated to a sociable and convivial use. Finally, males were more likely than females to have already used cannabis to enhance non-sportive performance (38.4% vs. 31.7%), as well as sportive performance (15.6% vs. 12.5%).

### 3.3. Factors associated with performance enhancing cannabis use

The single equation model (Table 3) indicated that the two depending variables were tightly correlated (with odds ratios attaining 8.0 and 8.8). Among exogenous variables, the first

Table 3
Cannabis use to enhance non-sportive or sportive performance, single and simultaneous equation models (odds ratios from logistic regressions), sport sciences subjects (subsample of cannabis users, *n*=488)

| | Single equation model | | Simultaneous equation model | |
|---|---|---|---|---|
| | Non-sportive | Sportive | Non-sportive | Sportive |
| Gender | | | | |
| Males (ref.) | 1 | 1 | 1 | 1 |
| Females | 1.1 ns | 0.5** | 1.2 ns | 0.5** |
| Age | | | | |
| 18–19 (ref.) | 1 | 1 | 1 | 1 |
| 20 | 1.9* | 0.6 ns | 1.8* | 0.8 ns |
| 21 | 1.1 ns | 0.7 ns | 1.1 ns | 0.9 ns |
| 22–24 | 1.7 ns | 0.6 ns | 1.6 ns | 0.7 ns |
| Competitive level | | | | |
| Departmental, regional | – | 1 | – | 1 |
| National, international | | 2.0** | | 1.9** |
| Main sport practiced | | | | |
| Other sports (ref.) | – | 1 | – | 1 |
| Sliding sport[a] | | 4.3*** | | 3.3*** |
| Main motive to cannabis use | | | | |
| For pleasure, other (ref.) | 1 | 1 | 1 | 1 |
| To relax, to forget problems | 3.1*** | 1.2 ns | 2.9*** | 1.0[ns] |
| To spend good time with friends | 1.6 ns | 0.3** | 1.7* | 0.4* |
| Frequency of cannabis use (prior 30 days) | | | | |
| No use (ref.) | 1 | – | 1 | – |
| 1–2 | 1.6 ns | | 1.5 ns | |
| 3–9 | 1.5ns | | 1.3 ns | |
| $\geq$10 | 3.4*** | | 2.8*** | |
| "Joints" smoked in a consumption session | | | | |
| $\leq$1 (ref.) | – | 1 | – | 1 |
| 2–3 | | 2.3** | | 1.8* |
| $\geq$4 | | 4.1*** | | 3.1*** |
| Cannabis use to enhance non-sportive performance | | | | |
| Never | – | 1 | – | 1 |
| At least once | | 8.0*** | | 2.2** |
| Cannabis use to enhance sportive performance | | | | |
| Never | 1 | – | 1 | – |
| At least once | 8.8*** | | 1.6** | |
| Chi-square[b] | 106.7*** | 102.5*** | 73.1*** | 66.3*** |

***, **, *, ns: statistically significant at 1%, 5%, 10% levels, non-significant (two-tail test), respectively.
[a] Sliding sport: windsurfing, skiing, snowboarding, surfing, sailing.
[b] Wald's $\chi^2$ testing global null hypothesis (all parameters are zero, except for the intercept).

equation indicated that respondents who used cannabis to relax and regular users were more prone to use cannabis to enhance non-sportive performance. In the second equation, females and respondents who used cannabis to "spend good time with friends" were less prone to use cannabis to enhance sportive performance, while such a behavior was more likely to occur

among students involved in national or international competition, students mainly practicing sliding sport, as well as those who smoked more than one joint per consumption session. These results were robust across specification, as they remained statistically significant in the simultaneous equation model. In the latter model, for both equations, the Wald's $\chi^2$ significantly decreased. So, the exogenous hypothesis was largely rejected for both depending variables. Their endogeneity was clearly illustrated by the estimated odds ratios, which were lower than the odds ratios computed in the single equation model.

## 4. Discussion

The present data result from a survey carried out on students from six major Sport Sciences Universities of the Southern France. Because of the specificities of the tested population, our findings cannot be generalized to all young adult sportsmen. When compared with available data collected among French students interviewed in general population surveys, the prevalence of cannabis use observed in our sample was quite higher, especially for females (Beck, Legleye, & Peretti-Watel, 2001). In addition, the method used does not allow rejecting the idea that young people may be prone to under-report cannabis use in a self-administered questionnaire (Brasseux, Guagliardo, & D'Angelo, 1997). Lastly, further research conducted in larger samples is needed to check the reliability of our results.

Our data indicate that a substantial minority of the French university sport students questioned have already used cannabis to enhance non-sportive or sportive performance (36.0% and 12.5%, respectively). The doping use of cannabis seems to be characteristic of chronic users, not occasional ones. Indeed, it was positively correlated with the frequency of use (for non-sportive performance) and with the number of joints smoked in each consumption session (for sportive performance). Moreover, the simultaneous equation model indicated that both kinds of enhancing-substance use were endogenous: cannabis use to enhance sportive performance may lead to cannabis use to enhance non-sportive performance and reciprocally.

The use of cannabis to enhance performance was more frequent among respondents for whom the main motive to use was relaxing or forgetting problems (for non-sportive performance), and less frequent among those for whom the main motive was recreational (spending good time with friends, for sportive performance). This result supports the view that relaxing properties of cannabis could be frequently used to enhance performance. Such a behavior is a source of concern, as a previous study found that using cannabis to reduce negative feelings (to overcome depression, to relieve tension, to get away from problems) at adolescence was associated with persistence of use at adulthood (Chen & Kandel, 1998). Another source of concern is the positive relationship between sporting competitive level and cannabis use to enhance sportive performance, which is consistent with the results from a previous survey conducted among French elite-student athletes (Peretti-Watel, Guagliardo, Verger, Pruvost, Mignon, & Obadia, 2003).

We also observed that practicing a sliding sport was strongly associated with cannabis use to enhance sportive performance. Previous studies already found that cannabis use was more frequent among adolescents involved in such sports (Beck, Choquet, Hassler, Ledoux,

Legleye, & Peretti-Watel, 2000; Cherpitel, Meyers, & Perrine, 1998; Pillard, Cances-Lauwers, Godeau, Navarro, Rolland, & Riviere, 2001). Both sliding sports and drug use may be impelled by sensation-seeking: to get thrilled, to search for exhilaration (Caillois, 1967; Lyng, 1990; Zuckerman & Kuhlman, 2000). In addition, our findings suggest that cannabis use and sliding sports may not be two independent ways to seek sensations, but rather that cannabis could be used as an adjunct to sensation-seeking during sliding sport practice.

Finally, the present study helps to improve understanding on an empirical paradox about the relationship between doping agents use and the so-called 'recreational' drug use. Because of all the doping agents do not provide psychoactive effects and since they are used to improve performance and/or appearance, one could expect that subjects using doping agents would be less prone to consume recreational drugs which are unhealthy and which may be prejudicial to sporting performance (Pedersen & Wichström, 2001). Cannabis presents several proven effects on sport performance as a lower reaction time, problems of motor coordination, problems of hand–eye coordination, problems of perceptual accuracy, etc. (Wilmore & Costill, 1999). However, several surveys indicated a positive correlation between the two consumption behaviors (Adlaf & Smart, 1992; DuRant, Escobedo, & Health, 1995; Kindlundh, Isacson, Berglund, & Nyberg, 1999; Scott, Wagner, & Barlow, 1996). Our findings point out a solution to solve this apparent paradox for cannabis: subjects using doping agents may also use 'recreational' drugs for a 'non-recreational' purpose. Future preventive action programs targeting young adults (and especially young sportsmen) should take into account the 'non-recreational' motives of drug use.

## Acknowledgements

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