

Cannabis use and drug related problems among adolescents in 27 European countries: The utility of the prevention paradox

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ABSTRACT

AIMS – To study the prevalence of cannabis use and drug-related problems among European adolescents and the utility of the prevention paradox. **METHODS** – Survey data from the European School Survey Project on Alcohol and Other Drugs (ESPAD) in 2007 in the 27 countries with information about drug use and drug-related problems was used. We analysed the proportion of all drug-related problems that occurred in a high risk group and among others who had used cannabis in the previous 12 months. The cut-off for the high risk group was chosen to include 10-15 % of the most frequent cannabis users. **RESULTS** – The high risk groups accounted for a substantial, but a minority, of drug-related problems among boys as well as girls. A minority of those who had used cannabis reported any drug-related problem. The proportion of adolescents with drug-related problems and the average number of problems increased with frequency of cannabis use. **CONCLUSIONS** – We find support for policy measures of more general character, supported by the prevention paradox. However, this does not exclude a policy supporting frequent drug users if they can be identified

KEYWORDS – drugs, drug-related problems, youth, prevention, ESPAD, drug policy

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Introduction

According to the European Drug Report 2013 (EMCDDA, 2013) 85 million adults, a quarter of the European population has used drugs, and 77 million have used cannabis. In the general population, as well as among adolescents, cannabis is by far the

most widely used drug, with figures only slightly lower than for all illicit drugs in total (Hibell et al., 2012; EMCDDA, 2014). About 15 % in the ages 15-24 had used drugs in the previous 12 months. The increase in use of illicit drugs between 1995

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(11%) and 2003 (20%) observed among 15–16 years old students in the European School Survey Project on Alcohol and Other Drugs (ESPAD)- countries came to a halt in 2003, since the average prevalence was 18% both in 2007 and in 2011. The ESPAD study in 2011 showed a large variation between countries, from 5 % in Norway and an over eight times higher lifetime prevalence of illicit drugs in the Czech Republic. Hence, drug use is a common habit among European adolescents.

Numerous studies have shown that cannabis use is associated with a variety of health and social problems, including impaired cognitive functioning (Windle, 1990; Lynskey, Heath & Buccholz et al., 2003; Harvey, Sellman, Porter, & Framton, 2007), chronic health effects such as cannabis dependence (Hall & Solowij, 1998), psychotic disorders and low educational attainment (Legleye et al., 2010). Given that regular cannabis use has been established as an important predictor of later drug use (Cox, Zhang, Johnson, & Bender, 2007), it is essential to identify high-risk users at an early stage.

Fergusson, Horwood, & Swain-Campbell, (2002) conducted a 21-year longitudinal study of the health, development and adjustment of a birth cohort of 1265 New Zealand children to examine the associations between frequency of cannabis use at age 14–21 years and psychosocial outcomes, including a range of adjustment problems in adolescence/young adulthood; other illicit drug use, crime, depression and suicidal behaviours. They found that the frequency of cannabis use was significantly associated with all outcomes, and particularly other illicit drug use. They concluded that cannabis use, and especially regular or

heavy use, was associated with increased rates of a range of adjustment problems in adolescence/young adulthood, with the adverse effects being most evident among regular cannabis users.

In a twin study, Lynskey et al. (2003) found that twins who used cannabis by the age of 17 had 2.1 to 5.2 increased odds of other drug use, alcohol dependence, and drug abuse/dependence compared to their non-using co-twin. This was also the case after adjusting for known risk factors (i.e. early-onset of alcohol or tobacco use, parental conflict/separation, childhood sexual abuse, conduct disorder, major depression, and social anxiety).

It is obvious that young people's use of cannabis can have negative consequences, which calls for relevant prevention strategies. One strategy that has been discussed in the alcohol field relates to the prevention (or epidemiological) paradox and the question on whether preventive measures shall be directed towards a special high-risk group or towards a broader group, for example the general population.

The prevention paradox concept was introduced by Geoffrey Rose in an analysis of risk factors for ischemic heart disease more than 30 years ago (Rose, 1981). If those with low-moderate level of some risk factor for one or more health problems, by some measure, account for the majority of problems, then the prevention paradox is regarded as valid for the health problem(s) under study.

The prevention paradox with regard to alcohol was first analysed by Kreitman in 1986 who found support for this concept for some common social and health problems in an analysis of survey data from Scotland. In one of our previous studies

(Danielson, Wennberg, Hibell, & Romelsjö, 2012), we found that the prevention paradox, based on measures of annual alcohol consumption and heavy episodic drinking, seemed valid for adolescents in Europe. However, a minority with frequent heavy episodic drinking accounted for a large proportion of all problems, illustrating the limitations of the concept.

There are only few studies on the validity of a prevention paradox for alcohol use in adolescents, and in the drug field we have been able to identify just one study (Stockwell et al., 2004). The approach in this study is unusual as the authors analyse the proportion of ever users of cannabis, alcohol and tobacco based on number of risk and protective factors in three groups, and not in relation to frequency or amount of substance use. They found support for the prevention paradox of varying degree, dependent on which measure of cannabis use they analysed.

In a commentary to a paper by Temple, Brown & Hine in *Addiction*, Andréasson (2011) raised the issue on whether a prevention paradox for illicit drugs exists. Although he had data from a large national survey in Sweden and data on number of subjects in the Prison and Probation Services who had been identified as drug users, it was not possible to provide an answer to this issue.

Thus, little is known about the possible relevance of the prevention paradox in the development of a strategy for preventing drug related problems among young people.

Objective

To study the prevalence of cannabis use and drug-related problems among Euro-

pean adolescents, and the utility of the prevention paradox.

Methods

Study population

The ESPAD project collects survey data about substance use among students that will become 16 years during the year of the data collection. The first survey was conducted in 1995 with 26 participating countries and data collections have after that been repeated every fourth year on nationally representative samples with an increasing number of countries. In 2007 35 countries took part in the survey (Hibell et al., 2009). To make data as comparable as possible, the core questions are the same in all countries and it is compulsory to follow a strict protocol about how to prepare, conduct and report from a data collection.

We used data from the 2007 ESPAD survey (Hibell et al., 2009) which, contrary to the 2011 data collection, included information about self-perceived drug-related problems. Approximately 105 000 adolescents answered the questionnaire anonymously in a class room setting under the supervision of a teacher or research assistant.

Data from 27 countries were included in our study: Russia, Greece, Netherlands, Belgium(Flanders), France, Hungary, Romania, Switzerland, Great Britain, Denmark, Sweden, Norway, Poland, Iceland., Malta, Cyprus, Bulgaria, Lithuania, Latvia, Estonia, Ukraine, Croatia, Slovenia, Czech Republic, Slovakia, Isle of Man and Portugal. Data from seven countries lacking questions about drug-related problems and/or about cannabis consumption during the last 12 months were excluded. The student response rates were 79% or above

in all countries, with an average of 87% (Hibell et al., 2009).

Study participants

In the analysis we have included all that reported cannabis use during the past 12 months. They were divided into two groups. One group included students that had only used cannabis and the other group adolescents that had also used other drugs. Altogether 3199 boys and 1952 girls responded that they had used only cannabis during the last 12 months, while 2513 boys and 1999 girls had used cannabis during the last 12 months as well as other drugs during life-time and/or ecstasy during the last 12 months. In the questionnaire, the questions about use of cannabis (and ecstasy) and use of other drugs covered different time periods (last 12 months vs. life-time).

Measures

Consumption levels

We focused on cannabis, the most commonly used drug, and adolescents that had used cannabis during the last 12 months. Since it may be the case that adolescents, who use other drugs besides of cannabis, may experience more drug-related problems, we analysed two categories of cannabis users: adolescents who had used cannabis during the last 12 months but no other drugs and adolescents who had used cannabis or ecstasy during the last 12 months as well as other drugs during their lifetime.

Frequencies of cannabis use during the last 12 months were measured with the question: 'On how many occasions during the last 12 months have you used marihuana or hashish (cannabis)?' The an-

swering categories were 0, 1–2, 3–5, 6–9, 10–19, 20–39 and 40 times or more. When grouping the students we used the category mid-points, i.e. the frequency for those answering 3–5 times was set to 4, etc. The frequency of >40 times was set to 45 times. (Gmel et al., 2010).

The same answering categories, and mid-point calculations, were used for the "other drugs"-category. In the analysis we have included students who answered to the question: 'On how many occasions (if any) have you used any of the following drugs?', i.e. answered on any of the sub questions about tranquillizers or sedatives (without a doctor's prescription), amphetamines, LSD or some other hallucinogens, crack, cocaine, heroin, "magic mushrooms", GHB, anabolic steroids, drug injection with a needle, and alcohol together with pills in order to get high. We also included 12-months users of ecstasy. All of these substances are not classified as drugs in all countries, but were included in order to use the same definition of "other drugs than cannabis". Another reason for our classification is that the students may have had these substances in mind when connecting experienced problems to their drug use.

As already mentioned, the time period covered included "the last 12 months" for cannabis and ecstasy, and "ever" for other drugs, i.e. other drugs could have been used in the previous 12 months as well as earlier in life.

Drug-related problems

Frequencies of 10 types of problems (physical fight, accident or injury, serious problems with parents or with friends, poor performance at school or work, victimization by robbery or theft, trouble

with police, hospitalization or admittance to an emergency room, sexual intercourse without a condom and sexual intercourse regretted the next day) experienced in the last 12 months, and attributed to own drug use, were measured using category mid-points, and a summary index ranging from 0 to >45 times was created. The question was 'Because of your own drug use (for example cannabis, ecstasy or amphetamines), how often during the last 12 months have you experienced the following?' The answering categories were the same as for 12 months cannabis use (i.e. 0, 1–2, etc.). As for drug use, all category mid points were used (i.e. 3–5 times was set to 4, etc.) and >40 times was equal to 45.

Use of category mid-point has its potential limitations as the midpoint for a category may not represent the distribution within this category. Also, for use >40 times, we chose the value "45". However, this does not affect the figures related to proportions; i.e. the percent of users and percent of problems, which are our main focus in analysing the prevention paradox.

Statistical analyses

Analyses were based on adolescents who had reported use of cannabis during the past 12 months. All analyses were carried out separately for boys and girls. Proportions and mean levels of problems related to drug use for different groups were calculated. Six consumption groups — from 1–2 times to 40 times or more — were compared. A high-risk group was compared to the rest of the group.

One issue is where to set the cut-off-limit for the high risk group. The likelihood of finding empirical support for the validity of the prevention paradox rests upon

the relative size of the high-risk group (Stockwell, Hawks, Lang, & Rydon, 1996). In studies of the prevention paradox in relation to alcohol, the risk groups have constituted between 5 % and 15 % of the populations, depending on the measures used (Rossow & Romelsjö, 2006). From a practical point of view, it seems unlikely that targeted individual strategies can be delivered effectively to more than 10% to 15% of the general population. This is a main reason to confine the high risk group to about this size of the population.

We have chosen the measure of 'use 20 times or more', which means that the high risk group included about 10–15 % of the drug-using population, a proportion similar to the one used in studies in the alcohol field. Additionally we have used the measure "10 times or more" for girls that have only used cannabis during the last 12 months (Table 2), as only about 6 % of them had done so 20 times or more.

All analyses were carried out, using SPSS program version 22.

Results

Almost 22 % of the boys and 21 % of the girls, who had used cannabis as the only drug, reported any drug-related problem during the previous 12 months. Hence, the proportion of last 12 months cannabis users without any reported drug related problem was about the same for boys and girls. This proportion decreased with an increased frequency of cannabis use, with 88.8 % reporting no drug-related problems among those who had used cannabis 1–2 times to 44.5 % reporting no drug-related problems among those who had used cannabis 40 times or more.

The average frequency of use of canna-

Table 1. Number and distribution (%) of self-reported drug problems during the previous 12 months among those boys (n=3199) who during the last 12 months had used cannabis as the only drug.

Frequency of cannabis use	Percent of cannabis users	Percent of problems	Mean number of problems
1-2	51.5	23.2	0.9
3-5	18.2	10.2	1.1
6-9	10.4	14.6	2.8
10-19	8.7	15.1	2.6
20-39	5.2	15.0	5.8
40 or more	5.9	25.9	8.8

Table 2. Number and distribution (%) of self-reported drug problems during the previous 12 months among those girls (n=1952) who during the last 12 months had used cannabis as the only drug.

Frequency of cannabis use	Percent of cannabis users	Percent of problems	Mean number of problems
1-2	57.6	30.3	0.7
3-5	19.7	20.8	1.4
6-9	10.1	11.4	1.4
10-19	6.4	12.1	2.5
20-39	3.7	15.5	5.3
40 or more	2.5	9.9	5.2

bis was 7.7 times for boys and 5.6 times for girls in the last 12 months. The mean number of problems was 2.0 for boys and 1.5 for girls, calculated for all 12 months cannabis users, and 9.3 and 6.2 among those boys and girls who reported any drug-related problem.

The 11 % of boys and the 6 % of girls who during the last 12 months had used only cannabis 20 times or more accounted for about 40 % and 25 % of all drug-related problems, respectively (Tables 1 and 2). The 13 % of girls who had used cannabis 10 times or more accounted for 38 % of the problems. This means that the proportion of all drug-related problems is high in the male as well as the female risk group, but below 50%.

Among adolescents using cannabis and other drugs, the average frequency of use was 10.3 times for boys and 7.9 for girls.

The mean number of drug-related problems for the whole group was 7.6 for boys and 4.9 for girls, and 20.0 among those boys and girls who reported any problem.

The average level of problems was higher among those cannabis users that also reported having used other drugs (Tables 3 and 4), than among those who had only used cannabis (Tables 1 and 2). The tables also show that the average level of problems, with one exception, is higher among boys than among girls in each frequency category of drug users. Unsurprisingly, the frequency of drug problems increased considerably with frequency of drug use.

The high-risk group (20 times or more) accounted for about 40 % of all the reported drug-related problems among both boys and girls, i.e. less than the 50% that is seen as the critical figure related to the relevance of the prevention paradox.

Table 3. Number and distribution (%) of self-reported drug problems during the previous 12 months among those boys (n=2513) who had used cannabis and other drugs.

Frequency of use	Percent of users	Percent of problems	Mean number of problems
1-2	43.8	16.6	2.9
3-5	17.3	13.1	5.7
6-9	11.0	13.9	9.5
10-19	10.1	16.3	12.2
20-39	7.1	13.0	14.0
40 or more	10.7	27.1	19.1

Table 4. Number and distribution (%) of self-reported drug problems during the previous 12 months among those girls (n=1999) who had used cannabis and other drugs.

Frequency of use	Percent of users	Percent of problems	Mean number of problems
1-2	47.8	20.9	2.1
3-5	19.3	14.9	3.8
6-9	12.6	12.4	4.8
10-19	8.8	12.6	6.9
20-39	6.0	16.0	12.9
40 or more	5.5	23.2	20.6

Discussion

Our analyses show that the high risk group accounted for less than 50 % of the drug-related problems, providing a general support for the prevention paradox.

Another important finding is that the majority of those who answered that they had used cannabis reported no drug-related problems. This is similar to the results in the ESPAD 2011 survey, where a total of 80% of the students who had smoked cannabis in the past 12 months reported never having experienced any of a list of problems in the CAST measure (which are different from the kind of problems used in the core ESPSD question used in this article) (Papst et al., 2012).

A third important, although expected, finding is that the proportion of adolescents reporting drug-related problems increased with frequency of use. The mean number of problems was higher among

those who had used other drugs besides cannabis. This is to be expected, since, for one thing, the impact of effect is in all probabilities larger when using two or more drugs compared to using one.

A larger proportion of boys had used drugs compared to girls. The mean number of problems and the proportion who had used drugs 20 times or more was also higher among boys. This is consistent with most other reports on gender differences in drug use among adolescents (EMCDDA, 2014), and also for alcohol use (Danielson et al., 2012),

It can be argued that we don't know whether the reported life-time consumption of other drugs besides cannabis really occurred during the past 12 months, which is the time frame for reported problems. However, with regard to the fact that the population was students aged 15–16 years old, it seems likely that most of the

reported use of other drugs occurred within the last 12 months. Even if this was not always the case, all reported problems occurred during the last 12 months among the 12-months cannabis users included in our analyses.

Most adolescents who reported having used cannabis had done so just a few times. However, we found that also a relatively substantial proportion of those who reported use at a low frequency, reported drug-related consequences. Similar findings were found by Huas, Hassler & Choquet (2008) in a study of a total of 16 934 French adolescents who completed questionnaires on substance consumption, psychopathology, socio-demographics and schooling. When former users were compared with never-users, significant differences were found with regard to suicide attempt, multiple acts of violence and running away from home. These differences remained even after adjustment for alcohol and tobacco consumption.

Like in the alcohol field, we have chosen to set the size of the risk group to about 10% of the population, the main reason being that selective measures cannot be seen as relevant if the target population is too large. This has been elaborated above.

In conclusion, how can our findings be used in the formulation of a drug prevention policy, especially in the choice of prioritizing between the general population of adolescents, drug-using adolescents or adolescents who are frequent users of cannabis?

The small group of frequent users accounted for a substantial proportion of the drug-related problems reported. Also, the average number of problems was high in this group. One may argue that it is

easier to reach a small than a large group, but how could this be managed? General preventive initiatives seem most logical. One reason is that in reality there is no pragmatic way to identify those adolescents that have used drugs and, even less, who among those who have experienced or will experience drug-related problems. The same is true for those that did not report any drug use. We don't know if any of these adolescents are potential future users with potential drug-related problems.

Due to certain social, psychological or unknown genetic factors, some people have an increased risk of trying drugs and of continuing using them, and of experiencing drug-related problems (Jessor & Jessor, 1977; Stenbacka, Allebeck, & Romelsjö, 1992; Molero-Samuelsson, 2011; Brook et al., 2013). If such individual information could be attained it might be used in programs for high-risk individuals and their families. However, such an approach requires a well-educated staff, is costly and it is unclear whether it is particularly efficient.

In the scientific literature, the prevention paradox is seen as valid if the high risk group accounts for less than 50 % of all problems, as was the case in our study. This indicates that the prevention paradox has some utility in the drug field when it comes to the distribution of problems related to adolescent's cannabis use and points in the direction of general prevention initiatives.

Strengths & limitations

One issue concerns self-reported problems and attribution, which may vary between subjects and countries in an unknown

way. For alcohol, Kuendig et al. (2008) have shown that young adults in countries with stereotypical history of being “dry” or with a stereotyped “binge” drinking culture, were more likely to attribute consequences to their alcohol consumption than people in “wet” countries. It cannot be excluded that there are similar differences among drug-using adolescents in different countries.

Generally, in epidemiology, attribution is not part of the measure, but this has been, and usually is, the case for alcohol and drugs. However, Gmel, Kuntsche, Wicki, & Labhart (2010) made a comparative methodological study of attributed and non-attributed alcohol-related consequences in a total of 7174 Swiss adolescents aged 13–16 years. They found that more than twice as many consequences were alcohol-related without attribution than with. It seems likely that a similar situation with differences between attributed and non-attributed problems may exist in the drug field. Therefore, a comparative study of use of drugs and attributed and non-attributed consequences is warranted, both to advance methodology and to have a more solid basis for estimating the validity of the prevention paradox.

It is also warranted to study the validity of the prevention paradox for other categories of drug users and for each drug separately.

One of the limitations in this study is that we have no measure of the severity of the problems under study. Also, as the absolute majority of cannabis users also were alcohol consumers, we cannot rule out that a proportion of the different problems may be due to interaction with alcohol.

Another concern is the measure of frequency of use as a measure of exposure. It does not inform of the quantity of intake. This issue is discussed and criticized in the seminal paper by Temple et al. (2011) about limitations in the literature that hinder understanding of cannabis use and its consequences.

Steppan, Kraus, Piontek, & Siciliano (2012) have found an acceptable comparability of national prevalence estimates that are based on a common survey methodology. However, since our study includes adolescents from 27 countries with different experiences of drug use and different cultural attitudes to drug use, it cannot be excluded that the willingness to report drug-related problems might differ between students in the different countries. Studying the utility of the prevention paradox in different countries, with different frequency of use and different cultural contexts, would be warranted. In the alcohol field we found that the prevention paradox was valid for adolescents in almost all the studied European countries (Danielsson et al., 2012), but this might not be the case for cannabis. This would, however, be more difficult to study as the proportion of adolescents who has used cannabis is much smaller than the proportion that has used alcohol.

This study also has its strengths. With very few exceptions, the study populations in the different countries were nationally representative. The participation rate was high. Our study adds to the scientific literature by examining the utility of the prevention paradox among adolescents from 27 countries, taking into account use of cannabis, gender differences and various types of drug-related problems.

Conclusion

Although a minority among cannabis-using adolescents reported drug-related problems, the frequency of such problems increased with frequency of use. In spite of this, the high-risk group accounted for less than half of the reported problems. Consequently, we find a general support for the validity of the prevention paradox in relation to cannabis use. This provides additional support for a drug policy directed towards a larger group of adolescents, which certainly does not exclude supporting frequent drug users or users with observed problems if they can be identified

Declaration of interest None.

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