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Cannabis use and other illicit drug use: Do subjective experiences during first cannabis use increase the probability of using illicit drug?

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Cannabis use and other illicit drug use: Do subjective experiences during first cannabis use increase the probability of using illicit drug use?

ABSTRACT

Background and aims. Few studies have examined whether subjective experiences during first cannabis use are related to other illicit drug (OID) use. This study investigated this topic.

Methods. Baseline data from a representative sample of young Swiss men was obtained from an ongoing Cohort Study on Substance Use Risk Factors (N = 5,753). Logistic regressions were performed to examine the relationships between cannabis use and of subjective experiences during first cannabis use with 15 OID use.

Results. Positive experiences increased the likelihood of using hallucinogens (hallucinogens, salvia divinorum, spice; $p < .015$), stimulants (speed, ecstasy, cocaine, amphetamines/methamphetamines; $p < .006$), and also poppers, research chemicals, GHB/GBL, and crystal meth ($p < .049$). Sniffed drugs (poppers, solvents for sniffing) and ‘hard’ drugs (heroin, ketamine, research chemicals, GHB/GBL and crystal meth) were more likely to be used by participants who experienced negative feelings on first use of cannabis ($p < .034$).

Conclusion. Subjective feelings seemed to amplify the association of cannabis with OID. The risk increased for drugs with effects resembling feelings experienced on first cannabis use. Negative experiences should also be a concern, as they were associated with increased risk of using the ‘hardest’ illicit drugs.

Keywords: Cannabis; Other illicit drug; Subjective first experiences.

INTRODUCTION

Progression of drug use is a well studied topic, with a sequence beginning with licit drugs, then moving to cannabis use, and finally to the use of other illicit drugs (OID) (Fergusson, Boden, & Horwood, 2006; Kandel, 2002; Kokkevi, Richardson, Florescu, Kuzman, & Stergar, 2007; Pape, Rossow, & Storvoll, 2009; Pentz & Li, 2002; Wagner & Anthony, 2002; Willner, 2001; Wu, Schlenger, & Galvin, 2006). Cannabis is therefore often described as associated with OID (DeSimone, 1998; Fergusson et al., 2006; Kandel, 2002, 2003; Kandel & Faust, 1975; Lynskey et al., 2003; Swift et al., 2012), as its use precedes and promotes the use of OID. However, the role of subjective experiences on first cannabis use (i.e. feelings and impressions experienced on first use) is an under-investigated topic. Subjective experiences related to first cannabis use can be divided into positive feelings (e.g. euphoria, stimulation, enjoyment) and negative ones (e.g. passing out, feeling dizzy) (Grant et al., 2005; Lyons et al., 1997). Positive experiences are related to continued use and dependence (Davidson, Finch, & Schenk, 1993; Fergusson et al., 2006; Le Strat et al., 2009) and a few studies reported their association with increased use of other drugs (Pomerleau, Marks, Pomerleau, & Snedecor, 2004; Rhea, Gross, Haberstick, & Corley, 2006). On the opposite, less is known about the negative experiences during first cannabis use. Indeed, while results dealing with positive experiences have been relatively consistent across studies, findings about negative experiences have been more ambiguous. For example, these experiences are described as having no association with later cannabis dependence (Fergusson et al., 2006; Le Strat et al., 2009) and to our knowledge, their association with involvement in OID use remains unexplored.

Thus, the aim of the study was to investigate the role of subjective experiences of first cannabis use and if they increase the probability of using OID use in the same way as cannabis use itself.

METHODS

Participants and procedures

The data are part of the Cohort Study on Substance Use Risk Factors (C-SURF), a study designed to assess substance use patterns and their related consequences in young Swiss men. Baseline data were collected between September 2010 and March 2012 in 3 out of 6 national army recruitment centres covering 21 of Switzerland's 26 cantons, including all French-speaking cantons. There is no pre-selection for this conscription, and all young men around 20 years-old are evaluated to determine their eligibility for military, civil or no service as army recruitment is obligatory in Switzerland. Assessment was carried out outside the army environment and independently of eligibility for military service.

A total of 5,990 filled in the baseline questionnaire. Missing values were listwise deleted, resulting in 5,753 participants (96.0% of the total sample). More information about sampling and non-response can be found in Studer et al. (2013). This study reported that non-respondents were more often substance users, but non-response bias was small. The study protocol (Protocol No. 15/07) was approved by Lausanne University Medical School's Clinical Research Ethics Committee.

Measures

Cannabis use. Participants were asked whether they had ever used cannabis (hashish, marijuana or grass). Answers were coded as 'used' or 'not used'. Age of onset of cannabis use was also assessed.

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Subjective experiences during first cannabis use. The subjective experience related to first cannabis use was measured using eight symptoms (Fergusson, Horwood, Lynskey, & Madden, 2003), which can be perceived as either positive (got high, felt happy, felt relaxed, did silly things, laughed a lot) or negative (felt ill or dizzy, felt frightened, passed out). Each answer was coded 1 for ‘yes’ or 0 for ‘no’. Mean scores for 5 positive and 3 negative experiences were computed, ranging from 0 to 1.

Groups of cannabis users. Groups of cannabis users distinguished between cannabis users who mostly experienced positive feelings on first cannabis use (i.e. a mean score of positive experiences higher than the mean score of negative experiences), cannabis users who mostly experienced negative feelings on first cannabis use (i.e. a mean score of negative experiences higher than the mean score of positive experiences), cannabis users who experienced nothing at all on first cannabis use (i.e. no symptoms reported) and non-users of cannabis. Seventeen participants were excluded, as they experienced all the positive and negative experiences (both mean scores equalled 1) and could neither be included in an existing group nor be considered as a separate group due to their small number.

Other illicit drug use. Lifetime use of OID was measured through fifteen categories. Answers were coded either 1 for ‘used’ or 0 for ‘not used’. The substances included 1) magic mushrooms; 2) other hallucinogens (e.g. LSD, angel dust); 3) salvia divinorum; 4) speed; 5) amphetamine/methamphetamine; 6) crystal meth; 7) poppers; 8) solvents for sniffing; 9) ecstasy, MDMA; 10) cocaine, crack, freebase; 11) heroin; 12) ketamine; 13) GHB/GBL; 14) research chemicals (e.g. mephedrone, butylone and methedrone); and 15) spice. Five variables were computed: a) one for the use of any OID; b) one for stimulants, including speed, ecstasy, cocaine, amphetamines and methamphetamines; c) one for hallucinogens, including magic

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mushrooms, other hallucinogens, salvia divinorum and spice; d) one for snuffed drugs, including poppers and solvents for sniffing; and e) one for ‘hard’ drugs, including ketamine, heroin, GHB/GBL, research chemicals and crystal meth. All 5 variables were coded 0 for ‘no OID use’ and 1 for ‘OID use’.

Covariates. Demographic covariates included language (French- or German-speaking), age, perceived family income (‘below average income’, ‘average income’, ‘above average income’) and level of education attained (‘lower secondary’, ‘upper secondary’, ‘tertiary level of education’). Lifetime alcohol use was also assessed and coded 0 for ‘no alcohol use’ and 1 for ‘alcohol use’.

Statistical analyses

First, the relationship between cannabis use and subjective experiences with OID use were tested with two sets of models. The first set tested the relationship between cannabis use itself (yes *vs* no, independent variable) with each of the 15 OID (dependent variables), with logistic regressions, including the whole sample ($N = 5,753$). The second set of models tested the relationship between positive and negative subjective experiences of first cannabis use and each of the 15 OID, with logistic regressions, using mean scores of negative and positive experiences as independent variables and focusing on the subsample of cannabis users only ($N = 2,693$).

Second, five successive logistic regressions were performed (with use of any of the 15 OID, use of stimulants, use of hallucinogens, use of snuffed drugs and use of ‘hard’ drugs as dependent variables), using the different groups of cannabis users as the independent variables ($N = 5,753$). Helmert contrasts were performed to assess the difference between groups of users: 1) non-users of cannabis ($N=3,060$) *vs* the 3 different user groups (no first experiences reported ($N=222$),

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negative (N=228) or positive experiences (N=2,226)), 2) no first experiences reported *vs* negative or positive experiences, and 3) negative experiences *vs* positive experiences. All analyses were performed controlling for language, age, perceived family income, level of education attained and lifetime alcohol use. Age of onset of cannabis use was also controlled for when only cannabis users were included in the analyses. We controlled for other illicit drug use in the second set of analyses (i.e. OID that were not included as dependent variables in the models). The analyses were performed using SPSS 21 software.

RESULTS

Participants were on average 20.00 ± 1.24 years old. Table 1 shows descriptive statistics for illicit drug use. Almost half of the participants had used cannabis (46.7%), whereas OID use was less prevalent, ecstasy (5.7%), magic mushrooms (5.6%) and cocaine (5.5%) being the most prevalent. Most of the cannabis users reported positive subjective experiences on first cannabis use, with ‘felt relaxed’ and ‘laughed a lot’ as the most cited feelings (70.6% and 71.1%, respectively). Subjective negative experiences were quite rare, with ‘passed out’ as the least mentioned feeling (2.3%). Cannabis users reported an onset of use at 15.80 ± 1.93 years of age.

Insert Table 1 about here

Table 2 reports odds ratio and p-values for the two sets of logistic regressions. All results were significant when cannabis use was considered as independent variable for OID use. Participants who had ever used cannabis were more likely to use magic mushrooms ($OR = 13.51; p < .001$), other hallucinogens ($OR = 12.69; p < .001$), and salvia divinorum ($OR = 13.05; p < .001$) than

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non-users of cannabis. They were also more likely to use speed (OR = 13.09; p < .001), ecstasy (OR = 15.60; p < .001), cocaine (OR = 17.39; p < .001), and amphetamines/methamphetamines (OR = 9.78, p < .001). The odds ratios were lower, but still significant, for the ‘hardest’ drugs (research chemicals, OR = 2.17, p = .005; heroin, OR = 2.59, p = .001; crystal meth, OR = 2.88, p < .001; GHB/GBL, OR = 2.84, p < .001; ketamine, OR = 3.57, p < .001).

When mean scores of positive and negative subjective experiences during first cannabis use were used as independent variables for OID use among cannabis users only (N = 2,693), the results showed that positive experiences were more frequently positively associated with OID use than negative experiences (12 significant effects vs 7). Positive subjective experiences were predictive of hallucinogen use (magic mushrooms, OR = 4.09, p < .001; other hallucinogens, OR = 2.79, p < .001; salvia divinorum, OR = 2.82, p < .001; spice, OR = 3.55, p = .015) and stimulants use (speed, OR = 3.22, p < .001; ecstasy, OR = 2.98, p < .001; cocaine, OR = 2.93, p < .001; amphetamines/methamphetamines, OR = 2.30, p = .006). Positive subjective experiences also increased the likelihood of using poppers (OR = 1.75, p = .019), research chemicals (OR = 4.44, p = .020), GHB/GBL (OR = 3.81, p = .022), and crystal meth (OR = 3.38, p = .049).

On the other hand, negative subjective experiences on first cannabis use were not positively associated with the use of hallucinogens and stimulants. In fact, they increased the risk of using ‘hard’ drugs (research chemicals, OR = 5.75, p = .001; GHB/GBL, OR = 4.46, p = .005; ketamine, OR = 3.66, p = .013; crystal meth, OR = 5.37, p = .003; heroin, OR = 5.03, p = .004) and snuffed drugs (poppers, OR = 2.22, p = .007; solvents for sniffing, OR = 1.96, p = .034).

Insert Table 2 about here

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Comparisons between the different groups of cannabis users are depicted in Table 3, also controlling for illicit drug use not included as dependent variables. Non-cannabis users reported less frequent use of OID than cannabis users for any drug use ($p < .001$), excepted for the “hard” drugs ($p = .107$). Cannabis users who reported no subjective experience at all on first cannabis use also reported less frequent use of OID than participants who did report feelings (positive or negative) on first cannabis use for four models ($p < .032$), but not the sniffed drugs model ($p = .760$). Finally, cannabis users who felt more positive subjective experiences than negative ones on first cannabis use reported more frequent use of OID ($p = .001$), of stimulants ($p < .001$) and of hallucinogens ($p = .044$). However, there was no difference for sniffed drugs ($p = .929$) and ‘hard’ drugs ($p = .282$).

Insert Table 3 about here

DISCUSSION

This study investigated if subjective experiences during first cannabis use increase the probability of using OID use in the same way as cannabis use did.

In line with previous results, cannabis users showed an increased likelihood of using all of the 15 OID investigated (DeSimone, 1998; Fergusson et al., 2006; Kandel, 2002, 2003; D. Kandel & Faust, 1975; Lynskey et al., 2003; Swift et al., 2012), even if effect size was lower for the ‘hard’ drugs. Moreover, the results showed that subjective feelings experienced on first cannabis use were related to the use of OID (Pomerleau et al., 2004; Rhea et al., 2006). Indeed, cannabis users with positive subjective experiences on first cannabis use showed an increased likelihood of using hallucinogens (magic mushrooms, others hallucinogens, salvia divinorum, spice),

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stimulants (speed, ecstasy, cocaine, amphetamines/methamphetamines), poppers, research chemicals, GHB/GBL, and crystal meth. Cannabis users with negative subjective experiences on first cannabis use also showed an increased risk of using some OID, but these were neither the same OID nor in the same patterns. Sniffed drugs (poppers, solvents for sniffing) and ‘hard’ drugs (heroin, ketamine, research chemicals, GHB/GBL and crystal meth) were more likely to be used by these participants. Thus subjective experiences on first cannabis use had differentiated associations with subclasses of OID. Enjoyment at first use of cannabis could increase the probability of using certain OID. The subjective effects of hallucinogens and stimulants can be similar to the symptoms of positive subjective feelings described on first cannabis use (e.g. felt high, felt happy, laughed a lot). On the other hand, participants reporting negative subjective experiences on first cannabis use showed an increased use of ‘hard’ drugs, especially depressants (heroin, ketamine, GHB/GBL). The effects of these drugs could be compared to the symptoms of negative subjective feelings that some participants described on first cannabis use (e.g. passed out). The results for poppers and solvents are understandable; these drugs could be associated with depressants, as they induce relaxation and have depressants effects such as drowsiness, numbness, slowed reflexes and fatigue. Thus participants seemed to choose OID that gave feelings in accordance with the subjective feelings they had experienced on first cannabis use. Further studies would be necessary to examine whether they chose specific OID because of a high innate sensitivity to certain kinds of effects (be they positive or negative ones).

The second set of analyses confirmed the results of the first, comparing cannabis users to non-cannabis users in the same analyses. First, cannabis use increased the probability of a participant using any OID, stimulants, hallucinogens and sniffed drugs, but not ‘hard’ drugs. This result was in line with the first set of analyses, which showed lower odd-ratios for these OID. Second, the

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subjective feelings experienced during first cannabis use affected OID use differently. Hallucinogen and stimulants use was higher for participants who experienced more positive subjective feelings on first cannabis use, whereas ‘hard’ drug use was higher for those who experienced more negative subjective feelings on first cannabis use. These findings are especially valuable, as effects of negative experiences at first cannabis use showed ambiguous results in previous studies. Indeed, even if negative experiences were not described as related to later cannabis dependence (Fergusson et al., 2006; Le Strat et al., 2009), the current study showed that they have deleterious associations with OID, even if the group of first cannabis users with negative first experiences was smaller.

This study had several limitations. One was related to the memory of first use, which may have altered with time. Another limitation is that the first cannabis use may vary among individuals. For example, some cannabis users may not ‘know how to smoke’ (Becker, 1953) and thus the dose of Δ9-tetrahydrocannabinol inhaled may vary among them (Agrawal, Budney, & Lynskey, 2012). Another shortcoming was that the sample was exclusively composed of men. A study including women is needed in order to establish whether these findings are consistent for both sexes. Finally, the temporal relationship was not assessed: We did not know whether participants started first to use cannabis or OID. Further studies should include prospective associations between subjective experiences at first cannabis use and OID use in order to assess if positive or negative experiences affect and promote later OID use.

In conclusion, this study highlighted the importance of subjective experiences during first cannabis use. Previous studies reported that these feelings are associated with continued cannabis

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use and cannabis dependence, and our results showed that subjective feelings are associated with increased OID use. Significantly, this was not restricted to positive feelings: negative subjective experiences should also be at concern for prevention, as participants who experienced these feelings showed an increased the risk of using the ‘hardest’ illicit drugs.

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Table 1. Descriptive statistics for drug use

| Drug use (N = 5,753) | % | Cannabis users (N = 2,693) | % |
|--|-----------------|--|--------------|
| Alcohol | 94.2 | Positive experiences on first cannabis use | |
| Cannabis | 46.7 | Felt high | 63.8 |
| Magic mushrooms | 5.6 | Felt relaxed | 70.6 |
| Others hallucinogens | 4.2 | Laughed a lot | 71.1 |
| Salvia divinorum | 5.1 | Did crazy things | 23.5 |
| Poppers | 5.2 | Felt happy | 61.6 |
| Solvents for sniffing | 4.8 | Mean score ¹ | 0.58 (0.31) |
| Speed | 4.6 | Negative experiences on first cannabis use | |
| Ecstasy | 5.7 | Passed out | 2.3 |
| Cocaine | 5.5 | Felt frightened | 10.6 |
| Amphetamine/methamphetamines | 3.4 | Felt ill or dizzy | 14.9 |
| Spice | 1.4 | Mean score ¹ | 0.09 (0.20) |
| Research chemicals | 1.1 | Onset of cannabis use ¹ | 15.80 (1.93) |
| GHB/GBL | 1.2 | | |
| Ketamine | 1.2 | | |
| Crystal meth | 1.1 | | |
| Heroin | 1.0 | | |
| Number of other illicit drugs used | | | |
| No. other illicit drugs ¹ | 0.51 (1.72) | | |
| No. ‘stimulants’ ¹ | 0.19 (0.72) | | |
| No. ‘hallucinogens’ ¹ | 0.16 (0.59) | | |
| No. ‘hard’ drugs ¹ | 0.06 (0.43) | | |
| Groups of cannabis use ² | | | |
| No cannabis use | 53.3 (N=3,060) | | |
| Cannabis use without first exp. ³ | 3.9 (N=222) | | |
| Cannabis use with first negative exp. ⁴ | 4.0 (N=228) | | |
| Cannabis use with first positive exp. ⁵ | 38.8 (N =2,226) | | |

¹ Mean and standard deviation are given.

² Excluding participants who reported all the negative and positive symptoms (N = 17).

³ Cannabis users who reported no symptoms at first cannabis use.

⁴ Cannabis users with mean score of negative experiences higher than mean score of positive experiences.

⁵ Cannabis users with mean score of positive experiences higher than mean score of negative experiences.

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Table 2. Logistic regressions of other illicit drug use on cannabis use and subjective experiences on first cannabis use

| (VD) | All (N = 5,753) | | Cannabis users (N = 2,693) | | | |
|-------------------------------|---------------------------|---------|-----------------------------------|---------|-----------------------------------|---------|
| | Cannabis use ¹ | | Positive experiences ² | | Negative experiences ² | |
| | OR | p-value | OR | p-value | OR | p-value |
| Hallucinogens/magic mushrooms | 13.51 | <.001 | 4.09 | <.001 | 0.47 | .034 |
| Others hallucinogens | 13.80 | <.001 | 2.79 | <.001 | 0.82 | .600 |
| Salvia divinorum | 13.05 | <.001 | 2.82 | <.001 | 0.77 | .433 |
| Poppers | 5.02 | <.001 | 1.75 | .019 | 2.22 | .007 |
| Solvents for sniffing | 3.61 | <.001 | 1.56 | .080 | 1.96 | .034 |
| Speed | 12.54 | <.001 | 3.22 | <.001 | 0.99 | .967 |
| Ecstasy | 15.60 | <.001 | 2.98 | <.001 | 0.78 | .448 |
| Cocaine | 16.55 | <.001 | 2.93 | <.001 | 0.81 | .528 |
| Amphetamine/methamphetamines | 10.35 | <.001 | 2.30 | .006 | 1.73 | .119 |
| Spice | 3.48 | <.001 | 3.55 | .015 | 2.64 | .068 |
| Research chemicals | 2.17 | .005 | 4.44 | .020 | 5.75 | .001 |
| GHB/GBL | 2.84 | <.001 | 3.81 | .022 | 4.46 | .005 |
| Ketamine | 3.57 | <.001 | 1.76 | .270 | 3.66 | .013 |
| Crystal meth | 2.88 | <.001 | 3.38 | .049 | 5.37 | .003 |
| Heroin | 2.59 | .001 | 2.42 | .146 | 5.03 | .004 |

¹ Fifteen logistic regressions for all users, with cannabis use as independent variable for other illicit drug use ('no use of the respective drug' as the reference category). Language, age, perceived family income, level of education and lifetime alcohol use were controlled for.

² Fifteen logistic regressions for cannabis users only, with two independent variables (mean scores of positive and negative experiences) for other illicit drug use ('no use of the respective drug' as the reference category). Language, age, perceived family income, level of education, lifetime alcohol use and onset of cannabis use were controlled for.

OR: Odds Ratio.

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Table 3. Logistic regressions of other illicit drugs used according to the groups of cannabis users
(N=5,753)

| | | Proportion of other illicit drugs used (VD) | | | | |
|--------------------------------|-------------------------------------|---|------------|---------------|---------------|--------------|
| | | All illicit drugs | Stimulants | Hallucinogens | Sniffed drugs | 'Hard' drugs |
| Groups of cannabis users (VI) | No cannabis use | .05 | .01 | .01 | .03 | .00 |
| | No first exp. | .16 | .06 | .04 | .09 | .00 |
| | Negative first exp. | .23 | .07 | .05 | .09 | .02 |
| | Positive first exp. | .33 | .13 | .13 | .09 | .01 |
| p-values for Helmert contrasts | No cannab use vs later ¹ | <.001 | <.001 | <.001 | <.001 | .107 |
| | No first exp. vs later ² | <.001 | .021 | <.001 | .760 | .032 |
| | Negative exp. vs positive exp. | .001 | <.001 | <.001 | .929 | .282 |

¹ Helmert contrast for no cannabis use *vs* no first experience, negative and positive experiences.

² Helmert contrast for no first experience *vs* negative and positive experiences.

Language, age, perceived family income, level of education and lifetime alcohol use were controlled for.