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Cannabis-induced psychosis-like experiences are associated with high schizotypy

Abstract
OBJECTIVE: Recent studies have suggested that cannabis use is a risk factor for developing schizophrenia. We tested the hypothesis that cannabis use increases the likelihood of psychosis-like experiences in non-clinical participants who scored highly on a measure of schizotypy. METHOD: The psychological effects of cannabis were assessed in 137 healthy individuals (76% female, mean age 22 years) using a newly developed questionnaire concerned with subjective experiences of the drug: the Cannabis Experiences Questionnaire. The questionnaire has three subscales: Pleasurable Experiences, Psychosis-Like Experiences and After-Effects. Respondents also completed the brief Schizotypal Personality Questionnaire. RESULTS: Cannabis use was reported by 72% of the sample. Use per se was not significantly related to schizotypy. However, high scoring schizotypes were more likely to report both psychosis-like experiences and unpleasant after-effects associated with cannabis use. The pleasurable effects of cannabis use were not related to schizotypy score. CONCLUSION: High scoring schizotypes who use cannabis are more likely to experience psychosis-like phenomena at the time of use, and unpleasant after-effects. Our results are consistent with the hypothesis that cannabis use is a risk factor for full psychosis in this group.

Keywords
psychosis, schizotypy, high, associated, experiences, induced, like, cannabis

Disciplines
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Cannabis-Induced Psychosis-Like Experiences Are Associated with High Schizotypy

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Key Words
Cannabis · Schizotypy · Psychosis-like experiences

Abstract
Objective: Recent studies have suggested that cannabis use is a risk factor for developing schizophrenia. We tested the hypothesis that cannabis use increases the likelihood of psychosis-like experiences in non-clinical participants who scored highly on a measure of schizotypy. ***Method:*** The psychological effects of cannabis were assessed in 137 healthy individuals (76% female, mean age 22 years) using a newly developed questionnaire concerned with subjective experiences of the drug: the Cannabis Experiences Questionnaire. The questionnaire has three subscales: Pleasurable Experiences, Psychosis-Like Experiences and After-Effects. Respondents also completed the brief Schizotypal Personality Questionnaire. ***Results:*** Cannabis use was reported by 72% of the sample. Use per se was not significantly related to schizotypy. However, high scoring schizotypes were more likely to report both psychosis-like experiences and unpleasant after-effects associated with cannabis use. The pleasurable effects of cannabis use were not related to schizotypy score. ***Conclusion:*** High scoring schizotypes who use cannabis are more likely to experience psychosis-like phenomena at the time of use, and unpleasant after-effects. Our results are consistent with the hypothesis that cannabis use is a risk factor for full psychosis in this group.

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A preliminary report of this study was presented (by E.J.B.) at the ICSR, Colorado Springs, April 2003.

Introduction

It is accepted that the use of street drugs, including cannabis, increases both the risk of relapse and severity of symptoms in individuals already diagnosed with schizophrenia [e.g. 1, 2]. According to van Os et al. [3], cannabis use significantly increases the risk of developing a psychotic disorder in individuals with no previous history of illness and, additionally, predicts poor prognosis in those with an established vulnerability.

An unresolved issue is whether people who are prone to psychosis are drawn to cannabis use (an association model), or whether cannabis use truly increases the incidence of psychotic experiences (a causal model) [e.g. 3–5]. Data from the recently reported cohort study by Arse-

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nault et al. [6] favour the causal model since cannabis use in adolescence appears to be a risk factor for later psychosis. However results do not consistently indicate whether a pre-existing biological vulnerability is necessary to underpin the development of psychosis in the causal model.

Researchers have frequently used self-report measures of schizotypy in non-clinical samples as an index of psychosis proneness, and some studies have reported that cannabis users have higher schizotypy scores than non-users [7–10]. Skosnik et al. [11] have, for example, reported that current cannabis users had higher schizotypy scores than either past users or those who had never used cannabis. Cannabis use has long been associated with an increase in the reporting of 'psychosis-like' experiences [12–14]. Verdoux et al. [15] recently explored this association in relation to psychosis proneness determined by structured interview. Using an experience sampling method, researchers showed that *both* degree of psychosis vulnerability and cannabis use were independently associated with unusual perceptual experiences.

We have developed a new questionnaire (the Cannabis Experiences Questionnaire, CEQ) to enable cannabis users to record the various psychological effects they experience both as they smoke, and for some time after use. We hypothesized that: (1) cannabis use would be associated with higher schizotypy scores, and (2) that cannabis users with high schizotypy scores would report more psychosis-like experiences and after-effects under the influence of the drug.

Method

Participants

Participants were recruited on an opportunity sample basis. Our sample comprised 137 university students [33 (24.1%) males and 104 (75.9%) females; average age 22.01 (SD 5.50) years]. The participants were either completing single honours or combined studies courses which involved psychology or sociology (accounting for the greater numbers of females to males in this sample). Participants received no financial compensation for taking part in the study.

Measures

Schizotypy

Participants completed the brief Schizotypal Personality Questionnaire (SPQB) [16], a 22-item questionnaire consisting of the most reliable items taken from the longer Schizotypal Personality Questionnaire [17]. The SPQB provides a total score and scores on three sub-scales: 'disorganized' (SPQB-D), 'cognitive-perceptual' (SPQB-CP) and 'interpersonal' (SPQB-I).

Drug Use

Participants were asked how often (everyday, more than once a week, about once a week, about once a month, a few times each year, about once a year, only once or twice, never) and when they smoked cannabis (during the morning, during the day, during the evening, frequently during the day and night). Information about other drugs used for recreational purposes was also sought.

Experiences with Cannabis

The CEQ was developed specifically for this study to investigate the subjective effects of cannabis. It consists of three subscales that record respectively: pleasurable experiences, psychosis-like experiences and after-effects. The Pleasurable Experiences subscale consists of items such as: feeling happy, feeling laid back, able to understand the world better and so on [18]. Scores on this subscale could range from 18 to 90. The Psychosis-Like Experiences subscale comprises psychological features akin to symptoms associated with psychotic disorders: delusional thinking, experiencing auditory hallucinations, feeling paranoid etc. [e.g. 19, 20]. For this subscale scores could range from 25 to 125. The After-Effects subscale attempts to quantify the consequences of cannabis (after) use and consists of items associated with the 'amotivational syndrome' commonly reported in habitual users, e.g. loss of drive, reduced attention, feeling generally slowed down and so on [e.g. 21]. Scores on this scale could range from 12 to 60. Participants completed the CEQ by indicating on a five-point Likert scale (Never, Occasionally, Sometimes, More often than not, Always) the frequency of each 'experience' (when using cannabis).

Procedure

Respondents were asked to complete both the CEQ and the SPQB as fully and honestly as possible. The questionnaires were completed by participants in their own time (either at home or in the university) and returned to a labeled post box placed in a communal area of the university. An anonymisation procedure ensured that respondents were identifiable by a number only. Data analysis was performed using SPSS version 11.5. Non-normally distributed data were transformed as appropriate. The study had full ethical approval as part of a larger project examining psychosis risk factors in a psychologically healthy population.

Results

72.5% of our sample reported having used cannabis at least once. For these, the frequency of use broke down as follows: everyday 6%, at least once a week 21%, at least once a month 23%, at least once a year 26%, less than once a year 23%. There were no gender differences in the rates of cannabis use.

Fifty-two per cent of cannabis users had used only cannabis. Participants who used cannabis more frequently (frequency use: at least once a week, a few times each month and about once a year) reported using more recreational drugs [$f(2, 95) = 4.11$, $p < 0.02$]. For those who used cannabis once a week ($n = 27$) the mean number of

drugs used was 2.15 (SD = 2.14); for those who used cannabis a few times each month (n = 48): 1.23 (1.82); for those who had smoked cannabis about once a year (n = 23): 0.70 (1.43). The number of additional drugs used varied between 1 (41% of the sample) and 10 (0.7% of the sample) for the whole sample. Other recreational drugs of choice (listed according to frequency of reporting) included cocaine (19%), ecstasy (19%), LSD (13%), amphetamine (11%), magic mushrooms (7%), poppers (7%) and ketamine (4%). Drugs which were used by fewer than 2% of the participants included: solvents, GHB, nutmeg, benzodiazepines, MDA, opiates and barbiturates. Three participants who had not smoked cannabis but had used other drugs (LSD, cocaine and morphine) were included in the analyses reported below as non-cannabis users.

SPQB means and standard deviations (in brackets) for the entire sample were as follows: SPQB-CP: 3.03 (2.10), SPQB-I: 2.65 (2.33), SPQB-D: 1.82 (1.76) and for the SPQB total score 7.50 (4.71). The distribution of the SPQB total score approximated to normal but each of the subscales required (logarithmic) transformation prior to statistical analysis. There were no significant differences between those who reported having used cannabis and those who had not on the SPQB total or any of the SPQB subscales.

Relationship between SPQ-B Scores and CEQ Subscales

In the sample who reported ever using cannabis (n = 99, 72%) the means for the subscales from the CEQ were as follows: Pleasurable Experiences 39.94 (9.94), Psychosis-Like Experiences 43.12 (12.98) and After-Effects 22.71 (9.31). In each case, distribution of data was approximately normal. Bivariate correlational analyses were performed in line with the study hypotheses indicating significant positive correlations between the Psychosis-Like Experiences subscale and the SPQB-D subscale ($r = 0.40$, $p < 0.01$), the SPQB-CP subscale ($r = 0.33$, $p < 0.01$) and the SPQB total score ($r = 0.44$, $p < 0.01$). The After-Effects subscale was also correlated with the SPQB-D subscale ($r = 0.35$, $p < 0.01$), the SPQB-P subscale ($r = 0.47$, $p < 0.01$) and the SPQB total score ($r = 0.49$, $p < 0.01$). The Pleasurable Experiences subscale was not significantly correlated with any SPQB scores.

There were 51 participants who had used only cannabis. When the correlational analysis was restricted to only these participants the results remained largely similar to those reported above. There were positive correlations between the Psychosis-Like Experiences subscale and the SPQB-CP ($r = 0.30$, $p < 0.05$), the SPQB-D ($r = 0.40$, $p < 0.01$) and the SPQB total ($r = 0.38$, $p < 0.01$). The After-Effects subscale was also correlated with the SPQB-CP ($r = 0.44$, $p < 0.01$) and the SPQB total ($r = 0.39$, $p < 0.01$).

Discussion

This paper reports on the concurrent and subsequent effects of recreational cannabis use in a sample of healthy respondents using a newly developed scale (the CEQ) to examine subjective experiences. The modest sample size in this exploratory study was partly compensated for by the high rate of reported cannabis use (72%). The CEQ appears to be an acceptable and useful instrument which generates quantitative data about subjective experiences.

Unlike previous research [7–11] we did not find that cannabis users had higher schizotypy scores than non-users. In our sample at least, it seems that schizotypal traits do not predispose young people to smoke cannabis, nor does cannabis use, per se, elevate schizotypy scores. It may be that this 'failure to replicate' is partly a consequence of the high rates of reported cannabis use in our sample: Verdoux et al. [15] found considerably lower rates of recent or current drug use in their French cohort, for example. However, the main hypotheses were confirmed in that amongst individuals who smoked (or had ever smoked) cannabis, high schizotypy was associated with a greater likelihood of experiencing both psychosis-like features during drug use and unpleasant after-effects. Pleasurable experiences, on the other hand, were equally reported across the sample and apparently unrelated to schizotypy score.

Despite the comparatively high rate of cannabis use in our sample, the increased reporting of psychosis-like experiences in cannabis users with high schizotypy scores broadly supports the findings of Verdoux et al. [15]. Taken together, both sets of results suggest that those most prone to psychosis, whilst experiencing similar levels of the pleasurable experiences of cannabis as other respondents, are more likely to additionally experience psychosis-like experiences and after-effects.

A limitation of the current study is that participants were not screened for the presence of psychiatric illnesses. The collection of the data in this study did not permit follow-up which would have presented the opportunity for a screening tool to be used. Similarly, a family history of psychiatric illness may impact upon participants' experiences during cannabis use, assuming that a biological individual difference mediates cannabis response. The data were collected from students, some of whom were known

to the researchers; therefore every effort was made to permit complete anonymity for the participants, and this to some extent restricted the data which could be collected.

Individuals who have high schizotypy scores and who report psychosis-like responses to cannabis may represent a particularly high risk group for psychosis. Delta-9-tetrahydrocannabinol is the principle active ingredient in cannabis [22]. In humans, it binds to cannabinoid (CB1) receptors localized in the prefrontal cortex, basal ganglia and hippocampus [23] where it has a dopamine agonist action [24, 25]. The heightened sensitivity of dopamine systems observed in acute schizophrenia [26] may also be present to some degree along the psychosis continuum [e.g. 27]. This would explain why high scoring schizotypes who use cannabis are more likely to have psychosis-like experiences and pronounced after-effects than their low scoring counterparts. There is an overlap in the characteristics of schizotypal personality, in particular the positive aspects (e.g. unusual perceptual experiences) and possible responses to recreational drug use. However, Verdoux et al. [13] have shown that psychosis proneness does influence people's experiences for a time following cannabis use, lending some support to the notion that individual differences in response to cannabis may be related to psychosis proneness. Perhaps individuals who have many features of the schizotypal trait prior to cannabis use experience psychosis-like responses to cannabis use as well as more after-effects, leading to an increase in both the negative and positive aspects of schizotypy. However, those who do not have schizotypal characteristics only experience the unusual perceptual experiences commonly reported during cannabis use and do not have the 'amotivational' after-effects. This would mean only the positive aspects of schizotypy would increase. Testing such a hypothesis would require a longitudinal study involving adolescents prior to their exposure to cannabis and it may shed some further light on the relationship between cannabis and psychotic symptoms.

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