

## Impulsivity, Sensation Seeking and Anhedonia as Possible Explanations for Cannabis Abuse Comorbidity among First Psychotic Episode Inpatients

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### Abstract

**Objective:** There have been relatively few reported carefully constructed studies to date concerning the link between psychoactive substance abuse among first-episode psychotic individuals and specific behavioral aspects that might clarify the comorbidity. Using standard toxicological testing, we compared consecutively admitted inpatients diagnosed with first psychotic episode with and without lifetime and/or active (last month) cannabis abuse or dependence and the levels of impulsivity, sensation seeking and anhedonia.

**Methods:** Ninety-one consecutively admitted psychiatric patients diagnosed using the DSM-IV criteria with a first psychotic episode due to schizophrenia, schizophreniform disorder, bipolar disorder, brief psychotic episode, and psychosis NOS disorder were included in the study. Patients were aged 18 to 41 (mean 27.1±9.2); seventy-six of the patients (83.5%) were males. Standard urine tests for tetrahydrocannabinol (THC) were performed and self-report questionnaires were administered during the first 48 h after admission. The following rating scales were used: the PANSS (Positive and Negative Syndrome Scale), the Barratt Impulsivity Scale (a 34-item self-report), the Zuckerman Sensation-Seeking Scale (form V), and the Chapman Physical Anhedonia Scale (a 61-item self-report).

**Results:** According to bivariate correlations, the PANSS Positive Scale was significantly correlated with the Barratt Rating Scale (0.260;  $p \leq 0.05$ ) and the PANSS Negative with Physical Anhedonia Scale (0.389,  $p \leq 0.001$ ). Rates for the Zuckerman Rating Scale ( $f=20.1$ ,  $p \leq 0.001$ ) and the Barratt Rating Scale ( $f=5.15$ ,  $p \leq 0.05$ ) were significantly higher in the group of cannabis abusers with no clear difference between abusers and nonusers in the PANSS and the Physical Anhedonia Scale.

**Conclusion:** The results of the study showed high levels of impulsivity and sensation seeking in the group of inpatients suffering from first psychotic episode and cannabis abuse comorbidity compared to first-episode inpatients with no substance abuse.

**Keywords:** First psychotic episode; Cannabis; Impulsivity; Sensation seeking; Anhedonia

### Introduction

The comorbidity of schizophrenia (psychosis) and the abuse of cannabis (marijuana) is a well-known clinical finding [1]. However, despite the significant prevalence of substance use disorders in schizophrenia and its clinical implications, little is known about why these two disorders are so predominantly comorbid. This phenomenon has sparked extensive research into the nature of the relationship [2,3] and the resolution of this connection is more difficult than it would seem. It is hard to distinguish between the cause and the effect of the comorbidity owing to such methodological issues as the ascertainment and sampling of study populations, the setting of criteria regarding questionable clinical severity, and the use of varying diagnostic standards [4].

Khantzian first postulated the self-medication hypothesis for drug abusers some 35 years ago [5], but the data concerning the source of the comorbidity are still inconclusive. Some researchers find support for the hypothesis that suggests that the functioning of the different areas of the cortex, thought to be impaired in cases of prominent

negative symptoms, is better preserved in dual-diagnosis schizophrenia. This relative preservation could be primary or secondary to substance abuse [6,7]. In some clinical studies, the comorbidity of drug use and schizophrenia accounted for the ability of some illicit substances to improve signs of anhedonia and other negative symptoms [8]. Results of our previous study suggested that cannabis can produce some antidepressant and anxiolytic effects on psychotic and affective inpatients, which might partly explain the high level of comorbidity and recurrent exacerbations of psychotic and manic symptoms in this group of patients [9]. Even so, this suggestion hardly covers all the possible ways of understanding the nature of comorbid drug abuse.

A high level of impulsivity and aggressiveness was also described in a general population using cannabis, cocaine, and alcohol [10]. Blanchard et al. found that in individuals suffering from schizophrenia, disinhibition was associated with greater maladaptive skills such as avoidance coping, leading to an increased degree of substance use [11]. In a subsequent review, he proposed a model of substance abuse in which impulsivity interacting with daily stress exacerbates substance use in psychosis [12].

Huddy et al. conducted empirical research to define the effect of the comorbidity of first-episode psychosis (FEP) and cannabis abuse with respect to two components of impulsivity-response inhibition and reflection impulsivity [13]. He demonstrated that compared to healthy controls patients with FEP had significantly greater impairment in response inhibition but not in reflection impulsivity. These data may provide insight in support of the idea that impulsivity is a type of personality characteristic and not simply the consequence of prolonged drug abuse. Furthermore, Huddy calls for a study within a sample at high risk for psychosis to determine whether impulsivity in this sample predates psychosis onset or heavier cannabis use [14].

A study by Cassidy et al. focused on measuring pleasure and deficits in the anticipation of reward in cases of both psychotic illness and drug addiction [15]. Their results showed that anticipatory pleasure may not decrease in early psychosis patients with no cannabis use, but that the hedonic response was lower with persistent, heavy cannabis use in patients with a first psychotic episode. The need for social relationships, coping strategies and pleasurable experiences appear to be important for the initiation of substance use in patients suffering from first psychotic episode [16]. Against this background, the present study was designed to compare impulsivity, sensation seeking and anhedonia in consecutively admitted inpatients diagnosed with first psychotic episode and active (last month) cannabis abuse or dependence. In our view, the high rate of the comorbidity between cannabis abuse and first psychotic episode could be partly explained by a high level of impulsivity, sensation seeking and anhedonia in these specific patients.

## Materials and Method

### Patients' characterization

Ninety-one consecutively admitted psychiatric patients diagnosed with a first psychotic episode due to schizophrenia, schizophreniform disorder, bipolar disorder, brief psychotic episode or psychosis NOS disorder were recruited between the years 2012 and 2014 from the inpatient population of the Jerusalem Mental Health Center, which comprises a catchment area of approximately one million people.

Patients were aged 18 to 41 (mean 27.1+9.2); seventy-six of the patients (83.5%) were males.

### Diagnostic tools

The patients were diagnosed by two certified psychiatrists (G. K. and Y. K.), who also administered the scales up to two days after admission. Psychosis and cannabis and alcohol abuse were diagnosed using the Hebrew Version of Structured Clinical Interview for DSM IV Axis I Disorders (SCID-I)-IV-a diagnostic exam used to determine major mental disorders according to the criteria of the DSM [17]. Urine tests for THC, amphetamine, methamphetamine, and natural and synthetic opiates were performed during the first 48 h of admission using Sure Step TM kits (Applied Biotech, Inc., San Diego). Active abuse of cannabis (during the month prior to hospitalization) was registered based on urine tests and/or self-reports and lifetime abuse according to self-reports only. Alcohol abuse and dependence were diagnosed via psychiatric history and self-report. In cases of combined cannabis-alcohol abuse or dependence, cannabis was defined as the leading substance of abuse owing to its persistency and influence on lifestyle. The study did not include any cases in which

predominant alcohol dependence could be seen as the major reason for psychiatric comorbidity.

The following rating scales were used: the PANSS (Positive and Negative Syndrome Scale-a medical scale used for measuring symptom severity in patients with schizophrenia) [18], the Barratt Impulsivity Scale (a 34-item self-report, a widely used measure of different aspects of impulsiveness-attention, motor, self-control, cognitive complexity, perseverance, and cognitive instability impulsiveness, among others) [19], the Zuckerman Sensation-Seeking Scale (form V) (a 40-item self-report for measuring sensation seeking with four different aspects-thrill and adventure seeking, disinhibition, experience seeking, and boredom susceptibility) [20] and the Chapman Physical Anhedonia Scale (a 61-item self-report for measuring personal abilities for different aspects of pleasure) [21].

### Ethical considerations

Institutional Review Board approval was received from the Jerusalem Mental Health Center. Informed consent was obtained according to the Helsinki declaration. Patient anonymity was maintained using codes for all forms and test results.

### Statistical analysis

Pearson correlation coefficients were calculated to examine bivariate relationships among the various psychopathologic questionnaires. Additionally, demographics, DSM diagnoses, and the use of cannabis were assessed for significant bivariate associations with the questionnaires using variance analyses (ANOVA). Data analyses were performed using SPSS/PC version 21.0. Two-sided tests of significance were used with an alpha set at 0.05 for all analyses.

## Results

The general demographic data of the population and psychiatric diagnoses are described in the Table 1.

<b>Gender</b>		
Male	76	83.50%
Female	15	16.50%
<b>Age (18-41) according to groups</b>		
≤ 21	31	34.10%
22-26	28	30.80%
27+	32	35.20%
Mean (SD)	27.1 (9.2)	
<b>Diagnosis according to DSM-4</b>		
Schizophrenia	6	6.60%
Acute psychotic episode	70	76.90%
Mania with psychotic features	12	13.20%
Severe depression with psychotic features	3	3.30%
<b>Current abuse per self-report and/or urine</b>		
No use	53	58.20%

Use only THC	20	22.00%
Use THC and other drugs	14	15.40%
Unclear	4	4.40%

**Table 1:** Characteristics of respondents and current THC abuse.

According to positive self-reports of 26 patients and positive urine tests in 20 cases, 20 patients (22%) were diagnosed as using cannabis alone and 14 (15.4%) as using cannabis and another psychoactive substance (Table 1). A relatively high rate of agreement (87.9%) on cannabis use between self-reports and objective toxicological tests were observed. Three patients were diagnosed as abusing only methamphetamine and two patients as abusing only opiates. No statistically significant differences for demographic variables between the groups of cannabis abusers and nonusers were observed (Table 2). The mean score for the PANSS Positive Scale and the General Scale reflected a relatively high intensity of psychotic features with less prominent negative symptoms-according to the PANSS Negative Scale (Table 2). Internal consistency of PANSS subscales and the Barratt Scale measured by Cronbach's Alpha test based on the correlations among different items on the same test was relatively high (Table 3). Bivariate correlations among the research tools are summarized in Table 4. The PANSS Positive Scale corresponded significantly with the Barratt Rating Scale and the PANSS Negative with Physical Anhedonia Scale. Rates for the Zuckerman Rating Scale and the Barratt Rating Scale were significantly higher in the group of cannabis abusers with no clear difference between abusers and nonusers in the other scales (PANSS and Physical Anhedonia Scale; Table 5).

## Discussion

Overall, the prevalence of substance use (including tobacco and alcohol) and mental disorders is high. The 1990 ECA (Epidemiologic Catchment Area) study, for example, indicated that 47% of individuals with schizophrenia spectrum disorders met criteria for a comorbid substance use disorder (33.7% for any alcohol use disorder, 27.5% for any drug use disorder) [22]. Several mechanisms have been proposed to explain this comorbidity.

Variables	Total	No use	Use
	N=87 <sup>‡</sup>	N=53	N=34
<b>Gender</b>			
Male	74 (85.10)	42 (79.2%)	34 (94.1%)*
Female	13 (14.90)	11 (20.8%)	2 (5.9%)*
<b>Age (groups)</b>			
≤ 21	30 (34.5%)	20 (37.7%)	10 (29.4%)*
22-26	26 (29.9%)	16 (30.2%)	11(32.4%)*

	Number of Items	Scale range	Cronbach's Alpha	The potential scale range (actual)	Mean (SD)
PANSS Positive scale	7	0-6	0.647	0-42 (7-42)	23.9 (7.9)
PANSS Negative scale	7	0-6	0.859	0-42 (0-37)	13.0 (9.8)

27+	31 (35.6%)	17 (32.1%)	13 (38.2%)*
Mean (SD)	27.2 (9.4)	26.6 (9.4)	28.1 (9.4)*
<b>Years of education (groups)</b>			
≤ 10	25 (28.7%)	13 (24.5%)	12 (35.3%)*
11-12	50 (57.5%)	31 (58.5%)	19 (55.9%)*
13+	12 (13.8%)	9 (17.0%)	3 (8.8%)*
Mean (SD)	11.6 (2.3)	11.9 (2.2)	11.0 (2.5)*
<b>Occupation<sup>#</sup></b>			
Professional	7 (8.0%)	6 (11.3%)	1 (2.9%)*
Blue collar	17 (19.5%)	8 (15.1%)	9 (26.4%)*
Unprofessional	27 (31%)	16 (30.1%)	11 (32.4%)*
Student	7 (8.0%)	7 (13.2%)	0.0*
Unemployed	22 (25.30%)	16 (30.2%)	13 (38.3%)*
<b>Marital Status</b>			
Married	22 (25.30%)	15 (28.3%)	7 (20.6%)*
Unmarried	65 (74.70%)	38 (71.7%)	27 (79.4%)*

**Table 2:** Characteristics of respondents according to categories of using THC (N=87<sup>‡</sup>); <sup>‡</sup> for four participants using THC was not clear, <sup>#</sup> for seven participants occupation was not clear, \*Not significant (F/χ<sup>2</sup>).

The present study was designed to characterize levels of personality traits (sensation seeking, anhedonia and impulsivity) in a group of inpatients suffering from first psychotic episode and cannabis abuse comorbidity compared to first-episode inpatients with no evidence of substance abuse. We attempted to determine whether certain stable individual differences in personality traits that can be measured using standard questionnaires increase the risk for comorbidity.

Our results showed high levels of impulsivity and sensation seeking in the group of inpatients suffering from first psychotic episode and cannabis abuse comorbidity compared to first-episode inpatients with no evidence of substance abuse. These data are consistent with other studies assessing impulsivity and sensation seeking in chronic schizophrenia patients with substance abuse disorders, including alcohol, cannabis, opiate, and cocaine use [23-27]. Zhonitsky et al. suggested that: (i) substance abuse/dependence patients with and without schizophrenia are characterized by abnormally high sensation seeking; and (ii) non-abusing schizophrenia patients are characterized by abnormally low sensation seeking [28]. Interestingly, the Zhonitsky study did not find significant differences in impulsivity between substance abuse/dependence patients with and without schizophrenia in discordance with sensation-seeking behavior. This is in discordance with our findings as well as the other studies above [23-27].

PANSS General scale	16	0-6	0.767	0-96 (13-73)	37.7 (14.2)
Zukerman	12	0-5		0-55 (0-55)	20.2 (13.7)
Physical Anhedonia scale	61	0-1		0-61 (1-47)	18.7 (10.7)
Barrat scale	34 (reversed items: 1, 7, 8, 9, 10, 12, 13, 15, 19, 21, 33)	0-4	0.934	34-136 (43-123)	80.3 (18.1)

**Table 3:** Description of the research tools (N=91).

In line with several previous studies [23-25,28] and contrary to the belief that sensation seeking is a way of counteracting anhedonia in certain schizophrenia patients [29,30], we did not find a link between physical anhedonia scores and cannabis abuse in our population. These data suggest that the classic self-medication hypothesis explaining comorbidity of psychosis and cannabis abuse is far from being comprehensive. However, other studies have obtained different results. Liraud and Verdoux [31] assessed the associations between substance use disorders and temperamental characteristics in subjects with non-affective psychotic or mood disorders. Among these patients, 25.2% presented with a lifetime history of alcohol abuse/dependence and 23.3% presented with a lifetime history of cannabis abuse/dependence. A lifetime history of cannabis abuse was independently associated with higher scores on disinhibition tests and on non-planning activity. These results suggest that sensation seeking and impulsivity are temperamental characteristics that may favor cannabis abuse in patients with psychotic or mood disorders, independently from categorical DSM diagnoses.

	Zukerman rating scale	Physical Anhedonia Scale	Barrat Rating Scale
PANSS Positive Scale	0.108	-0.155	0.260*
PANSS Negative Scale	-0.085	0.371***	-0.06
PANSS General Scale	0.022	0.122	0.1

**Table 4:** Bivariate correlations between the research tools (N=91), \*p ≤ 0.05; \*\*\*p ≤ 0.001.

Cannabis users report a lower incidence of depression than non-users as judged from a scale using depressed affect, positive affect, somatic and retarded activity and interpersonal symptoms as markers [32].

The present study demonstrates that although cannabis may improve anhedonia in the context of clinical depression, it may not be effective in preventing the negative signs and symptoms of schizophrenia, including anhedonia. Recent studies of potential antianxiety and antidepressive medication have explored the possibility of enhancing the effects of endogenously released cannabinoid ligands in the brain to provide therapeutic effects more safely and effectively [33].

An important advantage in the present study was that the study population consisted of patients with first psychotic episode, which minimized the influence of long-term positive and negative symptoms on levels of impulsivity and sensation seeking. Barring differences in demographic and psychopathological variables, we can assume that a

high level of impulsiveness and sensation seeking is one of the possible causative factors for cannabis abuse in our sample. Attempts to overcome feelings of “boredom,” to alleviate aloneness, and estrangement in this population may result in sensation seeking and impulsive behavior, including substance abuse [34]. This model assumes that patients may engage in polysubstance abuse and not choose specific substances to medicate specific undesired psychological states [35].

	THC use according to self-report & urine <sup>‡</sup>		F
	No use (N=53)	Use (N=34)	
Scales	Mean (SD)	Mean (SD)	
PANSS Positive	23.6 (8.0)	24.8 (7.8)	
PANSS Negative	14.1 (10.1)	11.1 (9.6)	
PANSS General	38.2 (14.8)	37.2 (14.0)	
Zukerman Rating	15.5 (12.2)	27.8 (13.0)	20.1***
Physical Anhedonia	18.3 (9.2)	19.1 (12.5)	
Barrat	76.7 (15.1)	85.6 (21.3)	5.15*

**Table 5:** Comparison between use and no use of THC according to the scales; \*p<0.05; \*\*\*p<0.001; ‡ For four participants using THC was not clear.

## Limitations

The present study has some limitations:

The study was cross-sectional and the sample was middle-sized.

The design does not enable investigation of the connection between psychopathology after the first psychotic episode and the behavioral aspects we studied. We did not use subscales for the Barret Impulsivity Scale and the Zukerman Sensation-Seeking Scale as we tried to discern general tendencies. Some of the cannabis abusers also abused other substances, which might have influenced the results of the study. Not controlling for group of substance abusers without psychiatric comorbidity was included in the study.

## Conclusion

Among the patients suffering from first psychotic episode (regardless of cannabis abuse) the level of impulsivity correlated with the severity of positive psychopathology. High levels of impulsivity and sensation seeking were observed in the group of inpatients suffering



from first psychotic episode and cannabis abuse comorbidity compared to first-episode inpatients with no substance abuse.

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## Conflict of Interest

The authors declare no conflicts of interest.

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