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Abstract
Cannabis is one of the most widely used illegal substances in the world. Its use has been reported to be over-represented in many psychiatric conditions and has frequently been found to predate the onset of psychiatric symptoms. However, cannabis may also have detrimental effects on the general population. Factors that predict the onset of use are receiving increased attention to aid in identifying groups of young people who may be more prone to consume cannabis. Personality traits may be one such factor as they are readily identifiable and offer information that can be used for improved targeting of educational material about the effects of cannabis use. This review summarizes the role that personality traits may play in cannabis use, with a focus on impulsivity and schizotypy, both of which have been extensively studied for their contribution in this setting. Additionally, other traits and the potential overlap between personality traits are highlighted. The wider implications of a better understanding of personality traits and cannabis use for cannabis research are also discussed.

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Personality and Cannabis Use: A Review of the Current Literature

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Cannabis is one of the most commonly used illegal substances in the world. Its use has been reported to be over-represented in many psychiatric conditions and has frequently been found to predate the onset of psychiatric symptoms. However, cannabis may also have detrimental effects on the general population. Factors that predict the onset of use are receiving increased attention to aid in identifying groups of young people who may be more prone to consume cannabis. Personality traits may be one such factor as they are readily identifiable and offer information that can be used for improved targeting of educational material about the effects of cannabis use. This review summarizes the role that personality traits may play in cannabis use, with a focus on impulsivity and schizotypy, both of which have been extensively studied for their contribution in this setting. Additionally, other traits and the potential overlap between personality traits are highlighted. The wider implications of a better understanding of personality traits and cannabis use for cannabis research are also discussed. Adv Schizophr Clin Psychiatry 2008;3(3):84–9.
of data available on these traits and cannabis use. The articles examined take a continuous-trait approach to personality and do not use cut-offs to indicate clinical or non-clinical status. The current review aims to summarize key arguments within the literature published to date on the role of personality and its associations with cannabis use. There are only a small number of longitudinal studies that have considered the role of personality in patterns of cannabis use; hence, unless otherwise stated, the investigations described are cross-sectional.

Impulsivity
Impulsivity is believed to play a role in many risk-taking behaviors, including illicit drug use. In particular, its role in the use of methylenedioxymethamphetamine, or “ecstasy”, and the impact that this drug has on impulsivity, has been widely explored because of their shared underlying neurobiology of the serotonin system [8,9]. To date, no longitudinal studies have been performed to determine whether impulsivity leads to drug use or whether drug use leads to elevated impulsivity [e.g. 10]. However, an indication of the stability of the impact that this drug has on impulsivity, has been widely considered because of their shared underlying neurobiology of the serotonin system [8,9]. To date, no longitudinal studies have been performed to determine whether impulsivity leads to drug use or whether drug use leads to elevated impulsivity [e.g. 10]. However, an indication of the stability of the relationship between impulsivity and cannabis use can be sought by considering whether it is associated with use per se, current use, and the degree of use.

Impulsivity is a trait characterized by motor, attentional, and non-planning components [11]. The motor component is demonstrated in behaviors such as acting on the spur of the moment, an inability to sit still, and general levels of agitation. The attentional component is indicated by a lack of focus and sustained effort in cognitive tasks. The non-planning component contains both cognitive factors, such as planning and thinking ahead, and more general indicators of self-control relating to the ability to finish a task and the degree of caution applied to daily life. Novelty or sensation seeking and risk taking are behavioral evidence of these components and may be the most important aspects of impulsivity in predicting drug use. Novelty seeking is the trait that has been most frequently studied when considering the role of impulsivity in cannabis use.

For individuals who express impulsive tendencies, cannabis may have a relaxing and calming influence [12]. Anecdotal evidence for this comes from reports that cannabis is often used to alleviate the unpleasant effects following ecstasy use (“coming down”) [e.g. 13]. This has been proposed as evidence that cannabis is used to self-medicate for unwanted reactions to ecstasy. Previous studies have shown that those who have high scores when tested for impulsivity are more likely to use cannabis [7,14–16] and to use the drug more heavily [e.g. 17]. Furthermore, impulsivity is associated with current use of cannabis [e.g. 7,15,16].

Hypomania is thought to be normally distributed in the general population, with impulsivity comprising a large proportion of the many aspects of this trait [18]. In an epidemiological study, Henquet and colleagues reported an association between cannabis use and hypomanic symptoms in the general population. This association remained after controlling for baseline mania, psychosis, and other psychiatric symptoms, as well as demographic variables and use of other drugs [19].

However, associations between cannabis and impulsivity have not been consistently reported. For example, Adams and colleagues found that low novelty seeking scores were associated with tobacco and cannabis use, while high scores were associated with polysubstance use [20]. Chakroun et al. reported that cannabis users had high novelty seeking scores compared with individuals who had not used any substances, and that polysubstance users had the highest novelty seeking scores of all the groups studied [15]. It may be that cannabis use has become perceived as too conservative for highly impulsive individuals and that they favor more “adventurous” drug taking, resulting in a – in relative terms – “mild” form of impulsivity being expressed among those who still prefer smoking cannabis.

Sensation seeking has also been shown to be associated with current cannabis use and prediction of future use in adolescents [21]. However, Donohew and colleagues suggest that the relationship between sensation seeking and drug use in adolescents may not be a simple one [22]. They report that the sensation-seeking levels of adolescents’ peers predicted drug use 2 years later more directly than the adolescent’s own sensation-seeking scores. This has been replicated more recently in a study specifically examining cannabis use [23]. Romer and Hennessy described a biosocial-affect model, in which the likelihood of cannabis use was mediated by affective evaluation of cannabis effects, peer attraction to risky behavior, and individual differences in sensation-seeking, with no direct relationship between sensation seeking behavior and cannabis use. These studies highlight that personality needs to be considered in a wider social and interpersonal context, where some traits may be protective against cannabis use whereas others could leave individuals more open to being influenced by others, thereby mediating a susceptibility to drug use initiation.

The literature includes some limited evidence for a relationship between biological vulnerability, personality, and a negative outcome from cannabis use. Reports of cannabis consumption leading to violence in a small number of individuals have been published and it is possible that impulsivity is mediating this relationship [e.g. 24–26], in that persons who are impulsive may be more likely to become...
violent after using cannabis. Neurobiological differences in people who use cannabis may explain this association. In an assessment of brain activation during a “go–no go” task, Tapert and colleagues demonstrated that individuals with a history of cannabis use had an elevated blood oxygen level-dependent signal compared with non-users, indicating increased brain activity [27]. The go–no go task is a measure of response inhibition; those who score highly on impulsivity have to complete the task with greater care in order to inhibit their response. These results suggest that greater cognitive effort is required to complete this task successfully following cannabis use. Therefore, those who are impulsive will have to work harder to inhibit their behavior following cannabis use given that they are already less inhibited compared with their less impulsive counterparts.

In summary, there appears to be a close relationship between impulsivity and cannabis use. However, individuals who express particularly high levels of impulsivity may prefer the excitement of polysubstance drug use to the more readily available and seemingly commonplace cannabis. Impulsivity may not be elevated by cannabis use but there is some evidence suggesting that expression of impulsivity influences the experiences that individuals have when using cannabis.

Schizotypy
Due to their proximity to psychosis, the relationship between schizotypal traits, or schizotypy, and cannabis has been investigated extensively. Schizotypy is a normally distributed trait in the general population of hypothetical proneness to psychosis [e.g. 28]. It is characterized by attenuated psychotic symptoms, unusual belief systems, social withdrawal, and some negative symptoms in the form of anxiety and depression [e.g. 29]. In a 20-year prospective community study of psychotic experiences in the general population, schizotypal traits were associated with adverse psychiatric and social outcomes [30]. Psychotic symptoms in individuals with schizotypal traits have been shown to be mediated by the same factors reported in patients with schizophrenia, including urbanicity [31], stress [e.g. 32], and cannabis use [33,34].

Schizotypal traits have been associated with cannabis use in some studies [35–42], but not in others [e.g. 33, see 43 for a cautionary note]. Schizotypal traits are also associated with more frequent or persistent cannabis use [37,44].

It is difficult to determine whether schizotypal traits predate cannabis use; however, a number of longitudinal studies have tried to address this question. van Os and colleagues conducted a 3-year investigation and reported that cannabis use increased the likelihood of psychotic symptoms, but that the effect was more pronounced in those who had a proneness to psychosis at baseline [45]. Schiffman et al. took a novel approach to determining whether schizotypal traits predated the onset of cannabis use: they asked participants to rate when they first started to notice the traits and determined whether they predated the average age of first cannabis use [46]. They found that most schizotypal traits predated the onset of cannabis use.

Given that some features of schizotypy may precede the onset of cannabis use, it is possible that high schizotypal individuals may be self-medicating. There is some evidence that individuals with schizotypal traits are more sensitive to the effects of cannabis [33,34,47]; this would mean that they may be more likely to experience the pleasurable and relaxing effects, as well as the psychosis-like effects. However, Pedersen reported that cannabis use initiation was not predicted by mental health problems in 16–19-year-old adolescents [48]. Additionally, Stefanis and colleagues found that cannabis use in persons with high schizotype personalities was not associated with the distress they experienced as a result of their unusual experiences [37].

It seems that schizotypal traits may be associated with cannabis use and there is some suggestion that the schizotypal traits predate the onset of cannabis use. However, the data from van Os et al. suggest that cannabis can induce psychotic symptoms even in those who do not have any proneness to psychosis [45]. Additionally, Solowij and Michie have gone as far as proposing that long-term cannabis users are an endophenotypic model for the cognitive symptoms of schizophrenia [49]. It is possible that heavy or long-term cannabis use may produce neurobiological changes that could lead to the development of schizotypal traits. Cannabis use does result in functional changes in some brain areas that are also affected in schizophrenia, such as the frontal lobes and hippocampus, as well as alterations in global cortical blood flow [e.g. 50,51].

The relationship between cannabis, schizotypy, and psychotic symptoms is controversial. There is emerging evidence that schizotypal traits predate the onset of cannabis use and perhaps cannabis use exacerbates the expression of schizotypy. In order to determine whether cannabis use causes the expression of high schizotypal traits, examination of a longitudinal database is required to determine whether there is an association between increasing rates of cannabis use and population levels of schizotypal traits. Long-term cannabis users do exhibit many of the cognitive deficits seen in patients with schizophrenia, some or all of which may be underpinned by neurobiological changes.

Other personality traits
Impulsivity and schizotypy are the most widely studied traits in relation to use of cannabis, both as a cause and as an
effect. One study reported that cannabis use was associated with low scores for conscientiousness in a group of young adolescent social drinkers [51]. Other investigators have adopted a somewhat different approach. A number of large studies have examined the expression of psychiatric symptoms in the general population and their association with cannabis use [53,54]. The research on subclinical psychiatric symptoms mirrors the interest in schizotypy; perhaps they reflect an extreme of personality that, under particular circumstances, leaves an individual prone to the expression of a full psychiatric disorder.

In a general population study, cannabis use before the age of 15 years correlated with a greater incidence of depression and anxiety in early adulthood; this result remained significant after correction for confounds such as use of other drugs [53]. In another investigation, weekly or frequent smoking of cannabis was associated with clinically defined (at interview) depression and anxiety; the reverse causation did not exist in this study, i.e. adolescents with depression or anxiety were not more likely to smoke cannabis than those without depression or anxiety [54]. Additionally, anxiety has been identified as one of the personality factors that predicts severity of cannabis use [55,56].

Social anxiety has been specifically investigated since reduction of anxiety in social situations may be evidence of the self-medication hypothesis for cannabis use. In a non-clinical sample, an association was reported between symptoms of social anxiety and symptoms of cannabis dependence [57]. In a clinically recruited cohort of adolescents, a baseline diagnosis of social anxiety correlated with increased risk of cannabis dependence at follow-up [58]. This association did not extend to other anxiety disorders. These two studies suggest that individuals who are prone to social anxiety may be more likely to use cannabis. This situation may not be as clear cut for all anxiety disorders. A recent systematic review demonstrated a significant association between cannabis use and first major depressive episode, but the association with anxiety disorders disappeared after correcting for confounding factors [59].

Anxiety and depression have been treated as continuous traits rather than discrete categories in most studies investigating associations with cannabis use. There is a limitation to these investigations in that they are concerned with the frequency of psychiatric symptoms in the general population rather than using measures that allow a proneness to these disorders to be determined. However, it appears that anxious and depressive symptoms do present after cannabis use, but whether this only occurs in those prone to these symptoms is yet to be determined.

Possible overlap between traits
Two models explaining the emergence of drug use in adolescence and its persistence into problem drug use were developed during the 1970s and 1980s: the socialization theory [60] and the theory of problem behavior proneness [63]. At the centre of both is an interaction between a number of personality traits, along with environmental stressors such as parental divorce and instability, and the degree of engagement the young person has with societal norms. Both impulsivity and schizotypy, and specifically delusional proneness, may predispose individuals to developing beliefs that are not congruent with societal norms. Pedersen reported that subcultural belief systems along with poor mental health and parental divorce predicted heavy cannabis use in 17–20-year-olds, whereas just experimenting with the drug was predicted by subcultural beliefs alone [48]. These results suggest that individuals with unusual beliefs who do not conform to societal norms may experiment with cannabis, but that additional destabilizing factors are required for an individual to be prone to heavier use of cannabis.

Perhaps the role of personality in predicting cannabis use should be considered in an additive fashion, with increasing extreme high scoring on particular traits that are more likely to lead to problem cannabis use. Furthermore, the greater the number of personality traits that an individual possesses in their extreme form, the less likely the person is to be influenced by societal norms.

Personality traits may confer a risk for cannabis use through two different mechanisms: the social deviance model and the self-medication model [7]. In the social deviance model, those who score highly on certain personality traits are less likely to be influenced by societal norms and, therefore, more likely to engage in deviant behaviour. An alternative to this theory may be that cannabis use and extreme personality are both an expression of dysfunction but may co-exist with a third variable that increases the likelihood of cannabis use. For example, both the socialization theory [60] and the theory of problem behavior proneness [63] highlight the role for peer groups in mediating risk-taking in adolescents. Those with extremes of personality may be more drawn to one another and exert social pressure upon other group members to engage in further risk-taking behaviors, which they may have inhibited in other social circles.

An alternative biological example may be that the expression of extreme scores on some personality measures is indicative of an underlying biological proneness to psychopathology. Individuals will be drawn to using particular substances due to their pharmacological properties, in order to counter some internal abnormality in
a particular neurotransmitter system – the self-medication hypothesis. However, cannabis has a non-specific pharmacological effect, targeting γ-aminobutyric acid (GABA) directly and dopamine and serotonin indirectly [63–66]. Therefore, it is difficult to conclude which trait would draw individuals to self-medicate using cannabis.

**General conclusions and future research**

Given that personality traits are readily recognizable and could be used to identify those individuals who are most likely to initiate cannabis use during adolescence, there have been relatively few studies examining their role in this context. Additionally, the mechanisms through which personality traits may increase the likelihood of cannabis use have not been tested or fully explored, nor whether certain combinations of traits increase the risk for cannabis use. Personality may also be a confounding factor in many longitudinal studies examining patterns of cannabis use in different populations. Gender is a potential confound to both studies of personality and cannabis use. For example, males are more likely to smoke cannabis and also score significantly higher on impulsivity and the negative aspects of schizotypy [e.g. 61]. Martin and colleagues reported that sensation-seeking scores among cannabis users in their sample were higher for males than for females [62].

Individual differences in response to cannabis use are now becoming well documented [e.g. 33,47]. The persistence in the reporting of inter-individual variation suggests that there may be an intermediary variable accounting for differing sensitivities to cannabis. Personality may be such an intermediate variable. Expression of particular personality traits may be biologically determined [e.g. 67], and the same biological mechanisms may underpin individual differences in experiences with cannabis. If psychiatric diseases can be considered at the extreme end of personality traits such as schizotypy, the experiences that people report after cannabis use could reveal the underlying tendency a person may have towards a particular psychiatric condition. From a biological perspective, the non-specific mode of action of cannabis may highlight whether an individual is sensitive to fluctuations in levels of dopamine, serotonin, or GABA, which could be exacerbated by cannabis use and expressed behaviorally in the experiences the person reports after use.

There is a need for further systematic research to be conducted to clarify the relationship between personality and cannabis use. To date, there have been no large longitudinal studies specifically designed to address questions concerned with patterns of cannabis use and personality that have included more than one personality trait. Furthermore, the social contexts of drug taking and adolescent development are ignored in many investigations. The inclusion of more than one personality trait in a study would permit teasing apart of the traits that lead young people into initiating cannabis use and those that protect against use per se and, perhaps more importantly, against aberrant and intrusive patterns of cannabis use.

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**References**
