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Letter to the Editor

Multifaceted impairments of impulsivity in cannabis users?

With great interest, we read the article by Huddy *et al.* (2013) recently published by *Psychological Medicine*. The authors aimed to shed empirical light on the co-morbidity of first episode psychosis (FEP) and cannabis consumption with respect to two subdomains of impulsivity – response inhibition and reflection impulsivity. It was shown that patients with FEP had significantly greater impairment in response inhibition but not in reflection impulsivity compared to healthy controls. By contrast, patients with current cannabis use had greater reflection impulsivity but no impairments in response inhibition.

Over the past years an increasing number of studies have shown that impaired aspects of impulsivity like response inhibition are found across multiple substances with different pharmacological effects (Verdejo-Garcia *et al.* 2008; Solowij *et al.* 2012) and across several neuropsychiatric diseases (Fontanelle *et al.* 2011). In particular, there is a growing body of evidence for impaired impulsivity FEP on the one hand and complex associations of different aspects of impulsivity with cannabis consumption on the other. Interestingly, the study by Huddy *et al.* (2013) fails to show differences in response inhibition in cannabis users compared to drug-naive and discontinued users. It was concluded that abnormal reflection impulsivity is associated with substance use in psychosis but not psychosis itself; the opposite relationship may hold for response inhibition.

The findings by Huddy *et al.* are in line with previous evidence of non-acute studies with different abstinence periods starting from 17 hours to more than a year. No impairments of cognitive inhibition among recreational (Griffith-Lendering *et al.* 2012) and long-term users (Pope *et al.* 2002) have been shown. Interestingly, performance of the Stroop task was affected by marijuana use only in individuals with lower cognitive reserves (Bolla *et al.* 2002) while cannabis users in another study did not differ significantly from controls, but were vulnerable to task complexity with increasing demands creating more sources of interference (Solowij *et al.* 2002). Moreno *et al.* (2012) did find significantly different inhibitory control in recreational users with Stroop and Go/No-Go; and heavy users in Pope & Yurgelund-Todd (1996) exhibited more errors of inhibition than light users. In contrast, clear impairments among cannabis users of this aspect of impulsivity have been shown after acute administration (McDonald *et al.* 2003; Metrik *et al.* 2012).

While reflection inhibition in FEP in Huddy *et al.* (2013) is not significantly impaired compared to healthy controls, this is the case for cannabis users compared to non-users. Co-morbid continued usage in FEP shows earlier onset of psychosis and cannabis consumption, increased daily usage, more abuse of other drugs and tends to increase positive symptoms, interpretable as being more prone to jumping to conclusions. Reflection inhibition is a failure of predecisional information sampling and evaluation of situations (Solowij *et al.* 2012). Thus, it putatively influences decision making, which is impaired among acutely intoxicated cannabis users (Ramaekers *et al.* 2006; Vadhan *et al.* 2007) as well as after a time of abstinence (Griffith-Lendering *et al.* 2012; Moreno *et al.* 2012). However, whether impulsivity is the consequence of prolonged drug abuse or simply a personality trait leading to discontinuation difficulties, is still open to debate.

Although neuroimaging studies have provided compelling evidence for cannabis-related effects on brain structure and functioning (Martín-Santos *et al.* 2010), it still remains to be seen whether there are any specific effects on response inhibition. In conclusion, we suggest more studies like Huddy and colleagues (2013) as well as longitudinal and prospective designs are needed to investigate whether specific aspects of impulsivity could be considered neuropsychiatric endophenotypes of comorbid psychiatric disorders.

Declaration of Interest

None.

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Letter to the Editor

Multifaceted impairments of impulsivity in cannabis users? – a reply

We are grateful to Wrege & Borgwardt (2013) for their interest in our article. We agree with their call for further studies that examine interaction between psychosis, cannabis use and impulsivity. As Wrege & Borgwardt (2013) note impulsivity is a multifaceted concept and consequently a diffuse array of measures has been developed to index it. This is reflected in the wide variability measures used in existing studies that focus on psychosis leading to few replications using the same measures. A large study, with a representative range of measures, would help identify the factor structure of the dimensions impulsivity in people with psychosis who are substance users *versus* non-users as a guide to future research. Meda *et al.* (2009) recently reported such a study in a non-psychotic sample, describing a five-factor solution that was similar in the substance-using and non-using populations. They reported differences between the groups only on reward sensitivity and self-reported impulsivity factors, with no differences on behavioural activation, temporal discounting or risk taking factors. It would be useful to determine if similar factors emerge in a sample of people with psychosis.

A model-building approach at the level of impulsivity could be complemented by further evaluating models of substance use in psychotic samples that incorporate impulsivity. One model (Blanchard *et al.* 2000) suggests that impulsivity interacts with daily stress to exacerbate substance use in psychosis. At the time this model was put forward there was no obvious methodology available to test it. More recent work on the Experience Sampling Method (Myin-Germys *et al.* 2009) has provided a technique