



## Trait impulsivity and cognitive domains involving impulsivity and compulsivity as predictors of gambling disorder treatment response



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### HIGHLIGHTS

- Impulsivity and compulsivity cognitive related variables play an important role in relapse, dropout and treatment compliance.
- Trait impulsivity (namely negative urgency and sensation seeking) predicts poorer treatment outcomes.
- Worse cognitive flexibility delays dropout but as treatment progresses it increases risk of dropout and lower compliance.

### ARTICLE INFO

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### ABSTRACT

**Background and aims:** Gambling disorder (GD) is a highly heterogeneous condition with high rates of chronicity, relapses and treatment dropout. The aim of this study was to longitudinally explore the associations between trait impulsivity, impulsivity-compulsivity related cognitive domains, and treatment outcome in an outpatient sample of adult patients with GD.

**Methods:** 144 adult male participants diagnosed with GD undergoing cognitive-behavioural treatment (CBT) at a specialized outpatient service completed a series of neuropsychological tests to assess executive functioning (including cognitive flexibility, inhibition control and decision making) and psychometric questionnaires.

**Results:** Trait impulsivity predicted low compliance [UPPS-P negative urgency ( $B = 0.113$ ;  $p = 0.019$ )] and relapse [UPPS-P negative urgency ( $B = 0.140$ ;  $p = 0.015$ )] at 5 weeks of treatment and dropout at the end of treatment [(UPPS-P sensation seeking  $B = 0.056$ ;  $p = 0.045$ )]. Cognitive flexibility performance predicted: dropout rates at the end of treatment [WCST perseverative errors ( $B = 0.043$ ;  $p = 0.042$ )]; dropout [WCST categories completed ( $B = -1.827$ ;  $p = 0.020$ )] and low compliance or relapses at follow-up [WCST perseverative errors ( $B = 0.128$ ;  $p = 0.020$ )] and time to first relapse [WCST failure to maintain set ( $B = -0.374$ ;  $p = 0.048$ )] and time to dropout [WCST perseverative errors ( $B = 0.0198$ ;  $p = 0.019$ )].

**Conclusions:** Our findings indicate impulsivity-compulsivity levels may influence response to GD treatment (i.e.: low compliance and dropout or relapse rates) thus representing a potential target for improving treatment outcomes.

### 1. Introduction

Gambling disorder (GD) is a prevalent mental health condition characterized by persistent and recurrent problematic gambling

behaviour that leads to a clinically significant impairment and distress. In the fifth edition of the Diagnostic and Statistical Manual of the American Psychiatric Association (DSM-5), GD was included within the substance related and addictive disorders chapter as a “non-substance-

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related disorders” (American Psychiatric Association, 2013). GD is a very heterogeneous mental condition and 96% of individuals with GD present a lifetime psychiatric condition (Yau & Potenza, 2015), with substance related addictions and mood or anxiety disorders being the most frequent. It also presents high rates of chronicity (Abbott, Romild, & Volberg, 2017) and frequent relapses and dropout from treatment (Aragay et al., 2015; Jiménez-Murcia et al., 2015).

GD has been conceptualized as being placed within an impulsive-compulsive spectrum, in which gambling gains saliency through reward-based learning processes evolving into a compulsive behaviour often triggered by anxiety or stressful events (Brewer & Potenza, 2008). In fact, although many factors can contribute to the development and maintenance of GD, high levels of impulsivity (a tendency to carry out risky behaviours usually linked to maladaptive decision making patterns and to inhibitory control alterations) and compulsivity (a tendency to repeatedly perform acts in a habitual way to prevent perceived negative consequences, even if the act itself can lead to negative consequences) stand out (Fauth-Bühler, Mann, & Potenza, 2017; Savvidou et al., 2017; Yau & Potenza, 2015). It must be noted that both impulsivity and compulsivity constructs imply impaired impulse control, however, while individuals with GD tend to score high across different domains of impulsivity, compulsivity impairments appear more limited to decreased control over mental activities and to fears of losing control over motor behaviours (Yau & Potenza, 2015).

Impulsivity is a complex construct that can be defined along three different domains: choice impulsivity, motor impulsivity and trait impulsivity (Sharma, Markon, & Clark, 2013). Trait impulsivity is a stable personality characteristic related to difficulties in inhibiting inappropriate behaviours, for example acting prematurely in situations that have undesirable consequences or acting without previous reflection of the consequences derived from one's own behaviour (Griffin, Lynam, & Samuel, 2017; Rodenacker, Hautmann, Görtz-Dorten, & Döpfner, 2017). Therefore, trait impulsivity encompasses different cognitive domains and refers to the difficulty to autoregulate dominant preferences (Leshem, 2016). In this line, the UPPS-P model is one of the most accepted theoretical approaches for measuring trait impulsivity and it covers five different dimensions: lack of premeditation, lack of perseverance, sensation seeking, as well as positive and negative urgency (Berg, Latzman, Bliwise, & Lilienfeld, 2015; Canale, Rubaltelli, Vieno, Pittarello, & Billieux, 2017). Positive urgency describes the propensity to act impulsively when undergoing positive emotions; negative urgency reflects the tendency to act impulsively when experiencing negative affect; lack of perseverance refers to the tendency to not persist in an activity that can be boring; lack of premeditation shows the tendency to act without considering the consequences of a behaviour; and sensation seeking indicates one's disposition to seek exciting and new experiences (Verdejo-García, Lozano, Moya, Alcázar, & Pérez-García, 2010). Of these five dimensions, urgency seems to be most highly related to comorbid psychopathology and GD severity (Savvidou et al., 2017).

When examining impulsivity and compulsivity on an endophenotypic level, neurocognitive research suggests that the impulse control deficits observed in GD are highly linked to executive function (EF) impairments (Hinson, Jameson, & Whitney, 2003; Mallorquí-Bagué et al., 2017). EF performance is crucial for the formation of successful goal-directed behaviours (Lezak, Howieson, Bigler, & Tranel, 2012) and difficulties in this cognitive domain can lead to different maladaptive behaviour patterns. Mainly, patients with GD display impaired response inhibition (Odlaug, Chamberlain, Kim, Schreiber, & Grant, 2011) and poor self-regulation together with deficits in planning, cognitive flexibility and decision-making (Forbush et al., 2008; Goudriaan, Oosterlaan, De Beurs, & Van Den Brink, 2008; Hodgins, Stea, & Grant, 2011; Ledgerwood et al., 2012; Zhou, Zhou, & Zhu, 2016). The observed decision making difficulties seem to extend to both the learning process and the whole decision making performance when assessed with the Iowa Gambling Task (IGT; Mallorquí-Bagué et al.,

2016), and are characterized by myopia for the future, deficits in immediate/delayed reinforcements and reward/punishment, as well as poor cognitive flexibility (Ochoa et al., 2013). It should be noted that poor cognitive flexibility (set-shifting) is robustly associated with high compulsivity and with disordered compulsive behaviours (Potenza, 2007). In GD, poor cognitive flexibility seems to be partially explained by a greater difficulty in learning from mistakes and finding alternative methods of problem-solving (Marazziti et al., 2008) when assessed with the Wisconsin Card Sorting Task (WCST; Alvarez-Moya et al., 2009; Forbush et al., 2008).

In reference to the association between impulsivity and treatment outcome, previous studies in the field of substance addiction suggest that inhibitory control and choice impulsivity are both relevant facets of impulsivity when treating addiction and maintaining abstinence (Mitchell & Potenza, 2014); still this has not been robustly explored in GD. Regarding impulsivity levels, a current meta-analysis has proposed that negative urgency and lack of premeditation are both associated with poorer psychotherapy outcomes in substance-related addictions when measured with the UPPS-P (Hershberger, Um, & Cyders, 2017); however, there is a lack of studies examining association between the five dimensions of UPPS-P and GD treatment outcome. From a neuropsychological level, findings on the association between impulsivity-compulsivity and GD treatment outcomes are still scarce (Verdejo-García & Manning, 2015). So far, studies seem to point towards the implication of EF impairments in relapse rates and dropouts. For instance, self-regulatory impairments and executive dysfunction have been found to predict treatment dropout (Alvarez-Moya et al., 2011) and two recent studies have suggested that impaired decision making as well as higher disinhibition can predict relapse rates (Goudriaan et al., 2008; Yau & Potenza, 2015). Additionally, better performance on decision-making tasks (as assessed with the IGT) predicted GD recovery, regardless of the type of therapy that was implemented (Rossini-Dib, Fuentes, & Tavares, 2015). Yet, these findings are still controversial: several studies have conversely suggested that there is no clear association between decision-making and GD treatment outcome. One study found that poor decision-making was only associated with higher risk of dropouts and not associated with relapse (Alvarez-Moya et al., 2011). The reported inconsistent findings across studies are likely to reflect methodological issues relating to the measurement instruments. Likewise, other authors have reported that Card Playing Task performance is a significant predictor of relapses, whereas performance on the IGT is not (Goudriaan et al., 2008).

In sum, although impulsivity and compulsivity have been widely described in GD, the limited existing research prospectively examining the link between these constructs and treatment outcome on an endophenotypic level is still inconclusive. Therefore, the aim of this study was to longitudinally explore the impact of impulsivity and compulsivity on GD treatment outcome. The specific objective was to determine the predictive power of EF and trait impulsivity on therapy compliance, relapse and dropouts during outpatient treatment of GD.

## 2. Methods

### 2.1. Sample

The final sample consisted of 144 adult male participants diagnosed with GD, according to the DSM-5 criteria (American Psychiatric Association, 2013) (see supplementary material for the flowchart diagram specifying the initial number of male participants who accepted to be part of the study but were excluded for not meeting DSM-5 criteria or for not starting treatment). All participants were consequently referred through general practitioners or via another health care professional for problematic gambling to the Gambling Disorder Unit within the Department of Psychiatry at Bellvitge University Hospital. This public hospital oversees the treatment of very complex cases as it is certified as a tertiary care centre for the treatment of addictive

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