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# The role of impulsivity in the development of substance use and eating disorders

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## Abstract

Impulsivity is now widely viewed as a multidimensional construct consisting of a number of related dimensions. Although many measures of impulsivity are correlated, most recent factor analyses support at least a two-factor model. In the current paper, these two factors have been labelled reward sensitivity, reflecting one of the primary dimensions of Gray's personality theory, and rash-spontaneous impulsiveness. The evidence supporting the existence of two dimensions of impulsivity is reviewed in relation to substance misuse and binge eating.

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*Keywords:* Impulsivity; Substance use; Binge eating; Personality; Reward

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In everyday parlance the term impulsivity typically refers to behaviour that incorporates a component of rashness, lack of foresight or planning or as a behaviour that occurs without reflection or careful deliberation. We all engage in such impulsive acts from time to time, some of us more so than others; thus the term is understood to reflect a continuum of a personality feature or trait. Within the psychopathology literature, we also see the use of the term 'impulsive' to describe behaviour that occurs without consideration for the consequences of such behaviour. Those psychiatric disorders that include the term impulsivity as a criteria are diverse: substance use disorders, paraphilias, conduct disorder and its adult variant antisocial personality disorder, attention deficit/hyperactivity disorder, borderline personality disorder, and mania (by implication although the term impulsivity is not specifically listed in the criteria for mania). Indeed there is an entire chapter in the DSM IV in which disorders such as pathological gambling, pyromania

and kleptomania are classified under the heading of 'impulse control disorders not elsewhere classified' [1].

However, despite widespread use of the term within current diagnostic nomenclature, there are many authors who draw attention to the varied definitions of the impulsivity construct across studies of personality in non-clinical and clinical groups [2,3]. There is now wide agreement that impulsivity is not a unidimensional construct but probably consists of a number of related dimensions. To some extent the difficulties in defining and then measuring the construct of impulsivity have been complicated by the nature of the underlying theoretical model of personality in which the construct is conceptualised. The term impulsivity or impulsiveness as a core dimension within theoretical frameworks has been used, amongst others, by Hans Eysenck, Robert Cloninger, Marvin Zuckerman, and Jeffrey Gray, and whilst there is some conceptual similarity, there are nonetheless critical differences that make extrapolation from studies problematic. For example, whilst impulsivity is not one of Eysenck's [4] primary personality dimensions, the Impulsiveness (I<sub>7</sub>) questionnaire of the Eysenck Personality Scales [5] is a frequently used

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measure of impulsiveness, with items derived from both the Extraversion and Psychoticism dimensions of Eysenck's Big Three theory of personality. Designed to measure two related facets of impulsiveness, the I<sub>7</sub> consists of an Impulsiveness subscale (Imp) which measures rash, unplanned impulsive behaviour without consideration of the consequences (a style of impulsiveness related to Psychoticism), and a Venturesome subscale that measures impulsive acts in which consequences have been weighed and considered acceptable risks (i.e. extraverted impulsivity/thrill-seeking).

Cloninger's personality taxonomy [6] proposes a more explicit impulsivity dimension labelled Novelty Seeking (NS), which is defined as a tendency to frequently engage in exploratory activity and to experience intense exhilaration in response to novel stimuli. Frequently used in clinical studies NS, usually assessed via the Temperament and Character Inventory (TCI) [7], correlates strongly with Eysenck's Imp scale. A second dimension, Harm Avoidance (HA), reflects individual differences in inhibited behaviour. A Reward Dependence dimension and a Persistence dimension have also been proposed [8]. Measures of these two dimensions assess sensitivity to social cues and a tendency to persist with tasks despite frustration, respectively. Individual differences in the expression of these four dimensions are proposed to reflect genetically influenced sensitivity on a range of neurological systems, including the dopamine reward pathways (NS), the serotonergic system (HA), and noradrenaline (RD).

Zuckerman [9] has similarly proposed a theory of impulsive behaviour, referred to as Sensation Seeking. Like Eysenck's Imp dimension, Sensation Seeking is a tendency to seek out intense, novel forms of sensation and experience, and a willingness to seek such experiences regardless of the risks involved. Sensation seeking is measured by the Sensation Seeking Scale (SSS), which comprises four subscales; Thrill and Adventure Seeking, Experience Seeking, Disinhibition, and Boredom Susceptibility [10]. Zuckerman, also proposes biological substrates, although in a more complex fashion than Cloninger [11].

Gray's [2,12,13] theory of personality proposes two independent biologically based dimensions of motivation and personality—impulsivity and anxiety. Derived in part from Eysenck's Big Three, and conceptually similar to Cloninger's NS and HA, Gray's impulsivity dimension reflects individual variation in sensitivity to rewarding (conditioned and unconditioned) stimuli in the environment, whereas anxiety relates to individual differences in sensitivity to learned signals of punishment, novel stimuli, and frustrative non-reward. These personality dimensions are putatively mediated by two biologically based motivational systems: the Behavioural Approach System (BAS), which regulates response to appetitive stimuli, and the Behavioural Inhibition System (BIS), which regulates an inhibited response to aversive stimuli. This model has been recently labelled as the Reinforcement Sensitivity

Theory (RST) and is described in detail by Corr (this volume). In short, RST proposes that there are individual differences in the sensitivity or perhaps reactivity of basic brain-behavioural systems that respond to reinforcing (and other) stimuli [14]. The underlying neural substrate of BAS involves dopaminergic systems and in particular mesolimbic dopaminergic pathways comprising projections from the ventral tegmental area to structures including the nucleus accumbens, amygdala, and the prefrontal cortex. Notably, this is one of the critical (although not only) pathways underlying the positively reinforcing effects of natural reinforcers such as food and sex, and drugs of abuse [15]. In essence, individuals with high BAS sensitivity are more prone to engage in approach behaviour and experience positive affect in situations with cues for reward [16]. In terms of behavioural learning theory, BAS is thought to be involved in the behavioural response sets of approach (making a behavioural response, i.e. pressing a lever in order to gain reward) and active avoidance (making a behavioural response in order to avoid punishment).

Although there are a number of questionnaires developed to assess BIS and BAS responsivity, two measures gaining prominence are the BIS/BAS Scales [16] and the Sensitivity to Punishment and Sensitivity to Reward Questionnaire (SPSRQ) [17,18]. The BIS/BAS scales reflect the general conceptualisation of BIS and BAS, focusing on items that tap emotional responses to appetitive and aversive stimuli. The BIS/BAS scales provide a single score for BIS and three subscale scores for BAS. The subscales include items tapping persistence in obtaining desired goals (Drive subscale; BAS-Drive); statements indicative of a willingness to seek out and spontaneously approach potentially rewarding experiences (Fun Seeking subscale; BAS-FS); and items measuring anticipation and positive response towards reward (Reward Responsiveness subscale; BAS-RR). The SPSRQ consists of two scales. The Sensitivity to Punishment scale (SP) measures behavioural inhibition under specific conditions of threat or punishment and the Sensitivity to Reward scale (SR) reflects approach behaviour to specific conditioned and unconditioned rewards, notably money, social status and sexual partners [19].

Whilst all four models described above have a biological basis in which an approach dimension is considered a central facet, at a conceptual level the models are nonetheless different and thus we find that the measures of impulsivity although often correlated, do not provide uniformly consistent results. Unlike measures of anxiety and behavioural inhibition, which appear to tap a single construct, measures of impulsivity assess a number of related domains. Indeed, recent factor analytic studies have found specific measures of Gray's BAS construct to load on a separate factor from measures of impulsivity as conceptualised by Eysenck, Cloninger and Zuckerman. As the summary of factor analytic findings in Table 1 shows, the Imp scale, NS scale, SSS (and other related scales such

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