

# ■ Impulsivity-targeted selective preventive interventions and treatments in addictive behaviors

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## Abstract

Impulsivity is one of the personality characteristics most associated with several psychopathological problems, and it is proposed as a transdiagnostic marker. One of the important health-related issues most consistently associated with high impulsivity is that of addictive behaviors. Specifically, facets such as positive and negative urgency, lack of premeditation and impulsive choice have the greatest empirical support. Several studies have developed psychological interventions and techniques aimed at reducing impulsivity in both healthy and substance using and dependent individuals. Emotional regulation training, trigger identification and training in alternative behaviors and dialectical-behavioral skills have shown to be effective in reducing urgency. Regarding lack of premeditation, problem solving strategies and goal management training are shown as effective techniques. Finally, several experimental techniques (framing, priming and reward bundling) have obtained promising results in reducing impulsive choice. Despite the available evidence, most results are based on preliminary and/or experimental studies, and more research is necessary to replicate these findings and to examine the best approach for translating the available evidence into clinical practice in order to generalize the study findings to real world behaviors.

*Keywords: Impulsivity, Addictions, Prevention, Treatment.*

## Resumen

*Intervenciones centradas en la impulsividad para la prevención y tratamiento de conductas adictivas.* La impulsividad es una de las características de personalidad más relacionada con multitud de problemas psicopatológicos, siendo propuesta como un marcador transdiagnóstico. Uno de los problemas de salud más consistentemente asociados con una alta impulsividad son las conductas adictivas. En concreto, las facetas de urgencia positiva y negativa, falta de premeditación y toma de decisiones impulsiva cuentan con el mayor apoyo empírico sobre esta relación. En línea con estos hallazgos, diversos estudios han desarrollado técnicas e intervenciones destinadas a reducir los niveles de impulsividad tanto en individuos sanos como consumidores y dependientes. El entrenamiento en regulación emocional, en identificación de disparadores y desarrollo de conductas alternativas y en habilidades dialéctico-comportamentales se han mostrado eficaces para reducir los niveles de urgencia. En cuanto a la falta de premeditación, las técnicas de resolución de problemas y el entrenamiento en manejo de metas se han mostrado como técnicas eficaces. Por último, distintas técnicas experimentales (framing, priming y agrupación de las recompensas) han obtenido resultados prometedores para reducir la toma de decisiones impulsiva. A pesar la evidencia existente, la mayoría de los resultados se basan en estudios preliminares y/o experimentales, siendo necesaria más investigación que replique los hallazgos y que encuentre la mejor manera de trasladar la evidencia disponible a la práctica clínica para generalizar los resultados obtenidos al comportamiento diario de las personas.

*Palabras clave: Impulsividad, Adicciones, Prevención, Tratamiento.*

## Impulsivity as a transdiagnostic variable in clinical and health psychology

Impulsivity can be defined as a predisposition toward rapid and unplanned reactions to (internal or external) stimuli without considering the potential negative consequences (Moeller, Barratt, Dou-

gherty, Schmitz, & Swann, 2001). Consequently, it is considered a fundamental variable common to several psychological disorders and risky behaviors (Dir, Coskunpinar, & Cyders, 2014; Jakuszkowiak-Wojten, Landowski, Wiglusz, & Cubala, 2015; Schag, Schonleber, Teufel, Zipfel, & Giel, 2013; Swann, Anderson, Dougherty, & Moeller, 2001; Turner, Sebastian, & Tuscher, 2017).

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As it is involved in numerous disorders, impulsivity—and specifically delay discounting (Lempert, Steinglass, Pinto, Kable, & Simpson, 2019)—is considered one of the most important transdiagnostic markers of the Research Domain Criteria (RDoC), a project of the National Institute of Mental Health (Brooks, Lochner, Shoptaw, & Stein, 2017). From this perspective, psychological disorders are conceptualized as distinct phenomenological manifestations stemmed from dysregulations in normal psychological processes. Thus, impulsivity is a fundamental common factor in externalizing disorders (Krueger & Eaton, 2015). Also, consensus exists regarding the multidimensional nature of impulsivity (Bickel, Jarmolowicz, Mueller, Gatchalian, & McClure, 2012; Verdejo-Garcia, Lawrence, & Clark, 2008) which can be divided into three general categories: trait impulsivity, impulsive actions and impulsive choice (MacKillop, Weafer, Oshri, Palmer, & de Wit, 2016). In line with this classification, several instruments have been developed to assess specific facets within each category.

### Assessment of impulsivity: Facets and characteristics to consider

The instruments for assessing impulsivity can be divided into self-reports and behavioral tasks and, although both approaches are supposed to measure the same construct, evidence supports their independence (Cyders & Coskunpinar, 2011; Cyders & Coskunpinar, 2012; Sharma, Markon, & Clark, 2014). This lack of association persists despite the use of alternative scorings aimed at capturing more state-dependent features, such as those detected in behavioral tasks (Ellingson, Potenza, & Pearson, 2018). This fact may be directly related with the multidimensionality of impulsivity as well as with the higher specificity of the behavioral task. Whereas in the behavioral tasks participants have to perform specific behaviors in a very limited normative environment, self-reports are comprised of general statements, regarding sometimes complex behaviors, to which participants have to weight their level of agreement. In this sense, it may be possible that individuals that frequently behave in an impulsive or risky manner consider their behavior to be stable, and thus low in impulsivity, as it has been shown in relation with risk perception (Albert & Steinberg, 2011). Individuals who have recently engaged in novel or unusual situations may see themselves as individuals who tend to seek out thrilling situations or who make decisions without forethought.

Research in the personality field has developed a plethora of questionnaires to assess several facets of impulsivity. Whiteside and Lynam propo-

sed a comprehensive model of impulsivity built on previous research and scales (Cyders et al., 2007; Whiteside & Lynam, 2001), and an instrument (i.e., the UPPS-P Impulsive Behavior Scale) for its assessment (Pilatti, Lozano, & Cyders, 2015). The model posits five domains: positive and negative urgency (the tendency to act rashly under intense positive/negative affect), lack of premeditation (the tendency to act without thinking or forethought), lack of perseverance (the inability to remain focused on a task and avoid boredom) and sensation seeking (the tendency to seek out new and exciting experiences).

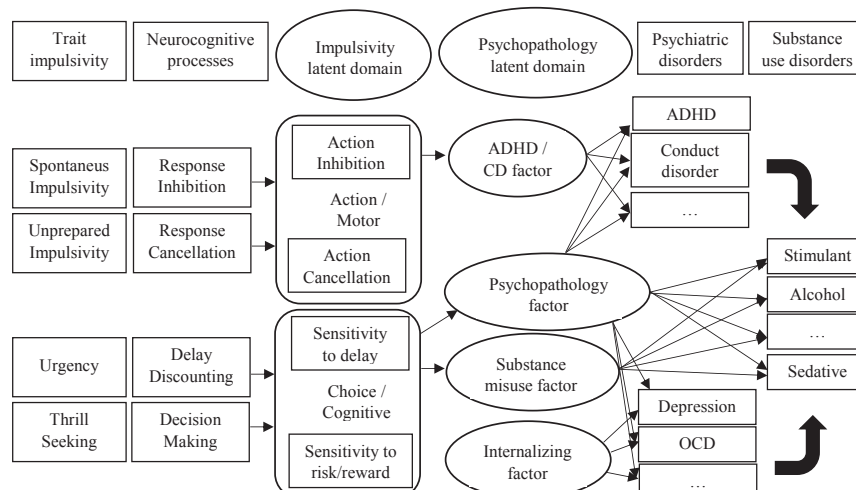
Current neuropsychological models are based on two complementary systems: a bottom-up system associated with emotion-related limbic brain structures and a top-down executive system associated with the prefrontal cortex (Bechara, 2005; Bickel et al., 2012). In line with this model, two domains were proposed (Stevens et al., 2014): Impulsive actions (deficits in cognitive and/or motor inhibition) and impulsive choice (preference for smaller immediate rewards over larger but delayed rewards or delayed punishments). Impulsive action is typically assessed using go/no-go and Stroop tasks, covering motor and cognitive disinhibition, respectively. Impulsive choice is assessed using delay discounting tasks, the Iowa Gambling Task or the Balloon Analogue Risk Task among others (Stevens et al., 2014).

### Association between impulsivity and risk behaviors: The case of addictions

A large body of evidence supports the role of impulsivity from early use to dependence and recovery in alcohol (Stautz & Cooper, 2013), tobacco (Kale, Stautz, & Cooper, 2018), cannabis (VanderVeen, Hershberger, & Cyders, 2016) and gambling (Dowling et al., 2017).

Although longitudinal studies confirm cross-sectional evidence (Isen, Sparks, & Iacono, 2014; Martínez-Loredo, Fernández-Hermida, Fernández-Artamendi, Carballo, & García-Rodríguez, 2015; Richardson & Edalati, 2016; Robinson, Ladd, & Anderson, 2014) on the association between early use of substances and impulsivity, it is still not clear which facets are the most important (Audrain-McGovern et al., 2009; Janssen et al., 2015; O'Loughlin, Dugas, O'Loughlin, Karp, & Sylvestre, 2014). The same mixed evidence exists when exploring the association between impulsivity and frequent use and escalation (Farley & Kim-Spoon, 2015; Isen, Sparks, & Iacono, 2014; Khurana et al., 2013, 2015; Martínez-Fernández, Lloret-Irles, & Segura-Heras, 2018; Martínez-Loredo, Fernández-Hermida, De La Torre-Luque, & Fernández-Artamendi, 2018a, 2018b). However, evidence supports the

Figure 1. Diagram adapted from Vassileva and Conrod (2019) linking impulsivity facets and neurocognitive processes to psychopathological and substance use disorders through impulsivity and psychopathology latent domains.



relevance of lack of premeditation (Leeman, Hoff, Krishnan-Sarin, Patock-Peckham, & Potenza, 2014), and positive (Lopez-Vergara, Spinalle, Merrill, & Jackson, 2016) and negative urgency (Tomko, Prisciandaro, Falls, & Magid, 2016) in predicting alcohol use frequency and gambling disorders (Maclaren, Fugelsang, Harrigan, & Dixon, 2011; Torres et al., 2013). Elevated levels of urgency are also associated with regular tobacco use (Balevich, Wein, & Flory, 2013; Lee, Peters, Adams, Milich, & Lynam, 2015). Impulsive choice (Field, Christiansen, Cole, & Goudie, 2007) and inhibitory control (Field et al., 2007; Henges & Marczinski, 2012; Moreno et al., 2012) have also been associated with frequent substance use. Recently, Vassileva and Conrod (2019) have proposed a multidimensional integrative framework relating the abovementioned facets to different psychopathological domains and specific substance use disorders (see Figure 1).

## Impulsivity-targeted psychological techniques and interventions

### Urgency

Emotion-based impulsivity and emotional dysregulation (i.e., difficulties in controlling emotional states and emotion-driven behaviors) are theoretically and empirically related constructs (Dir, Banks, Zapolski, McIntyre, & Hulvershorn, 2016). Not surprisingly, individuals who find it difficult to manage and regulate their emotions or engage in goal-directed behaviors are more likely to report problems of substance use (Rogers et al., 2018), especially among those who tend to act rashly in the presence of intense affects (Bold et al., 2017; Dir et al., 2016). Against this background, there has been an increasing interest in developing interventions specifically aimed at reducing urgency (Kim & Hodgins, 2018).

Zapolski, Settles, Cyders, and Smith (2010) summarized the current available strategies to target different impulsivity facets within the UPPS-P model. In addition to others, strategies focused on the identification of precipitating events, training of alternative behaviors aimed to increase distress tolerance and adjust emotional reactions by considering a wider context, have been shown effective to reduce urgency (Zapolski et al., 2010). Engaging in relaxing, pleasurable activities and evaluating choices considering long-term goals have been proposed as effective ways to reduce negative urgency and other facets.

Emotion regulation training has shown evidence for improving emotion regulation and reducing urgency (Weiss et al., 2015). In this study, participants were randomly allocated to two different training modules targeting emotion regulation (EM) and impulsivity reduction (IR, discussed below), respectively. The EM session was adapted from acceptance-based emotion regulation group therapy (ERGT, see Gratz & Tull, 2011). The EM training included psycho-education on the context-dependent nature of emotion regulation and the paradoxical effects of emotional avoidance, focusing on adaptive regulation strategies to modulate the intensity/duration of emotions and training strategies to replace avoidant emotion strategies. Participants attending the EM module significantly reduced their emotional dysregulation and urgency, which accounted for 44% of change in risky behaviors (Weiss et al., 2015).

Recent preliminary evidence derived from a pilot study also exists regarding a brief universal preventive school-based intervention. This study (Zapolski & Smith, 2016) implemented a 9-week brief Dialectical-Behavioral Therapy (DBT) skills training to reduce emotional dysregulation and reported reductions in engagement in risky behaviors, especially among youths with high urgency. The intervention

adapted the DBT modules on emotion regulation, distress tolerance, and interpersonal skills (Linehan, 1993). A review of mindfulness-based intervention for substance use (Tang, Tang, & Posner, 2016) also found preliminary support for integrative Body-Mind Training (IBMT) in reducing negative affect and urgency through the enhancement of emotion regulations skills.

### Lack of premeditation

Many interventions have been proposed for reducing the tendency to act without thinking, mainly focusing on social problem-solving strategies (SPS), goal management training (GMT) or cognitive remediation training (CRT) (Zapolski et al., 2010). The IR module of the study by Weiss et al. (2015) trained the identification of impulsive behaviors and their negative associated consequences, the recognition of the transitory nature of urges and four strategies aimed at reducing them: distraction, substitution, pros/cons of acting impulsively and modification of consequences (Weiss et al., 2015). Participants in the IR module increased their premeditation significantly. Similarly, contemporary SPS focuses on training four areas: Multitasking enhancement skills; the Stop-Slow down-Think-Act method to minimize impulsive attempts at PS; healthy thinking; and imaginary and playful PS (Nezu, Greenfield, Nezu, 2015).

From a neuropsychological approach, GMT improves participants' planning by defining goals and monitors their performance by training cognitive control through response inhibition exercises and implementing adequate decision-making strategies. GMT can be complemented with mindfulness practice to increase emotional awareness, bolster sustained attention and reinstate cognitive control (Levine et al., 2011; Verdejo-García, Alcázar-Córcoles, & Albein-Urios, 2018). A combined GMT+Mindfulness approach showed significant effects on working memory, attention/response inhibition, decision-making and reflection impulsivity among polydrug users (Alfonso, Caracuel, Delgado-Pastor, & Verdejo-García, 2011; Valls-Serrano, Caracuel, Verdejo-García, 2016). Finally, CRT has shown preliminary evidence to improve cognitive functions in dependent individuals, including cognitive bias modification (Challet-Bouju, Bruneau, IGNACE Group, Victorri-Vigneau, & Grall-Bronnec, 2017). However, the heterogeneity of CRT studies has precluded any conclusion to date (Rezapour, DeVito, Sofouglu, & Ekhtiari, 2016).

Worthy of mention is a personality-targeted preventive intervention for substance misuse that has been shown effective to reduce substance use and mental health outcomes up to 3 years. The *Prevention Programme* (Edalati & Conrod, 2019) targets four personality facets particularly associated with substance misuse (i.e., impulsivity, sensation seeking, anxiety sensitivity and hopelessness) by providing psycho-education and developing skills specifically designed to overcome difficulties, when targeting impulsivity in behavioral response inhibition in the presence of immediate rewards (Woicik, Stewart, Pihl, & Conrod, 2009).

### Impulsive choice

Impulsive choice (i.e., excessive delay discounting or DD) has been widely associated with substance use, dependence and treatment outcomes. For decades, several experimental and a few clinical studies have focused on interventions aimed at reducing impulsive choice. Recently, Rung and Madden performed the first systematic review and meta-analysis addressing this topic (Rung & Madden, 2018a). The paucity of studies examining the effect of clinical interventions on

DD yield mixed findings regarding contingency management (CM) and working memory training (WMT). Despite the evidence supporting the efficacy of CM in treating addictive behaviors (Petry, Alessi, Olmstead, Rash, & Zajac, 2017), only 3/6 studies found any significant reduction in DD after treatment (Rung & Madden, 2018a). The same mixed evidence exists regarding WMT (Houben, Wiers, & Jansen, 2011; Verdejo-García et al., 2018).

Experimental manipulations of DD have reported the most consistent results. Framing manipulations such as describing a specific date to receive the delayed reward, making explicit the absence of any reward if the immediate option is selected and segregating the delayed reward produced the largest effect sizes (Rung & Madden, 2018a). Also, the use of construal priming, cues or creating a wider context during decision making increases the likelihood of selecting the delayed option. Interestingly, Rung and Madden's review shows learning-based approaches promote the largest and longest-lasting effects. Of particular interest is reward bundling (Stein, Smits, Johnson, Liston, & Madden, 2013), as this technique may increase the effectiveness of CM protocols among impulsive individuals by progressing treatment from a contingent reward delivery to a voucher bundling upon increasing the number of negative submissions.

The vivid imagination of specific future situations (i.e., episodic future thinking, EFT) presents evidence of large effects on DD, even among individuals with steep discounting (Rung & Madden, 2018a; Stein et al., 2016). Nonetheless and despite these promising results, some studies failed to prove the proposed psychological (Dassen, Jansen, Nederkoorn, & Houben, 2016) or neural (Kwan et al., 2015) mechanisms accounting for the EFT effects, suggesting that they may be an experimental artifact (Rung & Madden, 2018b; but see Stein et al., 2017 and Rung & Madden, 2019). As virtually all experiments using EFT ask participants to engage in delay-matched EFT while performing a DD task, future studies should explore the effect of practicing delay-mismatched EFT before performing DD tasks.

In sum, the major conclusion of Rung and Madden's meta-analysis is that there is not enough theory-based knowledge about how to reduce DD and that research must address important threats to validity of the proposed techniques before translating experimental findings into clinical practice (Rung & Madden, 2018a). Importantly, translational research would only succeed if research studies do not focus on simply reducing DD but on developing strategies embedded in clinical and preventive interventions to reduce impulsive choice in real-life situations (*subsequently* confirmed by reductions in DD).

## Conclusions

The present work summarized the available evidence of psychological interventions and techniques aimed at reducing impulsivity and their potential use when implementing preventive interventions and treatments targeting impulsive behavior. Although some interventions have shown to be effective, the field is still in its infancy as most evidence is derived from preliminary results. Future research should examine the best approach to translate current experimental evidence into clinical practice and to determine the extent to which the reported benefits generalize to real world behaviors of individuals.

## Conflict of interest

The authors declare no conflict of interest.

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