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Review

A cognitive-behavioral model of Internet gaming disorder: Theoretical underpinnings and clinical implications

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ABSTRACT

Cognitive contributions to the behaviors observed in substance and non-substance addictions have been investigated and characterized. Based on models of drug addictions and the extant literature on Internet gaming disorder (IGD), we propose a cognitive-behavioral model for conceptualizing IGD. The model focuses on three domains and their roles in addictive behaviors. The three domains include motivational drives related to reward-seeking and stress-reduction, behavioral control relating to executive inhibition, and decision-making that involves weighing the pros and cons of engaging in motivated behaviors. Based on this model, we propose how behavioral therapies might target these domains in the treatment of IGD.

1. Background

Internet addiction disorder (IAD) or problematic Internet use has been proposed as a diagnostic entity and studied for more than a decade; however, there has been debate regarding a standardized definition for such a disorder. Although no formal diagnostic criteria for a psychiatric condition characterized by excessive and interfering patterns of Internet use were included in the fourth edition of the Diagnostic and Statistical Manual (DSM-IV) (Block, 2008; Shaw and Black, 2008; Liu et al., 2011), the DSM-5 committee considering substance-use and addictive disorders generated criteria for Internet gaming disorder (IGD), and this condition is included in the section of the DSM-5 containing disorders warranting additional study (American Psychiatric Association, 2013; Petry and O'Brien, 2013). Given this recent change in the DSM, we will refer to excessive Internet gaming, addictive Internet gaming, or pathological online gaming as IGD in the current manuscript, although we recognize that the term and diagnostic construct might differ and none have been systematically examined with respect to current criteria for IGD.

Unlike drug addiction or substance abuse, no chemical or substance intake is involved in IAD or IGD, although excessive Internet use may lead to physical dependence, similar to other addictions (Holden, 2001; Dong et al., 2013a). This observation suggests that people's online experiences may change brain structure and function, and related cognitive processes, in manners that may perpetuate Internet use (Holden, 2001; Weinstein and Lejoyeux, 2010; Dong et al., 2011b). Although it has been proposed that excessive Internet use may involve at least three subtypes relating to gaming, sexual preoccupations, and email/text messaging (Block, 2008), other subtypes may exist (e.g. relating to other types of behaviors (social networking) or motivations that may underlie Internet use, such as those relating to positive or negative reinforcements). While additional research is needed to identify clinically meaningful subgroups, a model that describes cognitive domains, their interrelationships and how the domains might be targeted in treatment could be helpful in the study and research of IGD.

Unanswered questions exist regarding the precise features that may lead some individuals to use the Internet excessively or compulsively. IGD behaviors may be driven by experiences involving strong emotions. The frequent and repetitive engagement in such behaviors may alter brain structure and function underlying specific cognitive processes. In this paper, we propose a cognitive-behavioral model for IGD based on the extant literature.

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Although few trials have been conducted to test the efficacies and tolerabilities of medications in the treatment of IGD (Liu and Potenza, 2007; Flisher, 2010; Huang et al., 2010; Yau et al., 2012), IGD treatments might consider psychological or cognitive processes as potential targets for pharmacological or behavioral interventions (Huang et al., 2010). Based on the proposed cognitive-behavioral model, possible approaches for the treatment of IGD are discussed, with a focus on behavioral therapies.

2. A cognitive-behavioral model of IGD

A central component of addictions involves reward-seeking (Potenza, 2013). Reward-centric models have focused on pleasurable aspects of drug-taking with the notion that drugs may "hijack" brain reward circuits (Volkow and Li, 2004; Nestler, 2005). The incentive salience model of drug addiction proposes that "liking" a drug may be separated from "wanting" the drug (Berridge, 2007). A "reward deficiency syndrome" model posits that addicted individuals engage in addictive behaviors to compensate for hypofunctioning reward signals in the mesolimbic dopamine pathway (Blum et al., 2006). Negative-reinforcement models suggest that relief from aversive states (e.g., relating to stress) may drive participation in addictive behaviors. Motivation-focused models have proposed that addiction might be considered a disorder of misdirected motivation in which relatively greater priority is given to drug use (as opposed to other motivational behavioral domains like occupational or familial) (Chambers et al., 2003; Kalivas and Volkow, 2005). These and other models (e.g., the impaired response inhibition salience attribution – IRISA (Goldstein and Volkow, 2011)) consider that diminished executive control over pro-motivational drives may contribute to decisions to engage in addictive behaviors.

Like in these models of drug addiction, we propose that motivational drives linked to reward-seeking contribute importantly to IGD and that diminished executive function/cognitive control over these motivational drives contribute to decision-making that leads to persistent engagement in Internet game-playing in IGD (Fig. 1). In the figure, we also indicate possible areas which may be targeted with specific therapies (which are discussed later in the manuscript), although these possible relationships remain largely untested at this point. Nonetheless, the proposed model provides a theoretical basis for hypothesis testing in mechanistic studies and treatment development.

2.1. Reward and motivation in IGD

Given the role of reward processing in behavioral and drug addictions, investigators have examined aspects of reward sensitivity in IGD. Studies that have used guessing tasks have found that individuals with IGD show enhanced reward sensitivity and decreased loss sensitivity in mild (Dong et al., 2011a, Dong et al., 2012) and extreme (Dong et al., 2013a) winning and losing situations. Online behaviors may be perceived as rewarding through feelings of being in control and immediate achievement (Leung, 2004). Enhanced reward sensitivity in IGD may underlie desires to use the Internet and promote online game-playing for longer periods of time. In this manner, enhanced reward sensitivity and decreased loss sensitivity might contribute to the development of IGD (Dong et al., 2013b).

2.2. Executive control: Inhibition of cravings and limiting excessive Internet use

Executive systems are posited to promote cognitive and behavioral control over motivational drives and may enable individuals to inhibit desires and control the extent of participation in reward-seeking behaviors (Everitt et al., 2007; Goldstein and Volkow, 2011; Sofuoglu et al., 2013). These features may contribute importantly to IGD. Reduced response-inhibition and cognitive-control tendencies or abilities have been demonstrated in subjects with IGD (as compared to those without) using go/no-go (Dong et al., 2010), Stroop (Dong et al., 2011c) and switching

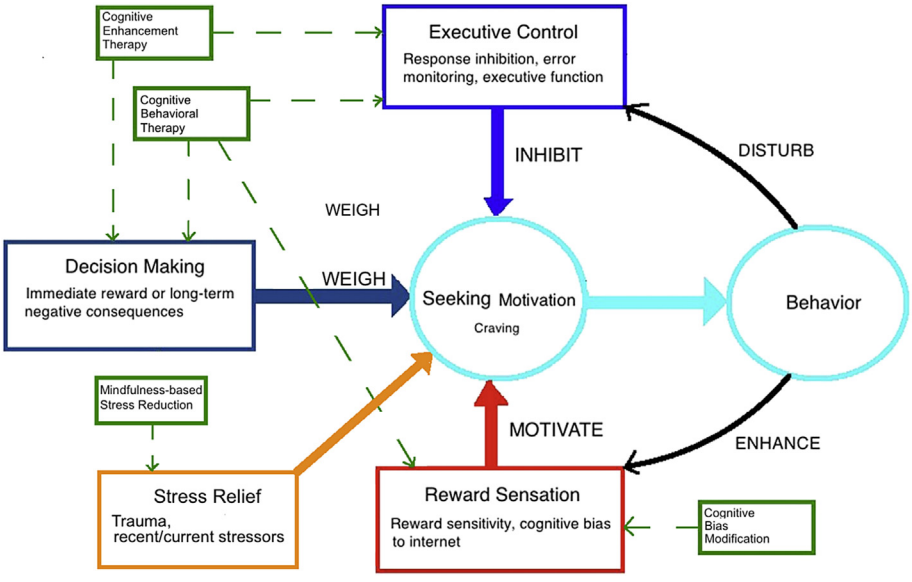

Fig. 1. A cognitive-behavioral model of IGD. This figure shows proposed cognitive domains associated with IGD. The model focuses on three cognitive domains and their possible roles in addictive behaviors. The three domains include motivational drives related to reward-seeking and stress reduction, behavioral control relating to executive inhibition, and decision-making that weighs the consequences of engaging in motivated behaviors. Online gaming behaviors might further disturb executive control and reinforce rewarding online experiences, which may lead to a vicious cycle of addictive Internet game-playing. The contents framed in green boxes show potential psychological and cognitive treatments for IGD. Dashed lines indicate potential targets of intervention strategies, with further studies needed to investigate efficacies and possible mechanisms of actions. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)