An Investigation of Neural and Behavioural Substrates of Pathological Gambling as an Addictive Disorder

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Abstract

Pathological gambling is a maladaptive behaviour associated with diminished self-control over persistent compulsive gambling behaviour despite negative consequences. A significant revision to the clinical perspective of pathological gambling is underway, and the disorder will likely be recognized as a behavioural addiction in the fifth edition of Diagnostic and Statistical Manual of Mental Disorders. However, the neurobiological, cognitive and behavioural processes that drive a 'behavioural addiction' are unclear.

A series of five studies were conducted to investigate cognitive mechanisms associated with neural and behavioural substrates of addictive processes in disordered gambling. Studies 1 through 3 investigated neurobiological correlates of addiction in individuals with pathological gambling as compared to individuals with cocaine dependence, and as compared to non-addicted healthy controls. Study 1 investigated brain activity associated with anticipatory and consummatory reward processing during slot-machine gambling. Study 2 investigated executive control processes by examining functional brain networks associated with loss-chasing behaviour. Study 3 employed voxel-based morphometry (VBM) to explore alterations in grey-matter volumes in individuals with addictive disorders. Studies 4 and 5 investigated the behavioural substrates of addiction in regular gamblers utilizing emerging and novel research techniques. Study 4 examined continuous hand motion trajectories to explore approach biases and implicit processing. Study 5 employed an adaptive testing methodology to explore the influence of gaming machine preferences on cognitive processes and gambling behaviour.

Research identified neurobiological and behavioural substrates of gambling-related beliefs and biases that indicate significant contributions of cognitive mechanisms to the development and persistence of a behavioural addiction. Results suggest addictive disorders may share some common features of anticipatory reward processing and brain structure (Studies 1 and 3), while neural signals associated losing outcomes and decision-making during gambling may be specific to disordered gambling (Studies 1 and 2). Furthermore, cognitive distortions in regular gamblers may influence reinforcement and executive control processes (Study 4), and individual preferences for gaming speed may influence cognitions and behaviour during machine gambling.

As additional psychological disorders are being considered for classification as behavioural addictions, and clinicians will be faced with the challenges of treating individuals with these non-substance-related addictive disorders, a better understanding of behavioural addictions, through the study of disordered gambling, will be essential under the new diagnostic framework.

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