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Higher impulsivity after exposure to the internet for individuals with high but not low levels of self-reported problematic internet behaviours

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ABSTRACT

The current study explored the impact of internet exposure on the impulsivity of individuals who reported higher or lower levels of problematic internet behaviours. Levels of problematic internet use in 60 individuals were measured using the Internet Addiction Test. Participants were exposed to a choice assessment, in which they could choose between a small immediately-delivered outcome (impulsive), a medium-sized outcome with a medium delay (optimal), and a larger longer-delayed outcome (self-controlled). They were given 15 min access to the internet, and finally were presented with the choice test again. Of the sample, 28% (17/60) had internet-problems, with no difference being found between male and female rates of problematic internet use. Those reporting higher levels of internet-problems displayed no greater impulsive behaviours, prior to internet exposure, than those reporting fewer problems. After internet exposure, higher-problem users displayed greater impulsivity, reflected by a move from self-controlled to impulsive choices. These findings suggest that individuals reporting internet-related problems become more impulsive after exposure to the internet.

1. Introduction

The association between behavioural and cognitive problems and excessive use of the internet is a growing concern for authorities in many countries (Dong, Huang, & Du, 2011; Niemz, Griffiths, & Banyard, 2005), and the prevalence of such problematic internet usage appears to be increasing (Byun & et al., 2009; Christakis, 2010; Young, Yue, & Ying, 2011). These concerns have prompted the suggestion that a new psychiatric disorder – Internet Addiction Disorder (IAD) – should receive further study (Christakis, 2010). It has been noted that individuals who report problems associated with their internet usage also report experiencing severe problems across multiple areas of their lives, including work, social relationships, as well as with their physical and mental health (Caplan & High, 2011; Niemz et al., 2005; Shaw & Black, 2008). Such individuals also report needing to spend increasing amounts of time online to satisfy their internet-related needs (Griffiths, 2000), and display negative affect when separated from the internet (Romano, Osborne, Truzoli, & Reed, 2013). Additionally, there are a wide range of psychiatric co-morbid problems associated with problematic internet-usage, such as depression and social isolation (Bernardi & Pallanti, 2009; Kim & Haridakis, 2009), elevated psychotic and schizotypal traits (Bernardi & Pallanti, 2009; Romano et al., 2013), as well as lowered levels of inhibition and higher levels of aggression Dong & et al., 2010; Ko et al., 2010; Ko, Jen, Liu, Huang, & Yen, 2009). However, much of this evidence results from self-report studies, rather than from experimental analyses of behaviour, and, hence, the concept of IAD requires further empirical validation.

An area of particular importance and concern for many behavioural addictions is the relationship between excessive engagement in an activity and high levels of impulsive behaviour (Bechara, Tranel, & Damasio, 2000; Lawrence & et al., 2009; Wetterneck & et al., 2012), which has also been suggested as a potential concern in terms of IAD (Dong et al., 2010; Yen et al., 2012). Patterns of behaviour that can be described as 'impulsive' are associated with deficits in decision-making (Bechara et al., 2000), and predict engagement in many problematic behaviours, such as gambling or pornography usage (Lawrence et al., 2009; Wetterneck et al., 2012). As a consequence, attempts have been made to increase self-control in many groups showing clinical addiction problems (e.g., Dixon & et al., 1998). Given the potential importance of impulsivity to behavioural addictions, such as IAD

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(e.g., Dong et al., 2010; Yen et al., 2012), a number of studies have examined associations between internet use and impulsivity. Survey-based reports indicate that high scores on the Internet Addition Test (IAT; Young, 2009), which measures life problems and disruptions associated with internet use, are associated with self-reports of greater impulsivity (Ko et al., 2010; Mottram & Fleming, 2009; Yen et al., 2012), and individuals with high self-reported internet usage also display lower levels of motor impulse control when tested experimentally (Dong & et al., 2010).

It should be noted that many of the above reports rely on aggregated self-assessments of internet use and impulsive behaviour over a period of time (e.g., Yen et al., 2012), and the few experimental tests that have been conducted have been largely concerned with motor inhibition, rather than psychological inhibition (Dong et al., 2010). Moreover, it is unclear whether the high levels of impulsivity are the result of exposure to the internet or whether they predict its usage, and how impulsivity changes after exposure to the internet (although see Yen et al., 2012). Similarly, it is not known whether exposure to the internet will affect higher- and lower-level problematic-internet users in the same manner. The current study aimed to address these questions, and to provide further laboratory-based empirical exploration of the concept of an IAD by establishing whether problematic internet usage is associated with an important problem (i.e. impulsivity) commonly seen with other behavioural addictions.

Impulsivity can be studied experimentally by presenting participants with several alternatives that pit choices between a smaller but more immediately-delivered reinforcement outcome (termed 'impulsive') against a larger but delayed reinforcement outcome (termed 'self-controlled'). Under such conditions, participants typically show greater numbers self-controlled choices (Ito & Nakamura, 1998; Reed, Thompson, Osborne, & McHugh, 2011), but groups who display behavioural addictions, like gambling, tend to display more impulsive choices (Lawrence & et al., 2009). It should be noted that, although 'self-controlled' behaviour is typically encouraged (Dixon et al., 1998), it is not always the 'rational' behaviour (i.e. the behaviour that leads to the greatest or most optimal numbers of reinforcers). In fact, under some conditions, may not lead to the optimal outcomes. In fact, some studies find that humans demonstrate a bias towards self-control, rather than optimising (Kirk & Logue, 1996; Reed et al., 2011; Sonuga-Barke, Lea, & Webley, 1989). For example, Kirk and Logue (1996) noted that adult humans tended to pick a larger, delayed reinforcer, even when this choice did not lead to the greatest overall number of reinforcing outcomes. In order to explore this issue, a three-alternative choice procedure is needed, which was previously developed by Reed et al. (2011), where one alternative reflects 'impulsivity' (small-immediate, reinforcers), one 'self-control' (large-delayed reinforcers), and a third option leads to optimal performance (a reinforcer with intermediate size and delay). Under such conditions, optimal performance could be disambiguated from both 'self-control' and 'impulsivity'.

As there has been no laboratory-based experimental study of how internet exposure impacts on changes in impulsivity. The current study aimed to employ the above behavioural impulsivity test before and after a session of internet surfing to analyse how this internet-exposure impacts impulsive choices in those who do and do not report problematic internet behaviours.

2. Method

2.1. Participants

Sixty participants (30 males and 30 females) were recruited after responding to advertisements placed around a university campus. This number of participants has been used in previous demonstrations of internet-withdrawal symptoms (Romano et al., 2013). An online recruitment strategy was not employed, as this method may bias potential relationships in studies of internet use (see Widyanto & McMurran, 2004). All participants were students and were volunteers, and none received any form of compensation for their participation.

The participants had a mean age of 24.60 (±2.65, range 20–30) years old. The participants' self-reported ethnicity was: 42 (70%) White; 3 (5%) Mixed/Multiple Ethnic Groups; 10 (17%) Asian/Asian British; 4 (7%) Black/African/Caribbean/ Black British; and 1 (1%) Other Ethnic Group. The marital status of sample was: 34 (57%) single, 5 (8%) married or in a civil partnership; 20 (33%) in other forms of relationship; and 1 (1%) divorced or widowed.

Participants were excluded if they had used the internet (broadly defined to include social networking sites, such as Facebook and Twitter) in the last four hours (including through use of their mobile phones). This procedure was adopted in an attempt to equate the length of time from last usage in lower and higher internet problem groups, and to try to maximise the impact of the current experimental exposure to be the internet, which might otherwise be trivial in the context of daily use. Participants were also excluded if they reported a history of psychiatric problems.

Ethical approval for this research was obtained from the Department of Psychology Ethics Committee, Swansea University. The participants provided their written informed consent to participate in this study, and the Ethics Committee approved this consent procedure.

2.2. Materials

2.2.1. Internet addiction test

(IAT; Young, 2009) is a 20-item scale covering the degree to which use of internet disrupts everyday life (work, sleep, relationships, etc.). Each item is scored on a 1–4 scale, and the overall score ranges from 20 to 100. The factor structure of the IAT is currently debated (cf. Chang & Man Law, 2008; Widyanto & McMurran, 2004), but a cut-off score of 40 or more for the total score of the IAT is taken as representing some level of problematic internet usage (Hardie & Tee, 2007; Romano et al., 2013; Young, 2009). The internal reliability of the scale has been found to be between .90 (Widyanto & McMurran, 2004) and .93 (Young, 2009).

2.2.2. Choice test

The choice test (Reed et al., 2011) involved a computer task which presented the participant with three 3×3 cm coloured squares (red, yellow, green) on the screen. The squares presented in a row, centrally on the screen, 10 cm from the top of the screen, and separated from each other by 1 cm. If clicked by the mouse, each colour was associated with the delivery of a particular number of points (10, 25, or 60), which remained constant throughout the experiment. When a square was clicked, all squares disappeared, and, after a delay, the words: "*You have scored x points*" would appear in the centre of the screen, in 3 cm high black letters, 15 cm from the top of the screen. Each square was associated with a particular delay until the information was presented; the 10 point square was associated with a 5 s delay, the 25 point square with a 10 s delay, and the 60 point square with a 30 s delay. Every 5 s the words: "*You have X seconds left*" would appear in the bottom left of the screen, and remained visible for 1 s. This counted down the time left in the study.

2.3. Procedure

The participants were tested individually in a room containing a desk, chair, and computer. All participants were presented with the