

# Are Compulsive Buyers Impulsive? Evidence of Poor Response Inhibition and Delay Discounting

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**Publication details:**

Journal of Experimental Psychopathology

v. 3

Chapter No. 5

pp. 794-806

2043-8087 (ISSN)

**Publication Date:**

2012

**Publisher DOI:**

<http://dx.doi.org/10.5127/jep.025211>

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# Are Compulsive Buyers Impulsive? Evidence of Poor Response Inhibition and Delay

## Discounting

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Running head: impulsivity in compulsive buying

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### **Abstract**

Compulsive buying (CB) is not formally classified in the diagnostic and statistical manual (DSM), but it is widely considered an impulse-control disorder not otherwise specified. However, relatively few studies have systematically examined impulsivity or inhibition-related functions in CB. The aim of the present study was therefore to examine impulsivity as indexed by a multidimensional self-report measure of impulsivity (BIS) and behavioural paradigms that assess impulsive responding in the form of delay discounting and response inhibition. In a sample of compulsive buyers ( $n = 26$ ), pathological gamblers ( $n = 23$ ), and healthy controls ( $n = 26$ ) analysis of variance (ANOVA) revealed that both self-report and behavioural responses of the CB group were comparable to that of pathological gamblers, reflecting elevated impulsivity in comparison to healthy controls. Results may be interpreted in the context of models of gambling pathology that underscore the failure of heavily discounted consequences to deter engagement in maladaptive behaviours and that highlight the role of poor response inhibition in disorder maintenance. Limitations and future directions are discussed.

**Keywords:** compulsive buying; impulse control; impulsivity; pathological gambling; delay discounting; response inhibition

Compulsive buying (CB), although not formally classified in the DSM, is considered an impulse-control disorder not otherwise specified and is defined as chronic, repetitive purchasing behaviour that does not occur in the context of mania, is difficult to control, and results in harmful consequences including marked distress, marital and social conflict, and significant financial debt (Faber, 2011; O'Guinn & Faber, 1989). Current diagnostic issues centre on the question of whether CB should be classified as a disorder of impulsivity or compulsivity. Grant and Potenza (2006) argue that impulsive and compulsive behaviours are not necessary diametrically opposed and highlight the fact that both behaviours can occur simultaneously in the course of a disorder, or can occur at different times within the same disorder, hence the proposal of an impulsive-compulsive spectrum (Hollander & Allen, 2006). Relatively few studies have systematically examined impulsivity or inhibition-related functions in the context of CB. DeSarbo and Edwards (1996) showed that impulsivity, as assessed by self-report, predicted higher scores on an unstandardized questionnaire assessing compulsive buying. Lejoyeux, Bailly, Moula, Loi, and Adès (1997) found that using their own criteria for compulsive buying, individuals who met criteria for depression and compulsive buying scored higher on a self-report measure of impulsivity than depressed patients without compulsive buying problems. Billieux, Rochat, Rebetz, and Van der Linden (2008) found that compulsive buying was positively correlated with three specific facets of impulsivity: urgency, lack of perseverance and lack of premeditation. Finally, in a community-recruited sample of compulsive buyers and healthy controls Williams and Grisham (in press) also found that CB was significantly related to both negative and positive urgency, lack of perseverance, and lack of premeditation.

Research therefore does support a relationship between compulsive buying and self-report tendencies to either engage in impulsive behaviour or to self-ascribe characteristics of impulsivity to oneself. However, conflicting research exists as to whether or not self-report

measures of impulsivity provide meaningful information about how individuals actually behave. Several studies have demonstrated a positive correlation between various self-report and behavioural measures of impulsivity (Kirby, Petry, & Bickel, 1999; Richards, Zhang, Mitchell, & de Wit, 1999; Swann, Bjork, Moeller, & Dougherty, 2002). However, other studies have failed to support this conceptual overlap (Cheung, Mitsis, & Halperin, 2004; Crean, de Wit, & Richards, 2000; Dougherty et al., 2003; Edmonds, Bogg, & Roberts, 2009; Reynolds, Ortengren, Richards, & de Wit, 2006; Swann, Pazzaglia, Nicholls, Dougherty, & Moeller, 2003), raising the question of how valid inferences about impulsive behaviour are when they are made solely on the basis of self-report data. Therefore, to gain the most comprehensive understanding of impulsivity in the context of compulsive buying, it is also essential to demonstrate that compulsive buying is associated with behavioural measures of impulsive responding.

Two widely-used behavioural indices of impulsivity are derived from response inhibition and delay discounting tasks. Response inhibition tasks such as the stop-signal or go-stop paradigm assesses the ability to override a prepotent 'go' response when presented with a 'stop' signal. Impulsivity is associated with more frequent inhibition errors when presented with a 'stop' signal, particularly as the latency between the target stimulus and the stop signal increases (Dougherty, Mathias, Marsh, & Jagar, 2005). Delay discounting is defined as the tendency to discount larger, delayed rewards/consequences in favour of smaller, more immediate ones and is argued to be a key process involved in some forms of impulsive decision making (Madden & Johnson, 2010). Extensive research demonstrates that impulsive individuals discount delayed rewards to a greater degree than control groups (see Madden & Bickel, 2010).

The current study aimed to investigate the association between these measures of impulsivity and CB given their theoretical relevance to CB behaviours. Participants identified

as compulsive buyers were compared to pathological gamblers and healthy controls on both self-report and laboratory-based measures of impulsivity. Pathological gamblers were selected as an appropriate clinical comparison group due to extensive evidence that documents elevated impulsivity on self-report questionnaires (Blaszczynski, Steel, & McConaghy, 1997; Castellani & Rugle, 1995; Petry, 2001b; Steel & Blaszczynski, 1998; Vitaro, Arseneault, & Tremblay, 1997) as well as behavioural tasks that measure both delay discounting (Dixon, Marley, & Jacobs, 2003; Petry, 2001a) and response inhibition (Fuentes, Tavares, Artes, & Gorenstein, 2006; Goudriaan, Oosterlaan, de Beurs, & van den Brink, 2006). It was hypothesized that compulsive buyers would score similar to pathological gamblers on both self-report and behavioural measures of impulsivity, and that performance on these measures would be reflective of significantly greater levels of impulsivity in comparison to the healthy control group. Finally, the current study sought to investigate the concordance between self-report and behavioural measures of impulsivity in the context of compulsive buying. Due to the mixed evidence of an association between these two methods of assessment collected in other domains, no specific hypotheses regarding this association were made.

## Method

### Participants

**Healthy Control Group.** Twenty-seven individuals who did not endorse any current or lifetime mood, anxiety, substance-abuse, head injury, psychotic disorder, or gambling pathology were initially included in this group. One participant who scored above the cut-off score of 5 of the South Oaks Gambling Screen (SOGS) was excluded resulting in a final sample of 19 females and 7 males with a mean age of 28.35 ( $SD = 5.91$ ).

**Compulsive Buying Group.** This group included 24 females and 2 males with a mean age of 28.31 ( $SD = 11.47$ ) who all met proposed DSM criteria (McElroy, Keck, Pope, Smith, & Strakowski, 1994) and Structured Clinical Interview for DSM-IV-TR (SCID) Impulse Control Disorder criteria for compulsive buying. Current and lifetime diagnostic information obtained from the full Structured Clinical Interview for DSM Disorders (SCID-I/NP Non-patient Edition; First, Spitzer, Gibbon, & Williams, 2002) is presented in Table 1.

**Pathological Gambling Group.** This group included 14 males and 9 females with a mean age of 39.43 ( $SD = 11.83$ ) who met DSM-IV-TR criteria for pathological gambling based on a structured clinical interview. SOGS scores ranged from 8 to 20 with a mean of 15.30 ( $SD = 4.03$ ). Current and lifetime diagnostic information for this group is also presented in Table 1.

Insert Table 1 about here

## Measures

**Barratt Impulsiveness Scale (BIS-11;** Patton, Stanford, & Barratt, 1995). The BIS-11 is a 30-item self-report measure of impulsivity with three subscales: attentional impulsiveness, motor impulsiveness and non-planning impulsiveness. Scores range from 30–120, with nonpsychiatric controls generally scoring between 50–60 (Stanford et al., 2009). The BIS-11 demonstrates good psychometric properties (Patton et al., 1995). Cronbach's alpha was .83 in the current sample.

**South Oaks Gambling Screen (SOGS;** Lesieur & Bloom, 1987). The SOGS is a widely used 20-item measure of pathological gambling with good psychometric properties (Lesieur & Bloom, 1987). Scores of 5 and above are typically necessary for classification of pathological gambling. Cronbach's alpha was .85 in the current sample.

**The Yale Brown Obsessive Compulsive Scale – Shopping Version (YBOCS-SV;** Monahan, Black, & Gabel, 1996). The YBOCS-SV is a 10-item measure of preoccupations, behaviours, and subsequent distress associated with compulsive buying. It has shown promise as an index of compulsive buying severity that is sensitive to clinical change (Black, Monahan, & Gabel, 1997). Cronbach's alpha was .92 in the current sample.

**Structured Clinical Interview for DSM Disorders** (SCID-I/NP Non-patient Edition; First et al., 2002). The SCID is a semi-structured interview for making the major DSM-IV Axis I diagnoses. The SCID was used to determine current and lifetime history in the clinical groups.

**Structured Clinical Interview for DSM-IV-TR (SCID) for impulse-control disorders not elsewhere classified** (SCID-ICD; First, 2008, draft). The SCID-ICD contains 6 modules for disorders of impulse-control currently in the DSM-IV-TR (intermittent explosive disorder, kleptomania, pyromania, trichotillomania, ICD-NOS, and pathological gambling) as well as 4 modules not currently defined in the DSM (impulsive-compulsive buying, impulsive-compulsive non-paraphilic sexual behaviour, impulsive-compulsive internet use, and impulsive-compulsive skin picking). The pathological gambling and impulsive-compulsive buying modules were used to help substantiate classification of participants in the PG and CB groups. Inter-rater agreement (Kappa) calculated on a proportion ( $n = 18$ ) of interviews (SCID-I/NP and ICD) was .94.

**Structured Clinical Interview for DSM Disorders- Screening Module** (SCID-I/NP; First, Spitzer, Gibbon, & Williams, 2002). The SCID screening module was used to screen participants recruited from the community and to rule out any history of Axis I symptoms in the healthy control group.



**Task Effort Ratings.** Participants were asked to rate their level of effort (concentration, attempt to do well) on each of the behavioural tasks following completion on a scale of 0 = '*I put in no effort at all*' to 4 = '*I put in my best effort*'.

**Behavioural Tasks.** Three tasks from a computerized battery of impulsivity measures (Dougherty, et al., 2005) were used to index response inhibition and delay discounting as described below. The validity and reliability of each of the paradigms has been tested across a range of populations and ages (see Dougherty, et al., 2005).

***GoStop Impulsivity Paradigm (GoStop).*** GoStop is a response inhibition procedure for assessing the capacity to inhibit an already initiated response. In this version participants are asked to attend to a series of 5- digit numbers displayed on a computer screen and must either respond when a target 'go' signal appears or withhold a response when a 'stop' signal appears. The 'go' signal is a number identical to the one that immediately preceded it that is presented in black. A 'stop' signal is a number identical to the one that immediately preceded it, but that changes from black to red at some specified interval after stimulus onset. Stop Signals occur randomly at 50, 150, 250, and 350 milliseconds following the go stimulus onset. Typically the poorest response inhibition occurs at the 350-millisecond (Dougherty et al., 2005). A novel trial occurs when a non-matching number is presented. The percentage of inhibited responses (proportion of correctly inhibited responses to the number of stop signals presented) at the extreme latencies (50ms, 350ms) were used as the indices of response inhibition.

***The Two Choice Impulsivity Paradigm (TCIP).*** The TCIP is a measure of delay-discounting in the form of a discrete-choice procedure. In this paradigm participants are exposed to series of trials in which they must press a mouse button to select one of two shapes that appear side-by-side on the computer screen (the left-right orientation of the

stimuli is determined randomly for each trial). Each shape choice is associated with a different delay–reward contingency. Default settings of 5 seconds and 5 points for the immediate choice and 15 seconds and 15 points for the delayed choice were used. Feedback is provided in the form of a cumulative point total that is displayed on the computer screen allowing participants to infer the delay–reward contingency. Given that the payout schedule was fixed, the total number of smaller/sooner reward choices was used as the primary dependent variable indicating impulsive choices.

***The Single Key Impulsivity Paradigm (SKIP).*** The SKIP is another measure of delay-discounting, but that permits assessment of the rate and pattern of free operant responses for reward. In this task, participants are free to respond as often as desired to obtain a reward that is linearly related to the delay between consecutive responses. A point counter at the top of the screen displays the total points accumulated during the session, and a counter at the bottom of the screen displays the number of points earned by the most recent response. The latter point counter provides information regarding the delay–reward contingency, allowing the participant to infer that responses emitted at faster rates earn smaller rewards than responses emitted at slower rates do. The total number of responses, the longest delay between consecutive responses, and the average response interval (IRT) across the entire session were used as the dependent variables.

## **Procedure**

Ethical approval was obtained by the Human Research Ethics Committee of St. Vincent’s Hospital and the University of New South Wales. Participants were recruited via separate advertisements placed in the community either targeting individuals with no current or lifetime history of mental health concerns to participate in a study of buying behaviours, or through advertisements placed on mental health websites and in a local gambling treatment

unit seeking individuals with symptoms consistent with compulsive buying or pathological gambling. All participants were initially screened over telephone by a registered psychologist using the screening module of the SCID-I/NP, and those who endorsed symptoms consistent with CB or PG also were screened using the relevant module of the SCID-ICD. Current substance abuse, history of head injury, and psychotic disorder were exclusion criteria for all participants. Eligible respondents were then invited to attend a research session where they completed the battery of self-report questionnaires, full SCID (clinical groups only), and behavioural tasks. Both versions of the SCID were administered by either the author (AW) or the research assistant (AW-S), both of whom are registered psychologists with extensive experience in diagnostic assessments for clinical and research purposes. Participants also completed additional experimental tasks that were unrelated to the aims of the current study and are reported elsewhere (see Williams, 2012). Informed consent was obtained for each participant prior to commencement of the study and a small financial reimbursement was provided in exchange for participants' time.

## Results

### Sample Characteristics

Groups were matched with respect to education,  $\chi^2(8) = 14.74, p > .05$ , ethnicity,  $\chi^2(8) = 5.86, p > .05$ , and marital status,  $\chi^2(8) = 8.29, p > .05$ . Average annual income did not differ with salaries of \$33,269.43 ( $SD = 22702.49$ ), \$34,684.62 ( $SD = 28822.16$ ), and \$40,652.17 ( $SD = 25055.29$ ) for the HC, CB, and PG groups, respectively,  $F(2, 72) = .58, p > .05$ . There was a gender imbalance,  $\chi^2(2) = 16.49, p < .001$  with less males in the CB group. This difference is not unexpected given the greater proportion of females (80-95%) who volunteer for CB research (Koran, Chuong, Bullock, & Smith, 2003). Gender did not, however, correlate with any of the outcome variables, all  $p$ 's  $> .05$ . There was also an

imbalance in age  $F(2, 72) = 8.50, p < .001$ , with participants in the PG group significantly older than in the CB and HC group,  $p < .001$ . Age did not, however, correlate with any of the outcome variables, all  $p$ 's  $> .05$ , with the exception of TCIP Immediate choices,  $r = .31, p < .01$ .

### **Disorder-Specific Measures**

For the SOGS there was a main effect of group,  $F(2, 72) = 191.85, p < .001$ , indicating that as expected both the HC ( $M = 1.00, SD = 1.66$ ) and CB groups ( $M = 1.53, SD = 3.07$ ) scored below the clinical cut-off and significantly lower in comparison to the PG group ( $M = 15.77, SD = 3.97$ ),  $p$ 's  $< .001$ . For the YBOCS-SV there was also a main effect of group,  $F(2, 72) = 23.11, p < .001$ , indicating that as expected the CB group scored significantly higher ( $M = 16.07, SD = 4.51$ ), in comparison to both the HC ( $M = 5.19, SD = 65.41$ ) and PG groups ( $M = 8.78, SD = 7.51$ ),  $p$ 's  $< .001$ .

### **Self-Report Measures of Impulsivity**

On self-report measures of impulsivity (BIS) MANOVA revealed a main effect of group,  $F(6, 118) = 4.63, p < .001$ . As expected, the HC group scored significantly lower on all subscales in comparison to both clinical groups, with the exception that BIS Non-planning impulsivity did not differ between the HC and CB groups,  $p > .05$ . The PG group scored significantly higher on this dimension,  $p$ 's  $< .05$ . However, the two clinical groups did not differ in terms of BIS Total, Attentional impulsivity, or Motor impulsivity,  $p$ 's  $> .05$ . Means, standard deviations, and effect sizes (eta squared, Cohen's  $d$ ) are reported in Table 2.

### **Behavioural Measures of Impulsivity**

Separate ANOVAs<sup>1</sup> were then used to compare the groups on the behavioural measures of impulsive responding (see Table 2 for means). The groups did not differ with respect to GoStop task effort,  $F(2, 72) = 2.04, p > .05$ , with mean ratings of 3.03 ( $SD = .82$ ), 3.34 ( $SD = .74$ ), and 3.47 ( $SD = .79$ ), for the HC, CB, and PG groups, respectively. The percentage of inhibited responses (proportion of correctly inhibited responses to the number of stop signals presented) at latency intervals for the shortest (50ms) and longest (350ms) delay after onset of presentation were used to index inhibition. A mixed model ANOVA with stimulus latency as a within-subjects variable and group as the between-subjects variable was then conducted. Results revealed a main effect of time,  $F(1, 72) = 668.78, p < .001$ , and a main effect of group,  $F(2, 72) = 8.21, p = .001$ . There was no time x group interaction,  $p > .05$ . Comparisons revealed that irrespective of group, the percentage of correctly inhibited responses was higher at the 50ms latency delay ( $M = 80.14, SD = 17.08$ ) compared to the 350ms latency delay ( $M = 25.13, SD = 14.84$ ),  $t(74) = 25.23, p < .001$ . Also as expected, comparisons revealed that for both the 50ms and 350ms delay the HC group demonstrated a higher percentage of correctly inhibited responses compared to the CB and PG groups,  $p$ 's  $< .05$ , who did not differ from one another,  $p$ 's  $> .05$ .

The groups did not differ with respect to TCIP task effort,  $F(2, 72) = .95, p > .05$ , with mean ratings of 2.76 ( $SD = 1.06$ ), 3.03 ( $SD = .91$ ), and 3.13 ( $SD = .95$ ), for the HC, CB, and PG groups, respectively. For TCIP Immediate Choices ANOVA revealed a main effect of group,  $F(2, 72) = 7.21, p = .001$ . Planned comparisons revealed that as expected, the HC group made significantly fewer Immediate Choices in comparison to the CB and PG group,  $p$ 's  $< .05$ . The difference between the two clinical groups was not significant,  $p > .05$ . For TCIP Delayed Choices ANOVA revealed a main effect of group,  $F(2, 72) = 7.21, p < .05$ .

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<sup>1</sup> Due to violations of data normality non-parametric test (Kruskal-Wallis) were also conducted. Results supported all parametric results.

Planned comparisons revealed that as expected, the HC group made significantly more Delayed Choices in comparison to the CB and PG group,  $p$ 's  $< .05$ . The difference between the two clinical groups was not significant,  $p > .05$ .

The groups did not differ with respect to SKIP task effort,  $F(2, 72) = 2.34, p > .05$ , with mean ratings of 3.50 ( $SD = .64$ ), 2.96 ( $SD = 1.07$ ), and 3.17 ( $SD = .93$ ), for the HC, CB, and PG groups, respectively. For SKIP total number of responses there was a main effect of group,  $F(2, 72) = 4.57, p < .05$ . Planned comparisons revealed that the HC group made significantly fewer responses in comparison to the CB and PG group  $p$ 's  $< .05$ . The difference between the two clinical groups was not significant,  $p > .05$ . For SKIP average IRT there was a main effect of group,  $F(2, 72) = 6.12, p < .01$ . Planned comparisons revealed that the HC group responded with the longest delay between consecutive responses in comparison to the CB and PG group,  $p$ 's  $< .01$ . The two clinical groups did not differ,  $p > .05$ . For SKIP longest response delay there was also a main effect of group,  $F(2, 72) = 3.26, p < .05$ . Planned comparisons revealed that the HC group responded with the largest mean response delay in comparison to the CB and PG group,  $p$ 's  $< .01$ . The two clinical groups did not differ,  $p > .05$ .

Insert Table 2 about here

### **Relationship between Self-Report and Behavioural Measures**

Pearson  $r$  correlations conducted in the full sample did not support an association between BIS Total and any of the behavioural measures,  $p$ 's  $> .05$ . At the subscale level, BIS Motor Impulsivity was inversely related to GoStop inhibition at the longest latency (350ms),  $r = -.32, p < .01$ , but was non-significant when adjusting for multiple comparisons. No other relationships were significant,  $p$ 's  $> .05$ .

## Discussion

The primary aim of the current study was to answer the basic question of whether CB is indeed associated with impulsivity as indexed by behavioural measures of impulsive responding. As predicted, the CB group scored significantly higher on a multidimensional self-report measure of impulsivity in comparison to the HC group and importantly, scored within a comparable range to the PG group (with the exception of non-planning). In addition the CB group performed similarly on behavioural tasks of impulsivity (delay discounting and response inhibition) compared to the PG group and the performance of both clinical groups was discrepant from that of the HC group. Importantly, results corresponded to medium to large effect sizes for the differences between these groups.

BIS non-planning was the only measure that the CB group scored lower on than the PG group. This finding of moderate magnitude (Cohen's  $d = .57$ ) may be attributable to potential age effects given that the pathological gamblers in the current study were older than participants in the CB and HC groups. It is conceivable that younger individuals may be less likely to endorse items that reflect future preparation and planning compared to older respondents (Steinberg et al., 2009), however, age did not correlate with any of the BIS subscales, including non-planning impulsivity, in the current study. It is important to note that age was positively correlated with selection of immediate over delayed rewards on the TCIP. Again, age may have influenced the findings related to delay discounting on this task. However, participants in the PG group still evidenced a comparable number of immediate choices to the CB group. The overall pattern of results was also strikingly consistent across all other variables, making it seem unlikely that age unduly influenced the key findings relevant to compulsive buying. Future research would benefit from examining potential age effects more explicitly, possibly by investigating the influence of age on speed of cognitive processing that may be relevant to behavioural tasks of impulsive responding. It is also

possible that the imbalance between males and females in the current sample could account for this finding as there were a greater proportion of males in the PG group. It is important to note that gender did not correlate with any of the self-report or behavioural indices of impulsivity; a finding that is consistent with previous research focusing on the BIS (see Stanford et al., 2009). Further examination of this potential difference in pathological gamblers and compulsive buyers seems warranted.

The finding of poorer response inhibition in compulsive buyers (and gamblers) relative to healthy controls aligns with existing theoretical proposals of CB maintenance. Billieux et al. (2009) suggested that impulsivity in the form of urgency may be related to a poorer ability to deliberately suppress prepotent responses. The authors proposed that compulsive buying may be maintained if urges to buy are associated with increased difficulty resisting strong impulses (poor response inhibition), especially when combined with negative mood states. The impact of comorbid depression, which is frequently observed in CB (de Zwaan, 2011), may further weaken inhibitory control and result in an increased likelihood of engaging on CB behaviours. Experimental studies that manipulate mood while measuring response inhibition may be able to help disentangle the relationship between these constructs and provide a better understanding of how inhibition difficulties could possibly be targeted therapeutically.

Performance on both measures of delay discounting by the CB group may be interpretable in the context of theoretical approaches to understanding gambling pathology. Petry and Madden (2010) suggest that if the delayed negative consequences typically associated with gambling, such as loss of income or the resultant conflict in interpersonal relationships, are significantly discounted by the gambler, then their diminished negative value may not represent a strong enough deterrent to promote abstinence from continued engagement in gambling behaviours. Gambling is also typically associated with direct



pleasure or gratification, therefore it is conceivable that any adverse effects are further discounted as a consequence of the preference for immediate reward (Petry, 2012). This process has been compared to how the obvious long-term consequences of smoking or drug use fail to deter these behaviours in substance abusers (Petry & Madden, 2010). By extension, the adverse outcomes associated with compulsive buying (which are similar to those identified in pathological gambling), may be heavily discounted in compulsive buyers susceptible to variations in punishment-reward contingencies.

Interestingly, correlational results failed to support concordance between the self-report and behavioural measures of impulsivity. This finding is consistent with several other reports (Cheung et al., 2004; Crean et al., 2000; Dougherty et al., 2003; Edmonds et al., 2009; Reynolds et al., 2006; Swann et al., 2003), highlighting the need for researchers to consider the multidimensional nature of impulsivity and to measure specific facets of the construct accordingly. It has been suggested that behavioural measures may capture specific aspects of impulsive behaviour that are functionally distinct from the broader range of thoughts, feelings, and self-acknowledged behaviours indexed by self-report measures (Edmonds et al., 2009).

Research is beginning to emerge that links these behavioural concepts that are typically measured in the lab to treatment outcome in patients. Petry (2012) has demonstrated that variations in delay and probability (choice between smaller certain and larger probabilistic outcome) discounting are meaningfully related to treatment response in pathological gamblers. Pathological gamblers who discounted probabilistic reinforcers less steeply were more likely than those gamblers who discounted probabilistic reinforcers more steeply to reduce the amount of money wagered during treatment and to maintain gambling abstinence following treatment. Petry (2012) highlights the potential of these findings to guide treatment decisions by suggesting that depending on their discounting curve, a gambler

seeking treatment may benefit more from a model that adopts complete abstinence as an end goal or from a model that focuses on reducing the frequency or extreme gambling behaviours without the goal of complete abstinence. Adaptation of this treatment approach may prove beneficial when applied to cognitive behavioural approaches of compulsive buying, such as Mitchell's (2011). Although due to the necessity of shopping and consumer behaviours in everyday life, it may not be feasible to adopt a complete abstinence model in the case of compulsive buying. However, it may be desirable to encourage abstinence in the early phases of treatment with the aim to help individuals develop management skills over impulsive responding and associated behaviours. Future research documenting the potential impact of both delay discounting tendencies and difficulties in response inhibition on treatment response in compulsive buyers is needed.

The results of the current study must be considered in light of a number of limitations. Although the behavioural measures employed in the current study have been used extensively to index impulsivity in a range of populations, the validity of these measures in the context of compulsive buying has not been established. Furthermore, the cross-sectional nature of the data does not permit conclusions about directionality. It may be that a tendency to discount delayed consequences or to possess poor response inhibition plays a causal role in the development of CB behaviours, or alternatively, that a learning or conditioning process occurs in which continued engagement in CB behaviours later influences impulse responding. Future studies that employ prospective designs would help address this issue. Finally, the disproportionate numbers of males and females across the two clinical groups may also limit the generalizability of the findings therefore future research may benefit from recruitment of more gender-balanced samples. Clearly any significant advances in this field will necessitate acknowledgment of the diagnostic legitimacy of compulsive buying as this evidence accrues as well as agreement over its correct classification.

Acknowledgment: Funding for this study was provided by a National Health and Medical Research Council (NHMRC) of Australia Clinical Research Fellowship (630746) awarded to A. D. Williams. The Author would like to thank Alicia Erskine and the St. Vincent's Hospital Gambling Treatment Program for assistance in recruitment and Aliza Werner-Seidler for assistance in data collection.

Table 1

*Current and lifetime Axis I diagnoses for the pathological gambling group and the compulsive buying group*

Diagnosis	Compulsive Buyers		Pathological Gamblers	
	Current	Lifetime	Current	Lifetime
	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)	<i>n</i> (%)
<b>Mood Disorder</b>	<b>6 (23%)</b>	<b>13 (50%)</b>	<b>5 (22%)</b>	<b>10 (43%)</b>
<b>Anxiety Disorder</b>	<b>14 (54%)</b>	<b>2 (8%)</b>	<b>5 (22%)</b>	<b>9 (39%)</b>
<b>Other</b>	<b>2 (6%)</b>	<b>1 (3%)</b>	<b>1 (5%)</b>	<b>7 (30%)</b>
Skin Picking Disorder	1 (3%)	1 (3%)	0 (0)	0 (0)
Intermittent Explosive Disorder	0 (0)	0 (0)	1 (4%)	0 (0)
Alcohol Abuse/Dependency	0 (0)	0 (0)	0 (0)	5 (22%)
Substance Abuse/Dependency	0 (0)	0 (0)	0 (0)	2 (8%)
Bulimia Nervosa	1 (3%)	0 (0)	0 (0)	0 (0)

*Note.* Percentages do not sum to 100 due to multiple comorbidities.

Table 2

*Planned comparisons and effect sizes of group differences on self-report and behavioural measures of impulsivity*

	Healthy Controls (n = 26)	Compulsive Buyers (n = 26)		Pathological Gamblers (n = 23)			
	<i>M (SD)</i>	<i>M (SD)</i>	<i>d</i>	<i>M (SD)</i>	<i>d</i>	<i>F</i>	$\eta^2$
BIS Total	61.22 (8.42) <sup>a</sup>	70.82 (12.12) <sup>b</sup>	.91	72.95 (10.83) <sup>b</sup>	1.20	6.62**	.18
BIS Attentional	14.61 (3.71) <sup>a</sup>	18.91 (4.67) <sup>b</sup>	1.01	18.08 (3.27) <sup>b</sup>	.99	6.52**	.17
BIS Motor	23.05 (3.07) <sup>a</sup>	28.04 (5.46) <sup>b</sup>	1.12	28.08 (4.32) <sup>b</sup>	1.34	8.05***	.21
BIS Non-planning	23.55 (3.82) <sup>a</sup>	23.86 (4.65) <sup>a</sup>	.57	26.78 (5.50) <sup>b</sup>	.68	6.52**	.09
SKIP Total Responses	22.11 (18.77) <sup>a</sup>	56.15 (55.96) <sup>b</sup>	.81	61.86 (66.16) <sup>b</sup>	.81	4.57*	.11
SKIP Average IRT	44.32 (36.72) <sup>a</sup>	20.00 (23.87) <sup>b</sup>	.78	20.98 (20.14) <sup>b</sup>	.78	6.12**	.14
SKIP Longest Delay	116.83 (112.77) <sup>a</sup>	57.07 (40.99) <sup>b</sup>	.70	75.78 (88.87) <sup>b</sup>	.40	3.26*	.08
TCIP Immediate	8.50 (9.33) <sup>a</sup>	14.92 (10.04) <sup>b</sup>	.66	20.56 (13.82) <sup>b</sup>	1.02	7.21***	.17
TCIP Delayed	41.50 (9.33) <sup>a</sup>	35.07 (10.04) <sup>b</sup>	.66	29.43 (13.82) <sup>b</sup>	1.02	7.21***	.17
GoStop 50	88.11 (8.89) <sup>a</sup>	75.19 (17.40) <sup>b</sup>	.93	80.14 (17.08) <sup>b</sup>	.58	4.83*	.12
GoStop 350	32.50 (16.44) <sup>a</sup>	23.26 (11.21) <sup>b</sup>	.65	18.91 (13.48) <sup>b</sup>	.90	6.19**	.15

*Note.*  $d$  = between-group Cohen's  $d$  effect size based on the pooled standard deviation; BIS = Barratt Impulsiveness Scale; SKIP = Single Press Impulsivity Task; TCIP = Two-Choice Impulsivity Task; GoStop = GoStop Impulsivity Task (50 ms latency, 350 ms latency). Means with different superscripts are significantly different.  $*p < .05$ ,  $**p < .01$ ,  $***p \leq .001$

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