

**PLAYING WITHIN YOUR LIMITS:  
FACTORS IMPACTING ADHERENCE TO MONETARY LIMITS  
IN A SESSION OF SLOT MACHINE GAMBLING**

by

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## Abstract

A failure to set and adhere to monetary limits has been implicated in the development of problematic gambling. The present study assessed the effectiveness of pop-up messages that initially prompted slot players ( $N = 59$ ) to set monetary limits and subsequently informed them when the limit was reached on limit adherence. The mechanisms (i.e., dissociation, craving to gamble) by which gambling symptomatology undermined adherence to monetary limits were also assessed. Participants who received a monetary limit pop-up reminder were significantly more likely to adhere to monetary limits than participants who did not. Dissociation mediated the relationship between gambling symptomatology and adherence to monetary limits, but only among those who did not receive a monetary limit pop-up reminder. Craving to gamble did not mediate the relationship between gambling symptomatology and adherence to monetary limits. The efficacy of monetary limit pop-up messages as a tool to facilitate responsible gambling is discussed.

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Playing Within Your Limits: Factors Impacting Adherence to Monetary Limits  
in a Session of Slot Machine Gambling

When gambling, many people sets limit on the amount of money they wish to spend in a given session. However, upon reaching their limit, they may decide to keep gambling and spend more money than initially intended (Wohl, Christie, Matheson, & Anisman, in press). This is not unlike people's inability to set and stay within limits on the amount people say they want to eat (Polivy, 1996), drink (Collins, 1993), and exercise (DeCoverley Vale, 1987). However, gambling may stand apart from these other failed attempts of staying within preset limits due to the structural characteristics of gambling activities. Slot machines are designed to facilitate dissociation through their rapid wheel spin, auditory stimulation, and variable-ratio payout schedules (see Griffiths, 1993). Thus, although gamblers may have intentions to stay within their limits, characteristics of the game might hinder their ability to do so. It is known, however, that a failure to set and stay within monetary limits contributes to and is a symptom of gambling problems (see Walker et al., 2006). As such, setting and staying within monetary limits is a central component of responsible gambling (Manitoba Gaming Control Commission [MGCC], 2009). The present study investigated factors that assist gamblers to stay within their preset monetary limits when gambling. Specifically, the ability for pop-up messages to assist gamblers in staying within preset monetary limits was assessed.

In a recent study of slot machine gamblers, Wohl and colleagues (in press) found that while the vast majority of gamblers (91%) report setting limits on the amount of money they wish to spend in a given gambling session, many gamblers (25%) do not adhere to these limits. This is particularly troublesome when considering that exceeding

monetary limits is associated with a host of negative consequences, including gambling-related debts, bankruptcy, and committing illegal acts to obtain money to gamble with (Petry, 2005). In order to decrease the potential harm associated with exceeding limits, it is important to design responsible gambling initiatives aimed at encouraging gamblers to play within their monetary limits set prior to gambling.

According to Monaghan and Blaszczynski (2010), a promising means to increase adherence to monetary limits is the use of pop-up messages on slot machines that aim to heighten awareness of the amount of money spent gambling (e.g., “Have you spent more than you intended?”). While increasing awareness of the amount of money lost is of import, the effectiveness of pop-up messages to facilitate responsible gambling should be focused on explicit monetary limits identified by the gambler prior to play. Indeed, monetary limit-setting is a key strategy for properly regulating gambling behaviour (Brown & Newby-Clark, 2005; Gollwitzer, Fujita, & Oettingen, 2004). Thus, the current research examined the effectiveness of a pop-up message that 1) initially asked gamblers to set a limit and 2) subsequently informed gamblers when that limit had been reached on gamblers’ willingness to stay within that limit. The current research also assessed possible mechanisms (i.e., dissociation and craving to gamble) that may influence whether these pop-up messages were effectiveness in encouraging adherence to preset monetary limits among individuals with a range of gambling symptomatology.

### **Slot Machine Gambling**

Following amendments to the Criminal Code of Canada in 1985, electronic gaming machines, such as slot machines and video lottery terminals (VLTs), became a legalized form of gambling (Korn & Shaffer, 1999). Since its legalization, slot machine

gambling has become an increasingly popular activity as well as the primary source of gambling growth in Canada. In Ontario, 26.1 % of residents report playing slots (Wiebe, Mun, & Kauffman, 2006) and these rates of participation should continue to increase alongside with its growing popularity among gamblers (Collier, 2008). Indeed, the increasing popularity of slot machine gambling is apparent when considering that between 2000 and 2004, the number of slot machines in Canada increased by 52% (Azmier, 2005).

While slot machine gambling is nothing more than an enjoyable form of entertainment and recreation for most gamblers, some slot machine players develop serious gambling-related problems. In fact, Williams and Wood (2003) found that almost 15% of slot machine players experience moderate to severe gambling problems and account for approximately 60% of total slots revenue. Coinciding with these findings, Schellinck and Schrans (1998) found that approximately 16% of slot machine players were problem gamblers and contributed 53% of total slots revenue. Similar to other forms of gambling, some individuals become so involved in slot machine play that they meet the criteria for pathological gambling, a condition associated with significant distress and disruption to individuals, families, communities, and society (American Psychiatric Association [APA], 1994).

Importantly, slot machine gambling is an extremely addictive form of gambling. Indeed, it is often referred to as the 'crack cocaine of gambling' (see Korn & Shaffer, 1999). Relative to other types of gamblers, those who play slot machines exhibit more rapid onset of gambling problems (Breen & Zimmerman, 2002; Breen, 2005) and experience a higher prevalence rate of problem gambling (Cox, Kwong, Michaud, &

Enns, 2000; Doiron & Nicki, 2001; Wiebe & Cox, 2001; Wiebe et al., 2006). Slot machines facilitate problematic play, in part, because they are a rapid, continuous, and repetitive means of betting (Griffiths, 1993) and they do not provide gamblers with cues for episodic cessation (unlike poker where there is an end to the game), thus prolonging play (Breen, 2005). Moreover, slot machines operate on a variable ratio schedule of reinforcement, which is highly resistant to extinction and encourages further gambling (Ferster & Skinner, 1957). These structural characteristics of the game enhance the potential addictiveness of slot machine gambling (Williams, West, & Simpson, 2007). The net effect is that among slot machine gamblers, progression toward pathology occurs almost four times faster than among gamblers who prefer other forms of gambling (e.g., blackjack) (Breen, 2005). As such, slot machine gamblers are at risk of significant financial loss, relational and familial problems, physical and mental health problems, work-related difficulties, and legal problems (see Feigelman, Wallisch, & Lesieur, 1998; Petry, 2005).

### **Responsible Gambling Strategies**

In recent years, there has been a push to educate the public on how to gamble in a manner that reduces the risks of problem gambling and the negative consequences associated with problematic play. Specifically, initiatives have been undertaken to educate the public on responsible gambling strategies that are designed to “reduce pathological gambling by helping gamblers exert control over themselves and the gambling situation” (Smith & Wynne, 2004, p.43). As a result, researchers (see Williams et al., 2007) have begun to assess the effectiveness of responsible gambling initiatives aimed at decreasing the potential harm associated with slot machine gambling. While

some initiatives show promise in promoting responsible gambling (e.g., Monaghan & Blaszczynski, 2010), others have had limited success (e.g., Hing, 2003, 2004; Williams & Connolly, 2006). In this section, results of initiatives used to promote responsible gambling among slot machine gamblers are reviewed.

Some responsible gambling initiatives have focused on dispelling gambling-related irrational beliefs among slot machine players, as irrational beliefs have been found to play an important role in the development and maintenance of problem gambling (Blaszczynski, 2000; Delfabbro & Winefield, 2000; Ladouceur & Walker, 1996). These initiatives are based on the presupposition that improved knowledge about the odds of success at gambling will facilitate responsible gambling (see Manitoba Gaming Control Commission [MGCC], 2004). Unfortunately, although such initiatives have been successful at increasing knowledge of irrational beliefs, they have not been found to lead to changes in gambling (Hing, 2003, 2004; MGCC, 2004; Williams & Connolly, 2006). This is because gamblers tend to misinterpret the information, believe that the information does not apply to them, believe that they can employ specific strategies (e.g., personal luck) to beat the odds, or fail to believe the information all together (Delfabbro, 2004).

Another type of initiative has involved the use of warning messages (usually in print media, the radio, and posters in gambling venues) about the perils of gambling. These initiatives are based on recommendations of government and industry policy makers who argue that information detailing the dangers and potential risks of gambling should be made visible to players in gambling venues (National Gambling Impact Study Commission [NGISC], 1999). Specifically, it is argued that warning messages can

promote responsible gambling among slot players because they increase knowledge of the possible adverse outcomes associated with excessive slot machine play. Through such increased knowledge, it is argued, slot machine players would acquire the necessary tools to engage in responsible gambling (Productivity Commission, 1999). In a test of this presupposition, Steenbergh, Whelan, Meyers, May, and Floyd (2004) exposed gamblers to a brief warning message prior to gambling (e.g., “For some people gambling can become a problem with serious economic, social, and legal difficulties”). While exposure to the warning message increased gamblers’ knowledge of the potential risks of gambling, it did not decrease the amount of time and money spent gambling. Thus, despite the knowledge gain from warning messages about the potential risks of gambling, they have not proven effective in promoting more responsible gambling (Hing, 2003).

In part because of the failure of the aforementioned strategies to encourage responsible gambling among slot machine gamblers, attention has begun to turn to the promotion of limit-setting prior to engaging in play in order to facilitate responsible gambling. Two types of limit-setting have been the focus of this avenue of research: 1) the amount of time spent gambling and 2) the amount of money spent gambling. It is important to distinguish between these two types of limits as success appears to be more probable with the latter than the former. One possible reason for this discrepancy is that gamblers rarely set time limits on their play (MGCC, 2009). In fact, gamblers tend not to associate play with time (Productivity Commission, 1999). As such, responsible gambling might not be facilitated when time restrictions are placed on the gambler. Indeed, Ladouceur and Sévigny (2009) showed that presenting slot machine gamblers with a clock to help manage their time whilst playing did not promote responsible

gambling. Gamblers that had a monetary display however, reported that it did, indeed, help them gamble responsibly. Thus, responsible gambling might be best promoted by helping gamblers set and stay within monetary limits, not time limits.

Indeed, there is some suggestion that setting limits on the amount of money spent gambling is an effective responsible gambling strategy among slot machine players (e.g., Responsible Gambling Council, 2006). For example, setting monetary limits has been associated with a decrease in gambling expenditures among slot players (Omnifacts Bristol Research, 2007). Rather than decreasing the enjoyment of gambling, initiatives aimed at increasing monetary limit-setting allow gamblers to better manage the amount of money spent gambling. Furthermore, educating gamblers on the importance of setting monetary limits appears to encourage such behaviour, as limit-setting increased after the implementation of the MGCC's public education campaign stressing its importance (MGCC, 2009).

Importantly for the current investigation, although gamblers frequently set monetary limits before playing slots due to the aforementioned educational initiatives, many gamblers exceed the monetary limits they set prior to play (MGCC, 2009; Wohl et al., 2008; Wohl et al., in press). This may, in part, be due to the manner in which information regarding limit-setting is conveyed to gamblers. Specifically, previous research (e.g., Hing, 2003, 2004; MGCC, 2009) has used signs and posters on or in close proximity to slot machines when educating gamblers on the importance of setting monetary limits when they gamble. While awareness of such signage is relatively high, many gamblers report failing to read the content of the signs and posters, especially problem gamblers who deny they have a gambling problem (Hing 2003, 2004; Hing &

Mattinson, 2005). Further, a review of the effectiveness of existing responsible gambling strategies found signs on or in close proximity to slot machines to be of limited value in encouraging slot machine players to gamble responsibly for the reasons just expressed (Williams et al., 2007).

Gamblers that read the content of these messages and then set monetary limits, however, are not always able to stay within the limit set (see Wohl et al., in press). Indeed, gamblers often report that they intend to spend a certain amount of money gambling, but after becoming involved in slot machine play, they spend more money than initially planned (Wynne, 1994). The aim of the current study was to assess a means to help slot machine gamblers both set and stay within preset monetary limits in order to facilitate responsible gambling. Specifically, one strategy that may be effective in increasing adherence to monetary limits is to remind gamblers when they have reached this limit. If gamblers are exposed to a message appearing on the screen of the slot machine during play that reminds them when they have reached their monetary limit, they should be more likely to adhere to this limit than when no such message is provided. The most expeditious way to accomplish this end is to incorporate pop-up messages into the structural characteristics of a slot machine.

### **Pop-Up Messages on Slot Machines**

According to Bailey, Konstan, and Carlis (2001), competing information that interrupts a task and captures attentional focus has the ability to affect task performance for a longer period than the time it is presented. Specifically, the presentation of this competing information appears to have a lasting effect on thoughts and behaviours. Capitalizing on this attentional focus, messages promoting responsible gambling have

been designed to more effectively capture gamblers' attention when engaged in slot machine gambling. Commonly referred to as 'pop-up messages', these intermittent, dynamic messages appear on the slot machine screen during play in order to "create a break in play and potentially encourage players to actively decide to continue or discontinue their gambling session" (Monaghan, 2008, p. 216).

Indeed, slot machine pop-up messages have been found to be more successful in capturing the attention of gamblers than responsible gambling signs and posters placed in gambling venues and on slot machines (Monaghan & Blaszczynski, 2007). For example, Monaghan and Blaszczynski (2010) found that pop-up messages were more frequently and accurately recalled after slot machine play (as well as at a two-week follow-up) than signs placed on the exterior of slot machines. Compared to signs placed on slot machines, pop-up messages were also found to have a greater influence on gamblers' awareness of time spent playing, estimations of winning, and increased the likelihood that gamblers would take a break from play.

By capturing gamblers' attention, the presentation of pop-up messages during slot machine play appears to be a particularly effective means of encouraging responsible gambling. As a result, pop-up messages have been the focus of research aimed at promoting responsible slot machine gambling (e.g., Cloutier, Ladouceur, & Sévigny, 2006; Floyd, Whelan, & Meyers, 2006; Ladouceur & Sévigny, 2003; Schellink & Schrans, 2002). However, much of this research has used pop-up messages to convey information about the probabilities of success at gambling and random nature of gambling outcomes, even though it is known that this information does not promote

responsible gambling (see Cloutier et al., 2006; Floyd et al., 2006; Ladouceur & Sévigny, 2003).

Recently, attention has turned to including information about limit setting in the pop-up messages provided to slot machine gamblers. For example, Ladouceur and Sévigny (2009) examined the impact of pop-up messages that remind gamblers when they have reached preset time limits. Although it has already been found that time limits are not perceived by gamblers as being important in controlling their slot machine play (MGCC, 2009), it was anticipated that these pop-up messages would encourage responsible gambling among slot machine players. However, the majority of gamblers (79%) reported that setting a time limit and receiving a reminder when they had reached this limit did not help control their gambling. Moreover, most gamblers (82%) reported that receiving a pop-up message that reminded them of their time limit did not result in them ending the gambling session once they reached their limit. Given that gamblers rarely, if ever, set time limits when gambling (MGCC, 2009), it is perhaps not surprising that these pop-up messages were ineffective in promoting responsible gambling.

While time limit pop-up messages appear ineffective in controlling gambling behaviour, pop-up messages promoting self-awareness of the amount of time and money spent gambling have received some support as an effective responsible gambling strategy among slot machine gamblers (Monaghan & Blaszczynski, 2010). By encouraging gamblers to think about how long they have been gambling and how much money they have spent (e.g., “Do you know how long you have been playing?”; “Have you spent more than one intended?”), these pop-up messages were found to be more effective than informative pop-up messages (e.g., “All outcomes are randomly determined by chance”)

in promoting responsible gambling. Indeed, self-awareness pop-up messages were reported to have a greater impact than informative pop-up messages on in-session thoughts and behaviours immediately following play as well as in gambling sessions two weeks after exposure to such pop-up messages. Importantly, self-awareness pop-up messages were found to facilitate gambler's awareness of the amount of time and money spent gambling and increased the likelihood that gamblers' would take a break from play.

Although helpful in increasing awareness of the amount of money spent gambling, these self-awareness pop-up messages are not tied to actual monetary limits set prior to gambling. As setting limits on gambling expenditures has been suggested as a key strategy for properly regulating gambling behaviour (Brown & Newby-Clark, 2005; Gollwitzer et al., 2004; MGCC, 2009) and an effective means of controlling gambling expenditures (Omnifacts Bristol Research, 2007), it would seem that pop-up messages reminding gamblers when they have reached their monetary limit would be an effective way to decrease the incidence of exceeding limits. By allowing individuals to reflect on the situation at hand, these forced breaks encourage individuals to exert a measure of control over their gambling. Importantly, pop-up messages may be effective in encouraging adherence to monetary limits because they inform a gambler of their limits without compromising the enjoyment of play (Floyd et al., 2006). As gamblers find it difficult to keep track of the amount of money spent gambling (Wynne, 1994), a pop-up message reminding them that they have reached their limit may be an effective way to increase the likelihood that gamblers adhere to preset monetary limits.

### **Gambling Symptomatology**

Upon beginning a session of slot machine play, gamblers find it difficult to stop playing and this is particularly the case among those with increased gambling symptomatology (Schellinck & Schrans, 2002). Indeed, the gambling behaviour of problem gamblers has been found to differ greatly from that of recreational gamblers. Compared to recreational gamblers, problem gamblers have been found to continue gambling in the face of loss (Young & Wohl, 2009), experience higher levels of dissociation while gambling (Diskin & Hodgins, 1999; Jacobs, 1988; Wynne, 1994) and report increased levels of craving to gamble (Young & Wohl, 2009). Further, problem gamblers are less likely than recreational and at-risk gamblers to report setting monetary limits prior to play and instead let the situation dictate how much they spend gambling (Nower & Blaszczynski, in press). For example, rather than setting an explicit monetary limit prior to play, problem gamblers often decide how much to spend based on the amount of money they are behind. In relation, gamblers who fail to set monetary limits and end a gambling session only when they have run out of money, as well as gamblers who set vague monetary limits have been found to endorse significantly higher levels of gambling symptomatology than those who set monetary limits and adhere to them (Wohl et al., 2008). As such, those with increased severity of gambling problems may also be less likely to adhere to monetary limits when asked to set them.

However, despite these differences in gambling behaviour, research examining the effectiveness of pop-up messages as a responsible gambling strategy has by and large failed to take gambling symptomatology into consideration. In one of the few studies to assess gambling symptomatology (Monaghan & Blaszczynski, 2010), a small number of

problem gamblers limited the ability to make comparisons of gambling based on level of pathology. In fact, a major limitation of much of the literature on slot machine pop-up messages involves the failure to assess participants' level of gambling symptomatology. In order to address this gap in the literature, the current research will assess the efficacy of monetary limit pop-up reminders among individuals with a range of gambling symptomatology.

### **Mechanisms Influencing Adherence to Monetary Limits**

The current research assessed two possible mechanisms that may influence the relationship between gambling symptomatology and adherence to preset monetary limits. Specifically, it was predicted that experiences of dissociation and craving to gamble would impact the relationship between gambling symptomatology and adherence to preset monetary limits. Further, it was predicted that the mediating role of both dissociation and craving would be dependent upon whether or not participants were exposed to a pop-up message reminding them when they reached their monetary limit.

#### **Dissociation**

According to Jacobs (1986), while engaging in addictive behaviours, addicted individuals often experience a common dissociative state, which is characterized by a blurring of reality, a reduction in self-criticism and self-consciousness, and the development of flattering, positive fantasies about oneself. These experiences of dissociation are said to occur when a behaviour or activity "so completely concentrates one's attention on a specific here-and-now event that coexisting aversive aspects of one's life situation are blurred out" (Jacobs, 1988, p. 29).

Numerous studies have shown slot machine gambling to be highly conducive to experiences of dissociation (Diskin & Hodgins, 1999, 2001; Grant & Kim, 2003; Kofoed, Morgan, Buchkowski, & Carr, 1997; Wynne, 1994). While gamblers with varying levels of gambling symptomatology have been found to dissociate when engaging in slot machine play, these dissociative experiences are more common among those with increased gambling symptomatology, who often report feeling as though they are in a trance, are completely oblivious to their surroundings, and lose track of time and money while gambling (Diskin & Hodgins, 1999; Jacobs, 1988; Wynne, 1994). Gamblers have also been found to fail or be slower to respond to external stimuli and dissociate from previous thoughts (Anderson & Brown, 1984; Diskin & Hodgins, 1999; Jacobs, 1986), indicating that they become absorbed in slot machine play and focus their attention exclusively on the game. Although they may initially intend to gamble for half an hour or spend only \$20, they may 'come to' several hours later only to realize they have spent far more money than intended. Thus, these dissociative experiences may help explain why gamblers exceed monetary limits set prior to gambling.

As slot machine pop-up messages were implemented with the intent of increasing awareness of the here and now situation (Monaghan, 2008), they may be effective in breaking the intense focus on play that has been found to be common among slot machine gamblers. Further, it has been suggested that pop-up messages presented during slot machine play encourage responsible gambling by disrupting cognitive processes that tend to facilitate narrowed attention and loss of reality (i.e., dissociation; Ladouceur & Sévigny, 2003). Thus, the presentation of a pop-up message reminding gamblers of their monetary limit may break the intense focus and deep absorption in play, which

characterize experiences of dissociation. As a result, gamblers may be more likely to adhere to monetary limits set prior to gambling. Therefore, it was predicted that increased gambling symptomatology would be associated with increased experiences of dissociation, thus leading to a failure to adhere to preset monetary limits. However, it was predicted that this association would break down in the presence of a monetary limit pop-up reminder. As such, it was predicted that the mediating role of dissociation on the relationship between gambling symptomatology and adherence to preset monetary limits would only occur among those gamblers who were not exposed to the monetary limit pop-up reminder during slot machine play.

### **Craving to Gamble**

While many gamblers understand the negative repercussions stemming from continued play, they still often experience an overwhelming urge or craving to gamble. According to Tiffany and Conklin (2000), craving is a strong urge or desire for the positive aspects of a given substance or behaviour and is often considered a consequence of withdrawal from a substance or behaviour. Further, craving comprises both positive and negative reinforcing properties anticipated as a result of engaging in a given behaviour (e.g., Tiffany & Drobes, 1991; Young & Wohl, 2009). Indeed, gambling has been found to produce both positive, arousing states (e.g., Anderson & Brown, 1984; Ladouceur, Sévigny, Blaszczynski, O'Connor, & Lavoie, 2003) as well as an escape from negative affective states (e.g., Grant & Kim, 2003; Jacobs, 1988; Kofoed et al., 1997; Woods & Griffiths, 2007). In relation, Young and Wohl (2009) conceptualize craving to gamble as a multidimensional construct that consists of a strong, urgent desire to gamble

(i.e., *desire*); an intention to gamble that is anticipated as being fun and enjoyable (i.e., *anticipation*); and the expectation that gambling will relieve negative affect (i.e., *relief*).

Extant literature suggests that craving plays an important role in producing and maintaining gambling behaviour (Young, Wohl, Matheson, Baumann, & Anisman, 2008). Higher levels on each of the three dimensions of craving to gamble (i.e., desire, anticipation, and relief) have been found to be associated with increased levels of gambling pathology, as well as persistence in the face of loss - a key indicator of problematic gambling (Young & Wohl, 2009). Indeed, craving is a central aspect of problem gambling that may help explain why some gamblers continue to gamble despite adverse consequences, such as spending more money than one can afford or exceeding monetary limits set prior to gambling.

According to the cognitive processing model (CPM), blocking or preventing an addictive behaviour leads to craving in addicted individuals (Tiffany, 1990). For example, both smokers (Jacobson, Hasenfratz & Battig, 1994) and alcoholics (Rankin, Hodgson, & Stockwell, 1979) have been found to crave more after being blocked from engaging in their addictive behaviours. Recently, Sztainert and Wohl (2009) showed a similar relationship between blocking and gambling. Specifically, when blocked from gambling after anticipating the opportunity to gamble, pathological gamblers experienced higher levels of craving than recreational gamblers. Since pop-up messages are designed with the intent of breaking focus on play by stopping the game for a brief period of time, they may be perceived by gamblers as a block. Consequently, these pop-up messages may have the inadvertent effect of leading to an increase in craving.

In accordance with the CPM (Tiffany, 1990), pop-up messages would be predicted to increase craving only among pathological gamblers. Indeed, pathological gamblers have reported higher cravings after being blocked from gambling, compared to recreational gamblers (Sztainert & Wohl, 2009). Given that craving has also been associated with problematic gambling (e.g., persistence in the face of loss; Young & Wohl, 2009), these pop-up messages may lead pathological gamblers to exceed monetary limits set prior to gambling. Therefore, it was hypothesized that increased gambling symptomatology would lead to an increase in craving to gamble, thus leading to a failure to adhere to preset monetary limits. Further, it was predicted that this association would only occur in the presence of a monetary limit pop-up reminder.

Specifically, based on Young and Wohl's (2009) measure of gambling-related craving, it is hypothesized that this increase in craving among participants who are blocked from gambling (i.e., those who receive the monetary limit pop-up reminder) will manifest itself as a strong, urgent desire to gamble. Similarly, despite the fact that gamblers already engaged in slot machine play, the presentation of a monetary limit pop-up message reminder during play may also lead to increases in the anticipation dimension of craving, as gamblers were blocked from continuing their session of slot machine play. As a result, gamblers may anticipate engaging in play again. Conversely, it was predicted that gamblers would not crave to gamble in order to relieve negative affect, as relief may already have been gained from the session of slot machine play they just engaged in. Thus, it was expected that exposure to the monetary limit pop-up message would not lead to increases in the relief dimension of craving.

### **Overview of the Current Research**

The current research investigated the effect of a pop-up message that initially prompted gamblers to set a monetary limit on play and then reminded them when they had reached their monetary limit on gamblers' willingness to stay within that limit. In addition, the present study examined possible mechanisms (i.e., dissociation and craving to gamble) that may influence the relationship between gambling symptomatology and adherence to preset monetary limits. Specifically, it was hypothesized that increased gambling symptomatology would be associated with increased experiences of dissociation, thus leading to a failure to adhere to preset monetary limits. However, it was predicted that this association would break down in the presence of a monetary limit pop-up reminder. It is also hypothesized that increased gambling symptomatology would lead to an increase in craving to gamble, thus leading to a failure to adhere to preset monetary limits. Further, it was predicted that this mediating relationship would only occur in the presence of a monetary limit pop-up reminder.

### **Method**

#### **Participants**

Fifty nine university students (43 males and 16 females) enrolled in a broad range of undergraduate courses at Carleton University participated in the current study. Participants were recruited from a catalogue of gamblers compiled by the Carleton University Gambling Laboratory, who had previously indicated that they would be willing to participate in research pertaining to gambling at Carleton University. Potential participants were contacted via telephone or email (Appendix A). Participants ranged in age from 18 to 32 years ( $M = 20.76$ ,  $SD = 3.04$ ) and represented mixed racial and ethnic

backgrounds, including Caucasian (72.9%), Asian (5.1%), South Asian (3.4%), South East Asian (3.4%), African Canadian (3.4%), Hispanic and South American (3.4%), and Middle Eastern (1.7%). An additional 6.8% indicated other or multi-ethnic. The majority of participants were full-time students (86.4%). The remaining were part-time students (8.5%) and special students (5.1%). In terms of employment status, over half of participants (50.8%) were unemployed, while 39.0% were employed part-time, 3.4% were employed full-time, and the remaining 6.8% were seasonally employed.

Using the DSM-IV checklist for pathological gambling (APA, 1994), participants consisted of 17 (28.8%) recreational gamblers (no DSM-IV symptoms), 26 (44.2%) subthreshold pathological gamblers (1 – 4 DSM symptoms) and 16 (23.8%) pathological gamblers (5 or more DSM-IV symptoms; for a discussion of DSM-IV classification see Cox, Enns, & Michaud, 2004). A full spectrum of gamblers with varying degrees of gambling problems was of import because gambling symptomatology was used as a continuous predictor in the current study.

In terms of gambling involvement, 78.0% of participants reported that they currently gamble, while 22.0% reported that they had not gambled in the past six months. Of those who reported that they currently gamble, 19.6% gamble more than once a week, 23.9% gamble more than once a month, 32.6% gamble more than once every three months, and 23.9% gamble less than once every three months. An overwhelming 94.9% of participants reported setting monetary limits for themselves prior to gambling. In relation to monetary limits set in the current study, the amount of credits participants wished to spend during slot machine play ranged from 10 to 75 credits ( $M = 38.25$ ,  $SD = 16.57$ ). As would be expected, increased gambling symptomatology was associated with

setting a higher credit limit before play,  $r = .31$ ,  $p < .05$ . Participants were compensated \$20 for their participation in the study<sup>1</sup>.

### **Procedure**

Upon arrival at the laboratory, the experimenter greeted participants and explained to them that the study involved assessing gambling behaviour and as such, they would gamble on slot machines in a virtual reality (VR) casino. Participants were then asked to read and sign a written informed consent (Appendix B). After providing consent, participants engaged in slot machine play within a VR casino environment. Specifically, participants were escorted to a computer terminal and asked to put on a head-mounted display (Z800 3D Visor, eMagin Corporation, Fishkill, New York) that enabled participants to view the VR environment. The headset was connected to a computer that ran *VR Worlds II* software constructed by Psychology Software Tools in consultation with the Carleton University Gambling Lab.

Upon putting on the head-mounted display unit, participants were given the opportunity to acclimatize to the look and feel of the VR environment by navigating around a downtown city environment, finding and entering the casino, and walking around the casino for five minutes. During this time, participants familiarized themselves with navigation controls and interactions with objects in the VR environment by using a keyboard and mouse. This acclimatization period also helped to identify any participants

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<sup>1</sup> Before entering the laboratory, participants were randomly assigned to the pop-up reminder or no pop-up reminder condition. However, in order to ensure that both conditions contained an equal number of participants with different levels of gambling symptomatology, participants were randomly assigned to conditions within each level of gambling symptomatology. This measure of gambling symptomatology was obtained from a survey previously completed by participants.

who may experience nausea or motion sickness (cybersickness) during the experiment, due to immersion in the VR environment<sup>2</sup>.

Following the acclimatization period, participants removed the head-mounted display and then received instructions regarding how to play slots in the VR environment. Specifically, all participants were told:

Before you begin gambling in the virtual reality casino, there are a few things I would like to explain. First, in this session you will be gambling on the virtual reality slot machines and will have the opportunity to win money, depending upon the outcome of the spins. You will be given a total of 80 credits to gamble with on the slots. At 25 cents a credit you will have a total of \$20 in which to gamble with. You will be allowed to trade in any remaining credits at the end of the session for money, which you will be allowed to keep. So if you end up with 40 credits, you will be given \$10. You may gamble as long as you want or until all of your credits are gone.

Once you put on the head-mounted display, you will be in the virtual reality casino. In order to begin gambling, please walk up to any slot machine in the casino that doesn't already have someone sitting at it and insert all of your \$20 into the slot machine by pressing the enter button on the keyboard. This will give you 80 credits to gamble with. Upon doing so, a message will appear on the screen that will ask you to set a limit on the amount of credits you wish to spend gambling. It is completely up to you what you want your limit to be. After setting your

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<sup>2</sup> In the current study, no participants experienced cybersickness during the acclimatization period.

desired limit, the screen will change such that you will be able to play the slot machine. Lastly, know that we set the odds of winning in consultation with the Ottawa and Gatineau casinos (the Rideau-Carleton Raceway and Lac Leamy Casino). That is, the odds of winning in this casino are the same as those in real casinos.

If participants asked the payout amount, they were told that it is set at 85% - the average payout rate in Ontario and Quebec. In order to keep bet size consistent, participants were told that they could bet only one credit per spin. The outcome of each spin was programmed on the slot machine such that all participants experienced the same sequence of wins and losses. Specifically, after 10 spins all participants had more credits than they started with and were above their preset monetary limit. Thereafter, each spin was programmed such that participants began to lose more credits than won and continued to experience a series of such outcomes until they reached their preset monetary limit.

In the pop-up reminder condition, when participants hit their preset monetary limit, a pop-up message appeared that informed them of such. The message then asked if they would like to continue gambling. Upon providing their answer by clicking either a *yes* or *no* icon, another pop-up message appeared that instructed participants to inform the experimenter of this decision. Regardless of whether or not participants indicated they wished to continue, participants were asked to complete a battery of questionnaires that assessed gambling-related craving, experiences of dissociation and gambling symptomatology. In addition, participants answered standard demographic questions (e.g., age, sex) and questions assessing gambling behaviour and involvement (Appendix

C). Upon finishing the questionnaire battery, participants who indicated that they wished to continue gambling were permitted to do so<sup>3</sup>. All other participants were informed that the study had reached its conclusion. In the no pop-up reminder condition, participants gambled until they decided to stop or had run out of credits. When either of these situations occurred, participants were asked to complete the same battery of questionnaires that were completed by participants in the pop-up reminder condition.

All participants were fully debriefed regarding the purpose of the study following completion of the questionnaires (Appendix D). As deception was involved in the study, following debriefing, participants were asked to sign a form permitting the use of data for research and teaching purposes (Appendix E). Thereafter, all participants were paid \$20 for their time, regardless of how much money they had remaining at the end of the gambling session.

## Measures

**Demographic & gambling involvement questionnaire.** This questionnaire was used to provide participant background information (e.g., gender, ethnicity, employment status). Also assessed was gambling frequency, whether participants generally set a time and/or spending limit prior to gambling sessions, and when participants last engaged in gambling.

**Gambling symptomatology.** The 10-item gambling checklist from the *Diagnostic and Statistical Manual of Mental Disorders*, fourth edition (DSM-IV; APA, 1994) was used to assess symptoms of gambling pathology. Participants were instructed

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<sup>3</sup> Of the 29 participants in the pop-up reminder condition, three indicated that they wanted to continue gambling upon receiving the pop-up message which informed them that they had reached their preset monetary limit. Two participants gambled until they had no remaining credits while one participant gambled until 28 credits remained (this participant initially set a credit limit of 40).

to indicate *Yes* if the statement applied to them and *No* if it did not. For example, item 7 asks, “Have you made repeated unsuccessful attempts to control, cut back or stop gambling?” This checklist was used to identify *recreational gamblers* (0 items endorsed), *subthreshold pathological gamblers* (1 – 4 items endorsed), and *pathological gamblers* (5+ items endorsed). The DSM-IV gambling checklist demonstrated good internal consistency in the present study ( $\alpha = .82$ ).

**Craving to gamble.** The Gambling Craving Scale (GACS; Young & Wohl, 2009) was used to assess participants’ craving to gamble. The GACS is a nine-item multidimensional measure of gambling-related craving that is comprised of three subscales: *Desire*, *Anticipation* and *Relief*. The *Desire* subscale assesses a strong and urgent desire to gamble (e.g., “I need to gamble now”). The *Anticipation* subscale assesses an intention to gamble that is anticipated to be fun and enjoyable, (e.g., “Gambling would be fun right now”). Lastly, the *Relief* subscale assesses the expectation that gambling will relieve negative effect (e.g., “Gambling would make me less depressed”). Participants were asked to rate their level of agreement with each item on a seven-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) with higher scores indicating higher levels of gambling-related craving. All GACS subscales demonstrated good internal consistency in the present study (Desire  $\alpha = .85$ ; Anticipation  $\alpha = .85$ ; Relief  $\alpha = .82$ ).

**Dissociation.** Jacobs’ (1988) four-item dissociation questionnaire was used to assess participants’ experiences of dissociation during the session of slot machine play. An additional fifth item was added, which assessed the experience of ‘loss of time’ while gambling (similar to Gupta & Derevensky, 1998; Diskin & Hodgins, 2001). On a four-

point scale anchored at 0 (*not at all*) and 4 (*all the time*), participants were asked to indicate how much they had experienced a dissociative-like state during the previous gambling session (e.g., “In the previous gambling session, how much did you feel like you were in a trance?”). Higher scores indicated increased levels of dissociation. Jacobs’ (1988) dissociation questionnaire demonstrated good reliability in the current study ( $\alpha = .82$ ).

## Results

### Preliminary Analyses

The dataset was screened for the presence of missing data and potential outliers. In addition, the data were examined to ensure that statistical assumptions for the planned analyses were satisfied. Frequency tests indicated that all data were entered within the appropriate range of values for each of the respective measures. An inspection of missing data revealed no missing data for any of the measured variables of interest. However, pre-screening identified three participants who reported that they did not set a monetary limit prior to slot machine play. These cases were removed from the dataset<sup>4</sup>.

Prior to testing statistical assumptions, the dataset was divided into groups based on the two conditions: no pop-up reminder and pop-up reminder. Homogeneity of variance was not violated for any of the measured variables as indicated by scatterplots that showed all cases were evenly scattered with no particular patterns that would suggest

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<sup>4</sup> Prior to the removal of these three cases, the sample consisted of 62 participants. These removed cases were not included in the demographic description of participants in the method section. These participants set a limit of 80 credits (the total number of credits they had to gamble with) when presented with the pop-up message that asked them to set a limit on the amount of credits they wished to spend in the gambling session. Interestingly, these participants were all pathological gamblers, as measured using the DSM-IV checklist for pathological gambling (APA, 1994). This is perhaps not surprising, as those with increased levels of gambling pathology have been found to be less likely to set monetary limits while gambling (Nower & Blaszczynski, in press; Wohl et al., 2008).

violation. Furthermore, linearity was also not compromised as an examination of scatterplots indicated the relationships between variables were linear. Visual analysis of the variables was conducted by examining histograms, indicating a possible departure from normality for some of the variables. In addition, an examination of a statistical test of normality (Kolmogorov-Smirnov) indicated that normality was not met for gambling symptomatology in both the no pop-up reminder [ $D(30) = .22, p < .01$ ] and pop-up reminder condition [ $D(29) = .20, p < .01$ ]. In addition, normality was not met for the relief dimension of craving in both the no pop-up reminder [ $D(30) = .18, p < .05$ ] and pop-up reminder condition [ $D(29) = .22, p < .01$ ]. However, an examination of skewness and kurtosis values for all variables were within acceptable range.

No univariate outliers were detected when calculating z-scores to identify outlying cases, as all z-scores fell within 3.29 standard deviations above or below the mean. The dataset was then screened for multivariate outliers by calculating the Mahalanobis distances using the chi-square value of  $\chi^2(5) = 20.51, p = .001$ . This failed to identify any multivariate outliers as none of the cases were above the critical value (highest value = 18.38). The data were subsequently assessed for multicollinearity by examining bivariate correlations, tolerance values, and variance inflation factors (VIF) for the variables of interest. There was no evidence of multicollinearity when examining the bivariate correlations as none of the correlations between variables were greater than .80 – .90. Tolerance values closer to one are recommended (Pedhazur, 1997) and the tolerance values in the current study were deemed sufficient. In addition, none of the VIF values were greater than or equal to 10. Given that these three criteria were met, multicollinearity did not appear to be an issue. Lastly, the binomial assumption of logistic

regression was satisfied as the sample was random and observations were independent from one another.

In order to confirm random assignment and the equivalency of groups by experimental condition, a series of one-way ANOVAs were conducted to determine whether there were any systematic, pre-existing differences in gambling symptomatology and preset monetary limits among participants assigned to the pop-up reminder vs. no pop-up reminder condition. These analyses indicated that participants in the pop-up reminder ( $M = 2.41, SD = 2.51$ ) and no pop-up reminder condition ( $M = 2.77, SD = 2.58$ ) did not significantly differ in gambling symptomatology,  $F(1, 57) = .28, p = .60$ . Similarly, participants in the pop-up reminder ( $M = 37.48, SD = 16.50$ ) and no pop-up reminder message condition ( $M = 36.67, SD = 17.49$ ) did not significantly differ in preset monetary limits,  $F(1, 57) = .03, p = .85$ . As the main effect of condition was non-significant across both measures, it was deemed that any differences observed between groups may be attributed to the effect of the manipulation, and not to pre-existing or systematic differences between groups.

In order to identify any gender differences among participants in terms of level of gambling symptomatology, dissociation, craving to gamble, monetary limits, or adherence to monetary limits, a chi square and series of one-way ANOVAs were conducted using each variable in turn as a dependent measure. As has been shown in previous research (Blanco, Hasin, Petry, Stinson, & Grant, 2006; Bland, Newman, Orn, & Stebelsky, 1993; Blaszczynski, Steel, & McConaghy, 1997; NGISC, 1999; Welte, Barnes, Wieczorek, Tidwell, & Parker, 2001), a one-way ANOVA revealed that males

( $M = 3.19$ ,  $SD = 2.44$ ) had significantly higher levels of gambling symptomatology than females ( $M = 1.00$ ,  $SD = 2.10$ ),  $F(1, 57) = 10.04$ ,  $p < .01$ ,  $\eta_p^2 = .15$ .

A one-way ANOVA revealed that males ( $M = 1.42$ ,  $SD = .93$ ) and females ( $M = 1.14$ ,  $SD = .85$ ) did not significantly differ on experiences of dissociation,  $F(1, 57) = 1.10$ ,  $p = .30$ . Similarly, males ( $M = 38.07$ ,  $SD = 17.42$ ) and females ( $M = 34.38$ ,  $SD = 15.48$ ) did not significantly differ in monetary limits set prior to slot machine play,  $F(1, 57) = .56$ ,  $p = .46$ . Lastly, males and females did not significantly differ on adherence to preset monetary limits,  $\chi^2(1, N = 59) = .13$ ,  $p = .72$ . However, a one-way ANOVA revealed that males ( $M = 3.54$ ,  $SD = 1.14$ ) endorsed significantly higher levels of craving to gamble than females ( $M = 2.46$ ,  $SD = 1.02$ ),  $F(1, 57) = 11.07$ ,  $p < .01$ ,  $\eta_p^2 = .16$ . This is not surprising when considering that males had significantly higher levels of gambling symptomatology than females and increased levels of craving to gamble have been found to be associated with higher levels of gambling pathology (Young & Wohl, 2009). As the sample size in the current study ( $N = 59$ ) was not large enough to assess gender differences between conditions<sup>5</sup>, participant gender was collapsed across for all subsequent analyses.

Descriptive statistics and correlation analyses were conducted among the variables of interest. Means, standard deviations, and bivariate correlations for both the variables of interest are presented in Table 1.

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<sup>5</sup> The control condition consisted of 23 males and 6 females, while the experimental condition consisted of 20 males and 10 females.

Table 1. *Descriptive Statistics and Intercorrelations for Gambling Symptomatology, Dissociation and Craving to Gamble.*

	<i>M</i>	<i>SD</i>	1	2	3	4	5
1 Gambling Pathology	2.59	2.53	-	-	-	-	-
2 Dissociation	1.34	.91	.40**	-	-	-	-
3 Craving – Desire	2.84	1.41	.35*	.52**	-	-	-
4 Craving – Anticipate	4.67	1.50	.28*	.36**	.61**	-	-
5 Craving – Relief	2.12	1.20	.57**	.51**	.64**	.40**	-

### **Adherence to Monetary Limits Set Prior to Slot Machine Play**

Overall, participants in the pop-up reminder condition ( $n = 26$ ) were significantly more likely than those in the no pop-up reminder condition ( $n = 13$ ) to adhere to preset monetary limits,  $\chi^2(1, N = 59) = 14.12, p < .001$ . Put another way, whereas the majority of participants (89.66%) in the pop-up reminder condition adhered to their monetary limit, adherence to limits was low (56.67%) among participants in the no pop-up reminder condition.

### **Predictors of Adherence to Monetary Limits**

**Gambling symptomatology.** Logistic regression was used to assess whether gambling symptomatology predicted adherence to preset monetary limits during slot machine play. The analysis revealed a significant association between gambling symptomatology and adherence to monetary limits,  $\chi^2(1) = 11.01, p < .01$ . Specifically, as gambling symptomatology increased the likelihood that participants would adhere to preset monetary limits decreased,  $OR = .68$ , Wald's  $\chi^2(1) = 9.37, p < .01$ . The Hosmer-

Lemeshow goodness-of-fit test was insignificant, thus suggesting that the model was a good fit to the data,  $\chi^2(5) = 4.00, p = .55$ .

**Dissociation.** Logistic regression revealed that dissociation was a significant predictor of adherence to preset monetary limits,  $\chi^2(1) = 11.72, p < .01$ . As experiences of dissociation increased the likelihood that participants would adhere to preset monetary limits decreased,  $OR = .30$ , Wald's  $\chi^2(1) = 8.49, p < .01$ . The Hosmer-Lemeshow goodness-of-fit test was insignificant, thus suggesting that the model is a good fit to the data,  $\chi^2(7) = 6.95, p = .43$ .

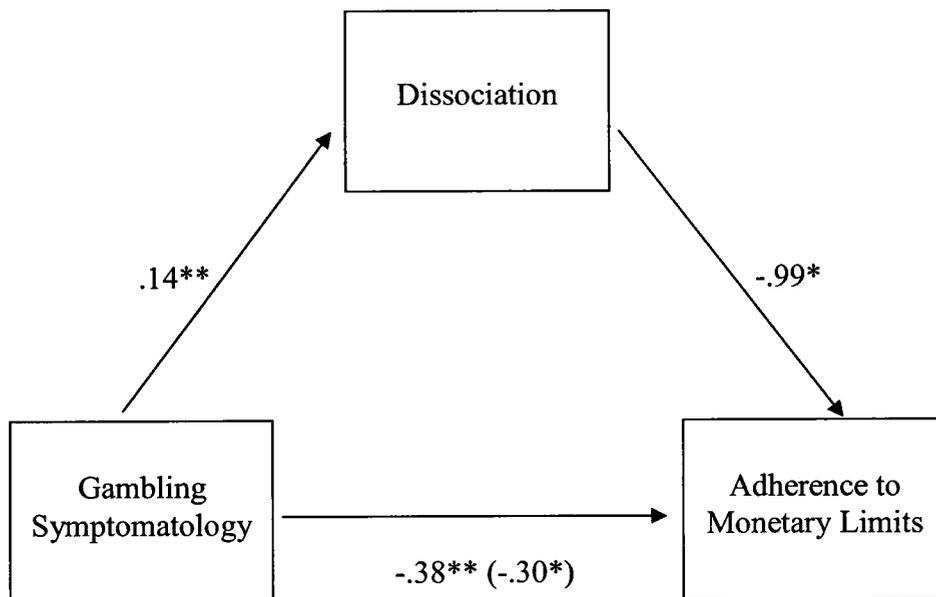
**Craving to gamble.** Logistic regression revealed that all three dimensions of craving (i.e., desire, anticipation, relief) were significant predictors of adherence to preset monetary limits. Specifically, the desire dimension of craving significantly predicted adherence to preset monetary limits,  $\chi^2(1) = 5.64, p < .05$ . This revealed that as the desire to gamble increased the likelihood that participants would adhere to preset monetary limits decreased,  $OR = .62$ , Wald's  $\chi^2(1) = 5.14, p < .05$ . The Hosmer-Lemeshow goodness-of-fit test was insignificant, thus suggesting that the model is a good fit to the data,  $\chi^2(8) = 7.88, p = .45$ . Further, the anticipation dimension of craving was found to significantly predict adherence to preset monetary limits,  $\chi^2(1) = 6.24, p < .05$ . As the anticipation to gamble increased the likelihood that participants would adhere to preset monetary limits decreased,  $OR = .60$ , Wald's  $\chi^2(1) = 5.24, p < .05$ . The Hosmer-Lemeshow goodness-of-fit test was insignificant, thus suggesting that the model is a good fit to the data,  $\chi^2(7) = 7.32, p = .40$ . Lastly, the relief dimension of craving was found to significantly predict adherence to preset monetary limits,  $\chi^2(1) = 7.91, p < .01$ . Specifically, as the need to seek relief through gambling increased the likelihood that

participants would adhere to preset monetary limits decreased,  $OR = .51$ , Wald's  $\chi^2(1) = 7.07$ ,  $p < .01$ . The Hosmer-Lemeshow goodness-of-fit test was insignificant, thus suggesting that the model is a good fit to the data,  $\chi^2(6) = 7.80$ ,  $p = .25$ .

### **Mediation Analysis for Dissociation**

We next tested whether the effect of gambling symptomatology on adherence to preset monetary limits was mediated by the extent to which participants dissociated. To do so, Baron and Kenny's (1986) procedures for testing mediation were employed. As the logistic regression indicated, gambling symptomatology significantly predicted adherence to monetary limits. Importantly, gambling symptomatology was positively associated with dissociation,  $B = .14$ ,  $SE = .04$ ,  $t(58) = 3.24$ ,  $p < .01$ . As such, we proceeded to test the full mediated model by regressing gambling symptomatology and dissociation simultaneously on adherence to preset monetary limits. The coefficient associated with experiences of dissociation remained a significant predictor of staying within preset monetary limits,  $B = -.99$ ,  $SE = .44$ ,  $z(58) = -2.27$ ,  $p < .05$ , however, so too did gambling symptomatology,  $B = -.30$ ,  $SE = .13$ ,  $z(58) = -2.26$ ,  $p < .05$  (see Figure 1).

To determine whether the indirect effect of level of gambling symptomatology on adherence to preset monetary limits, via experiences of dissociation, was significantly different from zero, the bootstrapping technique for small samples (with 5000 iterations) recommended by Preacher and Hayes (2004, 2008) was employed. For experiences of dissociation, the indirect effect was estimated to lie between  $-.38$  and  $-.02$  with 95% confidence. Because zero was not in the 95% confidence interval for the mediator, the indirect effect of dissociation was significantly different from zero at  $p < .05$  (two tailed), establishing mediation.

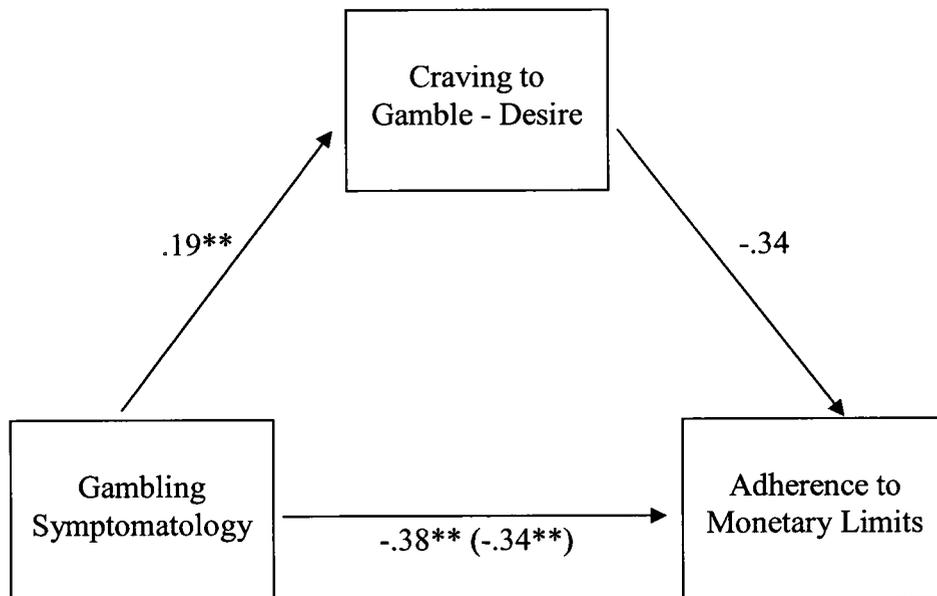


*Figure 1.* Model of dissociation as a mediator between gambling symptomatology and adherence to preset monetary limits. Coefficients with an asterisk indicate significant unstandardized beta weights,  $p < .05$ . Coefficients with a double asterisk indicate significant unstandardized beta weights,  $p < .01$ .

### **Mediation Analysis for Craving to Gamble: Desire**

To determine whether the effect of gambling symptomatology on adherence to preset monetary limits was mediated by the extent to which participants experienced a strong urge or desire to gamble, Baron and Kenny's (1986) procedures for testing mediation were employed. As the logistic regression indicated, gambling symptomatology predicted adherence to preset monetary limits. Importantly, gambling symptomatology was positively associated with the desire dimension of craving,  $B = .19$ ,  $SE = .07$ ,  $t(58) = 2.82$ ,  $p < .01$ . As such, we proceeded to test the full mediated model by regressing gambling symptomatology and the desire dimension of craving simultaneously on adherence to preset monetary limits. The coefficient associated with gambling

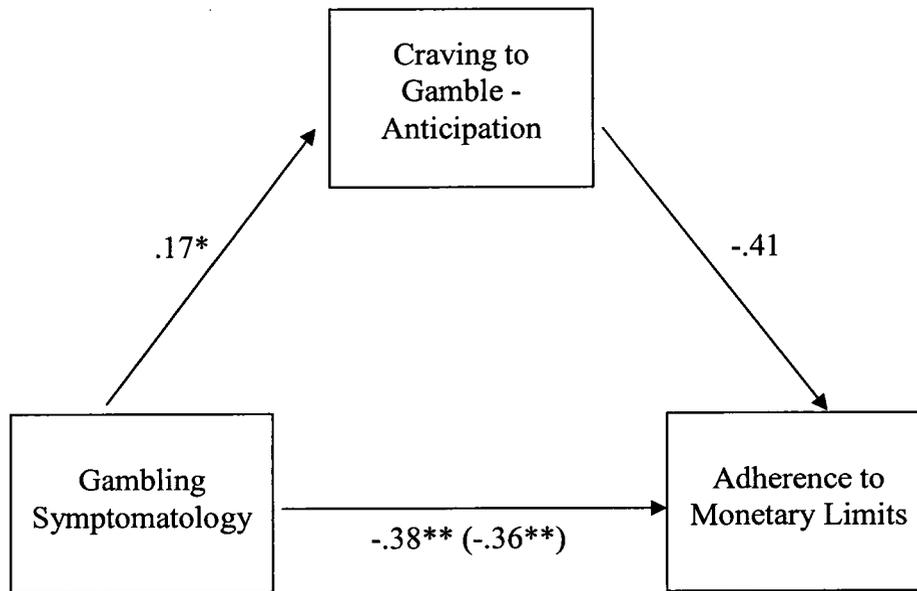
symptomatology remained a significant predictor of adherence to preset monetary limits,  $B = -.34$ ,  $SE = .13$ ,  $z(58) = -2.62$ ,  $p < .01$ ; however, this was not the case for the desire dimension of craving,  $B = -.34$ ,  $SE = .23$ ,  $z(58) = -1.46$ ,  $p = .14$  (see Figure 2). Thus, the desire dimension of craving did not act as a mediator for the direct effect of gambling symptomatology on adherence to preset monetary limits. Coinciding with these findings, the bootstrapping technique for small samples (with 5000 iterations) recommended by Preacher and Hayes (2004, 2008) indicated that for the desire dimension of craving, the indirect effect was estimated to lie between  $-.26$  and  $.04$  with a 95% confidence interval. As zero was included in the 95% confidence interval for the mediator, the indirect effect was not significantly different from zero.



*Figure 2.* Model of the desire dimension of craving as a mediator between gambling symptomatology and adherence to preset monetary limits. Coefficients with an asterisk indicate significant unstandardized beta weights,  $p < .05$ . Coefficients with a double asterisk indicate significant unstandardized beta weights,  $p < .01$ .

**Mediation Analyses for Craving to Gamble: Anticipation**

We next tested whether the effect of gambling symptomatology on adherence to preset monetary limits was mediated by the extent to which participants experienced the anticipation dimension of craving to gamble. To do so, Baron and Kenny's (1986) procedures for testing mediation were employed. As the logistic regression indicated, gambling symptomatology predicted adherence to preset monetary limits. Importantly, gambling symptomatology was positively associated with the anticipation dimension of craving,  $B = .17$ ,  $SE = .08$ ,  $t(58) = 2.22$ ,  $p < .05$ . As such, we proceeded to test the full mediated model by regressing gambling symptomatology and the anticipation dimension of craving simultaneously on adherence to preset monetary limits. Although the coefficient associated with gambling symptomatology remained a significant predictor of adherence to preset monetary limits,  $B = -.36$ ,  $SE = .13$ ,  $z(58) = -2.72$ ,  $p < .01$ , this was not the case for the anticipation dimension of craving,  $B = -.41$ ,  $SE = .23$ ,  $z(58) = -1.78$ ,  $p = .08$  (see Figure 3). Thus, the anticipation dimension of craving did not act as a mediator for the direct effect of gambling symptomatology on adherence to preset monetary limits. In line with these findings, the bootstrapping technique (with 5000 iterations) outlined by Preacher and Hayes (2004, 2008) indicated that for the desire dimension of craving, the indirect effect was estimated to lie between  $-.27$  and  $.02$  with a 95% confidence interval. Because the obtained confidence interval contained zero, the indirect effect was not significantly different from zero.

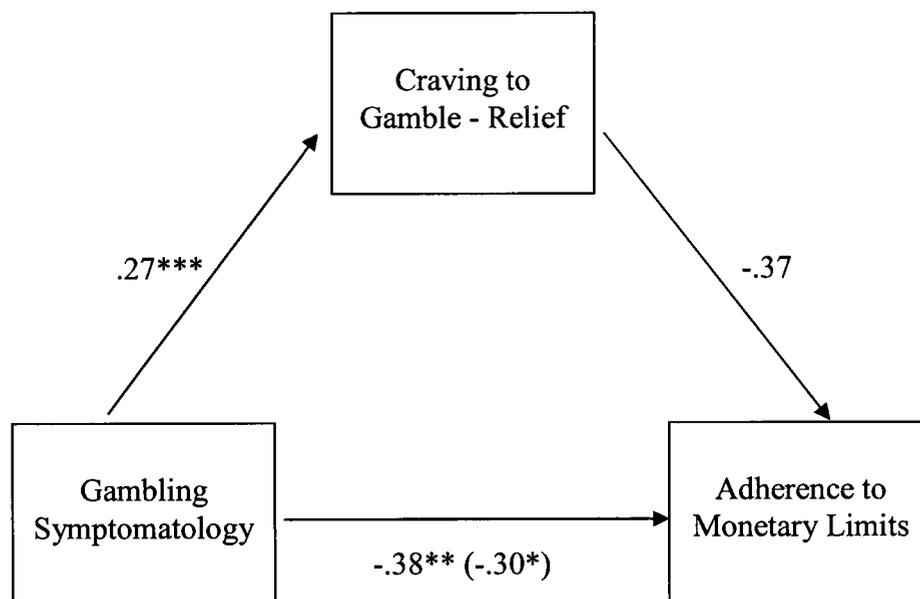


*Figure 3.* Model of the anticipation dimension of craving as a mediator between gambling symptomatology and adherence to preset monetary limits. Coefficients with an asterisk indicate significant unstandardized beta weights,  $p < .05$ . Coefficients with a double asterisk indicate unstandardized significant beta weights,  $p < .01$ .

### **Mediation Analyses for Craving to Gamble: Relief**

To determine whether the effect of gambling symptomatology on adherence to preset monetary limits was mediated by the extent to which participants experienced the relief dimension of craving, Baron and Kenny's (1986) procedures for testing mediation were employed. As the logistic regression indicated, gambling symptomatology predicted adherence to preset monetary limits. Importantly, gambling symptomatology was positively associated with the relief dimension of craving,  $B = .27$ ,  $SE = .05$ ,  $t(58) = 5.21$ ,  $p < .001$ . As such, we proceeded to test the full mediated model by regressing gambling symptomatology and the relief dimension of craving simultaneously on adherence to preset limits. Although the coefficient associated with gambling symptomatology remained a significant predictor of adherence to preset monetary limits,  $B = -.30$ ,

$SE = .14$ ,  $z(58) = -2.11$ ,  $p < .05$ , the relief dimension of craving failed to significantly predict adherence to preset monetary limits,  $B = -.37$ ,  $SE = .30$ ,  $z(58) = -1.25$ ,  $p = .21$  (see Figure 4). Thus, the anticipation dimension of craving did not act as a mediator for the direct effect of gambling symptomatology on adherence to preset monetary limits. Consistent with these findings, the bootstrapping technique (with 5000 iterations) recommended by Preacher and Hayes (2004, 2008) indicated that for the desire dimension of craving, the indirect effect was estimated to lie between  $-.32$  and  $.09$  with 95% confidence. As zero was in the 95% confidence interval for the mediator, the indirect effect was not significantly different from zero.



*Figure 4.* Model of the relief dimension of craving as a mediator between gambling symptomatology and adherence to preset monetary limits. Coefficients with an asterisk indicate significant unstandardized beta weights,  $p < .05$ . Coefficients with a double asterisk indicate significant unstandardized beta weights,  $p < .01$ . Coefficients with a triple asterisk indicate significant unstandardized beta weights,  $p < .001$ .

### **Moderated Mediation Analysis**

Moderated mediation was then conducted to determine whether the significant mediated effect of gambling symptomatology on adherence to preset monetary limits, via experiences of dissociation, was moderated by condition (pop-up reminder vs. no pop-up reminder). Specifically, I tested a model in which the path from the predictor variable (gambling symptomatology) to the mediator variable (dissociation) is moderated (by condition). This was the only moderated mediation model tested as none of the three craving subscales were significant mediators of the gambling symptomatology-adherence to preset monetary limits relationship, thus ruling out moderated mediation.

In line with Preacher and Hayes (personal communication, January 20, 2010), the SPSS macro provided by Preacher and Hayes (2008) was used to conduct moderated mediation with dichotomous outcomes. While designed to assess the significance of indirect effects, this macro is also capable of assessing moderated mediation with dichotomous outcomes<sup>6</sup>. In order to do so, both the proposed moderator (condition) and the interaction of the moderator and the predictor variable (gambling symptomatology) were included as covariates in the model. The indirect effect for the predictor (gambling symptomatology) assessed the significance of the conditional indirect effect when the moderator equals zero. By coding one of the two levels of the moderator (pop-up reminder or no pop-up reminder) as zero prior to computing the interaction term, the conditional indirect effect of the predictor (gambling symptomatology) at this specific value of the moderator (the condition coded as zero) was generated. Because the moderator in the present study had only two values, the macro was run two separate times

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<sup>6</sup> While an SPSS macro discussed in Preacher, Rucker, and Hayes (2007) has been designed to conduct moderated mediation, it is not capable of handling dichotomous outcomes.

(once with pop-up reminder condition coded as 0 and no pop-up reminder condition coded as 1; once with pop-up reminder condition coded as 1 and no pop-up reminder condition coded as 0).

**No pop-up reminder condition.** Among those in the no pop-up reminder condition, gambling symptomatology predicted adherence to preset monetary limits, such that as gambling symptomatology increased the likelihood that participants in the no pop-up reminder condition would adhere to preset monetary limits decreased,  $B = -.40$ ,  $SE = .19$ ,  $z(29) = -2.15$ ,  $p < .05$ . It was also established that gambling symptomatology was positively related to experiences of dissociation  $B = .23$ ,  $SE = .06$ ,  $t(29) = 3.91$ ,  $p < .001$ . Specifically, increased gambling symptomatology was associated with increased experiences of dissociation. With the mediator in the model, the coefficient associated with experiences of dissociation remained significant,  $B = -1.45$ ,  $SE = .57$ ,  $z(29) = -2.52$ ,  $p < .05$ , however the relationship between gambling symptomatology and adherence to preset monetary limits became non-significant,  $B = -.18$ ,  $SE = .21$ ,  $z(29) = -.87$ ,  $p = .39$ . To determine whether this conditional indirect effect among those in the no pop-up reminder condition was significantly different from zero, the bootstrapping technique for small samples recommended by Preacher and Hayes (2004, 2008) was employed. With 5000 resamples, the conditional indirect effect among those in the no pop-up reminder condition was estimated to lie between  $-.83$  and  $-.01$  with 95% confidence. Because zero was not in the 95% confidence interval, the conditional indirect effect among participants in the no pop-up reminder condition was significantly different from zero at  $p < .05$  (two tailed).

**Pop-up reminder condition.** Among those in the pop-up reminder condition, gambling symptomatology predicted adherence to preset monetary limits, such that as gambling symptomatology increased the likelihood that participants in the pop-up reminder condition would adhere to preset monetary limits decreased,  $B = -.78$ ,  $SE = .38$ ,  $z(28) = -2.08$ ,  $p < .05$ . However, there was not a significant relationship between gambling symptomatology and experiences of dissociation,  $B = .04$ ,  $SE = .06$ ,  $t(28) = .67$ ,  $p = .50$ . As such, experiences of dissociation did not appear to act as a mediator for the direct effect of gambling symptomatology on adherence to preset monetary limits among participants in the pop-up reminder condition. Consistent with these findings, the bootstrapping technique (with 5000 iterations) outlined by Preacher and Hayes (2004, 2008) indicated that the conditional indirect effect among those in the no pop-up reminder condition was estimated to lie between  $-.32$  and  $.18$  with 95% confidence. Because zero was in the 95% confidence interval, the conditional indirect effect among participants in the pop-up reminder condition was not significantly different from zero at  $p < .05$  (two tailed).

As predicted, results revealed that dissociation mediated the effect of gambling symptomatology on adherence to preset monetary limits among participants in the no pop-up condition, but not among those in the pop-up reminder condition. Specifically, results revealed that for the no pop-up reminder condition only, gambling symptomatology was associated with increased experiences of dissociation, which, in turn led to a failure to adhere to preset monetary limits. Thus, moderated mediation was established.

### **Post-Experimental Interview**

It was also of interest to assess participants' subjective experiences of the monetary limit pop-up reminder. Specifically, participants in the monetary limit pop-up reminder condition were asked about their perceptions of the effectiveness of such a feature in promoting responsible gambling. The majority of participants who received the monetary limit pop-up reminder (79.3%) reported that it was helpful in controlling their gambling expenditure. Further, most participants (72.4%) reported that they would use this feature if it was implemented on actual slot machines.

### **Discussion**

Although no gambler wants to lose money, this often occurs due to their failure to set and stay within preset monetary limits. The effects of this situation are not benign as it can contribute to gambling problems (see Walker et al., 2006). So important is setting and staying within monetary limits that educating gamblers about the perils of not doing so has become a central component of responsible gambling initiatives (see MGCC, 2009). In the current research, the effectiveness of pop-up messages that prompted slot machine players to set monetary limits before play and then informed them when those limits had been reached were examined as a tool to facilitate responsible gambling.

In line with predictions, participants who received a pop-up message reminding them when they reached their preset monetary limit were significantly more likely to adhere to their monetary limits than participants who did not receive the monetary limit pop-up reminder. That is, gamblers who were exposed to a pop-up message that helped them initially set a limit and then informed them when that limit was reached were more likely to gamble responsibly than those who were not exposed to the monetary limit pop-

up reminder. Indeed, those in the no pop-up reminder condition gambled away (i.e., lost) more money than those in the pop-up reminder condition. This finding was confirmed by participants as the majority reported that the pop-up message reminding them when they had reached their monetary limit was helpful in controlling the amount of money they spent gambling. Further, most participants reported that they would utilize this responsible gambling feature if it was implemented on actual slot machines. These results suggest that monetary limit pop-up reminders may be especially efficacious as a strategy to promote responsible gambling among slot machine players.

Increased gambling symptomatology was also associated with adherence to preset monetary limits. Specifically, participants with greater severity of gambling pathology were less likely to stop gambling once they had reached their monetary limit set before play. As such, the use of pop-up messages might be especially relevant to those with greater symptoms of gambling pathology. Indeed, it has long been postulated that pathological gamblers have the most difficulty placing restrictions on the amount of money they wish to spend gambling (e.g., Nower & Blaszczynski, in press; Wohl et al., 2008). Thus, results suggest that not only are those with increased gambling symptomatology less likely to set monetary limits when they gamble, they are also less likely to adhere to these limits when asked to set them.

The mechanisms by which gambling symptomatology undermined adherence to preset monetary limits were also assessed. Two central mediators were postulated – dissociation and craving to continue play. As predicted, increased gambling symptomatology was associated with a failure to adhere to preset monetary limits, to the extent that participants reported heightened dissociation during slot machine play. Past

research has highlighted that experiences of dissociation are more pronounced among pathological gamblers (Diskin & Hodgins, 1999, 2001; Jacobs, 1988; Wynne, 1994). The current research reveals how this relationship impacts the likelihood that gamblers will play within their monetary limits. Specifically, dissociation provides one explanation for why gamblers fail to adhere to such limits while gambling. When a gambler intensely focuses on play and becomes absorbed in play, time and space are not easily tracked. Thus, when preset monetary limits have been reached, the gambler may not be aware. That is, exceeding limits might not be a conscious decision (e.g., “I think I will just continue playing for a while longer”), but an unfortunate consequence of the dissociation.

Importantly, the mediating role played by dissociation was qualified by whether or not participants received a monetary limit pop-up message. Specifically, mediation was only present when participants were not reminded of their preset monetary limit. When presented with a monetary limit pop-up message, the relationships among gambling symptomatology, dissociation, and adherence to monetary limits were not observed. One explanation for this lack of association in the monetary limit pop-up reminder condition is that the presence of the pop-up reminder stopped participants from experiencing dissociation. Indeed, participants who received a monetary limit pop-up reminder reported less dissociation than those who did not receive this pop-up reminder. Thus, it is likely that the presentation of a monetary limit pop-up reminder during slot machine play breaks the intense focus on play that epitomizes dissociation.

None of the dimensions of craving, however, mediated the relationship between gambling symptomatology and adherence to preset monetary limits. Moreover, the pop-up reminder manipulation did not influence any of the dimensions of craving. It was

anticipated that the relief dimension of craving would not significantly mediate the relationship between gambling symptomatology and adherence to preset monetary limits. This is because participants played slots upon entering the laboratory. As such, relief was likely gained from this session of slot machine play. Because relief would be gained through play, the presence of a pop-up message would not influence this dimension of craving. This contention was supported by the data. Contrary to expectations, however, neither the desire nor anticipation dimensions of craving significantly mediated the relationship between gambling symptomatology and adherence to preset monetary limits. Furthermore, the pop-up reminder manipulation did not moderate the association between gambling symptomatology and participants' experience with the desire or anticipation dimensions of craving.

It is possible that the length of time participants were blocked from gambling may help explain the lack of association between the pop-up message manipulation and craving. Previous research (e.g., Sztainert & Wohl, 2009) has indicated that blocking individuals from gambling facilitates craving; however, this break in play occurred for a prolonged period of time whereas the pop-up reminder in the present study only suspended play for a short time period. As such, it is possible that the short break in play accompanying the presentation of the monetary limit pop-up reminder was not perceived as enough of a block to heighten craving to gamble. If this is, in fact, the case then pop-up messages may be an ideal means of encouraging responsible gambling as they allow gamblers a moment to reflect on the situation at hand and decide whether or not they wish to continue gambling while, at the same time, not inadvertently increasing craving to gamble.

### **Implications**

The current research has important implications for the prevention of problematic gambling among slot machine players. By suspending play for a brief period of time to remind gamblers when they reach their limit set before play, monetary limit pop-up reminders provide gamblers with a reality check that allows them to decide whether they want to continue gambling after reaching their monetary limit. In doing so, these pop-up messages encourage slot players to gamble according to their limits and reduce the risk of problematic slot machine play.

Further, monetary limit pop-up messages appear capable of breaking the intense focus and extreme absorption commonly experienced by gamblers while engaged in slot machine play. This finding provides empirical support for the claim that pop-up messages disrupt cognitive processes that facilitate dissociation (Ladouceur & Sévigny, 2003). As these dissociative experiences are associated with problematic gambling (e.g., Diskin & Hodgins, 1999, 2001; Jacobs, 1988; Wynne, 1994), monetary limit pop-up reminders may be effective in preventing the development of gambling problems among recreational gamblers and reducing the risk of problematic play among those at-risk for gambling problems.

These results also have immediate applied significance for policy makers. Specifically, policy makers should consider implementing monetary limit pop-up reminders on slot machines as a means of encouraging responsible gambling among slot machine players and curbing the potential harm associated with slot machine gambling. By assisting gamblers in both setting and adhering to limits placed on the amount of money they wish to spend gambling, these monetary limit pop-up messages may be

particularly efficacious in reducing the financial burden associated with excessive slot machine play. More immediate consequences of the implementation of such a feature on slot machines would be a potential reduction in gambling expenditure, as well as an increase in the incidence of limit-setting among slot machine gamblers. Indeed, setting monetary limits is an essential component of responsible gambling and the use of slot machine pop-up messages appears to be an ideal way to increase the likelihood that gamblers engage in this behaviour.

### **Caveats**

Some limitations of the current research should be noted. First, the sample used in the current study was undergraduate university students and as such, results of the study may not generalize to other populations. Further, a more diverse sample may have provided a wider range of gambling pathology. It is important to note, however, that rates of problem gambling are alarmingly high among young adults. While approximately 2% of the general population engages in pathological gambling behaviour and an additional 4% have experienced subclinical gambling-related problems, these rates are more than double among young adults, with approximately 5% engaging in pathological gambling behaviour and over 9% reporting subclinical gambling-related problems (Shaffer, Hall, & Vander Bilt, 1997). As such, university students may be an ideal population through which to assess the efficacy of strategies aimed at promoting responsible gambling. Despite the benefits of using a university sample of gamblers, further research is needed to verify the results in a community sample of slot machine gamblers.

Second, participants did not use their own money while playing slots and instead were given \$20 in credits to gamble with. Consequently, participants may not have been

as financially invested in the final outcome of the gambling session as they might have been had they gambled with their own money. However, in order to increase investment in the gambling session, participants were informed that they had the chance of winning money and could keep any money remaining at the end of the gambling session. While the gambling behaviour of participants may have differed had they wagered with their own money, this was not ethically feasible.

Third, both dissociation and craving to gamble were assessed solely through the use of self-report measures. Although these measures demonstrated good reliability, they may not be the most accurate assessment of these variables. Further, experiences of dissociation were assessed by asking participants to recall how much they dissociated during the previous session of slot machine play. This may further decrease its accuracy as dissociative experiences during slot machine play were measured retrospectively. To reduce the likelihood or impact of these biases, convergent behavioural measures should be included as additional controls.

A final caveat is that the current study occurred in a laboratory setting rather than an actual gambling venue. As such, the extent to which results can be generalized to an actual gambling situation is limited. Indeed, laboratory research on gambling has been criticized for lacking in ecological validity (Anderson & Brown, 1984). However, participants have reported that if appropriate factors are introduced, such as the chance to win or lose money, the experience is similar to gambling in an actual casino (Leary & Dickerson, 1985). Further, conducting gambling research in a laboratory setting allows for the control of extraneous variables and random allocation of participants to experimental conditions. Consequently, internal validity increases and greater causal

inferences can be drawn when assessing relationships between variables. Lastly, the virtual reality casino used in the current study provided gamblers with a highly realistic environment within which to gamble and allowed all participants to receive the same series of wins and losses. Despite the benefits of conducting gambling research in a laboratory setting, however, future research is needed to substantiate the results in an actual gambling venue.

### **Conclusions**

There is little doubt that spending more money gambling than one can afford contributes to gambling problems (see Walker et al., 2006). In light of the financial harm often associated with problematic gambling, it is increasingly important to design responsible gambling initiatives that encourage gamblers to set and stay within limits on the amount of money they can afford to spend gambling. The current research provides support for the effectiveness of monetary limit pop-up reminders as a responsible gambling strategy that can be used to encourage gamblers to play within their monetary limits while gambling.

Specifically, gamblers were more likely to adhere to monetary limits when presented with a pop-up message reminding them when they reached their limit than when not exposed to a monetary limit pop-up reminder. Further, monetary limit pop-up reminders appear effective in breaking the intense focus and deep absorption commonly experienced by slot machine gamblers while failing to increase craving to gamble. As such, monetary limit pop-up reminders may be a viable and effective means of reducing the potential harm associated with slot machine gambling.

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## Appendices

### *Appendix A. Phone and Email Recruitment*

Hi, my name is Melissa Stewart and I am with a team of researchers from the Carleton University Gambling Lab. You have indicated that you would be willing to participate in research pertaining to gambling at Carleton University.

In the current study being run, you will be asked to complete a number of questionnaires assessing your perceptions of gambling, as well as engage in gambling in a virtual reality environment. Virtual reality involves you putting on a head mounted display and gambling in a computer simulated casino. To play in the virtual casino you will receive \$20 with the opportunity to win more money, which you can take home with you.

The study should take approximately one hour to complete and has been approved by the Carleton University Ethics Committee for Psychological Research. Would you be interested in participating? If so, could we arrange a time for you to take part in the study? If not, thanks for your time and goodbye.

*Appendix B. Informed Consent***Informed Consent**

*The purpose of an informed consent is to ensure that you understand the purpose of the study and the nature of your involvement. The informed consent has to provide sufficient information such that you have the opportunity to determine whether you wish to participate in the study.*

**Study Title:** Reactions to virtual gambling

**Study Personnel:** Melissa Stewart (Principal Investigator, 520-2600, ext. 6312)  
Dr. Michael Wohl (Faculty Investigator, 520-2600, ext. 2908)

If you have any ethical concerns about this study please contact Dr. Monique Sénéchal (Chair of the Carleton University Ethics Committee for Psychological Research, 520-2600, ext. 1155) or Dr. Janet Mantler (Chair of the Department of Psychology at Carleton University, 520-2600, ext. 4173). This study has been approved by the Carleton University Ethics Committee for Psychological Research.

**Purpose and Task Requirements:** The purpose of this study is to assess gambling behaviour. We will be asking you to wear virtual reality headgear which creates a realistic and interactive casino atmosphere (sights and sounds). The user has the capability of interacting with the virtual casino in a gaming situation, and you will have the opportunity to do so. You will also be asked to complete a series of questionnaires about your background (e.g., age, sex, ethnicity), and gambling (e.g., propensity to gamble and attitudes toward gambling). The study will take about 60 minutes to complete.

**Potential Risk and Discomfort:** There are no physical risks in this study. Some individuals may experience discomfort when asked to respond to personal, sensitive questions. In addition, some individuals may experience discomfort or nausea when interacting with the virtual reality console (a.k.a. "Cyber-sickness"). If you do feel nauseous when using the virtual reality console, please take a break (i.e., close your eyes). If the nausea continues, please tell the experimenter and he or she will terminate the study.

**Anonymity/Confidentiality:** All the information collected in this study will be kept confidential. We take special precautions to make sure that no one else will be able to identify you and what your responses were. Any identifying information associated with your code will be confined to a single page that will be separated from your questionnaire, and kept in a separate and secured file by the research investigators who will keep this information confidential.

**Right to Withdraw:** Your participation in this study is entirely voluntary. At any point during the study you have the right to not complete certain questions or to withdraw with no penalty whatsoever.

*I have read the above description of the study concerning my reactions to virtual gambling. The data collected will be used in research publications and/or for teaching purposes. My signature indicates that I agree to participate in the study, and this in no way constitutes a waiver of my rights.*

Full Name (please print): \_\_\_\_\_  
Participant Signature: \_\_\_\_\_  
Date: \_\_\_\_\_  
Researcher Signature: \_\_\_\_\_  
Date: \_\_\_\_\_

*Appendix C. Measures*

Gambling Craving Scale (GACS)

**Instructions:** Please indicate your agreement or disagreement with the following statements by circling the appropriate number.

1. Gambling would be fun right now.

1	2	3	4	5	6	7
Strongly Disagree				Strongly Agree		

2. If I had an opportunity to gamble right now I would probably take it.

1	2	3	4	5	6	7
Strongly Disagree				Strongly Agree		

3. I would not enjoy gambling right now.

1	2	3	4	5	6	7
Strongly Disagree				Strongly Agree		

4. I crave gambling right now.

1	2	3	4	5	6	7
Strongly Disagree				Strongly Agree		

5. I need to gamble now.

1	2	3	4	5	6	7
Strongly Disagree				Strongly Agree		

6. I have an urge to gamble.

1	2	3	4	5	6	7
Strongly Disagree				Strongly Agree		

7. If I were gambling now I could think more clearly.

1	2	3	4	5	6	7
Strongly Disagree				Strongly Agree		

8. I could control things better right now if I could gamble.

1	2	3	4	5	6	7
Strongly Disagree				Strongly Agree		

9. Gambling would make me less depressed.

1	2	3	4	5	6	7
Strongly Disagree				Strongly Agree		

Jacobs' Dissociation Questionnaire

In the previous gambling session, how much did you.....

1.....lose track of time?

<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Never	Rarely	Occasionally	Frequently	All the time

2.....feel like you were a different person?

<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Never	Rarely	Occasionally	Frequently	All the time

3.....feel like you were outside of yourself, watching yourself gamble?

<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Never	Rarely	Occasionally	Frequently	All the time

4.....feel like you were in a trance?

<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Never	Rarely	Occasionally	Frequently	All the time

5.....experience a memory blackout for things that happened while you were gambling?

<b>0</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
Never	Rarely	Occasionally	Frequently	All the time

## DSM-IV Checklist

**Instructions:** Please answer the following questions by circling the appropriate answer.

1. Have there <b>ever</b> been times when you spent a lot of time thinking about past gambling experiences, planning your next gambling activity, or thinking of ways to get money to gamble?	Yes	No
2. Have you <b>ever</b> needed to gamble with larger amounts of money or with larger bets in order to obtain the same feeling of excitement?	Yes	No
3. Have you ever tried to control, cut back, or stop gambling <b>several times</b> in the past and have been unsuccessful?	Yes	No
4. Do you feel <b>restless or irritable</b> when you try to cut down or stop gambling?	Yes	No
5. Do you feel that you gamble as a way to <b>avoid or escape</b> from personal problems or to relieve uncomfortable emotions, such as feelings of nervousness, helplessness, guilt, anxiety, or sadness?	Yes	No
6. After you lose money gambling, do you <b>often</b> return another day to get even or try to win back your losses?	Yes	No
7. Have you <b>ever</b> lied to family members, friends, or others to hide your gambling from them?	Yes	No
8. Have you <b>ever</b> committed any illegal acts such as forgery, fraud, theft, or embezzlement to get money to gamble or to pay gambling debts?	Yes	No
9. Have you <b>risked or lost</b> a relationship with someone important to you, or a job, or school or career opportunity because of gambling?	Yes	No
10. Have you relied on others to pay your gambling debts or to pay your bills when you have had financial problems <b>caused by gambling</b> ?	Yes	No

## Demographic Information

1. Age \_\_\_\_\_

2. Sex

\_\_\_\_ Male  
\_\_\_\_ Female

3. Ethnic/racial background

\_\_\_\_ Caucasian/European origin  
\_\_\_\_ Asian (Chinese, Japanese, Korean)  
\_\_\_\_ South Asian (East Indian, Pakistani, Punjabi, Sri Lankan)  
\_\_\_\_ South East Asian (e.g., Cambodian, Indonesian, Laotian)  
\_\_\_\_ Black (e.g., African, Haitian, Jamaican, Somali)  
\_\_\_\_ Hispanic and South American Origin  
\_\_\_\_ Middle Eastern  
\_\_\_\_ Native Canadian/American  
\_\_\_\_ Other or multi-ethnic origin

4. Current employment status

\_\_\_\_ Not employed  
\_\_\_\_ Part-time  
\_\_\_\_ Full-time  
\_\_\_\_ Seasonal/Temporary/Contract

5. Are you currently a student?

\_\_\_\_ YES  
\_\_\_\_ NO

6. If you answered YES to question 5, what is your student status?

\_\_\_\_ Full-time  
\_\_\_\_ Part-time  
\_\_\_\_ Special student

## Gambling Behaviour and Involvement Questionnaire

1. Do you currently gamble?

YES, I currently gamble

NO, I used to but I haven't gambled in the last the last 6 months

2. If you answered YES to question 1, how often do you gamble?

More than once a day

More than once a week

More than once a month

More than once every 3 months

Less than once every 3 months

3. When was the last time you gambled? \_\_\_\_\_

4. How long have you gambled for? (Please answer in years, then months) \_\_\_\_\_

5. What is your favorite form of gambling (e.g., cards, sports betting, slot machine gambling, horse racing, lottery tickets, etc)?

\_\_\_\_\_

6. When do you typically gamble? (circle one):

Morning

Afternoon

Evening

7. Do you typically place limits on the amount of money you will spend in a gambling session?

YES

NO

8. If you answered YES to question 7, how much are your typical money limits?

\_\_\_\_\_

9. Do you typically place limits on the amount of time you will spend in a gambling session?

YES

NO

10. If you answered YES to question 9, how much are your typical time limits?

\_\_\_\_\_

11. When you gamble, how much money do you spend on average? \_\_\_\_\_

12. When you gamble, how many hours do you typically spend in a given session? \_\_\_\_\_

13. Where do you typically gamble (e.g., home/internet, casino, etc.)? \_\_\_\_\_

*Appendix D. Debriefing*

## Debriefing

**Thank you for participating in this study!** This post-test information is provided to inform you of the exact nature of the study you just participated in.

**What are we trying to learn in this research?**

Past research has found that setting and staying within monetary limits is a central component of responsible gambling. While the vast majority of gamblers set limits on the amount of money they wish to spend in a given gambling session, many gamblers do not adhere to these limits. This is particularly troublesome when considering that exceeding monetary limits is associated with a host of negative consequences, including gambling-related debts, bankruptcy, and committing illegal acts to obtain money to gamble with. In order to decrease the potential harm associated with exceeding limits, it is important to design responsible gambling initiatives aimed at encouraging gamblers to play within their monetary limits set prior to gambling.

A promising means to increase adherence to preset limits is the use of pop-up messages (i.e., intermittent, dynamic messages appearing on the slot machine screen during play) on slot machines that aim to heighten awareness of the amount of money spent gambling. While increasing awareness of the amount of money lost is of import, the effectiveness of pop-ups to facilitate responsible gambling should be focused on explicit monetary limits identified by the gambler prior to play. The purpose of the present study is to examine the effectiveness of a pop-up message that 1) initially asks gamblers to set a limit and 2) subsequently informs gamblers when that limit has been reached on gamblers' willingness to stay within that limit. We are also interested in assessing possible mechanisms that may influence whether these pop-up messages are effective in encouraging adherence to preset monetary limits among both recreational and pathological gamblers.

The outcomes on the slot machine you just played were predetermined to win or lose in a particular sequence. We were unable to disclose this part of the study to you at the onset because it would have influenced your behaviour and responding to the questions. As such, after you read this debriefing form, the experimenter will present a new informed consent form. The purpose of an informed consent is to ensure that you now understand the true purpose of the study and that you agree to allow your data to be used for research and teaching purposes. Because you were only told of the procedures and not the purpose of this study at the outset, we will be asking you for your consent to allow your data to be used for research and teaching purposes.

**What are the hypotheses and predictions?**

It is predicted that for recreational, but not pathological gamblers, exposure to a monetary-limit pop-up reminder will decrease experiences of dissociation, thus leading to adherence to preset monetary limits. It is also predicted that for pathological, but not recreational gamblers, exposure to a monetary-limit pop-up reminder will increase craving to gamble and as a result, lead to a failure to adhere to preset monetary limits. Therefore, pop-up messages that remind gamblers of their preset monetary limits may only be effective for those with lower levels of gambling pathology.

**Why is this important to scientists or the general public?**

This research will contribute to psychologists' knowledge and understanding of the effectiveness of monetary limit pop-up messages as a responsible gambling strategy among slot machine gamblers. Specifically, findings from this study will help us better understand whether these pop-up messages are effective in increasing the likelihood that gamblers adhere to monetary limits set prior to gambling, and what factors impact adherence to these limits.

**What if I have questions later?**

If you have any questions or comments about this research, then please feel free to contact Melissa Stewart (520-2600 ext. 6312; [mstewar5@connect.carleton.ca](mailto:mstewar5@connect.carleton.ca)) or Dr. Michael Wohl (520-2600 ext. 2908; [michael\\_wohl@carleton.ca](mailto:michael_wohl@carleton.ca)). If you feel that this experiment has influenced your behaviour towards gambling in any way (i.e. if you now have a craving, or urges, to gamble), please contact or speak to the experimenter immediately.

If you have any ethical concerns about this study please contact Dr. Monique Sénéchal (Chair of the Carleton University Ethics Committee for Psychological Research, 520-2600, ext. 1155) or Dr. Janet Mantler (Chair of the Department of Psychology at Carleton University, 520-2600, ext. 4173).

Lastly, gambling may become harmful to ones relationships and well being, both emotionally and financially. The current research is in no way an endorsement to gamble but rather aims to discover ways to help and prevent gambling. If you think you may have gambling problems, it is suggested that you contact one of the organizations listed below. It is not a good idea to allow problems to fester, as ruminating over these problems will typically not make them go away. In addition, your family physician or counselor will may also be able to help you or to refer you to someone who can help.

- Ontario Problem Gambling Helpline: 1-888-230-3505  
<http://www.opgh.on.ca/>
- Addictions and Problem Gambling Services of Ottawa: (613) 789-8941  
[http://www.sandyhillchc.on.ca/mainEngl/apgso\\_engl.html](http://www.sandyhillchc.on.ca/mainEngl/apgso_engl.html)
- Distress Centre: Ottawa and Region: (613) 238-3311  
<http://www.dcottawa.on.ca>
- Health and Counselling Services at Carleton University: (613) 520-6674.  
<http://www2.carleton.ca/health/>

**Thank you for participating in this study!** Your assistance will help us better understand gambling behaviour among university students. We greatly appreciate your participation, but we ask that you refrain from discussing this study with potential participants (i.e., other undergraduate students) because their responses may be influenced.

*Appendix E. Informed Consent to the Use of Data*

## Informed Consent to the Use of Data

**The purpose of an informed consent is to ensure that you now understand the true purpose of the study and that you agree to allow your data to be used for research and teaching purposes. Because you were only told of the procedures and not the purpose of this study at the outset, we are now asking for your consent to allow your data to be used for research and teaching purposes.**

**Purpose.** The purpose of this study is to assess whether a monetary limit pop-up reminder is effective in encouraging adherence to preset monetary limits among gamblers with differing levels of gambling pathology.

**Anonymity/Confidentiality.** The data collected in this study are kept anonymous and confidential. The consent forms are kept separate from your responses.

**Right to withdraw data.** You have the right to indicate that you do not wish your data to be used in this study. If you indicate this is your choice, then all measures you have provided will be destroyed.

**Signatures:** I have read the above description of the study investigating the effectiveness of monetary limit pop-up reminders. The data in the study will be used in research publications or for teaching purposes. My signature indicates that I agree to allow the data I have provided to be used for these purposes.

Full Name (Print): \_\_\_\_\_

Participant Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Researcher Signature: \_\_\_\_\_

Date: \_\_\_\_\_