Appraisals and Expectancies in Relation to the Evolution and Cessation of Gambling Behaviours Among Young Adults

Report to the Ontario Problem Gambling Research Centre

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EXECUTIVE SUMMARY

Background

The prevalence of gambling-related problems among youth has increased steadily in recent years. Specifically, while ~1.6% of the general public meet criteria for pathological gambling, recent figures indicate that these rates more than double among young adults, with approximately 5% reporting pathological gambling and over 9% reporting sub-clinical gambling related problems (Ferris & Stirpe, 1995; Shaffer, Hall, & Vender Bilt, 1997). Given the disproportionate number of young adults experiencing gambling problems, understanding the development of gambling problems and identifying risk factors among this population is critical.

Despite high rates of gambling among young adults, very little research has been conducted with this population, and research concerning pathological gambling and its treatment are often based upon studies of older adults (e.g., Derevensky & Gupta, 2000; DiClemente, Story & Murray, 2000; Jacobs, 2000). Importantly, factors that promote gambling and cessation may not be the same across populations (Getty, Watson & Frisch, 2000; Spunt, Dupont, Lesieur, Liberty & Hunt, 1998). Consistent with the pathways model of problem gambling (Nower & Blaszczynski, 2004), we propose that individuals may follow different routes towards disordered gambling, and that one model is unlikely to account for the experiences of all gamblers. Rather, a host of dispositional factors (e.g., impulsivity, perceptions of personal luck, illusions of control over winning) might interact with situational variables (e.g., game characteristics) to inform an individual’s appraisal of the event. Furthermore, these appraisals may contribute to the selection of subsequent coping activities, physiological responses (i.e., anticipation, craving to gamble), and gambling behaviours (e.g., Wohl, Matheson & Anisman, 2004; Wohl, Young & Hart, 2005).
Study 1

In Study 1, we assessed the relationship between gambling expectancies, appraisals, and personal characteristics (e.g., impulsiveness, depressive symptoms, coping styles) and the onset of problem gambling symptoms among young adults over time. We hypothesized that dispositional characteristics, including perceptions of personal luck and illusory control, might heighten gamblers’ expectancies of winning and encourage individuals to view their behaviour as non-problematic (e.g., benign or controllable), thus serving as a precursor for disordered gambling.

Our previous OPGRC funded research has indicated that beliefs in personal luck and illusions of control over winning may be associated with elevated expectancies of winning, and are associated with greater indices of problem and pathological gambling (Wohl, Matheson & Anisman, 2004). Given the cross-sectional nature of this research, however, it remains unclear if this cluster of appraisals and positive outcome expectancies predict gambling pathology prospectively among young adults. As such, the purpose of this research was:

1) To prospectively identify predictors of gambling pathology among young adults.

2) To identify factors (e.g., poor coping tendencies, depressive symptoms, positive outcome expectancies) that hinder treatment seeking among young adults, and

3) To determine if dispositional factors (e.g., gender, impulsivity) influence appraisals, coping strategies and gambling behaviours among young adults over time.

Method

Following an initial pre-selection phase, 2020 University-aged participants completed a questionnaire package at Carleton University in Ottawa, Canada, assessing:

- Appraisals of gambling (Peacock & Wong, 1990);
• Depressive symptoms (Beck, 1967);
• Coping styles (Matheson & Anisman, 2003);
• Impulsivity (Barratt, 1965);
• Illusions of control over winning (Steenbergh, Meyers, May & Whelan, 2002);
• Beliefs in personal luck (Darke & Freedman, 1997);
• Attitudes towards seeking treatment (Fischer & Turner, 1970);
• Problem gambling symptoms (Ferris & Wynne, 2001).

These variables were assessed at an initial session, and then again 6 and 12 months later in order to observe changes in these variables over time.

Results

Among all participants at time 1 (baseline), problem gambling symptoms and the use of avoidant coping strategies were negatively associated with attitudes towards seeking treatment, such that problematic gambling and ineffective means of coping with gambling were associated with more negative views towards seeking help for gambling-related problems. Furthermore, positive expectancies, including high illusions of control and perceptions of personal luck, predicted reliable increases in problem gambling symptoms, and these effects were typically stronger for men compared to women. Other significant predictors of gambling involvement among University students included impulsivity, depressive symptoms, poor coping repertoires, and perceptions of gambling as a “challenge”. Importantly, young adults identified as problem gamblers tended to appraise gambling as a challenge to a greater extent than other participants, and this effect appeared to strengthen over time.

Study 2
In Study 2, we extended our investigation to examine if positively-based appraisals and expectancies of gambling influence subjective craving to gamble and physiological responses (i.e., circulating cortisol levels). We hypothesized that positive appraisals would predict a greater self-reported desire (i.e., craving) to gamble, and that these subjective feelings would be associated with greater corticoid activation in anticipation of gambling.

Method

A sub-sample of participants from study 1 (n = 86) were randomly selected to participate in a second study on gambling and stress. These participants completed questionnaires assessing appraisals and craving, and completed a daily diary to record changing attitudes towards gambling and daily participation in gambling activities.

Results

As expected:

- positive appraisals of gambling significantly predicted craving to gamble at week 1 and week 2 of the daily diary investigation, and
- this self-reported craving to gamble significantly predicted increases in gambling behaviour among young adults over time

Although a morning rise in systemic cortisol was observed among all participants, however, hypotheses regarding greater cortisol reactivity among problem gamblers in anticipation of gambling were not supported.

Study 3

In study 3, we further extended our analysis to evaluate the role of game characteristics in appraisals and the promotion of problem gambling behaviour among young adults. Indeed, previous research has indicated that game characteristics, particularly features that suggest a
degree of skill, might influence individual’s appraisals, behaviours and neuroendocrine responses while gambling (Wohl, Young & Hart, 2005). In order to investigate craving within a realistic gambling context, Study 3 employed a virtual reality casino paradigm to assess how features of the gaming situation (extent of skill involved) interact with individual difference characteristics to influence anticipatory excitement, cravings, appraisals, and cortisol reactivity. Specifically, we hypothesized that:

- characteristics of the gambler (illusory control, belief in luck) would interact with game characteristics (skill vs. chance) to influence appraisals and gambling persistence, and
- that, among problem gamblers, anticipation of gambling would trigger increased craving and cortisol levels.

**Method**

Participants from Study 1 were randomly selected and asked to participate in a virtual reality casino study. In the virtual reality environment, they were randomly assigned to play one of three different gambling games: 1) slots (pure chance), 2) slots with a wheel stop mechanism (pure chance with an illusory control element), or 3) blackjack (chance plus an element of perceived skill). Participants additionally completed questionnaires assessing perceptions of luck, appraisals of gambling, craving, mood, and illusions of control over winning.

**Results**

Compared to low-risk and non-problem gamblers, young adults who were classified as problem gamblers:

- appraised gambling as a challenge to a greater extent than those in other groups, and
- reported significantly greater cravings to gamble.
Although an initial rise in systemic cortisol was evident among all participants, this effect did not vary as a function of the type of game subsequently played (e.g., skill or chance-based).

**Study 4**

Study 3 indicated that reported craving to gamble and rises in cortisol did not vary as a function of game characteristics (e.g., skill vs. chance). However, individuals may vary in the types games they prefer to play, and may respond *differently* when playing their preferred game versus another type of game. To assess this, a second lab study was conducted in which participants were permitted to play their *preferred* game type (i.e., chance-based, skill-based), and the relations between appraisals, craving and gambling symptoms were assessed. Building upon results from Study 3, we hypothesized that individuals would 1) demonstrate positive appraisals and exaggerated (e.g., heightened) craving levels when they played their favourite game (as opposed to being assigned to a game), and 2) appraise their gambling as being *more controllable* when it involved a degree of perceived skill versus chance.

**Measures**

A sub-set of participants (*N* = 153) from Study 1 were randomly selected to participate in a virtual reality gambling study. The questionnaire and gambling task procedures were identical to those described in Study 3, except that participants were permitted to play their *preferred* game type (slots, slots with stop button, blackjack), rather than having a game type randomly assigned to them by the research team.

**Results**

As in the previous study, problem gamblers endorsed more positive appraisals of gambling and reported greater cravings to gamble relative to low-risk or non-problem gamblers. In addition, those gamblers who preferred to play skill-based games (i.e., blackjack) subsequently
appraised gambling as being *more* controllable than those in the chance condition. This suggests that game type (and specifically games that promote a skill orientation) influence gambler’s appraisals of gambling, and the degree of control they feel they possess over their actions and the outcome of the game.

**Conclusions and Discussion**

In line with research on adult populations, this study indicated that several factors are associated with problem gambling symptoms among young adults. Specifically, as has been suggested by others (Toneatto, Blitz-Miller, Calderwood, Dragonetti & Tsanos 1997; Wohl & Enzle, 2002; Wohl, Young & Hart, 2005), we found that positive outcome expectancies (illusions of control, perceptions of personal luck) and challenge-based appraisals of gambling significantly predicted problem gambling symptoms among young adults. These findings reinforce the notion that illusions of control over winning (Langer, 1975; Moore & Ohtsuka, 1999) and heightened perceptions of personal luck (e.g., Wohl & Enzle, 2002) are important risk factors for problem gambling, and may be instrumental in the onset and progression of gambling behaviours. In the longitudinal component of Study 1 (6 and 12 month follow-up sessions), we found that the tendency to appraise gambling as a challenge *increased* among participants over time, and that this effect was especially pronounced among young men. These results suggest that such appraisals are dynamic in nature, and highly predictive of problem gambling symptoms over time. Studies 2 and 3 provided further support for these results. Specifically, these studies showed that problem gamblers tended to appraise gambling as more challenging and controllable than either non-problem or low-risk gamblers, and that these appraisals were associated with 1) increased cravings to gamble, and 2) elevated problem gambling symptoms among young adults. Considering these studies together, it appears that challenge and control-related appraisals of
gambling represent important process variables that link personal (e.g., individual difference) characteristics to the emergence of problematic behaviours.

**Limitations**

There are several limitations of the present study that should be mentioned.

- This research focused on an undergraduate student population from a single institution, and random assignment to groups (e.g., non-problem vs. problem gambler) was not possible. As such, these results may not generalize to different populations of youth.

- Although participants in the daily diary study were encouraged to provide in-the-moment reports and cortisol measurements, it is possible that participants recorded their diary entries based upon retrospective thoughts and behaviours (e.g., completed a diary entry for the previous day(s), or that the time of saliva sample collection was not accurately recorded. As such, it is possible that daily fluctuations in cortisol and mood were not accurately captured via this method, or that effects have been muted.

- As with other studies employing self-report data, it is possible that problem gambling symptoms have been under-reported in these studies due to social desirability effects, or due to a genuine motivation on behalf of participants to conceal gambling problems or negative attitudes towards seeking treatment for such problems.

**Future Research and Next Steps**

Given that this research was conducted at a single institution, future research might focus on examining these variables among community samples of young adults. If these results are replicated with diverse or heterogeneous samples, this would lend additional support to the processes observed in our research, and shed light on the stability of these risk factors among young adults. Additionally, although reliable changes in gambling appraisals were observed over
6 and 12 months, future research might examine these appraisals over a longer time course, in order to better understand the extent to which these effects are amplified or sustained among young adults over time, and how they related to long-term gambling behaviour. Finally, consideration might be given to the development and testing of resources to educate young adults about these risk factors, given that youth represent a group at high risk of developing gambling problems.
Abstract

Despite high prevalence rates of gambling problems among young adults, there has been little research focusing on risk factors and the progression of gambling problems among this population. As such, we argue the need for longitudinal research to address the underlying causes and processes involved in the development of gambling problems among young adults. The first study comprised a longitudinal survey ($N = 2020$) designed to assess relations among outcome expectancies, appraisals of gambling, coping strategies, individual difference variables (e.g., gender, impulsivity, depressive symptoms), and to determine the contribution of these variables to problem gambling symptoms and gambling behaviours. Six and 12 month follow-up sessions were conducted to identify changes in these variables and relationships over time. In the second study, participants ($N = 86$) completed an online diary and provided saliva samples in order to determine if positive expectancies and appraisals of gambling predicted greater craving to gamble, and to ascertain if craving was related to increased gambling and neuroendocrine responses among young adult gamblers. In the third and fourth studies, participants completed questionnaires and gambled in a virtual reality casino, allowing us to examine the effects of appraisals, expectancies, craving, mood and neuroendocrine responses among individuals in a realistic gaming environment. These variables were examined as a function of gambling involvement (non-problem, at-risk, and problem gambler) and game type (pure chance, chance with skill element, skill). Specific factors that render young adults vulnerable to pathology and implications for treatment are discussed.
Introduction

Participation in gambling and the prevalence of gambling-related problems among youth has increased steadily in recent years. In fact, University-aged young adults are now exposed to a broad range of socially acceptable, accessible and legal forms of gambling, including lotteries and internet gaming (Jacobs, 2000). Although approximately 84% of adults in Ontario report gambling in one form or another (e.g., lotteries, scratch tickets, casino gambling) on an annual basis (Ferris & Stirpe, 1995; Wiebe, Single & Falkowski-Ham, 2001), it appears that gambling pathology is especially prevalent among young adults. Recent research indicates approximately 1.6% of the general public engages in pathological gambling, with an additional 3.85% demonstrating problems at sub-clinical levels. Among university students these rates double, with approximately 5% reporting pathological gambling and over 9% reporting sub-clinical gambling related problems (Ferris & Stirpe, 1995; Shaffer, Hall, & Vender Bilt, 1997). Given the disproportionate number of young adults experiencing gambling problems, understanding the development of gambling problems and identifying risk factors among this population is critical.

Several risk factors for problem gambling have been explored in recent literature, notably positive outcome expectancies (e.g., expectations of winning), appraisals of the gambling event, and cognitions regarding one’s personal ability, luck, or likelihood of success (e.g., Wohl & Enzle, 2002; Wohl, Matheson & Anisman, 2004; Wohl, Young & Hart, 2005). This research has indicated that problem gamblers tend to report a greater number of positive outcome expectancies than non-problem gamblers, expect fewer negative consequences of their behaviour, and may be more likely to perceive that they are “lucky” or able to exert control over their gambling (Wohl & Enzle, 2002; Wohl, Young & Hart, 2005). Once gambling problems set in, they can be resistant to change (Petry & Armentano, 1999) and may carry important implications.
for the health and well-being of the individual. Indeed, numerous negative consequences have been observed among problem gamblers, including financial, emotional and interpersonal distress (e.g., marital conflict, loss of occupational status or social networks). Furthermore, gambling pathology is often accompanied by depressive symptoms and other affective disorders (McCormick, Russo, Ramirez, & Taber, 1984; Black & Moyer, 1998), as well as other addictive behaviours, including smoking, alcohol and substance use (e.g., Peacock & Wong, 1990; Petry & Pietrzak, 2004). In an extensive literature review, Petry and Armentano (1999) reported that as many as 50% of pathological gamblers in the United States may suffer from concurrent substance use disorders, including alcohol and drug dependence. Pietrzak, Molina, Ladd, Kerins and Petry (2005) found that among older adult gamblers, rates of depression and anxiety were significantly higher than non-gamblers, and pathological gamblers were more likely to contemplate or attempt suicide relative to non-gamblers (Petry & Armentano, 1999). These comorbidities further contribute to poor outcomes, and can exact a considerable toll on one’s daily functioning and quality of life.

Compounding this problem, gamblers (and young adult gamblers in particular) might fail to appraise their behaviour as problematic and to seek treatment for gambling-related problems. In previous research, our own data revealed that of 2,000 first year university students, 24% had gambling-related problems, although they did not necessarily evaluate their behaviours as problematic (Wohl, Matheson & Anisman, 2004). Those who did were often reluctant to acknowledge a need to seek treatment, even though they reported greater distress, depressive symptoms and reduced quality of social and academic life. Based upon these results, it appears that individuals may not recognize when their gambling has reached problematic levels, or may deny that problems exist, despite evidence to the contrary (e.g., despite disruptions to daily life
and social interactions, increased depressive symptoms, etc.). As such, these appraisals might have a significant impact on behaviours and treatment-seeking efforts.

Despite high rates of gambling among young adults, particularly university students, very little research has been conducted with this population, and research concerning pathological gambling and its treatment are often based upon studies of older adults (e.g., Derevensky & Gupta, 2000; DiClemente, Story & Murray, 2000; Jacobs, 2000). Importantly, however, factors that promote gambling and cessation may not be the same across populations (Getty, Watson & Frisch, 2000; Spunt, Dupont, Lesieur, Liberty & Hunt, 1998). As such, the purpose of the present investigation was to identify specific precursors of gambling pathology among young adults. In addition, given the observed association between appraisals, poor coping repertoires and problem gambling symptoms among older adults (e.g., Toneatto, Blitz-Miller, Calderwood, Dragonetti & Tsanos, 1997; McCormick, 1994), a secondary goal of this research was to determine the role that gambling appraisals, expectancies and coping styles play in the development of problem gambling behaviour among young adults.

In accordance with the pathways model of problem gambling (Nower & Blaszczynski, 2004), we hypothesized that individuals may follow different processes towards disordered gambling, and that one model is unlikely to account for the experiences of all gamblers. Rather, as suggested by the pathways model, dispositional factors (e.g., impulsivity, depressive symptoms) might interact with situational variables (e.g., game characteristics) to inform an individual’s appraisal of the event and subsequent coping and behavioural responses. In order to account for the possibility that such complex relationships exist, we assessed the relationship between individual difference variables (e.g., gender, impulsivity, depressive symptoms), appraisals and expectancies of gambling, and problem gambling symptoms over time. In a
second study, we examine whether positively-based appraisals and expectancies of gambling influence subjective craving to gamble and physiological responses (i.e., circulating cortisol levels). In Studies 3 and 4, this analysis is extended by investigating the role of game-type (skill-based vs. chance-based) plays in gambling. Specifically, it is hypothesized that positive expectancies and appraisals will be associated with problem gambling symptomatology, and that this association will be more pronounced among “vulnerable” individuals (e.g., those with poor coping abilities, impulsivity, depressive symptoms, etc.). In addition, we expect that positive appraisals and expectancies of gambling will predict greater subjective craving to gamble and heightened physiological responses to gambling among young adults.

**Appraisals and Expectancies**

Individual’s decisions and behavioural responses while gambling might be influenced by their expectancies and appraisals of gambling. These appraisals are likely influenced by a number of factors, including situational variables (e.g., game characteristics, previous experiences), personal factors (e.g., premorbid depressive symptoms, impulsivity, coping styles), as well as perceptions of personal luck and control over gambling. Subjective appraisals are believed to reflect an evaluation of how threatening a situation is (i.e., odds of losing), how much of a challenge the situation represents (i.e., confidence of a win), and perceived control or ability to deal with the challenge (Carver & Scheier, 1994; Lazarus & Folkman, 1984). Individuals continue to appraise their behaviour in the long term in regards to cost (e.g., financial loss) or benefit (e.g., social approval). If an individual consistently appraises their gambling as threatening, harmful, or beyond their control, they may experience sufficient distress to consider seeking help. However, individuals who maintain positively-biased expectancies (e.g., who feel lucky or “in control”), who appraise gambling as a challenge, or who feel that their behaviour is
non-problematic might persist in their gambling behaviours and be less likely to seek treatment (see Wohl & Enzle, 2002). We have found previously (e.g., Matheson, Wohl, & Anisman, 2009) that several appraisal features that were common to both pathological and problem gamblers. These included beliefs in personal luck, illusions of control, and fewer negative expectations concerning the consequences of gambling. As these features were present among individuals who were not yet pathological gamblers, this pattern of cognitions may represent a risk factor for pathology. Given the cross-sectional nature of this research, however, it is possible that these cognitions reflect consequences of gambling behaviours rather than risk factors. Building upon this research, the present study *prospectively* evaluates the role of appraisals and expectancies in the development of gambling pathology among young adults.

As suggested by the pathways model of problem gambling (Blaszczynski & Nower, 2002), there may be different *subtypes* of gamblers, and these individuals may follow different paths towards disordered gambling. According to this model, individuals may develop gambling problems as a result of *behavioural conditioning* (i.e., learning, prior experiences with gambling), *emotional vulnerability* (i.e., pre-existing psychological symptoms that render individuals more susceptible to gambling problems), or *biological factors* (i.e., genetic or biological factors that ‘predispose’ individuals to gambling pathology). As suggested by these pathways, some individuals may be more prone to problematic behaviours than others, regardless of how they appraise their gambling. Highly impulsive gamblers, for instance, may be particularly prone to developing gambling problems, as impulsivity might represent a genetic variable that interferes with normal appraisal processes that would otherwise discourage gambling (e.g., impulsivity might foster a sense of challenge or lessen feelings of threat related to gambling).

*Coping styles and problem gambling*
Although individuals may adopt a range of different coping strategies in response to stressors, coping has generally been described as either problem-focused or emotion-focused (e.g., Anisman & Matheson, 2003). Problem-focused coping strategies are typically aimed at reducing or resolving the source of stress (i.e., problem solving, searching for alternatives or options to change the situation), whereas emotion-focused strategies are used to minimize negative emotions elicited by the stressor (Anisman & Matheson, 2003; Folkman & Lazarus, 1980). Emotion-focused coping strategies might include actions such as expressing or suppressing emotional responses to a situation, ruminating about an event, or engaging in wishful thinking to offset the negative emotions produced by the stressor.

Interestingly, it appears that the coping strategy one chooses may vary as a function of how they appraise the situation, and that different coping strategies may be adaptive in different situations. Lazarus and Launier (1978), for instance, found that when individuals appraised a situation as threatening or uncontrollable, they tended to use emotion-focused coping strategies (e.g., humour, resignation, wishful thinking). Conversely, when a situation was appraised as being within one’s control or was evaluated as a challenge, individuals tended to rely upon both problem and emotion-focused coping strategies. Importantly, this research suggests that the coping strategy one selects is likely informed by a number of personal, situational and appraisal variables, and that a single strategy may not be adaptive in all settings (e.g., problem solving may be of limited use in the event of a situation that is truly beyond one’s control; in this case, emotion-management strategies may be more effective in reducing distress).

From a problem gambling perspective, several studies have indicated that individuals who tend to adopt poor or ineffective coping skills (e.g., avoidant or emotion-based coping strategies) may be more likely to gamble as a means of coping with stress than those who employ
adaptive, problem-focused coping strategies (e.g., Bergevin, Gupta, Derevensky & Kaufman, 2006; Ledgerwood & Petry, 2006; Lightsey & Hulsey, 2002; Thomas & Moore, 2003). Conversely, problem-focused coping has been negatively associated with problem gambling (Bergevin, Gupta, Derevensky & Kaufman, 2006; Getty, Watson & Frisch, 2000; Lightsey & Hulsey, 2002), suggesting that individuals who approach stressful situations with a propensity to action and problem-solve are less likely to turn to gambling as a means of coping. Supporting this research, we found that in addition to comorbid depressive symptoms, pathological gamblers demonstrated dysfunctional coping styles often linked to depression (Matheson et al., 2009). In addition, pathological gamblers endorsed lower problem-solving, support seeking, and emotional expression, and greater wishful thinking. Together, these coping styles likely hinder motivation and capacity to take steps toward change.

Although depression is often a comorbid feature of pathological gambling, gambling may reflect an attempt to diminish depression, particularly among those who are emotionally vulnerable (i.e., gambling may serve to temporarily distract them from negative mood) (Beaudoin & Cox, 1999; Blaszczynski & Nower, 2002; Brown & Coventry, 1997). For this subtype of gambler, ineffective coping styles may contribute to gambling initiation, and may hinder attempts at cessation. Importantly, the link between gambling and depression may differ between males and females, as males may be more motivated by the excitement of wagering, whereas women may gamble to escape personal problems (Blaszczynski & Nower, 2002; Brown & Coventry, 1997; Matheson et al., 2009; Spunt, Dupont, Lesieur, Liberty & Hunt, 1998). Thus, a prospective study on the relationship between gambling and depression in males and females is needed, along with the implications for treatment seeking.

The Role of Dispositional Factors in Appraisals, Expectancy and Coping
As previously mentioned, the pathways model of problem gambling (Blaszczynski & Nower, 2002) suggests that some individuals may be more prone to problematic behaviours than others, regardless of their expectancies or how they appraise their gambling. Indeed, several dispositional variables have been hypothesized to play a role in the evolution of gambling pathology. In particular, individual differences in impulsivity (Alessi & Petry, 2003) and robust gender differences in gambling behaviour (e.g., Ladd & Petry, 2002) have been noted. These variables may represent important risk factors or dimensions along which gamblers are differentiated, and a prospective examination of these variables among young adults is warranted.

**Impulsivity.** Pathological gambling is classified as an impulse control disorder in the DSM-IV (American Psychological Association [APA], 1994), and is characterized by persistent involvement in gambling which produces negative consequences (to the self or others), impaired feelings of control, and the repeated failure to reduce or cease gambling despite wishes or attempts to do so. Further to this definition, individuals may risk relationships or employment opportunities to gamble, may engage in illegal acts (such as theft or fraud) in order to fund their gambling habits, and may attempt to “chase” or recoup losses by persisting with play or returning to gambling venues on successive occasions (Breen & Zuckerman, 1999). Although the classification of pathological gambling as an impulse control disorder has been debated, the notion that impulsivity is a risk factor has received some support. Recent research has indicated that pathological gambling is significantly associated with both impulsive behaviours (Alessi & Petry, 2003) and low impulse control (Petry, 2001), and that this effect may be compounded among individuals with concurrent substance use problems (Petry, 2001). Similarly, Peele (2002) found that individuals who were high in impulsivity, endorsed positive expectancies related to gambling, and exhibited poor coping strategies were more likely to continue gambling within a
given session relative to less impulsive individuals (Peele, 2002). It appears, therefore, that impulsivity may play a significant role in the development of gambling pathology, and that the intersection of impulsivity, positive expectancies and poor coping might represent an especially important “vulnerability profile” for this process.

Sex differences in gambling behaviour and pathology. Prevalence data suggest that men may be at higher risk for developing gambling and substance use problems, may begin gambling at a younger age, and may be more resistant to seeking treatment or modifying gambling behaviour than women (Greenberg, Lewis & Dodd, 1999; Nower, Derevensky & Gupta, 2004). Concomitantly, Ladd and Petry (2002) found that women were less likely than men to gamble (comprising only approximately 32% of pathological gamblers), and were less likely to develop concurrent legal or substance use problems. It appears, however, that although women tend to gamble less frequently than men and to develop gambling problems later in life, they may advance to pathology more quickly than men once gambling is initiated (e.g., Brown & Coventry, 1997; Ladd & Petry, 2002).

Sex differences in reported motivations for gambling have also been noted, with women tending to gamble primarily in order to escape or dissociate from negative life events, stress or trauma, and men gambling in order to seek or maintain social bonds (Burger, Dahlgren & MacDonald, 2006). These gender differences in motivations, attitudes and behavioural tendencies suggest that men and women follow different etiological pathways in the development of gambling problems. Although the consequences of gambling addiction may be equally detrimental among both genders, it is important to recognize the different factors which influence this process in order to develop appropriate counseling and prevention strategies.
Taken together, research on individual difference variables including sex, impulsivity and depressive symptoms indicates that these variables may indeed influence individual’s appraisals and expectancies of gambling, as well as their gambling behaviours. Based upon this research, the present investigation will examine the extent of the relationship between these variables, and the extent to which they predict problem gambling symptoms among young adults over time.

Craving and neuroendocrine responses

In addition to encouraging gambling behaviours, positively-biased appraisals and expectancies regarding gambling might promote subjective cravings to gamble, as well as heightened physiological responses (e.g., cortisol circulation) among young adults. In our previous OPGRC funded research (Wohl, Anisman, Matheson & Young, 2006), we found that positive expectations and appraisals of gambling significantly predicted problem gambling symptoms and cortisol elevations among individuals, thus supporting a relationship between appraisals and craving to gamble. As this research was cross-sectional in nature, however, it is not clear if these appraisals are associated with craving and physiological responses in a causal manner, or if craving to gamble predicts increases in actual gambling behaviours over time.

When examining physiological responses, it has been well documented that individuals experience elevations of circulating corticoids (e.g., cortisol) in response to stressors (e.g., Sapolsky, Romero & Munck, 2000), and that the hypothalamic-pituitary-adrenal axis (HPA) system which regulates this cortisol response is highly reactive to cues of threat and emotional distress (Pacak & Palkovits; cited in Olff et al., 2005). Interestingly, however, it appears that this system may also become activated in response to pleasurable stimuli. Many problem gamblers, for instance, experience a “eustress” or high (e.g., a feeling of excitement or “positive stress”)
when engaging in play, comprising feelings of euphoria, elevated heart rate (Petry, 2001), and increases in systemic dopamine (e.g., Nordin & Sjodin, 2007). In addition, our research has shown that cortisol increased among gamblers in anticipation of positive events (Merali, McIntosh & Anisman, 2004). Preliminary data from our virtual casino lab has revealed that among gamblers, cortisol increased both in anticipation of gambling and in response to gambling-related stimuli (Wohl et al., 2006). It may be that the “anticipatory high” among problem and pathological gamblers reflected by hypothalamic-pituitary-adrenal (HPA) activation provides an objective index of craving or excitement. Indeed, cortisol elevations may be predictive of those problem gamblers at increased risk for becoming pathological gamblers. From this perspective, cortisol elevations reflect excitement in anticipation of the game, in contrast to dopamine functioning, which may be more aligned with reward processes (Shizgal & Arvanitogiannis, 2003). Similarly, it appears that HPA activation may also occur when individuals are faced with making decisions or acting in ways that contradict desired or reflexive behaviours (Anisman & Matheson, 2005). This activation of the central nervous system in response to opposing desires and appraisals might create tension and carry important implications for gamblers. Specifically, among individuals contemplating cessation, anticipatory cues may conflict with the desire to cease gambling. If this is the case, their attributions for arousal (craving vs. distress) may have implications for movement away from gambling vs. maintaining their addiction.

Game characteristics

In addition to dispositional factors and appraisals of gambling, features of the game may influence gambling behaviours (Wohl, Young & Hart, 2005), and may interact with characteristics of the gambler to promote pathology. Illusions of control and perceptions of
personal luck might increase gambling participation by increasing individuals’ positive outcome expectancies (e.g., Wohl & Enzle, 2002; Wohl & Enzle, 2003). Further, research in our lab has indicated that gamblers who prefer games containing an element of skill (e.g., blackjack) may be more likely to attribute outcomes to personal luck relative to gamblers who prefer games of pure chance (e.g., slots) (Wohl, Young & Hart, 2005). Taken together, when gamblers with a predisposition to appraising outcomes as reflecting their own luck are exposed to games that contain both skill and chance components, the results may be particularly ‘toxic’; wins may be particularly reinforcing in that they serve to consolidate beliefs in personal luck and control.

Overview of Current Research

Given the high prevalence rate of gambling problems among young adults, and the lack of specific, longitudinal research on the evolution of gambling pathology among this population, the purpose of the present research was to prospectively monitor gambling behaviour among University students over time, and to identify predictors of pathological behaviour among this population. Based upon previous research conducted with adult gamblers (Derevensky & Gupta, 2000; DiClemente, Story & Murray, 2000; Jacobs, 2000), we examined expectancies (e.g., beliefs in personal luck, illusion of control), coping styles and dispositional factors (e.g., gender, impulsivity) in order to identify their role in predicting gambling pathology among young adults, as well as to determine how these factors may hinder treatment seeking among this high-risk population.

Our research on the progression of gambling pathology is based on a model that integrates expectancy theory (Jones, Corbin & Fromme, 2001) with a transactional theory of coping that emphasizes the reciprocal relationship between appraisals of a situation and physiological and behavioural responses (Lazarus & Folkman, 1984). We hypothesize that
dispositional characteristics, including perceptions of personal luck and illusory control, might heighten gamblers’ expectancies of winning and encourage individuals to view their behaviour as non-problematic (e.g., benign or controllable). Furthermore, these expectancies may influence individuals’ appraisals of the gambling situation and subsequent behavioural responses, including the selection of coping strategies that might foster gambling progression (or cessation). Indeed, our previous research has indicated that beliefs in personal luck and illusions of control over winning may be associated with elevated expectancies of winning, and these are associated with greater indices of problem and pathological gambling (Wohl, Matheson & Anisman, 2004). Given the cross-sectional nature of this research, however, it remains unclear if this cluster of appraisals and positive outcome expectancies predict gambling pathology prospectively among young adults. As such, the present study was guided by the following objectives:

1) To prospectively identify predictors of gambling pathology among young adults.

2) To identify factors (e.g., poor coping tendencies, depressive symptoms, positive outcome expectancies) that hinder treatment seeking among young adults.

3) To determine if dispositional factors (e.g., gender, impulsivity) influence appraisals, coping strategies and gambling behaviours among young adults over time.

4) To investigate neuroendocrine responses among young adult gamblers, and to determine if cortisol elevations predict a) greater reported craving to gamble, and b) greater problem gambling symptoms among this population.

STUDY 1

In Study 1, we adopted a longitudinal design to prospectively examine the relationship between expectancies (illusion of control, perceptions of personal luck), appraisals, coping, and gambling behaviour among young adults, and to identify the predictive utility of these variables
in relation to changes in behaviour and treatment seeking over time. To accomplish this, we conducted a broad-based survey of University students over a two-year period.

Methods

Pre-selection

In order to determine the range of gambling behaviours and gambling-related problems among university students, an initial pre-selection phase was conducted. In this phase, we contacted first-year course instructors via email, and asked if they would be willing to allow a member of our research team to speak with their class briefly and administer the DSM-IV checklist for problem gambling symptoms (APA, 1994). Based on accepted scoring procedures, a score greater than 5 was used to identify pathological gamblers, a score ranging from 1 to 4 represents problem gamblers, and a score of 0 represents recreational gamblers. This pre-screening measure allowed us to identify students at different levels of gambling involvement.

Participants and procedure

Following the pre-selection phase, eligible students were contacted by email by a member of the research team and invited to participate in a larger study on personal experiences and gambling. A total of 2020 participants completed the questionnaire package and provided valid responses. Of these, 822 participants (40.69%) were men, 1181 (58.47) were women, and 16 (.79%) declined to report their gender. Participants were 17 to 54 years of age, with a mean age of 20.48 years ($SD = 4.29$ years). Participants represented mixed ethnic and racial backgrounds, including Caucasian ($n = 1394, 69\%$), East Asian ($n = 178, 8.8\%$), South Asian ($n = 87, 4.3\%$), Middle Eastern ($n = 72, 3.6\%$), African-Canadian ($n = 68, 3.4\%$), Native Canadian/American ($n = 62, 3.1\%$), Hispanic/South American ($n = 38, 1.9\%$), and other/multi-ethnic ($n = 111, 5.5\%$).

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1 N.B. The original dataset comprised 2048 participants. A total of 28 cases were deleted due to missing data (> 15%) on one or more of the variables of interest, resulting in a final $N = 2020$. 

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In terms of gambling pathology, 56.6% of eligible participants (314 men, 814 women, 1 unspecified) were classified as non-problem gamblers, 22.2% (219 men, 225 women) were classified as low-risk gamblers, and 21.2% (285 men, 138 women) were classified as problem gamblers based upon scores on the CPGI (Ferris & Wynne, 2001). Students who agreed to participate in this study were compensated $10 CAD for their time, or offered course credit if enrolled in an introductory Psychology course. All participants were then debriefed regarding the purpose of the study (see Appendix C), and asked for permission to be contacted for future (e.g., follow-up) studies.

**Measures**

Participants completed a number of questionnaires assessing appraisals of gambling (Peacock & Wong, 1990), depressive symptoms (Beck, 1967), coping styles (Matheson & Anisman, 2003), impulsivity (Barratt, 1965), illusions of control (Steenbergh, Meyers, May & Whelan, 2002), beliefs in personal luck (Darke & Freedman, 1997), attitudes towards seeking treatment (Fischer & Turner, 1970) and problem gambling symptoms (Ferris & Wynne, 2001). Measures were re-administered at 6 and 12 month follow-up sessions to assess any changes in these variables over time (see Appendix B for complete questionnaire package).

**Problem gambling symptoms.** The 9-item Canadian Problem Gambling Index (CPGI-9; Ferris & Wynne, 2001) was used to assess the presence and severity of gambling problems among participants. The CPGI-9 contains five items that assess problem gambling behaviour (e.g., “Have you bet more than you could really afford to lose?”) and four items addressing the consequences of gambling (e.g., “Has gambling caused you any health problems, including stress or anxiety?”). Participants were asked to rate items on a 4-point Likert scale, with 1 representing ‘Never’ and 4 representing ‘Almost Always’. Items were then re-calibrated on a 0 to 3 scale, and
summed to yield a composite score of gambling pathology. Scores ranged from 0 to 23 ($M = 1.54$, $SD = 2.77$). Based upon this score, individuals were classified into one of three levels of gambling involvement. Participants with a total score of 0 were classified as ‘non-problem’ gamblers, those with a total score ranging from 1 to 2 were classified as ‘low-risk’ gamblers, and participants with a total score above 3 were classified as ‘moderate-risk/problem’ gamblers. As in previous research (e.g., Ferris & Wynne, 2001), the CPGI-9 demonstrated high internal consistency reliability in the present sample (Cronbach’s $\alpha = .86$).

**Perceptions of personal luck.** The 12-item Belief in Good Luck Scale (BIGL; Darke & Freedman, 1997) was used to assess the extent to which participants perceived themselves to be personally lucky when gambling. Participants were asked to read a series of statements (e.g., “I am likely to win when gambling because I am lucky”) and to indicate their agreement on a scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Responses were summed and a mean calculated to create an overall score. Scores ranged from 1 to 5 ($M = 2.23$, $SD = 0.70$), with higher scores indicating greater perceptions of personal luck. Internal consistency reliability for this scale was high in the present study (Cronbach’s $\alpha = .82$).

**Illusions of control over winning.** The 10-item illusion of control subscale of the Gamblers’ Beliefs Questionnaire (GBQ; Steenbergh, Meyers, May & Whelan, 2002) was used to assess participant’s perceptions of personal skill and control over gaming outcomes. Items (e.g. “My choices or actions affect the outcome of the game on which I am betting”) were rated on a 5-point Likert scale, with 1 representing ‘Strongly Disagree’ and 5 representing ‘Strongly Agree’. Responses were summed and a mean score was calculated, with higher scores representing greater illusions of control over winning. Mean scores ranged from 1 to 5 ($M = 2.04$, $SD = .86$).
Subscale items yielded high internal consistency reliability in the current sample (Cronbach’s α = .91).

Appraisals of gambling. The 37-item Stress Appraisal Measure (SAM; adapted from Peacock & Wong, 1990) was used to assess primary appraisals of Challenge (e.g., “Is my gambling going to have a positive impact on me?”), Threat (e.g., “How threatening is my gambling behaviour?”), Control by self (e.g., “Do I have what it takes to do well when I gamble?”), Control by others (e.g., “Is there anyone who can help me manage problems arising from my gambling?”), and Uncontrollability (e.g., “Is my gambling behaviour uncontrollable?”) in response to gambling. Items were rated on a 5 point Likert scale, with 1 representing ‘Not at All’ and 5 representing ‘Extremely / Very Much’. Responses were summed and a mean score calculated for each subscale, with higher scores representing greater endorsement of the given appraisal. All SAM subscales demonstrated adequate reliability and internal consistency in the present study (Challenge α = .55; Threat α = .85; Control by others α = .91; Control by self α = .78; Uncontrollability α = .58).

Coping strategies. The 50-item Survey of Coping Profiles Endorsed (SCOPE; Matheson & Anisman, 2003) was used to assess participants’ use of various coping strategies along three primary dimensions: Problem-focused (e.g., social support seeking, problem solving, cognitive restructuring), Emotion-focused (e.g., rumination, emotional expression/emotional containment, wishful thinking) and Avoidance (e.g., active distraction, avoidance). These coping strategies have demonstrated high internal consistency and a stable factor structure across samples (e.g., Mantler, Matejicek, Matheson & Anisman, 2005). Participants were asked to read a series of questions (e.g., “Ordinarily, in recent weeks have you … talked to friends or relatives about your problems?”), and to respond to each item on a 5-point scale ranging from 0 (never) to 4 (almost
always). Responses were summed and a mean score calculated for each primary form of coping, with higher scores representing greater endorsement of the given coping strategy. As in previous research, coping subscales demonstrated high reliability in the present sample (Problem-focused $\alpha = .92$; Emotion-focused $\alpha = .94$; Avoidance $\alpha = .77$).

*Depressive symptoms.* The Beck Depression Inventory (BDI; Beck, 1967) was used to assess presence and severity of depressive symptoms among participants. This 21 item self-report questionnaire assesses a wide range of depressive cognitions, including Self-Dislike (e.g. “I hate myself”), Sense of Failure (e.g. “I feel I am a complete failure as a person”), and Suicidal Wishes (e.g. “I would kill myself if I could”). Participants were asked to read 21 groups of statements corresponding to each of 21 symptoms, and to select one statement from each group which best corresponded with their feelings. Items were rated on a 4 point Likert scale, with 0 representing low symptom intensity (e.g. *I do not feel sad*) and 3 representing high symptom intensity (e.g. *I am so sad or unhappy that I can’t stand it*). Responses were summed, with higher scores representing a higher frequency and intensity of depressive symptoms. Scores ranged from 0 to 56 ($M = 8.08, SD = 8.49$). As in previous research (e.g., Beck, Steer & Garbin, 1988; Beck, Steer & Brown, 1996), the BDI demonstrated high reliability in the current sample (Cronbach’s $\alpha = .91$).

*Impulsivity.* The 30-item Barratt Impulsiveness Scale (BIS; Barratt, 1965) was used to assess trait impulsivity along 4 dimensions: general impulsivity (e.g., “I make up my mind quickly”), cognitive/attentional impulsivity (e.g., “I have outside thoughts when thinking”), behavioural impulsivity (e.g., “I buy things on impulse”), and impulsivity related to non-planning (e.g., “I act on the spur of the moment”). Items were rated on a 4-point Likert scale, with 1

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2 Participants scoring 2 or above on item 9 of the BDI (Suicidal Wishes) were identified during the test session, and were encouraged to seek counseling through Carleton University Health and Counseling Services.
representing ‘Rarely/Never’ and 4 representing ‘Almost Always’. Responses were summed and a mean calculated for each subscale. All subscales demonstrated adequate reliability and internal consistency in the present study (General $\alpha = .83$; Cognitive/Attentional $\alpha = .70$; Behavioural $\alpha = .68$; Non-planning $\alpha = .65$).

*Attitudes towards seeking treatment.* The 29-item Attitudes toward Seeking Psychological Help scale (ATST; adapted from Fischer & Turner, 1970) was used to gauge participant’s beliefs and attitudes toward seeking professional treatment for gambling problems. Participants were asked to rate their agreement or disagreement with a series of statements, (e.g., ‘If I believed I had a serious gambling problem, my first inclination would be to get professional attention’). Responses where anchored at 0 (*disagree*) and 3 (*agree*), with higher scores representing more positive attitudes toward seeking professional help for gambling behaviour. Mean responses ranged from 0.29 to 3.00 ($M = 1.87$, $SD = 0.41$). Internal consistency reliability for this scale was high in the present sample (Chronbach’s $\alpha = .84$).

**Results and Discussion**

*Associations between variables*

A series of bivariate correlations were examined to identify the strength and direction of the relationship between measured variables. Supporting previous research (e.g., Wohl et al., 2005), we found that problem gambling symptoms were positively associated with both illusions of control over winning ($r = .52$) and perceptions of personal luck ($r = .31$), such that higher perceptions of luck and control were associated with greater gambling symptoms. Problem gambling symptoms were also positively associated with the use of emotion and avoidance based coping strategies, depressive symptoms, and with the tendency to appraise gambling as a challenge or as a threat. As expected, problem gambling symptoms correlated *negatively* with
attitudes towards seeking treatment, indicating that greater symptomatology was associated with more negative views towards seeking help for gambling-related problems (see Table 1 for a summary of bivariate correlations).

Table 1. Correlations between measured variables.

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<td>1. Problem Gambling Symptoms (CPGI)</td>
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<td>2. Depressive Symptoms</td>
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<td>3. Perceptions of Luck</td>
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<td>4. Problem Coping</td>
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<td>5. Emotion Coping</td>
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<td>6. Avoidant Coping</td>
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<td>7. Threat</td>
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<td>8. Challenge</td>
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<td>9. Uncontrollable</td>
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<td>10. Attitudes toward seeking Treatment</td>
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<td>11. Illusion of control</td>
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*p < .05; **p < .01

Positive expectancies and appraisals of gambling

Heirarchical linear regression was used to test the hypothesis that positive expectancies and appraisals regarding gambling would predict greater problem gambling symptomatology. Based upon previous research (Matheson et al., 2009), it was expected that individuals’ personal expectations might influence subsequent appraisals of gambling, and specifically that positive expectations would encourage appraisals that perpetuated gambling behaviour. In order to examine this relationship, expectancies of gambling (illusion of control, perceptions of luck) were entered in the first block of the analysis, and appraisals of gambling (centrality, challenge, threat, controllable by self, controllable by others, uncontrollable) were entered in the second step. As hypothesized, positive expectancies significantly predicted problem gambling
symptoms, $F(2, 1968) = 390.71, p < .01, r^2 = .28$. Specifically, individuals who endorsed high illusions of control over winning ($t = 15.51, p < .01$) and who tended to perceive themselves as personally lucky ($t = 2.23, p = .03$) demonstrated greater problem gambling symptoms than those who did not have such expectancies.

Individuals’ appraisals of gambling were then entered in to the model, and these appraisals accounted for an additional 18.8% of the variance in problem gambling symptoms, over and above the effect of gambling expectancies, $F(8, 1962) = 219.00, p < .01$. Participants who appraised gambling as a threat ($t = 14.12, p < .01$) and beyond anyone’s control ($t = -4.25, p < .01$) experienced problem gambling symptoms to a greater extent than those who did not endorse these appraisals. These results support the hypothesis that positive expectancies regarding gambling contribute to individuals’ appraisals of the gaming environment, and suggest that expectancies and appraisals of gambling uniquely contribute to the development of gambling pathology.

Impulsivity and depressive symptoms

Multiple linear regression was used to test the hypothesis that dispositional factors, including impulsivity and prior depressive symptoms, would predict problem gambling symptoms. Impulsivity (general, non-planning, behavioural, cognitive), and depressive symptoms (BDI total score) were examined as predictor variables. In this analysis, depressive symptoms and impulsivity significantly predicted problem gambling symptoms, $F(5, 1998) = 35.79, p < .01, R^2 = .082$. Specifically, greater depressive symptoms ($t = 6.25, p < .01$) and high behavioural impulsivity ($t = 2.74, p = .01$) were predictive of problem gambling symptoms in this sample. Interestingly, general impulsivity ($p = .19$), impulsivity related to non-planning ($p = .20$), and cognitive impulsivity ($p = .40$) were not significantly associated with problem gambling
symptoms. It appears, therefore, that impulsivity in general may not be a sensitive predictor of gambling symptoms; rather, the development of these symptoms may be preceded by a specific tendency towards behaviourally-based, impulsive actions.

Coping strategies and attitudes towards seeking treatment

Multiple linear regression was used to determine if coping strategies predict attitudes towards seeking treatment for gambling. It was expected that more effective (e.g., problem-focused) coping strategies would be associated with a tendency towards active, positive views towards seeking treatment, while avoidance and emotion-based coping would predict negative views towards help-seeking. As hypothesized, coping strategies significantly predicted attitudes towards seeking treatment, $F(3, 1992) = 100.85, p < .01, R^2 = .13$. Specifically, the use of problem-focused coping strategies significantly predicted willingness to seek treatment, $t = 16.65, p < .01$, while emotion-focused coping strategies were negatively associated with treatment seeking attitudes, $t = -11.44, p < .01$. Avoidant coping strategies (e.g., wishful thinking, passive resignation) were negatively associated with treatment seeking, although this relationship did not reach statistical significance ($p = .21$). These results are consistent with previous research (e.g., Bergevin, Gupta, Derevensky & Kaufman, 2006; Ledgerwood & Petry, 2006) that has demonstrated a relationship between poor (e.g., avoidant) coping strategies and problem gambling, and support the hypothesis that more active, problem centered coping styles are predictive of positive views towards treatment-seeking among young adults.

Group differences in predictor variables

As previously noted, reasons for gambling may differ across genders, and men and women may follow different routes towards disordered gambling (e.g., Greenberg, Lewis & Dodd, 1999; Ladd & Petry, 2002; Nower, Derevensky & Gupta, 2004). In order to investigate
these processes, a series of MANOVAs were used to assess group (non-problem, at-risk and problem gamblers) and sex differences on each of the predictor variable sets.

*Expectancies.* A between-subjects MANOVA was first used to determine if expectations of gambling (illusions of control and perceptions of luck) vary among individuals as a function of problem gambling symptomatology and sex. MANOVA revealed a significant gambling severity x sex interaction, indicating that gamblers differed significantly on the composite expectancy measure as a function of these two variables, $F(4, 3968) = 7.33, p < .01$, partial $\eta^2 = .01$. The main effects of gambling symptomatology, $F(4, 3968) = 152.73, p < .01$, partial $\eta^2 = .13$ and sex, $F(4, 3968) = 40.05, p < .01$, partial $\eta^2 = .04$ were also significant.

Following the significant omnibus test, post-hoc tests were performed to identify which pairs of groups differed on the composite DV. Separate multivariate tests (Hotelling’s $T^2$) were used to assess pairwise comparisons between non-problem, low-risk and problem gamblers on the composite dependent measure.footnote3 These post-hoc tests revealed that non-problem gamblers differed significantly from low-risk gamblers on the composite expectancy measure, $F(2, 1561) = 122.85, p < .01$, partial $\eta^2 = .14$. Similarly, low-risk gamblers differed from problem gamblers, $F(2, 861) = 44.97, p < .01$, partial $\eta^2 = .10$, and non-problem gamblers differed significantly from problem gamblers, $F(2, 1543) = 339.04, p < .01$, partial $\eta^2 = .31$.

Univariate ANOVAs were then examined for each significant pairwise comparison to determine which of the dependent variables these groups differed on. In terms of gambling symptomatology, univariate ANOVA revealed that non-problem gamblers ($M = 1.64, SD = .64$) endorsed fewer illusions of control than did low-risk gamblers ($M = 2.30, SD = .76$), $F(1, 1562) = 245.19, p < .01$, partial $\eta^2 = .14$. Non-problem gamblers also reported fewer perceptions of

footnote3 Following recommendations by Stevens (2002), the overall $\alpha$ was set at .15 and divided by the number of comparisons being made in order to preserve the familywise error rate (resulting in $\alpha = .03$).
personal luck \((M = 2.06, SD = .59)\) compared to low-risk gamblers \((M = 2.30, SD = .68)\), \(F(1, 1562) = 38.10, p < .01\), partial \(\eta^2 = .02\). A significant pathology by gender interaction was also observed for illusions of control, \(F(1, 1562) = 6.41, p = .01\), partial \(\eta^2 = .004\), indicating that although control perceptions were associated with greater problem gambling symptoms, this effect was stronger for males than it was for females.

As expected in regards to the second pairwise comparison, univariate ANOVA indicated that low-risk gamblers \((M = 2.30, SD = .76)\) endorsed fewer illusions of control than problem gamblers \((M = 2.86, SD = .83)\), \(F(1, 862) = 76.52, p < .01\), partial \(\eta^2 = .08\). These individuals also reported significantly fewer luck-related perceptions \((M = 2.30, SD = .68)\) than did problem gamblers \((M = 2.61, SD = .80)\), \(F(1, 862) = 40.99, p < .01\), partial \(\eta^2 = .05\).

In the third and final comparison, non-problem gamblers \((M = 1.64, SD = .64)\) reported fewer illusions of control over winning than problem gamblers \((M = 2.86, SD = .83)\), \(F(1, 1544) = 653.50, p < .01\), partial \(\eta^2 = .30\) and fewer perceptions of personal luck \((M = 2.06, SD = .59)\) than problem gamblers \((M = 2.61, SD = .80)\), \(F(1, 1544) = 189.94, p < .01\), partial \(\eta^2 = .11\). A significant pathology by gender interaction was also observed for illusions of control, \(F(1, 1544) = 4.23, p < .01\), partial \(\eta^2 = .006\), and for perceptions of luck, \(F(1, 1544) = 3.46, p < .01\), partial \(\eta^2 = .005\). Interestingly, this interaction indicates that while perceptions of control and luck in general are associated with greater problem gambling symptoms, males and females differ in these expectations. Specifically, illusions of control were associated with greater symptomatology among males, while perceptions of personal luck were associated with greater problem gambling symptoms among women. See Figures 1 and 2 for a summary of this interaction.
Figure 1. Illusion of control scores by sex and gambling group.

Figure 2. Perceived luck scores by sex and gambling group.
Appraisals. A between-subjects MANOVA was then used to determine if appraisals of gambling (as a threat, a challenge, central to the individual, or as uncontrollable by the self or others) vary among individuals as a function of problem gambling symptoms and sex. MANOVA revealed a significant gambling severity x sex interaction, indicating that gamblers differed significantly on the composite appraisal measure as a function of these variables, $F(12, 3898) = 2.25$, $p = .01$, partial $\eta^2 = .01$. The main effects of gambling symptomatology, $F(12, 3898) = 50.71$, $p < .01$, partial $\eta^2 = .14$ and sex, $F(12, 3898) = 7.46$, $p < .01$, partial $\eta^2 = .02$ were also significant.

Again, post-hoc tests were performed to identify which pairs of groups differed on the composite DV. Separate multivariate tests (Hotelling’s $T^2$) were used to assess pairwise comparisons between non-problem, low-risk and problem gamblers on the composite dependent measure. These post-hoc tests revealed that non-problem gamblers differed significantly from
low-risk gamblers on the composite appraisal measure, $F(6, 1527) = 23.11, p < .01$, partial $\eta^2 = .08$. Similarly, low-risk gamblers differed from problem gamblers, $F(6, 856) = 27.81, p < .01$, partial $\eta^2 = .16$, and non-problem gamblers differed significantly from problem gamblers, $F(6, 1508) = 106.10, p < .01$, partial $\eta^2 = .30$.

Univariate ANOVAs were then examined for each significant pairwise comparison to determine which of the dependent variables these groups differed on. In terms of gambling symptomatology, univariate ANOVA revealed that non-problem gamblers differed from low-risk gamblers on all types of gambling appraisals. Specifically, relative to non-problem gamblers, low-risk gamblers endorsed their gambling as being more central ($MD = .13, p < .01$), more controllable by the self ($MD = .59, p < .01$) and more controllable by others ($MD = .27, p < .01$).

In addition, low-risk gamblers viewed gambling as being more threatening ($MD = .15, p < .01$), and as presenting more of a challenge than did non-problem gamblers ($MD = .29, p < .01$)(see Table 2 for means and standard deviations). A significant pathology by sex interaction was also observed for challenge-oriented appraisals of gambling, $F(1, 1532) = 2.40, p = .03$, partial $\eta^2 = .03$, indicating that the relationship between challenge appraisals and gambling symptoms was stronger for males than it was for females. Interactions involving all other appraisal types were not statistically significant.

In regards to the second pairwise comparison, univariate ANOVA again indicated that low-risk gamblers differed from problem gamblers on appraisals of threat, $F(1, 861) = 128.36, p < .01$, partial $\eta^2 = .13$, challenge, $F(1, 861) = 70.94, p < .01$, partial $\eta^2 = .08$, self-control, $F(1, 861) = 21.47, p < .01$, partial $\eta^2 = .02$, centrality, $F(1, 861) = 128.44, p < .01$, partial $\eta^2 = .13$ and uncontrollability, $F(1, 861) = 42.33, p < .01$, partial $\eta^2 = .05$. Specifically, relative to low-risk gamblers, problem gamblers endorsed greater perceptions of centrality ($MD = .13, p < .01$), self-
control ($MD = .37, p < .01$), threat ($MD = .49, p < .01$), and challenge ($MD = .43, p < .01$).

Participants did not vary in their appraisals of gambling as controllable by others as a function of gambling group or sex ($p = .20$).

In the third comparison, non-problem gamblers differed significantly from problem gamblers on all appraisal measures, reporting lower levels of perceived threat, $F(1, 1513) = 432.23, p < .01$, partial $\eta^2 = .22$, challenge, $F(1, 1513) = 256.98, p < .01$, partial $\eta^2 = .15$, self-control, $F(1, 1513) = 174.53, p < .01$, partial $\eta^2 = .10$, other-control, $F(1, 1513) = 13.90, p < .01$, partial $\eta^2 = .01$, centrality, $F(1, 1513) = 280.92, p < .01$, partial $\eta^2 = .16$ and uncontrollability, $F(1, 1513) = 152.48, p < .01$, partial $\eta^2 = .09$. See Table 2 for a summary of means and standard deviations by group and sex.
Table 2. Summary of appraisal scores (M ± SD) by group and sex.

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Non-problem</td>
<td>Low-risk</td>
<td>Problem</td>
</tr>
<tr>
<td>Threat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.16 (.38)</td>
<td>1.36 (.47)</td>
<td>1.84 (.74)</td>
</tr>
<tr>
<td>Challenge</td>
<td>1.62 (.73)</td>
<td>1.98* (.73)</td>
<td>2.30 (.68)</td>
</tr>
<tr>
<td>Controllable (Self)</td>
<td>2.42 (1.11)</td>
<td>2.99 (.96)</td>
<td>3.26 (.89)</td>
</tr>
<tr>
<td>Controllable (Others)</td>
<td>3.10 (1.49)</td>
<td>3.24 (1.35)</td>
<td>3.25 (1.18)</td>
</tr>
<tr>
<td>Centrality</td>
<td>1.32 (.62)</td>
<td>1.45 (.61)</td>
<td>2.07 (.88)</td>
</tr>
<tr>
<td>Uncontrollable</td>
<td>1.15 (.39)</td>
<td>1.26 (.50)</td>
<td>1.46 (.61)</td>
</tr>
</tbody>
</table>

* = significant mean group difference, p < .05;
** = significant mean group difference, p < .001

Follow-up studies

Participants were contacted by telephone 6 and 12 months following the initial research session and asked to complete the set of questionnaires again to assess any changes in these variables over time. A total of 312 participants (107 male, 206 female) completed the 6 month follow-up, and 165 participants (51 male, 114 female) completed the 12 month follow-up. At the final (12 month) assessment period, a total of 85 non-problem, 50 low-risk and 31 problem gamblers provided valid responses and were available for comparison.

Changes in expectancies. Multi-level modeling (MLM) was used to assess changes associated with individuals’ responses over time. This technique was selected over ANOVA as it offers greater power, requires fewer statistical assumptions, and is flexible in cases with high attrition rates or unequal sample sizes (Raudenbush & Bryk, 2002; Tasca & Gallop, 2009). A two-level heirarchical model was used to assess the effect of individual difference variables...
(gender, impulsivity, depressive symptoms, problem gambling symptoms) on expectancies (illusions of control and perceptions of personal luck) over time. Based on the observed relationships between these variables at time 1, we expected that individuals would endorse greater expectancies of gambling over time as a function of behavioural impulsivity, depressive symptoms and level of gambling involvement. First-level units were expectancies assessed at baseline, 6 months and 12 months (e.g., the repeated measures variables). Second-level units were individual difference variables, including gender, impulsivity, problem gambling symptoms and depressive symptoms. Multi-level modeling was implemented through HLM, Version 6 (Raudenbush, Bryk & Congdon, 2000).

In the hypothesized model, variables at level 1 were declared to be random (i.e. time-varying) effects, and variables at level 2 (individual differences) were declared fixed effects. A random intercepts, random slopes model was specified, allowing us to examine both variability among participants on the repeated measures, as well as higher-order variability between participants (i.e., variability over time as a function of level 2 individual difference variables).

The full model including all predictors provided a significantly better fit to the data than the model including only intercepts (i.e., means), indicating that the independent variables as a group predicted changes in gambling expectancies over time better than examining variability in assessment times (level 1) or individuals (level 2) alone, $\chi^2 (4, N = 387) = 5527.63 - 4880.16 = 647.47, p < .01$.\footnote{The $\chi^2$ difference statistic was calculated by the equation deviance$_{null \ model} -$ deviance$_{full \ model}$, as per Raudenbush & Bryk (2002).}

Overall, mean illusion of control scores ($p = .09$) and perceptions of luck ($p = .15$) did not vary significantly among participants over the 3 assessment periods. When these observations were nested within level 2 variables, however, changes were observed as a function of individual
difference variables. Specifically, illusions of control tended to increase over time among participants with greater problem gambling symptoms, $t(2011) = 5.74, p < .01$, higher depressive symptoms, $t(2011) = 2.24, p = .03$, and among males, $t(2011) = -5.65, p < .01$. Illusions of control did not vary among participants as a function of impulsivity ($p = .49$, ns). Problem gambling symptomatology was the only variable that significantly predicted changes in perceptions of luck over time, $t(2011) = -2.41, p = .02$. Interestingly, the direction of this relationship was negative, such that greater gambling symptoms were associated with decreased perceptions of luck over time. It appears, therefore, that depressive symptoms, male gender and gambling involvement may encourage feelings of illusory control among young adults over time, but that prolonged gambling involvement may eventually predict decreases in perceptions of luck. See Table 3 for a summary of the final multilevel model including expectancies and individual difference variables.

Table 3. *Summary of two-level model of gambling expectancies, as a function of individual difference variables.*

<table>
<thead>
<tr>
<th>Random Effect</th>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>$t$ (df)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Illusion of control</td>
<td>Problem gambling symptoms</td>
<td>0.17</td>
<td>0.03</td>
<td>5.74 (2011)**</td>
</tr>
<tr>
<td></td>
<td>Sex</td>
<td>-0.62</td>
<td>0.11</td>
<td>-5.65 (2011)**</td>
</tr>
<tr>
<td></td>
<td>Depressive symptoms</td>
<td>0.01</td>
<td>0.01</td>
<td>2.24 (2011)*</td>
</tr>
<tr>
<td></td>
<td>Impulsivity</td>
<td>0.10</td>
<td>0.15</td>
<td>0.69 (2011)</td>
</tr>
<tr>
<td>Perceptions of Luck</td>
<td>Problem gambling symptoms</td>
<td>-0.02</td>
<td>0.01</td>
<td>-2.41 (2011)*</td>
</tr>
<tr>
<td></td>
<td>Sex</td>
<td>0.09</td>
<td>0.05</td>
<td>1.84 (2011)</td>
</tr>
<tr>
<td></td>
<td>Depressive symptoms</td>
<td>-0.01</td>
<td>0.01</td>
<td>-1.85 (2011)</td>
</tr>
<tr>
<td></td>
<td>Impulsivity</td>
<td>-0.02</td>
<td>0.06</td>
<td>-0.38 (2011)</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01
Changes in appraisals of gambling. Again, multi-level modeling (MLM) was used to assess changes in appraisals of gambling over time. In this analysis, appraisal scores (baseline, 6 and 12 months) were treated as level 1 variables, and individual difference variables (sex, impulsivity, depressive symptoms, problem gambling symptoms) were entered as fixed level 2 variables. Again, based on the role of appraisals observed in the initial survey study, we expected that individuals would endorse greater challenge and/or threat-based appraisals of gambling over time as a function of behavioural impulsivity, depressive symptoms, sex and level of gambling involvement.

As in the previous analysis, the full model including all predictors provided a significantly better fit to the data than the model including only intercepts, indicating that the independent variables as a group predicted changes in appraisals over time better than examining variability in assessment times or individuals alone, $\chi^2 (4, N = 1986) = 5499.28 - 5216.68 = 282.60, p < .01$.

Two of the four predictor variables were significantly associated with changes in challenge appraisals. Specifically, greater problem gambling symptoms, $t (1986) = 12.56, p < .01$ and male gender, $t (1986) = -5.28, p < .01$ predicted greater challenge appraisal scores over the 3 assessment periods. The effects of depressive symptoms ($p = .37$) and impulsivity ($p = .37$) were not associated with changes in challenge-based appraisals of gambling over time. No significant differences were observed in terms of either threat ($p = .56$) or uncontrollability appraisals ($p = .09$) over time. Although MANOVA previously revealed that problem gamblers endorsed greater challenge and threat appraisals relative to non-problem or low-risk gamblers, results of this analysis provide further information about the development of these appraisals over time. Specifically, it appears that challenge-based appraisals of gambling may increase and become
more entrenched over time as gambling behaviour becomes more problematic, and that this effect is especially prominent among males. Challenge appraisals, therefore, might perpetuate or reinforce gambling behaviour among young adults, and may forecast gambling problems to a greater extent than other types of appraisals.

Table 4. *Summary of two-level model of challenge-based appraisals of gambling, as a function of individual difference variables.*

<table>
<thead>
<tr>
<th>Random Effect</th>
<th>Fixed Effect</th>
<th>Coefficient</th>
<th>Standard Error</th>
<th>t (df)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge Appraisals</td>
<td>Problem</td>
<td>0.09</td>
<td>0.01</td>
<td>12.56 (1986)**</td>
</tr>
<tr>
<td></td>
<td>gambling</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>symptoms</td>
<td>-0.17</td>
<td>0.03</td>
<td>-5.28 (1986)**</td>
</tr>
<tr>
<td></td>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Depressive</td>
<td>0.002</td>
<td>0.002</td>
<td>0.91 (1986)</td>
</tr>
<tr>
<td></td>
<td>symptoms</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Impulsivity</td>
<td>0.03</td>
<td>0.03</td>
<td>0.89 (1986)</td>
</tr>
</tbody>
</table>

**p < .01

STUDY 2

In Study 1, we found that both positive expectancies (e.g., perceptions of luck, illusions of control) and favourable appraisals of gambling (as a challenge or as personally “controllable”) significantly predicted problem gambling symptoms among young adults. It remains unclear, however, if these positive expectancies promote greater subjective craving to gamble, greater physiological responses to gambling, or increased frequency of gambling among young adults. If individuals tend to appraise gambling favourably, for instance, and hold high expectations of winning, they may feel excitement at the thought of gambling and experience a greater desire or craving to gamble. Similarly, they may experience changes in neurochemical activity in anticipation of gambling, resulting in stable elevations of morning cortisol among problem gamblers (e.g., Matheson & Anisman, 2005). Importantly, heightened neurochemical reactivity and cravings to gamble might promote greater participation in gambling behaviour, and might
contribute to the onset or development of problem gambling symptoms. To investigate this relationship, Study 2 assessed the association between self-reported cravings for gambling, appraisals, and physiological stress responses among young adults over time. Specifically, the purpose of this study was to examine how gamblers appraise their situation on a daily basis, and the interplay between both psychological and physiological responses.

Based on previous research in our lab (Wohl, Young & Hart, 2005) and the observed relationship between positive outcome expectancies, appraisals and problem gambling symptoms in Study 1, we hypothesized that positive appraisals would predict a greater self-reported desire (i.e., craving) to gamble, and that these subjective feelings would be associated with greater corticoid activation in anticipation of gambling. Indeed, previous research has demonstrated that although physiological responses (e.g., cortisol circulation) are typically elevated in response to stressful stimuli (e.g., Sapolsky, Romero & Munck, 2000), these elevations might also occur in response to positive stimuli (e.g., Matheson & Anisman, 2005) and even in anticipation of positive stimuli (e.g., Merali, McIntosh & Anisman, 2004).

In our previous OPGRC funded research, we found that a subset of gamblers experienced elevations in cortisol in anticipation of gambling, and hypothesized that this reactivity might serve as a marker of vulnerability to gambling problems. It is unclear, however, if the degree of physiological reactivity experienced by gamblers is associated perceptions of ‘craving’ and problem gambling severity among young adults. Based upon these outstanding questions, the purpose of Study 2 was:

1) To determine if positive appraisals are associated with greater reported craving for gambling among young adults.

2) To determine if subjective craving levels vary among gamblers at different stages of
gambling pathology, and

3) To determine if variations in reported craving are associated with variations in diurnal cortisol (in particular, morning cortisol rise) among young adults.

Methods

Participants and procedure

A sub-sample of participants from Study 1 (n = 86) were randomly selected and asked to participate in a second study on gambling and stress. Individuals who agreed to participate were invited in to our lab to meet with a member of the research team, who provided detailed information and instructions regarding both the daily diary component of the study, and the collection of saliva samples for cortisol analysis (see Appendix D for interview and participant instructions). Participants completed an on-line daily questionnaire over a 3 week time period, in which they were asked to report craving, gambling-related thoughts and behaviours (as well as other stressors) experienced each day over the 3 week period. Participants were also asked to provide saliva samples on a weekly basis, allowing us to observe fluctuations in cortisol reactivity as a function of reported craving over time. A strength of this design is that it permits us to capture the dynamic nature of appraisal and coping processes “in the moment”, and to reduce retrospection bias (e.g., Bolger, Davis & Rafaeli, 2003). To enhance completion rates (Park, Armeli & Tennen, 2004), we encouraged participants to log on to the system at a convenient, set time each day (e.g., logging on after dinner) and offered either a financial incentive of up to $50 CAD, or course credit if participants were enrolled in an introductory Psychology course. To maximize compliance, participants received daily emails from a member

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5 Participants were awarded $1.50 CAD for each completed diary entry (21 days = $31.50), and the per diem was topped up to $5 for each of the 3 days of completed saliva samples. Thus, participants were awarded a total of up to $50 for completing all 21 diary entries, in addition to completing all saliva samples.
of the research team reminding them to complete their entry.

Saliva samples were collected on a total of 3 days one week apart, starting one week into the diary study. On these days, participants were asked to provide saliva samples upon waking and again 0.5, 1, 4, and 8 hours later. To ensure time precision, participants were given a beeper (with and option of vibrating or beeping) and were asked to activate their beeper upon waking. To provide saliva samples, participants were asked to hold a piece of sterile dental cotton in their mouths for 2 – 3 minutes until completely saturated, to place the saturated cotton in a test tube and freeze the saliva samples at the end of the day. A member of the research team collected all materials at the end of the 3-week period. Saliva samples were stored at –80°C for subsequent cortisol determinations, in duplicate, using a solid phase radio-immuno assay\textsuperscript{125}I kit (ICN Biomedicals) that has negligible cross-reactivity with other steroids. The procedure yields less than 8% inter- and intra-assay variability. In the online questionnaire portion of the study, participants were asked to complete a brief checklist of craving and gambling behaviours, as well as to report any other significant stressors they encountered that day (see Appendix F for questionnaire package). A total of 28 participants (32.6%) who completed the diary study were classified as non-problem gamblers, 27 participants (31.4%) were classified as low-risk gamblers, and the remaining 30 participants (35.3%) were classified as moderate-risk/problem gamblers. Of these participants, 81.4% (n = 70) provided a complete set of saliva samples for each of the 3 required days.

Measures

Gambling behaviours. This questionnaire was completed by participants each day, and simply asked participants to record any gambling activities they had participated in that day.
**Appraisals.** An abbreviated, 9-item version of the Stress Appraisal Measure (SAM; Peacock & Wong, 1990) was used to assess daily appraisals of gambling as a threat, a challenge or uncontrollable among participants. This is a shortened version of the appraisal measure used in Study 1 (see Study 1 methods for a detailed description).

**Craving.** The 10-item Gambling Related Urges Scale (GRUS; Young & Wohl, 2005) was used to assess self-reported craving to gamble among participants. Items (e.g., ‘All I want right now is to gamble’) were rated on a 6-point Likert scale, with 1 representing ‘Strongly Disagree’ and 7 representing ‘Strongly Agree’. Items were summed, with higher scores representing greater craving to gamble.

**Results and Discussion**

Linear regression was first used to test the hypothesis that positive appraisals would predict greater self-reported craving for gambling among young adults. This analysis revealed that appraisals significantly predicted craving at week 1, $F(3, 76) = 8.87, p < .01, R^2 = .26$, week 2, $F(3, 65) = 5.42, p < .01, R^2 = .20$ and week 3, $F(3, 65) = 7.14, p < .01, R^2 = .25$. Specifically, craving at week 1 was predicted by appraisals of gambling as a challenge ($p = .05$) and a threat ($p = .01$), such that greater subjective craving was associated with higher appraisals along these dimensions. At week 2, craving remained positively associated with perceptions of gambling as a threat ($p < .01$) and negatively associated with perceptions of uncontrollability ($p = .04$). In the third week, craving was significantly associated with challenge appraisals ($p < .01$). Again, there was a negative relationship between the tendency to appraise gambling as uncontrollable and self-reported craving, although this effect failed to reach statistical significance (see Table 5 for a summary of these effects).
Table 5. Summary of linear regression predicting self-reported craving from appraisals of gambling.

<table>
<thead>
<tr>
<th></th>
<th>Craving Week 1</th>
<th>Craving Week 2</th>
<th>Craving Week 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Challenge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>.24</td>
<td>.11</td>
<td>.37</td>
</tr>
<tr>
<td>SE</td>
<td>.12</td>
<td>.11</td>
<td>.13</td>
</tr>
<tr>
<td>t</td>
<td>2.02*</td>
<td>.97</td>
<td>2.97**</td>
</tr>
<tr>
<td>Threat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>.40</td>
<td>.49</td>
<td>.35</td>
</tr>
<tr>
<td>SE</td>
<td>.14</td>
<td>.15</td>
<td>.21</td>
</tr>
<tr>
<td>t</td>
<td>2.80**</td>
<td>3.34**</td>
<td>1.63</td>
</tr>
<tr>
<td>Uncontrollable</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>-.08</td>
<td>-.42</td>
<td>-.09</td>
</tr>
<tr>
<td>SE</td>
<td>.18</td>
<td>.19</td>
<td>.29</td>
</tr>
<tr>
<td>t</td>
<td>-.46</td>
<td>-.15*</td>
<td>-.33</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01

Daily craving and gambling behaviour

Logistic regression was then used to determine if higher reported craving to gamble did, in fact, predict increased gambling behaviour. Participants were asked to indicate each day if they had participated in any gambling activity (yes/no). This response was treated as a binary dependent variable, with craving scores serving as a predictor. Logistic regression indicated that craving significantly predicted gambling behaviour at week 1, $B = 1.24$, $SE = .50$, Wald $\chi^2 = 6.17$, $p = .01$. Specifically, for each unit increase in craving, participants were 3.44 times more likely to engage in gambling behaviour. This effect remained significant at week 2, $B = 1.09$, $SE = .46$, Wald $\chi^2 = 5.63$, $p = .02$ and at week 3, $B = .89$, $SE = .43$, Wald $\chi^2 = 4.42$, $p = .04$ with odds ratios of 2.98 and 2.44, respectively. These ratios indicate that for each unit increase in craving, individuals were approximately 2 ½ to 3 times more likely to engage in gambling behaviour over the 3 week assessment period. As expected, these results support a significant relationship between self-reported craving to gamble and subsequent behaviours.
Craving and neuroendocrine response

To assess whether self-reported craving was associated with a morning rise in cortisol among participants, a 3 x 5 mixed-measures analysis of variance (ANOVA) was conducted with level of gambling pathology (non-problem, at-risk, problem gamblers) and craving as between subjects factors, and cortisol level assessed at 5 time periods (upon awakening, ½, 1, 4 and 8 hours later) as a within subjects factor. This analysis indicated a main effect of cortisol among participants, $F(4, 48) = 23.34, p < .01$. Among all participants, cortisol increased significantly within the first half hour after waking, and gradually declined throughout the day (see Table 6 for means and standard deviations). This pattern of cortisol reactivity was anticipated based on previous research (e.g., Wohl, Young & Hart, 2005). The main effects of craving ($p = .86$) and gambling group ($p = .47$) were non-significant, indicating that individuals experienced similar cortisol patterns throughout the day, regardless of their level of gambling involvement or self-reported craving to gamble.
Table 6. Cortisol (M ± SD) by gambling group.

<table>
<thead>
<tr>
<th></th>
<th>Waking</th>
<th>+ ½ hour</th>
<th>+ 1 hour</th>
<th>+ 4 hours</th>
<th>+ 8 hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-problem</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gamblers</td>
<td>M= 2.29**</td>
<td>M= 2.94**</td>
<td>M= 3.09</td>
<td>M= 2.00</td>
<td>M= 1.66</td>
</tr>
<tr>
<td></td>
<td>SD= 1.53</td>
<td>SD= 1.20</td>
<td>SD= 1.29</td>
<td>SD= .70</td>
<td>SD= .67</td>
</tr>
<tr>
<td>Low-risk</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gamblers</td>
<td>M= 1.73**</td>
<td>M= 2.44**</td>
<td>M= 2.35</td>
<td>M= 1.71</td>
<td>M= 1.21</td>
</tr>
<tr>
<td></td>
<td>SD= 1.01</td>
<td>SD= 1.25</td>
<td>SD= 1.37</td>
<td>SD= 1.06</td>
<td>SD= .65</td>
</tr>
<tr>
<td>Problem</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>gamblers</td>
<td>M= 1.96**</td>
<td>M= 2.53**</td>
<td>M= 2.23</td>
<td>M= 1.69</td>
<td>M= 1.20</td>
</tr>
<tr>
<td></td>
<td>SD= .78</td>
<td>SD= .77</td>
<td>SD= .55</td>
<td>SD= .84</td>
<td>SD= .43</td>
</tr>
</tbody>
</table>

**p < .01

STUDY 3: Virtual Reality Casino Study

Although craving to gamble was not significantly associated with increases in cortisol in Study 2, individuals did not necessarily gamble on the days that they provided craving information, nor were cortisol measurements tied to gambling behaviour. As such, it is possible that the effect of craving on cortisol reactivity was muted in this study, or that individuals were too far removed from a genuine gambling environment to experience neurochemical effects. Furthermore, there may be features unique to the gaming environment that serve to enhance anticipation and/or craving to gamble. Indeed, previous research has indicated that game characteristics, particularly features that suggest a degree of skill, might influence individual’s appraisals, behaviours and neuroendocrine responses while gambling (Wohl et al., 2005). In order to investigate craving within a realistic gambling context, and to assess the role of game characteristics on craving, appraisals and gambling symptoms, Study 3 employed a virtual reality casino paradigm to assess how features of the gaming situation (extent of skill involved) interact with individual difference characteristics to influence anticipatory excitement, cravings, appraisals, and cortisol reactivity. In accordance with the pathways model of problem gambling...
(Blaszczynski & Nower, 2002), we hypothesized that characteristics of the gambler (illusory control, belief in luck) would interact with game characteristics (skill vs. chance) to influence appraisals and gambling persistence. Specifically, we expected that individuals who regarded themselves as personally “lucky” or being “in control” would demonstrate greater persistence when gambling, and that this effect would be especially high when individuals were playing skill-based games in which wins might reinforce beliefs in personal luck and control. We further expected that among problem gamblers, anticipation of gambling would trigger increased craving and cortisol levels.

Methods

Participants and procedure

Participants from the prospective portion of Study 1 were contacted by telephone and asked to participate in a virtual reality casino study. Individuals who agreed to participate ($N = 175$; 64 non-problem, 70 low-risk and 41 problem gamblers) were randomly assigned to play one of three different gambling games in a virtual reality casino. These games included: (1) slots (pure chance), (2) slots with a wheel stop mechanism (pure chance with an illusory control element), and (3) blackjack (chance plus an element of perceived skill). This random assignment of participants to gaming condition allowed for an assessment of short-term causal effects of gaming features (see Table 7 for a summary of participants assigned to each condition). Participants ranged from 17 to 47 years of age, with a mean age of 21.25 years ($SD = 4.28$ years). The majority of participants were male ($67\%, n = 122$).
Table 7. Summary of participants by condition and gambling group.

<table>
<thead>
<tr>
<th>Group</th>
<th>Slots (without stop button)</th>
<th>Slots (with stop button)</th>
<th>Blackjack</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-problem</td>
<td>23</td>
<td>19</td>
<td>22</td>
<td>64</td>
</tr>
<tr>
<td>Low-risk</td>
<td>27</td>
<td>21</td>
<td>22</td>
<td>70</td>
</tr>
<tr>
<td>Problem</td>
<td>13</td>
<td>13</td>
<td>15</td>
<td>61</td>
</tr>
<tr>
<td>Total</td>
<td>64</td>
<td>54</td>
<td>61</td>
<td>N = 175</td>
</tr>
</tbody>
</table>

Upon arrival at the laboratory, participants were informed that the purpose of the study was to investigate gambling behaviour using virtual reality software. Participants were then asked to read and sign a written informed consent (see Appendix H), and were given a period of 5 minutes for relaxation. Following this relaxation period, participants were asked to complete a series of questionnaires assessing craving (GRUS; Young & Wohl, 2005), mood (PANAS; Watson, Clark & Tellegen, 1988), appraisals (SAM; Peacock & Wong, 1990), illusions of control (GBQ; Steenbergh, Meyers, May & Whelan, 2002) and beliefs in good luck (BIGL; Darke & Freedman, 1997) (see Appendix I for questionnaire package).

Following completion of the questionnaire booklet, participants were invited to enter the virtual environment. In order to acclimatize to the virtual reality environment, participants were instructed to put on a head-mounted display (HMD) and explore a virtual downtown city environment for 3 minutes. Participants were then invited to enter the casino and begin playing their assigned game (slots, slots with stop button or blackjack). All participants were given 20 credits worth 25 cents each ($5) to play their assigned game.

Saliva samples were collected at 7 time periods to ascertain changes in circulating cortisol: upon waking (serving as a baseline measure), 30 minutes post-waking, 1 hour prior to the lab session, 20 minutes and 1 minute prior to gambling (to capture acute cortisol increases in anticipation of gambling), and again 15 and 30 minutes after gambling to identify patterns of
decline in cortisol reactivity (see Figure 3 for cortisol timeline). As described in the previous study, cortisol samples were stored at -80°C and analyzed using a solid phase radio-immuno assay ¹²⁵I kit (ICN Biomedicals). Students enrolled in Introductory Psychology were given the option of receiving a 1% grade increase and $10 CAD, or receiving financial compensation only in the amount of $20 CAD. Participants not enrolled in Introductory Psychology were compensated $20 CAD.

*Figure 3. Timeline of saliva sample collection*

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waking</td>
<td>½ hour post-waking</td>
<td>1 hour prior to lab session</td>
<td>20 minutes prior to gambling (anticipation)</td>
<td>1 minute prior to gambling (anticipation)</td>
<td>15 minutes after gambling (decline)</td>
<td>½ hour after gambling (decline)</td>
<td></td>
</tr>
</tbody>
</table>

*Measures*

**Problem gambling symptoms.** As described in Study 1, the 9-item Canadian Problem Gambling Index (CPGI-9; Ferris & Wynne, 2001) was used to assess the presence and severity of gambling problems among participants. Participants rated items on a 4-point Likert scale, with 1 representing ‘Never’ and 4 representing ‘Almost Always’. Items were then re-calibrated on a 0 to 3 scale, and summed to yield a composite score of gambling pathology. Scores ranged from 0 to 18 (M = 3.37, SD = 3.54). Based upon this score, individuals were classified as ‘non-problem’ gamblers (total score of 0), ‘low-risk’ gamblers (total score ranging from 1 to 2), and ‘moderate-risk/problem’ gamblers (total score of 3 or higher). As in Study 1, the CPGI-9 demonstrated high internal consistency reliability in the present study (Cronbach’s α = .80).

**Perceptions of personal luck.** The 12-item Belief in Good Luck Scale (BIGL; Darke & Freedman, 1997) was used to assess the extent to which participants perceived themselves to be
personally lucky when gambling. Participants were asked to read a series of statements (e.g., “I am likely to win when gambling because I am lucky”) and to indicate their agreement on a scale ranging from 1 (Strongly Disagree) to 5 (Strongly Agree). Responses were summed and a mean calculated to create an overall score. Scores ranged from 1 to 5.67 (M = 3.03, SD = .99), with higher scores indicating greater perceptions of personal luck. Internal consistency reliability for this scale was high in the present study (Cronbach’s α = .83).

*Illusions of control over winning.* The 10-item illusion of control subscale of the Gamblers’ Beliefs Questionnaire (GBQ; Steenbergh, Meyers, May & Whelan, 2002) was again used to assess perceptions of control over gaming outcomes. Items were rated on a 5-point Likert scale, with 1 representing ‘Strongly Disagree’ and 5 representing ‘Strongly Agree’. Responses were summed and a mean score calculated, with higher scores representing greater illusions of control over winning. Mean scores ranged from 1 to 5 (M = 2.57, SD = .91). Subscale items yielded high internal consistency reliability in the current sample (Cronbach’s α = .90).

*Appraisals of gambling.* As described in Study 1, the 28-item Stress Appraisal Measure (SAM; adapted from Peacock & Wong, 1990) was used to assess primary appraisals of challenge, threat, control, and uncontrollability in response to gambling. Items were rated on a 5 point Likert scale, with 1 representing ‘Not at All’ and 5 representing ‘Extremely / Very Much’. Responses were summed and a mean score calculated for each subscale, with higher scores representing greater endorsement of the given appraisal. All SAM subscales demonstrated adequate reliability and internal consistency in the present study (Challenge α = .51; Threat α = .89; Control by others α = .91; Control by self α = .68; Uncontrollability α = .70).

*Craving.* A 22-item extended version of the Gambling Related Urges Scale (GRUS; Young & Wohl, 2005) was used to assess self-reported craving to gamble among participants.
Items (e.g., ‘All I want right now is to gamble’) were rated on a 6-point Likert scale, with 1 representing ‘Strongly Disagree’ and 7 representing ‘Strongly Agree’. Items were summed, with higher scores representing greater craving to gamble. As in study 1, this scale yielded high internal consistency reliability ($\alpha = .94$).

Mood. The 37-item Positive and Negative Affect Schedule (PANAS; Watson, Clark & Tellegen, 1988) was used to assess mood among participants. Participants were asked to read a series of 37 adjectives representing positive affect (e.g., happy, relaxed) or negative affect (e.g., tense, anxious, sad), and to rate the extent to which they currently felt each emotion. Responses were rated on an 11-point Likert scale, with 0 representing ‘Not at All’ and 10 representing ‘Extremely’. Responses were summed and a mean score calculated, with higher scores representing greater positive or negative mood.

Results and Discussion

Hierarchical linear regression was used to assess whether gambling symptoms were influenced by personal factors (i.e., expectancies and appraisals) and situational variables (i.e., game characteristics). In this analysis, appraisal dimensions (i.e., appraisals of threat, challenge, uncontrollability and centrality) were regressed onto gaming condition, followed by individual difference variables (perceptions of luck, illusion of control). Interactions between these variables were entered in the final stage of the analysis. This procedure allowed us to examine the extent to which expectancies and appraisals predicted problem gambling symptoms as a function of differences in game characteristics.

Results of this analysis indicated that participants did not differ on the number of problem gambling symptoms reported as a function of condition (i.e., type of game played) ($p = .42, ns$). When appraisal dimensions were regressed onto gaming condition, however, these combined
variables significantly predicted problem gambling symptoms, $F(7, 74) = 15.43, p < .01$. This model accounted for 59.3% of the variance in gambling symptoms. In particular, perceptions of gambling as a threat, $t = 4.65, p < .01$, or as uncontrollable, $t = 3.26, p < .01$ significantly predicted problem gambling symptoms. Expectancies regarding gambling (perceptions of luck and illusions of control) were then entered into the model, and accounted for an additional 13.4% of the variance in gambling symptoms, $F(9, 72) = 21.33, p < .01$. Specifically, illusions of control over winning were strongly and positively associated with greater symptomatology, $t = 5.15, p < .01$. Perceptions of luck were not significant in this model ($p = .61, ns$).

To assess variations in mood and gambling expectancies as a function of gambling group and condition, a series of 3 (gambling group) x 3 (gaming condition) MANOVAs were conducted. In the first analysis, MANOVA was used to determine if appraisals of gambling (as a threat, challenge, controllable by the self or others, or uncontrollable) vary among individuals as a function of group and gaming condition. MANOVA revealed a significant effect of gambling group, $F(12, 150) = 3.49, p < .01$, partial $\eta^2 = .22$. Post-hoc tests revealed that non-problem gamblers differed significantly from low-risk gamblers on the composite appraisal measure, $F(6, 44) = 3.20, p = .01$, partial $\eta^2 = .30$. Similarly, non-problem gamblers differed from problem gamblers, $F(6, 74) = 11.62, p < .01$, partial $\eta^2 = .49$. Low risk gamblers did not differ from problem gamblers, $p = .09, ns$.

Univariate ANOVAs revealed that low-risk gamblers appraised gambling as a challenge ($M = 2.28, SD = .73$) to a greater extent than non-problem gamblers ($M = 1.63, SD = .65$), $F(1, 49) = 11.29, p < .01$, partial $\eta^2 = .19$ and perceived their gambling as being personally controllable ($M = 3.17, SD = .69$) to a greater extent than non-problem gamblers ($M = 2.58, SD = .99$), $F(1, 49) = 8.64, p = .01$, partial $\eta^2 = .15$. As expected, non-problem gamblers also differed
from problem gamblers along these appraisal dimensions. Specifically, problem gamblers apraised gambling as a challenge ($M = 2.54, SD = .71$) to a greater extent than non-problem gamblers ($M = 1.63, SD = .65$), $F(1, 79) = 35.46, p < .01$, partial $\eta^2 = .31$. Problem gamblers also reported higher threat appraisals than non-problem gamblers ($M_{\text{problem}} = 2.00, SD = .75; M_{\text{nonprob}} = 1.19, SD = .36$), $F(1, 79) = 31.89, p < .01$, partial $\eta^2 = .29$, higher centrality appraisals ($M_{\text{problem}} = 2.24, SD = .88; M_{\text{nonprob}} = 1.34, SD = .47$), $F(1, 79) = 28.48, p < .01$, partial $\eta^2 = .27$ and higher self-control appraisals ($M = 3.43, SD = .76$) than non-problem gamblers ($M = 2.58, SD = .99$), $F(1, 79) = 24.57, p < .01$, partial $\eta^2 = .24$.

In the second analysis, mixed-measures ANOVA was used to determine if participant mood (positive and negative) varied among individuals as a function of group, gaming condition and time of assessment (pre vs. post gambling). ANOVA revealed a significant within-subjects effect of positive mood, $F(1, 120) = 374.77, p < .01$, partial $\eta^2 = .76$, and negative mood, $F(1, 120) = 31.58, p < .01$, partial $\eta^2 = .21$. Specifically, positive mood tended to decrease across participants from the beginning of the gambling session ($M = 3.29, SD = .95$) to the end of the session ($M = 3.03, SD = 1.23$). Similarly, negative mood tended to decrease across participants from the pre-gambling ($M = .85, SD = .99$) to the post-gambling assessment point ($M = .52, SD = .78$). It appears, therefore, that the virtual reality gambling task may have had a neutralizing effect on participant’s mood, regardless of their level of gambling involvement or the type of game they were assigned to play (see Table 8). Interactions involving gambling group and condition were non-significant in the present study.
Table 8. Positive mood (M ± SD) as a function of gambling group and condition.

<table>
<thead>
<tr>
<th></th>
<th>Slots (without stop)</th>
<th>Slots (with stop)</th>
<th>Blackjack</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Time 1 (Pre-gambling)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-problem</td>
<td>3.26 (.83)</td>
<td>3.76 (1.02)</td>
<td>3.04 (.98)</td>
</tr>
<tr>
<td>Low-risk</td>
<td>3.93 (.82)</td>
<td>2.47 (1.09)</td>
<td>3.53 (.92)</td>
</tr>
<tr>
<td>Problem</td>
<td>3.25 (.93)</td>
<td>3.48 (.70)</td>
<td>3.13 (.91)</td>
</tr>
<tr>
<td><strong>Time 2 (Post-gambling)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-problem</td>
<td>2.75 (1.16)</td>
<td>3.30 (1.42)</td>
<td>2.62 (1.09)</td>
</tr>
<tr>
<td>Low-risk</td>
<td>3.70 (.92)</td>
<td>2.54 (1.27)</td>
<td>2.85 (1.67)</td>
</tr>
<tr>
<td>Problem</td>
<td>3.29 (1.02)</td>
<td>3.12 (.95)</td>
<td>3.21 (1.32)</td>
</tr>
</tbody>
</table>

**Craving and game characteristics**

To examine the relationship between game characteristics and reported craving to gamble, we used a 3 x 3 x 2 mixed-measures ANOVA. Gambling group (non-problem, low-risk, problem gambler) and gaming condition (slots, slots with stop button, blackjack) were assessed as between-subjects variables, and craving to gamble (assessed at 2 time periods, before and after gambling) was examined as a within-subjects factor. This analysis revealed a significant main effect of gambling group, $F(2, 121) = 17.28, p < .01, \eta^2 = .22$. Post-hoc tests (Tukey’s HSD) indicated that problem gamblers ($M = 2.41, SD = 1.14$) reported significantly higher craving levels than either low-risk ($M = 1.82, SD = .93$) or non-problem gamblers ($M = 1.31, SD = .48$), collapsed across time and condition. The main effect of condition ($p = .39$) and the within-subjects main effect of craving ($p = .22$) were not significant in the present study, nor were any interactions involving these variables. These results suggest that reported craving levels overall were higher among problem gamblers than non-problem gamblers, but that craving was not significantly affected by the virtual reality gaming environment or the degree of skill present in the game being played.
Neuroendocrine responses

To examine the relationship between game characteristics and patterns in stress reactivity, participants’ cortisol and reported craving levels were assessed using a 3 x 2 x 3 x 7 mixed-measures ANOVA. Again, gambling group (non-problem, low-risk, problem gambler), craving scores (high vs. low reported craving) and gaming condition (slots, slots with stop button, blackjack) were assessed as between-subjects variables, and cortisol measurements collected across 7 time intervals were examined as a within-subjects factor. ANOVA revealed a significant main effect of cortisol over time, $F(6, 528) = 46.20, p < .01, \eta^2 = .34$, collapsed across gambling group, craving level and condition. An analysis of means indicated that cortisol levels increased among participants from baseline ($M = .59, SD = .33$) to 30 minutes post-waking ($M = .79, SD = .36$), followed by a gradual decrease in cortisol over the course of the day (see Table 9 and Figure 4 for a summary of this analysis). This supports the pattern of cortisol reactivity we observed among gamblers in Study 2, and suggests that although cortisol increased from baseline (waking) to 30 minutes later, it did not appear to increase prior to (or during) gambling in a virtual reality casino. The main effects of gambling group ($p = .58$), craving ($p = .41$) and game condition ($p = .98$) were non significant in this study, indicating that the pattern of cortisol change among participants did not vary as a function of gambling involvement, craving level or the type of game played.
Figure 4. Patterns of cortisol reactivity, by gambling group and participant condition.
STUDY 4: Virtual Reality Casino Study

Although results from Study 3 indicated that reported craving to gamble and rises in systemic cortisol did not vary as a function of game characteristics, individuals may vary considerably in the types games they prefer to play, and may respond differently when playing their preferred game versus another type of game. To address this possibility, a second lab study was conducted in which participants \( N = 153 \) were permitted to play their preferred game type (i.e., chance-based, skill-based), and the relations between appraisals, craving and gambling symptoms were assessed. Building upon results from the previous lab study, we expected that individuals would 1) demonstrate positive appraisals and exaggerated (e.g., heightened) craving levels when they played their favourite game (as opposed to being assigned to a game), and 2) appraise their gambling as being more controllable when it involved a degree of perceived skill versus chance.

Methods

Participants and procedure

As in Study 3, a sub-set of participants \( N = 153 \) from the initial survey study were randomly approached and asked to participate in a virtual reality gambling study. The questionnaire and gambling task procedures were identical to those described in Study 3, except that participants were permitted to play their preferred game type (slots, slots with stop button, blackjack), rather than having a game type randomly assigned to them by the research team. Participants were 17 to 49 years of age, with a mean age of 21.07 years \( (SD = 5.58 \text{ years}) \). Males (49.7%, \( n = 76 \)) and females (50.3%, \( n = 77 \)) were represented equally in this study. A total of 57 participants (\( n = 21 \) male, \( n = 36 \) female) were classified as non-problem gamblers, 36 participants (\( n = 18 \) male, \( n = 18 \) female) were classified as low-risk gamblers, and 59 (\( n = 37 \)
male, $n = 22$ female) participants were classified as problem gamblers based upon scores on the CPGI (Ferris & Wynne, 2001). Surprisingly, only 1 participant chose to play slots without the stop button feature. As such, the remaining analyses were conducted with respect to only 2 gaming conditions; slots with a stop button feature (chance with illusory control element) and blackjack (skill). See Table 10 for a summary of participants by gaming condition and gambling group.

Table 9. Summary of participants self-selected to each gaming condition.

<table>
<thead>
<tr>
<th>Group</th>
<th>Slots</th>
<th>Blackjack</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-problem</td>
<td>31</td>
<td>25</td>
<td>56</td>
</tr>
<tr>
<td>Low-risk</td>
<td>18</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td>Problem</td>
<td>34</td>
<td>25</td>
<td>59</td>
</tr>
<tr>
<td>Total</td>
<td>83</td>
<td>68</td>
<td>N = 151</td>
</tr>
</tbody>
</table>

Measures

*Problem gambling symptoms.* As described in Study 1, the 9-item Canadian Problem Gambling Index (CPGI-9; Ferris & Wynne, 2001) was used to assess the presence and severity of gambling problems among participants. As in Study 1, the CPGI-9 demonstrated high internal consistency reliability in the present study (Cronbach’s $\alpha = .82$).

*Perceptions of personal luck.* The 12-item Belief in Good Luck Scale (BIGL; Darke & Freedman, 1997) was used to assess the extent to which participants perceived themselves to be personally lucky when gambling. This is the same luck measure described in Study 1. Internal consistency reliability for this scale was high in the present sample (Cronbach’s $\alpha = .85$).

*Illusions of control over winning.* The 10-item illusion of control subscale of the Gamblers’ Beliefs Questionnaire (GBQ; Steenbergh, Meyers, May & Whelan, 2002) was again
used to assess perceptions of control over gaming outcomes. Subscale items yielded high internal consistency reliability in the current sample (Cronbach’s α = .91).

*Appraisals of gambling.* As described in Study 1, the 28-item Stress Appraisal Measure (SAM; adapted from Peacock & Wong, 1990) was used to assess primary appraisals of challenge, threat, control, and uncontrollability in response to gambling. All SAM subscales demonstrated adequate reliability and internal consistency in the present study (Challenge α = .82; Threat α = .77; Control α = .67; Uncontrollability α = .65).

*Craving.* As in Study 2, the abbreviated 9-item version of the Gambling Related Urges Scale (GRUS; Young & Wohl, 2005) was used to assess self-reported craving to gamble among participants. This scale again yielded high internal consistency reliability (α = .91).

*Mood.* The 37-item Positive and Negative Affect Schedule (PANAS; Watson, Clark & Tellegen, 1988) was used to assess mood among participants. See Methods sections from Study 1 and 2 for a detailed description of these measures.

Results and Discussion

As in Study 3, hierarchical linear regression was used to assess if appraisals, expectancies and game characteristics predicted problem gambling symptoms. In this analysis, appraisal dimensions (i.e., appraisals of threat, challenge, uncontrollability and centrality) were regressed onto gaming condition, followed by expectancy variables (perceptions of luck, illusion of control). Interactions between these variables were entered in the final stage of the analysis. This procedure allowed us to examine the extent to which expectancies and appraisals predicted problem gambling symptoms as a function of differences in self-selected game characteristics.

Results of this analysis indicated that participants did not differ on the number of problem gambling symptoms reported as a function of gaming condition (p = .07, ns). When appraisals
were regressed onto gaming condition in the second step of the analysis, however, these variables significantly predicted problem gambling symptoms, \( F(6, 104) = 16.20, p < .01 \). This model accounted for 48.3\% of the variance in problem gambling symptoms. An examination of individual parameters indicated that the tendency to appraise gambling as a threat, \( t = 4.28, p < .01 \), or as personally controllable, \( t = 2.68, p = .01 \) drove this effect, with greater perceptions of threat and personal control predicting increases in problem gambling symptoms. Expectancies regarding gambling (perceptions of luck and illusions of control) were then entered into the model. These expectancies accounted for a very small proportion of additional variance in problem gambling symptoms (6\%), and this effect failed to reach statistical significance, \( (F\Delta = .55, ns) \). It appears, therefore, that when gamblers were permitted to play their preferred type of game (chance vs. skill-based), appraisals of gambling played a larger role in gambling symptoms than did perceptions of personal luck or illusions of control over winning. Although the reason for this is unclear, it is possible that when individuals are permitted to choose a game, they may tend to focus more on aspects of this game and the gaming environment, and to focus less upon personal characteristics (i.e., personal “luckiness”).

A 3 (gambling group) x 2 (gaming condition) MANOVA was used to determine if appraisals of gambling vary among individuals as a function of group and gaming condition. MANOVA revealed a significant effect of condition, \( F(12, 282) = 1.85, p < .04 \), partial \( \eta^2 = .07 \). An examination of univariate ANOVAs and group means revealed that gamblers in the “chance” (i.e., slots) condition differed significantly from those in the “skill” (i.e., blackjack) condition on the composite appraisal measure, \( F(2, 145) = 5.88, p < .01 \), partial \( \eta^2 = .08 \). Specifically, gamblers who preferred to play blackjack appraised gambling as being more controllable by the self (\( M = 2.53, SD = .73 \)) than those who preferred to play slots (\( M = 2.39, SD = .77 \)). This
finding supports our hypothesis that individuals would appraise gambling as being more controllable when it involved a (perceived) degree of skill, and suggests that these game characteristics might influence gambling appraisals and subsequent behaviours. The main effect of gambling group was not significant in this analysis (\( p = .16 \)), indicating that participants did not differ in their appraisals of gambling as a function of their level of gambling involvement.

In the second analysis, mixed-measures ANOVA was used to determine if participant mood (positive and negative) varied among individuals as a function of group, gaming condition and time of assessment (pre vs. post gambling). ANOVA revealed a significant within-subjects effect of positive mood, \( F(1, 145) = 98.77, p < .01 \), partial \( \eta^2 = .41 \), and negative mood, \( F(1, 145) = 5.75, p = .02 \), partial \( \eta^2 = .04 \). As seen in Study 3, positive mood decreased among participants from the beginning of the gambling session (\( M = 3.23, SD = 1.04 \)) to the end of the session (\( M = 2.56, SD = 1.17 \)). A similar pattern was observed with negative affect, which decreased across participants from the pre-gambling (\( M = .85, SD = .81 \)) to the post-gambling assessment point (\( M = .69, SD = .86 \)). Once again, it appeared that the gambling task had a neutralizing effect on participant’s mood, regardless of their level of gambling involvement or the type of game they were assigned to play.

**Craving and game characteristics**

As in Study 3, we wished to examine the relationship between game characteristics and reported craving to gamble. A 3 x 2 x 2 mixed-measures ANOVA was used to test the hypothesis that craving would be heightened among gamblers when they were permitted to choose the type of game they wished to play (e.g., skill vs. chance-based). Gambling group (non-problem, low-risk, problem gambler) and gaming condition (slots, blackjack) were assessed as between-subjects variables, and craving to gamble (assessed at 2 time periods, before and after gambling)
was examined as a within-subjects factor. This analysis revealed a significant main effect of gambling group, $F(2, 145) = 3.33, p = .04$, partial $\eta^2 = .04$. As expected, post-hoc tests (Tukey’s) indicated that problem gamblers ($M = 2.54, SD = 1.17$) reported significantly higher craving levels than non-problem gamblers ($M = 2.06, SD = .75$), collapsed across time and gaming condition. A significant craving x condition interaction was also observed, $F(1, 145) = 4.75, p = .03$, partial $\eta^2 = .03$. An examination of means indicated that craving levels decreased from the beginning of the virtual reality gambling session to the end of the session, and that this effect was especially pronounced for individuals in the blackjack (skill) condition.

Figure 5. Craving x condition interaction.
General Discussion

It is apparent that problem gambling symptoms are on the rise among young adults in Ontario, with approximately 5% reporting pathological gambling and an additional 9% reporting sub-clinical gambling problems (e.g., Shaffer, Hall & Vender Bilt, 1997). This figure well exceeds the average population rate for pathological gambling in Ontario (1.6%), suggesting that this disorder is particularly acute among young adults. As such, the purpose of this research was to identify specific factors related to the development of problem gambling symptoms among young adults, and to suggest ways to curb problem gambling among this population.

Several risk factors for problem gambling have been explored in studies with older adults, including positive outcome expectancies (e.g., expectations of winning), appraisals of gambling, and cognitions regarding one’s personal ability, luck, or likelihood of success (e.g., Langer, 1975; Toneatto, Blitz-Miller, Calderwood, Dragonetti & Tsanos 1997; Wohl, Matheson & Anisman, 2004). This research has indicated that problem gamblers tend to have higher positive outcome expectancies than non-problem gamblers, expect fewer negative consequences of their behaviour, and are more likely to perceive that they are “lucky” or able to exert control over the outcome of their gambling (e.g., Wohl & Enzle, 2002; Wohl, Young & Hart, 2005). Despite these findings, however, very little research has focused prospectively on younger adults to establish causal effects and risk factors in the progression of problem gambling. The present research aimed to correct this deficit, and to prospectively monitor changes in gambling expectancies, appraisals and behaviour over time.

Based upon previous research with adult gamblers, we hypothesized that individual difference variables, including poor coping tendencies, depressive symptoms, impulsivity, and positive outcome expectancies would predict problem gambling symptoms among young adults
over time. We further predicted that situational variables (game characteristics) would encourage positive appraisals and expectancies of gambling, and would be associated with greater reported craving to gamble and heightened physiological responses (e.g., cortisol elevations) among young adults. This investigation builds upon our previous OPGRC funded research on gambling pathology, appraisal processes and perceived luck (e.g., Wohl, Anisman & Matheson, 2004; Wohl, Young & Hart, 2005) by adopting a longitudinal, multi-method approach. This strategy allowed us to capture changes in gambling symptoms over time, and to identify the role of previously acknowledged variables (i.e., appraisals and expectancies) in the evolution of problem gambling symptoms among young adults.

**Expectations, appraisals and problem gambling symptoms**

In line with previous research (Toneatto, Blitz-Miller, Calderwood, Dragonetti & Tsanos 1997; Wohl & Enzle, 2002; Wohl, Young & Hart, 2005), we found that positive outcome expectancies (illusions of control over winning, perceptions of personal luck) and challenge-based appraisals of gambling significantly predicted problem gambling symptoms among young adults. These findings reinforce the notion that illusions of control over winning (Langer, 1975; Moore & Ohtsuka, 1999) and heightened perceptions of personal luck (e.g., Wohl & Enzle, 2002) are important risk factors for problem gambling, and may be instrumental in the onset and progression of gambling behaviours.

In the longitudinal component of Study 1 (6 and 12 month follow-up sessions) we found that the tendency to appraise gambling as a challenge increased among participants over time in concert with problem gambling symptoms, and that this effect was especially pronounced among young men. These results highlight the importance of challenge appraisals among young gamblers, and suggest that these appraisals are both dynamic in nature and highly predictive of
problem gambling symptomatology over time. Studies 2 and 3 further supported these results, revealing that problem gamblers tended to appraise gambling as more challenging and controllable than either non-problem or low-risk gamblers, and that these favourable appraisals were associated with increases in problem gambling symptoms among young adults. Considering these studies together, it appears that challenge and control-related appraisals of gambling might represent important process variables that link personal (e.g., individual difference) characteristics to the emergence of problematic behaviours.

*Individual differences.* As in previous research (e.g., Brown & Coventry, 1997; Ladd & Petry, 2002), we found sex differences in both appraisals of gambling and outcome expectancies, with women endorsing greater perceptions of personal luck related to gambling, and men demonstrating greater challenge-based appraisals of gambling, greater behavioural impulsivity, and heightened illusions of control over winning. These results support the view advanced by the pathways model (Nower & Blaszczynski, 2004), as well as our own contention that individuals may follow different routes towards gambling pathology, and that the relative influence of risk factors may vary from person to person as a function of personal characteristics (e.g., sex) and circumstances (e.g., prior experiences, depressive symptoms). In our view, the importance of these differences cannot be overstated, as they carry important implications for the prevention and treatment of problem gambling. In particular, understanding how risk factors and behaviours differ between men and women might provide us with a deeper understanding of individuals’ motivations for gambling, and inform more effective ways to circumvent gambling problems at an individual level.

As expected, depressive symptoms were also associated with problem gambling symptoms and with the use of poor coping strategies among both sexes. In particular, depressive
symptoms were highly associated with avoidant coping strategies (i.e., wishful thinking) and with greater involvement in gambling. As depressive symptoms were present among a sub-set of participants at the outset of the study, and we were not able to experimentally manipulate this variable, the directionality of this effect is not clear. It is possible, for instance, that individuals suffering depressive symptoms during the course of this study engaged in gambling in order to escape from worries or stressors (e.g., Burger, Dahlgren & MacDonald, 2006). Conversely, it is possible that participation in gambling occurred first, and that depressive symptoms represented a consequence of gambling, rather than a vulnerability factor.

Pathological gambling is currently classified as an impulse control disorder in the DSM-IV (APA, 1994). As such, the role of trait impulsivity in problem gambling behaviour has been extensively examined and debated. Recent research has linked pathological gambling with both impulsive behaviours (Alessi & Petry, 2003) and low impulse control (Petry, 2001). Our research partially supports an association between impulsivity and problem gambling symptoms among young adults. In Study 1, we found that behavioural impulsivity was associated with greater problem gambling symptoms, however, other forms of impulsivity (e.g., non-planning, impulsive thoughts/cognitions) were not significant predictors of gambling involvement. It appears, therefore, that trait impulsivity must involve a behavioural component in order to have the capacity to influence problem gambling behaviour. In addition, although behavioural impulsivity was correlated with greater problem gambling symptoms in Study 1, this impulsivity did not appear to predict changes (i.e., increases) in problem gambling symptoms over time. Based on these results, it appears that trait impulsivity might influence initial participation in gambling (i.e., young adults who are highly impulsive might be more likely to gamble than those with low impulsivity), however, this variable does not appear to adequately explain or predict the
evolution of gambling from recreational to problematic levels. Stated differently, there may be a proportion of problem gamblers who demonstrate high behavioural impulsivity, but this trait in itself may be insufficient to predict the development of problem gambling symptoms.

Appraisals, expectancies and subjective craving

In addition to examining the relationship between appraisals, expectancies and problem gambling symptoms, we were also interested in determining if positive appraisals were associated with greater craving to gamble among young adults. As highlighted in Study 2, subjective craving tended to be higher among young gamblers when they appraised gambling as being personally controllable. The directionality of this relationship was consistent across the daily diary and virtual reality studies, suggesting that individuals who appraise gambling as controllable subsequently experience greater urges to gamble. Importantly, reported craving was also associated with increases in gambling behaviour among young adults. Individuals who reported greater craving levels in Study 2 also reported participating in gambling-related activities to a greater extent than those with low craving levels, and this effect persisted across the 3 week study period. It appears, therefore, that positive appraisals of gambling might not only encourage cravings to gamble, but that these cravings also influence the actual behaviours of young adults.

Although our previous research found a relationship between subjective craving and anticipatory increases in cortisol among problem gamblers (Wohl et al., 2006), this effect was not replicated in the present investigation. In fact, patterns of cortisol reactivity were similar across all participants, with cortisol peaking approximately ½ hour after waking, and declining gradually throughout the day. This effect was observed regardless of condition (i.e., type of game played), level of gambling pathology and level of reported craving.
The role of game characteristics. Given our previous finding that craving levels were elevated when individuals appraised gambling as being personally controllable, we hypothesized that craving would be particularly high when individuals played games that included an element of skill. We expected that when gamblers felt as though they could exert personal skill, they would tend to perceive the outcome of the game as more controllable, and that this perception might reinforce craving and predict increased neuroendocrine responses. This hypothesis was only partially supported in the present research. In study 4, individuals who played games with a level of skill involved (blackjack) did report experiencing a greater craving to gamble than did gamblers who played chance-based games (slots). As observed in Study 3, however, reported craving levels were not significantly associated with changes in cortisol levels among participants in a virtual reality setting. Although this finding was unexpected, it is possible that the virtual reality gaming environment was not salient enough to elicit a neurochemical response among participants, or that this effect would reach significance with a larger or more diverse sample.

Limitations

A primary limitation of this research is that it focused on an undergraduate student population, and (for clear ethical reasons), we were unable to randomly assign participants to gambling groups for the purpose of this research (e.g., non-problem vs. problem gambler). Although we were interested in examining gambling appraisals, beliefs and behaviours among young adults, and we believe that student populations provide a fair representation of many such individuals, we also recognize that studying undergraduates from a single university might limit our ability to generalize to other youth (e.g., those enrolled in different institutions or occupied with other vocational or non-academic pursuits). In order to examine differences among youth
more broadly, it would be desirable to conduct a study including young adults from the community (i.e., non-students) or from other academic institutions across Ontario.

Conclusion

In sum, the present research indicates that challenge and control-oriented appraisals of gambling play a key role in the development of problem gambling symptoms over time, and supports earlier contentions that personality and individual difference variables, in particular depressive symptoms and male gender, do in fact contribute to the development of gambling problems among young adults. Further research is needed to develop programs targeted at correcting inflated expectancies and appraisals among this population and reducing the prevalence of problem gambling symptoms.
References


Appendix A: Study 1 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: Personal experiences and gambling

Study Personnel: Dr. Michael Wohl, Department of Psychology, Carleton University
Phone: (613) 520-2600 ext 2908
Dr. Hymie Anisman, Department of Psychology, Carleton University
Phone: (613) 520-2699
Dr. Kim Matheson, Department of Psychology, Carleton University
Phone: (613) 520-2684

Other Research Personnel: Carolyn Barnes (cbarnes@connect.carleton.ca), Katherine Raspopow (kraspopo@connect.carleton.ca), Ritu Gill (ritu_gill7@hotmail.com), Matthew Young (mmyoung@connect.carleton.ca), Lisa Williams (lwilla3@connect.carleton.ca)

If you have any ethical concerns about how this study please contact Dr. C. Davis (Chair of the Carleton University Ethics Committee for Psychological Research, 520-2600, ext. 2251) or Dr. M. Gick (Acting Chair of the Department of Psychology at Carleton University, 520-2680, ext. 2648).

Purpose and Task Requirements: We are asking you to fill out a number of questionnaires regarding your background (e.g., family history), personal characteristics (e.g., how you cope with things in your life), and gambling (e.g., propensity to gamble and attitudes toward gambling). The questionnaires 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 that require focusing on a potentially stressful situation.

Anonymity/Confidentiality: In this questionnaire, we will be asking you to indicate whether or not you have been involvement in illegal activity (e.g., theft). We will not ask specifics about this behavior. Know that all the data collected in this study will be kept confidential. Because we will want to keep track of your answers in this questionnaire to match up with possible later measures, we will have to be able identify who you are on your questionnaire. We will do this using a personal code that you will develop momentarily. However, 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 personal experience and 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 B: Study 1 Questionnaires

Demographic and Background Information

Please fill out the following information about yourself and your background:

1. Age:

2. Gender (circle one): Male / Female

3. Marital Status (circle one):
   Never Married / Married / Separated / Divorced / Widowed / Common-Law (living together)
   1  2  3  4  5  6

4. Ethnicity (circle # from a-h below):
   a) Caucasian/European origin
   b) African-Canadian/American
   c) East Asian (Chinese, Japanese, Korean)
   d) South Asian (Indian, Pakistani, Sri Lankan, etc.)
   e) Middle Eastern
   f) Native Canadian/American
   g) Hispanic and South American Origin
   h) Other or multi-ethnic origin

5. Are you a resident of Ontario, Canada? (Circle one)
   YES  /  NO
   If NO, what country do you reside in? (circle one)
   1. Canada
   2. U.S.A.
   3. Other

6. Your current employment status (circle # from 1-4 below):
   1. Not employed
   2. Part-time
   3. Full-time
   4. Seasonal/Temporary/Contract

7. Has anything bad ever happened to you as a result of your gambling? (circle one)
   YES / NO (If NO, skip to question #8)
   If YES, please describe in one sentence

8. Would life be better if you gambled less? (circle one) YES / NO

9. Are you currently involved in any efforts to change your gambling (this question excludes
historical efforts)? (circle one)

YES / NO (If NO, skip to question #10)

If YES, what kinds of efforts? (circle all that apply to you)

a) formal treatment program
b) psychotherapy
c) Gamblers' Anonymous
d) Other gambling support group (not GA)
e) Self-help literature
f) Talking to friends, family members, significant others, parish priest, minister, other spiritual/community leader, etc.
g) quitting on your own without outside help
h) other efforts to change (please specify): ________________________________

10. In your lifetime, have you ever been to a meeting of gamblers Anonymous?

YES / NO (If NO, skip to question #11)

If YES, how old were you when you first went? ___________ years old

11. In your lifetime, have you ever been to a professional counselor (e.g. gambling specialist, social worker, psychologist, etc.) to help with your excessive gambling?

YES / NO (If NO, skip to question #12)

If YES, how old were you when you first went? ___________ years old

13. Do you currently gamble? (circle one from 'a' to 'd' below)

a) YES, I currently gamble
b) NO, I quit or cut back significantly within the last 6 months
c) NO, I quit or cut back significantly more than 6 months ago
d) NO, I have never gambled

14. For gamblers only: (if you have never gambled, please skip the following questions and proceed to the next section)

a. In the last year, how many times have you quit or significantly cut down on your gambling for at least 24 hours? ________________

b. Are you seriously thinking of quitting or cutting down on your gambling?

   a) YES, within the next 30 days
   b) YES, within the next 6 months
   c) NO, not thinking of quitting or cutting down

15. Have you ever smoked? (circle one) YES / NO (If No, skip to question #20)

16. Do you currently smoke? (circle one) YES / NO

17. Have you tried to quit smoking? (circle one) YES / NO (If No, skip to question #19)

18. How often have you tried to quit smoking ___________

19. Has anything bad ever happened to you as a result of your gambling?
20. Have you ever drunk alcohol? (circle one) YES / NO (If No, skip to question #6)

21. Do you currently drink alcohol? (circle one) YES / NO (If No, skip to next page)

22. Have you tried to quit drinking alcohol? (circle one) YES / NO (If No, skip to question #24)

23. How often have you tried to quit drinking alcohol __________

24. Has anything bad ever happened to you as a result of your drinking?

YES / NO (If No, skip to next page)

If YES, please describe in one sentence
Canadian Problem Gambling Index – 9-item Version (CPGI-9)

Instructions: THINK ABOUT THE LAST 12 MONTHS and tell us - as truthfully as you can - about your gambling. Some of the items may not seem to apply to you. In this case, answer 1 (for ‘Never’).

1. Have you bet more than you could really afford to lose?


2. Still thinking about the last 12 months, have you needed to gamble with larger amounts of money to get the same feeling of excitement?


3. When you gambled, did you go back another day to try to win back the money you lost?


4. Have you borrowed money or sold anything to get money to gamble?


5. Have you felt that you might have a problem with gambling?


6. Has gambling caused you any health problems, including stress or anxiety?


7. Have people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?


8. Has your gambling caused any financial problems for you or your household?


9. Have you felt guilty about the way you gamble or what happens when you gamble?

Belief in Good Luck Scale

1) I believe some people are luckier than others.

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2) I consider myself to be a lucky person.

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3) My wins are evidence that I have luck related to gambling.

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4) My luck helps me win.

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5) I am really lucky when I gamble.

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6) My luck plays an important part in my gambling.

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7) I feel secure about gambling, because I am a lucky person.

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8) I am not a lucky person.

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9) My luck influences the probability that I will win.

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10) I try to use my luck when I gamble.

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11) I am likely to win when gambling because I am lucky.

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12) I am not any luckier than other gamblers.

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Illusion of Control Scale

INSTRUCTIONS: Please indicate your agreement with these statements by circling the appropriate answer.

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<td>1</td>
<td>I think of gambling as a “challenge”.</td>
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<td>2</td>
<td>My knowledge and skill in gambling contribute to the likelihood that I will make money.</td>
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<td>3</td>
<td>My choices or actions affect the outcome of the game on which I am betting.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I keep track of previous winning bets so that I can figure out how I should bet in the future.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Gambling is more than just luck.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>My gambling wins are evidence that I have skill and knowledge related to gambling.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>I have a “lucky” technique that I use when I gamble.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Even though I may be losing with my gambling strategy or plan, I maintain that strategy or plan because I know it will eventually come through for me.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>I am pretty accurate at predicting when a “win” will occur.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>I have more skills and knowledge related to gambling than most people who gamble.</td>
<td>1 2 3 4 5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Personal Evaluation BIS-11**

People differ in the way they think, act or approach situations. These questions measure some ways in which you think or act. Read each statement and choose the corresponding number from the rating scale provided for each statement. Place your answer in the space provided.

<table>
<thead>
<tr>
<th></th>
<th>1 Rarely/Never</th>
<th>2 Occasionally</th>
<th>3 Often</th>
<th>4 Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I plan tasks carefully.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>I do things without thinking.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>I make up my mind quickly.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>I am happy-go-lucky.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>I don't &quot;pay attention&quot;.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>I have &quot;racing&quot; thoughts.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>I plan trips well ahead of time.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>I am self-controlled.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>I concentrate easily.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>I save regularly.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>I &quot;squirm&quot; at plays or lectures.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>I am a careful thinker.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>I plan for job security.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>I like to think about complex problems.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>I change jobs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.</td>
<td>I act &quot;on impulse&quot;.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.</td>
<td>I get easily bored when solving thought problems.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19.</td>
<td>I act on the spur of the moment.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.</td>
<td>I am a steady thinker.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21.</td>
<td>I change where I live.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.</td>
<td>I buy things on impulse.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23.</td>
<td>I can only think about one problem at a time.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24.</td>
<td>I change hobbies.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25.</td>
<td>I spend or charge more than I earn.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26.</td>
<td>I have outside thoughts when thinking.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27.</td>
<td>I am more interested in the present than the future.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28.</td>
<td>I am restless at lectures or talks.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>29.</td>
<td>I like puzzles.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30.</td>
<td>I plan for the future.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Stress Appraisal Measure

INSTRUCTIONS: This questionnaire concerns with your thoughts about your gambling behavior. Respond according to how you view this situation right NOW. Answer each question by CIRCLING the appropriate number corresponding to the following scale.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Slightly</td>
<td>Moderately</td>
<td>Considerably</td>
<td></td>
</tr>
</tbody>
</table>

1. Is this a totally hopeless situation?  
2. Does this situation create tension in me?  
3. Is the outcome of this situation uncontrollable by anyone?  
4. Is there someone or some agency I can turn to for help if I need it?  
5. Does this situation make me feel anxious?  
6. Does this situation have important consequences for me?  
7. Is this going to have a positive impact in me?  
8. How eager am I to tackle this problem?  
9. How much will I be affected by the outcome of this situation?  
10. To what extent can I become a stronger person because of this problem?  
11. Will the outcome of this situation be negative?  
12. Do I have the ability to do well in this situation?  
13. Does this situation have serious implications for me?  
14. Do I have what it takes to do well in this situation?  
15. Is there help available to me for dealing with this problem?  
16. Does this situation tax or exceed my coping resources?  
17. Are there sufficient resources available to help me in dealing?  
18. Is this beyond anyone’s power to do anything about this situation?  
19. To what extent am I excited thinking about the outcome of this situation?  
20. How threatening is this situation?  
21. Is the problem unresolvable by anyone?  
22. Will I be able to overcome the problem?  
23. Is there anyone who can help me manage the problem?
24. To what extent do I perceive this situation as stressful? 1 2 3 4 5
25. Do I have the skills necessary to achieve a successful outcome to this situation? 1 2 3 4 5
26. To what extent does this event require coping efforts on my part? 1 2 3 4 5
27. Does this situation have long-term consequences for me? 1 2 3 4 5
28. Is this going to have a negative impact on me? 1 2 3 4 5
COPING STRATEGIES SCALE

INSTRUCTIONS: The purpose of this questionnaire is to find out how people deal with their problems or the stresses in their lives. The following are activities that you may have done. After each activity, please indicate the extent to which you would use this as a way of dealing with problems or stresses in recent weeks.

<table>
<thead>
<tr>
<th>Ordinarily, in recent weeks have you</th>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Often</th>
<th>Almost always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. accepted that there was nothing you could do to change your situation?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2. tried to just take whatever came your way?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3. talked with friends or relatives about your problems?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4. tried to do things which you typically enjoy?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5. sought out information that would help you resolve your problems?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6. blamed others for creating your problems or making them worse?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7. sought the advice of others to resolve your problems?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8. blamed yourself for your problems?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9. exercised?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10. fantasized or thought about unreal things (eg., the perfect revenge, or winning a million dollars) to feel better?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>11. been very emotional compared to your usual self?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>12. gone over your problems in your mind over and over again?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>13. asked others for help?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>14. thought about your problems a lot?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>15. became involved in recreation or pleasure activities?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>16. worried about your problems a lot?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>17. tried to keep your mind off things that are upsetting you?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>18. tried to distract yourself from your troubles?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>19. avoided thinking about your problems?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>20. made plans to overcome your problems?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>21. told jokes about your situation?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>22. thought a lot about who is responsible for your problems (besides yourself)?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>23. shared humorous stories etc. to cheer yourself and others up?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>24. told yourself that other people have dealt with problems such as yours?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Ordinarily, in recent weeks have you

<table>
<thead>
<tr>
<th></th>
<th>Never</th>
<th>Seldom</th>
<th>Sometimes</th>
<th>Often</th>
<th>Almost always</th>
</tr>
</thead>
<tbody>
<tr>
<td>25. thought a lot about how you have brought your problems on yourself?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>26. decided to wait and see how things turn out?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>27. wished the situation would go away or be over with?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>28. decided that your current problems are a result of your own past actions?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>29. gone shopping?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>30. asserted yourself and taken positive action on problems that are getting you down?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>31. sought reassurance and moral support from others?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>32. resigned yourself to your problems?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>33. thought about how your problems have been caused by other people?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>34. daydreamed about how things may turn out?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>35. been very emotional in how you react, even to little things?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>36. decided that you can grow and learn through your problems?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>37. told yourself that other people have problems like your own?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>38. wished I was a stronger person or better at dealing with problems?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>39. looked for how you can learn something out of your bad situation?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>40. asked for God’s guidance?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>41. kept your feelings bottled up inside?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>42. found yourself crying more than usual?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>43. tried to act as if you were not upset?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>44. prayed for help?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>45. gone out?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>46. held in your feelings?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>47. tried to act as if you weren’t feeling bad?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>48. taken steps to overcome your problems?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>49. made humorous comments or wise cracks?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>50. told others that you were depressed or emotionally upset?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
BECK INVENTORY

On this questionnaire are groups of statements. Please read the entire group of statements of each category. Then pick out **ONE** statement in that group which best describes the way you feel. Check off the number beside the statement you have chosen.

| 1.   | ___ 0 = I do not feel sad  
|      | ___ 1 = I feel sad or blue  
|      | ___ 2a = I am blue or sad all of the time and I can't snap out of it  
|      | ___ 2b = I am so sad or unhappy that it is very painful  
|      | ___ 3 = I am so sad or unhappy that I can't stand it  
| 2.   | ___ 0 = I am not particularly pessimistic or discouraged about the future  
|      | ___ 1 = I feel discouraged about the future  
|      | ___ 2a = I feel I have nothing to look forward to  
|      | ___ 2b = I feel I won't every get over my troubles  
|      | ___ 3 = I feel that the future is hopeless and things cannot improve  
| 3.   | ___ 0 = I do not feel like a failure  
|      | ___ 1 = I feel I have failed more than the average person  
|      | ___ 2a = I feel I have accomplished very little that is worthwhile or that means anything  
|      | ___ 2b = As I look back on my life, all I can see is a lot of failures  
|      | ___ 3 = I feel I am a complete failure as a person  
| 4.   | ___ 0 = I am not particularly dissatisfied  
|      | ___ 1a = I feel bored most of the time  
|      | ___ 1b = I don’t enjoy things the way I used to  
|      | ___ 2 = I don’t get satisfaction out of anything anymore  
|      | ___ 3 = I am dissatisfied with everything  
| 5.   | ___ 0 = I don’t feel particularly guilty  
|      | ___ 1 = I feel bad or unworthy a good part of the time  
|      | ___ 2a = I feel quite guilty  
|      | ___ 2b = I feel bad or unworthy practically of the time now  
|      | ___ 3 = I feel as though I am very bad or worthless  
| 6.   | ___ 0 = I don’t feel I am being punished  
|      | ___ 1 = I have a feeling that something bad may happen to me  
|      | ___ 2 = I feel I am being punished or will be punished  
|      | ___ 3a = I feel I deserve to be punished  
|      | ___ 3b = I want to be punished  
| 7.   | ___ 0 = I don’t feel disappointed in myself  
|      | ___ 1a = I am disappointed in myself  
|      | ___ 1b = I don’t like myself  
|      | ___ 2 = I am disgusted with myself  
|      | ___ 3 = I hate myself  
| 8.   | ___ 0 = I do not feel I am any worse than anybody else  
|      | ___ 1 = I am very critical of myself for my weaknesses or mistakes  
|      | ___ 2a = I blame myself for everything that goes wrong  
|      | ___ 2b = I feel I have many bad faults  

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9. ___ 0 = I don’t have thoughts of harming myself  
___ 1 = I have thoughts of harming myself but I would not carry them out  
___ 2a = I feel I would be better off dead  
___ 2b = I have definite plans about committing suicide  
___ 2c = I feel my family would be better off if I were dead  
___ 3 = I would kill myself if I could

10. ___ 0 = I don’t cry anymore than usual  
___ 1 = I cry more now than I used to  
___ 2 = I cry all the time now. I can’t stop it  
___ 3 = I used to be able to cry but now I can’t cry at all even though I want to

11. ___ 0 = I am no more irritated now than I ever am  
___ 1 = I get annoyed or irritated more easily than I used to  
___ 2 = I get irritated all the time  
___ 3 = I don’t get irritated at all the things that used to irritate me.

12. ___ 0 = I have not lost interest in other people  
___ 1 = I am less interested in other people than I used to be  
___ 2 = I have lost most of my interest in other people and I have little feeling for them  
___ 3 = I have lost all my interest in other people and don’t care about them at all

13. ___ 0 = I make decisions about as well as ever  
___ 1 = I am less sure of myself now and try to put off making decisions  
___ 2 = I can’t make decisions anymore without help  
___ 3 = I can’t make decisions at all anymore

14. ___ 0 = I don’t feel I look any worse than I used to  
___ 1 = I am worried that I am looking old or unattractive  
___ 2 = I feel that there permanent changes in my appearance and they make me look unattractive  
___ 3 = I feel that I am ugly or repulsive looking

15. ___ 0 = I can work about as well as before  
___ 1a = It takes extra effort to get started at doing something  
___ 1b = I don’t work as well as I used to  
___ 2 = I have to push myself very hard to do anything  
___ 3 = I can’t do any work at all

16. ___ 0 = I can sleep as well as usual  
___ 1 = I wake up more tired in the morning than I used to  
___ 2 = I wake up 1-2 hours earlier than usual and find it hard to get back to sleep  
___ 3 = I wake up early every day and can’t get more than 5 hours sleep

17. ___ 0 = I don’t get anymore tired than usual  
___ 1 = I get tired more easily than I used to  
___ 2 = I get tired from doing anything  
___ 3 = I get too tired to do anything

18. ___ 0 = My appetite is no worse than usual  
___ 1 = My appetite is not as good as it used to be  
___ 2 = My appetite is much worse now  
___ 3 = I have no appetite at all any more
19. ___ 0 = I haven’t lost much weight, if any, lately
   ___ 1 = I have lost more than 5 pounds
   ___ 2 = I have lost more than 10 pounds
   ___ 3 = I have lost more than 15 pounds

20. ___ 0 = I am no more concerned about my health than usual
   ___ 1 = I am concerned about aches and pains or upset stomach or constipation or other unpleasant feelings in my body
   ___ 2 = I am so concerned with how I feel or what I feel that it’s hard to think of much else
   ___ 3 = I am completely absorbed in what I feel

21. ___ 0 = I have not noticed any recent change in my interest in sex
   ___ 1 = I am less interested in sex than I used to be
   ___ 2 = I am much less interested in sex now
   ___ 3 = I have lost interest in sex completely
Attitudes Toward Seeking Treatment

Instructions: Please indicate your agreement with the following statements by circling the appropriate response.

<table>
<thead>
<tr>
<th></th>
<th>0 = Disagree</th>
<th>1 = Probably disagree</th>
<th>2 = Probably agree</th>
<th>3 = Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Although there are programs for people with gambling problems, I would not have much faith in them.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>If a good friend asked my advice about a gambling problem, I might recommend that he/she see a counsellor.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>I would feel uneasy going to a counsellor because of what some people would think of me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>A person with a strong character can get over gambling problems by himself/herself, and would have little need of a counselor.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>There are times when I have felt completely lost and would have welcomed professional advice.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>Considering the time and expense involved in gambling treatment, it would have doubtful value for a person like me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>I would willingly confide intimate matters to an appropriate person if I thought it might help me or a member of my family.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>I would rather live with certain gambling problems than go through the ordeals of getting treatment.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>Gambling problems, like many things, tend to work out by themselves.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10.</td>
<td>There are certain problems that should not be discussed outside one’s immediate family.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11.</td>
<td>A person with a serious gambling problem would probably feel most secure in a good residential (in-patient) treatment program.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12.</td>
<td>If I believed I had a serious gambling problem, my first inclination would be to get professional attention.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>13.</td>
<td>Keeping one’s mind on a job is a good solution for avoiding personal worries and concerns.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>14.</td>
<td>Having been in treatment for gambling is a blot on a person’s life.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>15.</td>
<td>I would rather be advised by a close friend than by a gambling counsellor, even for a gambling problem.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>
16. A person with a gambling problem is not likely to solve it alone; he or she is most likely to solve it with professional help. 0 1 2 3

17. I resent a person – professional trained or not who wants to know about my personal difficulties. 0 1 2 3

18. I would want to get professional attention if I was worried or upset about my gambling behaviour for a long period of time. 0 1 2 3

19. The idea of talking about problems with a gambling counsellor strikes me as a poor way to get rid of a gambling problem. 0 1 2 3

20. A person who has had a gambling problem carries a burden of shame. 0 1 2 3

21. There are experiences in my life I would not discuss with anyone. 0 1 2 3

22. It is probably best not to know everything about oneself. 0 1 2 3

23. If I were experiencing a serious gambling problem at this point in my life, I would be confident that I could find relief by attending counselling. 0 1 2 3

24. There is something admirable in the attitude of a person who is willing to cope with his/her gambling problem without resorting to professional help. 0 1 2 3

25. At some future time I might want to have professional counseling. 0 1 2 3

26. A person should work out his or her own gambling problems; getting professional counselling would be a last resort. 0 1 2 3

27. Had I received treatment in a gambling treatment facility, I would not feel that it had to be “covered up”. 0 1 2 3

28. If I thought I needed help for excessive gambling, I would get it no matter who knew about it. 0 1 2 3

29. It is difficult to talk about personal affairs with highly educated people such as professional gambling counselors, doctors or psychologists. 0 1 2 3
Appendix C: Study 1 Debriefing

DEBRIEFING

This post-survey information is designed to help you understand the nature of the research. The questionnaire that you just completed will help us determine how much first year students at Carleton University gamble. Specifically, the purpose of this study is to assess the propensity of gambling among young adults at Carleton and the predictors associated with a willingness to seek treatment. This research will help reveal mechanisms by which gambling behavior is facilitated and promoted, which may have important implications for the rise of gambling pathology. It will also provide us with some insights regarding people who don’t gamble, that might reflect something that makes them more resilient to the temptation. Results from this project will also assist in determining the factors that predict treatment seeking behaviour among the young adults in our student population and the general population as well. Specifically, we hypothesize that people’s expectancy of success will predict their willingness to engage in games of chance and willingness to seek treatment for problem gambling behaviour.

Among university students, rates of pathological and problem gambling are double that reported in the general population. In stark contrast to research showing high rates of problematic gambling among young adults; other research shows rates of treatment seeking among this group are astonishingly low. This is an invisible problem at Carleton and abroad. Although drug and alcohol abuse take center stage with respect to research, treatment, and awareness, problem gambling has not received the same attention. Yet, if we examine the available statistics, there is a strong possibility that in each of your classes there at least one or two pathological gamblers. The symptoms of problem gambling include: Borrowing money to gamble; inability to stop gambling; feeling irritable if you do not gamble for a period of time; going back to the casino to win back lost money; lost relationships due to gambling behavior; spending a lot of time thinking about gambling; and needing to spend more and more money to get the same excitement out of gambling. This is not a comprehensive list, but someone who has problems with gambling may experience a few of the above symptoms (2-3), but not necessarily all of the above symptoms. If you have concerns about your gambling behaviour you may wish to contact Gamblers Anonymous 567-3271 or if you have a family member who gambles you might wish to call Gam-Anon 567-3271.

Also, approximately 10-15% of people will suffer some degree of depression during their lifetime. With advances in modern medicine, most people can readily be treated for this illness, which if unattended can be long lasting and affect many aspects of one’s life. The symptoms of depression comprise: Poor or depressed mood, or a reduction in the pleasure gained from otherwise positive experiences; Sleep disturbances; Eating disturbances (loss of appetite, or overeating despite not being hungry), which may be linked to weight changes; Lack of sexual interest; fatigue and lethargy (you don’t feel like doing anything); an inability to focus (e.g., have a hard time reading); reduced interactions with family and friends; and thoughts of suicide. Someone who is depressed may experience several (3-4), but not necessarily all of the above symptoms.

It is likewise the case that 60% of individuals will encounter a severe traumatic event and of these people, a fair number will develop symptoms that cause severe anxiety. Illnesses of this nature, including posttraumatic stress disorder (PTSD) can be treated. Once again, if unattended, the repercussions can be severe. Symptoms include: Hyperarousal (e.g., feelings of anxiety and reactive even to minor situations); Intrusive thoughts (the event comes into your head frequently); Avoiding thoughts or stimuli related to the event. These symptoms persist for more than a month following the event, and influence your day-to-day functioning.

If you think you may be experiencing depression or PTSD, it is suggested that you either contact your family physician, or 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. Your family physician or counselor will usually be able to help you or to refer you to someone who can.
Distress Centre: Ottawa and Region  (613) 238-1089; Web Site: www.dcottawa.on.ca
Distress Centres of Toronto: (416) 408 help
Distress Centre of Hamilton: (905) 525 8611
KW Distress Line: (519) 745 1166

If you have any questions or comments about this research, then please feel free to contact Carolyn Barnes (520.2600 ext. 6312; carolint@rocketmail.com), Dr. Michael Wohl (520.2600 ext. 2908; mwohl@connect.carleton.ca), Dr. Hymie Anisman (520.2600 ext. 2699; hymie_anisman@carleton.ca), or Dr. Kim Matheson (520-2684; kimmatheson@pigeon.carleton.ca).

If you have any ethical concerns about how this study please contact Dr. C. Davis (Chair of the Carleton University Ethics Committee for Psychological Research, 520-2600, ext. 2251) or Dr. M. Gick (Acting Chair of the Department of Psychology at Carleton University, 520-2600, ext. 2648).

We thank you very much for participating in this study. Your assistance will help us better understand gambling behavior among young adults.
Appendix D:
Daily-Diary Interview and Participant Instructions

Hello, welcome, and thanks for coming. My name is __________ and I’m working under the guidance of Dr. Michael Wohl, Kim Matheson and Hymie Anisman.

The purpose of this study is to examine gambling among students, and what effects it might have on them.

You will be a very important collaborator in the research and can help us to gather very important information about how you cope with the ups and downs associated with gambling. As a result, you will play a very valuable role in this research.

Often studies rely on participant’s recollection of events that they have experienced in the past and this can lead to certain details being forgotten or minimized. For this reason we have designed a study that will allow you to provide information on a daily basis about what has happened that day. Also, because coping with stress is considered more of a “process” than a one-time response, we are examining stressful experiences related to gambling over a period of time. We will be using a 21 day online diary study. You will log onto a Web site once per day and respond to a checklist of events that may or may not have occurred over the course of that day.

[The experimenter then demonstrates to the participant how to complete the survey by using one of the lab computers and accessing the daily diary website]

As you can see, you will be able to respond to each item using a pull down menu or by clicking on one of these buttons called “radio dials.” If you strongly disagree you will highlight the radio dial on the far left, if you strongly agree you will highlight the radio dial on the far right. The dials in between these extremes corresponds to the degree to which this item fits with what you experienced that day. This is not meant to require much thought and we would like you to be as honest as possible and provide the first answer that comes to mind. For example, you will be asked about CERTAIN STRESSES, like, “Tried to keep my mind off how upset I was.”, “Spent a lot of time over the day thinking about the even” or “Tried to laugh about it all.”. You’ll see more of these when I show you the diary portion of the study online.

INFORMATION

As we mentioned on the phone, there are several components to this study. There will be…

1. A diary component, to be completed daily for 21 days,
2. 3 days for scheduled saliva samples, which you will be able to take on your own (and we will show you how), and

So you can see that this study requires you to be a very committed collaborator.

Today, you will be asked to:

1. Complete a consent form to participate in the diary portion of the study and the 3 days of saliva samples,
2. Complete a short series of questionnaires about your health and well-being
3. You will receive training on how to complete the online diary entries and how to take your own saliva samples for the 3 saliva days. Today’s session will take less than 1 hour.

COMPENSATION

You will receive:

1) $1.50 for each completed diary entry (21 days = $31.50) and the per diem will be topped up to

2) $5 for each of the 3 days of completed saliva samples (total $19.50)

…for a total of up to $50 if you complete ALL 21 entries and complete ALL saliva samples.

Online Diary Demo

First, let me show you the online diary portion again so you can get a sense of what you would be doing. You might want to take notes as I show you each step, so that if you consent, you can remember how to log in and use the site each day.

For the diary portion, you’ll access the website through the link provided to you daily on your email account, once per day for 21 days. The time of day that you complete the diary will be negotiable, but we would like you to make your entries at roughly the same time each day. We will be checking everyday to see if people are doing their diary entries on time, and to make sure that you are not having any problems entering your data. The system will only allow you to provide one entry per day and if you miss three entries in a row, we will be phoning you to discuss whether you believe and we believe that you are still a committed and interested collaborator. Also, please feel free to contact us at any time if you are having problems with the website or if you have any other questions or concerns.

On that web site you will be asked to:

1. Indicate to what degree any of the following items occurred in that day.
   Next we want you to take your time and try to identify your gambling related feelings the last 24 hours.

2. [SHOW MEASURES for appraisal and coping for the experience described]

3. In addition, once per week we will be asking you to complete a series of questions in regards to your health over the past week, and how you coped with gambling-related stresses.

   [SHOW MEASURES]

   Again, try to answer these questions as honestly and accurately as possible (to the best of your ability).

You can start your entries tomorrow at the time that we agree upon.

Together, these measures should take approximately 10-15 minutes.

Saliva Days Demo
Once per week, and for 3 days in total, we will be asking you to provide saliva samples at FIVE time points throughout that day. We will negotiate which day is best for you, at the end of this session, but first I will demonstrate how and when you will need to take the saliva samples.

[SHOW SALIVETTES]

Taking a proper saliva sample involved bending the top off of the salivette and placing the piece of dental cotton in your mouth for two whole minutes [HAVE THEM TRY IT]. When you are done the cotton should be soaking wet with saliva and you will place the cotton back in the top of the tube and close it. You will notice that a used salivette will be much heavier than an unused one, and if you have any doubt about the cotton not being wet enough, feel free to spit into the top of the tube to make it even more wet and heavy.

You will need to take a sample right when you wake up. NOTE – this does not mean that if you wake up in the middle of the night to go to the bathroom or you wake up for a moment and then go right back to sleep that you have to take the sample, BUT if you wake up and plan to lie in bed for a while awake, then you should take the sample right when you initially wake up. Please do NOT get up or brush your teeth before taking this first sample, just in case you cause a micro cut, which could result in a minute amount of blood mixing in with your saliva sample. Also do not eat or drink (even water) 15 minutes before any sample as this may also wash away what we are trying to measure.

So, your first sample will be taken at awakening, and the remaining 4 samples will be taken 30 minutes after awakening, an hour after awakening and 4 and 8 hours after awakening. For example, if you wake up at 7:30 am, you would take your samples at 7:30am, 8am, 8:30am, 11:30am and 3:30pm.

Please mark on the tube what time the sample was taken and make sure you place all the samples for a given day together in your freezer until you bring them in for us, when you come in for the final lab session. Also, please be careful not to mix samples from separate days.

[Salivette packs and written instructions will be provided]

**RISKS**

There is little known risk that accompanies recording stressful experiences, and it is unlikely you will experience more risk recording your experience than would be associated with actually having the stressful experience. Some people may nevertheless experience discomfort when asked to respond to personal, sensitive questions that ask about their behaviours such as gambling. We have several resources that you may make use of if you have questions or want more support, and will give you a list of these resources at the end of today’s session.

[SHOW THEM CONTACT PAGE]

**BENEFITS**

There is research showing that writing about stressful experiences can have positive mental and physical health benefits. We can provide you with the citation for this research upon completion of the study if you desire. You will also benefit financially from participating in this study, as there is a
monetary incentive of up to $50.00, depending upon which portions of the study you decide to complete.

And importantly, because of your time commitment and the information that you will be providing us with, we really see you as a collaborator in this research. So you will also gain valuable insight into how research is done, and you might even see if this is a career you’d be interested in pursuing in the future.

On a more global level, you are helping to provide an understanding of how to help students cope with stressful life experiences.

We now want to remind you that all of your responses confidential:

CONFIDENTIALITY

Confidentiality of hard copy data:
There will be no identifying information on the questionnaire, and consent forms will be kept separately from the questionnaire data. All materials will be in a locked cabinet in a locked research room that can only be accessed by authorized researchers (Dr. M. Wohl, Dr. Kim Matheson and Dr. Hymie Anisman) and trained research assistants (Tania Morrison). The original questionnaires will be destroyed after 7 years, in accordance with the American Psychological Association’s guidelines.

Confidentiality of online data:
The data will be stored in a data file and will only be accessible by the researcher and research assistants. When completing the questionnaire online, it should be noted that due to the nature of the Internet, we cannot guarantee responses are confidential during the transmission of the data. Upon receipt of the electronic responses however, responses are kept securely and confidential.

Confidentiality of data presented in research:
Research findings may be presented at professional conferences, or reported in academic publications; however, only group means (there will be about 60 people participating) will be presented. Your individual responses will not be examined.

CONTACT

If you have questions at any time, about the study or the procedures, please contact me, Tania Morrison, by email and you will receive a prompt response.

[PROVIDE CONTACT SHEET – SHEET WILL BE A REPLICA OF WHAT APPEARS BELOW]
Health and Counselling Services at Carleton University 613-520-6674.

If you have any questions or comments about this research, then please feel free to contact Tania Morrison (520.2600 ext. 2683; tmorriso@connect.carleton.ca). Tania works from 9-5 Monday to Friday, and can be contacted via the phone number provided. If you need to contact her outside those hours, please email her with your question and/or provide her with your phone number and she will contact you as soon as possible.

If you have any other questions, please feel free to contact Dr. Michael Wohl (520.2600 ext. 2908; mwohl@connect.carleton.ca), Dr. Hymie Anisman (520.2600 ext. 2699; hymie_anisman@carleton.ca), or Dr. Kim Matheson (520-2684; kimmatheson@pigeon.carleton.ca).

PARTICIPATION

We want to make sure you know that your participation in this study is entirely voluntary and you may decline to participate at any point.

But, we also want you to know that quitting mid-way through is something we would like to prevent for many reasons. First, you are helping us with the gathering of data, so if we lose you, the study ceases to exist. Also, quitting or giving us “lazy data” (missing data, or data that you’re not really thinking about—0s in every column), could render all of the data inaccurate, and the study would end up being a waste of our time and money, and your time and effort.

If you have missed three entries in a row, you will be contacted to discuss whether you are still committed to completing the study.

If you withdraw from the study before data collection is complete your data will be destroyed. You have the right to omit any question(s) or procedure(s) that you choose.

Also, note that participation in the second phase of the study is contingent on full completion of both the diary portion and the 3 days of saliva samples.

CONSENT

Please read and sign this consent form if you understand the information and agree to participate in this study.

Negotiation for Time of Day for Diary Completion

The regular time of day set to complete the diary entries is open to negotiation. We prefer end of day, so we can get an immediate report of the day’s events and not a recollection from the day before, however the safety of the participant and her ability to have privacy when completing the diary entries will be of highest priority.

Negotiation for Day for Diurnal Cortisol samples

The best day of week set to complete saliva samples is open to negotiation. We prefer a more average day, however if work, class, un-predictable weekend schedules or other conflicts will get in the way of the participant’s ability to provide all 5 samples on the set schedule, then the day that the participant feels most confident to be able complete all saliva samples properly will be selected.
Participant will be reminded of the following:
- Not brush teeth prior taking samples
- Not eat/drink (even water) 15 mins prior taking samples
- What constitutes ‘waking up’ (i.e. NOT getting up to go to bathroom and then going back to sleep, but YES if wake up but stay in bed for a while)
- Disclosure of ‘mistakes’ (i.e. If they forget to take a sample, or if they take a sample later or earlier than they should this should be disclosed and will not lead to exclusion from the study. - It is MUCH more important to be honest and forthcoming about when and how samples were taken. If a participant forgets to take samples on a given day, she may switch to the next day, but she would have to let us know. Also, if she feels she has made a mistake with her samples, she can always contact us for additional salivettes – we will also provide extras automatically, just in case.)
- We will also call or email the participant on the night prior to their scheduled saliva collection days to remind them to collect their samples
Appendix E: Study 2 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: Daily Diary Study on Gambling

Study Personnel:

- Michael Wohl, Tel. 520.2600 ext. 2908; EMAIL: mwohl@connect.carleton.ca
- Hymie Anisman, Tel. 520.2600 ext. 2699; EMAIL hymie_anisman@carleton.ca
- Kim Matheson Tel. 520-2684; EMAIL: kimmatheson@pigeon.carleton.ca

Other Research Personnel: Tania Morrison (tmorriso@connect.carleton.ca), Matthew Young (mmyoung@connect.carleton.ca), Samantha Jolicoeur (sam532@hotmail.com)

If you have any ethical concerns about how this study please contact Dr. J. Mantler (Chair of the Carleton University Ethics Committee for Psychological Research, 520-2600, ext. 4173) or Dr. M. Gick (Chair of the Department of Psychology at Carleton University, 520-2600, ext. 2648).

Purpose and Task Requirements: We are asking you to fill out a couple of questionnaires regarding your gambling behavior. Specifically, in this questionnaire, we will be asking you to indicate whether or not you have gambled or plan to gamble today. We will also be asking you about your current thoughts and feelings about gambling. The questionnaires will take about 6 minutes a day to complete. Once a week, you will complete a slightly longer session lasting ~12 minutes. On three separate days, spaced one week apart, you will be asked for 5 saliva samples taken at awakening, 0.5, 1, 4, or 8 hrs later. Each sample takes ~ 1 minute to complete. This study will run for a total of 3 weeks.

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 that require focusing on a potentially stressful situation.

Anonymity/Confidentiality: The data collected in this study will be kept confidential. This informed consent form will be separated from your data and kept in a separate and secured file by one of the research investigators who will keep this information confidential. Your questionnaire responses will be associated with a code that you will generate, and this code will be used to match your responses in your diary with your saliva samples and your data from the gambling survey study conducted in the fall.

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 daily diary on gaming. 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 F: Study 2 Questionnaires

Gambling Related Urges Scale (Young & Wohl, 2005)

Please indicate your agreement or disagreement to the following statements by circling the appropriate response.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. All I want right now is to gamble.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
<tr>
<td>2. I would not enjoy gambling right now.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
<tr>
<td>3. I could control things better right now if I could gamble.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
<tr>
<td>4. Gambling would be very satisfying now.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
<tr>
<td>5. If I were gambling now I could think more clearly.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
<tr>
<td>6. I need to gamble now.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
<tr>
<td>7. If it were possible, I probably would gamble now.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
<tr>
<td>8. Gambling right now would make me feel less tired.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
<tr>
<td>9. If I had an opportunity to gamble right now I would probably take it.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
<tr>
<td>10. Gambling would be fun right now.</td>
<td>1</td>
<td>2 3 4 5 6 7</td>
</tr>
</tbody>
</table>
### SAM – 9 Item Version

**INSTRUCTIONS:** This questionnaire concerns with your thoughts about your gambling behavior. Respond according to how you view this situation right NOW. Answer each question by CIRCLING the appropriate number corresponding to the following scale.

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slightly</td>
<td>1</td>
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1. Is this a totally hopeless situation?
   - CIRCLED 1 2 3 4 5

2. Does this situation create tension in me?
   - CIRCLED 1 2 3 4 5

3. Is my gambling behavior uncontrollable?
   - CIRCLED 1 2 3 4 5

4. How eager am I to tackle this problem?
   - CIRCLED 1 2 3 4 5

5. To what extent can I become a stronger person because of this problem?
   - CIRCLED 1 2 3 4 5

6. Is it beyond anyone’s power to do anything about this situation?
   - CIRCLED 1 2 3 4 5

7. To what extent am I excited thinking about the outcome of this situation?
   - CIRCLED 1 2 3 4 5

8. How threatening is this situation?
   - CIRCLED 1 2 3 4 5

9. To what extent do I perceive this situation as stressful?
   - CIRCLED 1 2 3 4 5
Mood

This questionnaire consists of adjectives that may describe the way you presently feel. Using the scale below each item, please indicate how much each adjective describes how you currently feel by circling the number that most closely corresponds to your feelings.

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Appendix G: Study 2 Debriefing

This post-test information is designed to help you understand the nature of the research. This experiment is part of a larger research project being conducted to examine gambling behaviour and attitudes of young adults. Specifically, the purpose of this study is to assess the daily interplay between gambling behaviour and neuroendocrine reactivity. Results from this project will facilitate the identification of features that render young adults vulnerable to excessive gambling behaviour and will provide the basis for us to develop workshops and materials that may be used as an intervention strategy for problem-gambling among young adults.

The saliva samples collected during the study will provide physiological measures that indicate anticipation of the gambling task, as a function of daily gambling experienced. Several attributes of gambling may be associated with altered hypothalamic-pituitary-adrenal (HPA) and cardiovascular activity that is characterized by elevated circulating cortisol levels. This may provide important clues concerning who is most likely to develop gambling problems. When most individuals are exposed to gambling-related stimuli, or anticipate the opportunity to gamble, it is unlikely that marked physiological changes would be induced. However, among those with gambling problems, stimuli that trigger anticipatory responses might have more profound behavioural and neurochemical consequences. These stimuli may be associated with physiological activation that, combined with positive expectations, might propel the individual to enact their gambling propensities. Indeed, in male problem gamblers, such cues elicited gambling urges coupled with brain activity changes measured by functional MRI (in frontal, paralimbic, and limbic brain structures). Importantly, decreased neuronal activity was apparent in brain regions implicated in impulse regulation. It is our expectation that among individuals at risk for problem gambling, elevated cortisol levels, heart rate, and blood pressure will occur in response to engaging in gambling behaviour on a particular day, and these will rise still further in anticipation of gambling in the next 24 hours. Lastly, it may be that your evaluation of your gambling behaviour (assessed using a measure of gambling appraisals) and your desire to gamble (assessed using a measure of your craving to gamble) are central to gambling behaviours and persistence in the face of loss. As such, we asked you to complete an inventory of how much you won or lost on various games you might have played over the course of the study.

We greatly appreciate your participation in this study. Results from this project will facilitate the identification of factors that render young adults vulnerable to gambling pathology, and will provide the basis for us to develop workshops and materials that may be used as an intervention strategy for problem-gambling among young adults.

If you think you may have a gambling problem, it is suggested that you either contact your family physician, or one of the organizations listed below. It is not a good idea to allow problems to fester. Your family physician or counselor will usually be able to help you or to refer you to someone who can.

Gamblers Anonymous & Gam-Anon  (613) 567-3271
Distress Centre: Ottawa And Region  (613) 238-1089
Web Site:  www.dcottawa.on.ca
Distress Centres of Toronto: (416) 408 help; Distress Centre of Hamilton: (905) 525 8611
KW Distress Line: (519) 745 1166
Health and Counselling Services at Carleton University 520-6674.

If you have any questions or comments about this research, then please feel free to contact Tania Morrison (520.2600 ext. 2683; tmorriso@connect.carleton.ca), Dr. Michael Wohl (520.2600 ext. 2908; mwohl@connect.carleton.ca), Dr. Hymie Anisman (520.2600 ext. 2699; hymie_anisman@carleton.ca), or Dr. Kim Matheson (520-2684; kimmatheson@pigeon.carleton.ca).

If you have any ethical concerns about how this study please contact Dr. J. Mantler (Chair of the Carleton University Ethics Committee for Psychological Research, 520-2600, ext. 4173) or Dr. M. Gick (Chair of the Department of Psychology at Carleton University, 520-2600, ext. 2648).

We thank you very much for participating in this study. Your assistance will help us better understand gambling behavior among young adults.
Appendix H: Study 3 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 gaming

Study Personnel: Matthew Young, MA, Department of Psychology, Carleton University
Phone: (613) 520-2600 ext 6312
Dr. Michael Wohl, Department of Psychology, Carleton University
Phone: (613) 520-2600 ext 2908
Dr. Hymie Anisman, Department of Psychology, Carleton University
Phone: (613) 520-2699
Dr. Kim Matheson, Department of Psychology, Carleton University
Phone: (613) 520-2684

If you have any ethical concerns about this study please contact Dr. A. Parush, (Chair of the Carleton University Research Ethics Committee for Psychological Research, 520-2600, ext. 6026), or Dr. A. Bowker, (Chair, Department of Psychology, Carleton University at 520-2600, ext. 2648).

Purpose and Task Requirements: The purpose of this study is to assess perceptions, gambling behaviour and cortisol levels (a stress hormone) among university students. 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., family history), and gambling (e.g., propensity to gamble and attitudes toward gambling).

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: The data collected in this study will be kept confidential. Your informed consent form will be separated from your questionnaire and kept in a separate and secured file by one of the research investigators who will keep this information confidential. Your questionnaire responses will be associated with a code that you will generate, and this code will be used to match your questionnaire with your saliva samples.

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 gaming. 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: 

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Appendix I: Study 3 Questionnaires

**GRUS-22**

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<th>Statement</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
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<tr>
<td>2. I would do almost anything to gamble now.</td>
<td>1 2 3 4 5 6 7</td>
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<tr>
<td>3. Gambling now would make things seem just perfect.</td>
<td>1 2 3 4 5 6 7</td>
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<td>4. It doesn't matter to me one way or another whether or not I gamble today.</td>
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<td>5. If I were offered an opportunity to gamble right now, I would gamble.</td>
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<td>6. If I were gambling now I could think more clearly.</td>
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<tr>
<td>7. I could control things better right now if I could gamble.</td>
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<tr>
<td>8. Gambling would be fun right now.</td>
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<tr>
<td>9. I have no desire to gamble right now.</td>
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<tr>
<td>10. I want to gamble now.</td>
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<tr>
<td>11. I crave gambling right now.</td>
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<tr>
<td>12. All I want right now is to gamble.</td>
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<td>13. I need to gamble now.</td>
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<td>14. If it were possible, I probably would gamble now.</td>
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<tr>
<td>15. Gambling would be very satisfying now.</td>
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<tr>
<td>16. At the moment, I'm more preoccupied with other things going on in my life than I am about gambling.</td>
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<tr>
<td>17. Nothing would be better than gambling right now.</td>
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<tr>
<td>18. I would not enjoy gambling right now.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>19. I have an urge to gamble.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>20. My desire to gamble seems overpowering.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>21. Gambling would make me less depressed</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
<tr>
<td>22. The way I'm feeling at the moment has nothing to do with wanting to gamble.</td>
<td>1 2 3 4 5 6 7</td>
<td></td>
</tr>
</tbody>
</table>
Appendix J: Study 3 Debriefing

This post-test information is designed to help you understand the nature of the research. This experiment is part of a larger research project being conducted to examine young adults gambling behaviour and attitudes. Specifically, the purpose of this study is to assess the effects of gambling anticipation on neuroendocrine and affective responses among individuals with varying degrees of gambling interest. Using the virtual reality environment combined with an actual gaming simulation, we assess the behavioural and neuroendocrine consequences associated with negative or positive gambling outcomes. Results from this project will facilitate the identification of features that render young adults vulnerable to pathology, and will provide the basis for us to develop workshops and materials that may be used as an intervention strategy for problem-gambling among young adults.

The saliva samples collected during the study will provide a physiological measure that indicates anticipation of the gambling task as a function of the study manipulations. Several attributes of gambling may be associated with altered hypothalamic-pituitary-adrenal (HPA) and cardiovascular activity that is characterized by elevated circulating cortisol levels and increased heart rate and blood pressure. This may provide important clues concerning who is most likely to develop gambling problems. When most individuals are exposed to gambling-related stimuli, or anticipate the opportunity to gamble, it is unlikely that marked physiological changes would be induced. However, among those with gambling problems, stimuli that trigger anticipatory responses might have more profound behavioural and neurochemical consequences. These stimuli may be associated with physiological activation that, combined with positive expectations, might propel the individual to enact their gambling propensities. Indeed, in male problem gamblers, such cues elicited gambling urges coupled with brain activity changes measured by functional MRI (in frontal and limbic brain structures). Importantly, decreased neuronal activity was apparent in brain regions implicated in impulse regulation. It is our expectation that among individuals at risk for problem gambling, elevated cortisol, heart rate, and blood pressure will occur in response to gambling stimuli (sight, sound of gambling activities), and these will rise still further in anticipation of being able to gamble. In contrast, as problem gamblers may attribute loss to factors external to themselves and maintain their view of themselves as lucky, loss would not be expected to provoke particularly marked cortisol responses. In effect, it may be that anticipatory factors are more central to gambling behaviours and persistence in the face of loss than are the actual outcomes.

Previous research (Wohl, Young, & Hart, 2004) has found that some gamblers have extreme beliefs in personal luck or optimism, so that they over-attribute their wins to the self, and have exaggerated expectations of future gambling successes. As such, among some gamblers, anticipation of gambling may provoke a ‘high’ (eustress) similar to that experienced by people engaging in other risk-taking behaviours (e.g., skydivers). This process may contribute to a strong desire to gamble and a persistent reluctance to seek treatment when gambling reaches problematic levels. To assess this possibility, we asked you to complete measures that assess your belief in personal luck, your expectations of success at the gambling game, and your mood while gambling.

It is also being assessed whether some gamblers are influenced by type of game played. It is estimated that games that have some element of skill will cause more arousal than games of pure chance because there is more personal involvement with games that contain some element of skill. Because we wanted to specifically examine the amount of skill present in the game, some participants who played the slots where allowed to use a stop button that, when activated, stopped the wheel from spinning. We hypothesize that when participants play a slot machine (traditionally a game of pure chance) that contains a stop button their arousal will be similar to that of participants that play blackjack (a game with an element of skill). To test this hypothesis, a third of participants (randomly assigned) played blackjack, a third played traditional slots, and a third of the participants played slots with a stop button. We were unable to disclose this part of the study to you at the onset because you might have felt pressure to respond in the way you thought we expected you to, rather than reacting the way you normally would. The possibility that some participants might react on what they believed the experimenter expected is called the demand awareness effect. This can be a problem in research because the results could reflect nothing having to do with the psychological or physiological processes being studied, but could simply reflect demand awareness.

If you have any questions about this study when you leave, please feel free to use the contact information on this debriefing form that you are allowed to keep.

Lastly, if you think you may be experiencing depression or PTSD, it is suggested that you either contact your family physician, or 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. Your family physician or counselor will usually be able to help you or to refer you to someone who can.

If you have any personal concerns about your physical or emotional well-being, you might wish to contact one of the following:
- Carleton Health and Counseling Services, at (613) 520-6674
- Distress Centre: Ottawa and Region, at (613) 238-1089
- Distress Centre of Toronto, at (416) 525-8611

If you have any questions or comments about this research, please feel free to contact Jessica Palladina (520-2600, ext. 2683; jpalladina@connect.carleton.ca), Dr. Michael Wohl (520-2600, ext. 2908; michael_wohl@carleton.ca), Dr. Hymie Anisman (520-2600, ext. 2699; hanisman@ccs.carleton.ca), or Dr. Kim Matheson 9520-2600, ext. 2648; kim_matheson@carleton.ca).

If you have any ethical concerns about this study, please contact Dr. Avi Parush (Chair of the Carleton University Ethics Committee for Psychological Research, 520-2600, ext. 6026) or Dr. Janet Mantler (Chair of the Department of Psychology at Carleton University, 520-2600, ext. 4173).

We thank you very much for participating in this study. Your assistance will help us to better understand gambling behaviour among young adults.
Appendix K: Study 4 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 gaming II

Study Personnel: Dr. Michael Wohl, Department of Psychology, Carleton University
Phone: (613) 520-2600 ext 2908
Dr. Hymie Anisman, Department of Psychology, Carleton University
Phone: (613) 520-2699
Dr. Kim Matheson, Department of Psychology, Carleton University
Phone: (613) 520-2684

If you have any ethical concerns about this study please contact Dr. A. Parush, (Chair of the Carleton University Research Ethics Committee for Psychological Research, 520-2600, ext. 6026), or Dr. A. Bowker, (Chair, Department of Psychology, Carleton University at 520-2600, ext. 2648).

Purpose and Task Requirements: The purpose of this study is to assess perceptions and mood among university students. As well, we wish to identify the coping responses that are perceived as effective in certain situations by different people. 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., family history), personal characteristics (e.g., how you cope with things in your life) and gambling (e.g., propensity to gamble and attitudes toward gambling).

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 that require focusing on a potentially stressful situation. In addition, some individuals may experience discomfort or nausea when interacting with the virtual reality console (a.k.a. "Cybersickness"). If you do feel nauseous when using the virtual reality console, please take a break (i.e., turn away from the screen). If the nausea continues, please tell the experimenter and he or she will terminate the study.

Anonymity/Confidentiality: The data collected in this study will be kept confidential. Your informed consent form will be separated from your questionnaire and kept in a separate and secured file by one of the research investigators who will keep this information confidential. Your questionnaire responses will be associated with a code that you will generate, and this code will be separated from any personal identifying information.

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 gaming II. 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 L: Study 4 Debriefing

This post-test information is designed to help you understand the nature of the research. This experiment is part of a larger research project being conducted to examine young adults gambling behaviour and attitudes. Specifically, the purpose of this study is to assess the effects of gambling anticipation on affective responses among individuals with varying degrees of gambling interest. Using the virtual reality environment combined with an actual gaming simulation, we assessed the behavioural and affective consequences associated with negative or positive gambling outcomes. Results from this project will facilitate the identification of features that render young adults vulnerable to pathology, and will provide the basis for us to develop workshops and materials that may be used as an intervention strategy for problem-gambling among young adults.

The heart rate measures collected during the study will provide a physiological measure that indicates anticipation of the gambling task as a function of the study manipulations. Several attributes of gambling may be associated with altered cardiovascular activity that is characterized by elevated heart rate and blood pressure. This may provide important clues concerning who is most likely to develop gambling problems. When most individuals are exposed to gambling-related stimuli, or anticipate the opportunity to gamble, it is unlikely that marked physiological changes would be induced. However, among those with gambling problems, stimuli that trigger anticipatory responses might have more profound behavioural and neurochemical consequences. These stimuli may be associated with physiological activation that, combined with positive expectations, might propel the individual to enact their gambling propensities. Indeed, in male problem gamblers, such cues elicited gambling urges coupled with brain activity changes measured by functional MRI (in frontal and limbic brain structures). Importantly, decreased neuronal activity was apparent in brain regions implicated in impulse regulation. It is our expectation that among individuals at risk for problem gambling, elevated heart rate and blood pressure will occur in response to gambling stimuli (sight, sound of gambling activities), and these will rise still further in anticipation of being able to gamble. In contrast, as problem gamblers may attribute loss to factors external to themselves and maintain their view of themselves as lucky, loss would not be expected to provoke particularly marked cortisol responses. In effect, it may be that anticipatory factors are more central to gambling behaviours and persistence in the face of loss than are the actual outcomes.

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If you have any questions about this study when you leave, please feel free to use the contact information on this debriefing form that you are allowed to keep.

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