Inhibitory control, pathological gambling and criminal behaviour among Canadian offenders

Caleb Lloyd & Ralph C. Serin
Carleton University

Note: This research was supported by a grant from the Ontario Problem Gambling Research Centre
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Pathological gambling-impulsivity correlations (Krueger, Schedlowski, & Meyer, 2005), impulsivity-crime correlations (James & Seager, 2006), and pathological gambling-crime correlations (Slutske et al., 2001) suggest that these three variables compose a relevant triad for understanding key mechanisms underlying offending behaviour. There is an insufficient amount of research to draw firm conclusions about the causal connections between pathological gambling, impulsivity and criminal behaviour, if any causal connections exist. However, preliminary investigations suggest gambling and addiction to gambling within the offender population are worthy of greater attention (Williams, Royston, & Hagen, 2005). In particular, understanding offenders’ involvement with addictive behaviours of any kind has the potential to inform researchers about the mechanisms of stability underlying long-term criminal careers. The way offenders experience reinforcement for the continued pursuit of problematic, costly behaviours is relevant for understanding and interrupting long-term criminal pathways.

Gambling behaviours become pathological when they persist despite poor outcomes and harmful consequences for the addicted individual (American Psychiatric Association, 1994). Symptoms of pathological gambling include continued gambling despite attempts to cease, spending more money or time than one intends, cognitive preoccupation and impaired functioning in important life areas (Blaszczynski, Steel, & McConaghy, 1997; Blaszczynski & Nower, 2002; Vitaro, Arseneault, & Tremblay, 1999). Pathological gambling may be multi-dimensional; some disagreement exists regarding which aspects of problem or pathological gambling best define the disorder. Gambling frequency can range from minimal to excessive; however, frequency functions
as a separate dimension from the range of life problems that can be associated with gambling (Walters, 1997). The amount of money spent on gambling activities, or the amount spent relative to income, can also vary widely and may represent another important dimension. Certain gambling activities appear to be more prone to encouraging addiction in gamblers, specifically those activities with relatively instant feedback or a variable reinforcement schedule such as slot machines or lotteries (Welte, Barnes, Wieczorek, Tidwell, & Parker, 2004). Problem gambling lies along a continuum; however, results from an offender population also provides evidence that the most severe levels of pathological gambling simultaneously show signs of being a discrete taxon (Walters, 1997).

Prevalence of Pathological Gambling Among Offenders

Prevalence rates consistently reveal that offender populations are more at risk for pathological gambling compared to the general population. Large, representative epidemiological studies estimate that lifetime gambling pathology falls under 1% in the general population (0.90%, Cunningham-Williams, Cottler, Compton, & Spitznagel, 1998; 0.42%, Petry, Stinson, & Grant, 2005). Variance in estimates may be due to methodology; the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), a widely used measure of pathological gambling, was constructed on a sample composed mainly of a clinical population whereas the DSM-IV criteria is perhaps more appropriate for use in general population surveys (Petry et al., 2005). Prevalence of gambling problems may also be increasing, especially as the accessibility of internet gambling also increases (Shaffer, Hall, & Vander Bilt, 1999). University samples show a higher prevalence of pathological gambling compared to older adults (5.5%, Lesieur, Cross,
Frank, & Welch, 1991; Shaffer et al., 1999). Across all samples, there are higher percentages of individuals who report at least one gambling-related problem (4-15%) compared to those meeting the full diagnostic criteria (Cunningham-Williams et al., 1998; Lesieur et al., 1991; Shaffer et al., 1999). A meta-analysis of prevalence studies including clinical and offender samples revealed higher estimates of lifetime prevalence of pathological gambling than general population studies (1.6%; Shaffer et al., 1999). Inclusion of offender samples is certain to inflate estimates; in some cases, offender populations have shown rates of pathological gambling between 12-15% (Shaffer et al., 1999; Walters, 1997), while most studies reveal rates as high as 33-35% (Lahn, 2005; Williams et al., 2005).

There is some evidence that inmates frequently engage in gambling within institutions as well (Blaszczynski & Silove, 1996). In many Western countries, including Canada, gambling in prison is a disciplinary offence, thus self-reported estimates of gambling behaviours are likely conservative. Even so, on average across Western countries, 40% of inmates report gambling in prison with up to 22% reporting gambling on a weekly basis (Williams et al., 2005).

While frequency of gambling correlates with history of incarceration among offenders (Walters, 1997), an association between pathological gambling and adult antisocial behaviour has also been found in a large community sample of twins (Slutske et al., 2001). Severity of gambling problems is also mildly correlated with arrest history (Lesieur et al., 1991). In addition, pathological gamblers are more likely than non-gamblers to meet the criteria for antisocial personality disorder (APD; Slutske et al., 2001). Rates of APD among pathological gamblers in the community range between 15-
35% (Blaszczynski et al., 1997; Blaszczynski & Steel, 1998; Cunningham-Williams et al., 1998; Petry et al., 2005). The odds of an APD diagnosis were found to be 6.4 times greater among those with a history of pathological gambling compared to the general population (Slutske et al., 2001). However, some diagnostic overlap exists; the DSM-IV criteria for pathological gambling includes some antisocial behaviours such as “lying to significant others about gambling behaviours” and “committing illegal acts to finance gambling” (Petry et al., 2005).

High proportions of individuals seeking treatment for gambling report committing some form of illegal activity (59-65%); in these studies, a majority of those who self-report criminal behaviour directly link their motives for offending to gambling (Blaszczynski et al., 1997; Blaszczynski & McConaghy, 1994). Two-thirds of one sample of pathological gamblers reported engaging in some type of criminal or prostitution activity to pay gambling debts while one-fourth of the same sample committed robbery in order to gain funds for gambling (Spunt, 2002). Most frequently, the offences gamblers report are non-violent property crimes (Blaszczynski & Silove, 1996). Incarcerated offenders who state they have engaged in gambling-related crimes also report greater severity of gambling pathology (Lahn, 2005).

Intuitively, it can be assumed that intense desires to gamble and severe gambling debts may inevitably lead to gambling-related crimes (Blaszczynski & Silove, 1996); however, a vast majority (95%) of the offender population’s onset of criminal behaviour occurred prior to their onset of gambling (Abbott, McKenna, & Giles, 2000, as cited in Williams et al., 2005). The overlap between pathological gambling and APD also suggests delinquent behaviours precede gambling onset; individuals meeting the APD
criteria are required to have shown conduct problems as adolescents (Slutske et al., 2001). Gambling frequency and gambling problems are related to delinquency in mid-adolescent males; however, gambling at age 16 did not predict delinquency rates one year later (Vitaro, Brendgen, Ladouceur, & Tremblay, 2001). On the other hand, number of crimes does not predict gambling pathology once frequency, quantity and versatility in gambling behaviours are taken into account (Welte et al., 2004).

Thus, while crime and pathological gambling are related, the two constructs are neither synonymous nor consistently comorbid. In the general population of pathological gamblers, a small percentage of individuals are responsible for the majority of offences (Blaszczynski & McConaghy, 1994). This suggests that some high risk offenders augment gambling addiction to a prevailing and substantial set of problem behaviours, whereas the majority of pathological gamblers remain low risk for criminal behaviour or refrain from committing crimes altogether. While gambling is an important consideration within the offender population, pathological gambling cannot clearly be considered to play a causal role in crime or be a criminogenic need (Lahn, 2005; Williams et al., 2005). However, for a subset of offenders, gambling behaviours may serve to prolong their criminal careers or may be an important indicator of continued deficits in skills pertinent for prosocial living such as inhibitory control.

**Impulsivity and its Relation to Both Crime and Gambling**

Pathological gambling is categorized as a disorder of impulse control (American Psychiatric Association, 1994). Impulse control disorders, like criminal behaviour, are most common among males (Kertzman, Lowengrub, Aizer, Nahum, Kotler, & Dannon, 2006) and are characterized by failure to resist impulses that are harmful to oneself or
others (Specker, Carlson, Christenson, & Marcotte, 1995). While a deficit in ability to control impulses, or equivalently, a pattern of behaving impulsively is a defining aspect of pathological gambling, impulsivity should also be understood more broadly in its relation to the overarching structure of personality and personal functioning (Steel & Blaszczynski, 1998). Impulsivity in a particular situation may reflect a characteristically impulsive cognitive style or personality trait (Blaszczynski et al., 1997). In addition, impulsivity is made up of multiple related components, including: rapid responding without forethought about possible consequences, preference for immediate reinforcement over long-term rewards, disregard for punishment cues, proneness toward boredom, and failure to inhibit responses despite feedback revealing these responses to be maladaptive (Alessi & Petry, 2003; Blaszczynski & Silove, 1996; Krueger et al., 2005; Petry, 2001a; Vitaro et al., 2001; Vitaro et al., 1999).

Factor analyses confirm that impulsivity is not a unitary construct (Caseras, Àvila, & Torrubia, 2003; White, Moffitt, Caspi, Bartusch, Needles, & Stouthamer-Loeber, 1994) and some of the constructs that compose impulsivity appear to be orthogonal (Vanden Bergh et al., 2006). Indeed, many existing measures of impulsivity do not correlate strongly with one another or show important differences in content and interconnection, suggesting that each measure is likely tapping into different aspects of a heterogeneous construct (Caseras et al., 2003; White et al., 1994).

The components of impulsivity are related to the executive functions of the cognitive system. Executive functions are responsible for designing, implementing and maintaining effortful action as well as inhibiting task performance when alternative action or inaction is required (Schachar & Logan, 1990). The heterogeneous nature of
impulsivity allows multiple individuals exhibiting the same disorder of impulse control (i.e., pathological gambling) to embody separate sub-components of executive dysfunction. Highly impulsive people may exhibit deficits in inhibitory control, hypersensitivity to rewarding experiences or both characteristics at the same time. For example, Gray (1987) has characterized personality in terms of two simultaneously functioning motivational systems. The Behavioral Activation System (BAS) is related to the dopaminergic pathways in the brain and can be observed via fluctuations in heart rate. Individuals with heightened BAS are sensitive to signals of reward and exhibit pursuing, goal-directed behaviours. The Behavioral Inhibition System (BIS) is related to the neocortical area of the frontal lobe and can be observed via electrodermal activity. Individuals with heightened BIS are sensitive to signals for punishment, nonreward or novelty; such individuals are expected to avoid circumstances and tasks that are perceived to potentially be painful or costly. Evidence suggests that BIS is a unitary construct whereas BAS involves at least two dimensions, Reward Sensitivity and Rash Impulsiveness (Franken & Muris, 2006). Impulsivity is often linked to excessive BAS activity (Caseras et al., 2003) while some suggest that impulsivity is best characterized as both an over-active BAS as well as an under-active BIS (White et al., 1994).

Offending behaviour and, in particular, recidivism can be thought of as impulsive behaviour; repeat offenders fail to inhibit their criminal activity despite previously experiencing punishment for such behaviours. Impulsivity is correlated with delinquency and conduct disorder symptoms among adolescents (Petry, 2002; White et al., 1994), as well as offending and violent offending among adults (Bergeron & Valliant, 2001; James & Seager, 2006). Prospective studies show that impulsivity measured in adolescent
males at age 13 is weakly related to delinquency at age 17 (Vitaro et al., 2001). Although only a small amount of the variance in delinquency was explained by impulsivity in this study, other samples show impulsive traits predict delinquency stability in adolescence; males who continue to be delinquent also show the highest rates of impulsivity (White et al., 1994). Impulsivity is especially predictive of future delinquency unlike other problem behaviours such as substance use or gambling (Barnes, Welte, Hoffman, & Dintcheff, 2005). While the construct of impulsivity and its reverse, self-control, is central in Gottfredson and Hirschi’s (1995) theory of crime, criminal behaviour is generally accepted as multiply determined; thus, the multi-faceted natures of both crime and self-control suggest it is theoretically meaningful to sift further to determine which elements of impulsivity are specifically related to crime.

Some suggest that over-active BAS underlies high-risk offending behaviour and psychopathic personality; however, the elements of Gray’s theory do not automatically lead to the conclusion that high BAS people will prefer illegal activities over other rewarding endeavors (Carver & White, 1994). Research with psychopathic offenders does suggest these high risk offenders are characterized by BAS motivation, but does not provide support for an exaggerated hyper-sensitivity to reward (Arnett, Smith, & Newman, 1997). On the other hand, impulsivity among psychopaths does not appear to be related to BIS functioning; studies suggest psychopathic offenders are able to moderate and inhibit their behaviour at least in situations where the punishment contingencies are explicit and require little demand upon cognitive resources (Arnett et al., 1997; Newman, Wallace, Schmitt, & Arnett, 1997).
As an impulse control disorder, pathological gambling is expected to correlate strongly with measures of impulsivity. Compared to controls, pathological gamblers show higher rates of impulsivity whether measured by dispositional measures (Blaszczynski et al., 1997; Carlton & Manowitz, 1994; Steel & Blaszczynski, 1998; Vitaro, Ferland, Jacques, & Ladouceur, 1998) or behavioural tasks (Petry, 2001a; Petry, 2001b; Petry & Casarella, 1999), however, correlations range from weak (.26; Steel & Blaszczynski, 1998) to moderate (.40; Krueger et al., 2005). Although measures of impulsivity taken in early adolescence predict gambling problems in late adolescence, the amount of variance explained is small (Barnes, Welte, Hoffman, & Dintcheff, 1999; Vitaro, Arseneault, & Tremblay, 1997; Vitaro et al., 1999; Vitaro et al., 2001). Impulsivity predicts gambling beyond socioeconomic status (Vitaro et al., 1999), but fails to predict once parental monitoring, peer delinquency and other problem behaviours are taken into account (Barnes et al., 2005).

Thus, impulsivity appears to be a predisposing factor for pathological gambling but is not the sole predictive factor (Vitaro et al., 1999). However, prospective studies completed so far have limited their scope to the adolescent years. While impulsivity typically decreases with age, older pathological gamblers show impulsivity rates that are especially elevated for their cohort (Błaszczynski et al., 1997). It may be, when the entire life course is examined, that impulsive personality predicts pathological gambling.

Evidence that impulsivity alone does not strongly predict gambling behaviours does not preclude the possibility that individuals who show comorbid gambling and impulsivity represent more serious gambling pathology. High impulsivity is related to more severe gambling problems (Vitaro et al., 1997) and more versatility in gambling
activities (Steel & Blaszczynski, 1998), while the connection between impulsivity and moderate gambling problems is less clear (Reynolds, 2006). In addition, low impulsive gamblers do not manifest the impairment in psychosocial and psychological functioning that can be found in gamblers high in impulsivity (Blaszczynski et al., 1997).

Thus, the effects of impulsivity and gambling may compound to result in particularly problematic outcomes. There is evidence that together gambling history and trait impulsivity produce additive effects on impulsive decision making; the presence of gambling problems contributes to the prediction of preference for immediate small rewards over long-term large rewards beyond trait impulsivity alone (Alessi & Petry, 2003). In addition, impulsivity-gambling correlations may have been under-estimated by failure to attend to the multiple aspects of impulsivity. Dispositional and behavioural measures of impulsivity also show additive effects when predicting gambling behaviour (Vitaro et al., 1999).

While it remains unclear which particular elements of impulsivity are related to pathological gambling, some research suggests insensitivity to punishment cues rather than inability to delay gratification underlies gambling; indeed, it can be noted that gamblers contend with long reinforcement schedules (Vitaro et al., 1999). In contrast, as discussed above, some research suggests that high risk offenders do show sensitivity to punishment cues yet are characterized by heightened motivation for reward. Present research is far too limited to draw firm conclusions about which impulsivity mechanisms are most related to either offenders or pathological gamblers. Further exploration should investigate whether different aspects of impulsivity underlie each set of behaviours despite common overlap with impulsivity as a whole. Conclusions drawn from present
impulsivity-gambling research are also problematic due to over-sampling of individuals seeking treatment; these treatment populations may not be representative of the adult gambling population in general (Vitaro et al., 1998).

One Shared Factor, Many Manifestations?

Observation of high rates of comorbidity among impulsivity-related behaviours raises the question whether these behaviours can be best explained by a single generalized disorder (Stanford & Barratt, 1992; Vitaro et al., 2001). The evidence that many problem behaviours tend to cluster together may imply that either a single cause or common risk factors exist for a range of impulsive behaviours (Vitaro et al., 2001). In addition to associations between pathological gambling, crime and APD described above, high rates of comorbidity can be found between pathological gambling and substance use disorders (Barnes et al., 1999; Lesieur et al., 1991; Petry et al., 2005; Specker et al., 1995; Spunt, 2002). Also, in a treatment-seeking sample, 35% of pathological gamblers met the criteria for another impulse control disorder (Specker et al., 1995). Diagnosis of several personality disorders was highly common among a sample of pathological gamblers (93% of the sample met the criteria for at least one personality disorder); this trend was observed specifically for the Cluster B personality disorders which are all characterized to some degree by impulsivity (Blaszczynski & Steel, 1998; Steel & Blaszczynski, 1998). Some have labeled a subset of pathological gamblers as “antisocial impulsivists” (Blaszczynski et al, 1997). While problem gambling and alcohol consumption can be part of a linked network of problem behaviours (Barnes et al., 1999), the majority of adolescents with substance abuse or gambling pathology do not show comorbidity (Vitaro et al., 1998). Higher incidence of comorbidity may emerge later in
life or it may be that a relatively small subset of comorbid individuals are especially characterized by strong deficits.

Notably, comorbid individuals tend to show levels of impulsivity that are elevated above rates shown in individuals reporting only one problem behaviour (Barnes et al., 1999; Petry, 2001a; Petry, 2002; Vitaro et al., 1998). Alternatively, greater gambling severity increases the likelihood of meeting criteria for other disorders (Blaszczynski & Steel, 1998; Cunningham-Williams et al., 1998; Walters, 1997). Some comorbidity may be encouraged due to participation in problem behaviours simultaneously, such as drinking alcohol while gambling (Lesieur & Blume, 1993).

Unlike when a single addiction is present, comorbidity of impulse control problems is associated to genetic vulnerability (Blum et al., 2000, as cited in Blaszczynski & Nower, 2002). Genetic factors accounted for much of the overlap between gambling and APD in one study (Slutske et al., 2001) and impairments in the same frontal lobe regions of the brain seem to underlie multiple addictions (Grant, Brewer, & Potenza, 2006). However, the relationship between a genetic predisposition for pathological gambling and antisocial behaviours is likely to be mediated through impulsivity (Slutske et al., 2001). Additional neurobiological evidence suggests both high-impulsive gamblers (Krueger et al., 2005) and psychopathic individuals (Lorber, 2004) show increased sympathetic nervous system activity. Evidence suggests biological vulnerabilities may define the subset of comorbid individuals given that pathological gamblers (Grant et al., 2006), offenders (Barratt, Stanford, Kent, & Felthous, 1997) and high-impulsive individuals (White et al., 1994) all show deficits in the executive functions located in the frontal lobe region. However, in one study, offenders did not
differ from non-offenders in all measures related to executive functioning; rather, offenders showed deficits in the brain areas involved in careful planning, awareness of long-term consequences and inhibitory control (Bergeron & Valliant, 2001). Patients with damage in similar brain areas are unresponsive to future consequences yet do not show simultaneous increases in insensitivity to punishment or hypersensitivity to reward (Bechara, Damasio, Damasio, & Anderson, 1994). Thus, evidence supports the conclusion that certain biological deficits may predispose some individuals to multiple life problems while it also points to the potential importance of both cognitive planning and inhibitory control for offending behaviours.

However, each additional problem behaviour shows additive effects on the degree of an individual’s impulsivity (Petry, 2001a; Petry & Casarella, 1999; Vitaro et al., 1998), which suggests that all behaviours cannot be explained as different manifestations of the same underlying factor. Since the number of problematic behaviours is a relevant consideration, a simple binary understanding of the relationship between impulsivity and pathology is not well supported (Reynolds, 2006). In addition, evidence does not support the conclusion that causal relations exist among impulsive behaviours within adolescence (Vitaro et al., 2001). Moreover, the hypothesis that a common antecedent cause is responsible for all impulsive behaviours also appears to be too simplistic to account for the available data. While various life problems can stem from shared risk factors (Dickson, Derevensky, & Gupta, 2002), as noted before, a better understanding for the inter-relationships may be gained by greater attention to which specific aspects of impulsivity relate to each problem behaviour (Petry, 2001a).
At the same time, certain behaviours may be more relevant than others when considering poor outcomes. Among the cluster of impulsive behaviours, delinquency has been shown to be of greater importance compared to gambling and substance dependence; a history of deviance in adolescence (conduct disorder diagnosis) explained much of the variance in the other problem behaviours (Slutske et al., 2001). Impulsivity best predicts future delinquency but does not directly predict gambling and substance abuse (Barnes et al., 2005). On the other hand, gambling behaviours appear to have the lowest intercorrelations when considering the full set of impulsive behaviours (Barnes et al., 2005). In one study, alcoholism preceded gambling problems within a two-year span for 65% of the gamblers; this again suggests that gambling may be the least relevant concern within the behaviour set (Cunningham-Williams et al., 1998). Among offender populations, gambling also appears to be a secondary concern compared to high rates of alcohol and drug dependence (Bushnell & Bakker, 1997). While one-third of offenders experience addictions to gambling (Lahn, 2005; Williams et al., 2005) close to three-quarters of offenders suffer from lifetime substance abuse disorder (Peters, Greenbaum, Edens, Carter, & Ortiz, 1998).

*Multiple Pathways to Pathological Gambling*

Pathological gambling shows evidence of being both a categorical disorder as well as the endpoint on a continuum (Blaszczynski & Nower, 2002; Walters, 1997), yet there also appear to be important differences among the characteristics and motivations of the range of individuals who gamble excessively. The heterogeneity among pathological gamblers can be separated into at least two developmental pathways: a subgroup seeking stimulation (thrill-seekers) and a subgroup seeking to tranquilize adverse moods.
(Blaszczynski & Nower, 2002; Petry et al., 2005). Each pathway is proposed to vary in the degree of biological vulnerability and characteristic affective states (Blaszczynski & Nower, 2002). The subgroup of pathological gamblers high in impulsivity are also expected to have comorbid impulsive disorders, whereas those who gamble in order to escape from stress or depression are expected to have comorbid mood or anxiety disorders (Blaszczynski et al., 1997; Blaszczynski & Nower, 2002; Cunningham-Williams et al., 1998; Petry et al., 2005). Mood disorders are prevalent among pathological gamblers (Blaszczynski et al., 1997; Petry et al., 2005). Some gamblers show aspects of disassociation and absorption while gambling which suggests these individuals seek activities to distract them from adverse moods (Diskin & Hodges, 1999).

While research examining whether impulsivity predicts gambling behaviours remains in its infancy and is somewhat inconclusive (Barnes et al., 2005; Vitaro et al., 2001), it is important for future research to take into account known predictors of pathological gambling. Males, compared to females, are not only at more risk for pathological gambling (Barnes et al., 1999; Lesieur et al., 1991; Petry et al., 2005; Spunt, 2002), but also gamble more frequently and more money at each activity (Lesieur et al., 1991). Unmarried individuals are also at more risk, however the relation between age and ethnic minorities show mixed results; only some research suggests black individuals are at greater risk for gambling pathology while both older age and younger age have been related to increased risk (Barnes et al., 1999; Petry et al., 2005; Shaffer et al., 1999; Walters & Contri, 1998). Frequency of gambling behaviours is consistently shown to predict pathological gambling (Walters, 1997; Welte et al., 2004) while versatility of gambling activities may also be related to problem gambling (Lahn, 2005). Association
with deviant peers, early onset of gambling and substance abuse have all shown some, albeit weak, predictive power for gambling problems (Barnes et al., 1999; Blaszczynski & Steel, 1998; Vitaro et al., 1999; Vitaro et al., 2001). Although depression is related to problem gambling, in one study of largely female university students, impulsivity fully mediated this relationship (Clarke, 2006). Finally, gambling expectancies, or personal beliefs regarding the probable consequences that will occur if gambling activities are pursued, were related to gambling pathology in an offender sample (Walters & Contri, 1998).

The Present Study

As discussed, offender populations show higher prevalence of problematic gambling than the general population. While preliminary research shows promise that shared deficits in impulse control likely underlie both criminal and gambling behaviours, it is also reasonable to assume that impulsive individuals represent one of several subgroups of pathological gamblers. Given that this subgroup shows important signs of being the most high risk offenders and severe problem gamblers, additional examination of pathological gambling among offenders is warranted.

The present study was conducted with offenders incarcerated in minimum and medium security institutions; offenders were asked about their substance use, gambling behaviours and levels of impulsivity. Of interest are the intercorrelations among the variables as well as differences in impulsivity among non-gambling/non-substance abusing offenders versus pathological gambling/substance dependent offenders. This research is exploratory, but hypotheses predict that impulsivity will be related to both greater substance use and gambling problems in this offender sample.
Method

Participants

One hundred and forty offenders were recruited within minimum and medium security institutions for participation in this study. Participants were excluded only if education level or mental illness impeded their ability to complete the questionnaires. Volunteers ranged in age from 20 to 71 with a mean age of 41.7 years. A majority of the offenders were Caucasian (74.6%) while the remaining participants were Aboriginal (8.7%), Black (5.1%), Asian (2.9%), Latino (0.7%), multi-racial (0.7%), or listed as Other (7.2%). Most participants were single, either never married (40.3%), divorced (33.1%), or widowed (3.6%) while 23.0% of the sample was married.

Slightly less than half of the sample was incarcerated for a non-sexual violent index offence, whether assault or murder (49.3%), while the remaining half was split between sexual assault (19.1%) and non-violent offences (31.6%). Similarly, about half of the sample had served a previous sentence for assault (52.9%) and a majority of those with a prior assault conviction reported that the victim was not their partner or girlfriend (76.3%). Some offenders had served a prior federal sentence (22.3%) while a greater percentage had served a prior provincial sentence (54.0%).

Materials

Substance Abuse

The Alcohol Dependence Scale (ADS; Skinner & Horn, 1984) screens for alcohol dependence in adults. The scale consists of 25 questions regarding experiences with alcohol and was adapted for offenders by asking participants to report their experiences in the last 12 months prior to incarceration. The ADS is strongly associated with alcohol
dependence diagnosis (AUC = .89 ± .02); scores range from 0-47 with higher scores indicating greater alcohol abuse (Ross, Gavin, & Skinner, 1990). Recommended diagnostic cut-off for this instrument is 8/9 points.

The Drug Abuse Screening Test (DAST-20; Skinner, 1982; Skinner & Goldberg, 1986) uses 20 forced choice yes/no questions to identify adults who abuse prescription or illegal drugs, specifically excluding alcohol. The scale also assesses problems caused by drug use in specific life areas such as family, relationships, employment, legal problems and medical problems. The DAST-20 appears to be composed of multiple factors, shows good internal consistency ($\alpha = .86-.94$) and shows good test-retest reliability (.78; Yudko, Lozhkina, & Fouts, 2007). Scores range from 0-20 with higher scores indicating greater drug use dependence and problems; the recommended cut-off is six points (Yudko et al., 2007).

**Personality Measures**

Barratt’s Impulsivity Scale (BIS-11; Patton, Stanford, & Barratt, 1995) contains 24 items used to classify three aspects of impulsivity: motor (acting without thinking), cognitive (quick decisions) and non-planning (present orientation). All items are measured on a four-point scale ranging from rarely/never to almost always/always. Scores range from 24-96 with higher scores indicating greater impulsivity. Internal consistency among incarcerated populations is good ($\alpha = .80$); on average, male offenders score 76.3 on the scale (Patton et al., 1995).

The Sensation Seeking Scale (Zuckerman, Kolin, Price, & Zoob, 1964) is composed of 19 true/false items assessing preference for high arousal situations.
Sensation seeking is negatively correlated with self-control (Zuckerman & Link, 1968). Scores range from 0-19 with higher scores indicating greater sensation seeking.

The Behavioural Inhibition System/Behavioural Activation System Scale (Carver & White, 1994) is a 20-item Likert scale to assess reward sensitivity (BAS) and punishment sensitivity (BIS) as proposed by Gray’s personality theory. The questionnaire assesses a single BIS component and three components of BAS: reward responsiveness, fun seeking and drive. Internal consistencies range from acceptable to good ($\alpha = .66-.76$) and test-retest correlations are medium to large ($r = .59-.69$; Carver & White, 1994). The number of items differs for each subscale; for BIS, scores range from 7-35, while the BAS scales have the following ranges: Reward Responsiveness (5-20), Fun Seeking (4-16) and Drive (4-16).

**Gambling Abuse**

The Canadian Centre on Substance Abuse (2003) developed the Canadian Problem Gambling Index (CPGI) which assesses gamblers and problem gamblers’ range of gambling experiences. Participants indicate which gambling activities they have engaged in from a comprehensive list of locally-available gambling opportunities. Frequency, time spent, average monthly spending and largest total daily amount are also assessed. The CPGI also includes the Problem Gambling Severity Index (PGSI) which consists of nine items assessing problem gambling behaviour and adverse consequences that have resulted from personal gambling. Items on the PGSI are scored on a four-point scale (0-3). Scores of 1-2 indicate low risk for problem gambling, 3-7 indicate moderate risk while a score of 8 or above indicates the individual is a problem gambler. Internal consistency for the PGSI is good ($\alpha = .84$) as is the test-retest reliability ($r = .78$). The
CPGI also assesses known correlates to problem gambling for research purposes, including mood, faulty cognitions, family experiences, comorbidity with substance abuse and salient first gambling experiences.

Procedure

Participants were individually approached by a research assistant and invited to participate in the study. Participants were fully informed of the nature of the experiment and the fact that they would receive no compensation for volunteering. It was also made clear that any question could be omitted without penalty. Following completion of a written consent form, each volunteer was given a test package that consisted of the self-report questionnaires. The scales were given in the order listed above for each participant as no order effects were expected. The research assistant was available to answer any questions and, upon completion, participants were debriefed and thanked.

Results

As discussed above, the sample consisted of mainly violent, older offenders. The average age at first offence was 21.4 years. Offenders were serving between 2-25 year sentences (average: 7.8 years) for offences that were committed at an average age of 32.7 years. This sample of offenders was also fairly well educated; 18.1% of the sample had completed some college or university credits with an additional 17.3% having completed college or university programs. The rest of the sample had completed up to seventh (1.4%), ninth (3.6%), tenth (11.6%), eleventh (19.6%) and twelfth (28.2%) grades.

Substance and Gambling Abuse

Fewer offenders met the criteria for alcohol dependence as measured by the ADS (29.9%; scoring 9 and above) compared to the percentage of offenders meeting the
criteria for drug dependence as measured by the DAST (40.4%). On the other hand, 36.8% showed no alcohol-related problems and 25.0% showed no drug-related problems. A large majority of the participants showed no problem gambling behaviors (58.6%) whereas 16.5% showed low risk for problem gambling, 14.5% showed moderate risk for problem gambling and fourteen individuals (10.8%) met the diagnostic cut-off on the PGSI for problem gambling.

Correlations listed in Table 1 show that drug dependence is moderately and significantly correlated with both alcohol dependence and severity of problem gambling within this offender sample. However, the magnitude of the association between alcohol dependence and gambling severity falls within the small range. Given that over one-third of the sample are drug dependent and drug abuse is moderately correlated with alcohol and gambling problem behaviours, these results confirm the tendency for substance abuse behaviors to cluster together. Furthermore, for this sample, drug abuse appears to be more central than other types of substance addiction.

Table 1. Correlations Among Substance Abuse Scales

<table>
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<tr>
<th>Substance Abuse Scales</th>
<th>DAST</th>
<th>PGSI</th>
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<tbody>
<tr>
<td>Alcohol Dependence Scale (ADS)</td>
<td>.42**</td>
<td>.22*</td>
</tr>
<tr>
<td>Drug Abuse Screening Test (DAST)</td>
<td>-</td>
<td>.41**</td>
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PGSI = Problem Gambling Severity Index
* p < .02; ** p < .001
As seen in Table 2, the various measures of impulsivity and impulsivity-related constructs largely correlate in expected ways. The three BAS measures are moderately to strongly correlated with each other while both BAS Fun Seeking and BAS Drive are also moderately to strongly correlated with impulsivity and sensation seeking. However, BAS Reward Responsiveness is only mildly related to sensation seeking whereas the correlation with impulsivity did not reach significance. In addition, impulsivity as measured by BIS-11 is strongly correlated with sensation seeking. Other correlations among impulsivity-related constructs are non-significant but in the expected direction.

Table 2. Correlation Matrix of Personality Scales and Problem Gambling Severity Index

<table>
<thead>
<tr>
<th>Personality Scales</th>
<th>SSS</th>
<th>BIS</th>
<th>Reward</th>
<th>Fun</th>
<th>Drive</th>
<th>PGSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barratt Impulsivity Scale (BIS-11)</td>
<td>.69**</td>
<td>.12</td>
<td>.13</td>
<td>.58**</td>
<td>.37**</td>
<td>.13</td>
</tr>
<tr>
<td>Sensation Seeking Scale (SSS)</td>
<td>-</td>
<td>.09</td>
<td>.21*</td>
<td>.75**</td>
<td>.50**</td>
<td>.17*</td>
</tr>
<tr>
<td>Behavioral Inhibition System (BIS) scale</td>
<td>-</td>
<td>.50**</td>
<td>.22*</td>
<td>.14</td>
<td>.11</td>
<td></td>
</tr>
<tr>
<td>BAS Reward Responsiveness</td>
<td>-</td>
<td>.43**</td>
<td>.55**</td>
<td>.19*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAS Fun Seeking</td>
<td>-</td>
<td>.59**</td>
<td>.17†</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BAS Drive</td>
<td>-</td>
<td>.19*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

PGSI = Problem Gambling Severity Index
†p < .06; *p < .05; **p < .001

As Gray’s theory of personality postulates that the Behavioral Activation System (BAS) and Behavioral Inhibition System (BIS) are orthogonal constructs, it is somewhat surprising to observe positive associations between BAS measures and the BIS construct.
Results show sensitivity to punishment is positively related to sensitivity to reward. In addition, BIS shows small magnitude correlations with BAS fun seeking. The mean BIS scale score ($M = 18.28$) suggests that these offenders do not experience deficits in sensitivity to punishment on average. However, the present sample did show a reduced mean level of impulsivity ($M = 48.7$) compared to a previously tested sample of offenders (Patton et al., 1995).

Also seen in Table 2, some of the correlations of personality measures with gambling severity reached significance or approached significance; however, these correlations are small in magnitude. Trends indicated that problem gambling is mildly related to higher levels of sensation seeking and the three BAS measures. Although it was expected that problem gambling would be negatively associated with sensitivity to punishment as measured by the BIS subscale, Table 2 indicates there was a non-significant positive correlation instead. As noted above, a majority of the sample scored no problems on the PGSI; a sample screened to include more problem gamblers is likely required in order to further investigate the relationships between these measures.

Not shown in the table, some of the personality measures correlated more strongly with other types of substance abuse. The only significant correlations observed were between drug dependence as measured by the DAST and impulsivity ($r = .38; p < .001$), sensation seeking ($r = .40; p < .001$), BAS Fun Seeking ($r = .24; p < .01$) and BAS Drive ($r = .33; p < .001$). However, a correlation between sensation seeking and alcohol dependence as measured by the ADS approached significance ($r = .17; p < .06$).

Offenders were divided into two groups (those who scored as no or low risk on the PGSI vs. those who scored moderate or high risk for pathological gambling) and
compared on personality measures. Those with moderate or high risk for problem
gambling scored higher on Barratt’s Impulsivity Scale (BIS-11) than non-problem
offenders, however this difference only approached significance ($t(130) = 1.80, p = .07,
$\eta^2 = .02$). Similarly, participants showing some gambling problems scored significantly
higher on sensation seeking ($t(130) = 2.63, p = .01, \eta^2 = .05$).\(^1\) Examination of effect
size, however, indicates a small effect size for the difference between gamblers and non-
problem offenders on impulsivity and a small-to-medium effect size for sensation
seeking. As seen in Table 3, similar findings are revealed when conducting chi-square
analyses comparing PGSI moderate and high scorers vs. non-scorers and low scorers to
binary median-split groups on the BIS-11 and SSS scales. Analyses again reveal a small-
to-medium effect size for the tendency for offenders with at least one gambling problem
to also score above the median on sensation seeking.

PGSI scorers versus non-scorers also showed no significant differences on the
BIS subscale ($t(129) = 1.17, ns, \eta^2 = .01$). However, results consistently show a trend for
problem gamblers to score higher on the three BAS scales than non-problem offenders:
BAS Reward Responsiveness scale ($t(129) = 2.48, p = .02, \eta^2 = .05$), BAS Fun Seeking
scale ($t(128) = 2.28, p = .02, \eta^2 = .04$) and BAS Drive scale ($t(129) = 2.68, p < .01, \eta^2 =
0.05$). Although only the BAS Drive test surpassed the strict family-wise significance
level, effect sizes indicate small-to-medium effects for all three BAS measures.\(^2\)

\(^1\) Bonferroni-corrected significance levels for these tests are $p = .025$.
\(^2\) Bonferroni-corrected significance levels for these tests are $p = .0125$. 

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Table 3. Chi square Values and Percentages for ‘No Scorers & Low Scorer’ and ‘Medium & High Scorers’ on PGSI Compared with Median Splits on Personality Scales

<table>
<thead>
<tr>
<th>Personality Scales</th>
<th>Problem Gambling Severity Index</th>
<th>No Gambling Problem</th>
<th>Score of 3 or More</th>
<th>$\chi^2$</th>
<th>$\Phi$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>% (n/n)</td>
<td>% (n/n)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barratt Impulsivity Scale</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>51.0 (51/100)</td>
<td>37.5 (12/32)</td>
<td>1.77</td>
<td>.12</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>49.0 (49/100)</td>
<td>62.5 (20/32)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensation Seeking Scale</td>
<td></td>
<td></td>
<td></td>
<td>7.57*</td>
<td>.24</td>
</tr>
<tr>
<td>Low</td>
<td>48.5 (48/99)</td>
<td>21.2 (7/33)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>51.5 (51/99)</td>
<td>78.8 (26/33)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* $p < .01$

**Established Correlates of Problem Gambling**

Offenders who did not show gambling pathology were less likely to endorse the two items measuring faulty cognitions; effect size suggests this is a medium effect ($t(121) = 2.81, p < .01, \eta^2 = .06$). These items assess beliefs that an individual can anticipate betting outcomes while gambling; offenders who experience gambling problems more strongly endorse beliefs that they can anticipate what bets will lead to a win. On the other hand, problem gamblers and offenders without gambling pathology showed no differences in reporting whether anyone in their family had ever had a drug, alcohol or gambling problem ($\chi^2(2, N = 131) = 0.60, ns$, Cramér’s $V = 0.07$). Finally, the groups showed a difference in the items measuring depressed mood and motivation to turn to substances when anxious or upset; those indicating gambling pathology scored higher on
depression as an antecedent to drug use ($t(126) = 2.38, p = .02, \eta^2 = .04$). Effect size for this test indicates a small effect.

Investigation of two variables related to gambling-specific behaviours were also conducted: experiencing important wins or losses early in one’s gambling career and use of substances while gambling. For these tests, participants who do not indicate engaging in gambling behaviour or who did not show any gambling problems were excluded. Accordingly, those who scored low on the PGSI were compared to moderate/high scorers on these two variables. Analyses indicate that individuals’ reports that they experienced either big wins or losses (or both) early in their gambling career were related to scoring moderate or high risk for gambling pathology ($\chi^2(1, N = 55) = 13.64, p < .001, \Phi = 0.50$). This is a large effect. On the other hand, no difference in gambling problems was observed between gamblers who report using or abusing alcohol and drugs while gambling and gamblers with no comorbid substance abuse problems ($t(53) = 1.05, ns, \eta^2 = .02$).

Discussion

While the losses and poor outcomes associated with pathological gambling are delayed over time, the wins and excitement generated by anticipating wins are immediate (Petry, 2001a). The tendency to accept immediate small magnitude rewards over delayed larger rewards is one dimension of impulsivity; notably, this aspect of impulsivity is shown to be associated with conduct problems (Alessi & Petry, 2003; Petry, 2002). Although most children have developed inhibitory control skills by the second grade (Schachar & Logan, 1990), it appears that offenders continue to show deficits in these skills later in life (James & Seager, 2006; Patton et al., 1995). Impulsivity is not only
important for understanding pathways into criminal behaviour, but may also be important for understanding persistence in offending; one reason persistent offenders show a tendency for poor engagement in rehabilitation programs may be their resistance to working toward rewards that are not attainable without a substantial amount of time and effort (Petry, 2002). Treatment engagement may not be viewed as desirable or valuable when it offers no immediate reward.

This study sought to investigate impulsivity as an important mechanism underlying gambling behaviours among offenders. A sample of offenders showed greater proneness for alcohol and drug dependence compared to gambling pathology; however, these three addictions were inter-correlated. Among the substance addictions, drug use appeared to be of most concern for this sample.

While it is unclear whether impulsivity is the mechanism that underlies these problem behaviours, results do provide evidence that offenders who report at least one gambling-related problem also tend to score higher in impulsivity, sensation seeking and appetitive motivations. Highest effect sizes were for sensation seeking, reward responsiveness and drive. This suggests gambling pathology among offenders may be most related to heightened desire for stimulating experiences. Given that seeking high arousal situations is not in itself pathological, results still leave open the possibility that an inability to restrict engaging in exciting situations that clearly lead to poor outcomes is the core deficit underlying gambling problems among offenders. BIS scale scores support the conclusion that offenders with gambling problems are sensitive to punishment.
While faulty gambling cognitions were moderately related to gambling pathology, the association between gambling and mood disturbance in this offender population was of small magnitude. As predicted by a pathway model of problem gambling (Blaszczynski & Nower, 2002), gamblers with elevated levels of antisocial behaviours and comorbid substance abuse are expected to show inhibitory control, but not mood, deficits.

This exploratory research provides encouraging reasons to further examine the relationship between impulsivity and gambling among offenders. This study was limited by a sample with a low percentage of participants experiencing elevated levels of gambling problems; the sample should be further enhanced for more detailed data analysis. This study was also limited in the range of definitions of impulsivity employed; as discussed above, impulsivity appears to be multi-dimensional and it would require a substantial amount of measures to attempt to tap all of these dimensions. Further research is likely to benefit from also adopting behavioral or vignette-style measures of impulsivity to increase external validity. However, while noting this limitation, this study was also able to provide information on five separate aspects of impulsivity. This represents a strong attempt to narrow the focus on which impulsivity dimensions are especially related to gambling and offending. As such, if it can be found that a single aspect of impulsivity underlies risk for both pathological gambling and offending, this can directly lead to effective intervention and treatment targets. Of interest, then, is whether a brief intervention can be developed to address these specific inhibitory control deficits and whether changes in inhibitory control will yield changes in offenders’ gambling behaviour.
References


Canadian Centre on Substance Abuse (2003). *The Canadian Problem Gambling Index*. Edmonton, Canada: Wynne Resources.


