Mechanisms of action in the relationship between mindfulness and problem gambling
behaviour

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Abstract

Previous studies have found an inverse relationship between mindfulness and problem gambling severity. This paper presents the findings from two studies of treatment seeking problem gamblers designed to explore the role of mindfulness in problem gambling. Treatment-seeking problem gamblers displayed significantly lower mindfulness scores than adult community members and university students. Mindfulness was significantly related to most indices of gambling, and psychological distress was an important mechanism in these relationships. Rumination, emotion dysregulation and thought suppression were also implicated as mediators in the inverse relationship between mindfulness and psychological distress. Taken together, the findings provide theoretical support for existing models of mindfulness which suggest that mindfulness operates by reducing psychological distress through these cognitive mechanisms. They also suggest that mindfulness training may be a new and innovative avenue for therapy to improve treatment effectiveness for problem gambling.

Keywords

Problem gambling, gambling, mindfulness, distress, rumination, emotion dysregulation, distress tolerance, thought suppression

Cognitive and behavioural therapies (CBT) are currently considered the treatment of choice for problem gambling (Cowlshaw et al., 2012; Thomas et al., 2011). CBT interventions have been successfully applied in individual and group settings, over the Internet, and in self-help workbooks (Carlbring & Smit, 2008; Dowling, Smith, & Thomas, 2006, 2007; Petry et al., 2006). They have also been successfully employed in combination with other interventions (Carlbring & Smit, 2008; Petry et al., 2006) and with treatment goals of abstinence and controlled gambling (Dowling, Smith, & Thomas, 2009; Ladouceur, Lachance, & Fournier, 2009). However, CBT is not effective for all problem gamblers and relapse rates can be relatively high (Cowlshaw et al., 2012; Thomas et al., 2011). Moreover, CBT efficacy studies generally report high rates of client attrition as therapy proceeds (Dowling, 2009).

Given these limitations, it is important to consider innovative therapeutic approaches that can enhance treatment effectiveness (Najavits, 2003). In the past several years, there has been a growing interest in mindfulness-based interventions that may help problem gamblers attend, with an attitude of discovery, acknowledgement, observation and engagement, to gambling-related thoughts and feelings (de Lisle, Dowling, & Allen, 2011, 2012; Riley, 2012; Shonin, van Gordon, & Griffiths, 2013a, 2013b, 2013c; Toneatto, Vettese, & Nguyen, 2007). There is now evidence to suggest that several mindfulness-based psychotherapies, such as mindfulness-based cognitive therapy (MBCT), dialectical behaviour therapy (DBT), and meditation awareness training (MAT) may improve both gambling and other therapeutic outcomes for problem gambling (Christensen et al., 2013; de Lisle et al., 2011; Korman et al., 2008; Shonin et al., 2013c; Toneatto et al., 2007).

Mindfulness is an inherent state of consciousness that involves heightened states of clarity and sensitivity (Brown & Ryan, 2003). Brown and Ryan suggested that individuals must differ in the frequency with which they deploy attention and awareness and that there

must be intra-individual variations in the levels of mindfulness. According to the big-5 model of disposition and situation interaction (Reynolds & Karraker, 2003), behaviour is restricted to acts that do not contradict the dispositional tendencies of the person. So, given a high risk gambling situation, context-appropriate behavioural responses are elicited in accordance with the dispositional parameters of the individual concerned. From this perspective, gamblers with a relatively greater level of mindfulness may exhibit differing behavioural responses to those with a lower level of mindfulness. This conceptualisation of mindfulness is useful because it highlights mindfulness as an innate skill or tendency that can contribute to the behavioural responses of a given situation.

However, the extent of research efforts into mindfulness and problem gambling are currently limited. In a non-randomised study of 185 undergraduate students who gambled at least weekly, Lakey, Campbell, Brown, and Goodie (2007) found that mindfulness was negatively correlated with gambling-related pathology after controlling for gambling frequency and trait self-control. Similarly, Riley (2012) found that mindfulness was negatively associated with problem gambling in a sample of 103 treatment-seeking problem gamblers. These findings seem to suggest that a higher level of mindfulness provide a level of present-centred awareness to gambling-related thoughts and feelings which facilitate the application of more adaptive behavioural choices (Lakey et al., 2007).

In understanding the mechanisms involved in this process, Lakey and colleagues (2007) found that the relation between mindfulness and problem gambling was mediated by cognitive processes which underlie gambling-related risk-taking and decision-making tasks. As such, gamblers with a higher level of mindfulness displayed greater accuracy in assessing gambling-related risk taking and could learn mixed reward and punishment contingencies better than less mindful gamblers. Similarly, Riley (2012) found that experience avoidance mediated the relationship between mindfulness and problem gambling. However, these

constructs only partially mediated the relationship between mindfulness and problem gambling severity, suggesting that other mechanisms are involved in this relationship. Lakey et al. (2007) speculated that mechanisms relating to psychological distress represented one possibility.

There is evidence that there is a significant relationship between mindfulness and psychological distress in a range of samples such as university students, community adults, and substance users (Arch & Craske, 2006; Bowen, Witkiewitz, Dillworth, & Marlatt, 2007; Carmody, Baer, Lykins, & Olendzki, 2009; Coffey & Hartman, 2008; Shapiro, Carlson, Astin, & Freedman, 2006). Problem gambling is also associated with significant personal distress (Blaszczynski & Nower, 2002), as well as a range of mood disorders, anxiety disorders, alcohol and substance use disorders, personality disorders, and other impulse control disorders (Lorains, Cowlishaw, & Thomas, 2011; Petry, 2005).

There is an emerging literature that has investigated the role of some psychological processes, such as rumination, emotion dysregulation and thought suppression, in mediating the relationship between mindfulness and psychological distress (Arch & Craske, 2006; Bowen et al., 2007; Carmody et al., 2009; Coffey & Hartman, 2008; Shapiro et al., 2006). Rumination has been identified as a mediator in this relationship in samples of introductory psychology students (Coffey & Hartman, 2008) and has been associated with dysphoric affect in those at risk of relapse from depression (Teasdale, Segal, & Williams, 1995). Moreover, there is clear empirical support for the role of mindfulness in reducing ruminative thought in the general and clinical population (Borders, Earleywine, & Jajodia, 2010; Jain et al., 2007; Ramel, Goldin, Camona, & McQuaid, 2004; Shapiro, Brown, & Biegel, 2007). It may be argued that problem gamblers are frequently pre-occupied by ruminative thought patterns, in the form of preoccupation with re-living past gambling experiences, planning to gamble, or thinking of ways to secure money with which to gamble (Atlas & Peterson, 1990;

Orford, Morison, & Somers, 1996; Ratelle, Vallerand, Mageau, Rousseau, & Provencher, 2004). Gamblers with higher levels of mindfulness may be in a better position to choose what action to perform because they are more able to effectively disrupt the connection between gambling cognitions and psychological distress.

Emotion dysregulation has also been identified as a mediator of the relationship between mindfulness and psychological distress (Coffey & Hartman, 2008). Mindfulness training is also increasingly used as a clinical intervention to assist people cope with strong emotional states (Arch & Craske, 2006; Hayes & Feldman, 2004; Linehan, 1993) by enhancing their ability to mindfully attend to present moment experience without reactivity (Shapiro et al., 2006). Emotion dysregulation, which refers to the apparent inability of some individuals to regulate strong emotions (Chambers, Gullone, & Allen, 2009), can be conceptualised as loading on the regulation facet of the distress tolerance construct (Simon & Gaher, 2005). According to Simons and Gaher (2005, p. 83), distress tolerance represents an individual's overall capacity "to experience and withstand negative psychological states" and collectively refers to the capacity to tolerate strong emotions, appraise the experience of distress, regulate strong emotions, and become absorbed by the presence of distressing emotions. Although emotion dysregulation and distress tolerance among problem gamblers has not been extensively researched, there is emerging evidence that there is heightened emotion dysregulation among problem gamblers (Lee et al., 2008) and that problem gamblers are motivated to gamble in order to reduce negative mood states or to improve positive emotions (Błaszczynski & Nower, 2002; Stewart & Zack, 2008). A higher level of mindfulness may allow gamblers to step back from strong emotional states and simply observe such states come and go without engaging in a behavioural response.

Thought suppression may represent another mechanism in the relationship between mindfulness and psychological distress (Bowen et al., 2007). Many problem gamblers

attempt to suppress unwanted thoughts as they attempt to discontinue gambling (Ciarrocchi, 2002). In his study of treatment-seeking problem gamblers, Riley (2012) found that thought suppression was associated with problem gambling and that experiential avoidance mediated that relationship. However, attempts to suppress thoughts often lead to a paradoxical increase in the frequency and intensity of such thoughts (Wegner, 1989; Wegner & Erber, 1992).

While the mechanisms of action are not fully understood, research suggests that acceptance of unwanted thoughts partially mediates the relationship between mindfulness therapy participation and addictive behaviour (Bowen et al., 2007). Rather than decreasing the frequency of unwanted thoughts, mindfulness training imbues participants with an adaptive coping response for such thoughts as they enter conscious awareness. It would therefore be expected that gamblers with higher levels of mindfulness may be able to increase awareness and acceptance of unwanted thoughts as they attempt to disengage from gambling activity.

In their review of the literature, deLisle et al. (2013) posits that rumination, emotion dysregulation, and thought suppression, among a range of other constructs, may underpin the relationships between mindfulness, psychological distress, and problem gambling behaviour. Importantly, these factors have already been identified as mediational mechanisms in the relationship between mindfulness and psychological distress (Arch & Craske, 2006; Bowen et al., 2007; Carmody et al., 2009; Coffey & Hartman, 2008; Shapiro et al., 2006). Problem gamblers with higher levels of mindfulness may be able to manage gambling and non-gambling related thoughts and feelings in a more direct and helpful way rather than using gambling as a means of decreasing the psychological distress associated with them. However, to date, no study has investigated the role of mindfulness in promoting emotional regulation and reducing rumination and thought suppression in problem gamblers.

This paper presents the findings from two studies of treatment seeking problem gamblers designed to explore the role of mindfulness in problem gambling. The first aim of

these studies is to compare mindfulness scores of treatment seeking populations of problem gamblers with normative samples available for each measure. It is hypothesised that problem gamblers will display lower mindfulness scores than normative samples of adult community members and university students. A second aim is to explore the relationship between mindfulness and indices of gambling behaviour in a treatment seeking population of problem gamblers. It is hypothesised that mindfulness will be related to gambling pre-occupation, gambling urges, problem gambling severity, gambling expenditure, gambling frequency, and gambling duration. A third aim is to explore Lakey's et al. (2007) hypothesis that psychological distress mediates the relationship between mindfulness and these indices of gambling behaviour. It is hypothesised that psychological distress will mediate the relationship between mindfulness and gambling pre-occupation, gambling urges, problem gambling severity, gambling expenditure, gambling frequency, and gambling duration. A final aim is to explore the degree to which rumination, emotion dysregulation/distress tolerance, and thought suppression mediate the relationship between mindfulness and psychological distress. It is hypothesised that these factors will mediate the relationship between mindfulness and psychological distress.

STUDY 1

Method

Participants

Participants were 78 (49 male, 29 female) self-identified problem gamblers who were active clients of a metropolitan Melbourne problem gambling service. Males ranged from 21 to 76 years of age ($Mdn=43$, $M=44.6$, $SD=12.9$) and females ranged from 37 to 76 years of age ($Mdn=58$, $M=57.0$, $SD=10.8$). Most participants (60%) were not in a cohabiting relationship. Sixty one per cent of participants reported that they gambled exclusively on electronic gaming machines (EGMs). Smaller proportions reported that they engaged in non-

EGM activities such as horse racing (8%), casino betting (4%), and on multiple gambling activities (25%). In relation to gambling severity, 13% reported that they had never thought that their gambling had been a problem over the previous four weeks, 22% reported they sometimes considered their gambling had been a problem, 16% considered their gambling a problem most of the time, and 17% considered their gambling a problem almost always. Gambling dollars spent over the previous fortnight (gambling expenditure) ranged from \$AUS0.00 to \$AUS3000.00 ($Mdn=0$, $M=242.33$, $SD=516.43$). Days spent gambling over the previous fortnight (gambling frequency) ranged from 0 to 14 days ($Mdn=0$, $M=1.74$, $SD=2.82$).

Measures

The survey used for this research included items that assessed demographic characteristics, mindfulness, possible mediators (rumination, emotion dysregulation, and thought suppression), psychological distress, and indices of gambling behaviour (gambling urges, problem gambling severity, gambling expenditure, and gambling frequency).

Mindfulness. The Mindfulness Awareness Assessment Scale (MAAS; Brown & Ryan, 2003) is a 15-item self-report measure which assesses attention to, and awareness of, present moment experience. Items are arranged on a 6-point scale ranging from (1) *almost always* to (6) *almost never*. There is evidence for the convergent validity and discriminant validity of the scale. The scale has adequate internal consistency, ranging from .82 to .87 across samples (Brown & Ryan, 2003). The internal consistency of the MAAS in the current sample was excellent ($\alpha = .90$).

Rumination. The Rumination subscale of the Rumination-Reflection Questionnaire (RRQ; Trapnell & Campbell, 1999) is a 12-item scale that measures the tendency to ruminate on events and experiences. Items are arranged on 5-point scale ranging from (1) *strongly*

disagree to (5) *strongly agree*. Internal consistency is good, with Cronbach α ranging from .89 to .92 across samples (Trapnell & Campbell, 1999) and .85 in the current sample.

Emotion dysregulation. The Repair subscale of the Trait Meta-Mood Scale (TMMS; Salovey, Mayer, Goldman, Turvey, & Palfai, 1995) comprises six items which measure the ability to regulate negative affect. Items are arranged on 5-point scale ranging from (1) *strongly disagree* to (5) *strongly agree*. Higher scores reflect greater ability to regulate negative affect. Internal consistency is adequate, with Cronbach α ranging from .79 to .81 across samples (Salovey et al., 1995) and .66 in the current sample.

Thought suppression. The White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994) is a 15-item scale that measures the tendency of individuals to suppress thoughts across a variety of situations and thought topics. Items are arranged on a 5-point scale ranging from (1) *strongly disagree* to (5) *strongly agree*, with high scores indicating chronic thought suppression. The WBSI is significantly correlated with other measures of psychopathology such as depression, anxiety, obsessive-compulsive symptoms, and pathological worry. The internal consistency of the WBSI is excellent, with a Cronbach α of .91 in previous studies (Schmidt et al., 2009; Wegner & Zanakos, 1994) and .89 in the current sample.

Psychological distress. The Kessler 6 (K6; Kessler et al., 2002) is a validated quantifier of non-specific psychological distress, based on six questions about the level of nervousness, agitation, psychological fatigue and depression, which participants may have experienced over the previous four weeks. The K6 has had excellent internal consistency in previous studies (Cronbach's $\alpha = .89$) (Kessler et al., 2002) and the current study (Cronbach's $\alpha = .93$).

Gambling urges. The Gambling Urges Scale (GUS; Raylu & Oei, 2004) is a six item scale that assesses gambling-related urges. Items are arranged on a 7-point scale ranging from (0) *strongly disagree* to (6) *strongly agree*. The GUS can significantly discriminate problem

from non-problem gamblers, predicts responses on other gambling severity measures, and has significant positive correlations with gambling motivations, gambling cognitions, and psychopathology, providing good evidence for predictive validity, criterion-related validity, and concurrent validity respectively. Internal consistency is good in previous studies (Cronbach $\alpha = .81$) (Raylu & Oei, 2004) and in the current study (Cronbach's $\alpha = .95$).

Problem gambling severity. Item 5 from the Problem Gambling Severity Index (PGSI) of the Canadian Problem Gambling Index (CPGI; Ferris & Wynne, 2001) was used to identify whether the respondent had thought that their gambling had been a problem over the previous four weeks. Responses are rated on a four-point scale ranging from (0) *never* to (3) *almost always*.

Gambling expenditure and frequency. Single items were employed to measure the amount of money gambled and the number of days gambled over the previous fortnight.

Procedure

Approval for this research (Ethics number CF09/1544 – 2009000828) was granted by the Monash University Standing Committee on Ethics in Research involving Humans and by the specialist problem gambling service in Melbourne (Gamblers Help Southern) in which the research was conducted. The questionnaire used for this research was added to a periodic survey of current clients designed to gain an extended understanding of their experience of the service. Every existing problem gambling client of the service was offered the opportunity to complete the survey which was conducted in the third quarters of 2008 and 2009. Counsellors distributed and collected copies of the survey questionnaires to consenting clients. The questions for this study were located on a separate sheet that had no identifying details. This sheet was removed by the counsellor and sealed in an envelope for later collection by the research team.

Data Analysis

Missing data (4.7% for the major study variables) was not considered as a serious threat to data integrity (Tabachnick & Fidell, 2001). Respondents completing less than 30% of any scale or subscale were excluded from analysis associated with that scale or subscale using pair-wise deletion. Mean person substitution (Tabachnick & Fidell, 2001) was employed to impute missing data for cases with less than 30% missing data on individual scales or subscales. An examination of histograms, normal Q-Q plots, detrended normal Q-Q plots, the Kolmogorov-Smirnov statistic, the skewness statistic, and kurtosis statistic revealed that gambling expenditure and gambling frequency had non-normal distributions. Outliers for these variables were retained in the analyses as they represented a realistic depiction of problem gambling behaviour. A single sample *t*-test was conducted to evaluate the difference between the MAAS and the normed value reported by Brown (n.d) for community adults. A series of Pearson's correlations (for normally distributed variables) and Spearman's correlations (for non-normally distributed variables) were employed to explore the relationships between mindfulness, the indices of gambling behaviour, psychological distress, rumination, emotion dysregulation, and thought suppression.

Results

Mindfulness norms for community adults ($M = 4.20$, $SD = 0.69$) were significantly higher than mindfulness scores for this sample of problem gamblers ($M = 3.82$, $SD = 0.87$), $t(74) = -3.81$, $p < 0.01$.

Table 1 displays results of Spearman's and Pearson's correlations between mindfulness, the proposed mechanisms of mindfulness (rumination, emotion dysregulation, and thought suppression) distress, and indices of gambling behaviour (gambling urges, problem gambling severity, gambling expenditure, and gambling frequency).

Table 1

Correlations between mindfulness, mechanisms of action, psychological distress, and indices of gambling behaviour (N=78)

	Mindfulness (MAAS)	Rumination (RRQ)	Emotion dysregulation (TMMS)	Thought suppression (WBSI)	Psychological distress (K6)	Gambling urges (GUS)	Problem gambling severity	Gambling expenditure
Rumination (RRQ)	-.30**	-						
Emotion dysregulation (TMMS)	.27*	-.29*	-					
Thought suppression (WBSI)	-.35**	.51**	-.21	-				
Psychological distress (K6)	-.58**	.45**	-.28*	.42**	-			
Gambling urges (GUS)	-.41**	.26*	-.09	.28*	.44**	-		
Problem gambling severity	-.37**	.28*	-.10	.44**	.43**	.68**	-	
Gambling expenditure	-.23*	.10	-.03	.15	.28*	.56**	.28*	-
Gambling frequency	-.25*	.17	-.06	.21	.35**	.55**	.35**	.91**

Note. * Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed).

From Table 1, it can be seen that there was a significant negative relationship between mindfulness and all indices of gambling behaviour (gambling urges, problem gambling severity, gambling expenditure, and gambling frequency). There was also a significant negative relationship between mindfulness and psychological distress, as well as psychological distress and each index of gambling behaviour. Furthermore, there was a significant relationship between mindfulness, all the proposed mechanisms of mindfulness (rumination, emotion dysregulation, and thought suppression), as well as all proposed mechanisms of mindfulness and psychological distress.

STUDY 2

Method

Participants

Participants were 205 (148 male, 55 female, 2 unreported) self-identified problem gamblers who were new clients of a metropolitan Melbourne problem gambling service. Males ranged from 21 to 67 years of age ($Mdn = 37$, $M = 38.4$, $SD = 11.3$) and females ranged from 25 to 74 years of age ($Mdn = 47$, $M = 46.2$, $SD = 10.5$). In terms of relationship status, 52% of participants were single, 30% were in a cohabiting relationship, 14% were in a non-cohabiting relationship, and 4% were married but not living with their partner. Over half (53%) were working full time, 18% worked on a part-time or casual basis, 12% were unemployed, and 9% were on a disability pension. Most participants were born in Australia (69%), with smaller proportions from Asia (17%), Europe (9%), New Zealand (3%), Africa (2%), and North America (1%). Over half reported their primary gambling activity as EGMs (54%), with smaller proportions reporting primary problems with horse/dog race betting (29%), casino gambling (10%), and sports betting (5%). Fortnightly income ranged from zero to \$10,000 ($Mdn = 1300$, $M = 1545$, $SD = 1364$). The average Problem Gambling Severity

Index (Ferris & Wynne, 2001) scores was 17.2 ($SD = 6.3$, $Mdn = 18$) which is categorised within the problem gambling range.

Measures

The survey used for this research included measures that evaluated demographic characteristics, mindfulness, distress tolerance, psychological distress, and indices of gambling behaviour (gambling pre-occupation, problem gambling severity, gambling expenditure, gambling frequency, and gambling duration).

Mindfulness. The 12-item Cognitive and Affective Mindfulness Scale-Revised (CAMS-R; Feldman, Hayes, Kumar, Greeson & Laurenceau, 2007) was employed to measure mindfulness. Items are arranged on a four-point Likert scale from (1) *rarely/not at all* to (4) *almost always* with scores ranging from 12 to 48. Items are designed to assess four components of the mindfulness construct: regulation of attention, orientation to present experience, awareness of experience, and acceptance/non-judgment towards experience. However, factor analysis reveal that items load onto one factor (Feldman et al., 2007). Internal consistency is satisfactory, with alphas ranging from .74 to .77 across different previous samples (Feldman et al., 2007) and .78 for the current sample.

Distress-Tolerance. The Distress-Tolerance Scale (DTS; Simons & Gaher, 2005) is a 15-item self-report questionnaire which measures the degree to which individuals believe the experience of negative affect is unbearable. In this study, three subscales of the DTS were employed: Tolerance (the perceived ability to tolerate emotional distress), Absorption (attention being absorbed by negative emotions), and Regulation (regulation efforts to alleviate distress). Items are rated on a 5-point scale ranging from (1) *Strongly agree* to (5) *Strongly disagree*. The DTS displays good convergent, discriminant, and criterion validity, with significant associations with measures of dysregulation, positive affectivity, mood regulation expectancies, mood acceptance, and alcohol coping motives (Simons & Gaher,

2005). The internal consistencies for the current study were high: Tolerance (Cronbach's $\alpha = .85$), Absorption (Cronbach's $\alpha = .81$), and Regulation (Cronbach's $\alpha = .86$).

Psychological distress. The Kessler 6 (K6; Kessler et al., 2002) was employed to measure non-specific psychological distress and is described in Study 1. The K6 had excellent internal consistency in the current study (Cronbach's $\alpha = .86$) (Kessler et al., 2002).

Gambling pre-occupation. A single item was employed to evaluate how much of the time participants had thought about gambling over the previous fortnight. Participants responded using a 5-point scale ranging from (0) *none of the time* to (5) *all of the time*.

Problem gambling severity. The Problem Gambling Severity Index (PGSI) of the Canadian Problem Gambling Index (CPGI; Ferris & Wynne, 2001) was used to assess problem gambling severity. A score of 0 on the PGSI indicates non-problem gambling; a score between 1 and 2 indicates a low risk gambling; a score between 3 and 7 indicates moderate risk gambling; while a score between 8 and 27 indicates problem gambling on the PGSI. The PGSI displays good internal consistency, test-retest reliability, criterion validity with measures of gambling involvement, unitary dimensional structure, item variability and concurrent validity with measures of problem gambling (Ferris & Wynne, 2001; Jackson, Wynne, Dowling, Tomnay, & Thomas, 2010). The PGSI has good sensitivity (the rate of positive test results among those with the disorder) and specificity (the rate of negative test results among those with the disorder) (Ferris & Wynne, 2001). The internal consistency of the PGSI in the current sample was good (Cronbach's $\alpha = .86$).

Gambling expenditure, frequency and duration. Single items were employed to evaluate the amount of money gambled, the number of sessions gambled, and the amount of time gambled over the previous fortnight.

Procedure

Approval for this research (Ethics number CF09/1592 - 2009000829) was granted by the Monash University Standing Committee on Ethics in Research involving Humans and the specialist problem gambling service in Melbourne (Gamblers Help City) in which the research was conducted. Every new client presenting to the service receives a survey evaluating demographic characteristics, gambling behaviour, and psychological functioning. Data was collected from August 2009 through to April 2011. The DTS was added to the survey in December 2009. Participants who could not speak and read English were excluded as there was no provision to translate the questionnaires and related materials. Ninety percent of new clients completed the survey. De-identified questionnaires were collected by the research team.

Data Analysis

Missing data (4.9% for the major study variables) was not considered as a serious threat to data integrity (Tabachnick & Fidell, 2001). Respondents completing less than 30% of any scale or subscale were excluded from analysis associated with that scale or subscale using pair-wise deletion. Mean person substitution (Tabachnick & Fidell, 2001) was employed to impute missing data for cases with less than 30% missing data on individual scales or subscales. Univariate outliers for gambling expenditure, frequency, and duration were replaced with the next extreme value for that variable in the analyses as they represented a realistic depiction of problem gambling behaviour (Tabachnick & Fidell, 2011). No multivariate outliers were identified through examination of Mahalanobis distances (Pallant, 2005). An examination of histograms, normal Q-Q plots, detrended normal Q-Q plots, the Kolmogorov-Smirnov statistic, the skewness statistic, and kurtosis statistic revealed that gambling expenditure, frequency, and duration had non-normal distributions.

One sample *t*-tests were conducted to evaluate the difference between the CAMS-R and the normed values reported by Feldman et al. (2007) for two samples of ethnically diverse university students. The relationships between mindfulness, distress tolerance, psychological

distress, and indices of gambling behaviour were inspected using a series of Pearson's correlations (for normally distributed variables) and Spearman's correlations (for non-normally distributed variables). A series of hierarchical regression analyses were then employed to formally test whether psychological distress mediated the inverse relationship between mindfulness and indices of gambling behaviour and whether distress tolerance mediated the relationship between mindfulness and psychological distress. Mediation hypotheses are frequently tested using methods such as the Sobel test. However, the Sobel test has been criticised because it tends to become less conservative with smaller sample sizes and assumes that the sampling distribution is normally distributed (Preacher & Hayes, 2008). Bootstrapping is a nonparametric approach to effect-size estimation and hypothesis testing that makes no assumptions about the shape of the distributions of the variables or the sampling distribution of the statistic (Preacher & Hayes, 2008). The method provides a bootstrap estimate of the indirect effect, an estimated standard error, and a 95% confidence interval. If zero is not in the 95% confidence interval, it can be concluded that the indirect effect is significantly different from zero at $p < .05$ (two tailed).

Results

Mindfulness scores for two samples of ethnically diverse university students ($M = 33.69$, $SD = 5.32$; $M = 34.11$, $SD = 5.50$, respectively) were significantly higher than mindfulness scores for this sample of problem gamblers ($M = 30.65$, $SD = 5.58$), $t(181) = -7.35$, $p < 0.01$, $t(181) = -8.34$, $p < 0.01$, respectively.

Table 2 displays results of correlations between mindfulness, distress tolerance (tolerance, absorption, and regulation), psychological distress, and indices of gambling behaviour (gambling pre-occupation, problem gambling severity, gambling expenditure, gambling frequency, and gambling duration).

Table 2

Correlations between mindfulness, distress tolerance, psychological distress, and indices of gambling behaviour (N=205)

	Mindfulness (CAMS-R)	Distress Tolerance (DTS Tolerance)	Distress Tolerance (DTS Absorption)	Distress Tolerance (DTS Regulation)	Psychological distress (K6)	Gambling pre- occupation	Problem gambling severity (PGSI)	Gambling expenditure	Gambling frequency
Distress Tolerance (DTS Tolerance)	.45**	-							
Distress Tolerance (DTS Absorption)	.46**	.84**	-						
Distress Tolerance (DTS Regulation)	.32**	.65**	.69**	-					
Psychological Distress (K6)	-.46**	-.26**	-.41**	-.18*	-				
Gambling pre-occupation	-.33**	-.27**	-.33**	-.13	.39**	-			
Problem gambling severity (PGSI)	-.34**	-.31**	-.29**	-.23**	.47**	.40**	-		
Gambling expenditure	-.05	-.03	.04	-.07	.18*	.16*	.27**	-	
Gambling frequency	-.10	-.07	-.06	-.12	.18*	.22**	.17*	.35**	-
Gambling duration	-.14	-.11	-.13	-.08	.22**	.27**	.29**	.49**	.70**

Note. * Correlation is significant at the 0.05 level (2-tailed), ** Correlation is significant at the 0.01 level (2-tailed).

From Table 2, it can be seen that there was a significant negative relationship between mindfulness and indices of gambling behaviour as measured by gambling pre-occupation and problem gambling severity, but not gambling expenditure, gambling frequency, or gambling duration. There was also a significant negative relationship between mindfulness and psychological distress, and between psychological distress and all gambling behaviour indices. Furthermore, there was a significant relationship between mindfulness and all indices of distress tolerance (tolerance, absorption, and regulation), and between all indices of distress tolerance and psychological distress.

Psychological distress as a mediator in the relationship between mindfulness and indices of gambling behaviour

The correlations displayed in Table 2 reveal that psychological distress satisfied the requisite conditions to be formally tested as a mediator in the relationship between mindfulness and gambling pre-occupation and problem gambling severity, but not gambling expenditure, gambling frequency, or gambling duration.

Table 3
Psychological distress as a possible mediator in the relationship between mindfulness and indices of gambling behaviour

	R ²	ΔR^2	df	B	SE B	95% CI	β	Partial Corr	Part corr
Gambling pre-occupation									
Step 1: Mindfulness (CAMS-R)	.11**		1,173						
(Constant)				3.76	0.39	3.00, 4.52			
Mindfulness (CAMS-R)				-0.06	0.01	-0.08, -0.03	-.33**	-.33	-.33
Step 2: Potential mediator	.18**	.17**	1,172						
(Constant)				2.21	0.55	1.13, 3.29			
Mindfulness (CAMS-R)				-0.03	0.01	-0.06, -0.01	-.19*	-.19	-.17
Psychological distress (K6)				0.05	0.01	0.02, 0.07	.30**	.28	.27
Problem gambling severity									
Step 1: Mindfulness (CAMS-R)	.11**		1,173						
(Constant)				28.98	2.53	23.99, 33.98			
Mindfulness (CAMS-R)				-0.38	0.08	-0.54, -0.22	-.34**	-.34	-.34
Step 2: Potential mediator	.24**	.23**	1,172						
(Constant)				15.73	3.47	8.89, 22.57			
Mindfulness (CAMS-R)				-.018	.008	-0.35, -0.01	-.16*	-.16	-.14
Psychological distress (K6)				0.40	0.08	0.25, 0.56	.39**	.37	.35

Note: * Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

Gambling pre-occupation. Table 3 provides the results from a hierarchical regression analysis examining whether psychological distress mediated the relationship between mindfulness and gambling pre-occupation. The addition of psychological distress significantly increased the proportion of variance accounted for by mindfulness ($p < .001$) and decreased the strength of the association between mindfulness and gambling pre-occupation. The bootstrapped 95% CI for the indirect effect of mindfulness on gambling pre-occupation through psychological distress is -.03 to -.01. This interval does not include zero, suggesting that the indirect effect is statistically significant at the .05 level. Examination of indirect effects therefore indicated that psychological distress was a mediator of the relationship between mindfulness and gambling pre-occupation.

Problem Gambling Severity. Table 3 provides the results from a hierarchical regression analysis examining whether psychological distress mediated the relationship between mindfulness and problem gambling severity. The addition of psychological distress significantly increased the proportion of variance accounted for by mindfulness ($p < .001$) and decreased the strength of the association between mindfulness and problem gambling severity. The bootstrapped 95% CI for the indirect effect of mindfulness on transformed problem gambling severity through psychological distress is -.30 to -.09. This interval does not include zero, suggesting that the indirect effect is statistically significant at the .05 level. Examination of indirect effects therefore indicated that psychological distress was a mediator of the relationship between mindfulness and problem gambling severity.

Distress tolerance as a mediator in the relationship between mindfulness and psychological distress

The correlations displayed in Table 2 reveal that all indices of distress tolerance (tolerance, absorption, and regulation) satisfied the requisite conditions to be formally tested as mediators in the relationship between mindfulness and psychological distress.

Tolerance. Table 4 provides the results from a hierarchical regression analysis examining whether Distress-Tolerance (Tolerance) mediated the relationship between mindfulness and psychological distress. The addition of Distress-Tolerance (Tolerance) did not significantly increase the proportion of variance accounted for by mindfulness ($p = .48$). Distress-Tolerance (Tolerance) therefore did not explain the inverse relationship between mindfulness and psychological distress.

Absorption. Table 4 also provides the results from a hierarchical regression analysis examining whether Distress-Tolerance (Absorption) mediated the relationship between mindfulness and psychological distress. The addition of Distress-Tolerance (Absorption) significantly increased the proportion of variance accounted for by mindfulness ($p < .001$) and decreased the strength of the association between mindfulness and psychological distress. The bootstrapped 95% CI for the indirect effect of mindfulness on psychological distress through Distress-Tolerance (Absorption) is -.27 to -.04. This interval does not include zero, suggesting that the indirect effect is statistically significant at the .05 level. Examination of indirect effects therefore indicated that Distress-Tolerance (Absorption) is a mediator of the inverse relationship between mindfulness and psychological distress.

Regulation. Table 4 provides the results from a hierarchical regression analysis examining whether Distress-Tolerance (Regulation) mediated the relationship between mindfulness and psychological distress. The addition of Distress-Tolerance (Regulation) did not significantly increase the proportion of variance accounted for by mindfulness ($p = .67$). Distress-Tolerance (Regulation) therefore did not explain the inverse relationship between mindfulness and psychological distress.

Table 4
Facets of distress tolerance as possible mediators in the relationship between mindfulness and psychological distress.

	R ²	ΔR ²	df	B	SE B	95% CI	β	Partial Corr	Part corr
Distress Tolerance (Tolerance)									
Step 1: Mindfulness (CAMS-R)									
(Constant)	.21**		1,128	32.75	2.69	27.44, 38.06			
Mindfulness (CAMS-R)				-0.50	0.09	-0.68, -0.33	-.46**	-.46	-.46
Step 2: Potential mediator	.21	.20	1,127						
(Constant)				32.70	2.70	27.37, 38.02			
Mindfulness (CAMS-R)				-0.47	1.00	-0.67, -0.28	-.43**	-.40	-.39
Distress-Tolerance (DTS Tolerance)				-0.11	0.16	-0.43, 0.20	-.06	-.06	-.06
Distress Tolerance (Absorption)									
Step 1: Mindfulness (CAMS-R)									
(Constant)	.21**		1,128	32.75	2.68	27.49, 38.06			
Mindfulness (CAMS-R)				-0.50	0.09	-0.68, -0.19	-.46**	-.46	-.46
Step 2: Potential mediator	.26**	.25**	1,127						
(Constant)				32.65	2.61	27.49, 37.81			
Mindfulness (CAMS-R)				-0.38	0.09	-0.57, -0.19	-.35**	-.34	-.31
Distress-Tolerance (DTS Absorption)				-0.48	0.16	-0.80, -0.15	-.25*	-.25	-.22
Distress Tolerance (Regulation)									
Step 1: Mindfulness (CAMS-R)									
(Constant)	.21**		1,128	32.75	2.68	27.44, 38.06			
Mindfulness (CAMS-R)				-0.50	0.09	-0.68, -0.33	-.46**	-.46	-.46
Step 2: Potential mediator	.21	.20	1,127						
(Constant)				32.90	2.71	27.53, 38.28			
Mindfulness (CAMS-R)				-0.49	0.09	-0.67, -0.31	-.45**	-.43	-.42
Distress-Tolerance (DTS Regulation)				-0.06	0.15	-0.37, 0.24	-.03	-.04	-.03

Note. * Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

Discussion

The overall aim of the two studies presented in this paper was to explore the role of mindfulness in problem gambling using treatment seeking problem gambling samples. As hypothesised, the sample of problem gamblers in Study 1 and Study 2 displayed significantly lower mindfulness scores than normative samples of adult community members and university students, respectively. This is an important finding because it highlights that individuals with comparatively low levels of mindfulness are potentially vulnerable to gambling related stimuli. In such situations, individuals may gamble without awareness and become habituated to gambling behaviour through repeated exposure.

The hypothesis that mindfulness would be significantly related to indices of gambling behaviour in a treatment seeking population of problem gamblers was partially supported. In Study 1, mindfulness was related to gambling urges, problem gambling severity, gambling expenditure, and gambling frequency. In Study 2, mindfulness was related to gambling pre-occupation and problem gambling severity but not gambling expenditure, gambling frequency, or gambling duration. The lack of a significant relationship for gambling expenditure, frequency, and duration may be a result of the restricted range of responses received for these variables as the sample was comprised only of problem gamblers. The evidence from these studies provide support for Lakey's et al. (2007) initial finding that a higher level of mindfulness was related to lower gambling-related pathology in student samples. Lakey et al. speculated that greater mindfulness broadened the range of behavioural choices that could be made. In turn, the selection of a more adaptive behavioural response lessened the severity of problem gambling outcomes. However, the absence of non-problem gamblers and the cross-sectional nature of the current study precludes the provision of causal statements concerning the exact nature of the relationship between mindfulness and problem

gambling. Future prospective studies should therefore endeavour to establish the temporal sequence of this relationship in large samples of adults within the general population.

In understanding the specific mechanisms involved in the relationship between mindfulness and problem gambling, Lakey et al. suggested that psychological distress represented one possibility. In Study 1, there were significant relationships between mindfulness, psychological distress, and all indices of gambling behaviour (problem gambling urges, problem gambling severity, gambling expenditure, gambling frequency, and gambling duration). The findings of Study 2, which employed a larger sample on which mediational analyses could be conducted, confirmed the meditational role of psychological distress in the relationship between mindfulness and gambling pre-occupation and problem gambling severity. This finding provides support for current theoretical models of problem gambling which implicates psychological distress as a significant mechanism in ongoing problem gambling behaviour. For example, Blaszczynski and Nower's (2002) pathways model highlights psychological distress as a consequence of problem gambling in gamblers who have become habituated to gambling through neo-Pavlovian behavioural mechanisms but also recognises problem gambling behaviour as a maladaptive behavioural response in those gamblers with pre-morbid psychiatric disorders. Mindfulness may enable an individual to step out of current experience and fully acknowledge, participate, and engage with thoughts and feelings. The ability to 'decenter' in this way seems important in reducing the level of overall psychological distress experienced (McIntosh & Martin, 1992; Teasdale et al., 1995).

A final aim was to explore the degree to which the proposed mechanisms of mindfulness mediated the relationship between mindfulness and psychological distress. Despite an inability to conduct hierarchical regressions due to a small sample size, rumination, emotion dysregulation, and thought suppression were implicated in the relationship between mindfulness and psychological distress in Study 1. Study 2 examined

the role of distress tolerance (tolerance, absorption, and regulation) and established that a facet of distress tolerance, 'attention being absorbed by negative emotions', is an important mediator in the relationship between mindfulness and psychological distress. These findings provide support for current theoretical models that seek to explain how mindfulness training may impart therapeutic benefit (Bowen et al., 2007; Coffey & Hartman, 2008).

Mindfulness has long been known to disrupt ruminative thought patterns associated with relapse into depression (Segal, Williams, & Teasdale, 2002). Results from Study 1 suggest that this process may also influence psychological distress in a treatment seeking sample of problem gamblers. One explanation for this relationship is that a higher level of mindfulness affords the opportunity for problem gamblers to become aware of present moment ruminative thought patterns with a sense of openness and curiosity. So, rather than judging and evaluating these patterns of thought in a negative and self-defeating manner, mindful gamblers may instead respond to them in a more adaptive and self-protective manner, thereby reducing the level of psychological distress they may otherwise experience. Future studies may wish to explore the mediational role of rumination with larger sample sizes.

Other potential mediators in the relationship between mindfulness and psychological distress are the related constructs of emotion dysregulation and distress tolerance. Regulation efforts to alleviate distress (as measured by the Regulation subscale of the Distress Tolerance Scale in Study 2) share many of the essential features of emotional dysregulation (as measured by the TMMS in Study 1) (Chambers et al., 2009, Salovey et al, 1995). Although the findings in Study 1 revealed significant associations between emotion dysregulation as measured by the TMMS, mindfulness, and psychological distress, the findings of Study 2 revealed that regulation efforts to alleviate distress did not mediate the relationship between mindfulness and psychological distress. The ability to tolerate emotional distress was also not

a significant mediator of this relationship. Instead, the findings of Study 2 supported the role of attentional deficits in the experience of negative affect only. This implies that less mindful gamblers are relatively inattentive to negative affect than their more mindful counterparts and that the experience of psychological distress operates via this mechanism rather than by an inability to tolerate emotional distress or an inability to regulate efforts to alleviate this distress. These findings, imply that, mindfully attending to negative emotions without a behavioural response may lead to a gradual extinction of the behaviours previously elicited by strong emotional states (Coffey & Hartman, 2008). Another possible explanation is that mindfulness allows a person to experience strong emotions with greater objectivity and less reactivity (Shapiro et al., 2006). The ability to ‘decenter’ in this way offers the opportunity for gamblers to step back from what is noticed, and simply watch strong emotions come and go.

The final proposed mechanism in the inverse relationship between mindfulness and psychological distress was thought suppression. Again, the absence of meditational analyses in Study 1 precluded the testing of thought suppression as a mediator. However, the findings of this study indicated significant relationships between mindfulness, thought suppression and psychological distress. These findings have important implications for those problem gamblers seeking treatment for their gambling problems because many gamblers attempt to avoid distressing thoughts that may ordinarily lead to further gambling (Ciarrocchi, 2002). Yet avoidance of thoughts is known to paradoxically increase the intensity and frequency of such thoughts (Wegner, 1989; Wegner & Erber, 1992), making for the increased likelihood of a return to gambling. This mechanism may represent one explanation for the high rates of attrition and relapse observed in current efficacy studies of CBT for problem gambling. Indeed, Toneatto et al. (2007) suggested that mindfulness training may represent a useful relapse prevention strategy following standard CBT. Future studies are required to explore

the degree to which thought suppression is a mediator underpinning the relationship between mindfulness and psychological distress in problem gambling.

The comparatively low levels of mindfulness displayed by the treatment-seeking samples in both studies highlight that mindfulness training may represent a new and innovative treatment for problem gambling. Based on the results of this study, a mindfulness-based intervention may improve treatment effectiveness for problem gambling by reducing the overall level of psychological distress experienced. The findings suggest that this may be achieved by reducing ruminative thought patterns, improving emotion dysregulation, promoting awareness of the experience of negative affect, and decreasing the tendency to avoid unwanted thoughts. If so, mindfulness-based interventions may be particularly appropriate for problem gamblers with pre-morbid disorders such as depression and anxiety, those who experience psychological distress following a gambling episode, or those who gamble in order to reduce negative mood states or to improve positive emotions (Blaszczynski & Nower, 2002; Stewart & Zack, 2008). There are now several mindfulness-based approaches that have produced promising results in the treatment of problem gambling, including MBCT, DBT, and MAT (Christensen et al., 2013; de Lisle et al., 2011; Korman et al., 2008; Shonin et al., 2013c; Toneatto et al., 2007). Moreover, several of these studies suggest that improvement in gambling outcomes is not only associated with improvements in psychological distress, but also mindfulness and distress tolerance (Christensen et al., 2013; de Lisle et al., 2011; Shonin et al., 2013c). However, because most of these studies involve case studies or small sample sizes, further research investigating the efficacy of these interventions and the role of possible underlying mechanisms, such as rumination, emotion dysregulation, and thought suppression, with larger samples is required.

The model tested in the current study posited that rumination, emotional regulation, and thought suppression mediates the relationship between mindfulness and psychological

distress, which in turn leads to problem gambling. However, it is equally plausible that these mechanisms also mediate the direct relationship between mindfulness and problem gambling, whereby increased mindfulness may help gamblers watch gambling-related thoughts come and go without feeling the need to act on them (Toneatto et al., 2007). Although the correlations examined in both studies suggest that this is a less likely explanation, the measures utilised assessed general, rather than gambling-related, thoughts and feelings. Moreover, complex constructs such as mindfulness should be analysed at a facet level to clarify the relationship between the facets and other variables of interest (Baer, Smith, Hopkins, Krietemeyer, & Toney, 2006). The interaction between mindfulness and problem gambling behaviour is therefore potentially very complex. Future studies may wish to explore these more complex models using appropriate measures and statistical procedures with large community and treatment-seeking samples.

In summary, the studies presented in this paper found that problem gamblers have comparatively low levels of mindfulness that may make them vulnerable to continued problem gambling behaviour. The findings support Lakey et al.'s (2007) suggestion that psychological distress is an important mechanism in this relationship and provides support for the hypothesis that rumination, thought suppression and emotion dysregulation are involved mechanisms in the relationship between mindfulness and psychological distress in problem gamblers. However, other mechanisms such as nonattachment and values clarification may provide additional explanatory power to this model (Baer et al., 2006; deLisle et al., 2013). Taken together, these findings imply that mindfulness-based approaches are worthy of further exploration in the treatment of problem gambling.

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