J Gambl Stud (2012) 28:637–648
DOI 10.1007/s10899-011-9274-9

ORIGINAL PAPER

Low Trait Self-Control in Problem Gamblers: Evidence from Self-Report and Behavioral Measures

Anne E. Bergen · Ian R. Newby-Clark · Andrea Brown

Published online: 12 October 2011

Abstract Problems with self-control are seen as a key cause of problem gambling behavior. Yet, self-control is rarely studied directly in gambling studies. We demonstrated that self-report and behavioral measures (derived from the strength model of self-control) show lower trait self-control in problem gamblers. In Study 1, a sample of 2,208 undergraduate students from the University of Guelph, Canada (73% female, mean age = 19 years, SD = 4) completed a self-report measure of self-control strength. In Study 2, a sample of 296 University of Guelph students and staff (58% female, mean age = 19 years, SD = 2) completed multiple behavioral measures of self-control strength. Both studies demonstrated that, compared to lower-risk gamblers, higher-risk gamblers have relative trait self-control deficits.

Keywords Trait self-control · Problem gambling · Self-report measure · Behavioral measure

Self-control problems are at the heart of problem gambling. Indeed, "repeated, unsuccessful attempts to resist the urge [to gamble] in the context of a genuine desire to cease, is the central, diagnostic and foundational feature of pathological gambling" (Blaszczynski and Nower 2002, p. 488). Understanding how loss of self-control leads to problem gambling and how gains in self-control reduce gambling severity are critical to developing treatment programs (Sharpe 2002; Williams et al. 2007).

Despite its central importance in understanding problem gambling, there are few studies examining self-control in a gambling context, and those few studies are problematic. As Xuan and Shaffer (2009) pointed out, the association between gambling severity and individual differences in trait self-control rests mainly on self-report findings embedded in unclear conceptualizations of self-control. Moreover, more attention has been paid to identifying predictors of impaired self-control than to measuring self-control itself. Past research on self-control and problem gambling has worked to identify determinants of

A. E. Bergen (✉) · I. R. Newby-Clark · A. Brown
Department of Psychology, University of Guelph, 50 Stone Road East, Guelph, ON N1G 2W1, Canada
e-mail: bergena@uoguelph.ca

impaired control (Raylu and Oei 2002) rather than assessing self-control in a reliable and theoretically grounded framework. Similarly, Tonneatto and Nguyen's (2007) review of individual differences and problem gambling behavior described personality factors such as impulsivity that predict impaired self-control, but did not discuss self-control as a predictor of problem gambling in its own right.

In this article, we use two complementary methods to demonstrate that gambling risk severity is related to trait self-control deficits, such that problem gamblers report and behaviorally evidence a lower degree of self-control than do lower-risk gamblers. More broadly our findings provide support for using measures derived from the strength model of self-control in a gambling context.

For the most part, conceptualizations of self-control in the gambling literature focus on identifying distal predictors of self-control failure. For example, the neuropsychological mechanisms implicated in self-control and self-control failure have been established. Dysfunctions in neurotransmitter systems, hemispheric regulation, and the prefrontal cortex are known risk factors for problem gambling (e.g., Carrasco et al. 1994; Rahman et al. 2001; Raylu and Oei 2002). This neuropsychological work is important because it gives insight into the specific mechanisms involved in self-control failure. At the same time, though, the insight gained does not inform our understanding of the nature of self-control or the circumstances under which self-control will succeed or fail.

Another stream of self-control research concerns the kinds of personalities that tend to encounter self-control problems in a gambling context. In particular, personality researchers find that impulsivity, some forms of sensation-seeking, and novelty-seeking are related to problem gambling behavior (e.g., Hammelstein 2004; Johansson et al. 2009; Maccallum et al. 2007; Nower et al. 2004; Steel and Blaszczynski 1998). Although this research is certainly useful in identifying personality dimensions that are likely related to self-control, the issue of trait self-control, in and of itself, remains (Dickerson and Baron 2000).

In order to understand how trait self-control relates to gambling behavior, it is necessary to locate self-control in a theoretical framework. The strength model of self-control, developed over the past decade or so by a number of researchers (e.g., Baumeister et al. 1998; Muraven and Slessareva 2003; Muraven et al. 1998, 2006b; Vohs et al. 2008), has contributed to understanding the influence of neuropsychological and personality characteristics on self-control while, at the same time, providing a framework for explaining how self-control operates within individuals and how it can be improved.

The Strength Model of Self-Control

The strength model of self-control posits that acts of self-control rely on a common reservoir. Like muscular strength, exerting self-control in one life domain means that less self-control is available for other domains. A decade of research and dozens of studies support the conceptualization of self-control as a limited supply of willpower, rather than a primarily cognitive process or an acquired skill (Hagger et al. 2010). A single reservoir of self-control strength fuels diverse regulatory actions, including managing thoughts and emotions, directing impulse and attentional control, guiding overt behavior, and making choices (see Baumeister et al. 2007, for an overview). Depletion of self-control strength, originally referred to as *ego depletion*, occurs as a function of "deliberate, conscious, controlled responses by the self" (Baumeister et al. 1998, p. 1252).

A classic ego depletion experiment (Baumeister et al. 1998) involved either denying oneself radishes in favor of cookies, or denying oneself cookies in favor of radishes. The habitual or impulsive response would be to eat the cookies, whereas denying oneself radishes in favor of cookies should not require much self-control. Participants who denied themselves cookies persisted for less time on a frustrating puzzle than did participants who denied themselves radishes (i.e., the control condition). This study provided initial evidence that self-control strength comes from a single reservoir. Since then, the same results have been obtained for diverse activities: exercising thought control (e.g., not thinking of a white bear), emotional control (e.g., remaining expressionless during a sad video), physical strength (e.g., squeezing a handgrip), and tolerating pain (e.g., the cold-pressor task; Baumeister et al. 1998; Muraven and Slessareva 2003; Muraven et al. 1998, 2006a) are all more difficult when self-control strength is lower. If self-control is depleted in one modality (e.g., physical endurance), there is less self-control remaining for other modalities (e.g., attention and emotional control).

Due to the fact that self-control comes from a single reservoir, activities that deplete self-control can also be used to assess self-control strength. For example, controlling one's emotions can be a depleting activity, and one's success at doing so is a measure of self-control strength.

The strength model of self-control describes how self-control fluctuates within an individual from moment-to-moment (i.e., state self-control). Of importance, it can also be used as a framework for describing and understanding inter-individual (i.e., trait) differences in self-control strength.

Trait Differences in Self-Control Strength

Trait self-control is a dispositional ability for self-control strength. Relative to people who have high trait self-control, people who have low trait self-control act as if they are chronically depleted, engaging in more impulsive and appetitive behaviors (Baumeister et al. 1994; Tangney et al. 2004). Of interest, trait and state self-control strength independently and additively predict engaging in risky behaviors (Freeman and Muraven 2010; Muraven et al. 2006a). Thus, whether self-control failure stems from depleted self-control resources or from an ongoing lack of self-control strength, the outcome will be the same. Furthermore, the same behavioral measures that can be used to assess state self-control strength can be used to assess trait, or general self-control ability. Schmeichel and Zell (2007) for example, found that self-reported trait self-control predicted performance on several behavioral measures of self-control, with about 9% of the variance uniquely shared between behavioral and self-report measures of self-control (i.e., controlling for arousal or mood).

Measuring Self-Control in Problem Gamblers

There is some circumstantial evidence that problem gamblers have a comparatively 'weak' self-control muscle. Bruyneel et al. (2009) found that participants whose self-control was depleted by means of a Stroop color-naming task (i.e., mismatched word and ink colors) spent more on lottery tickets than did participants whose self-control was not depleted. Similar results were found when participants engaged in a depleting mood-repair task. With respect to predicting actual problem gambling status, a retrospective measure of

self-control uniquely predicted problem gambling status when impulsivity and sensation seeking did not (Mishra et al. 2010). Of importance, the findings of Mishra et al. (2010) points to the conclusion that trait self-control is more than just a proxy for trait differences in impulsivity and sensation seeking.

One of the few individual difference measures of self-control used in a gambling context was developed by Corless and Dickerson (1989). To address the lack of measures of impaired self-control in the gambling literature, Corless and Dickerson (1989, p. 1529) developed and validated a 19-item scale that assessed "the likelihood of the occurrence of a gambling response given the influence of various factors." This measure of impaired self-control successfully distinguished problem and non-problem gamblers (Corless and Dickerson 1989), and has been used as a criterion for assessing various predictive variables, such as alcohol consumption and duration of gambling session (Baron and Dickerson 1999). Yet, this measure considers self-control in a gambling context only, and the issue of the relation between trait (i.e., general) self-control and problem gambling behavior remains.

Based on the strength model of self-control, Tangney et al. (2004) developed the self-control scale (SCS), a measure of individual differences in self-control. The SCS assesses trait self-control as an inclusive construct, comprising items assessing control of one's emotions, impulses, thoughts, and task performance (i.e., achievement in work or school). Higher trait self-control as assessed by the SCS is associated with less alcohol abuse and disordered eating, and better adjustment and interpersonal relationships (Tangney et al. 2004), and predicts performance on behavioral measures of trait self-control (Schmeichel and Zell 2007). These results suggest that the trait measures derived from the strength model of self-control may also be associated with problem gambling behavior.

Overview

Although the construct of self-control is central to understanding problem gambling and has been nominated as the prime focus of future gambling research (Dickerson and Baron 2000), there is a lack of reliable trait measures of self-control in the gambling literature. Here, we test well-validated self-report and behavioral measures derived from the strength model of self-control to determine whether trait self-control is associated with gambling risk severity. Specifically, across two studies, we tested the hypotheses that:

H1 Higher-risk gamblers have trait deficits in self-reported self-control relative to lower-risk gamblers.

H2 Higher-risk gamblers have trait deficits in behavioral self-control relative to lower-risk gamblers.

Study 1: Self-Report Measure of Self-Control

Method

Participants were 2,208 students (1,614 women and 594 men) enrolled in first-year psychology courses at the University of Guelph who completed an online mass testing questionnaire. The average age of participants was $M = 19$ ($SD = 4$); 50 respondents did not report their age.

Self-Control Strength

We measured self-control strength using the scale developed by Tangney et al. (2004). The multiple domains of self-control assessed by this self-report scale were designed to be congruent with the strength model of self-control (Tangney et al. 2004). Specifically, the scale consists of 36 questions designed to assess one's ability to control impulses, alter emotions and thoughts, and interrupt undesired behavioral tendencies (e.g., "I am always on time", "I never allow myself to lose control"). Items were rated on a 5-point scale (1 = *very much like me*, 5 = *not at all like me*). Items with negative wording (e.g., "Sometimes I can't stop myself from doing something, even if I know it is wrong", "I change my mind fairly often") were reverse-scored so that higher scores indicated greater self-control. Self-control scores showed good internal consistency (after reversals, $\alpha = .89$), and were normally distributed.[1]

Gambling Status

To assess gambling status, we used the Problem Gambling Severity Index (PGSI; Ferris and Wynne 2001). The PGSI is a nine-item scale that distinguishes four subtypes of gamblers: non-problem gamblers, low-risk gamblers, moderate-risk gamblers, and problem gamblers. The PGSI was designed for use in general populations, and has demonstrated adequate internal consistency, test–retest reliability, and validity (Ferris and Wynne 2001). Comparative evaluation suggests that the PGSI has better psychometric properties than do other popular gambling measures (i.e., the South Oaks Gambling Screen and the Victorian Gambling Screen; McMillen and Wenzel 2006). PGSI items include "Have you bet more than you could really afford to lose?", "Has your gambling caused any financial problems for you or your household?", and "Have you borrowed money or sold anything to get money to gamble?". Items were rated on a 4-point scale (scored as 0 = *never* to 3 = *almost always*), and the scale had good internal consistency ($\alpha = .84$). Given that the majority of the sample (78%) had an overall score of zero, the distribution of PGSI scores was positively skewed and leptokurtic, even after transformation. Therefore, analyses in which the PGSI was a continuous variable were performed using non-parametric tests.

Results

As per Ferris and Wynne (2001), participants were categorized into four groups based on the sum of their answers to the PGSI questions. Participants whose sum equaled 0 were categorized as non-problem gamblers ($n = 1{,}717$), participants with summed scores of 1 or 2 were categorized as low-risk gamblers ($n = 356$), participants whose summed scores were between 3 and 7 were categorized as moderate-risk gamblers ($n = 101$), and participants whose summed scores were 8 or greater were categorized as problem gamblers ($n = 34$).

Of interest, gambling status was related to gender, such that higher-risk gamblers were more likely to be male and lower-risk gamblers were more likely to be female, $\chi^2(3, N = 2{,}208) = 177.50$, $p < .001$. This finding is congruent with previous research showing

[1] In our initial analyses, we tested all continuous variables for normality by examining the skewness and kurtosis coefficients and associated standard errors. As suggested by Tabachnick and Fidell (2001), where the ratio of a coefficient over its standard error was less than 2.58, the distribution was assumed to be adequately normal. Where necessary, we transformed variables to meet assumptions of normality.

Table 1 Self-reported self-control across gambling categories

PGSI Category	Self-reported self-control score	
	M	SD
Non-problem	$3.21_{a,b,c}$	.48
Low-risk	$3.04_{a,c}$	.44
Moderate-risk	2.98_{b}	.49
Problem gambler	2.81_{c}	.49

* Means that share subscripts differ significantly at $p < .05$ (with Bonferroni correction)

that male gender is a risk factor for problem gambling (Johansson et al. 2009), especially in young adults and adolescents (Welte et al. 2008). Due to the low overall number of female problem gamblers ($n = 4$), further analyses by gender were not conducted.

A one-way analysis of variance (ANOVA) found that self-control differed significantly across gambling categories, $F(3, 2204) = 25.84$, $p < .001$, $\eta^2 = .03$. We followed up with Bonferonni-corrected multiple comparisons (Howell 2007). As can be seen in Table 1, low-risk, moderate-risk, and problem gamblers reported significantly less self-control than did non-problem gamblers, and problem gamblers reported significantly less self-control than did low-risk gamblers.

Spearman correlation analysis showed a significant inverse relation between total PGSI scores and self-control scores, $r_S(2206) = -.18$, $p < .001$, such that self-control scores decreased as problem gambling scores increased.

Discussion

These results suggest that self-control strength is inversely associated with problem gambling severity, such that higher-risk gamblers have relatively lower self-control than low-risk and non-problem gamblers. It must be noted, however, that this first study relied on self-reports of self-control strength. Perhaps problem gamblers simply believe that they have relatively low self-control strength. In the next study, we used behavioral measures of cognitive and emotional self-control, and compared self-control across PGSI categories. Evidence of relative self-control deficits in higher-risk gamblers across spheres of self-control will provide support for using the strength model of self-control in the context of problem gambling.

Study 2: Behavioral Measures of Self-Control

Method

Upon arrival at the lab, participants were told that they would be engaging in a series of activities designed to test various aspects of mental performance as they relate to gambling.

Participants

Participants were recruited from the undergraduate psychology participant pool at the University of Guelph and from the broader University of Guelph community. Due to low numbers of non-students (less than 3% of the sample), no comparisons between students and non-students were possible. Of the 313 people who participated in the study, 17 had

incomplete data (due to equipment failure) and their data were discarded. Of the remaining 296 participants, 172 (58%) were female. Participants ranged in age from 17 to 45 years of age (M = 19, SD = 2).

Gambling Status

First, participants completed the Problem Gambling Severity Index (PGSI; Ferris and Wynne 2001). The internal consistency of PGSI scores was good ($\alpha = .78$). As in Study 1, due to skewness and leptokurtosis in the PGSI scores, analyses involving the PGSI as a continuous variable were accomplished using non-parametric tests.

Self-Control Strength

Next, participants participated in activities designed to assess cognitive and emotional self-control strength. The order of these activities was counterbalanced.

The first measure of cognitive self-control was a short (3 min) speech during which participants talked about how they would spend an ideal day. Participants were instructed to avoid the use of speech fillers such as *um* and *er*. Such fillers are used commonly and relatively automatically during speech; overriding this habitual behavior requires self-control strength (Muraven and Slessareva 2003). All speeches were filmed. Self-control strength was operationalized as the number of speech fillers used by participants. Thus, higher scores were associated with greater self-control deficits.

The second measure of cognitive self-control was an anagram solving activity (Muraven et al. 1998). Participants were provided with a long list of anagrams to solve, and were told, "Remember that anagrams are words that can be rearranged into other words. Each anagram in this list can be transformed into another word. The anagram instructions are as follows: (1) Work on the anagrams one at a time in order, making sure you complete an anagram before moving onto the next one, and (2) Work until you are bored or frustrated, then ring the bell when you decide to stop working." The activity concluded after participants chose to ring the bell or after 20 min had passed. Self-control strength was operationalized as anagram solving time (in minutes). Thus, higher scores are associated with higher self-control strength.

The measure of emotional self-control involved emotional suppression. Participants were instructed to avoid showing any emotional response while watching both a 10-minute clip of an upsetting documentary about natural disasters and a 10-minute humorous video. Both videos were pretested using a focus group to ensure they elicited the desired emotional response. Emotional suppression requires self-control strength (Baumeister et al. 1998, p. 1258; Muraven et al. 1998). Participants were filmed while watching the video clips and self-control strength was operationalized as the total number of emotional responses for each participant. Thus, higher scores are associated with greater self-control deficits.

After completing the three self-control assessments, participants were fully debriefed.

Results

Inter-Rater Reliability

Three independent raters counted the number of filler words used during the speeches, and the number of emotions displayed during the videos. The intra-class coefficient for total

number of filler words during the speeches was .97, indicating excellent reliability among raters. The intra-class coefficient for total number of emotional displays was .78, indicating adequate reliability among raters. For both filler words and emotional displays, counts were averaged across raters.

Self-Control Measures

Participants used M = 8.55 filler words during their speeches (SD = 6.84). Participants persisted for M = 11.34 min on the anagram task (SD = 6.23). While watching the videos, participants showed an average of M = 4.43 emotional displays (SD = 4.10). In order to meet normality assumptions, a log transformation was performed on mean number of filler words and mean number of emotional displays; the transformed means were used in all subsequent analyses.

Gambling Status

Using the methods of Ferris and Wynne (2001), participants were categorized into four groups based on the sum of their answers to the PGSI questions. Participants whose sum equaled 0 were categorized as non-problem gamblers ($n = 112$), participants with summed scores of 1 and 2 were categorized as low-risk gamblers ($n = 73$), participants whose summed scores were between 3 and 7 were categorized as moderate-risk gamblers ($n = 93$), and participants whose summed scores were greater than 8 were categorized as problem gamblers ($n = 18$).

Once again, gambling status was related to gender, such that higher-risk gamblers were more likely to be male and lower-risk gamblers were more likely to be female, $\chi^2(3, N = 295) = 46.59$, $p < .001$. Due to the low overall number of female problem gamblers ($n = 4$), further analyses by gender were not conducted.

Emotional and Cognitive Self-Control Across PGSI Categories

A multivariate ANOVA found that self-control significantly differed across PGSI categories, Wilks' $\lambda = .90$, $F(9, 704) = 3.61$, $p < .001$, $\eta^2 = .10$. Follow up one-way ANOVAs showed that both cognitive self-control, as assessed by number of filler words, $F(3, 291) = 6.77$, $p < .001$, $\eta^2 = .07$, and emotional self-control, as assessed by number of emotional displays, $F(3, 291) = 4.09$, $p = .007$, $\eta^2 = .04$, significantly differed across PGSI categories. Cognitive self-control as assessed by anagram persistence times did not significantly differ among PGSI categories, $F(3, 291) = 1.35$, $p = .26$, $\eta^2 = .01$. To aid interpretation of the results, untransformed means and standard deviations for emotional displays, filler words, and anagram times are presented in Table 2. Note that for emotional displays and filler words, higher scores indicate lower self-control strength.

We conducted Bonferonni-corrected multiple comparisons to determine how emotional displays and filler words differed across gambling categories (Howell 2007). Multiple comparisons on the number of filler words used indicated that problem gamblers had significantly lower cognitive self-control than non-problem gamblers and marginally significantly lower cognitive self-control than low-risk gamblers ($p = .07$). Moderate-risk gamblers had significantly lower cognitive self-control than non-problem gamblers. A similar pattern of results was found for emotional self-control, such that problem gamblers had significantly lower emotional self-control than non-problem gamblers.

Table 2 Cognitive and emotional self-control across PGSI categories

PGSI Category	Cognitive self-control				Emotional self-control	
	# Filler words		Anagram time (mins)		# Emotional displays	
	M	SD	M	SD	M	SD
Non-problem	$7.07_{a,b}$	6.66	11.30	6.84	3.57_{a}	2.81
Low-risk	7.93	5.84	10.44	5.78	4.37	3.19
Moderate-risk	9.93_{a}	7.19	12.28	5.80	4.98	5.27
Problem gambler	13.09_{b}	7.11	10.41	5.96	7.15_{a}	5.75

* Within a measure of self-control, means that share subscripts differ significantly at $p < .05$ (with Bonferroni correction)

Table 3 Spearman correlations among total PGSI scores and self-control measures

Variable	1	2	3	4
Total PGSI Score	–			
Filler words	.25***	–		
Emotional displays	.17**	.18**	–	
Anagram time	.05	−.06	−.003	–

** $p = .001$

*** $p < .001$

Relations Among Variables

Inter-item Spearman correlations are presented in Table 3. As hypothesized, PGSI scores were related to both number of filler words used during speeches and number of emotional displays. Specifically, higher PGSI scores were associated with greater self-control deficits (i.e., more emotional displays or filler words). Anagram persistence was unrelated to filler words, emotional displays, or PGSI scores, suggesting that it was not a good measure of self-control in this study.

Discussion

In accordance with our predictions and with the results of Study 1, higher-risk gamblers demonstrated self-control deficits relative to lower-risk gamblers. In particular, problem gamblers had less emotional and cognitive self-control than did non-problem gamblers. This behavioral demonstration of relative trait self-control deficits in problem gamblers is a novel finding, as previous research has focused on self-report measures.

Conclusion

We demonstrated that problem gamblers report lower self-control and display less controlled behavior than do non-problem gamblers. Across multiple measures derived from

the strength model of self-control (self-report, cognitive control, and emotional control), problem gamblers showed trait self-control deficits relative to non-problem gamblers. We thus suggest problem gambling severity is associated with both self-report and behavioral measures of trait self-control.

Implications

Much research into self-control and gambling behavior has been hampered by the reliance on unclear operationalizations of self-control (Xuan and Shaffer 2009). The strength model of self-control provides a comprehensive account of self-control strength stemming from a reservoir common to multiple life domains. Rather than focusing on self-control failures related solely to gambling behavior, the strength model of self-control could help explain how gambling behavior varies as a function of daily demands on self-control (e.g., Muraven et al. 2005), such that trait and state self-control demands on self-control interact to predict gambling behavior.

Moreover, trait self-control is relatively malleable. Understanding problem gambling in the framework of the strength model of self-control has important implications for the treatment and the retraining of problem gamblers. As with muscles, regularly exercising self-control increases self-control strength (Muraven 2010a, b; Oaten and Cheng 2006a, b, 2007). Of importance, gains in self-control in one life domain translate into other life domains. For example, Oaten and Cheng (2006a) found that a program designed to improve study skills also produced general improvements in self-control (e.g., less smoking, healthier eating, more exercise, greater emotional control, greater financial monitoring) and improved ability to expend self-control after a depleting task. Forming a new habit, such as following a regular study program, requires self-control to override competing impulses (Oaten and Cheng, 2006a). Similarly, practicing self-control though regular participation in physical activity or engaging in regular financial monitoring (i.e., sticking to a budget) predicts greater general (trait) self-regulatory ability and a greater ability to deal with the effects of self-control depletion (Oaten and Cheng 2006b, 2007). Practicing self-control over a two-week period by cutting back on sweets or squeezing a handgrip improved performance on a laboratory measure of attentional control (Muraven 2010a). Furthermore, practicing these same small acts of self-control improved the success of smokers trying to quit, as compared to a control group who did not practice self-control (Muraven 2010b). If problem gamblers do have relatively low trait self-control, then interventions to increase general self-control capacity could lead to improvements in gambling-related self-control (i.e., reduced gambling frequency, reduced duration of gambling episodes). Interventions to reduce self-control deficits in problem gamblers could help them break out of a cycle of behavior controlled by the impulse to gamble (McCormick 1994). That is, as problem gamblers strengthen their self-control "muscles," they may experience less of a relative self-control deficit, and find it easier to avoid engaging in gambling to excess. Our findings also have important implications in awareness-raising efforts for gamblers. If problem gamblers are aware that their self-control resources are limited, they may be motivated to conserve self-control strength in order to refrain from unwanted gambling behavior.

Limitations and Future Research

Limitations of our study include the fact the self-report and behavioral measures of trait self-control were not combined in a single study. Furthermore, we relied on self-report

assessment of problem-gambling status, and did not differentiate among different kinds of problem gambling (e.g., Raylu and Oei 2002). Future research should address these shortcomings, in order to determine to what extent behavioral and self-report measures of self-control independently predict problem gambling tendencies.

Self-control is indeed at the heart of gambling pathology. Our findings, rooted in the strength model of self-control, point to a trait self-control deficit in problem gamblers, but there is a way forward. Helping problem gamblers to increase their self-control strength and promoting strategies for managing self-control hold definite promise for ameliorating problem gambling behavior.

Acknowledgments This project was funded by a grant from the Ontario Problem Gambling Research Centre (www.gamblingresearch.org).

References

Baron, E., & Dickerson, M. (1999). Alcohol consumption and self-control of gambling behaviour. *Journal of Gambling Studies, 15*, 3–15.

Baumeister, R. F., Bratslavsky, E., Muraven, M., & Tice, D. M. (1998). Ego depletion: Is the active self a limited resource? *Journal of Personality and Social Psychology, 74*, 1252–1265.

Baumeister, R. F., Heatherton, T. F., & Tice, D. M. (1994). *Losing control: How and why people fail at self-regulation*. New York: Academic Press.

Baumeister, R. F., Vohs, K. D., & Tice, D. M. (2007). The strength model of self-control. *Current Directions in Psychological Science, 16*, 351–355.

Blaszczynski, A., & Nower, L. (2002). A pathways model of problem and pathological gambling. *Addiction, 97*, 487–499.

Bruyneel, S. D., Dewitte, S., Franses, P. H., & Dekimpe, M. G. (2009). I felt low and my purse feels light: Depleting mood regulation attempts affect risk decision making. *Journal of Behavioral Decision Making, 22*, 153–170. doi:10.1002/bdm.619.

Carrasco, J. L., Sáiz-Ruiz, J., Hollander, E., César, J., & López-Ibor, J. J. (1994). Low platelet monoamine oxidase activity in pathological gambling. *Acta Psychiatrica Scandinavica, 90*, 427–431.

Corless, T., & Dickerson, M. (1989). Gamblers' self-perceptions of the determinants of impaired control. *British Journal of Addiction, 84*, 1527–1537.

Dickerson, M., & Baron, E. (2000). Contemporary issues and future directions for research into pathological gambling. *Addiction, 95*, 1145–1159.

Ferris, J., & Wynne, H. (2001). *The Canadian problem gambling index*. Ottawa, ON: Canadian Centre on Substance Abuse.

Freeman, N., & Muraven, M. (2010). Self-Control depletion leads to increased risk taking. *Social Psychological and Personality Science, 1*, 175–181. doi:10.1177/1948550609360421.

Hagger, M. S., Wood, C., Stiff, C., & Chatzisarantis, N. L. (2010). Ego depletion and the strength model of self-control: A meta-analysis. *Psychological Bulletin, 136*, 495–525. doi:10.1037/a0019486.

Hammelstein, P. (2004). Faites vos jeux! Another look at sensation seeking and pathological gambling. *Personality and Individual Differences, 37*, 917–931. doi:10.1016/j.paid.2003.10.014.

Howell, D. C. (2007). *Statistical methods for psychology*. Belmont, CA: Cengage Wadsworth.

Johansson, A., Grant, J. E., Kim, S. W., Odlaug, B. L., & Götestam, K. G. (2009). Risk factors for problematic gambling: A critical literature review. *Journal of Gambling Studies, 25*, 67–92. doi:10.1007/s10899-008-9088-6.

Maccallum, F., Blaszczynski, A., Ladouceur, R., & Nower, L. (2007). Functional and dysfunctional impulsivity in pathological gambling. *Personality and Individual Differences, 43*, 1829–1838. doi:10.1016/j.paid.2007.06.002.

McCormick, R. A. (1994). The importance of coping skill enhancement in the treatment of the pathological gambler. *Journal of Gambling Studies, 10*, 77–86.

Mcmillen, J., & Wenzel, M. (2006). Measuring problem gambling: Assessment of three prevalence screens. *International Gambling Studies, 6*, 147–174. doi:10.1080/14459790600927845.

Mishra, S., Lalumière, M. L., & Williams, R. J. (2010). Gambling as a form of risk-taking: Individual differences in personality, risk-accepting attitudes, and behavioral preferences for risk. *Personality and Individual Differences, 49*, 616–621. doi:10.1016/j.paid.2010.05.032.

Muraven, M. (2010a). Building self-control strength: Practicing self-control leads to improved self-control performance. *Journal of Experimental Social Psychology, 46*, 465–468. doi:10.1016/j.jesp.2009.12.011.

Muraven, M. (2010b). Practicing self-control lowers the risk of smoking lapse. *Psychology of Addictive Behaviors, 24*, 446–452. doi:10.1037/a0018545.

Muraven, M., Collins, R. L., Shiffman, S., & Paty, J. A. (2005). Daily fluctuations in self-control demands and alcohol intake. *Psychology of Addictive Behaviors, 19*, 140–147. doi:10.1037/0893-164X.19.2.140.

Muraven, M., Pogarsky, G., & Shmueli, D. (2006a). Self-Control depletion and the general theory of crime. *Journal of Quantitative Criminology, 22*, 263–277. doi:10.1007/s10940-006-9011-1.

Muraven, M., Shmueli, D., & Burkley, E. (2006b). Conserving self-control strength. *Journal of Personality and Social Psychology, 91*, 524–537. doi:10.1037/0022-3514.91.3.524.

Muraven, M., & Slessareva, E. (2003). Mechanisms of self-control failure: Motivation and limited resources. *Personality and Social Psychology Bulletin, 29*, 894–906. doi:10.1177/0146167203253209.

Muraven, M., Tice, D. M., & Baumeister, R. F. (1998). Self-Control as limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology, 74*, 774–789.

Nower, L., Derevensky, J. L., & Gupta, R. (2004). The relationship of impulsivity, sensation seeking, coping, and substance use in youth gamblers. *Psychology of Addictive Behaviors, 18*, 49–55. doi:10.1037/0893-164X.18.1.49.

Oaten, M., & Cheng, K. (2006a). Improved self-control: The benefits of a regular program of academic study. *Basic and Applied Social Psychology, 28*, 1–16.

Oaten, M., & Cheng, K. (2006b). Longitudinal gains in self-regulation from regular physical exercise. *British Journal of Health Psychology, 11*, 717–733. doi:10.1348/135910706X96481.

Oaten, M., & Cheng, K. (2007). Improvements in self-control from financial monitoring. *Journal of Economic Psychology, 28*, 487–501. doi:10.1016/j.joep.2006.11.003.

Rahman, S., Sahakian, B. J., Cardinal, R. N., Rogers, R. D., & Robbins, T. W. (2001). Decision making and neuropsychiatry. *Trends in Cognitive Science, 5*, 271–277.

Raylu, N., & Oei, T. P. S. (2002). Pathological gambling A comprehensive review. *Clinical Psychology Review, 22*, 1009–1061.

Schmeichel, B. J., & Zell, A. (2007). Trait self-control predicts performance on behavioral tests of self-control. *Journal of Personality, 75*, 743–755. doi:10.1111/j.1467-6494.2007.00455.x.

Sharpe, L. (2002). A reformulated cognitive-behavioral model of problem gambling. A biopsychosocial perspective. *Clinical Psychology Review, 22*, 1–25.

Steel, Z., & Blaszczynski, A. (1998). Impulsivity, personality disorders and pathological gambling severity. *Addiction, 93*, 895–905.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. Toronto: Allyn & Bacon.

Tangney, J. P., Baumeister, R. F., & Boone, A. L. (2004). High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality, 72*, 271–324.

Toneatto, T., & Nguyen, L. (2007). Individual characteristics and problem gambling behavior. In G. Smith, D. C. Hodgins, & R. J. Williams (Eds.), *Research and measurement issues in gambling studies* (pp. 279–303). New York: Academic Press.

Vohs, K. D., Baumeister, R. F., Schmeichel, B. J., Twenge, J. M., Nelson, N. M., & Tice, D. M. (2008). Making choices impairs subsequent self-control: A limited-resource account of decision making, self-regulation, and active initiative. *Journal of Personality and Social Psychology, 94*, 883–898. doi:10.1037/0022-3514.94.5.883.

Welte, J. W., Barnes, G. M., Tidwell, M. C., & Hoffman, J. H. (2008). The prevalence of problem gambling among U.S. Adolescents and young adults: Results from a national survey. *Journal of Gambling Studies, 24*, 119–133. doi:10.1007/s10899-007-9086-0.

Williams, R. J., West, B. L., & Simpson, R. I. (2007). *Prevention of problem gambling: A comprehensive review of the evidence*. Guelph, Ontario: Report Prepared for the Ontario Problem Gambling Research Centre.

Xuan, Z., & Shaffer, H. (2009). How do gamblers end gambling: Longitudinal analysis of internet gambling behaviors prior to account closure due to gambling related problems. *Journal of Gambling Studies, 25*, 239–252. doi:10.1007/s10899-009-9118-z.