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ORIGINAL PAPER

## Pathological Gambling in Estonia: Relationships with Personality, Self-Esteem, Emotional States and Cognitive Ability

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**Abstract** Due to changes in gambling accessibility during the last decade gambling has become more widespread in Estonia and the prevalence of pathological gambling has sharply increased. The present study attempts to identify psychological characteristics of Estonian pathological gamblers. It has been shown that a wide range of social, economic, and individual factors (e.g. personality traits and emotional states) predict the likelihood of becoming a pathological gambler. In the present study, pathological gamblers' ( $N = 33$ ) personality traits, self-esteem, self-reported emotional states and cognitive ability were compared to the respective characteristics in a non-gambling control group ( $N = 42$ ) matched for age, gender and educational level. It was found that compared to controls, pathological gamblers had higher scores on Neuroticism (especially on its immoderation facet) and lower scores on Conscientiousness (especially on its dutifulness and cautiousness facets) and on self-esteem scale. They reported more negative emotional states during the previous month (especially depression and anxiety). Finally, pathological gamblers had lower general cognitive ability. In a logistic regression model, the likelihood of being a pathological gambler was best predicted by high immoderation score and low cognitive ability.

**Keywords** Gambling · Pathological gambling · Personality · Cognitive ability · Self-esteem

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## Introduction

Within the last decade there has been an unprecedented increase in the availability of legalized forms of gambling in Estonia. Although by population Estonia is among the smallest countries in the world (1.34 million people; 2007 estimate), there are 169 casinos in Estonia. The main form of gambling is playing slot machines. In 2007 alone more than 1,000 new slot machines were taken into use—in January there were 3,978 slot machines in total but by the end of the year their number had grown to 5,165 (Estonian Gaming Operator Association 2009), meaning that there was one slot machine for every 203 people in the age between 15 and 74. After January 2008, however, their number has slightly decreased (Estonian Gaming Operator Association 2009).

Most authors agree that the rate of pathological gambling is related to the accessibility of gambling activities (Cox et al. 2005; Welte et al. 2004; Jacques et al. 2000; Volberg 1994; Abbott and Volberg 1994). In particular, casino gambling has frequently been found to be one of the most problematic forms of gambling (Fisher 2000). Furthermore, it has been argued that gambling on slot machines has more gambling-inducing structural characteristics than any other form of gambling and it has been identified as one of the world's major gambling problems (Parke and Griffiths 2006; Griffiths 1999).

There have been two gambling prevalence surveys among the Estonian population between ages 15 and 74. The first survey in 2004 (Faktum 2004; Laansoo 2005) looked at the extent of contact the Estonian population has had with gambling, while the second study in 2006 was aimed at finding out the changes in the prevalence rate of gambling (Turu-uuringud 2006; Laansoo and Niit 2008). In both surveys, Estonian version of the South Oaks Gambling Screen (SOGS; Lesieur and Blume 1987; Laansoo 2005) was used as the screening instrument for assessing pathological gambling. In the 2004 survey the estimates of probable pathological gamblers (SOGS score  $\geq 5$ ) and problem gamblers (SOGS score 2–4) were  $2.4\% \pm 0.96\%$  and  $2.6\% \pm 0.99\%$  of the population, respectively. In the 2006 survey the respective percentages were  $3.4 \pm 0.79\%$  and  $3 \pm 0.75\%$ . Thus, there had been a slight increase in the prevalence of gambling problems over the two-year period. Comparison of the Estonian prevalence rates to those found in other countries shows that in Estonia both levels of gambling are much more frequent. For example, Stucki and Rihs-Middel (2007) report that across a wide range of populations the mean prevalence rates of pathological and problem gambling (on the basis of SOGS scores) were 1.8% and 1.2%, respectively.

As a result of the described gambling situation in Estonia, there is an increasing public interest to understand the correlates and negative consequences of pathological gambling. On the basis of detailed knowledge of factors related to gambling, more effective treatment and prevention strategies could be developed. However, although studies have shown that a wide range of factors may predict the likelihood of becoming a pathological gambler, the picture is far from being clear.

### Personality Traits of Pathological Gamblers

Substantial evidence suggests that one of the major characteristics of pathological gamblers is impulsiveness (Raylu and Oei 2002). Several studies have found that pathological gamblers score higher in impulsivity compared to control participants (MacCallum et al. 2007; Steel and Blaszczynski 1998; Vitaro et al. 1997). However, Langewisch and Frisch (1998) found that among those who corresponded to the criteria of pathological gamblers, impulsiveness did not correlate with the severity of gambling pathology.

In a longitudinal study, Slutske et al. (2005) found that high negative emotionality and low constraint as measured by Multidimensional Personality Questionnaire (MPQ) at the age of 18 strongly predicted gambling problems at the age of 21. Gambling was also predicted by MPQ indicators of risk-taking and impulsiveness, but their effect was somewhat smaller.

Recently Bagby et al. (2007) examined the personality differences between non-treatment-seeking pathological gamblers and non-pathological gamblers using the domain and facet scales scores of the Revised NEO Personality Inventory (NEO-PI-R; Costa and McCrae 1992). Compared to controls, pathological gamblers scored significantly higher on the Neuroticism domain and lower on the Conscientiousness domain. Significant differences were also found in three facet level traits related to impulse control: pathological gamblers scored higher on impulsiveness (a facet of the Neuroticism domain) and lower on self-discipline and deliberation (facets of the Conscientiousness domain). In Neuroticism facets other than impulsiveness, pathological gamblers scored higher on depression, self-consciousness and vulnerability.

Bagby et al. (2007) also found that although there was no difference between pathological and non-pathological gamblers with respect to excitement-seeking, compared to general population, both groups scored higher on the trait. Authors interpreted this as evidence that excitement-seeking plays a general, rather than pathology specific, role in gambling behaviour. Somewhat consistently, Langewisch and Frisch (1998) found that sensation seeking, a closely related trait, did not predict gambling severity in pathological gamblers but did so in a group of non-pathological gamblers. Earlier studies have reported even more contradictory results. For example, Kuley and Jacobs (1988) found that problem gamblers scored higher on sensation-seeking than problem gamblers, while Blaszczynski et al. (1986) found that Australian pathological gamblers had even lower sensation-seeking scores than the general population. Thus, the relationship of excitement or sensation seeking with pathological gambling is not entirely clear and perhaps may vary across populations.

### Self-Esteem and Emotional States of Pathological Gamblers

Self-defeating behaviours such as gambling are usually related to emotional distress. According to Baumeister (1997), gambling is a self-defeating behaviour in at least two ways. First, it has direct negative consequences, such as expending a large amount of money. Second, gambling often undermines the personal program of self-regulation that has been designed to avoid self-defeating behaviours in the first place. Self-defeating behaviour affects self-appraisal and self-esteem—decreases in self-esteem are generally accompanied by negative affects like anxiety and depression. Symptoms of emotional disorders influence the motivation to gamble and gambling behaviours, on the other hand, are likely to modulate the symptoms of emotional disorders (Kim et al. 2006). Therefore, it is not surprising that high prevalence of emotional disorders, particularly anxiety and/or depression, has been found among pathological gamblers (Kim et al. 2006; el-Guebaly et al. 2006; Getty et al. 2000; Cunningham-Williams et al. 1998; Blaszczynski and McConaghy 1989). In a study on prevalence and co-morbidity of pathological gambling Petry et al. (2005) found high prevalence rates of mood disorder (49.6%), anxiety (41.3%), and personality disorders (60.8%) among pathological gamblers. Similarly, Kim and colleagues (2006) reported significantly increased overall prevalence of emotional disorders among pathological gamblers in comparison to general population. Psychiatric

co-morbidity among pathological gamblers may also be associated with greater severity of gambling pathology (el-Guebaly et al. 2006; Ibanez et al. 2001).

### Cognitive Ability of Pathological Gamblers

As pointed out above, pathological gambling is possibly related to a lack of self-regulation and inability to manage negative consequences accompanied with gambling behaviour. The principal question, thus, is why gamblers cannot learn from these consequences. As intelligence is often defined as the ability to learn from experience, it is reasonable to expect that low general intelligence might be a predictor of pathological gambling. In accordance with the hypothesis, it has been shown that intelligence is related to coping with a wide range of everyday situations (Gottfredson 1997; Jensen 1998). However, to date the possible interaction between pathological gambling and general cognitive ability has not been exhaustively studied.

### The Present Study

Due to very high prevalence of gambling, Estonia is a unique research ground for studying gambling and the related phenomena. Specifically, in a society with high gambling prevalence antecedents and correlates of gambling may differ from those in a society with lower rates of gambling prevalence. However, to date no studies focusing on psychological features of pathological gamblers have been carried out on Estonian population.

The main goal of this study was to establish a model of psychological characteristics that explains pathological gambling in Estonian population. On the basis of previous research in other cultures it was hypothesized that, compared to non-gambling controls, pathological gamblers will: (a) have higher scores on the Neuroticism domain and lower scores on the Conscientiousness domain; (b) inside the Neuroticism and the Conscientiousness domains, respectively, have higher scores on the immoderation and the depression facet scales and lower scores on the self-discipline, the cautiousness and the dutifulness facet scales; (c) have lower global self-esteem; (d) show higher prevalence of emotional problems; and (e) have lower scores of cognitive ability.

## Method

### Participants

Thirty-three pathological gamblers and 42 non-gamblers participated in the study. Pathological gamblers (31 men and 2 women) were recruited by the first author among the individuals seeking treatment from Gambling Problems Program in Tallinn, Estonia, between March 2006 and January 2008. Participants were interviewed in the first session using the structured clinical interview for the diagnostic criteria of pathological gambling of the 4th edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-IV, American Psychiatric Association 1994). As well, participants filled out the South Oaks Gambling Screen (SOGS). In this group all surpassed the SOGS cut-off for pathological gambling (cut-off  $\geq 5$ ;  $M = 12.4$ ,  $SD = 2.99$ ) and met the DSM-IV diagnostic criteria for pathological gambling.

The non-gambling control group (36 men and 6 women) consisted of volunteers whose SOGS scores remained under cut-off for problem and pathological gambling during

**Table 1** Characteristics of participants

		Gamblers <sup>a</sup>	Controls <sup>b</sup>
Age	Mean (SD)	33.90 (7.11)	33.07 (6.97)
	Range	22–48	22–47
Gender	Male	31	36
	Female	2	6
Education	Below high school	3	5
	High school	14	16
	Vocational school	14	18
	University	2	3

Note: <sup>a</sup>  $N = 33$ ; <sup>b</sup>  $N = 42$

lifetime (cut-off  $< 2$ ;  $M = 0.21$ ,  $SD = 0.42$ ). They were reached by personal invitation. Controls were matched to pathological gambling participants by age, gender and education (Table 1). Written informed consent to participate in the study was obtained from all participants.

## Measures

### Pathological Gambling

- (a) The Estonian version of South Oaks Gambling Screen (SOGS; Laansoo 2005), originally developed by Lesieur and Blume (1987), is a 16-item scale for identifying pathological gamblers. In the course of adaptation of the SOGS, certain forms of gambling had to be adjusted to the Estonian equivalents. The adjustments were implemented according to the guidelines by Lesieur and Blume (1993) of using SOGS in various frameworks. The authors of the original test were also consulted (Laansoo 2005).
- (b) In the group of pathological gamblers the SOGS was compared with the DSM-IV criteria for pathological gambling. DSM-IV criteria for pathological gambling were translated into Estonian and re-worded into lay language by three experts and administered as a face to face interview.

### Personality

The Estonian Personality Item Pool-NEO (EPIP-NEO; Mõttus et al. 2006) was used to measure the Big Five personality domains of Neuroticism (N), Extraversion (E), Openness (O), Agreeableness (A) and Conscientiousness (C), and six facet scales of each domain. The structure of the EPIP-NEO is analogous to the Revised NEO Personality Inventory (NEO-PI-R; Costa and McCrae 1992) but the EPIP-NEO is more readable due to shorter and grammatically less complex items (Mõttus et al. 2006). There is some dissimilarity concerning the names of facet scales of the two parallel instruments but essentially the scales measure similar constructs as evidenced by the mean convergent correlation of  $r = .73$  between the corresponding scales (Mõttus et al. 2006). For example, although with different labels, the N5: Immoderation facet scale of the EPIP-NEO measures the same construct [“inability to control cravings and urges” (Costa and McCrae 1992)] as the N5: Impulsiveness facet scale of the NEO-PI-R (convergent correlation  $r = .66$ ,  $p < .01$ ; Mõttus et al. 2006). Responses to the EPIP-NEO items were given on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

### *Self-Esteem*

The Estonian version of the Rosenberg Self-Esteem Scale (ERSES; Pullmann and Allik 2000) was used to measure global self-esteem. The Rosenberg Self-Esteem Scale (RSES; Rosenberg 1965) is the most widely used instrument for the measurement of global self-esteem understood as person's overall evaluation of his/her worthiness as a human being (Rosenberg 1979). ERSES has demonstrated good psychometric properties, and has shown to be identical to the original measure (Pullmann and Allik 2000). Participants responded on a 5-point scale ranging from 1 (strongly disagree) to 5 (strongly agree).

### *Self-Reported Emotional States*

The Emotional State Questionnaire (EST-Q; Aluoja et al. 1999) was used to measure the symptoms of depression, anxiety, agoraphobia and panic, fatigue and insomnia during the previous month. Aluoja et al. (1999) constructed the EST-Q on the basis of the relevant diagnostic criteria in the DSM-IV and the 10th revision of the International Classification of Diseases and Related Health Problems (ICD-10, World Health Organization 1993). Twenty-eight items in the five subscales were rated on a 5-point frequency scale ranging from 0 (never) to 4 (continuously).

### *Cognitive Ability*

Raven's Standard Progressive Matrices (RSPM; Raven 1981) were used to measure general cognitive ability of the participants. The RSPM is a measure of pure non-verbal reasoning ability that is relatively independent of specific learning acquired in a particular cultural or educational context (Jensen 1998). The RSPM is made up of a series of designs with a part missing. Test takers are expected to complete the designs by selecting the correct parts from a number of options printed beneath each design (Raven 2000). The test consists of 60 items presented in five sets (A–E), with 12 items per set gradually increasing in difficulty.

### *Procedure*

Participants completed the test battery privately in the sequence presented above. The only difference between the groups of gamblers and controls was DSM-IV interview, which was carried out in the group of pathological gamblers. Pathological gamblers filled the battery before starting the therapy or getting any consultations for their gambling problems. Prior to the beginning of the procedure they were presented with information about the study in general and about each test separately in both verbal and written form. Additional instructions were presented before RSPM. The participants were also assured that all information obtained was strictly confidential and would be used only for research purposes.

All tests were completed without time limits and the procedure took approximately two and a half to 3 hours for each participant. Participants received written feedback about their test results.

Participants had the right to withdraw from the study at any moment. Unfinished tests were excluded from further analyses. Number of valid tests is presented in Table 2.

**Table 2** Number of valid tests

Test	<i>N</i> (Total)	<i>N</i> (Gamblers)	<i>N</i> (Controls)
Diagnostics (SOGS)	75	33	42
DSM IV interview	33	33	0
Personality (EPIP-NEO)	69	32	37
Emotional states (EST-Q)	64	27	37
Self-esteem (ERSES)	64	27	37
Cognitive ability (RSPM)	61	24	37
Whole battery	53	21	32

## Results

### Differences Between Pathological Gamblers and Controls

For all measures, mean values and standard deviations of pathological gamblers and controls, as well as the results of the statistical tests for between-group differences, are displayed in Table 3. The significance of the between-group differences in mean values was assessed using *t*-test. In some cases the assumptions of *t*-test were not fully met, thus differences were additionally assessed with the non-parametric Mann–Whitney U test.

### Personality

At the level of the Big Five domains, pathological gamblers scored significantly higher on Neuroticism and lower on Conscientiousness than controls (Table 3). In case of Neuroticism, the effect size was remarkably large with  $d = 1.15$ . Accordingly, pathological gamblers scored significantly higher than controls on all of the Neuroticism facet scales, although the difference was not significant in case of the N1: Anxiety. The differences were especially large in the N5: Immoderation and the N3: Depression. In case of Conscientiousness, although pathological gamblers scored significantly lower only in two of its facets, the C3: Dutifulness and the C6: Cautiousness, the differences were large in magnitude. Extraversion, Openness, and Agreeableness in general did not predict gambling but a few of their facets did. Specifically, pathological gamblers scored higher on the Extraversion facet E4: Activity Level and the Openness facet O4: Adventurousness, whereas they had lower scores on the E6: Cheerfulness. No significant difference emerged for the E5: Excitement-seeking.

The distribution of scores was close to normal but the assumption of homogeneity of variances was not met in all personality traits. However, the Mann–Whitney U test gave similar significance estimates except for the N4: Self-consciousness, which lost its significance.

### Self-Esteem

Compared to controls, pathological gamblers scored significantly lower on the ERSES with a remarkably large effect size ( $d = -1.4$ ). The significance was confirmed by Mann–Whitney U test.

**Table 3** Means, standard deviations and effect size of differences between tests scores of pathological gamblers and controls

	Pathological gamblers		Controls		Cohen <i>d</i>
	Mean	SD	Mean	SD	
Neuroticism	96.72	29.35	67.27	21.11	1.15***
Extraversion	114.16	20.49	116.14	22.69	-0.09
Openness	126.13	17.66	123.68	17.94	0.14
Agreeableness	116.91	21.74	125.76	20.02	-0.42
Conscientiousness	109.59	25.97	124.14	21.81	-0.61*
N1: Anxiety	16.53	5.87	14.30	5.20	0.40
N2: Anger	16.69	8.75	11.46	6.65	0.67**
N3: Depression	13.69	6.43	8.08	3.89	1.06***
N4: Self-consciousness	13.59	5.93	11.00	4.66	0.49*
N5: Immoderation	23.75	4.60	13.76	4.98	2.08***
N6: Vulnerability	12.47	5.79	8.68	3.62	0.79**
E1: Friendliness	21.16	4.39	22.59	4.82	-0.31
E2: Gregariousness	17.47	4.79	18.70	5.33	-0.24
E3: Assertiveness	17.63	5.83	17.59	5.25	0.01
E4: Activity level	20.38	4.82	17.86	4.36	0.55*
E5: Excitement-seeking	19.50	4.96	18.05	5.29	0.28
E6: Cheerfulness	18.03	5.47	21.32	5.13	-0.62*
O1: Imagination	23.41	5.28	22.49	5.17	0.18
O2: Artistic interests	20.66	5.69	21.46	5.24	-0.15
O3: Emotionality	21.88	4.42	21.30	4.04	0.14
O4: Adventurousness	20.06	3.65	17.65	4.41	0.60*
O5: Intellect	19.56	5.68	19.51	4.10	0.01
O6: Liberalism	20.56	3.21	21.27	3.45	-0.21
A1: Trust	19.94	4.94	21.54	5.34	-0.31
A2: Morality	19.00	6.59	21.46	5.54	-0.40
A3: Altruism	21.53	4.44	22.49	3.88	-0.23
A4: Cooperation	19.19	5.00	21.14	4.12	-0.43
A5: Modesty	15.28	5.83	16.16	4.88	-0.16
A6: Sympathy	21.97	4.71	22.97	4.11	-0.23
C1: Self-efficacy	20.13	5.04	22.24	3.90	-0.47
C2: Orderliness	18.28	5.91	19.95	5.45	-0.29
C3: Dutifulness	17.38	5.62	22.92	4.20	-1.12***
C4: Achievement striving	21.50	5.82	20.24	5.06	0.23
C5: Self-discipline	17.00	6.11	18.76	6.01	-0.29
C6: Cautiousness	15.31	5.90	20.03	4.39	-0.91***
Cognitive ability (RSPM)	48.50	7.75	52.60	4.92	-0.63*
Self-esteem (ERSES)	23.85	7.68	32.65	4.49	-1.40***
Depression (EST-Q)	14.30	7.64	6.78	3.91	1.24***
Anxiety (EST-Q)	11.78	5.23	7.73	3.52	0.91***
Panic & Agoraphobia (EST-Q)	2.89	3.45	1.16	2.24	0.59*



**Table 3** continued

	Pathological gamblers		Controls		Cohen <i>d</i>
	Mean	SD	Mean	SD	
Asthenia (EST-Q)	8.07	4.09	5.46	2.67	0.76**
Insomnia (EST-Q)	4.93	2.89	3.22	1.96	0.69**

Note: \*  $p < 0.05$ ; \*\*  $p < 0.01$ ; \*\*\*  $p < 0.001$

### Emotional States

Pathological gamblers and controls differed significantly in all measured symptoms, with pathological gamblers having more frequently experienced negative emotions during the previous month. Largest effect sizes were found for depression and anxiety scores. The significance of all group differences was confirmed by Mann–Whitney U test.

### Cognitive Ability

Pathological gamblers had significantly lower total scores on the RSPM than controls ( $p < 0.05$ ). Although it can be seen from Table 3 that the variance of ability-test scores was considerably larger in pathological gamblers than in controls (according to Levene's test,  $p < 0.01$ ), the significance of mean-level difference was confirmed by Mann–Whitney U test.

### A Model Predicting Gambling Problems

Stepwise logistic regression was performed to assess the independent contribution of each variable to the model predicting the likelihood of being a problem gambler. The dichotomous variable of being or not being a gambler was used as the dependent variable. As the first step, all variables that had significantly ( $p < 0.05$ ) differentiated pathological gamblers from controls in previous univariate tests ( $t$ -test) were one by one tested as sole predictors. As expected, the best fit was shown by the N5: Immoderation,  $\chi^2 = 50.97$ ,  $p < 0.001$ . In the next step, the remaining significant predictors in  $t$ -test were one by one added to the model. Improvement was estimated by changes in  $-2 \cdot \log$ -likelihood. The best fit was obtained when cognitive ability was added to the N5: Immoderation,  $\chi^2 = 59.16$ ,  $p < 0.001$ . Adding further predictors did not improve the model. Final model is provided in Table 4.

**Table 4** Model of correlates for predicting gambling problems

Variable	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>p</i>
N5: Immoderation	0.73	0.17	2.08	<0.001
Cognitive ability	-0.32	0.11	0.73	<0.01

Note: *SE* Standard Error, *OR* Odds ratio

## Discussion

The present study investigated psychological characteristics of Estonian pathological gamblers.

With respect to personality traits pathological gamblers scored higher on Neuroticism and lower on Conscientiousness domains compared to controls. However, some narrower facet-level traits—especially immoderation, depression, cautiousness and dutifulness—performed even better in distinguishing pathological gamblers from controls. Generally, these results are consistent with a previous study (Bagby et al. 2007) which also used the five-factor model of personality to predict gambling pathology. There were a few discrepancies at the level of facets, nevertheless. First, self-discipline—predisposition to persist at difficult or unpleasant tasks until they are completed—did not distinguish pathological gamblers from controls in the present study as it did in Bagby et al. (2007). Although the score was slightly lower in the pathological gamblers group in comparison to controls, the non-consistent findings may indicate that self-discipline is not an omnipresent trait in gambling pathology. The same applies to self-efficacy and trust, in which significant differences were found by Bagby et al. (2007) but not in this study, as well as for anger and cheerfulness that significantly distinguished groups in the present study but not in that of Bagby et al. (2007). In all of these traits the trends were similar in the two studies but there were differences in effect sizes. With activity and adventurousness the situation was slightly different because in this study the group of pathological gamblers scored significantly higher on these traits but in Bagby et al. (2007) the differences were in the opposite direction (albeit non-significant).

The final personality trait that merits discussion is excitement-seeking. In Bagby et al. (2007) there was no difference between pathological and non-pathological gamblers on excitement-seeking but compared to normative data both groups scored higher. In the present results pathological gamblers also tended to score higher on excitement-seeking but the effect was not significant. In essence this finding, possibly implying that excitement-seeking might be related to, but is not a ubiquitous correlate of, pathological gambling, is consistent with several other previous studies (e.g. Langewisch and Frisch 1998; Allcock and Grace 1988).

To conclude with personality traits, our results show that the overall personality profile of pathological gamblers is a combination of impulse-control problems (high immoderation and low dutifulness and cautiousness), acting-out tendencies (high activity level and adventurousness) and emotional vulnerability (high anger, depression, self-consciousness and vulnerability and low cheerfulness).

Consistent with our hypothesis, pathological gamblers reported substantially lower self-esteem than controls. This may indicate that excessive gambling as self-defeating behaviour affects the global regard that one has for the self (Baumeister and Tice 1985). However, the results may equally well mean that low self-esteem is a risk factor of pathological gambling. Unfortunately, the results give no hint about the causal direction of the relationships.

As well, the hypothesis of emotional problems of pathological gamblers was confirmed by high frequency of negative emotional states. Comparing traits and states, the high trait level of depression was in compliance with the state of high depression in pathological gamblers. Interestingly, the state of anxiety was also remarkably higher in pathological gamblers compared to controls but not the trait of anxiety. One possible explanation is that there is a large common component between depression and anxiety and this overlap may constitute difficulties in separating the states by means of self-report measures (Aluoja

et al. 1999; Clark and Watson 1991). The conclusion about the results concerning emotional states, however, is that they point to a possibly significant role of co-morbid psychiatric conditions in pathological gamblers. This needs to be considered in the development of prevention strategies and treatment interventions. Consistently, Hodgins et al. (2005) pointed to the importance of lifetime emotional disorders in the treatment of gambling disorder.

A logistic regression model predicting the likelihood of being a pathological gambler showed that the most important independent predictors were high immoderation and low cognitive ability. Other variables had no incremental value in distinguishing pathological gamblers from controls. At first glance it was somewhat surprising that variables such as trait depression, low self-esteem or low dutifulness that appeared to be strong predictors of pathological gambling in univariate tests did not show substantial independent contribution. However, these findings can be easily explained by multicollinearity between the predictors. Immoderation, by far the most important predictor of pathological gambling, captured the variance of most of the other significant predictors as well, except for the ability scores.

With regard to underscoring the role of immoderation, the findings are consistent with previous studies which suggest that high impulsiveness is a main risk factor for problematic gambling and is also associated with the degree of severity of psychological and behavioural change in pathological gamblers (MacCallum et al. 2007; Clarke 2006; Blaszczyński et al. 1997). Thus, as immoderation reflects the inability to control impulsive behaviour, the development of pathological gambling might be a result of maladaptive effort to regulate affect or dampen the effects of high Neuroticism (Bagby et al. 2007).

There is not much literature on the role of cognitive ability in predicting pathological gambling. Therefore, its important role in the current results was more novel. Previously it has been found that individuals with less than a high school education are at increased risk for endorsing gambling symptoms assessed 10 years later (Scherrer et al. 2007). The positive correlation between educational attainment and IQ has been well documented (Strenze 2007), thus educational level can also be interpreted as a proxy for ability. However, because the variance of the RSPM scores was significantly larger within the group of pathological gamblers, this result has to be interpreted cautiously.

A possible mechanism for explaining the role of the combination of low cognitive ability and high Neuroticism (or its facet immoderation) in gambling pathology is provided by Perkins and Corr (2006). The authors demonstrated that there was an interaction between Neuroticism and cognitive ability in predicting military performance: Neuroticism was negatively related to performance only in case of low cognitive ability. On the basis of these results, Perkins and Corr (2006) suggested that cognitive ability acts as a buffer to reduce the negative impact of high Neuroticism. In the light of the present results, it is also possible that high cognitive ability plays a defensive role in preventing the development of gambling pathology.<sup>1</sup>

Due to the strictly correlational nature of the study, of course, we cannot draw causal conclusions. However, together with the findings of previous studies the present results indicate that personal predispositions may have a considerable role in creating vulnerability for the development of gambling problems. In other words, some individuals may due to their very nature be at higher risk for gambling-related problems. By definition, some of the variables tested in the present study were state-dependent (e.g. symptoms of

<sup>1</sup> In the present results, however, the interaction term between Neuroticism (or its facet immoderation) and cognitive ability did not significantly predict being a gambler.

emotional disorders). It is impossible to interpret these variables as risk factors because they may equally well be results of gambling-related problems. On the other hand, other tested variables such as personality traits and cognitive ability are supposed to be temporarily and cross-situationally more stable, which allows considering them as potential risk factors. At the same time we must bear in mind that assessment of personality traits and cognitive ability may also be influenced by the emotionally disturbing situation of pathological gamblers. The most crucial test of these predictors waits for studies with longitudinal design.

The present findings have some possible practical implications. High prevalence of emotional problems among pathological gamblers and identifiable individual predisposition related to pathological gambling need to be considered when developing treatment and prevention strategies. More precisely, in terms of clinical implications these results suggest that individuals seeking treatment for psychiatric disorders other than gambling (e.g. emotional disorders) could also be screened for pathological gambling. As well, treatment providers should be ready to conduct comprehensive evaluations of pathological gamblers and devise individual treatment plans that appropriately address their patients' relevant personal characteristics such as gambling-related personality traits, low self-esteem, disturbed emotional condition and possibly below-average cognitive ability. Knowing all patients' gambling-relevant characteristics is likely to raise the effectiveness of any psychotherapy. Similarly, the content and presentation of public education aimed to prevent pathological gambling is also likely to benefit from considering potential target's personal characteristics.

Of course, the study has its limitations. The sample predominantly consisted of males, since more male pathological gamblers were present and recruited from the treatment centre. The small number of female pathological gamblers in the present study restricted the possibility of separate analysis of female and male pathological gambling. Similarly, the sample of pathological gamblers consisted of treatment-seeking gamblers. Although comparison with the results of Bagby et al. (2007) showed that with respect to personality traits the non-treatment-seeking pathological gamblers and non-pathological gamblers were relatively similar, it is not feasible to automatically generalise the results to the whole population of pathological gamblers.

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