

# Problem Gambling and Sub-dimensions of Impulsivity among Regular Online Poker Players

Barrault S<sup>1</sup> and Bonnaire C<sup>2\*</sup>

<sup>1</sup>Psychology Laboratory Ages of Life, Francois Rabelais University of Tours, 3 rue tanners, France

<sup>2</sup>Paris Descartes University, Laboratory of Psychopathology and Health Processes, Psychological Institute of Paris Descartes University, France

\*Corresponding author: Céline Bonnaire, Laboratory Psychology of Ages of Life, University of Tours Francois Rabelais, 3 rue des tanneurs, 37000 Tours, France, Tel: +33 1 76 53 29 52; E-mail: [celine.bonnaire@parisdescartes.fr](mailto:celine.bonnaire@parisdescartes.fr)

Received date: Dec 07, 2015; Accepted date: Dec 21, 2015; Published date: Dec 31, 2015

Copyright: © 2015 Barrault S, et al., This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

## Abstract

**Introduction:** Impulsivity is a personality dimension known to be closely linked to addictive behaviour, including problem gambling. The aim of the present study is to assess impulsivity and its sub-dimensions (non-planning, attentional and motor impulsivity) among a sample of regular poker players, in order to determine whether these subtypes are linked to problem gambling and its severity.

**Method:** 232 regular online poker players completed online questionnaires (socio-demographic data, CPGI, BIS-11). CPGI was used to divide them into four groups according to the intensity of their gambling practice (non-problem gamblers, low problem gamblers, moderate problem gamblers and severe problem gamblers).

**Results:** Impulsivity significantly differentiated gamblers according to the intensity of their gambling behaviour and correlated significantly with problem gambling, confirming the idea that impulsivity is linked to the severity of problem gambling. Among its sub dimensions, only attentional impulsivity did not discriminate between the four groups of gamblers. Motor impulsivity and non-planning were significantly higher in severe problem gamblers and correlated with problem gambling. Motor impulsivity was also a significant predictor of problem gambling.

**Discussion:** Consistent with the literature, our results underline the link between impulsivity and problem gambling among poker players. In particular, motor impulsivity and non-planning appeared to play a role in the development and/or maintenance of problem gambling. These results may have clinical implications in terms of treatment and prevention, and open avenues of research regarding impulsivity among problem gamblers.

**Keywords:** Problem gambling; Online poker; Impulsivity; Sub-dimensions; Motor impulsivity

## Introduction

Impulsivity, defined as “a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions to the impulsive individual or to others” [1] appears to be specifically linked to addictive behaviors [2], including problem gambling [3,4].

Studying impulsivity among problem gamblers could provide a better understanding of how they function. Impulsivity could explain both impaired decision-making in gambling situations and the persistence of gambling despite negative consequences (financial losses); focusing on immediate rewards (potential win), these players do not take into account long-term negative consequences (accumulation of losses) [5].

Despite mixed findings in the literature, numerous studies suggest that impulsivity constitutes a risk factor for problem gambling [6,7]. Several longitudinal studies have shown that impulsivity preexists problem gambling and constitutes both a predictor and a risk factor [8-10]. Likewise, empirical evidence of an association between

impulsivity and problem gambling comes from a number of studies reporting a higher level of impulsivity in pathological gamblers [11,12].

Furthermore, impulsivity also appears to be a factor of clinical complexity. For example, Blaszczynski, Steel and McConaghy [13] showed that the severity of psychological and behavioral changes in problem gambling is associated with the level of impulsivity, and they proposed a model in which the severity of problem gambling is mediated by both impulsivity and psychopathy. Moreover, several studies have found that the severity of problem gambling is linked to the level of impulsivity [3,14,15] and to specific dimensions of impulsivity [16]. In line with the multidimensional nature of impulsivity [1,17,18], Ginley et al. [16] found differences between non-gamblers, low-risk gamblers and symptomatic gamblers in three impulsivity dimensions. However, the aim of that study was not to diagnose problem gambling, but to investigate dimensions of impulsivity and gambling disorder intensity.

In recent decades, the development of Internet gambling has led to the intensive spread of gambling behaviour [19]. Internet, a medium that inherently favours immediateness, could provide a facilitating frame for impulsivity, some of its features (ease of access, availability and speed) being conducive to impulsive decision-making, at the expense of thinking and planning. Assessing impulsivity among online gamblers thus seems to be a relevant line of research. Poker has

particular online gambling features [20] and appears to be one the most popular types of gambling, mostly because of the component of skill involved in long-term success [21]. As gambling appears to be a heterogeneous activity, according to the type of gambling practiced [22], we chose to focus our research on this single type of gambling.

Only a few studies have so far studied impulsivity among poker players, but they show that it has a predictive value for problem gambling [23-25]. In view of the important role of impulsivity in gambling disorders and the multidimensional aspect of this aspect of personality, it seems relevant to examine this dimension more closely, especially by investigating its sub-dimensions among problem gamblers. Thus, the objective of this research was to study the intensity of each subtype of impulsivity among regular poker players and to compare the results of non-problem and problem players in order to identify specific sub-dimensions involved in problem gambling in this population.

## Methods

### Participants and procedure

Participants were recruited from one of the most active Internet poker-related forums in France with the permission of the site's webmaster. An advertisement was posted on the website providing general information about the study. Potential participants were invited to click on a link leading to a description of the goals and method of the study and a consent form. Once they had given their consent, participants had access to the online questionnaires. The ethics committee of the University of Paris Descartes (CERES) approved the study.

Our sample was composed of regular online poker players, playing at least once a week for a minimum of one year. Age range was set at 18 to 55 years. Participants with any regular gambling activity other than poker were excluded.

### Measures

- Socio demographic data: a questionnaire (6 items) was designed for the study, with questions on age, marital status, and professional status.
- Gambling data: for each gambling activity (e.g., poker, betting on sporting events), participants were asked whether they played and, if so, how often.

- Canadian Problem Gambling Index (CPGI) (French version, Ferris and Wynne) [26]: The CPGI is a nine-item self-report questionnaire assessing problem gambling. The sum of responses ranges between 0 and 27. It was developed as a specific screening tool for problem gambling in the general public, and has good reliability and validity [26]. It has good psychometric properties [27], and identifies four intensity levels of gambling practice (0=non-problem gambling, score of 1 or 2=low problem gambling, score between 3 and 7=moderate problem gambling, and score between 7 and 27=severe problem gambling).
- Barratt Impulsiveness Scale-11 (BIS-11): to assess self-reported impulsivity, the French version of the scale was used. This 30-item scale is the most recent version of Barratt's scale and assesses impulsiveness as a multifactorial concept: non-planning impulsiveness, attentional impulsiveness and motor impulsiveness. This scale has good psychometric properties [17] and is widely used to assess impulsiveness. Internal consistency is satisfactory:  $\alpha=0.82$  for the total scale ( $\alpha=0.79$  for motor impulsiveness;  $\alpha=0.56$  for attentional impulsiveness, and  $\alpha=0.64$  for non-planning). A high score is indicative of a high level of self-reported impulsivity.

### Statistical analysis

Statistica<sup>®</sup> software (version 9) was used for the statistical analyses. The distribution was normal (assessed by measures of skewness and kurtosis). The Kaplan-Meier test and the Browne-Forsythe test confirmed normality and homoscedasticity. There were no significant outliers. Continuous variables (CPGI, BIS-11) were compared using a one-way analysis of variance (ANOVA), followed by post-hoc tests (Sheffé test) to ascertain the direction of differences. For categorical data, differences in percentages were compared using the chi-square test. Pearson's correlation coefficient was used to calculate correlations between variables. Multiple linear regressions were conducted to examine whether the variables had a predictive value for problem gambling. A p-value of <0.05 was used to indicate statistical significance.

### Results

CPGI scores and socio demographic data (Table 1).

	NPG (n=24)	Low PG (n=50)	Moderate PG (n=126)	Severe PG (n=32)	All sample (n=232)	ANOVA	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	F	p
AGE	33,7 (9,9)	31,6 (8,8)	31,1 (8,2)	30,5 (8,5)	31,4 (8,5)	0,77	0,5
	N (%)	N (%)	N (%)	N (%)	N (%)	CHI	p
PROFESSIONAL ACTIVITY						18,4	0,03*
Active	19 (79)	40 (80)	81 (64)	19 (59)	159 (68)		
Student	1 (4)	3 (6)	21 (16)	3 (9)	28 (12)		
Unemployed	2 (8)	5 (10)	22 (17)	10 (31)	39 (16)		
Other	2 (8)	2 (4)	2 (1)	0 (0)	6 (2)		

SOCIOPROFESSIONAL CATEGORY						16,44	0,35
Farmers	1 (4)	1 (2)	1 (0,7)	0 (0)	3 (1)		
Artisans	2 (8)	3 (6)	10 (8)	2 (6)	17 (7)		
Executives	7 (29)	20 (40)	35 (27)	4 (12)	66 (28)		
Employees	7 (29)	12 (24)	34 (26)	10 (31)	63 (27)		
Workman	2 (8)	5 (8)	4 (3)	4 (12)	15 (6)		
Other	5 (20)	10 (20)	41 (32)	12 (37)	68 (29)		
FAMILY SITUATION						9,44	0,14
Couple	14 (58)	30 (60)	63 (50)	14 (43)	121 (52)		
Single	10 (24)	20 (40)	62 (49)	16 (50)	108 (46)		
Divorced	0 (0)	0 (0)	1 (0,7)	2 (6)	3 (1)		

**Table 1:** Sociodemographic data; NPG: non-problem gamblers; Low PG: low problem gamblers; Moderate PG: moderate problem gamblers ; Severe PG: severe problem gamblers; \*p<0.05.

### Socio-demographic Characteristics

A total of 232 regular online poker players completed the online questionnaires. We used the CPGI to divide them into four groups: 24 (10.3%) had no gambling problem (NPG; CPGI =0), 50 (21.5%) showed low problem gambling (Low PG; CPGI score of 1 and 2), 126 (54.3%) showed moderate problem gambling (moderate PG; CPGI scores between 3 and 7), and 32 (13.7%) showed severe problem gambling (severe PG; CPGI scores between 7 and 27).

Only four of the participants were women (1.7%); three had a moderate level and one a severe level of problem gambling. As the prevalence and characteristics of problem gambling may differ between men and women [28], we conducted a statistical analysis to determine whether the women in our sample had significantly different scores than the men. As no impact on the results was found, we decided to keep the women in the sample.

Socio-demographic data of these groups are presented in Table 1. The mean age for the whole sample was 31.4 years (SD=8.5). There were no significant differences in the socio demographic data between the four groups, except for professional activity (Chi=18.4; df=9; p=0.03): fewer professionally active participants had severe PG (59%) than NPG (79%) or low PG (80%).

### Gambling Activities

We asked participants whether they participated in any gambling activity other than poker and if so, how often. Non-problem poker players had no other regular (once a week or more) gambling activity, except for two players (8%) who reported regular betting on horses. Among low-problem gamblers, four (7%) regularly bet on sporting events online and played online casino games, and six (11%) regularly bet on sporting events. In the moderate problem gambling group, nine (7%) regularly bet on sporting events, and nine (7%) bet on sporting events online. Sixteen (13%) regularly played online casino games. Among severe problem gamblers, two (6%) regularly bet on sporting events and two (6%) bet on sporting events online. Lottery tickets (n=4; 12.5%) and casino games (n=4; 12.5% for live casino games; n=3; 10% for online casino games) were the most frequently associated regular gambling activities.

### Impulsivity Scores

BIS-11 scores (Tables 2,3).

	NPG	Low PG	Moderate PG	Severe PG	All sample	ANOVA		
	(n=24)	(n=50)	(n=126)	(n=32)	(n=132)			
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	F	f	p
BIS 11 total	59,3 (9)	59,6 (10,3)	65 (9,7)	69,6 (10,9)	63,9 (10,4)	8,80	0.34	<0.001*
Attentional	16,5 (3,5)	15,8 (3,3)	17 (2,9)	17,8 (3,7)	16,8 (3,2)	2,80	0.21	0,04
Motor	19,6 (2,8)	21 (4,5)	22,6 (3,8)	24,6 (4,8)	22,2 (4,2)	8,79	0.42	<0.001*

Non planning	23,2 (5,4)	22,7 (4,8)	25,3 (5,1)	27,1 (4,5)	24,8 (5,1)	6,61	0,3	<0.001*
--------------	------------	------------	------------	------------	------------	------	-----	---------

**Table 2:** BIS-11 scores and ANOVA results; NPG =Non-problem gamblers; Low PG=low problem gamblers; Moderate PG=moderate problem gamblers ; Severe PG=severe problem gamblers; BIS-11=barratt Impulsiveness Scale 11; \*p<0.05.

### Overall BIS-11 scores

The ANOVA results show a significant difference between the four groups for the overall BIS-11 (F=8.8; f=0.34; p<0.001). Except for the NPG and low PG groups who obtained almost identical scores, there seemed to be a gradation in BIS-11 scores according to the intensity of gambling behavior. A more specific group comparison using Scheffe's test revealed no significant differences between NPG and low PG in overall BIS-11 scores. By contrast, participants with severe PG had

significantly higher scores than those with NPG (p=0.002) and low PG (p=0.001).

### Attentional subscale

The ANOVA results revealed no significant differences between the four groups in the attentional subscale of the BIS-11. Specific group comparison using Scheffe's test confirms this result.

	NPG/ Low PG	NPG/ Moderate PG	NPG/ Severe PG	Low PG/ Moderate PG	Low PG/ Severe PG	Moderate PG/ Severe PG
BIS 11 total	0,99	0,09	0,002*	0,01*	0,001*	0,14
Attentional	0,86	0,91	0,51	0,17	0,06	0,66
Motor	0,58	0,01*	0,001*	0,15	0,001*	0,09
Non planning	0,98	0,29	0,03*	0,01*	0,001*	0,35

**Table 3:** Comparisons between groups on BIS-11 and its subscales (Scheffé's test); NPG: Non-problem gamblers; Low PG: low problem gamblers ; Moderate PG: moderate problem gamblers ; Severe PG: severe problem gamblers; BIS-11: Barratt Impulsiveness Scale 11; \*p<0.05.

### Motor subscale

As for the BIS-11 score, we observed a gradation in the motor subscale scores according to the intensity of gambling. ANOVA results confirm the significant differences between the four groups (F=8.7; f=0.42; p<0.001). Scheffe's test shows that participants with severe PG had significantly higher scores on the motor subscale than those with NPG (p=0.001) and low PG (p=0.001). Participants with NPG had lower scores than those with moderate PG (p=0.01) but showed no significant difference with low PG.

### Multivariate analysis

Correlations (Table 4): Results of the correlation analysis show a weak but significant negative link between impulsivity (overall BIS-11) and the attentional subscale and age (r=0.10; p<0.05 for overall BIS-11 and r=0.14; p<0.05 for attentional subscale). Furthermore, gambling problems (CPGI scores) appeared to be significantly linked to impulsivity (r=0.34, p<0.05) and its three subscales. The strongest link was between CPGI scores and motor impulsivity (r=0.32, p<0.05).

### Non-planning subscale

As for the overall and motor subscale of the BIS-11, there were differences in the non-planning subscale, participants with NPG and low PG having lower scores than those with moderate and severe PG. ANOVA results show that these differences are significant (F=6.6; f=0.30; p<0.001). Scheffe's test revealed no significant differences between participants with NPG and low PG or between those with moderate and severe PG. However, participants with severe PG had significantly higher scores than those with NPG (p=0.03) and low PG (p=0.001). Those with moderate PG also scored higher than those with low PG (p=0.01) but not NPG.

### Multiple linear regression

A multiple regression model, including the three BIS-11 subscales, was conducted to determine whether components of impulsivity could predict CPGI scores. This model shows that these variables (non-planning, motor impulsivity and attentional impulsivity) account for 11% of the variance of CPGI scores (Adjusted R2=0.10; F (3,28)=10.26; p<0.001). Although this model is statistically significant, only one sub-dimension of impulsivity, motor impulsivity, constitutes a significant predictor of CPGI scores (β=0.22; p<0.001).

	Age	Non planning	Motor	Attentional	BIS-11 total	CPGI
Age	1,00	-0,03	-0,10	-0,14*	-0,10*	0,00
Non-Planning	-0,03	1,00	0,55*	0,46*	0,86*	0,28*
Motor impulsivity	-0,10	0,55*	1,00	0,50*	0,84*	0,32*

Attentional Impulsivity	-0,14*	0,46*	0,50*	1,00	0,74*	0,21*
BIS-11 total	-0,10	0,86*	0,84*	0,74*	1,00	0,34*
CPGI	0,00	0,28*	0,32*	0,21*	0,34*	1,00

**Table 4:** Correlations between age and BIS-11 total and subscales; BIS-11: Barrat Impulsiveness Scale 11; CPGI: Canadian Problem Gambling Index; \*p<0.05.

## Discussion

This research examined the intensity of different sub dimensions of impulsivity among poker players and their links with problem gambling and its intensity. We found that a substantial number of our sample of regular poker players encountered gambling issues: 13% displayed severe PG and 54% moderate PG. In our sample, only 10% had no gambling problem at all. These prevalence rates appear to be high. A recent study in France, where this study took place, found that among regular gamblers (all types of gambling activity), 3.7% are excessive gamblers and 7.1% have a moderate risk for problem gambling [29]. About 1 in 10 of these regular gamblers is a poker player. This discrepancy can partially be explained by the fact that we recruited our participants among regular and committed poker players on a very popular French poker forum. These results underline the need for a better understanding of gambling pathology among poker players, in order to propose preventive and therapeutic actions adapted to this specific population and its psychological characteristics.

The literature about problem gambling underlines its close links with impulsivity [3,7,14, 15]. Among regular and professional poker players, Biocalti, Passini and Griffiths [25] found that those who did not show a gambling problem had low impulsivity scores, whereas problem gamblers had significantly higher, although moderate, levels of impulsivity. Our results are consistent with these studies, showing a gradation in impulsivity level according to the intensity of gambling, and a significant positive correlation between impulsivity and problem gambling. Among poker players, impulsivity has already been found to be a predictor of problem gambling [12,23,24].

The present study adds to existing knowledge by examining the three sub dimensions of impulsivity (non-planning, motor and attentional impulsivity) among poker players. Among these three subtypes, only attentional impulsivity, which characterizes fast and mindless decision-making, did not differentiate between gamblers according to their intensity of gambling. It is also interesting to note that poker players, whatever their intensity of gambling, had lower scores on this sub-dimension than on the other two. However, although differences in scores were not significant, we found a weak but significant correlation between attentional impulsivity and problem gambling.

By contrast, motor impulsivity and non-planning significantly differentiated players according to their intensity of gambling. Non-planning, characterized by an orientation toward the present rather than the future and a lack of anticipation, was significantly higher in severe PG than in NPG and low PG, and was significantly correlated with problem gambling. This may largely explain the persistence of gambling, through the focus on immediate rewards and the lack of anticipation of negative financial consequences, as suggested by Petry [5].

Motor impulsivity is the behavioural dimension of impulsivity and involves mindless action. Like non-planning, it is significantly higher in severe PG than in NPG and low PG, and is significantly correlated with problem gambling. Our results suggest that this dimension may be involved in poker players with problem gambling. In fact, we found that impulsivity significantly predicted problem gambling among poker players but that, among the three sub-dimensions, only motor impulsivity was a significant predictor. The involvement of motor impulsivity may explain the mindless actions of betting, especially online where gambling actions are immediate, encouraging players to click impulsively, without thinking.

This study focuses on online poker players. It has several limitations, which should be taken into account when interpreting and generalizing the results. First, this is an online study with self-selected participants, who may not be totally representative of poker players. Secondly, the online survey format did not allow us to make a diagnostic observational evaluation of problem gambling, and we therefore assessed problem gambling using the CPGI [26], a self-report measure. This limitation also applies to impulsivity, which was only assessed with a self-report measure. Future studies should use both behavioural and self-report measures of impulsivity, including the multiple components within each domain [2]. Furthermore, the use of the BIS-11 scale may raise questions, as Reid, Cyders, Moghaddam and Fong [30] found that the factor structure of the BIS was not replicated in a sample of participants exhibiting addictive behaviours and impulsivity (pathological gamblers, hypersexual patients, and individuals seeking treatment for methamphetamine addiction). The authors suggested that future studies should investigate comparisons with a modified version of the BIS, and other impulsivity scales such as the UPPS-P Impulsive Behaviour Scale in clinical populations.

Despite these limitations, this study offers interesting results and suggests avenues for future research. Our results are consistent with the literature and confirm the links between impulsivity and problem gambling. They also identify the sub-dimensions that could play a role in problem gambling; attentional impulsivity did not differentiate between gamblers according to their intensity of gambling, whereas non-planning and motor impulsivity were specifically linked to problem gambling in our sample. As suggested by Canale, Vieno, Griffiths, Rubaltelli and Santinello [31], it is important to consider different routes when addressing impulsivity in problem gambling prevention and intervention. These two sub-dimensions should be taken into account when planning treatment and preventive actions aimed at poker players who are problem gamblers. For instance, in behavioural and cognitive therapy, therapeutic protocols could include actions that delay reward gratification. Furthermore, as motor impulsivity significantly predicted problem gambling among poker players, preventive actions could be targeted particularly at these at-risk individuals.

As our results show that impulsivity is not homogeneously involved in problem gambling, further research should assess its sub-dimensions among other types of gamblers to see whether the same sub-dimensions are involved as in poker players.

## References

1. Moeller FG, Barratt ES, Dougherty DM, Schmitz JM, Swann AC (2001) Psychiatric aspects of impulsivity. *Am J Psychiatry* 158: 1783-1793.
2. Gullo MJ, Potenza MN (2014) Impulsivity: mechanisms, moderators and implications for addictive behaviors. *Addict Behav* 39: 1543-1546.
3. Steel Z, Blaszczynski A (1998) Impulsivity, personality disorders and pathological gambling severity. *Addiction* 93: 895-905.
4. Maclaren VV, Fugelsang JA, Harrigan KA, Dixon MJ (2011) The personality of pathological gamblers: a meta-analysis. *Clin Psychol Rev* 31: 1057-1067.
5. Petry N (2004) Pathological gambling. Etiology, comorbidity and treatment, Washington, American Psychological Association.
6. Alessi SM, Petry NM (2003) Pathological gambling severity is associated with impulsivity in a delay discounting procedure. *Behav Processes* 64: 345-354.
7. Turner N, Jain U, Spence W, Zangeneh M (2008) Pathways to pathological gambling: component analysis of variables related to pathological gambling. *International Gambling Studies* 8: 281-298.
8. Vitaro F, Arseneault L, Tremblay RE (1999) Impulsivity predicts problem gambling in low SES adolescent males. *Addiction* 94: 565-575.
9. Slutske WS, Caspi A, Moffitt TE, Poulton R (2005) Personality and problem gambling: a prospective study of a birth cohort of young adults. *Arch Gen Psychiatry* 62: 769-775.
10. Shenassa ED, Paradis AD, Dolan SL, Wilhelm CS, Buka SL (2012) Childhood impulsive behavior and problem gambling by adulthood: a 30-year prospective community-based study. *Addiction* 107: 160-168.
11. Lai FD, Ip AK, Lee TM (2011) Impulsivity and pathological gambling: Is it a state or a trait problem? *BMC Res Notes* 4: 492.
12. Kräplin A, Bühringer G, Oosterlaan J, van den Brink W, Goschke T, et al. (2014) Dimensions and disorder specificity of impulsivity in pathological gambling. *Addict Behav* 39: 1646-1651.
13. Blaszczynski A, Steel Z, McConaghy N (1997) Impulsivity in pathological gambling: the antisocial impulsivist. *Addiction* 92: 75-87.
14. Castellani B, Rugle L (1995) A comparison of pathological gamblers to alcoholics and cocaine misusers on impulsivity, sensation seeking, and craving. *Int J Addict* 30: 275-289.
15. Myrseth H, Pallesen S, Molde H, Johnsen B, Lorvik I (2009) Personality factors as predictors of pathological gambling. *Personality and Individual Differences* 47: 933-937.
16. Ginley MK, Whelan JP, Meyers AW, Relyea GE, Pearson GD (2014) Exploring a multidimensional approach to impulsivity in predicting college student gambling. *Journal of Gambling Studies* 30: 521-536.
17. Patton JH, Stanford MS, Barratt ES (1995) Factor structure of the Barratt impulsiveness scale. *J Clin Psychol* 51: 768-774.
18. Broos N, Schmaal L, Wiskerke J, Kosteljik L, Lam T, et al. (2012) The relationship between impulsive choice and impulsive action: a cross-species translational study. *PLoS One* 7: e36781.
19. American Gaming Association (AGA) (2004) 2004 State of the States: The AGA Survey of Casino Entertainment, Washington. DC: American Gaming Association.
20. Barrault S, Untas A, Varescon I (2014) Special features of poker. *International Gambling Studies* 14(3): 492-504.
21. Shead W, Hodgins D, Scharf D (2008) Differences between poker players and non-poker-playing gamblers. *International Gambling Studies* 8: 167-178.
22. Bonnaire C, Bungener C, Varescon I (2009) Subtypes of French pathological gamblers: comparison of sensation seeking, alexithymia and depression scores. *J Gamb Stud* 25: 455-471.
23. Hopley AA, Nicki RM (2010) Predictive factors of excessive online poker playing. *Cyberpsychol Behav Soc Netw* 13: 379-385.
24. Barrault S, Varescon I (2013) Impulsive sensation seeking and gambling practice among a sample of online poker players. Comparison between non pathological, problem and pathological gamblers. *Personality and Individual Differences* 55: 502-509.
25. Biolcati R, Passini S, Griffiths MD (2015) All-in and bad beat: professional poker players and pathological gambling. *International Journal of Mental Health Addiction* 13: 19-32.
26. Ferris J, Wynne HJ (2001) The Canadian problem gambling index: Final report. Report to the Report to the Canadian Inter-Provincial Advisory Committee. Ottawa, ON: Canadian Centre on Substance Abuse.
27. Young M, Wohl M (2011) The Canadian Problem Gambling Index: an evaluation of the scale and its accompanying profiler software in a clinical setting. *Journal of Gambling Studies* 27: 467-485.
28. Petry NM, Stinson FS, Grant BF (2005) Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *J Clin Psychiatry* 66: 564-574.
29. Costes JM, Kairouz S, Pousset M (2012) Jeu problématique en France : une première enquête nationale. *Drogues, Santé et Sociétés* 12: 1-19.
30. Reid R, Cyders, MA, Moghaddam JF, Fong TW (2014) Psychometric properties of the Barratt Impulsiveness Scale in patients with gambling disorders, hypersexuality, and methamphetamine dependence. *Addictive Behaviors* 39: 1640-1645.
31. Canale N, Vieno A, Griffiths MD, Rubaltelli E, Santinello M (2015) How do impulsivity traits influence problem gambling through gambling motives? The role of perceived gambling risk/benefits. *Psychology of Addictive Behaviors* 29: 813-823.