COGNITIVE DISTORTIONS AND GAMBLING BEHAVIORS: WHICH COMES FIRST? ANALYZING THE RELATIONSHIP BETWEEN SUPERSTITIOUS BELIEFS AND PATHOLOGICAL GAMBLING

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Abstract

Objective: The aim of this study was to explore if and which specific cognitive biases play a role in pathological gambling.

Method: We recruited 343 participants, divided in two groups: I) 79 pathological gamblers and II) 264 no problematic gamblers. Data were analyzed using a series of analyses of variance and a series of linear regression analyses.

Results: Data showed that the dimensions of cognitive bias explained a significant amount of the variance in pathological gambling; besides results indicated that the severity of gambling problems was positively associated with the strength of all cognitive biases considered, also after controlling age and gender. In particular results underlined that gambling behaviors seem to be more related to the expectation that gambling is the only way to cope with stress gaming (Gambling Expectancies), and to the gamblers feelings that they are unable to stop gambling (Perceived Inability to Stop Gambling).

Conclusions: Our results are consistent with those of previous studies that showed a link between cognitive biases and gambling behaviors. Further investigation on this topic are needed to study the role that cognitive distortions could play in the onset, development, and maintenance of gambling behaviors.

Key words: gambling, cognitive biases, irrational beliefs, gambling behaviors

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Introduction

Pathological gambling (PG) is a behavioral addiction that has been associated with cognitive distortions in the processing of chance, probability and skill (Michalczuk et al. 2011). Cognitive distortions can be considered real "errors" of reasoning processes, due both to the "natural" cognitive limits of the mind, and to the need of making decisions in the shortest possible time, in order to adapt to the environmental demands. One of the defining features of gamblers' cognition is the tendency to overestimate the chances of winning, due to a variety of cognitive distortions in the processing of chance, skill and probability (Ladouceur and Walker 1996, Clark 2010).

Ladouceur and Walker (1996) suggest that an erroneous perception of randomness is the fundamental mistake made by gamblers. Gamblers attempt to control and predict events that are objectively random and uncontrollable by developing an illusion of control and superstitious beliefs that motivate them to develop strategies and skills to increase their winnings (Xian et al. 2008). Other cognitive biases associated with gambling include selectively remembering wins while not giving equal weight to the multitudes of losses experienced, overestimating the odds, superstitious behaviors, and

the "gambler's fallacy" (i.e., the belief that a future win or loss is related to past payoffs, when, in fact, each gambling event is discrete) (Xian et al. 2008). These concepts are presumed to contribute to gambling problems by affecting the gamblers' interpretations of their chances of winning, their subjective feeling of control over outcomes, their attributions for failure, their justifications for continuing, and their estimations of their skills or abilities (Breen et al. 2001, Toneatto 1999).

Indeed, there is consistent evidence that cognitive distortions play an important role in the onset, development, and maintenance of pathological gambling (Myrseth et al. 2010). Therefore, cognitive bias and distortions have been receiving extensive attention in research (Goodie and Fortune 2013).

Several studies have reported higher levels of distorted cognitions in individuals with disordered gambling compared to those without gambling problems (Miller and Currie 2008, Emond and Marmurek 2010, Myrseth et al. 2010). Particularly, Joukhador and colleagues (2004) have shown that problematic gamblers present a greater number of erroneous ideas and a greater trust in these ideas than non-problematic gamblers. Moreover, such distorted belief systems are found to be correlated with game intensity, meaning

that a greater level of gambling activity corresponds to a higher level of distorted beliefs (Miller and Currie 2008).

More recently, Xian and colleagues (2008) analyzed the onset and development of gambling behaviors and the co-occurrence of gambling-related irrational beliefs and attitudes. Based on a wide set of longitudinal data, the authors concluded that these cognitive biases could be considered significant risk factors of pathological gambling (Xian et al. 2008). However little is known about the existence and function of these cognitive biases, and, in particular, if irrational beliefs are consequent or pre-existent to the pathological gambling onset, and which are the causal links between erroneous thoughts and the gambling behaviors .

Given the lack of literature on this topic, this study has an exploratory nature and is aimed at verifying if: 1) specific cognitive biases play a role in pathological gambling, and 2) there are cognitive biases more involved in gambling behaviors.

Method

Participants and procedure

The initial sample consisted of 364 participants (155 males and 209 females) with a mean age of 27.40 years old (SD = 6.37) were recruited for the present study. In order to have a sample composed both pathological and no problematic gamblers, participants were recruited in the final year of study at the Schools of Psychology, Law, Political Sciences, and Architecture at the University of Florence and in some gambling rooms around Florence. Several trained researchers assumed the task to recruit participants. All subjects were informed fully about the aims of the research and invited at the Department of Psychology of Florence for the administering of the questionnaires. Participation in the survey was voluntary, and no monetary reward was given. In accordance with the American Psychological Association's guidelines for the ethical treatment of human participants, prior data collection all participants signed an informed consent form. Anyway, they could withdraw at any time. All participants anonymously and individually completed a battery of questionnaires designed to gather information about their gambling behaviors and the level of cognitive distortions.

Inclusion criteria for this study were participants' gambling involvement, using the cut-off points indicated by the authors of the Italian adaptation of SOGS (see Measure section) (Capitanucci and Carlevaro 2004). Subjects, who obtained a score greater than 5 on SOGS were classified as pathological gamblers; who obtained a score less than 3 on SOGS were classified as no problematic gamblers. The rest of participants (n = 21), with SOGS score between 3 to 5, were not considered in this study, also because some of them did not entirely complete the battery of the questionaries.

Therefore, the final sample included 343 participants, divided into two groups: I) a pathological gamblers group consisting of 79 individuals (70 males and 9 females) with a mean age of 35.53 years (SD= 6.19), and II) a non problematic gamblers group consisting of 264 subjects (76 males and 188 females), with a mean age of 25.13 years (SD= 2.93). Significant differences emerged between pathological and no problematic gamblers groups with respect to mean age (t (341)= -20.70; *p* =.000), and to gender ($\chi^2(1) = 89.01$, p =.000). Such result indicated an higher frequency of pathological gambling among males and older

participants.

Successively, in order to verify the two alternative hypotheses mentioned above, participants were divided and randomly assigned to two different subsamples. The first one consisted of 172 participants (40 pathological gamblers and 132 no problematic gamblers). The second one consisted of 171 participants (39 pathological gamblers and 132 no problematic gamblers).

Measures

Pathological gambling: The South Oaks Gambling Screen (SOGS) (Capitanucci and Carlevaro 2004, Lesieur and Blume 1987) was employed to assess the severity of gambling problems. The SOGS is a 20-item questionnaire based on *Diagnostic and Statistical Manual* (DSM)-III criteria to screen for life-time pathological gamblers that provides a range of information such as the type of game preferred, frequency of gambling activities, difficulty to play in a controlled way, awareness regarding problems with gambling, attempts to return to play to recover the money lost, moving away from work or school, the amount of loans requested, etc. The SOGS was found to have satisfactory reliability with Cronbach's alpha coefficients =.69 in the general population and .86 in gambler samples (Stinchfield 2002). The internal consistency coefficient was .79 for the sample of this research.

Cognitive distortions: Gambling Related Cognitions Scale –GRCS- (Iliceto and Fino 2014, Raylu and Oei 2004) was administered in order to measure cognitive distortions. The GRCS assesses a total score, and dimensions related to the main cognitive distortions: Predictive Control (e.g. "Losses when gambling are bound to be followed by a series of wins"); Illusion of Control (e.g. "Specific numbers and colors can help increase my chances of winning"); Interpretative Bias (e.g. "Relating my losses to bad luck and bad circumstances makes me continue gambling"); Gambling Expectancies (e.g. "Having a gamble helps reduce tension and stress"); and Inability to Stop Gambling (e.g. "It is difficult to stop gambling as I am so out of control"). Each item was rated on a seven-point Likert scale from 1 (strongly disagree) to 7 (strongly agree). The GRCS was found to have good reliability with Cronbach's alpha coefficients = .77, .87, .91, .87, .89 for the Predictive Control, Illusion of Control, Interpretative Bias, Gambling Expectancies, and Inability to Stop Gambling, respectively. Internal consistency coefficients for such main cognitive distortions in our sample, respectively, were .74, .72, .75, .82, and .69.

Data analysis

Descriptive statistics were calculated for all participants, and a series of analyses of variance was performed. Then, a correlation analysis between SOGS total score and different dimension scores of GRCS was carried out. Finally, a series of hierarchical multiple regression analyses was conducted separately for the two subsamples, after controlling for socio-demographilcal characteristics. For this purpose, in order to properly assess the incremental effect of hypothesized factors, on the first subsample age and gender (control variables) were entered at step 1 and cognitive bias as predictor of pathological gambling were entered at step 2, and on the second subsample, age and gender were entered at step 1 and pathological

gambling as predictor of cognitive bias were entered at step 2. All analyses were conducted with SPSS 22.

Results

Table 1 shows the descriptive statistics for all variables and results of analyses of variance performed on the total sample with the variable Group (no problematic gamblers vs. pathological gamblers) as independent variable, and with the five cognitive bias subscales and the total score of the GRCS as dependent variables (**table 1**). Appendix A displays the correlation table for all variables entered into the analyses.

These analyses showed that pathological gamblers have significantly higher scores on illusion

five dimensions of cognitive bias of the GRCS as independent variables, after controlling age and gender. Results are reported in **table 2**. Data showed that the model explained 66% of the variance in pathological gambling. Importantly, the dimensions of cognitive bias explained a significant amount of the variance in pathological gambling when controlling for both age and gender ($\Delta R2 = .099$, $\Delta F(5,163) = 9.923$, $p = .000$).

Finally, five hierarchical multiple regression analyses were performed with the SOGS total score as predictor of the five dimensions of GRCS as dependent variables, after controlling for age and gender at the first step. Results of these analyses were reported in **table 3**. Data showed that the severity of gambling problems was positively associated with the strength

Table 1. *Descriptive statistics of all the variables and differences in the GRSC mean scores between the two groups*

	No problematic gamblers (n=264)		Pathological gamblers (n=79)					
	M	SD	M	SD	DF	F	p	η^2
SOGS	.06	.23	11.42	3.70				
Predictive Control	7.79	3.88	12.90	6.90	1, 341	70.56	.000	.17
Illusion of Control	4.81	2.24	8.17	4.90	1, 341	71.38	.000	.17
Interpretative bias	5.02	2.75	10.25	6.11	1, 341	116.07	.000	.25
Gambling expectancies	4.99	2.85	10.85	6.27	1, 341	159.06	.000	.33
Perceived Inability to Stop Gambling	5.76	2.23	16.76	8.72	1, 341	345.70	.000	.50
Total cognitive bias	28.38	11.66	58.88	28.23	1, 341	196.99	.000	.37

of control, predictive control, interpretive bias, gambling expectancies, perceived inability to stop/control gambling, and total score of the scale than no problematic gamblers.

The correlation analysis between the SOGS score and the five GRCS dimensions showed robust positive correlations among all the variables. In particular, the Pearson's r values were .38, .36, .51, .67, and .64 respectively with Predictive Control, Illusion of Control, Interpretative Bias, Gambling Expectancies, and Perceived Inability to Stop Gambling.

Next, a hierarchical multiple regressions were performed. The first analysis was conducted with the SOGS total score as the dependent variable, and the

of all cognitive biases considered, also after controlling age and gender. Specifically, about illusion of control, the model explained 15% of the variance, with the SOGS score that explained a significant amount of the variance when controlling for both age and gender ($\Delta R2 = .035$, $\Delta F(1,167) = 6.896$, $p = .000$). Referring to predictive control, the model explain 16.4% of the variance, with SOGS score that explained a significant amount of the variance when controlling for both age and gender ($\Delta R2 = .021$, $\Delta F(1,167) = 4.288$, $p = .040$). With reference to interpretative bias, the model explain 26.6% of the variance, with the SOGS score that explained a significant amount of the variance ($\Delta R2$

Table 2. *Summary of the hierarchical multiple regression analyses for SOGS*

	B	SE	ß	t	p	ΔR^2
Step 1						.576***
Age	.461	.043	.636	10.842	.000	
Gender	-1.908	.560	-.200	-3.407	.001	
Step 2						.099***
Age	.297	.046	.409	6.382	.000	
Gender	-1.325	.522	-.139	-2.540	.012	
Illusion of control	.038	.142	.018	.270	.788	
Predictive control	-.207	.099	-.154	-2.086	.039	
Interpretative bias	.149	.132	.090	1.131	.260	
Gambling expectancies	.663	.158	.295	4.201	.000	
Perceived inability to stop/control gambling	.156	.068	.167	2.303	.023	

*** p < .001

= .088, $\Delta F(1,167) = 19.99$, p = .000). About gambling expectancies, the model explain 45.7% of the variance, with SOGS score that explained a significant amount of the variance ($\Delta R2 = .116$, $\Delta F(1,167) = 35.870$, p = .000). Finally, referring to percepived inability to stop/control gambling, the model explain 47% of the variance, with SOGS score that explained a significant amount of the variance ($\Delta R2 = .069$, $\Delta F(1,167) = 21.876$, p = .000).

Discussion

Current literature suggests that one of the defining features of gamblers' cognition is the tendency to overestimate the chances of winning, and this fact is due to a variety of cognitive distortions in the processing of chance, skill and probability (Ladouceur and Walker 1996, Clark 2010). Actually, several studies documented that problematic gamblers present a greater number of erroneous ideas and cognitions than non-problematic gamblers, and that these cognitive biases and distortions are significantly associated with the intensity of the game and the severity of the gambling problem (Clark 2010, Breen et al. 2001, Miller and Currie 2008). These concepts are presumed to contribute to gambling problems by affecting the gamblers' interpretations of their chances of winning, their subjective feeling of control over outcomes, their attributions for failure, their justifications for continuing, and their estimations

Table 3. *Summary of the hierarchical multiple regression analyses for GRCS dimensions*

	B	SE	ß	t	*p*	ΔR^2
Illusion of control						
Step 1						.115***
Age	.118	.028	.352	4.150	.000	
Gender	.121	.373	.028	.326	.745	
Step 2						.035**
Age	.056	.036	.169	1.554	.122	
Gender	.374	.379	.085	.988	.325	
SOGS	.133	.050	.288	2.626	.009	
Predictive control						
Step 1						.133***
Age	.134	.045	.248	2.975	.003	
Gender	-1.322	.595	-.185	-2.224	.027	
Step 2						.021*
Age	.057	.058	.105	.976	.331	
Gender	-1.002	.609	-.140	-1.645	.102	
SOGS	.168	.081	.225	2.071	.040	
Interpretative bias						
Step 1						.168***
Age	.132	.036	.302	3.700	.000	
Gender	-1.022	.470	-.178	-2.173	.031	
Step 2						.088***
Age	.006	.044	.013	.125	.900	
Gender	-.498	.461	-.087	-1.081	.281	
SOGS	.275	.061	.455	4.471	.000	
Gambling expectancies						
Step 1						.341***
Age	.157	.024	.486	6.650	.000	
Gender	-.674	.311	-.159	-2.168	.032	
Step 2						.116***
Age	.049	.028	.153	1.762	.080	
Gender	-.228	.292	-.054	-.781	.436	
SOGS	.233	.039	.524	5.989	.000	
Perceived inability to stop/control gambling						
Step 1						.401***
Age	.413	.054	.532	7.633	.000	
Gender	-1.681	.712	-.165	-2.360	.019	
Step 2						.069***
Age	.213	.067	.275	3.207	.002	
Gender	-.855	.695	-.084	-1.231	.220	
SOGS	.433	.093	.405	4.677	.000	

*** p < .001, ** p < .01, * p < .05

of their skills or abilities (Breen et al. 2001, Toneatto 1999).

Our results are significantly consistent with these assumptions, reinforcing the idea that gamblers attempt to control and predict events that are objectively random and uncontrollable by developing an illusion of control and superstitious beliefs that motivate them to develop strategies and skills to increase their winnings (Clark 2010, Breen et al. 2001, Xian et al. 2008).

In particular, our results showed that gambling behaviors seem to be predicted by two specific cognitive distortions related respectively to the expectation that gambling is the only way to cope with stress gaming (*Gambling Expectancies*), and to the gamblers feelings that they are unable to stop gambling (*Perceived Inability to Stop Gambling*). The percentage of variance explained by these variables indicates that these cognitive distortions could be considered as antecedent vulnerability factors predisposing to the development of a gambling disorder.

Both these cognitive distortions seem associated with all addictions. Therefore, it is not surprising that they, compared with the other cognitive distortions, have a greater impact, also in the onset and the maintenance of pathological gambling behaviors. Indeed, Gambling Expectation reflects the gamblers' need to play in order to cope with their own problems or underlying psychological distress. Therefore, this cognitive distortion could constitute an intrinsic motivation to gamble. In the same way, the inability to control or stop gambling is an aspect strictly linked to impulsivity, which represents a predisposing factor to developing any kind of behavioral or substance addiction.

Otherwise, the gambling behavior resulted to significantly affect all cognitive distortions investigated, suggesting that gambling behavior itself could play a role in the maintenance and reinforcement of cognitive distortions. Indeed, the illusion of controlling gambling outcomes *(Illusion of Control)*, the tendency to predict their starting from past wins or losses (Predictive Control), and to attribute wins to one's own gambling ability, and losses to external factors (Interpretative Bias), do not represent an intrinsic motivation to gamble, but are more strictly influenced by the activity itself of the gambling, and related to gamblers' perceptions about their own ability to achieve positive outcomes. In turn, the gamblers' need to play in order to cope with their own problems or underlying psychological distress could be further reinforced by the gambling itself, and, the gamblers' inability to stop and control themselves could increase their chances of gambling repeatedly, like in the study.

Taken together, our results suggest the presence of a vicious circle where cognitive bias and distortions and gambling behaviors affect each other in an articulate and complex way. Nevertheless this documented relationship between gambling behaviors and cognitive distortions, the direction of this relationship remains unknown, and little is known regarding the role that cognitive distortions play in the onset, development, and maintenance of gambling behaviors. In particular, the causal links between erroneous thoughts and gambling behaviors have not been verified; in other words, if irrational beliefs are pre-existent to the pathological gambling onset, and play a role in predicting and maintaining pathological gambling, or, on the contrary, they are consequences of gambling behaviors.

Despite these considerations, our results could have a clinical implication in at least two ways. At first the documented impact of gambling expectancies in gambling behaviors could suggest that one of the first step of the treatment with these subjects should include a reduction of expectancies related to gambling; besides considering the role of perceived inability to stop gambling another aspect of the treatment should consider the promotion of perceived self-efficacy to control gambling behaviors (Luca et al. 2012), as well as insight (Gori et al. 2015). Indeed, we think that "one of the aims of the treatments with these subjects should be that of improving the ability to modulate the emotions related with addictive behaviors" (Gori et al. 2016, p. 793) working within a window of tolerance, to better integrate the information received from both internal and external environments (Gori et al. 2016).

Although the interest of these results, there are a number of limitations of the current study that should be noted, and the findings of this paper must be interpreted according to such limitations. First, this is a first exploratory study for understanding the role of cognitive distortions in pathological gambling; so further studies would be needed to replicate these findings. Second, it would be desirable to replicate the study on a larger and more representative sample of gamblers, to ensure a greater generalization of results. Finally, to better understand the role of cognitive distortions in the onset, development, and maintenance of gambling behaviors, it would be useful to implement a longitudinal study that follows a sample of gamblers in the transition from no problematic to pathological gambling.

In summary, researches showed that cognitive distortions are presumed to contribute to gambling problems by affecting the gamblers' interpretations (Breen 2001, Toneatto 1999) and also playing an important role in the onset, development, and maintenance of pathological gambling (Myrseth et al. 2010). Our results are consistent with those of these studies and underlined that dimensions of cognitive bias explained a significant amount of the variance in pathological gambling. Despite such limitations the results obtained suggest that it would be valuable to continue further investigation on this topic. Future studies on this topic should use larger samples and

APPENDIX A: CORRELATION MATRIX

	1	2	3	4	5	6	7
1. SOGS	-						
2. Predictive Control	.41**	-					
3. Illusion of Control	.46**	.75**	-				
4. Interpretative bias	.51**	.78**	.67**	-			
5. Gambling expectancies	.57**	.76**	.67**	.83**	-		
6. Perceived Inability to Stop Gambling	.73**	.62**	.65**	.73**	.76**	-	
7. Total cognitive bias	.63**	.88**	.82**	.88**	.91**	.88**	-

Note. ** $p < .01$

analyse the role of cognitive distortions in relation to other variables linked to pathological gambling, as for example impulsivity and alexithymia (Craparo et al. 2015, Gori et al 2016, Michalczuk et al 2011) to allow more focused interventions of prevention and treatment of gambling disorder.

Acknowledgement

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