Cogn Comput (2014) 6:652–660
DOI 10.1007/s12559-014-9274-z

Youth at Stake: Alexithymia, Cognitive Distortions, and Problem Gambling in Late Adolescents

Marina Cosenza · Ivana Baldassarre · Olimpia Matarazzo · Giovanna Nigro

Received: 27 December 2013 / Accepted: 28 April 2014 / Published online: 11 May 2014

Abstract The purpose of this study was to examine the role of alexithymia and cognitive distortions in adolescent gambling. Five hundred and forty-six Italian high school students, between the ages of 17 and 19 years, were administered the South Oaks Gambling Screen Revised for Adolescents (SOGS-RA), the Toronto Alexithymia Scale (TAS-20), and the Gambling Related Cognitions Scale (GRCS). Results showed that problem gamblers scored highest on the GRCS and the TAS-20 scales. First-order correlations indicated strong positive associations among SOGS-RA and all GRCS subscales, as well among SOGS-RA and the TAS-20 factors, Difficulty Identifying Feelings and Difficulty Describing Feelings. The results of hierarchical regression analysis showed also that, along with gender, the most powerful predictors of gambling involvement were the GRCS subscales, Inability to Stop gambling and Interpretative Bias, and that SOGS-RA scores were moderately associated with the TAS-20 factor, Difficulty Identifying Feelings only. Mediation analyses revealed a significant indirect effect on the relation between alexithymia and gambling severity through specific gambling-related biases.

Keywords Gambling · Alexithymia · Cognitive distortions · Adolescence

Introduction

With the growth of gambling opportunities and venues, pathological and problem gambling has become an increasing public health concern. Even though research among adults has demonstrated that individuals with severe gambling-related difficulties begin gambling much earlier than those without gambling problems [1], adolescent gambling is still in its infancy, compared with the study of adult gambling and with other addictive behaviors [2, 3]. Today's adolescents appear to be actively participating in a wide array of gambling activities [4], and the prevalence of problem gambling among them has been shown to be 2–4 times that of adults [5]. Although there is remarkable variability in the estimates among different countries and periods of time, several studies have indicated that problem and pathological gambling are highly prevalent in adolescent populations [6–8]. Furthermore, there is growing evidence that adolescent involvement in gambling activities continues to increase in developed countries [9–11] and that young males are more likely to experience disordered gambling behaviors [6, 12–15]. Nevertheless, studies on adolescent pathological and problem gambling are surprisingly scarce, especially in Europe [1, 6, 16].

While there are a myriad of individual, relational, and social determinants implicated in the development of gambling problems among adolescents, there is still a lack of consensus regarding the relative weight of specific risk factors in predicting adolescent pathological gambling [14]. With regard to individual determinants, recent research has suggested that alexithymia on the one hand (see [5]) and cognitive distortions on the other [11] are among the most important risk factors for the development of disordered gambling among adolescents and young adults. Indeed, according to Mitrovic and Brown [17], it is plausible to assume that cognitive distortions, together with increased levels of alexithymia, draw problem gamblers to compulsively attempt to regulate negative emotions through gambling.

M. Cosenza · I. Baldassarre · O. Matarazzo · G. Nigro (✉)
Department of Psychology, Second University of Naples, Viale Ellittico, 31, 81100 Caserta, Italy
e-mail: giovanna.nigro@unina2.it

Alexithymia

The term *alexithymia* (from the Greek *a* for lack, *lexis* for word, and *thymos* for emotion), introduced by Sifneos in the mid-1970s, initially referred to the difficulties psychosomatic patients have in describing and communicating feelings and differentiating them from somatic sensations, as well as to their impoverished fantasy life, poor recall of dreams, and utilitarian mode of thinking [18–20]. Alexithymia has been subsequently redefined as a deficit in the cognitive processing and regulation of emotions [21–23]. According to Toneatto et al. [24], "alexithymia is characterized by a cognitive-affective disturbance defined by difficulty identifying and describing emotions, distinguishing feelings from bodily sensations associated with emotions, reduced introspective capacity, constricted imagination, and proneness to compulsive behavior" (p. 193).

Recent research has found that alexithymia represents a risk factor not only for psychosomatic disorders, but also for several clinical disorders, including pathological gambling and other addiction-related problems [17, 24–29].

To date, only two studies investigated the relationship between alexithymia and gambling behavior in adolescents and young adults. Both studies found that the prevalence of alexithymia was significantly higher in pathological gamblers than in nonproblem gamblers [27, 30].

Cognitive Distortions

There is a gathering consensus among gambling researchers that cognitive distortions play an important role in the development of pathological gambling and foster the persistence of gambling despite negative outcomes [31]. For example, Ladoucer and Walker [32] suggested that problem gamblers continue to play because they possess distorted beliefs about gambling that cause them to overestimate their chances of winning. Johansson et al. [33] identified erroneous perceptions as one of the most critical factors associated with problem gambling. Oei et al. [34] suggested that the persistence of problem gambling behavior is due to people's false and erroneous beliefs about their ability to control or predict gambling outcomes. According to Clark [35], two mechanisms are at work in the development of these faulty beliefs. First, humans are generally poor at processing probability and judging randomness. Second, there are several features of gambling games that directly foster these distorted beliefs. In a recent review, Goodie and Fortune [36] observed that "despite the fact that distortions are not a diagnostic criterion for pathological gambling, the correction of gambling-related distortions has been a primary avenue for the clinical treatment of pathological gambling" (p. 730). The role that cognitive distortions play in pathological gambling is so significant that recent research has begun to investigate their neural substrates (for a review see [37]).

To our knowledge, the only study that examined the relationship between problem gambling and both distorted cognitions and alexithymia was carried out by Mitrovic and Brown [17] in adult poker players. These authors found that distorted cognitions were positively related to involvement in gambling, and one aspect of alexithymia, namely difficulty identifying feelings, discriminated between problem and nonproblem gamblers.

So far, no study has directly addressed the role of both alexithymia and cognitive distortions in adolescent gambling. In an attempt to address this issue, we investigated the role of alexithymia and gambling-related cognitions in high school students.

Method

Participants

A sample of 546 late adolescents (273 males; 273 females) aged between 17 and 19 years (mean age = 18.1 years; SD = .53 years) from eight high schools in Southern Italy participated in the study. All participants were administered, in counterbalanced order, three pencil-and-paper measures, namely the Italian version of the South Oaks Gambling Screen Revised for Adolescents (SOGS-RA) [38], a self-report measure of gambling behavior and gambling-related problems, the Toronto Alexithymia Scale (TAS-20) [39, 40], a measure of alexithymia, and the Gambling Related Cognitions Scale[1] (GRCS) [41] that assesses belief in gambling-related cognitions.[2]

Materials

The SOGS-RA is the most widely used instrument for studying the prevalence of problem gambling among adolescents.[3] It consists of twelve scored items assessing gambling behavior and gambling-related problems during the past 12 months. The items address, among others, experiencing interference of gambling with school and

[1] We are very grateful to Prof. Tian Oei, who gave us permission to use the GRCS scale.

[2] For the psychometric properties of the Italian version of SOGS-RA and TAS-20 see [9, 42], respectively.

[3] The SOGS-RA is a modified version of the South Oaks Gambling Screen [43]. The construction of the SOGS-RA included rewording of several items from the SOGS to accommodate adolescent experience and reading levels, and the number of scoring items was reduced from 20 to 12.

home activities, chasing losses (returning to gamble to recover previous losses), lying to others to hide losses or evidence of gambling, and feeling guilty about gambling. In addition to the scored items, the SOGS-RA measures the frequency of participation in different gambling activities. Consistent with Winters et al.'s [38] original scoring system, a score of 0 to 1 is indicative of "nonproblem" gambling, a score between 2 and 3 reflects an "at-risk" level of gambling, whereas a score of 4 or more is indicative of "problem" gambling.

The GRCS is a 23-item questionnaire developed to identify common gambling distortions on the following five subscales: Gambling-related Expectancies (GE), Illusion of Control (IC), Predictive Control (PC), perceived Inability to Stop gambling (IS), and Interpretive Bias (IB). The GE subscale focuses on expected benefits from gambling; IC reflects cognitions relating to ability to control gambling outcomes; PC focuses on probability errors (such as gambler's fallacy); IS refers to respondents' perceived inability to control their gambling behavior. Finally, IB reflects cognitions relating to reframing gambling outcomes to encourage further play. Participants are requested to indicate the extent to which they agree with each statement on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*), with higher scores reflecting an elevated number of cognitive errors. This measure is useful to help screen for individuals that may be more at risk of developing gambling problems.

The 20-item Toronto Alexithymia Scale (TAS-20) is the most widely used and psychometrically best-validated self-report instrument for measuring three separate, yet conceptually related, facets of the alexithymia construct. The Difficulty Identifying Feelings (DIF) scale consists of 7 items assessing the reduced ability to identify feelings and to distinguish them from the somatic sensations that accompany emotional arousal. The Difficulty Describing Feelings (DDF) scale consists of 5 items tapping the reduced ability to describe feelings to other people. The Externally-Oriented Thinking (EOT) factor consists of 8 items assessing a cognitive style that is concrete and externally focused. Each item is rated on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*).

Results

All data analyses were conducted using SPSS 19.0. The alpha level was set at $p = .05$. All variables were initially screened for missing data, distribution abnormalities, and outliers [44]. Minor missing data (less than 2 %) for all variables were replaced with means. Given that the distributions of the SOGS-RA and GRCS total scores were all positively skewed, whereas the distribution of TAS-20 total scores was negatively skewed,[4] square-root transformations were performed on these variables so that assumptions of normality, linearity, and homoscedasticity had been adequately met. Using $p < .001$ criterion for Mahalanobis distance, two outliers were identified and deleted from data set.

Pearson correlation coefficients and partial correlations were calculated to examine the relations among SOGS-RA, TAS-20, and GRCS. Analysis of variance was used to assess mean differences on continuous variables. Additionally, to reveal potential predictors of gambling behavior and gambling-related problems, we conducted a multiple stepwise regression analysis with SOGS-RA scores as the dependent variable. Gender, the five dimensions of the GRCS, and the three TAS-20 factors were entered simultaneously as the independent variables. In order to control for the presence of multicollinearity, before interpreting the regression coefficients, we calculated the variance inflation factors (VIF), which were below the recommended cutoff of 10 (max. VIF = 1.831) [45]. Finally, on the basis of the results of the regression analysis to verify whether gambling-related cognitions mediate the association between alexithymia and gambling severity or vice versa, two mediation analyses were conducted. Mediation occurs when a causal effect of some variable X on an outcome Y is explained by some intervening variable M [46, 47]. The mediation model was tested with the SPSS macros for bootstrapping as provided by Preacher and Hayes [48].

First-order correlations between all variables are displayed in Table 1.

As can be seen, scores on the SOGS-RA were significantly correlated with all the GRCS subscales and the TAS-20 factors, Difficulty Identifying Feelings and Difficulty Describing Feelings. Furthermore, the SOGS-RA correlated significantly with both the total TAS-20 score and the GRCS total score.

Gender differences on the SOGS-RA, the GRCS, and the TAS-20 scales were tested by means of univariate analyses of variance (ANOVAs). Results showed significant gender differences on SOGS-RA total score ($F_{1,\ 542} = 99.42$; $p < .001$, $\eta_p^2 = .155$), all GRCS subscales [Gambling expectancies ($F_{1,\ 542} = 47.46$; $p < .001$, $\eta_p^2 = .081$), Illusion of Control ($F_{1,\ 542} = 9.88$; $p < .001$, $\eta_p^2 = .018$), Predictive Control ($F_{1,\ 542} = 31.21$; $p < .001$,

[4] More specifically, the distributions of GRCS total and all GRCS subscales scores were positively skewed. As regards to the alexithymia measure, the distributions of the dimensions Difficulty to Identifying Feelings and Difficulty to Describing Feelings were positively skewed, whereas the distributions of the total TAS-20 and the subscale Externally-Oriented Thinking scores were negatively skewed.

Table 1 Pearson correlation coefficients among all variables

	2	3	4	5	6	7	8	9	10	11
1. SOGS-RA	.179**	.110*	.017	.145**	.459**	.390**	.410**	.665**	.600**	.624**
2. DIF	–	.557**	.223**	.824**	.112**	.227**	.197**	.216**	.153**	.225**
3. DDF		–	.255**	.757**	.076	.170**	.160**	.158**	.111**	.168**
4. EOT			–	.659**	.054	.026	.108*	.052	.041	.075
5.TAS-20 total				–	.109*	.190**	.211**	.193**	.138**	.212**
6. GE					–	.454**	.533**	.580**	.639**	.782**
7. IC						–	.510**	.415**	.525**	.694**
8. PC							–	.492**	.676**	.844**
9. IS								–	.645**	.770**
10. IB									–	.885**
11. GRCS total										–

DIF difficulty identifying feelings, *DDF* difficulty describing feelings, *EOT* externally-oriented thinking, *GE* gambling expectancies, *IC* illusion of control, *PC* predictive control, *IS* inability to stop gambling, *IB* interpretative bias

* $p < .05$; ** $p < .01$

Table 2 Means and standard deviations for the GRCS and the TAS-20 scales by gambling status

	Total sample		Nonproblem gamblers		At-risk gamblers		Problem gamblers	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
GRCS total	46.23	18.84	40.19	14.20	60.32	17.62	75.98	16.85
Gambling expectancies	7.98	4.01	6.97	3.14	10.59	4.73	12.43	4.53
Illusion of control	6.63	3.70	5.91	2.97	8.40	4.48	10.02	5.01
Predictive control	13.67	6.17	12.46	5.63	16.40	5.60	19.84	6.82
Inability to stop gambling	8.51	4.44	7.06	2.67	11.41	4.76	16.59	5.70
Interpretative bias	9.44	5.28	7.79	4.08	13.52	5.03	17.09	4.84
TAS-20 total	54.96	10.40	54.05	10.10	57.44	11.23	58.70	10.16
Difficulty identifying feelings	16.73	5.56	16.15	5.11	18.08	6.54	19.57	6.30
Difficulty describing feelings	13.76	3.57	13.53	3.62	14.42	3.36	14.64	3.35
Externally-oriented thinking	24.48	4.77	24.38	4.84	24.93	4.75	24.50	4.21

$\eta_p^2 = .054$), Inability to Stop gambling ($F_{1,\ 542} = 75.27$; $p < .001$, $\eta_p^2 = .122$), Interpretative Bias ($F_{1,\ 544} = 78.21$; $p < .001$, $\eta_p^2 = .126$)], with males outscoring females, and on one of the three TAS-20 factors, namely Difficulty Identifying Feelings ($F_{1,\ 542} = 8.19$; $p < .01$, $\eta_p^2 = .015$) and the TAS-20 total score ($F_{1,\ 542} = 5.34$; $p < .01$, $\eta_p^2 = .010$), with females outscoring males.

In light of these results, to determine whether the measures remained correlated after controlling for gender, partial correlations between the tasks were computed. After partialling out gender, all positive associations between the different measures remained still significant.

On the basis of their scores on the SOGS–RA, participants were assigned to one of three gambling categories: (1) nonproblem gambler (score of 0 or 1), (2) at-risk gambler (score of 2 or 3), or (3) problem gambler (score of 4 or more). Of the total sample, 78.2 % were screened as nonproblem gamblers, 15.6 % as at-risk gamblers, and 8.2 % as problem gamblers. Means and standard deviations for the GRCS total and the five subscales raw scores, as well as for the TAS-20 total and three factor raw scores, are displayed for the entire sample and by SOGS-RA categories in Table 2.

Analysis of variance found significant differences in GRCS total score between SOGR-RA groups ($F_{1,\ 541} = 141.38$; $p < .001$, $\eta_p^2 = .343$). A subsequent 2 × 3 × 5 mixed ANOVA, with gender and the SOGS-RA groups (nonproblem, at-risk, and problem gamblers) entered as the between-subjects factors, and the GRCS subscales scores as within-subjects factor, yielded a significant main effect of group ($F_{2,\ 538} = 82.67$; $p < .001$, $\eta_p^2 = .24$). Bonferroni post hoc test ($p < .05$) showed that the problem gambler group scored significantly higher compared with all other groups ($p < .05$ in all cases). Figure 1 presents the GRCS subscales as a function of group (see Fig. 1).

Analysis of variance found significant differences in TAS-20 total score between SOGR-RA groups ($F_{1,\ 541} = 6.82$; $p < .001$, $\eta_p^2 = .025$). A 2 × 3 × 3 mixed ANOVA, with gender and the SOGS-RA groups (nonproblem, at-risk, and problem gamblers) entered as the between-subjects factors, and the TAS-20 subscales scores as within-subjects factor, revealed significant main effects

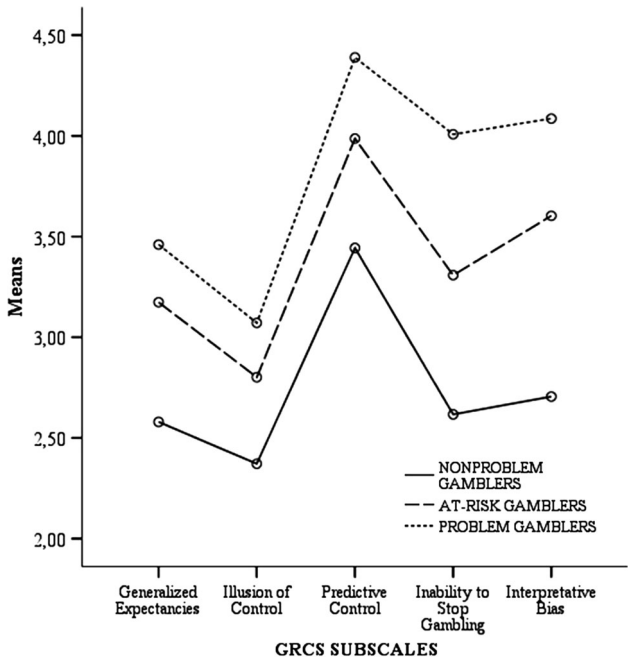

Fig. 1 GRCS subscales—mean across the three SOGS-RA groups

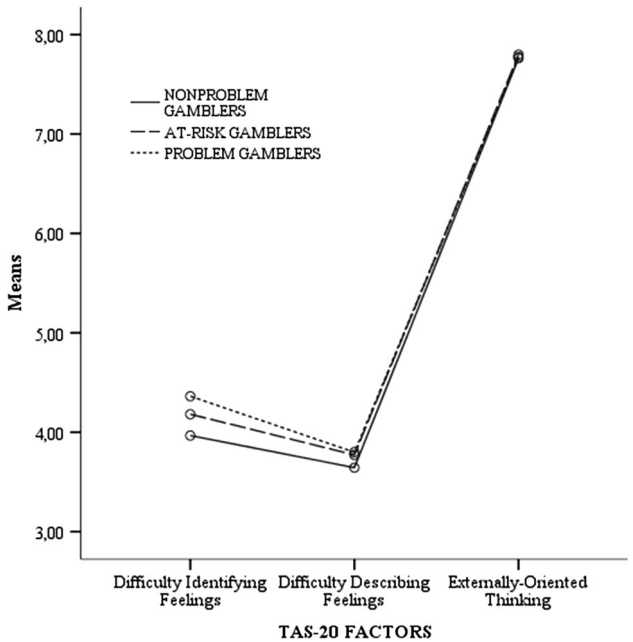

Fig. 2 TAS-20 factors—mean across the three SOGS-RA groups

of gender ($F_{1,\ 538} = 5.72$; $p < .05$, $\eta_p^2 = .011$) and group ($F_{2,\ 538} = 10.25$; $p < .001$, $\eta_p^2 = .037$). Bonferroni post hoc test ($p < .05$) showed that the nonproblem gambler group scored significantly lower on the TAS-20 compared with all other groups ($p < .05$ in all cases). Figure 2 presents the TAS-20 factors as a function of group.

The linear regression model indicated that males scored higher than females on the SOGS-RA and that SOGS-RA scores were positively associated with high scores on the GRCS subscales, Inability to Stop gambling and Interpretative Bias, and on the TAS-20, Difficulty Identifying Feelings factor. The overall model explained around half of the total variance of the SOGS-RA ($R^2 = .506$; $F_{4,\ 539} = 138.07$; $p < .001$). Results of hierarchical regression analysis are reported in Table 3.

Finally, since the results of regression analysis indicated that the best predictors of adolescent gambling severity were the GRCS subscales, Inability to Stop gambling and Interpretative Bias, and the TAS-20 dimension, Difficulty Identifying Feeling, to determine whether gambling-related cognitions mediate the relation between alexithymia and gambling severity, or vice versa, separate mediation analyses were conducted. Estimates of indirect effects (i.e., the effect of alexithymia on SOGS-RA through cognitive distortions) using Sobel's approximate significance test [49] revealed that Difficulty Identifying Feelings contributed to gambling severity through its influence on Inability to Stop gambling ($z = 4.97$; $p < .001$) and Interpretative Bias ($z = 3.52$; $p < .001$), respectively. Indirect effects were significant for both males (Inability to Stop gambling: $z = 4.86$; $p < .001$; Interpretative Bias $z = 3.57$; $p < .01$) and females (Inability to Stop gambling: $z = 3.67$; $p < .001$; Interpretative Bias: $z = 3.06$; $p < .01$). We tested also an alternate mediation model with alexithymia as a mediator between gambling-related cognitions and gambling severity. The indirect effects of cognitive distortions through alexithymia were nonsignificant (Inability to Stop gambling: $z = 1.17$; $p = .241$; Interpretative Bias $z = 1.91$; $p = .055$).

Discussion and Conclusions

This study first investigated the relationship of alexithymia and cognitive distortions to gambling severity in late adolescents living in Southern Italy, the geographical area with a higher pathological gambling rate [9, 50]. In line with previous research [34, 41, 51], the results indicated gender differences on all GRCS measures, with males scoring higher than females, and on one of the three TAS-20 factors, namely Difficulty Identifying Feelings, and the TAS-20 total score, with females outscoring males. Furthermore, the results showed that problem gamblers scored highest on both the GRCS and the TAS-20 total scores. First-order correlations indicated significant positive associations among SOGS-RA and all GRCS subscales, as well as among SOGS-RA and the TAS-20 factors, Difficulty Identifying Feelings and Difficulty Describing Feelings. Interestingly, the results of hierarchical regression analysis

Table 3 Summary of hierarchical regression analysis

Variable	*B*	R^2	ΔR^2	β	*t*	*p*	VIF
Step 1							
Gender	−.371	.155	.155	−.394	−9.971	.000	1.000
Step 2							
Gender	−.177			−.188	−5.573	.000	1.139
Inability to stop gambling	.410	.460	.305	.589	17.476	.000	1.139
Step 3							
Gender	−.139			−.148	−4.481	.000	1.178
Inability to stop gambling	.298			.428	10.613	.000	1.762
Interpretative bias	.154	.502	.042	.272	6.722	.000	1.771
Step 4							
Gender	−.155			−.164	−4.876	.000	1.239
Inability to stop gambling	.286			.411	10.022	.000	1.831
Interpretative bias	.151			.266	6.602	.000	1.777
Difficulty identifying feelings	.049	.506	.044	.070	2.208	.028	1.104

showed that, together with gender, the best predictors of gambling involvement in the present study's population were the GRCS subscales, Inability to Stop gambling and Interpretative Bias, and the TAS-20 factor Difficulty Identifying Feelings. Furthermore, mediation analysis indicated that gambling-related cognitions mediated the relation between alexithymia and gambling severity.

The results of regression analysis confirmed that among late adolescents problem gambling severity is strongly related to specific cognitive distortions associated with gambling. It should also be noted that the relationship between maladaptive cognitions and gambling severity has already been reported. Indeed, former studies have shown that adult pathological gamblers are particularly prone to various cognitive biases that may undermine adaptive behavioral regulation and facilitate the transition from recreational gambling to gambling-related pathology [52, 53]. Consistent with research on both adults and adolescents [33, 54–57] (see also [11, 58]), this finding provides further evidence that adolescent and young gamblers maintain cognitive biases similar to adult gamblers [59] and, more interestingly, that specific gambling-related cognitions, namely Inability to Stop gambling and Interpretative Bias, are the most important risk factors in the present study's population.

As stressed by Oei and Burrow [60], the perceived Inability to Stop gambling is similar to drinking refusal self-efficacy found for alcohol addiction: Like individuals who have alcohol problems, gamblers are aware of the consequences of their addiction, but are incapable to stop or control it. The perceived inability may give rise to a sense of helplessness and upset the gamblers further. In this sense, these beliefs may become self-fulfilling prophecies similar to what has been suggested for other types of addictions. As stated by Raylu and Oei [41, p. 759], "if individuals believe that they are incapable of controlling their urges, they are less likely to try to control them. Thus, this will confirm their beliefs about being helpless in overcoming their addictive problem. Such cognitions about their Inability to Stop gambling can contribute to relapses and be responsible for depression, which is common among problem gamblers." On the other hand, Interpretative Bias (i.e., reframing gambling outcomes that would encourage continued gambling despite monetary losses) leads to overestimate dispositional factors (e.g., one's own skills or abilities) to explain wins and to underestimate situational factors (e.g., luck, probability), as well as to remember wins with greater ease than losses. In sum, to support their beliefs, pathological gamblers selectively interpret current information in the context of the previously stored (erroneous) information in long-term memory [54].

With regard to the role of alexithymia, our results indicated that gambling severity is also associated with difficulties in identifying and describing feelings. This finding is consistent with previous studies on the relationship between alexithymia and gambling among young adults regarding the total TAS scores, even if, unlike Lumley and Roby [27] and Parker et al. [28], we found no significant association between the degree of gambling involvement and Externally-Oriented Thinking. In our study, instead, both the factors Difficulty Identifying Feelings and Difficulty Describing Feelings were found to show elevations among pathological gamblers. However, the results of regression analysis indicated that among the three TAS-20 components, only Difficulty Identifying

Feelings was retained in the model. This finding is similar to the results of recent research on adults [17, 26] and dovetails with that of the study of Toneatto et al. [24], who found that the pathological gamblers scored highest and the nonproblem gamblers lowest on the TAS-20 total score and on the factors Difficulty Identifying Feelings and Difficulty Describing Feelings. Even if results obtained in correlational studies make it difficult to differentiate whether alexithymia is an acquired characteristic or a risk factor for gambling [24], it is plausible that, rather than the result of prolonged gambling, among adolescents and young people, alexithymia is a trait characteristic (or better, a *trait-like* characteristic, given that in adolescents affect regulation abilities are not yet well developed until adulthood [61]). We do not rule out the possibility that the relationship between alexithymia and gambling severity is mediated by other factors, such as mood or depression. For instance, some studies on adults indicated that depression affects gambling severity [62, 63] and that the relationship between alexithymia and depression depends on the type of pathological gambler [26]. On the contrary, research on late adolescents demonstrated that the relationship between alexithymia and severity of problem gambling is independent of both mood and depression [27, 28].

Taken together, our results suggest that the tendency of late adolescents to shift from harmless to pathological gambling is due to a deficit in the cognitive processing of emotions and to specific cognitive biases. Since both cognitive distortions and poor affect regulation abilities are important vulnerability factors in the development of problem gambling and other addiction-related problems, it may be that this combination contributes to foster the cycle of disordered gambling in late adolescents and young adults. Results of mediation analysis clarified that the relationship between alexithymia and gambling severity is mediated by gambling-related cognitions. It seems that among the adolescents who show a reduced ability to identifying feelings, those who are unable to stop gambling and to correctly interpret gambling outcomes are more likely to develop disordered gambling.

These findings demonstrated the importance of gambling-related cognitions and alexithymia in understanding the gambling behavior among high school students and suggest that the susceptibility to common gambling distortions and not having "words for feeling" may be relevant targets in the prevention and treatment of youth gambling.

Acknowledgments This study was supported by a research grant from the Department of Psychology of the Second University of Naples awarded to Marina Cosenza.

References

1. Volberg R, Gupta R, Griffiths M, Olason D, Delfabbro P. An international perspective on youth gambling prevalence studies. Int J Adolesc Med Health. 2010;22:3–38.
2. Blinn-Pike L, Worthy SL, Jonkman JN. Adolescent gambling: a review of an emerging field of research. J Adolesc Health. 2010;47:223–36.
3. Derevensky JL, Gupta R. Internet gambling amongst adolescents: a growing concern. Int J Ment Health Addiction. 2007;5(2):93–101.
4. Derevensky JL, Sklar A, Gupta R, Messerlian C. An empirical study examining the impact of gambling advertisements on adolescent gambling attitudes and behaviors. Int J Ment Health Addict. 2010;8:21–34.
5. Parker JD, Taylor RN, Eastabrook JM, Schell SL, Wood LM. Problem gambling in adolescence: relationships with internet misuse, gaming abuse and emotional intelligence. Pers Individ Diff. 2008;45:174–80.
6. Villella C, Martinotti G, Di Nicola M, Cassano M, La Torre G, Gliubizzi MD, et al. Behavioural addictions in adolescents and young adults: results from a prevalence study. J Gambl Stud. 2011;27(2):203–14.
7. Nower L, Blaszczynski A. The pathways model as harm minimization for youth gamblers in educational settings. Child Adolesc Social Work J. 2004;21(1):25–45.
8. Wickwire EM, Whelan JP, Meyers AW. Outcome expectancies and gambling behavior among urban adolescents. Psychol Addict Behav. 2010;24(1):75–88.
9. Colasante E, Gori M, Bastiani L, Scalese M, Siciliani V, Molinaro S. Italian adolescent gambling behaviour: psychometric evaluation of the South Oaks Gambling Screen: Revised for Adolescents (SOGS-RA) among a sample of Italian students. J Gambl Stud. 2013. doi:10.1007/s10899-013-9385-6.
10. Spritzer DT, Rohde LA, Benzano DB, Laranjeira RR, Pinsky I, Zaleski M, et al. Prevalence and correlates of gambling problems among a nationally representative sample of Brazilian adolescents. J Gambl Stud. 2011;27:649–61.
11. Taylor RN, Parker JDA, Keefer KV, Kloosterman PH, Summerfeldt LJ. Are gambling related cognitions in adolescence multidimensional? Factor structure of the Gambling Related Cognitions Scale. J Gambl Stud. 2013. doi:10.1007/s10899-013-9368-7.
12. Dickson L, Derevensky JL, Gupta R. Youth gambling problems: examining risk and protective factors. Int Gambl Stud. 2008;8(1):25–47.
13. Faregh N, Derevensky JL. A comparative latent class analysis of endorsement profiles of DSM-IV diagnostic criteria for problem gambling among adolescents from a community and a treatment sample. Addict Res Theory. 2011;19(4):323–33.
14. Shead NW, Derevensky JL, Gupta R. Risk and protective factors associated with youth gambling. Int J Adolesc Med Health. 2010;22:39–58.
15. Wickwire EM, Whelan JP, Meyers AW, Murray DM. Environmental correlates of gambling behavior in urban adolescents. J Abnorm Child Psychol. 2007;35(2):179–90.
16. Olason DT, Kristjansdottir E, Einarsdottir H, Haraldsson H, Bjarnason G, Derevensky JL. Internet gambling and problem gambling among 13 to 18 year old adolescents in Iceland. Int J Ment Health Addict. 2011;9:257–63.
17. Mitrovic D, Brown J. Poker mania and problem gambling: a study of distorted cognitions, motivation and alexithymia. J Gambl Stud. 2009;25:489–502.
18. Nemiah JC, Freyberger H, Sifneos PE. Alexithymia: a view of the psychosomatic process. In: Hill OW, editor. Modern trends in psychosomatic medicine, vol. 3. London: Butterworths; 1976. p. 430–9.

19. Nemiah JC, Sifneos PE. Psychosomatic illness: a problem in communication. Psychother Psychosom. 1970;18:154–60.
20. Sifneos PE. Is dynamic psychotherapy contraindicated for a large number of patients with psychosomatic diseases? Psychother Psychosom. 1973;21:133–6.
21. Taylor GJ. The alexithymia construct: conceptualization, validation, and relationship with basic dimensions of personality. New Trends Exp Clin Psychiatry. 1994;10:61–74.
22. Taylor GJ, Bagby RM, Parker JDA. The alexithymia construct: a potential paradigm for psychosomatic medicine. Psychosomatics. 1991;32:153–64.
23. Taylor GJ, Bagby RM, Parker JDA. Disorders of affect regulation: alexithymia in medical and psychiatric illness. Cambridge: Cambridge University Press; 1997.
24. Toneatto T, Lecce J, Bagby RM. Alexithymia and pathological gambling. J Addict Dis. 2009;28:193–8.
25. Bonnaire C, Varescon I, Bungener C. Joueurs de machines à sous dans une population française: étude de la dépression, de l'alexithymie et de la recherche de sensations. Ann Med Psychol. 2010;168:350–6.
26. Bonnaire C, Bungener C, Varescon I. Alexithymia and gambling: a risk factor for all gamblers? J Gambl Stud. 2013;29(1):83–96.
27. Lumley MA, Roby KJ. Alexithymia and pathological gambling. Psychother Psychosom. 1995;63:201–6.
28. Parker JDA, Wood LM, Bond BJ, Shaughnessy P. Alexithymia in young adulthood: a risk factor for pathological gambling. Psychother Psychosom. 2005;74:51–5.
29. Williams AD, Grisham JR, Erskine A, Cassedy E. Deficits in emotion regulation associated with pathological gambling. Br J Clin Psychol. 2012;51:223–38.
30. Parker JDA, Shaughnessy PA, Wood LM, Majeski SA, Eastabrook JM. Cross-cultural alexithymia: validity of the 20-item Toronto Alexithymia Scale in North American aboriginal populations. J Psychosom Res. 2005;58:83–8.
31. Fortune EE, Goodie AS. Cognitive distortions as a component and treatment focus of pathological gambling: a review. Psychol Addict Behav. 2012;26:298–310.
32. Ladouceur R, Walker M. A cognitive perspective on gambling. In: Salkosvis PM, editor. Trends in cognitive and behavioural therapies. New York: Wiley; 1996. p. 89–110.
33. Johansson A, Grant JE, Kim SW, Odlaug BL, Gotestam KG. Risk factors for problematic gambling: a critical literature review. J Gambl Stud. 2009;25:67–92.
34. Oei TP, Lin J, Raylu N. The relationship between gambling cognitions, psychological states, and gambling: a cross-cultural study of Chinese and Caucasians in Australia. J Cross Cult Psychol. 2008;39:147–61.
35. Clark L. Decision-making during gambling: an integration of cognitive and psychobiological approaches. Philos Trans R Soc Lond B Biol Sci. 2010;365:319–30.
36. Goodie AS, Fortune EE. Measuring cognitive distortions in pathological gambling: review and meta-analyses. Psychol Addict Behav. 2013;27(3):730–43.
37. Clark L, Limbrick-Oldfield EH. Disordered gambling: a behavioral addiction. Curr Opin Neurobiol. 2013;23:655–9.
38. Winters KC, Stinchfield RD, Fulkerson J. Toward the development of an adolescent gambling problem severity scale. J Gambl Stud. 1993;9:63–84.
39. Bagby RM, Parker JDA, Taylor GJ. The twenty-item Toronto Alexithymia Scale-I. Item selection and cross-validation of the factor structure. J Psychosom Res. 1994;38:23–32.
40. Bagby RM, Taylor GJ, Parker JDA. The twenty-item Toronto Alexithymia Scale II. Convergent discriminant, and concurrent validity. J Psychosom Res. 1994;38:33–40.
41. Raylu N, Oei TPS. The Gambling Related Cognitions Scale (GRCS): development, confirmatory factor validation and psychometric properties. Addiction. 2004;99:757–69.
42. Bressi C, Taylor G, Parker JDA, Bressi S, Brambilla V, Aguglia E, et al. Cross validation of the factor structure of the 20-item Toronto Alexithymia Scale: an Italian multicenter study. J Psychosom Res. 1996;41:551–9.
43. Lesieur HR, Blume SB. The South Oaks Gambling Screen (SOGS): a new instrument for the identification of problem gamblers. Am J Psychiatry. 1987;144:1184–8.
44. Tabachnick BG, Fidell LS. Using multivariate statistics. 4th ed. Needham Heights, MA: Allyn & Bacon; 2001.
45. Ryan TP. Modern regression models. New York: Wiley; 1997.
46. Baron RM, Kenny DA. The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations. J Pers Soc Psychol. 1986;51:1173–82.
47. Shrout PE, Bolger N. Mediation in experimental and nonexperimental studies: new procedures and recommendations. Psychol Methods. 2002;7:422–45.
48. Preacher K, Hayes A. SPSS and SAS procedures for estimating indirect effects in simple mediation models. Behav Res Methods Instrum Comput. 2004;36:717–31.
49. Sobel ME. Asymptotic confidence intervals for indirect effects in structural equation models. In: Leinhardt S, editor. Sociological methodology. San Francisco: Jossey-Bass; 1982. p. 290–312.
50. Bastiani L, Gori M, Colasante E, Siciliano V, Capitanucci D, Jarre P, et al. Complex factors and behaviors in the gambling population of Italy. J Gambl Stud. 2013;29(1):1–13.
51. Oei TPS, Lin J, Raylu N. Validation of the Chinese version of the gambling related cognitions scale (GRCS-C). J Gambl Stud. 2007;23:309–22.
52. Hardoon K, Derevensky JL. Child and adolescent gambling behavior: our current knowledge. Clin Child Psychol Psychiatry. 2002;7(2):263–81.
53. Hardoon K, Gupta R, Derevensky JL. Psychosocial variables associated with adolescent gambling. Psychol Addict Behav. 2004;18:170–9.
54. Delfabbro PH, Lambos C, King DL, Puglies S. Knowledge and beliefs about gambling in Australian secondary school students and their implications for educational strategies. J Gambl Stud. 2009;25:523–39.
55. Derevensky JL, Gupta R. Gambling problems in youth: theoretical and applied perspective. New York: Kluwer Academic/Plenum; 2005.
56. Lakey CE, Goodie AS, Lance CE, Stinchfield R, Winters KC. Examining DSM-IV criteria in gambling pathology: psychometric properties and evidence from cognitive biases. J Gambl Stud. 2007;23:479–98.
57. Lambos C, Delfabbro PH. Numerical reasoning ability and irrational beliefs in problem gambling. Int Gambl Stud. 2007;7:157–72.
58. Moore SM, Ohtsuka K. The prediction of gambling behaviour and problem gambling from attitudes and perceived norms. Soc Behav Pers. 1999;27:455–66.
59. Ariyabuddhiphongs V. Lottery gambling: a review. J Gambl Stud. 2011;27(1):15–33.
60. Oei TPS, Burrow R. Alcohol expectancy and drinking refusal self-efficacy: a test of specificity theory. Addict Behav. 2000;25:499–507.
61. Parker JDA, Eastabrook JM, Keefer KV, Wood LM. Can alexithymia be assessed in adolescents? Psychometric properties of the 20-Item Toronto Alexithymia Scale in younger,

middle, and older adolescents. Psychol Assess. 2010;22: 798–808.
62. Thomsen KR, Callesen MB, Linnet J, Kringelbach ML, Møller A. Severity of gambling is associated with severity of depressive symptoms in pathological gamblers. Behav Pharmacol. 2009; 20(5–6):527–36.
63. Becoña E, Lorenzo MDC, Fuentes MJ. Pathological gambling and depression. Psychol Rep. 1996;78(2):635–40.