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5

## 6 **Abstract**

7

8 Although substantial research suggests that motivations have been found to mediate the  
9 relationships between impulsivity traits and various forms of substance use, no studies have  
10 examined how gambling motives may mediate the relationships between impulsivity traits  
11 and problem gambling. The primary purpose of this study was to test an integrative model  
12 linking impulsivity traits and gambling problems, evaluating the mediating effects of  
13 gambling motives. Participants were 594 students (73% male; mean age =19.92; SD=2.91)  
14 enrolled in public high schools or universities. Young people who tend to act rashly in  
15 response to extremely positive moods, showed higher enhancement and coping motives,  
16 which in turn were positively related to gambling problems. Individuals with higher levels of  
17 sensation seeking were more likely to have higher levels of enhancement motives, which in  
18 turn were also positively related to gambling problems. The model was examined in several  
19 groups, separately for the level of perceived gambling risk/benefits (lower perceived  
20 gambling risk, higher perceived gambling risk, lower perceived gambling benefits, and  
21 higher perceived gambling benefits). There were significant differences between these  
22 groups for this division. These findings suggest that prevention and/or treatment strategies  
23 might want to consider the model's variables, including impulsivity traits and gambling  
24 motives, in accordance with individual levels of perceived gambling risk/benefits.

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27 **Keywords:** gambling; impulsivity; gambling motives; gambling risk; gambling benefits,  
28 problem gambling.

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## 35 **1. Introduction**

36 Problem gambling among youth is an emerging public health issue in many countries  
37 (Molinaro et al., 2014) although in some countries such as the UK has been an area of  
38 concern for over 25 years (Griffiths, 1989). It has been associated with significant  
39 psychosocial and health problems (Blinn-Pike, Worthy, & Jonkman, 2010), and a recent  
40 Italian study (Bastiani et al., 2013), estimated past-year prevalence rate of 2.3% problem  
41 gambling among young adults (15-24 years) compared to 2.2% among older adults. In the  
42 fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American  
43 Psychiatric Association, 2013), ‘gambling disorder<sup>1</sup>’ was re-classified as an addictive  
44 disorder, representing a new official category of behavioral addictions (Hasin et al., 2013).  
45 As a consequence of this reclassification, there may be a substantial increase in the study of  
46 gambling disorder from a variety of perspectives, including an examination of gambling  
47 disorder’s personality correlates (Miller et al., 2013).

48 Among the diverse etiological contributions of the personality correlates, impulsivity is one  
49 of the most robust characteristics associated with addictions (including gambling disorder). A  
50 broad and growing body of literature suggests that: (i) impulsivity is not a unitary construct,  
51 but reflects multiple facets of personality that each contribute to rash and potentially  
52 dangerous behavior, such as problem gambling (Cyders & Smith, 2008); (ii) proximal  
53 mechanisms, for example motivations, have been found to mediate the relationships between  
54 impulsivity traits and various forms of substance use (e.g. Adams, Kaiser, Lynam, Charnigo,  
55 & Milich, 2012); (iii) perceptions about the benefits of alcohol could be a viable factor in  
56 explaining the different associations between impulsivity, motives and behaviors  
57 (Coskunpinar & Cyders, 2012). To date, no studies have examined how gambling motives  
58 may mediate the relationship between impulsivity traits and problem gambling, and how  
59 these relationships may differ in subgroups of young people in accordance with their levels of  
60 perceived gambling risk and benefits. The current study aimed to address this gap in the  
61 literature. Understanding the links between impulsivity traits, gambling motives, and

62 gambling-related outcomes related to individual levels of perceived gambling risk/benefits  
63 may help in developing appropriate evidence-based treatment and prevention strategies.

#### 64 *1.1. Multiple personality pathways to impulsive, risky behavior*

65 Impulsivity (i.e., the tendency to act rashly or without adequate forethought) has been  
66 consistently associated with pathological gambling (see MacLaren and colleagues 2011, for a  
67 recent review). Early conceptualizations of impulsivity focused on unidimensional definitions  
68 (e.g., Eysenck & Eysenck, 1978), but successive refinement of these aspects of personality  
69 has revealed several related but nonetheless putatively distinct dimensions (Patton, Stanford,  
70 & Barratt, 1995; Whiteside & Lynam, 2001). For example, the UPPS-P Impulsive Behavior  
71 Scale (Cyders et al., 2007; Whiteside & Lynam, 2001) is one of the most widely used  
72 measures of the impulsivity construct. The five UPPS-P impulsivity-related constructs have  
73 been identified (Cyders & Smith, 2007) as: negative Urgency, lack of Persistence, lack of  
74 Planning, Sensation-seeking, and Positive urgency. Negative urgency is associated with  
75 impulsive behavior under conditions of negative affect (e.g., anger, anxiety); lack of  
76 persistence is the inability to remain focused on a task while distracted; lack of planning is  
77 the tendency to act without thinking ahead, sensation-seeking is the tendency to seek out  
78 novel and thrilling experiences; and positive urgency is expressed under conditions of  
79 positive affect (e.g., joy, elation). Among the dimensions of trait impulsivity, negative  
80 urgency is related to pathological gambling clinical samples (Torres et al., 2013). Sensation-  
81 seeking and positive urgency are related to frequency of gambling among college students  
82 (Cyders & Smith, 2008; Fischer & Smith, 2008). Therefore, the model in the present study  
83 predicted a direct connection between impulsivity facets and gambling problems.

#### 84 *1.2. Motives as mediators of the personality-behavior relationship*

85 According to the Acquired Preparedness model of alcoholism risk, a possible mechanism  
86 through which personality traits may nurture drinking behavior is through drinking motives  
87 (Smith & Anderson, 2001; Settles, Cyders, & Smith, 2010). Considering individual motives  
88 for engaging in substance use (e.g., alcohol use) may allow for a better understanding of how  
89 certain personality traits put individuals at risk for problematic drinking (Cooper, 1994).  
90 Research supports the possibility that multiple facets of impulsivity (i.e., positive and  
91 negative urgency, sensation-seeking) contribute to rash and potentially dangerous behavior,  
92 such as problematic drinking (e.g., King, Karyadi, Luk, & Patock-Peckham, 2011), through,  
93 in part, drinking motives (e.g., Adams et al., 2012).

94 With respect to gambling, previous findings indicate that probable pathological gamblers  
95 score higher on some gambling motives (i.e., coping, enhancement, and social) than the non-  
96 pathological gamblers (e.g. Stewart & Zack, 2008). While all three motives are positively  
97 correlated with problem gambling in non-clinical populations (e.g., college students), only  
98 high enhancement motives for gambling were particularly predictive of problem gambling  
99 (Lambe, Mackinnon & Stewart, 2014). Although previous research supports the direct effects  
100 of gambling motives on gambling behavior, to date, no studies have investigated the  
101 possibility that motives mediate the relations between personality traits and gambling  
102 behavior.

### 103 *1.3. Risk/Benefit perception as moderators of the personality-motives-behavior relationship*

104 One important mechanism that may explain the association between drinking motives and  
105 alcohol outcomes involves individuals' perception of how beneficial or risky alcohol use is. A  
106 recent study (Coskunpinar & Cyders, 2012) suggested that perceptions relating to the benefits  
107 of alcohol could be a viable factor in explaining the different associations between  
108 impulsivity, motives and behaviors. In addition, a recent review on risk perception of  
109 gambling echoes this direction, and suggested that future research could examine the  
110 influence of individual differences on risk perception of gambling (Spurrier & Blaszczynski,  
111 2014). Interestingly, previous studies have suggested that attitudes and perceptions towards  
112 gambling may influence gambling behavior (e.g., Orford, Griffiths, Wardle, Sproston, &  
113 Erenset, 2009; Wood & Griffiths, 2004), but no studies have investigated how gambling-  
114 oriented perceptions influence the effects of impulsivity traits and gambling motives on  
115 gambling behaviors.

### 116 *1.4. The present study*

117 Consistent with the theoretical backgrounds reviewed, the current study considers the  
118 potential mediating role of gambling motives in the association between impulsivity traits and  
119 gambling problems in a sample of young Italian people. It is hypothesized that two traits –  
120 sensation-seeking and positive urgency – will relate to problem gambling through unique  
121 mediation pathways. More specifically, consistent with the previous studies on problematic  
122 alcohol use, it is hypothesized that (i) the relationship between positive urgency and gambling  
123 problems is mediated by enhancement motives (Coskunpinar & Cyders, 2012), and (ii) the  
124 relationship between sensation-seeking and gambling problems is mediated by enhancement  
125 motives (Adams et al., 2012). These relationships are tested in different subgroups of young

126 people in accordance with their levels of perceived gambling risk and benefits. Therefore, the  
127 present study examines the potential differences and similarities between four groups of  
128 young people with (i) lower perceived gambling risk, (ii) higher perceived gambling risk, (iii)  
129 lower perceived gambling benefits, and (iv) higher perceived gambling benefits.

## 130 **2. Method**

### 131 *2.1. Participants and data collection*

132 A total of 1,070 young people participated in the study. Since gambling motives were not  
133 applicable among abstainers, only individuals who endorsed gambling activity in year prior  
134 to the study were included in the analysis (53.4%). There were no differences in terms of age  
135 between non past-year gamblers ( $M=19.76$ ,  $SD=2.97$ ) and past-year gamblers ( $M=19.90$ ,  
136  $SD=2.92$ ),  $F(1,1069) = .604$ ,  $p=.43$ , although there was a difference in term of gender,  $\chi^2(1,$   
137  $N=1070) = 46.33$ ,  $p<.001$ , with more past-year gamblers being male (73.4%) than non past-  
138 year gamblers (53.4%). The model was tested on a final sample of 594 students (73% male;  
139 mean age =19.92 years;  $SD=2.91$ ) attending 4th and 5th grade of secondary school ( $n=385$ )  
140 or those in the first years of college ( $n=209$ ). The institutional review committee at University  
141 of Padova gave ethical approval for the study. The data were collected using standard  
142 questionnaires, completed on a voluntary basis in the school or college classroom. Parental  
143 permission to participate for minor students and informed consent for everyone was obtained.

### 144 *2.2. Measures*

#### 145 *2.2.1. Impulsivity*

146 Two of the most widely used impulsivity scales are the *UPPS-P Impulsive Behavior Scale*  
147 (Whiteside and Lynam, 2001) and the *Barratt Impulsiveness Scale* (BIS-11, Patton et al.,  
148 1995). Both scales are highly correlated with each other ( $r = 0.67$ ), but correlations between  
149 their subscales are weak and inconsistent, supporting the notion that the measures cover  
150 different aspects of impulsivity (Meule et al., 2011). In the present study, impulsivity was  
151 assessed using the short UPPS-P (Billieux et al., 2012; Italian version: Aiello, D'Orta,  
152 Timpanaro, & Khazaal, 2014). The UPPS-P is a 20-item scale that evaluates five different  
153 impulsivity facets (four items per dimensions) labeled as negative urgency (tendency to  
154 experience strong impulses under conditions of negative affect), positive urgency (tendency  
155 toward rash action in response to very positive mood), lack of premeditation (tendency to fail  
156 to think and reflect on the consequences of an act before engaging in that act), perseverance

157 (difficulties remaining focused on a task that may be long, boring, or difficult), and sensation-  
158 seeking (the tendency to enjoy and pursue exciting activities and an openness to trying new  
159 experiences that may or may not be dangerous. All items are scored on a Likert scale from 1  
160 (“I agree strongly”) to 4 (“I disagree strongly”). Average scores were calculated for each  
161 scale. All scales demonstrated adequate internal consistency in the present sample: negative  
162 urgency ( $\alpha=.77$ ,  $CI=.73/.79$ ); positive urgency ( $\alpha=.74$ ,  $CI=.70/.77$ ); premeditation ( $\alpha=.82$ ,  
163  $CI=.79/.84$ ); perseverance ( $\alpha=.85$ ,  $CI=.83/.87$ ); sensation seeking ( $\alpha=.82$ ,  $CI=.79/.84$ ).

### 164 2.2.2. *Gambling motives*

165 The Gambling Motives Questionnaire (GMQ; Stewart & Zack, 2008) was translated into  
166 Italian by the authors following procedures recommended by Geisinger (1994). This 15-item  
167 scale is specifically designed to assess individuals’ reasons for engaging in gambling. There  
168 are five items in each of three subscales: Social (e.g., “because it’s what most of your friends  
169 do when you get together”), Coping (e.g., “to forget your worried”) and Enhancement (e.g.,  
170 “because it’s exciting”). Relatively frequency of gambling was rated from 1 to 4 (1= “almost  
171 never/never”; 2= “sometimes”; 3= “often”; 4= “almost always”). Average scores were  
172 calculated for each scale. Internal consistency for each scale was adequate in the present  
173 sample: enhancement ( $\alpha=.83$ ,  $CI=.81/.85$ ); coping ( $\alpha=.83$ ,  $CI=.81/.85$ ); social ( $\alpha=.70$ ,  
174  $CI=.65/.74$ ).

### 175 2.2.3. *Modified perception of risk and benefit questionnaire*

176 This questionnaire on perceived risk and benefit was based on a scale by Siegel et al. (1994,  
177 19 items) and a subscale of the Domain-Specific Risk-Taking [DOSPERT] (gambling, 3  
178 items) scale (Weber, Blais & Betz, 2002). The items depict risk behaviors in the areas of  
179 driving, health, drugs, law-breaking and gambling. Two assessments are obtained: perception  
180 of extent of risk for each behavior; and perception of extent of benefit from each risk  
181 behavior. Internal reliabilities were 0.86 ( $CI=.84/.88$ ) and 0.89 ( $CI=.88/.90$ ), respectively.  
182 The original items were translated into Italian by the authors following procedures  
183 recommended by Geisinger (1994). The final list included 22 items – 19 from the Siegel et al.  
184 (1994) inventory and three from the DOSPERT gambling subscale (Weber, Blais & Betz,  
185 2002). Items are answered using a 5-point Likert Scale from 1 (“Not at all”) to 5  
186 (“Extremely”). To test the hypothesis, only the three items from the DOSPERT scale  
187 measuring perceived risk/benefits of gambling were considered for the analysis. The three-  
188 item gambling-risk-perception scale resulted in a Cronbach’s alpha of .76 ( $CI=.72/.79$ ). The

189 three-item gambling-benefits-perception scale resulted in a Cronbach's alpha of .71  
190 (CI=.67/.75).

#### 191 2.2.4. *Gambling Behavior*

192 Gambling behavior was assessed using the South Oaks Gambling Screen-Revised for  
193 Adolescents (SOGS-RA; Winters, Stinchfield, & Fulkerson, 1993; Italian version: Chiesi,  
194 Donati, Galli & Primi, 2013). Participants were initially asked to indicate the frequency of  
195 gambling in a list of gambling activities (e.g., cards for money, bets on sports teams).  
196 Following this they were presented with twelve "yes-no" items assess negative feelings and  
197 behaviors associated with gambling and are score 1 or 0, respectively. The sum of these items  
198 is the total SOGS-RA score, referred to as the "narrow" criteria (Winters, Stinchfield, & Kim  
199 1995). There is a lack of consensus regarding appropriate cutoff scores for determining the  
200 problem gambling status of adolescents (e.g., Derevensky, Gupta, & Winters, 2003;  
201 Ladouceur, Ferland, Poulin, Vitaro, & Wiebe, 2005). Hence, total SOGS-RA score  
202 (gambling problems) served as the primary dependent variable. To counteract skewness, the  
203 data were log-transformed according to procedures recommended by Tabachnick and Fidell  
204 (2001). Nonetheless, categorical definitions of adolescent problem gambling facilitate  
205 comparison across studies. In reporting past-year prevalence rates, Winters et al.'s (1993)  
206 original scoring system was used. A SOGS-RA score of 0-1 is labeled "no problem," 2-3  
207 merits an "at-risk" label, and 4 or more indicates "problem" gambling. The internal  
208 consistency of the SOGS-RA was .72 (CI=.69/.75). Following the standardized  
209 questionnaires of the European School Survey Project on Alcohol and Other Drugs project  
210 (Hibell et al. 2012), questions regarding gambling occasions ("On how many occasions (if  
211 any) have you bet money? – In your life and in the last 12 months") were also included.

#### 212 2.3. *Statistical Analyses*

213 Structural equation modeling (SEM) was used to test the primary hypotheses. SEM analyses  
214 were conducted using R (R Development Core Team, 2012) Package lavaan (Rosseel, 2012)  
215 and utilized a single observed score for each construct examined in the model. The final  
216 structural model was constructed in a stepwise fashion. At the first step, direct associations  
217 were considered from each personality trait to the gambling problems outcome variable to  
218 determine which traits were related to gambling problems and therefore candidates for  
219 mediation. The second step examined relations between personality traits identified at the  
220 first step and gambling motives. The third step tested for significant effects of gambling

221 motives on gambling problems, controlling for impulsivity. Thus, standardized parameters  
222 were estimated using the maximum likelihood method (Satorra & Bentler, 1988). To evaluate  
223 the adequacy of the model the R<sup>2</sup> of each endogenous variable and the total coefficient of  
224 determination (CD<sup>2</sup>, Bollen, 1989; Jöreskog & Sörbom, 1996) were considered.

225 There are multiple ways to assess for mediation (Beaujean, 2008). The present study used a  
226 SEM approach because it allows for simultaneous equation (relationship) estimation  
227 (MacKinnon, 2008). For the mediation effect, laavan uses the normal approximation method,  
228 and is based on the delta method (Casella & Berger, 2002). The stepwise fashion of the  
229 model (described above) pays respect to Baron and Kenny's (1986) three prerequisite  
230 conditions for testing mediation effects: (a) the predictor variable must be linked to the  
231 mediating variable, (b) the mediating variable must be linked to the outcome variable, and (c)  
232 the predictor variable must be linked to the outcome variable.

233 Finally, to test the model on the different groups the multi-group approach was used  
234 (Jöreskog & Sörbom, 1996; see, e.g., Byrne, 1989). The analyses were performed on four  
235 samples, using a median split into low and high subgroups on values of perceived gambling  
236 risk/benefits. This approach allows one to estimate the parameters simultaneously on  
237 different sub-groups. To more adequately evaluate multigroup comparisons, a series of more  
238 restrictive models to compare the final model with other alternative models was conducted  
239 within a nested model comparison framework (Widaman & Reise, 1997). Each model  
240 represents a different hypothesis of invariance to be tested<sup>3</sup>. The following hypotheses were  
241 compared: configural invariance (the same model is fitted in all groups without any equality  
242 constraints on the model parameters); invariance of the regressions (constraining regression  
243 parameters to be equal across groups); partial invariance of regression parameters  
244 (constraining regression parameters to be equal with the exception of the parameters that are  
245 more different between lower and higher perceived gambling risk/benefits).

### 246 **3. Results**

247 In the past-year gamblers sample, 443 (74.6%) had no gambling problem; 99 (16.7%) were  
248 at-risk gamblers, and 52 (8.8%) were problem gamblers. The mean score on the gambling  
249 problems was .50 (SD=.62). Descriptive statistics of all the variables considered for inclusion  
250 in the model are outlined in Table 1.

#### 251 *3.1. Step 1: Personality to gambling problems*



252 Throughout the results,  $\beta$  is used to represent the estimated standardized direct effect. In the  
253 first step, positive urgency ( $\beta=.15$ ,  $p=.003$ ) and sensation-seeking ( $\beta=.15$ ,  $p<.001$ ) were  
254 significantly and positive associated with gambling problems. Negative urgency,  
255 perseverance, and premeditation were not significantly related to gambling problems. Given  
256 these results, positive urgency and sensation seeking were identified as candidates for  
257 mediation effects in subsequent analyses.

258 [INSERT ABOVE HERE TABLE 1]

### 259 3.2. Step 2: Personality to gambling motives

260 In the second step, associations were investigated simultaneously from the two personality  
261 traits identified in the first step to gambling motives. Positive urgency was significantly  
262 related to enhancement motives ( $\beta=.19$ ,  $p<.001$ ) and social motives ( $\beta=.20$ ,  $p<.001$ ).  
263 Additionally, positive urgency was also significantly related to coping motives ( $\beta=.13$ ,  
264  $p=.004$ ). Sensation seeking was also significantly related to enhancement motives ( $\beta=.10$ ,  
265  $p=.020$ ). Significant relationships were retained for the next step.

### 266 3.3. Step 3: Personality, gambling motives, and gambling problems

267 In the third step, the direct relationships from personality to gambling problems that were  
268 found to be significant in Step 1 were reintroduced into the model along with significant  
269 associations from personality to motives and from motives to gambling problems. The direct  
270 relationships for both positive urgency and sensation seeking remained statistically  
271 significant. Figure 1 shows the estimated standardized parameters. The squared multiple  
272 correlations indicate that the model accounts for a modest portion of the variance in study  
273 variables, more specifically: 6% of the variance in enhancement motives, 4% in coping  
274 motives, 3% in social motives, and 23% in gambling problems. Moreover, the total  
275 coefficient of determination (CD) was .16.

276 [INSERT ABOVE HERE FIGURE 1]

277 Table 2 shows the decomposition of effects of impulsivity traits on gambling problems. The  
278 direct effect of positive urgency on gambling problems was significant and positive (.14).  
279 Along with the direct effects, positive urgency also has an indirect relationship with gambling  
280 problems (.10) through its effect on coping motives (.05) and enhancement motives (.05).  
281 Higher levels of positive urgency were associated with stronger endorsement of both coping  
282 motives and enhancement motives, which, in turn, were associated with higher gambling

283 problems scores. The direct effect of sensation-seeking on problem gambling was significant  
284 and positive (.13). Along with the direct effects, sensation-seeking also has an indirect  
285 relationship with problem gambling through its effect on enhancement motives (.03). Higher  
286 levels of sensation-seeking were associated with stronger endorsement of enhancement  
287 motives, which was associated with higher gambling problems scores.

288 [INSERT ABOVE HERE TABLE2]

289 After evaluating the model in the total sample, the model was tested separately in the  
290 different sub-groups: perceived gambling risk/benefits (higher and lower). The results of the  
291 comparisons across these models are presented in Table 3. In relation to the differences in  
292 perceived gambling risk, the values across configural invariance and invariance of the  
293 regressions significantly changed ( $\Delta\chi^2_{[9]} = 18, p=.03$ ). It is therefore important to analyze and  
294 compare the parameters of the model in the different subgroups. Table 4 presents all the  
295 parameters included in the model, the  $R^2$ , and the CD for each of the variables. Following this  
296 phase, further analysis allowed for partial invariance of regression parameters (freeing  
297 regression parameters that strongly indicated noninvariance across groups). The values across  
298 the configural invariance and the partial invariance of regression parameters did not  
299 significantly change ( $\Delta\chi^2_{[6]} = 8, p=.19$ ) suggesting that the model described by partial  
300 invariance fits the data better than the other model (same model in all groups). Therefore,  
301 some of the findings from the comparison of parameters across subgroups are of particular  
302 interest. More specifically, positive urgency is more related to social motive, sensation-  
303 seeking is more related to gambling problems and enhancement motive in young people who  
304 perceive fewer risks of gambling than young people who perceived higher risks of gambling  
305 for whom these relationships are not significant.

306 In relation to the differences in perceived gambling benefits, the values across configural  
307 invariance and invariance of the regressions significantly changed ( $\Delta\chi^2_{[9]} = 22, p=.005$ ). It is  
308 therefore important to analyze and compare the parameters of the model in the different  
309 subgroups (see Table 4). Following this phase, further analysis allowed for partial invariance  
310 of regression parameters (freeing regression parameters that strongly indicated noninvariance  
311 across groups). The values across the configural invariance and the partial invariance of  
312 regression parameters did not significantly change ( $\Delta\chi^2_{[4]} = 8, p=.10$ ) suggesting that the  
313 model described by partial invariance fits the data better than the other model (same model in  
314 all groups). Therefore, positive urgency is more related to gambling problems and social

315 motive, sensation-seeking is more related to gambling problems, and social motive is more  
316 related to gambling problems in young people who perceive greater benefits than young  
317 people who perceive fewer benefits of gambling for whom these relationships are not  
318 significant. Finally, the relationship between positive urgency and enhancement motive was  
319 significantly stronger at higher levels of benefit perception.

320 [INSERT ABOVE HERE TABLES 3 and 4]

#### 321 **4. Discussion**

322 The aim of the present study was to extend gambling research by differentiating the  
323 mechanisms of risk for gambling problems associated with impulsivity traits. In doing so, the  
324 study also served as a partial replication of some previous research on substance use (e.g.,  
325 Adams et al., 2012; Conskunpinar & Cyders, 2012) by demonstrating the links between  
326 impulsivity traits, gambling motives, and gambling-related outcomes. The results showed that  
327 in a sample of young Italian people, sensation seeking and positive urgency worked through  
328 different pathways to increase gambling-oriented problems, indicating that relationships  
329 between different aspects of impulsivity and gambling problems. A discussion of the more  
330 specific findings now follows.

##### 331 *4.1. Impulsivity and gambling-related problems*

332 The finding that sensation seeking predicts greater numbers of gambling problems supports  
333 existing theories of sensation seeking, which suggest that individuals with high levels of  
334 sensation seeking are motivated by behaviors that provide stimulation and reward (Brunelle  
335 et al., 2004; Zuckerman, 1994). The finding that positive urgency is a significant predictor of  
336 gambling-related problems supports the findings of previous research (Cyders & Smith, 2008;  
337 Fischer & Smith, 2008). This finding suggests that individual differences in the number of  
338 gambling problems are directly associated with positive affect. Variability in young people  
339 gambling seems to follow individual differences in rash acts during very positive emotional  
340 states, as opposed to rash acts during negative emotional states. Indeed, negative urgency did  
341 not significantly predict gambling-related problems in our sample. This result could be  
342 considered with the results of a recent study where negative urgency was unique in  
343 independently covarying with gambling severity in a sample of pathological gamblers (Torres  
344 et al., 2013). This is also consistent with previous reports that negative urgency is a sign of  
345 overpathologization in addictive processes (e.g., Michalczuk et al., 2011) rather than a  
346 characteristic of non-pathological behavior (e.g. at-risk, problem gambling).

347 Finally, lack of premeditation and perseverance did not significantly predict gambling-related  
348 problems and suggests that the emotional components of impulsivity (e.g., positive urgency  
349 and sensation seeking) may have greater influence on the gambling problems than the non-  
350 emotional components of impulsivity (lack of perseverance/premeditation). In this direction,  
351 previous studies have shown that automatic affective responses to substance-related stimuli  
352 may influence substance use behavior more strongly than reflective or ‘explicit’ cognition  
353 (Stautz & Cooper, 2014; Wiers & Stacy, 2006).

#### 354 *4.2. Gambling motives and their mediating effects*

355 The finding that the relationship between sensation seeking and gambling problems was  
356 partially mediated by enhancement motives is consistent with previous studies, where  
357 gamblers with high levels of enhancement motives for gambling, were also characterized by  
358 high levels of sensation-seeking and gambled for the ‘high’ and feelings of excitement that  
359 gambling can create (Bonnaire et al., 2009; Stewart et al. 2008; Vachon & Bagby, 2009). In  
360 addition, this finding supports the theory that sensation seekers are likely to endorse  
361 enhancement motives in an attempt to experience greater thrill and stimulation from their  
362 environment (Cooper et al., 2000; Gullo, Dawe, Kambouropoulos, Staiger, & Jackson, 2010).  
363 Consequently, high levels of sensation seeking were associated with high levels of  
364 enhancement motives, which in turn were associated with high levels of gambling problems.

365 The finding that the relationship between positive urgency and gambling problems was  
366 partially mediated by enhancement motives, supports Settles and colleagues (2010) research  
367 that found positive urgency led to increased alcohol use through expectations that alcohol  
368 enhances positive affect. Thus, young people who tend to act rashly in response to extremely  
369 positive moods are more likely to form strong reasons that gambling brings positive and  
370 arousing effects, which in turn lead to increased gambling problems.

371 An additional unpredicted indirect pathway was found through the results relating to coping  
372 motives. Generally, negative urgency (not positive urgency) is thought to lead to increased  
373 drinking quantity indirectly as well, by leading to increased motives to drink to cope with  
374 subjective distress, which in turn lead to increased drinking quantity (Fisher, Anderson, &  
375 Smith, 2004; Settles, Cyders, & Smith, 2010). It seems likely that this inconsistency is due to  
376 the result that negative urgency did not predict gambling-related problems in the multivariate  
377 analysis.

#### 378 *4.3. Differences and similarities in perceived gambling risk\benefits*

379 Inside this integrated perspective, perceived gambling risk/benefit related similarities and  
380 differences were also investigated, advancing the paucity of knowledge regarding this issue  
381 (Conskunpinar & Cyders, 2012). Results indicated that some regression parameters were  
382 significant only in young people who perceive greater benefits and fewer risks of gambling.  
383 This reflects previous studies that have found higher participation in risk behaviors were  
384 associated with the perception of greater benefits and fewer risks (e.g., Hampson, Severson,  
385 Burns, Slovic, & Fisher, 2001). More specifically, as for lower levels of gambling risk and  
386 higher levels of gambling benefit similarities, sensation-seeking was positively related to  
387 gambling problems in both groups . Previous studies have found that perception of lower risk  
388 among gamblers is associated with several factors, such as sensation seeking and self-worth  
389 (Derevensky, Sklar, Gupta, & Messerlian, 2010; Orford et al., 2009; Tao et al., 2011).  
390 Overall, these findings suggest that particular individual factors (e.g., sensation-seeking)  
391 predispose gamblers to develop particular beliefs associated with greater exposure to risk and  
392 harm. Positive urgency was positively associated with social motives in young people who  
393 perceived lower gambling risk and higher gambling benefits. It is possible that in individuals  
394 with more favorable attitudes towards gambling, positive urgency with its emphasis on rash  
395 action while experiencing a positive mood, interact with positive and arousing experiences  
396 (i.e., drinking makes one more attractive, horny, and social) (Cyders et al., 2007).

397 As for lower levels of gambling risk and higher levels of gambling benefit differences,  
398 sensation-seeking was positively related to enhancement motive in individuals with lower  
399 gambling perceived risk. This is consistent with previous research which showed young  
400 problem gamblers use gambling as a means of generating excitement that they perceive is  
401 missing from their lives (Getty, Watson, & Frisch, 2000; Griffiths, 1995; Gupta &  
402 Derevensky, 2000; McCormick, 1994). Positive urgency was positively related to gambling  
403 problems and enhancement in individuals who perceived higher levels of gambling benefits.  
404 The findings may be interpreted in relation to research by Conskunpinar and Cyders (2012)  
405 that found as benefit perception levels increased, the indirect effect of positive urgency on  
406 problematic alcohol consumption through enhancement motives changed.

407 Finally, an interesting result was the positive relation between social motive and gambling  
408 problems in young people who perceived higher levels of gambling benefits. Past researchers  
409 have found that social motives do not generally predict problem gambling (Dechant & Ellerly  
410 2011; Lambe, Mackinnon & Stewart, 2014; Stewart & Zack, 2008). The results here suggest  
411 that gambling for social reasons may be more risky for an individual with higher benefit

412 perception. It is likely that individuals with higher levels of perceived gambling benefits may  
413 be considered as extrinsically motivated gamblers who were more likely to do so because of  
414 external rewards such as money and social approval (Chantal et al., 1995).

#### 415 *4.4. Clinical Implications*

416 As highlighted by the discussion above, it is useful to consider two specific pathways when  
417 addressing impulsivity in problem gambling prevention or intervention. Young people who  
418 are high in sensation seeking and positive urgency engage in gambling to increase positive  
419 feelings. According to Adams et al. (2012), some potential ways of intervening may involve  
420 (i) working with young people on considering not only positive and immediate consequences  
421 of gambling, but also on effects that are less salient in the moment (e.g., economic losses and  
422 strained relationships with family members and friends), and (ii) providing alternative  
423 behaviors to gambling (e.g., sport) to enhancing positive sensation. On the other hand,  
424 positive urgency was also associated with coping motives, which in turn related to gambling  
425 problems. Individuals who score high on coping motives may, according to Adams et al.  
426 (2012), benefit from a type of intervention, aimed at educating them to focus on the negative  
427 social and emotional consequences of engaging in gambling to cope, as well as training in  
428 adaptive strategies for coping with negative effect (e.g., yoga).

429 It is also possible that different strategies may be required for young people as the present  
430 study found that specific relationships between impulsivity traits, gambling motives, and  
431 gambling problems, were only significant in young people who perceived lower gambling  
432 risk and higher gambling benefits. This may help in developing problem gambling treatment  
433 and prevention strategies suggesting that if benefit perception can be minimized, the direct  
434 effect (of positive urgency on gambling problems, enhancement motive and social motive,  
435 positive urgency on social motive, sensation seeking on gambling) could also be minimized.  
436 In addition, if risk perception can be maximized, the direct effect (of sensation seeking on  
437 enhancement motive and gambling problems; positive urgency on social motive) could also  
438 be reduced.

#### 439 *4.5. Limitations and future directions*

440 The findings of the present study must be understood in the context of the study's limitations.  
441 First, a significant limitation of the current study was the cross-sectional design. Examining  
442 these relations in a longitudinal study would allow for a clearer understanding of the  
443 relationship among impulsivity traits, gambling motives, and gambling outcomes and how

444 these relations change over time. Secondly the majority of the sample participants were males  
445 and students. It is important to investigate this risk model with a more diverse sample.  
446 Thirdly, although it was demonstrated that gambling motives contributed significantly to  
447 mediate the relationship between impulsivity and problem gambling, the fact remains that  
448 much of the variance in gambling motives remained unexplained. In explaining the potential  
449 effect of motives on addictive behaviors, most studies use numerous causal factors, only one  
450 of which is impulsivity. Other unconsidered factors associated with youth (i.e. extroversion,  
451 neuroticism and anxiety, Kuntsche, Knibbe, Gmel, & Engels, 2006; mood states, Goldstein,  
452 Stewart, Hoaken, & Flett, 2014) or the community (different countries; Molinaro et al., 2014)  
453 may also predict motives. Fourthly, all data were self-report and are therefore subject to the  
454 standard limitations of this type of data (e.g., social desirability biases, memory recall biases,  
455 etc.). Lastly, future research should aim to develop and to examine the effectiveness of  
456 treatment approaches tailored to specific impulsive personality traits and gambling motives.

457 Despite these limitations, as our review of the literature suggests, the present study is likely to  
458 be the first that has sought to clarify the mediating effects of gambling motives on the  
459 relationship between impulsivity traits and gambling problems. In particular, the findings  
460 give support to the idea that young people who tend to act rashly in response to extremely  
461 positive moods show higher enhancement and coping motives, which are, in turn, positively  
462 related to gambling problems. Individuals with higher levels of sensation seeking are more  
463 likely to have higher levels of enhancement motives, which, in turn, are also positively  
464 related to gambling problems. The model was examined in several groups, separately for the  
465 level of perceived gambling risk/benefits. There were significant differences between these  
466 groups for this division. Therefore, those interested in promoting responsible gambling (and  
467 decreasing gambling problems) might want to consider the model's variables, including  
468 impulsivity traits and gambling motives, in accordance with individual levels of perceived  
469 gambling risk/benefits.

#### 470 **Footnotes**

471 <sup>1</sup> Gambling disorder is a recognized mental health condition that is characterized by difficulty limiting gambling  
472 expenditure, chasing losses, lying about gambling, and severe negative consequences of excessive gambling  
473 (APA, 2013). Two categories of gambling disorders are salient in published work: pathological gambling and  
474 problem gambling. Pathological gambling is medically defined, with diagnostic criteria described in both the  
475 Diagnostic and Statistical Manual of Mental Disorders, 4th edition, text revision (DSM-IV-TR) and the  
476 International Classification of Diseases, 10th revision (ICD-10). Both classification systems summarize  
477 pathological gambling from an atheoretical perspective (i.e., they list only objective and behavioral diagnostic

478 criteria), and both classify pathological gambling within an impulse disorder section. Problem gambling is a  
479 more general term that incorporates subclinical conditions where an individual experiences significant negative  
480 consequences as a result of gambling, and as such this is an appropriate term to use in relation to harm  
481 minimization policies (Neal, Delfabbro, & O'Neil, 2005). This term is generally used in research where  
482 screening measures are used to identify problem gamblers without confirmation through clinical interviews, and  
483 as such typically includes those with gambling disorder.

484 <sup>2</sup> The CD is defined as:

$$1 - \frac{|\hat{\psi}|}{|\hat{\Sigma}_{yy}|}$$

485 here,  $|\hat{\psi}|$  is the determinant of the covariance matrix among the errors and  $|\hat{\Sigma}_{yy}|$  is the  
486 determinant of the fitted covariance matrix among endogenous variables. The CD shows the joined effect of the  
487 predictor variables on all dependent variables (i.e., the higher the CD the more is the variance explained).

488 <sup>3</sup> Testing for invariance was examined through the traditional perspective (Byrne & Stewart, 2006) that  
489 examines the change in chi-square values ( $\Delta\chi^2$ ) across nested models. If the  $\Delta\chi^2$  values do not change  
490 significantly as the models grow more restrictive, it indicates that the more restrictive model fits the data as well  
491 as the less restrictive model.

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