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Running Head: impulsivity, decision-making and gambling

Trait urgency and gambling problems in young people by age: The mediating role of decision-making processes

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Abstract

Although the personality trait of urgency has been linked to problem gambling, less is known about psychological mechanisms that mediate the relationship between urgency and problem gambling. One individual variable of potential relevance to impulsivity and addictive disorders is age. The aims of this study were to examine: (i) a theoretical model associating urgency and gambling problems, (ii) the mediating effects of decision-making processes (operationalized as preference for small/immediate rewards and lower levels of deliberative decision-making); and (iii) age differences in these relationships. Participants comprised 986 students (64% male; mean age=19.51 years; SD=2.30) divided into three groups: 16-17 years, 18-21 years, and 22-25 years. All participants completed measures of urgency, problem gambling, and a delay-discounting questionnaire involving choices between a smaller amount of money received immediately and a larger amount of money received later. Participants were also asked to reflect on their decision-making process. Compared to those aged 16-17 years and 22-25 years, participants aged 18-21 years had a higher level of gambling problems and decreased scores on lower levels of deliberative decision-making. Higher levels of urgency were associated with higher levels of gambling problems. The association was mediated by a lower level of deliberative decision-making and preference for an immediate/small reward. A distinct pathway was observed for lower levels of deliberative decision-making. Young people who tend to act rashly in response to extreme moods, had lower levels of deliberative decision-making, that in turn were positively related to gambling problems. This study highlights unique decision-making pathways through which urgency trait may operate, suggesting that those developing prevention and/or treatment strategies may want to consider the model's variables, including urgency, delay discounting, and deliberative decision-making.

Keywords: gambling; impulsivity; urgency; delay discounting; decision-making

1. Introduction

Youth problem gambling is an emerging public health issue in many European countries (Molinaro et al., 2014; Volberg et al., 2010) and it has been associated with significant health and psychosocial problems (Blinn-Pike, Worthy, & Jonkman, 2010). A recent study has shown that 1.6 - 5.3% of adolescents living in nine European countries had probable problem gambling (Molinaro et al., 2014).

Although a growing number of studies have suggested a clear relationship between pathological gambling and high impulsivity (e.g., MacLaren, Fugelsang, Harrigan, & Dixon, 2011 for a meta-analysis), these studies provide a limited understanding of the psychological mechanisms involved, as they have often been conducted with little consideration given to the multifaceted nature of impulsivity. Early approaches to impulsivity focused on unidimensional definitions (e.g., Eysenck & Eysenck, 1978), but successive refinement of these aspects of personality has reported several related – but also independent – dimensions (Patton, Stanford, & Barratt, 1995; Whiteside & Lynam, 2001). Whiteside and Lynam (2001) clarified the multidimensionality of impulsivity by subdividing it into four distinct facets: sensation seeking, lack of premeditation, lack of perseverance, and urgency (the latter defined as the tendency to act impulsively in response to strong emotions) (Sharma, Markon, & Clarke; 2014; Whiteside & Lynam, 2001). Studies conducted on gamblers from the community (i.e., non-clinical participants) have shown that gambling problems are predicted by high urgency (Canale, Vieno, Griffiths, Rubaltelli, & Santinello, 2015; Fischer & Smith, 2008) and lack of premeditation (Cyders & Smith, 2008). The psychological mechanisms by which heightened urgency might influence gambling disorder are not clearly understood. A previous research study found that young people who tend to act rashly in response to extremely positive moods show higher enhancement and coping motives, which are, in turn, positively related to gambling problems (Canale et al., 2015).

Young people's gambling behavior tends to be emotion-based (Cyders & Smith, 2008) with negative emotional mood states increasing the likelihood of gambling engagement (Griffiths, 2011). Both negative and positive urgency is strongly associated with emotional factors (Joseph et al., 2009). More specifically, urgency depends upon inadequate appraisal of (and response to) emotions that precede decisions. Urgency has been related to specific cognitive mechanisms (Bechara & Van der Linden, 2005). Research has shown that poor prepotent response inhibition at least partly underlies urgency (Gay et al., 2008; Billieux et al., 2010). More specifically, it has been shown that the tendency to make disadvantageous choices in a situation of decision-making under risk predicts high urgency that in turn predicts the occurrence of problematic behaviors (Billieux et al., 2010). Furthermore, urgency is related to impaired decision-making (e.g., Kraplin et al., 2014). The results provide evidence for reciprocal causal relationships between the decision-making process and urgency, although the effects of personality traits on psychological mechanisms were causally predominant. A previous longitudinal study (Castellanos - Ryan, Rubia, & Conrod, 2011) found that cognitive/ motivational measures of disinhibition (poor response inhibition, reward response bias) mediate the longitudinal relationship between personality measures (e.g., impulsivity) and externalizing behaviors in adolescence (e.g., binge drinking and drug use). From this perspective, urgency may reflect a disposition toward gambling problems, depending on the decision-making process.

Consistent with the Reyna and Farley's (2006) work, major explanatory models of risky decision-making can be roughly divided into (i) those that adhere to a rational behavioral decision-making framework that stresses deliberate, quantitative trading off of risks and benefits; and (ii) those that emphasize unconscious or irrational decision-making that appears to be the source of problems in adolescence (i.e., impulsive or reactive decision-making). Thus, in the present study, deliberative decision-making was considered as a measure of

preferences based on conscious, analytical thought (e.g., Beyth-Marom & Fischhoff, 1997)¹ and the delayed reward discounting was considered as a behavioral measure of preferences based on impulsive, intuitive, and affective thought (Weafer, Baggott, & de Wit, 2013).

According to Metcalfe and Mischel (1999), an increase of ‘hot’ system activation based on emotion appraisal and processing decreases the ability to delay gratification. Thus, urgency significantly predicts sensitivity to reward delay in the delay discounting task (Kraplin et al., 2014; Torres et al., 2013). Furthermore, several studies have shown that individuals with gambling problems discount delayed monetary outcomes at substantially higher rates than non problem-gambling controls (e.g., Albein-Urios, Martinez-González, Lozano, & Verdejo-Garcia, 2014; Clark, 2014; MacKillop et al., 2011 for a meta-analysis). In addition, urgency and lack of premeditation facets of impulsivity (i.e., the tendency to take into account the consequences of an act before engaging in that act) significantly correlate with each other (Whiteside & Lynam, 2001; Van der Linden et al., 2006), suggesting that higher levels of urgency could be related to lower levels of deliberative decision-making. Deliberative decision-making is the tendency to consider options and consequences before making a decision, and a failure to follow a deliberative process is associated with adolescent participation in a number of behaviors including substance use, risky sex, and delinquency (Wolff & Crockett, 2011).

An individual variable of potential relevance to impulsivity and addictive disorders is age. It has been found that: (i) urgency is heightened during adolescence compared to adulthood (Cyders & Smith, 2008); (ii) younger individuals discount delayed rewards more steeply than older individuals (e.g., Yoon et al., 2007); and (iii) deliberative decision-making abilities develop over time, probably due to cognitive maturation, learning, and experience (e.g., Ariely, 2008; Casey, Jones, & Hare, 2008); (iv) the basic intellectual abilities (such as working memory, digit-span and verbal fluency) reach adult levels at around 16 years of age

long before the process of psychosocial maturation (which include scores of the self-report measures of impulsivity, risk perception, sensation seeking, future orientation and resistance to peer influence mentioned earlier) is complete well into the young adult years (Steinberg, 2008; Steinberg et al., 2009). These issues are highly pertinent in adolescent risk-taking. Although adolescents are stereotypically considered as risk takers (e.g., Burnett, Bault, Coricelli, & Blakemore, 2010; Steinberg, 2008), a recent meta-analysis reveals that adolescents do not always engage in more risk-taking than children and adults (Defoe, Dubas, Figner, & van Aken 2014). These findings suggest that is important to examine age differences in risk-taking, and to determine whether these differences can be attributed to differences in how urgency and decision-making process contribute to gambling problems.

Consistent with the theoretical backgrounds reviewed, the current study aimed to test a theoretical model (see Figure 1) linking urgency with gambling problems, taking into account the mediating role of decision-making processes (operationalized as preference for small/immediate rewards and a lower level of deliberative decision-making). It was hypothesized that the relationship between urgency and gambling problems is mediated by higher preference for small/immediate rewards, and a lower level of deliberative decision-making. Those relationships were tested in different subgroups of young people in accordance with their age band. According to previous studies (Ariely, 2008; Cyders & Smith, 2008; Yoon et al., 2007) it was predicted that each of these relationships would be larger in adolescents (16-17 years) than in young adults (18-21 years and 22-25 years).

2. Methods

2.1. Participants and data collection

The sample comprised 986 participants (64% male) with an age range of 16-25 years ($M=19.51$, $SD=2.30$), recruited to yield an age distribution designed to compare adolescents with two specific groups of young adults: (a) individuals of traditional college age (who in some studies of decision-making behave in ways similar to adolescents (Gardner & Steinberg, 2005); (b) individuals who are no longer adolescents but who still are at an age during which the brain is continuing to mature, presumably in regions that subserve orientation toward long-term goals (Giedd et al., 1999). Therefore, for these reasons, data analysis was performed using three age groups: 16-17 years ($n=188$), 18-21 years ($n=603$), and 22-25 years ($n=195$). Participants were students attending 4th and 5th grade of secondary school or those in the first years of college. The institutional review committee at University of Padova gave ethical approval for the study. The data were collected using standard questionnaires, completed on a voluntary basis in the school or college classroom. All participants gave informed consent along with parental permission to participate for minor students.

2.2. Measures

2.2.1. Urgency

Urgency was assessed using the short UPPS-P (Billieux et al., 2012; Italian version: Aiello, D'Orta, Timpanaro, & Khazaal, 2015). Cronbach's alpha reliability coefficients in this sample were .77 (CI= .75/.79) for positivity urgency and .76 (CI= .74/.78) for negative urgency. As subscales were highly correlated ($r=.59$, $p<.001$) and correlations between the two urgency traits and outcome variables were very similar (all within .15), a combined score was used, as has been carried out previously (Smith et al., 2013; Stautz & Cooper, 2014). The internal consistency of the urgency was .84 (CI=.82/.85). Higher scores reflect heightened urgency.

2.2.2 Deliberative decision-making

Participants responded to four items² regarding the extent to which they thought through and evaluated their decision-making processes. These four items relate to key parts of the decision-making process outlined by Beyth-Marom and Fischhoff (1997) and have been used previously (e.g., Wolff & Crockett, 2011). The original items were translated into Italian by the authors following procedures recommended by Geisinger (1994). Items are answered using a 5-point Likert Scale from 1 (“strongly agree”) to 5 (“strongly disagree”). Scores were averaged ($\alpha=.69$; $CI = .65/.71$) and higher scores indicate lower levels of deliberative decision-making. The studies on the relationships between decision-making processes and adolescent risk behavior have used several operationalizations of (non) deliberative decision-making. For instance, adolescents who follow a systematic, deliberative process when choosing a course of action also report less drunkenness, drug use, delinquency, and risky sex both concurrently and one year later (Wolff & Crockett, 2011). According to: (i) decision theory (see for example Beyth-Marom & Fischhoff 1997) that specifies a systematic, logical process for optimal decision-making; (ii) a previous study that has used the same measure of deliberative decision-making (i.e., Wolff & Crockett, 2011), we hypothesized that the failure to follow a deliberative process when choosing a course of action would be associated with gambling problems, and may contribute to young people’s participation in problem gambling.

2.2.3. Preference for immediate/small reward

Participants responded to nine items from the delay-discounting questionnaire developed by Kirby and colleagues (Kirby, Petry, & Bickel, 1999). This paper-and-pencil task presents participants with hypothetical two-option choices between an immediate small reward, and a delayed larger one (e.g., would you prefer €55 now, or €110 in 15 days?). The values used in the nine items refer to the large delayed reward category. The total number of decisions was computed favoring the immediate reward and used it as a score of discounting ranging

between 0 and 9. This measure ($\alpha=.77$; $CI=.74/.79$) has been previously used by other researchers (Torres et al., 2013).

2.2.4. Gambling problems

Gambling problems was assessed using the South Oaks Gambling Screen-Revised for Adolescents (SOGS-RA; Winters, Stinchfield, & Fulkerson, 1993; Italian version: Chiesi, Donati, Galli, & Primi, 2013). Gambling problems was measured using twelve ‘yes-no’ items that assessed negative feelings and behaviors associated with gambling (scored 1 or 0 respectively). The sum of these items is the total SOGS-RA score, referred to as the “narrow” criteria (Winters, Stinchfield, & Kim 1995). Hence, total SOGS-RA score served as the primary dependent variable.³ The internal consistency of the SOGS-RA was .73 ($CI=.70/.75$). To counteract skewness, the gambling problems variable was log-transformed according to procedures recommended by Tabachnick and Fidell (2001).

2.3. Statistical Analyses

Study variables were evaluated using analysis of variance (ANOVA) for continuous variables. When statistical tests revealed overall group differences, post-hoc tests (e.g., least significant difference) were used to evaluate differences between each specific group. The pattern of associations specified by the proposed theoretical model and the mediations were evaluated using structural equation modeling (SEM) analyses, using R (R Development Core Team, 2012) Package lavaan (Rosseel, 2012) and utilized a single observed score for each construct examined in the model. Standardized parameters were estimated using the maximum likelihood method (Satorra & Bentler, 1988). To evaluate the adequacy of the model the R^2 of each endogenous variable and the total coefficient of determination (CD^4 ; Bollen, 1989; Jöreskog & Sörbom, 1996) were considered. For the mediation effect, lavaan uses the normal approximation method, and is based on the delta method (Casella & Berger, 2002). To

evaluate whether the proposed theoretical model was consistent for age, the model was also tested by using a multiple-group approach (i.e., the age band groups 16-17 years, 18-21 years, and 22-25 years).

3. Results

In the sample, 837 participants (84.6%) had no gambling problems; 104 (10.5%) were at-risk gamblers, and 48 (4.9%) were problem gamblers. Descriptive statistics of all the study variables are presented in Table 1. Compared to those aged 16-17 years and 22-25 years, participants aged 18-21 years had higher gambling problems and decreased scores on lower levels of deliberative decision-making. In addition, and as expected, all of the study variables were positively correlated with the others (e.g., higher urgency scores were significantly associated with lower levels of deliberative decision-making, preference for immediate/small reward, and gambling problems). The magnitude of correlation coefficients was relatively modest, ranging from .08 to .20.

[INSERT TABLE 1 ABOUT HERE]

Figure 1 shows the empirical estimation of the proposed model (estimated parameters are reported). Higher levels of urgency were associated with higher levels of gambling problems. The association was mediated by lower levels of deliberative decision-making and preference for immediate/small reward. The squared multiple correlations indicate that the model accounts for a modest portion of the variance in study variables, more specifically: 3% of the variance in lower levels of deliberative decision-making, 2% in immediate reward, and 7% in gambling problems. Moreover, the total coefficient of determination (CD) was .08.

[INSERT FIGURE 1 ABOUT HERE]

In addition to the direct effects shown in Figure 1, there was one significant indirect relationship. Urgency had an indirect relationship with gambling problems (.03) through its

effect on lower levels of deliberative decision-making (.03). Young people who tend to act rashly in response to extreme moods had lower levels of deliberative decision-making that in turn were positively related to gambling problems. After evaluating the model in the total sample, a multiple-group model tested whether this model was consistent across age, in terms of configural invariance and invariance of the regressions. There were no statistically significant differences found in the relationships between the estimated parameters among age groups ($\Delta\chi^2_{[10]} = 13, p=.24$).

4. Discussion

The present study provides new insight into the possible mechanisms underlying the relationship between high impulsivity and problem gambling by demonstrating the links between urgency trait, decision-making processes, and gambling-related outcomes. The finding that urgency was significantly associated with gambling-related problems supports the findings of previous research (e.g., Canale et al., 2015; Cyders & Smith, 2008) suggesting that gambling problems in young people are related to individual differences in rash acts during strong emotional states. In addition, urgency was positively related to decision-making processes. More specifically, urgency showed a significantly positive correlation with an immediate reward focus (e.g., delay aversion). This reflects previous studies that have found the involvement of urgency in reward delay sensitivity (Kraplin et al., 2014; Torres et al., 2013). It is possible that among individuals with a tendency to act impulsively in response to strong affects, affect tends to trigger impatience and myopia in inter-temporal choice, resulting in preferences toward smaller but immediate rewards over larger but delayed rewards (see Chang & Pham, 2013 for a review). Urgency was also positively related to lower levels of deliberative decision-making suggesting that young people (who tend to make

poor decisions under conditions of strong affects) are also characterized by tendency not to think of the consequences of an action before engaging in it. It is possible that the experience of extreme emotions can deplete a person's ability to control their behaviors (Muraven & Baumeister, 2000; Tice, Bratslavsky, & Baumeister, 2001), and intense emotions tend to bias decision-making in non-deliberative directions (Bechara, 2004; Driesbach, 2006).

The present study has also found direct effect of decision-making processes on gambling problems. The finding that an immediate reward focus was significantly associated with greater numbers of gambling problems supports numerous studies that have shown as problem gamblers exhibit higher rates of discounting than non-problem gambling controls (e.g., Kertzman et al., 2011; Reynolds, 2006; Robbins, & Clark, 2015). This is also consistent with recent models of pathological gambling (Bechara, 2003; Evans & Coventry, 2006; van Holst et al., 2010) that motivational and valuation systems in pathological gamblers may over-estimate the value of immediate short-term rewards. In addition, lower levels of deliberative decision-making were positively associated with gambling problems suggesting as young people who fail to follow deliberative or regulated decision-making have a greater tendency to take risks (Kahneman, 2003; Klaczynski, 2005). A significant indirect path from urgency to gambling problems via lower levels of deliberative decision-making was also found in the present study. According to Cyders and Smith (2008), it may be that in response to intense emotions, higher levels of urgency may lead to more impulsive and less deliberative decisions, which can increase the likelihood of gambling problems (e.g., betting more money, continuing gambling even when losing money, etc.).

Within this integrated perspective, age differences were also investigated. Results indicated that adolescents had lower levels of deliberative decision-making (e.g., Ariely, 2008). Surprisingly, there were no significant differences between adolescent and young adults (22-25 years old) in their scores of deliberative decision-making. However, this could be

examined in future studies. In addition, gambling problems were more common among young adults who attend the first-years of college and university (18-21 years old) than adolescent and young adults (22-25). According to Stone and colleagues (2012), moving out of the parental home and attending college may be related to increased gambling problems. Thus, it is possible that emerging adult-related lifestyle norms may “open the flood gates” to permit fully developed addiction problems (Sussman & Arnett 2014). Therefore, it is in the best interests of both prevention and intervention program to focus attention on the first year of college when trying to solve the problems created by more involvement in gambling. Finally, despite the studies showing that adolescents have higher levels of urgency, preference for immediate small reward, and non deliberative decision-making, the results showed that urgency had similar associations with decision-making processes and gambling problems across age bands (i.e., 16-17 years, 18-21 years, and 22-25 years).

A greater understanding of urgency, delay discounting, and deliberative decision-making differences in gambling problems, might also elucidate important ways to explore in terms of developing and refining problem gambling prevention or intervention. It appears that the experience of extreme emotions can deplete one's impulse control (Tice et al., 2001). Recently, researchers have developed very successful interventions to help individuals avoid rash actions and decisions when experiencing intense negative and positive affect, such as computer-delivered intervention tailored to motives (Canale, Vieno, Chieco, Santinello, & Andriolo, 2015) and mindfulness meditation (Shonin, Van Gordon, & Griffiths, 2014).

The present study has some limitations that also need to be considered. Firstly, the cross-sectional nature of the data does not allow the drawing of strong conclusions about the direction of the effects or to interpret the mediation relation in a causal sense. For example, longitudinal studies are needed to clarify the direction of causality between urgency, decision-making processes, and gambling problems. Secondly, participants were asked to

reflect on their decision-making process that may not capture their spontaneous strategies 'in the moment'. Additionally, non-rational and intuitive process of decision-making, such as heuristics, can also be useful and accurate tools that make the decision more successful (e.g., Slovic & Peters, 2006). Assessing the heuristics would be a valuable addition to the literature as these measures may be an effective way of improving professional decision-making in the real world (Gigerenzer, 2008). Thirdly, in the present study positive and negative urgency was used as a composite score of urgency. Individual facet score of urgency (positive and negative) should be included in future studies in order to gain a more comprehensive analysis of the relationships between impulsivity traits, decision-making process and gambling problems. Fourthly, although the SOGS (and its variations) is one of the most frequently used measures of problem gambling both in youth and in adults (Wiebe, Cox, & Mehmel, 2000), the SOGS was not created to directly reflect DSM criteria for pathological gambling (e.g., DSM criteria include content regarding tolerance and withdrawal that are absent from the SOGS). Finally, the effects found in this study were modest, suggesting that additional factors are likely to be influential for gambling problems. Despite these limitations, to our knowledge, the present study is the first to show that delay discounting as well as self-reported dimensions concerning the tendency to act rashly in an emotional context (urgency) and the lack of deliberative decision-making may be relevant mechanisms underlying gambling problems.

Footnotes

¹Decision theory defines how individuals should reason in order to choose the behavioral option that would be most beneficial in a given situation (see Beyth-Marom & Fischhoff 1997). From this perspective, and in accordance with the Rangel and colleagues (2008) model of decision-making, value-based decision-making involves thinking through five basic processes: (1) the construction of a representation of the decision problem, that involves

identifying internal and external states as well as potential courses of action; (2) the valuation of the different actions under consideration; (3) the selection of one of the actions on the basis of their valuations; (4) after implementing the decision the brain needs to measure the desirability of the outcomes that follow (evaluation); (5) the outcome evaluation is used to update the other processes to improve the quality of future decisions (learning).

²The following items were extracted from the work of Wolff and Crockett (2011): “When you have a problem to solve, one of the first things you do is get as many facts about the problem as possible”; “When you are attempting to find a solution to a problem, you usually try to think of as many different ways to approach the problem as possible”; “When making decisions, you generally use a systematic method of judging and comparing alternatives”; “After carrying out a solution to a problem, you usually try to analyze what went right and what went wrong.”

³There is a lack of consensus regarding appropriate cut-off scores for determining the problem gambling status of adolescents (e.g., Ladouceur, Ferland, Poulin, Vitaro, & Wiebe, 2005; Volberg et al., 2010). However, categorical definitions of adolescent problem gambling facilitate comparison across epidemiological studies. In reporting past-year prevalence rates, Winters et al.’s (1993) original scoring system was used. A SOGS–RA score of 0-1 was labelled “no problem,” 2-3 merits an “at-risk” label, and 4 or more indicates “problem” gambling.

⁴The CD shows the joined effect of the predictor variables on all dependent variables (i.e., the higher the CD the more is the variance explained).

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