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Higher trait levels of guilt may protect against gambling, whereas higher state levels lead to riskier behaviour.

Abstract

Research on the role of affect in problem gambling remains scarce to date, although it has been proposed that trait-levels of negative self-conscious emotions (SCEs) could be potential risk factors. We report two studies investigating the relationship between negative SCEs, gambling, and risky behavior. In the first study, we investigated shame, guilt and self-disgust in a group of problem-gamblers and control non-gamblers. In the second study, we investigated if experimentally manipulating state levels of guilt, using a narration-induction paradigm, in students with different levels of gambling behavior, would influence their behavior in the Balloon Analog Risk Task. We found that problem gamblers had significantly lower trait-levels of guilt when we adjusted for the influence of depression and anxiety symptoms (p=.008). Problem gamblers also exhibited lower levels of shame, but this difference seemed to be driven by guilt. Lower levels of guilt were significantly associated with higher levels of trait impulsivity (p=.004). In the second study, gamblers had higher state levels of guilt than non-gamblers at the outset, and the narration paradigm successfully induced guilt (p=.001). After the guilt induction, the group of gamblers had significantly less risky behaviour (lower number of pumps) than the group of non-gamblers (p=.021). However, this was primarily driven by an increase in risky behaviour in the non-gamblers (p=.006). Thus, overall our findings suggest that higher trait levels of guilt may act as a protective factor for gambling, whereas high state levels of guilt lead to riskier behaviour but only in people who are not gamblers.

Keywords: Gambling; shame; guilt; self-disgust; emotion-induction; risky behaviour

Introduction

In recent years there has been a growing research interest in problem gambling, which is considered to be under-investigated relative to other addictive behaviours (Griffiths, 2010). Problem gambling has an impact at the individual (e.g., health and finances) and societal levels (public economy and health; Griffiths, 2010), and has been identified by some authors as an "*emergent public health issue*" (Calado et al., 2016). In Europe, according to recent systematic reviews (Calado et al., 2016; 2017), the life-time and past-year prevalence rates for problem gambling range from 0.1% to 3.4% and 0.12% to 3.4%, respectively, with younger age (Calado et al., 2017; Gupta & Derevensky, 1998; 2000), and male gender (Calado et al., 2016; 2017) being among the socio-demographic factors associated with higher prevalence rates.

Although early studies (Gupta and Derevensky, 1998; Heatherton and Baumeister, 1991; Jacobs, 1986) proposed elevated negative affect as a risk factor for engaging in addictive behaviours (e.g., as a coping strategy), research on the role of affect in problem gambling remains scarce to date (Kushnir et al., 2016). In the few studies conducted so far, it has been proposed that trait-levels of negative self-conscious emotions (SCEs) could be potential risk factors for problem gambling (Gupta and Derevensky, 1998; Yi, 2012), predict motivational reasons to quit gambling (Kushnir et al., 2016), and act as a barrier for seeking treatment (Suurvali et al. 2012). Self-conscious emotions (e.g, shame, guilt, pride, embarrassment etc.) are complex emotions associated with higher-order goals, which have evolved to regulate social behaviour according to moral norms (Tangney et al., 2007; Tracy & Robins, 2004, 2007). Thus, it has been proposed that SCEs would play a significant role in self-regulation and self-control (Eyal and Fishbach, 2010; Gilead et al., 2016; Williams and DeSteno, 2008; Zemack-Rugar et al., 2007), by prioritizing long-term goals over short-term ones, particularly in the face of conflict. Research in relation to gambling has primarily focused on two of the negative

SCEs, guilt and shame. Although these two emotions are closely related, they possess distinct characteristics. While shame is directed towards the identity of the self as whole, guilt is attached to a particular behavior or action (Tangney, 1991, 1995; Tangney, et al., 1992; 1996). In addition, the experience of guilt tends to trigger adaptive reactions/behaviours (e.g., apologizing) to undo the damage that has been done, whereas shame seems to be a more pathogenic emotion without a clear adaptive function (Tangney, 1991, 1995; Tangney et al., 1992; 1996). Thus, Tangney, Baumeister, and Boone, (2004) have proposed that shame and guilt may relate differently to self-control. That is, high levels of guilt but lower levels of shame would be associated with enhanced self-control.

In line with this hypothesis, Yi (2012) found, in a sample of 284 participants, that problem gamblers had significantly higher levels of shame and lower levels of guilt than moderate-risk gamblers, who significantly differed in the same direction from low-risk gamblers. In addition, they found that gambling severity scores were positively correlated with shame and negatively correlated with guilt, and that the group of gamblers overall had significantly greater trait levels of guilt than shame. The author concluded that shame, but not guilt, is a potential risk factor for problem gambling. However, the study recruited only people "who felt badly about a recent gambling loss", so their findings may only be relevant to a particular group of gamblers. Further support for this hypothesis can be found in Kushnir et al.'s study (2016), which reported that higher trait levels of guilt were associated (predicted) with autonomous motivation to quit, which is in turn associated with sustained healthy behavioural changes (Koestner et al. 2008). On the other hand, higher trait levels of shame were associated (predicted) with more controlled forms of motivation for change (introjected and external). In a recent study, Sanchez et al. (2019) found that impulsivity was negatively related with guilt (but not with shame) in a sample of students. Furthermore, guilt significantly mediated the relationship between impulsivity and self-reported behavioural problems (e.g.,

substance use, aggressive behaviour). The authors concluded that people who have high levels of impulsivity may be less likely to evaluate their transgressions negatively, which would result in lower levels of guilt relative to non-impulsive people. On the other hand, people with higher trait levels of guilt may more likely supress their impulses to avoid experiencing negative emotions.

Two our knowledge, a third potentially relevant negative SCE, namely self-disgust, has not been explored in relation to gambling. Self-disgust is an enduring negative appraisal of the self as disgusting, which encompasses two aspects: disgust towards one's physical self (image) and towards one's actions (Overton et al., 2008; Powell et al., 2015). Self-disgust appears to be a pathogenic emotion that triggers maladaptive behaviours such as social avoidance (Powell et al., 2013). Despite the similarities between this emotion and shame, research supports the contention that self-disgust is independent of other negative self-conscious emotions (Powell et al., 2013; 2015). Studies have reported elevated self-disgust in impulse control-related disorders such as eating disorders (Fox & Froom, 2009), obsessive-compulsive disorder (Olatunji, Cox, & Kim, 2015), and Parkinson's disease (Tsatali, Overton & Vivas, 2019). Moreover, levels of self-disgust have been positively correlated with trait-impulsivity scores (Lazuras et al, 2018; Tsatali et el., 2019), and with clinical symptoms of impulsivity in Parkinson's disease (Tsatali et al., 2019). These findings suggest that, as with shame, trait self-disgust may be a potential risk factor for other impulse control disorders such as problem gambling.

While the evidence above supports a link between negative SCEs, impulsivity and impulse control in general, and gambling in particular, the directionality and exact nature of the relationship is still unclear. That is, higher levels of negative SCEs could act as barrier (e.g., guilt) or facilitator (e.g., shame, self-disgust) of impulsive behavior. At the same time, research also suggests that impulsive people may experience less guilt following impulsive

decisions (Lin et al., 2009). A better understanding of the relationship between negative SCEs and impulse control may have important implications for designing future interventions to reduce gambling and other impulsive behaviours. Having this in mind, we report here two studies investigating the relationship between negative SCEs, gambling, and risky behavior. In the first study we investigated shame, guilt and self-disgust in a group of problem-gamblers and in a group of non-gamblers, taking into account depressive and anxiety symptoms. In the second study, we investigated if experimentally manipulating state levels of guilt, using a narration-induction paradigm, in students with different levels of gambling behavior would influence their behavior in the *Balloon Analog Risk Task*.

Study 1

Although evidence supports a link between negative SCEs, and impulsivity and impulse control (Olatunji et al., 2015; Sanchez et al, 2019; Tsatali et al., 2019; Yi, 2012), there is very limited research investigating guilt and shame in problem gambling, and to our knowledge no study looking into self-disgust. In this first study we investigated these three negative self-conscious emotions in a group of problem gamblers, and a matched control group of non-gamblers. Yi (2012) reported lower levels of guilt and higher levels of shame in problem-gamblers relative to moderate and low risk gamblers. However, their sample may not have been representative of the general population of gamblers, since only those individuals who felt bad about their gambling behaviour were recruited. In addition, the authors did not take into accountdepressive symptoms, which are increased in problem gamblers (Boughton, & Falenchuk, 2007; Källmén, Andersson, & Andren, 2008), and are also strongly associated with shame (but less so with guilt; Kim, Thibodeau, & Jorgensen, 2011; Tangney et al. 1992). Thus, increased levels shame in the problem gamblers could have been due to elevated depressive symptoms in this group. Based on the few studies conducted so far, we expect that problem

gamblers will report higher levels of shame and lower levels of guilt than non-gamblers. In addition, based on the association between higher levels of self-disgust and impulse control disorders, and the pathogenic nature of this emotion, we also expect that problem gamblers will show higher levels of self-disgust relative to controls. We also tested whether the pattern of results was affected by the confound of depression and anxiety.

Method

Participants

For the purposes of this study, 80 Greek speaking participants were recruited from the population of Thessaloniki, Greece. Participants (53% male, 47% female) in the Problem-Gamblers group (N=40) were recruited from an online gambling ("slot machines") establishment in Thessaloniki. Specifically, every person who entered the establishment (which only admitted people above the age of 21), during the time that data collection took place, was informed about the study at the front desk and was given the opportunity to participate in the study. Inclusion criteria were a score equal to or above 8 in the *Problem Gambling Severity Index* (Stinchfield, Govoni & Frisch, 2007). Fourteen participants who agreed to participate but scored below this criterion were not included in the study. The ages of the participants in the Gambling group ranged from 23 to 70 years old (see Table 1). Participants (55% male, 45% female) in the Non-gambling group (N=40) were recruited from public institutions in Thessaloniki. The ages of control participants ranged from 23 to 72 years old. The inclusion criterion was a score of 0 in the *Problem Gambling Severity Index* (Stinchfield et al., 2007). Four participants were eliminated from this group due to incomplete data. The study was approved by the University of Sheffield Ethics Committee, and informed written consent was obtained from all the participants.

The group of problem gamblers did not differ significantly from the group of non-gamblers on age and distribution of gender, but problematic gamblers had significantly higher levels of trait impulsivity, anxiety and depressive symptoms (see Table 1).

-Insert Table 1 about here-

Measures and Procedure

The *Problem Gambling Severity Index* (PGSI; Stinchfield et al., 2007*)* was used to assess the gambling habits of the participants and create the groups. The tool is a brief self-report measure consisting of nine questions assessing gambling-related behaviors and the consequences of gambling for the past 12 months. The PGSI was developed to assess gambling in the general population (Holtgraves, 2008). It uses a scale from 0 (never) to three (almost always), and the total score ranges from zero to twenty-seven. A score of zero indicates that someone is not a gambler, while a score of eight (8) and above distinguishes someone as a problem-gambler. The tool was translated into Greek via the translation-back-translation method for the purpose of this study. The Cronbach's alpha for the current sample was .95, which is considered excellent.

The *Hospital Anxiety and Depression Scale* (HADS; Zigmond & Snaith, 1983; Michopoulos, Douzenis, Kalkavoura, et al., 2008) assesses anxiety and depression symptoms, since it is suitable for the general population (Bjelland, Dahl, Haug, & Neckelmann, 2002). The HADS includes 14 items, with a scale ranging from 0 (not at all) to 3 (most of the time). The maximum score in the anxiety and depression sub-scales is 21. The Cronbach's alpha for the current sample were α=.86 and α=.85 for the anxiety and depression subscales, respectively.

The *Barratt's Impulsiveness Scale-11* (BIS-11; Patton, Stanford, & Barratt, 1995; Giotakos, Markianos, Vaidakis, & Christodoulou, 2003) measures trait impulsivity. The BIS-

11 consists of 30 items, with a scale from one (rarely/never) to four (constantly/most of the time). The Cronbach's alpha for the current sample was α=.91.

The *Test of Self-Conscious Affect-3* (TOSCA-3; Tangney, Dearing, Wagner, & Gramzow, 2000; Gouva, Kaltsouda & Paschou, 2012) assesses proneness to shame, guilt, pride (alpha and beta), externalization and detachment. The tool consists of sixteen scenarios, with a scale from one (not likely) to five (very likely). For this study only the scores for shame and guilt were included in the analyses. The Cronbach's alpha for the current sample were α=.86 and α=.82 for guilt and shame, respectively.

The *Self-Disgust Scale* (SDS; Overton et al, 2008; see Tsatali et al., 2019 for the Greek validation, the SDS-G) measures disgust directed towards the Self. It consists of an 18-items (with 6 filler items), and scores can range from 12 to 84. The Cronbach's alpha for current sample was α=.81.

Participants from the gambling group were approached in the gambling establishment they frequent, and those who agreed to participate were provided with the self-report questionnaires in a closed envelope that they had to return to the staff of the establishment. Participants in the control group were approached by the researcher at public institutions (e.g, universities, the public library, gyms etc.), and those who agreed to participate were provided with the self-report questionnaires in a closed envelop that they had to return to the front desk.

Results

We conducted bi-variate Pearson correlations to explore the relationship between SCEs, impulsivity scores, and anxiety and depressive symptoms in the full sample (see Table 2). TOSCA-Guilt scores were significantly negatively correlated with BIS-11 scores, r=-.328, p = .004, HADS-D, r=-.320, p =.005, and positively correlated with TOSCA-Shame, r=.616, p <.001. That is, lower levels of guilt were associated with greater levels of trait impulsivity and

depression. TOSCA-shame scores were also significantly positively correlated with HADS-A, r=.392, p <.001, and SDS-G scores, r=.336, p =.033. In addition, SDS-G scores had significant positive correlations with HADS-A, r=.473, p <.004], HADS-D, r=.591, p <.001, and BIS-11, r=.357, p = .002. That is, higher levels of self-disgust were associated with higher levels of impulsivity, anxiety and depression. Finally, BIS-11 scores were significantly positively correlated with HADS-A, r=.292, p =.011, and HADS-D, r=.391, p <.001. Since anxiety and depression symptoms significantly correlated with the impulsivity measure, we then conducted partial correlations between SCEs and impulsivity adjusting for HADS total scores. The negative correlation between impulsivity and guilt remained significant, r=-.275, p = .017, whereas the correlation with self-disgust was no longer significant, r=.180, p = .122. The correlation between impulsivity and shame remained non-significant, r=-.175, p = .133.

-Insert Table 2 about here-

To test for differences between problem gamblers and non-gamblers on SCEs, the mean scores from the self-report questionnaires were submitted to a one-way MANOVA with group as the between subject factor and scores from the SDS-G, and the subscales of shame and guilt (TOSCA) as dependent variables. According to Pillai's Trace there was a significant main effect of group on SCEs, V = .153, F(3, 72) = 4.326, p = .007, ηp^2 = .153. Univariate analyses showed that problem-gamblers had significantly lower self-reported levels of guilt than non-gamblers, F(1, 74) = 11.24, p = .001,ηp^2 = .132. There were no significant differences between the groups on shame, F(1, 74) = 3.35, p = .071, ηp^2 =.043, and self-disgust scores, F(1, 74) = 1.62, p =.206, ηp^2=.021. Since Problem-Gamblers and Non-Gamblers significantly differed on depression and anxiety scores, and depressive and anxiety symptoms scores significantly correlated with self-disgust and shame scores, we conducted a further MANCOVA with Group as the between subject factor and HADS total scores as the co-variate. According to Pillai's

Trace, the main effect of Group on SCEs remained statistically significant, V = .120, F (3, 71) = 3.23, p = .028, ηp^2 = .120. Univariate analyses showed that the main effect of group on guilt scores continued to be significant after adjusting for the influence of depression and anxiety, $F(1, 73) = 8.26$, $p = .005$, $\eta p^2 = .102$; and the main effect of group on shame scores now reached statistical significance, $F(1, 73) = 8.36$, $p = .005$, $\eta p^2 = .103$. That is, problem gamblers had significantly lower levels of shame and guilt (adjusted means of 38.11 and 55.24, respectively) than non-gamblers (adjusted means of 45.97 and 63.47, respectively) after adjusting for the effect of depression and anxiety symptoms. The main effect of group on self-disgust scores remained non-significant, $F(1, 73) = .25$, $p = .616$, $\eta p^2 = .003$. Finally, given the relatively strong correlation between guilt and shame scores in this sample, we further conducted two univariate ANCOVAs to test for differences when adjusting for the influence of shame on guilt, and vice-versa. The results showed that problem gamblers had significantly lower levels of "shameless" guilt (adjusted mean of 56.24) than non-gamblers (adjusted mean of 62.37), $F(1, 73) = 7.48$, $p = .008$, $\eta p^2 = .093$. However, the main effect of group on shame scores was no longer significant when adjusting for the influence of guilt scores, $F(1, 73) = .033$, $p = .857$, $\eta p^2 < .001$.

Discussion

Although negative SCEs have been closely linked to impulse control and impulsivity, they have received very little attention in relation to problem gambling, which is also an under-researched addictive behaviour (Griffiths, 2010). In this study, we investigated shame and guilt, two emotions that have been linked to problem gambling in the limited research conducted so far (Yi, 2012), and self-disgust, an emotion yet to be studied in relation to problem gambling. Addressing limitations of previous studies we took into account the potential confounding effect of depression and anxiety in the analyses. We found that problem gamblers had

significantly lower trait-levels of guilt than non-gamblers, and this was still the case when we adjusted for the influence of anxiety and depressive symptoms. Lower levels of guilt were also significantly associated with higher levels of trait impulsivity, even after adjusting for the effect of anxiety and depressive symptoms. Problem gamblers had also significantly lower trait levels of shame, but only when we adjusted for the influence of depression and anxiety symptoms. Furthermore, the two groups no longer differed on shame when we adjusted for the influence of guilt. Shame scores were not significantly correlated with trait impulsivity, and the two groups did not significantly differ on self-disgust levels. Although self-disgust significantly correlated with trait impulsivity, this was no longer the case when we adjusted for the effect of anxiety and depressive symptoms.

To conclude, our first study suggests that lower levels of trait guilt may act as a risk factor (facilitator) for problem gambling. Although it is more logical to assume that lower trait levels of guilt may be an antecedent to the development of problem gambling, the quasi-experimental nature of our study does not allow for conclusions on causality. Thus it is possible that the reduced guilt in problem gamblers is the result of down-regulation by coping strategies. This would be in line with the study by Lin et al. (2009), which showed that impulsive people may experience less guilt following impulsive decisions. To address the issue of causality, in the next study we investigated the effect of manipulating levels of state guilt on risky behavior in students with different levels of gambling behavior.

Study 2

The second study aimed to investigate the causal link between guilt and impulsive, risky behaviour in students who exhibit some degree of gambling behaviour and a control group of non-gamblers. To do so we recruited 49 undergraduate and postgraduate students and based on their scores on the PGSI, we created a group of non-gamblers and a mixed group of gamblers

with low, moderate and problem gambling. Yi (2012) found that the pattern of findings with shame and guilt levels were similar across low-risk, moderate-risk and problem gambling groups, with the difference between the groups being quantitative and not qualitative in nature. To induce guilt experimentally we used a narration paradigm adapted from Dickerson et al., (2004), which has been shown to be effective in two Greek samples (patients and healthy controls; Tsatali et al., 2019). That is, participants were asked to narrate a past experience that made them feel guilty, and in the control condition, they were asked to narrate what they did the day before. Finally, we measured behavioural impulsivity with the *Balloon Analog Risk Task* (BART; Lejuez et al., 2002).

Impulsivity is a complex multidimensional construct (Castellanos & Tannock, 2002; Reynolds & Schiffbauer, 2004; Swann, Bjork, Moeller, & Dougherty, 2002). Different sub-components have been proposed by different authors, but most authors agree on the distinction between motor and cognitive impulsivity (see Chowdhury et al., 2017, for a meta-analysis). While cognitive impulsivity refers to prioritising smaller and immediate rewards over larger but delayed rewards in decision making, motor impulsivity refers to the ability to supress urges. Interestingly, self-report measures of trait impulsivity (e.g, the *Barratt Impulsivity Scale*) and behavioural measures tend to correlate weakly, which suggests that these measures may reflect different aspects of impulsivity (Broos et al., 2012; Clark, Robbins, Ersche, & Sahakian, 2006; Reynolds, Ortengren, Richards, & de Wit, 2006; Wingrove & Bond, 1997). In addition, the weak correlation could reflect some of the limitations of self-report measures, which may be influenced by social desirability and by lack of insight concerning behaviour (e.g., Ladouceur et al., 2000; Lejuez et al., 2002). The BART is a "*laboratory based measure that involves actual risky behavior for which, similar to real-world situations, riskiness is rewarded up until a point at which further riskiness results in poorer outcomes*" (p.76, Lejuez et al., 2002), which has

been shown to significantly correlate with most of the self-report measures of impulsivity and self-reported actual risky behaviour, including gambling.

If lower guilt facilitates (antecedent) gambling behaviour in impulsive individuals, then we expect that increasing state guilt via the narration induction will result in less risky behaviour as measured by the BART, relative to the neutral condition. Furthermore, this effect should be greater, or only present, in the gambling group.

Method

Participants

Forty-nine native Greek speaking participants (59% female), studying at a university in Northern Greece, were recruited for the present study. Their ages ranged from 19 to 39 years old. Based on scores obtained from the *Problem Gambling Severity Index* (Stinchfield et al., 2007), participants were further allocated to a Non-gambling (a score of 0, N = 30) and a Gambling group (a score of 1 or above, N=19). In the Gambling group, 52% of the participants were of low risk (a score of 1 or 2), 37% of moderate risk (a score from 3 to 7), and 11% were problem gamblers (a score of 8 or above). See Table 3 for demographic and psychological characteristics of the groups. The study was approved by the University of Sheffield Ethics Committee, and informed written consent was obtained from all the participants.

The group of gamblers did not significantly differ from the non-gamblers on age, distribution of gender, anxiety and depressive symptoms and trait impulsivity (see Table 3).

-Insert Table 3 about here-

Measurements and Procedure

Emotion induction paradigm. Emotion was induced with the narration paradigm employed in Tsatali et al. (2019), which was adapted from the one used by Dickerson et al., (2004) . Narration induction included two conditions: guilt induction and neutral. In the guilt

condition, the instructions were as follows: "*I would like you to describe one of the most traumatic experiences that made you feel guilty. It could be an experience such as a difficult romantic relationship, a time that didn't reflect to you expectations or someone else's expectations or a traumatic event that you feel responsible for. It is important that you talk about your deeper thoughts and emotions. Ideally, anything you talk about should be connected to a situation or experience you haven't talked about in detail to others*". In the neutral condition the instructions were: "*I want you to tell about what you did during the past 24 hours. You should describe your activities and schedule in detail, discussing the facts and circumstances as objectively as possible. You might describe what you had for dinner last night, what time you got up this morning, and so forth. The important thing is you discuss the facts and try to remain objective about your activities*". To measure emotional experiences before and after the induction, we employed a Visual Analogue Scale. To the prompt "How do you feel about yourself?", participants were asked to tick the number that best indicated their emotion from 0 (Not at all guilty) to a 100 (Intense guilty). Participants were also asked to report other non-target emotions (e.g., sadness, anger, happiness).

The Balloon Analog Risk Task (BART; Lejuez et al., 2002). This a computerized task developed to measure risky behaviour. The experiment was designed and run with the software Opensesame (Zosky, 2019). Each trial consists of a small balloon presented in the centre of the screen. Participants are instructed to press the space bar to inflate (pump) the balloon in order to earn money in a virtual bank. For each pump, 5 cents are deposited in a "temporary bank". To cash out the money in a permanent bank they must stop pumping and press the "?" key. However, if the balloon explodes they lose the money earned. Sound feedback was given for the key responses/events; that is, a "pop" sound occurred for each pump, "a slot-machine giving money" sound occurred every time the participant cashed out the money in a permanent bank,

and an explosion sound occurred every time the balloon exploded. There were twenty experimental trials. The total number of pumps was employed for the analyses.

In addition, the following self-report scales, also included in Study 1, were administered to participants; the *Problem Gambling Severity Index* (PGSI; Stinchfield et al., 2007*),* the *Hospital Anxiety and Depression Scale* (HADS; Zigmond&Snaith, 1983; Michopoulos et al., 2008), and the *Barratt Impulsiveness Scale-11* (BIS-11; Patton et al., 1995; Giotakos et al., 2003).

On arrival, participants were asked to fill in the self-report measures. Then, participants took part in one of the emotion-induction conditions (guilt or neutral), which was followed by the BART. Within 3 weeks, participants were asked to take part in the second emotion-induction condition, which was followed by the BART as before. The order of the emotion-induction condition was counterbalanced across participants.

Results

Emotion Induction analyses

VAS scores for guilt were submitted to a 2 x 2 x 2 mixed ANOVA with Induction condition (Guilt and Neutral) and Time (pre and post) as within-subject factors, and Group (Gamblers and Non-gamblers) as the between-subject factor (see Figure 1). The results showed significant main effects of Induction condition, Time and Group, $F(1, 47) = 21.79$, $p < .001$, $\eta p^2 = .317$, $F(1, 47) = 4.99$, $p = .030$, $\eta p^2 = .096$, and $F(1, 47) = 6.04$, $p = .018$, $\eta p^2 = .114$, respectively. That is, guilt experience intensity (VAS scores) was higher for the guilt condition (34) than for the neutral condition (19), for the post-induction (30) than the pre-induction condition (24), and for the gambling group (33) relative to the non-gambling group (20). The interaction Induction condition by Time also reached statistical significance, [$F(1, 47) = 36.65$,

p <.001, ηp^2 = .438]. The analysis of the interaction showed that the two Induction conditions did not significantly differ in guilt intensity before the induction (t =.052, p =.958); whereas guilt intensity was significantly higher for the guilt condition relative to the neutral condition after the induction (t = 7.67, p <.001; see Figure 2). That is, the experimental manipulation was successful in inducing the SCE of guilt. None of the other interactions reached statistical significance: Time by Group [F(1, 47) = .78, p =.382, ηp^2 = .016], Induction condition by Group [F(1, 47) = .06, p =.801, ηp^2 = .001], and Time by Induction condition by Group [F(1, 47) = .19, p =.661, ηp^2 = .004].

-Insert Figures 1 and 2 about here-

BART analyses

Total number of pumps was submitted to 2 x 2 mixed ANOVA with Induction condition (Guilt and Neutral) as the within-subject factor and Group (Gamblers and Non-gamblers) as the between-subject factor (see Figure 3). The main effects of Group and Induction condition did not reach statistical significance, F(1, 47) = 1.51, p =.225, ηp^2 = .031 and F(1, 47) = .19, p =.662, ηp^2 = .004, respectively. However, their interaction was statistically significant, F(1, 47) = 8.75, p =.005, ηp^2 = .157. The analysis of the interaction showed that Gamblers and Non-gamblers did not significantly differ on risky behaviour after the neutral narration induction (t(47) = .33, p =.742). However, after the guilt induction, the group of gamblers had significantly less risky behaviour (lower number of pumps) than the group of non-gamblers (t(47) = 2.39, p = .021; see Figure 3). In addition, while the number of pumps tended to increase for the Non-gamblers and decrease for the Gamblers in the guilt condition, relative to the neutral condition, the difference was only significant for the former, (t(29)=2.99, p =.006 and t(18)=1.43, p =.171, respectively).

-Insert Figure 3 about here-

Discussion

In the second study we tested the hypothesis that increasing state guilt in gamblers would reduce risky behaviour relative to a neutral condition. To this end, we employed a narration paradigm (Dickerson et al., 2004; Tsatali et al., 2019) to induce guilt in a group of students with different degrees of gambling behaviour, and without gambling, and measured guilt intensity using a VAS. The group of gamblers reported higher intensity of state guilt relative to the non-gamblers. Furthermore and regardless of the group, the guilt intensity was significantly higher at post induction for the guilt condition relative to the neutral condition. That is, the paradigm was effective in inducing guilt.

The key finding of this study is that the effect of the induction condition on risky behaviour (total number of pumps in the BART) was further modulated by the group factor. That is, the gambling group showed significantly less risky behaviour than the non-gambling group after the induction of guilt. However, this interaction was mostly driven by an increase in risky behaviour, after the guilt induction relative to the neutral condition, in the non-gambling group. Although there was a tendency for the gambling group to exhibit reduced risky behaviour after the guilt induction, relative to the neutral (see Figure 3), this was not statistically significant.

General Discussion

We present here two studies that investigated negative SCEs in gambling. In the first Study, we assessed trait-levels of shame, guilt and self-disgust in a group of problem-gamblers and in a matched (on age and gender) group of control non-gamblers, to test the hypothesis that negative SCEs may act as risk factors. Unlike previous studies, we also investigated the

potential confounding effect of elevated depressive and anxiety symptoms in problem-gamblers. In the second study, to investigate causality, we experimentally manipulated state guilt (via narrations), and measured the effects of this manipulation on risky behaviour in a group of students with different degrees of gambling behaviour, and a control group of non-gamblers. To our knowledge, this is the first study to investigate the effects of experimentally induced SCEs on risky behaviour using a computerised experimental task (BART). Our finding of reduced guilt experience in problem gamblers (Study 1) is in agreement with Yi's (2012) finding, but we further extended it to a sample of problem-gamblers that were randomly selected. We also found that reduced guilt was unaffected by the increase in general negative affect (depressive and anxiety symptoms) associated with problem gambling. In agreement with this and with the study of Sanchez et al. (2019), we also found that lower levels of guilt were significantly associated with higher levels of trait impulsivity in the overall sample.

However, we did not replicate the finding of increased shame in problem gamblers reported by Yi (2012). Actually, problem gamblers in our study had lower levels of shame when adjusting for the influence of general negative affect (anxiety and depression). Given that guilt and shame were strongly correlated in our sample, and that the difference in shame was no longer significant after adjusting for the influence of guilt, we conclude that this difference was driven by guilt. This conclusion is supported by the lack of a significant correlation between shame and impulsivity, and the findings of Sanchez et al. (2019), who also did not find a significant relationship between shame and impulsivity. In their study, unlike guilt, shame did not significantly mediate the relationship between impulsivity and general problem behaviour. Higher levels of shame have been more frequently associated in the literature with decreased impulse control than guilt (e.g., with alcohol problems in Dearing, Stuewig, & Tangney, 2005, and eating disorder symptoms in Sanftner et al., 1995). Further it has been

suggested that due to its maladaptive nature, higher trait level of shame may act as a risk factor by increasing the vulnerability to use behaviours, such as substance use or gambling, as an escape mechanism (Gupta and Derevensky, 1998; Yi, 2012). Our findings do not support this hypothesis.

Our conclusion regarding shame is supported by the lack of difference between the groups on self-disgust, an emotion that similarly to shame, and unlike guilt, has been associated with maladaptive behaviours (Powell et al., 2013). Given the strong relationship between shame and depression (Kim et al., 2011) and the higher prevalence of the later in problem gamblers (Boughton, & Falenchuk, 2007; Källmén et al., 2008), their effects may have been confounded in previous studies. For instance, Yi (2012) did not measure or control for the influence of anxiety and depressive symptoms. Similarly, in our study, the relationship between higher levels of self-disgust and impulsivity was no longer significant when adjusting for the influence of depressive and anxiety symptoms.

The findings from our second study are in partial agreement with our hypothesis, and suggest that trait and state guilt may relate differently with impulse control, and that this relationship may be further modulated by whether the individual has some degree of gambling problem or not. Partially in line with our hypothesis, we found that inducing guilt resulted in reduced risky behaviour in the group of gamblers, but only as compared to the non-gambling group. The finding of increased risky behaviour after the guilt induction in the group of non-gamblers, relative to a neutral condition was unexpected, and is not in agreement with the findings of our first study and other studies that reported higher trait levels of guilt in non-gamblers relative to gamblers (Yi et al., 2012). Thus, our findings suggest that higher trait level of guilt may act as a protective factor for gambling, whereas high state levels of guilt result in

riskier behaviour but only in people who are not gamblers. If this is the case, trait and state guilt may influence self-control and impulse control in opposite ways.

The discrepancy between trait and state measures of guilt was also supported by the finding of elevated baseline guilt in the group of gamblers relative to the group of non-gamblers. This finding is in opposition to the lower trait levels of guilt in gamblers relative to non-gamblers in our first study and in Yi's study (2012). The differentiation, and discrepancy, between state and trait measures of emotions is widely supported by the relevant literature (e.g., Bieg, 2013; Conner & Barrett, 2012). Trait emotions are generally believed to reflect individual tendencies to react in a certain way to similar situations (Bieg, 2013). In line with this notion, Tangney and Dearing (2002) showed that trait levels of guilt and shame at 12 years of age predicted relatively well the levels at the age of 18. On the other hand, state emotions are defined as momentarily occurring emotions, which are strongly influenced by situational variables (Eid & Diener, 1999). Consequently, it has been suggested that trait measures of emotions may reflect beliefs about ones' emotions rather than the actual emotions (Robinson & Clore, 2002), while state measures of emotions would more validly reflect real-time life experiences (Bolger et al., 2003; Shiffman et al., 2008). In support of this, TOSCA guilt focuses more on reparation than the affective component of guilt (Giner-Sorolla, Piazza, & Espinosa, 2011), and state and trait guilt can be dissociated in terms of their associations (Dorahy, & Schumaker, 1997). In conclusion, trait and state measures of guilt are both valuable but may capture different aspects of the same construct (Robinson & Clore, 2002).

In terms of limitations, although the problem gambler group in Study 1 had higher levels of impulsivity than the non-gambler group, in Study 2 this was not the case. Although this may suggest that the participants in the two studies differed somewhat, there is a trend in the scores on the BIS-11 to be higher in the gambler group than the non-gambler group in Study 2. The

lower levels of impulsivity in the gambler group may have resulted from the inclusion of participants who had relatively low scores on the PGSI.

To conclude, we studied the potential contribution of negative SCEs (shame, guilt and self-disgust) to gambling behaviour using two methodological approaches (self-reports and experimental manipulation) and in two different populations, namely in problem gamblers (Study 1) and in students with different levels of gambling behaviour (Study 2). Problem gambling is considered to be an emergent public health issue (Calado et al., 2016), with incurs great health and financial costs at the individual and societal levels. Thus, shedding light on the relationship between negative SCEs and impulse control may have important implications for designing future interventions. Our findings suggest that higher trait levels of guilt may act as a protective factor for gambling, whereas high state levels of guilt lead to riskier behaviour but only in people who are not gamblers. Since this is the first study to establish a *causal* relationship between state guilt and risky behaviour, future studies should aim at replicating this finding in other populations and with other measures that tap into different aspects of impulsivity and impulse control (e.g., inhibition, and delayed reward). Future studies should also investigate what aspects of trait versus state measures of guilt (e.g., reparation and remorse) lead to increase/decrease of gambling behaviour and risky behaviour overall.

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Table 1. Demographic and psychological characteristics of participants classified as Problem Gamblers and Non-Gamblers in Study 1.

	Problem Gamblers		Non Gamblers			
	Mean	S.D.	Mean	S.D.	t	p
Age (years)	46.68	11.38	43.56	13.17	1.11	.272
Men % (n)	53% (21)		55% (20)		χ^2=.07	.821
Women % (n)	47% (19)		45% (16)		--	--
HADS-A	8.48	4.47	6.13	3.72	2.46	.016
HADS-D	7.85	6.02	4.69	2.77	2.88	.005
BIS-11	77.73	16.61	60.33	9.00	5.586	<.001
PGSI	15.68	5.28	.00	.00	17.08	<.001

HADS-D= Depression subscale from the Hospital Anxiety and Depression Scale; HADS-A=Anxiety subscale; BIS-11= Barratt Impulsiveness Scale; PGSI= Problem Gambling Severity Index

Table 2. Correlations between psychological variables and self-conscious emotion outcome variables in the overall sample in Study 1(N=76).

	1.HADS-A	2.HADS-D	3.BIS-11	4.TOSCA-S	5.TOSCA-G	6.SDS-G
2.	.667**					
3.	.292*	.391**				
4.	.392**	.104	-.059			
5.	-.042	-.320**	-.328**	.616**		
6.	.473**	.591**	.357**	.336**	-.027	

HADS-D= Depression subscale; HADS-A=Anxiety subscale; BIS-11= Barratt Impulsiveness Scale; TOSCA-S=Shame subscale; TOSCA-G=Guilt subscale; SDS-G =Greek translation of the Self-Disgust Scale. *p<.05, **p<.001.

Table 3. Demographic and psychological characteristics of participants classified as Gamblers and Non-Gamblers in Study 2.

	Gamblers		Non Gamblers			
	Mean	S.D.	Mean	S.D.	t	p
Age (years)	25.37	5.49	25.70	5.36	.21	.835
Men % (n)	53% (10)		33% (10)		χ^2=1.79	.237
Women % (n)	47% (9)		67% (20)		--	--
HADS-A	8.21	4.99	8.03	4.39	.13	.897
HADS-D	5.37	3.61	4.50	3.17	.89	.396
BIS-11	64.21	10.97	62.20	9.31	.69	.496
PGSI	3.00	2.21	.00	.00	7.48	<.001

HADS-D= Depression subscale from the Hospital Anxiety and Depression Scale; HADS-A=Anxiety subscale; BIS-11= Barratt Impulsiveness Scale; PGSI= Problem Gambling Severity Index

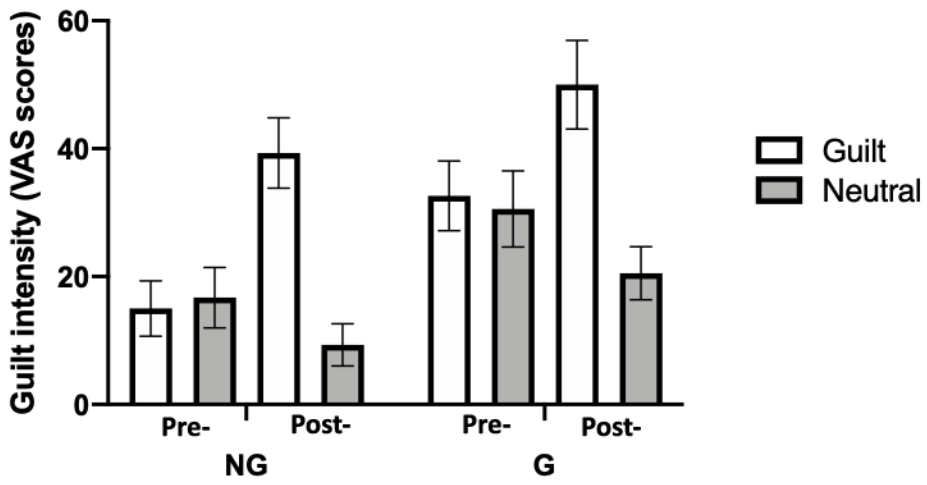

Figure 1. Guilt intensity (VAS scores) as a function of Group (NG=Non-gamblers and G=Gamblers), Time (Pre vs Post induction) and Induction condition (Guilt vs Neutral) in Study 2.

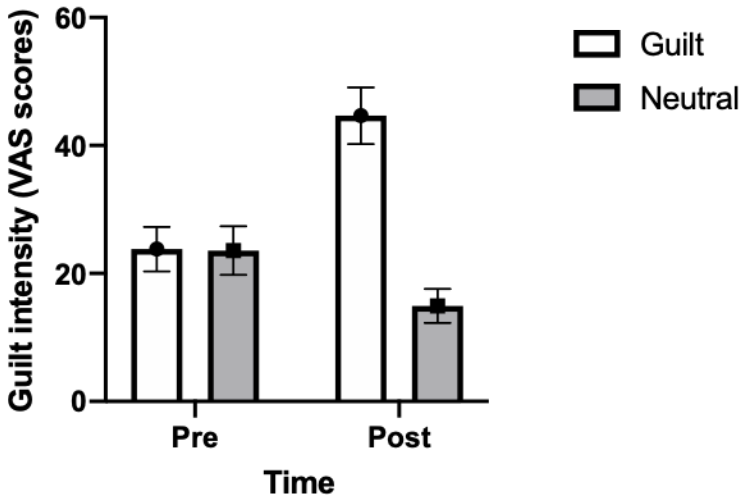

Figure 2. Guilt intensity (VAS scores) as a function of Time (Pre vs Post induction) and Induction condition (Guilt vs Neutral) in Study 2.

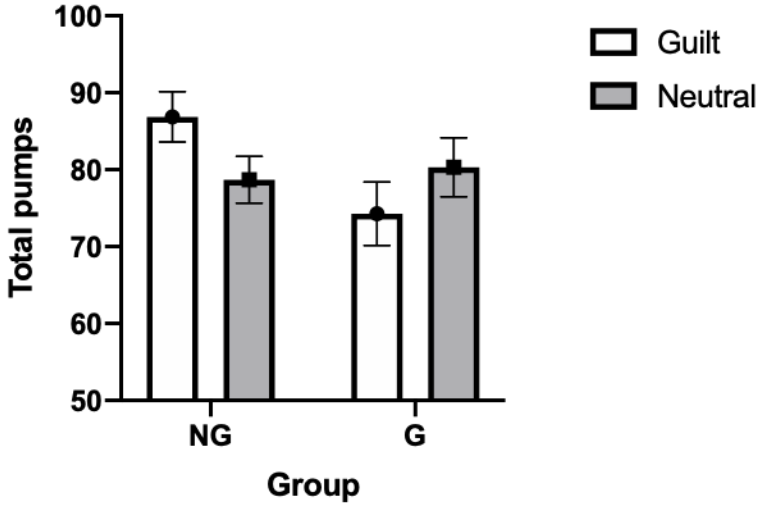

Figure 3. Total number of pumps in the BART as a function of Group (NG=Non-gamblers vs G=Gamblers) and Induction condition (Guilt vs Neutral) in Study 2.