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The relationship between gambling affinity, impulsivity, sensation seeking, superstition, and irrational beliefs: An empirical study among committed gamblers

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The relationship between gambling affinity, impulsivity, sensation seeking, superstition, and irrational beliefs: An empirical study among committed gamblers

Summary. *Much of the psychological research on individual gamblers has examined a range of personality characteristics (e.g., sensation seeking, impulsivity) and other characteristics associated with gambling (e.g., superstition). The current study sought to examine the relationship between gambling affinity and superstition, paranormal beliefs, irrational beliefs about gambling, sensation seeking and impulsivity. A sample of 329 mainly 'committed' gamblers participated in a cross-sectional survey employing a wide range of validated psychometric measures. Results showed that gambling affinity was positively correlated with all measures of irrational beliefs, sensation seeking and impulsivity. High affinity gamblers were significantly more likely to endorse superstitious and irrational beliefs, and to score higher in sensation seeking than low affinity gamblers. Superstition, sensation seeking, impulsivity, and irrational beliefs about gambling predicted 32.5% of the variance in gambling affinity. Only impulsivity was a non-significant predictor and may therefore be a mediator between other factors and gambling affinity.*

Keywords: *Gambling; Gambling affinity; Impulsivity; Sensation seeking; Superstition; Irrational beliefs*

La relació entre l'afinitat al joc, la impulsivitat, la recerca d'emocions, la superstició i les creences irracionals: Un estudi empíric en jugadors regulars

Resum. *Gran part de la recerca psicològica sobre els jugadors individuals ha examinat una sèrie de característiques de la personalitat (p.ex., recerca d'emocions, impulsivitat) i altres característiques associades al joc (p.ex., superstició). El present estudi ha tingut l'objectiu d'examinar la relació entre l'afinitat al joc i la superstició, les creences paranormals, les creences irracionals sobre el joc, la recerca d'emocions i la impulsivitat. Una mostra de 329 jugadors principalment 'regulars' va participar en una enquesta transversal que utilitzava un ampli ventall de mesures psicomètriques validades. Els resultats mostren que l'afinitat al joc correlaciona positivament amb totes les altres mesures de creences irracionals, recerca d'emocions i impulsivitat. Els jugadors amb alta afinitat presentaven una probabilitat més significativa de tenir creences supersticioses i irracionals i de tenir puntuacions més elevades en la recerca d'emocions que els jugadors amb afinitat baixa. La superstició, la recerca d'emocions, la impulsivitat i les creences irracionals sobre el joc van predir el 32.5% de la variança en l'afinitat al joc. Només la impulsivitat va resultar ser un predictor no significatiu i, per tant, podria actuar com a mediador entre els altres factors i l'afinitat al joc.*

Paraules clau: *joc; afinitat al joc; impulsivitat; búsqueda de sensacions; superstició; creences irracionals*

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Introduction

In Great Britain, gambling is both popular and widespread. In the latest British Gambling Prevalence Survey, 73% of people over 16 years old participated in some form of gambling, representing around 35.5 million adults (Wardle, Moody, Spence, Orford, Volberg, Jotangia, Griffiths, Hussey & Dobbie, 2011). The National Lottery is the most common form of gambling, even among those who do not consider themselves gamblers, and around 59% of adults bought lottery tickets in 2010 (Wardle et al, 2011). Over half (56%) participated in other forms of gambling such as betting on horse and dog races, sports betting, slot machines, poker, bingo, and roulette (Wardle et al., 2011). Gambling does not appear to be a cultural phenomenon limited to certain societies and it is hugely popular throughout the world (Meyer, Hayer & Griffiths, 2009). As a result of gambling's increased popularity, there has been a significant increase in empirical gambling research over the last decade (Meyer, et al., 2009). Much of the psychological research on individual gamblers has examined a range of personality characteristics (e.g., sensation seeking, impulsivity) and other characteristics associated with gambling (e.g., superstition) (Aasved, 2002).

Gamblers have been described as being "among the most superstitious people in the modern world" (Aasved, 2002; p. 133). This has been attributed to the fact that because winning occurs in such a random fashion, it can become associated with entirely unrelated events (Aasved, 2002). Thus, behaviours that precede a win will be seen as causal and repeated before placing a bet in future. The fallibility of human reason has been proposed to be the greatest source of superstitious belief (Vyse, 1997) and superstition can take many different forms, such as belief in lucky or unlucky actions, objects, numbers, dates or people; belief in astrology, the paranormal or ghosts (Jahoda, 1971). It has been proposed that superstition serves the purpose of giving people explanations and reasons for events that actually have no purpose (Wagenaar, 1988). This leads to a differentiation between 'chance', which is beyond control, and 'luck', which is viewed as a personal attribute that can be attracted and cultivated. This is particularly important to gamblers (Wagenaar, 1988). As a consequence, gamblers may also perform certain actions, such as touching wood, or carry a 'lucky' object (e.g., a rabbit's foot), in order to exert control over luck (Darke & Freedman, 1997).

It has been suggested that belief in luck and superstition provide gamblers with an "illusion of control" over the outcome of what are essentially games of chance (Langer, 1975). This illusion of control is stronger when players have a proactive role in the game and people show more confidence in the outcome of dice games when they throw the dice themselves, or in the result of a lottery when they have chosen their own numbers (Langer & Roth, 1975; Langer, 1983). Such irrational beliefs about gambling take many forms and it has been found that, compared to non-gamblers, problem gamblers have exaggerated views of the role of skill (Griffiths, 1994; Kallmen, Anderson & Andren, 2008). Other irrational beliefs include illusory correlations, 'gambler's fallacy' (the view that a particular chance outcome is overdue) and the 'hot-hand fallacy' (belief that a chance outcome is on a 'hot' streak) (Piatelli-Palmarini, 1994). Although it has been shown that most people, even those who do not gamble, have irrational beliefs about probabilities (Ayton, Hunt & Wright, 1989; Sundali & Croson, 2006), it is reasonable to suggest that such beliefs will correlate positively with gambling behaviour and affinity.

Superstitious behaviour designed to control luck has been observed among players of the dice game craps (Henslin, 1967) and bingo (Dixey, 1987). For instance, many bingo players have routines such as buying cards in a particular order, sitting in the same seat, wearing lucky clothes and using lucky pens (Dixey, 1987; King, 1990). Bingo players have also been shown to have a high rate of superstitious behaviours such as reading the horoscope, touching wood, avoiding walking under ladders and changing the colour of their pen (Griffiths & Bingham, 2005). It has been suggested that these beliefs in the ability to control chance events and predict the future relate to belief in 'psychic' phenomena (King, 1990). It has even been shown that one-third of a group of lottery winners attributed their wins to psychic and supernatural influences (Kaplan, 1988). However, little previous research has examined the paranormal beliefs of gamblers.

It has been speculated that high stakes gamblers have more need of superstition than low stakes gamblers, because the belief in influencing external events has positive survival value for people in high-risk professions (Jahoda, 1971). However, little previous research has examined this idea, other than one recent study which found that problem gamblers reported significantly more superstitious beliefs about gambling than non-problem gamblers (Joukhador, Blaszczynzki, & MacCallum, 2004). The conclusions of this study were that such beliefs are correlated with gambling intensity. However, the superstition items examined related specifically to gambling and not to general superstition and other irrational beliefs. The current study sought to address this gap in the literature by examining the extent of superstitious beliefs, both about gambling and about general superstition and paranormal beliefs, among gamblers. These areas have been under-researched in recent years.

Paranormal belief has been studied extensively in non-gambling related studies using the original Paranormal Belief Scale (PBS) (Tobyck & Milford, 1983) and Revised-Paranormal Belief Scale (Tobyck, 1988; 2004). However, no psychometrically validated superstition scale exists, so previous superstition research has employed the superstition sub-scale of the PBS.

Wiseman has noted that these items relate to negative superstitions, or belief in bad luck, and that positive superstitions (such as carrying a lucky charm), may serve the psychologically adaptive functions of increasing confidence and happiness (Wiseman & Watt, 2004). It is reasonable to assume that these positive functions would be valuable to gamblers so the present study sought to build on Wiseman's work using additional positive items.

While superstition and other irrational beliefs can be thought of as maintaining gambling behaviour, other factors must underpin the drive to gamble in the first place. The current study sought to examine two other areas of personality that have been associated with gambling, sensation seeking and impulsivity. The Gambling Attitudes and Beliefs Scale (Breen & Zuckerman, 1999) has been found to assess positive attitudes to gambling, and therefore affinity for gambling, and has been shown to correlate with sensation seeking, impulsivity, and gambling frequency (Breen, 2000; Lejuez, Strong, Breen & Read, 2003). Many gamblers report that they gamble for pleasure, excitement and risk, rather than just money (Anderson & Brown, 1984; Griffiths, 1993; Gupta & Derevensky, 1998).

It may seem intuitively convincing to think that sensation seeking must be a factor in gambling, which by definition involves risking something of value on an unknown outcome (Aasved, 2002). Indeed, Zuckerman originally thought that gamblers "entertain the risk of monetary loss for the positive reinforcement produced by states of high arousal during the periods of uncertainty, as well as the positive arousal produced by winning" (Zuckerman, 1979, p. 211). However, studies of this hypothesis have produced inconsistent results. For instance, one study found that people who gambled exclusively in an off-course betting shop (i.e., a gambling venue situated outside of a racetrack where gamblers can place bets) were lower in sensation seeking than non-gamblers and the general population (Coventry & Brown, 1993). Dickerson (1987) also found that off-course gamblers were lower in sensation seeking than the general population.

Coventry and Brown (1993), and Dickerson, Bayliss and Head (1987) found that casino gamblers are higher sensation seekers than non-gamblers and the general population. A more recent French study found that pathological gamblers who bet at racetracks had significantly higher sensation seeking scores than the general population and those who bet on games in cafes (Bonnaire, Bungener & Varescon, 2006). The authors of this study proposed that an 'active' subgroup of gamblers bet at racetracks or in casinos in order to stimulate excitement and arousal, whereas more 'passive' gamblers bet in shops, pubs or cafes in order to relieve boredom and negative affective states but not necessarily for excitement. Further evidence for this comes from a previous study in which scores on the boredom susceptibility sub-scale of the Zuckerman (1979) Sensation Seeking Scale (SSS) significantly correlated with the regularity of games played in cafes, such as lottery games (Bonnaire, Lejoyeux & Dardennes, 2004).

Many of the studies of sensation seeking and gambling have specifically looked at pathological gamblers. Hammelstein questioned the role of sensation seeking in pathological gambling and claimed that the few studies with positive findings may be explained by the overlapping trait of impulsiveness (Hammelstein, 2004). Zuckerman has responded to this by suggesting that sensation seeking is indeed higher among pathological gamblers in the community and that the results of studies of pathological gamblers in treatment programmes may be due to the effect of the treatment programme on self-reported risk taking or due to personality differences between those who seek treatment and those who do not (Zuckerman, 2005). Zuckerman concurs that it would be informative to study the separate role of impulsiveness and has said that this can be done using the impulsiveness subscale of the new ImpSS scale which is an abbreviated version of the SSS and measures two separate traits; one being a general need for excitement and the other being a tendency to act impulsively and without planning. Some recent studies have looked at impulsivity in relation to pathological gambling and have found the trait to be associated with changes in gambling severity (Blanco, Potenza, Won, et al., 2009), a significant predictor of pathological gambling (Myrseth, Pallesen, Molde, Johnsen & Lorvik, 2009) and a full mediator in the relationship between depression and problem gambling (Clarke, 2006).

The sensation seeking and impulsivity studies discussed above almost all focus on clinical populations of pathological gamblers or focus on specific types of gamblers. The current study was performed with a non-clinical population of 'committed' gamblers of a wide-variety of types in order to examine the relationship of irrational beliefs, sensation seeking and impulsivity to general gambling attitudes and behaviour. The study also sought to build on limited previous research into personality models of gambling, that have found that belief in luck and superstition, and willingness to take risks, are significantly related to gambling behaviour and that impulsiveness and superstition, among other factors, are predictive of gambling propensity (Mowen, Fang & Scott, 2009).

Based on the psychological literature, the hypotheses of the current study were as follows: (i) positive attitudes to gambling, as assessed by the Gambling Attitudes and Beliefs scale (Breen & Zuckerman, 1999) would positively correlate with measures of superstition, irrational beliefs, sensation seeking and impulsivity; (ii) high affinity gamblers would score higher on measures of superstition, irrational beliefs, sensation seeking and impulsivity measures than low affinity gamblers; (iii) high spending gamblers would score higher on measures of superstition, irrational beliefs, sensation seeking and impulsivity than low spending gamblers; and (iv) superstition, sensation seek-

ing, impulsivity and irrational beliefs about gambling would predict gambling affinity in a simple regression model.

Method

Participants

An opportunity sample of 428 gamblers was recruited. Of these, 89 were omitted from the final analysis, mainly due to failure to complete at least one of the questionnaires. This left a total of 329 gamblers (312 males, 17 females) with a mean age of 35.9 years (SD=11.9; age range 18-87 years).

Materials

A survey was constructed that examined a number of different variables. This included basic demographic information (e.g., age; gender; marital status; employment/education status), and questions relating to gambling (types of gambling engaged in; how often they engaged in gambling; questions relating to superstitious behaviour). The survey also included a number of psychometrically validated scales including the Paranormal Beliefs Scale (Tobacyk, 1988; 2004), Gambling Attitudes and Beliefs Scale (Breen & Zuckerman, 1999), Beliefs about Gambling scale (Jonsson, Andren, Nilsson, et al., 2003), and the Impulsive Sensation Seeking Scale (Zuckerman, Kuhlman, Joirement, Teta & Kraft, 1993).

Revised Paranormal Beliefs Scale (R-PBS): The R-PBS (Tobacyk, 1988; 2004) is a 26-item scale measuring degree of belief in different aspects of paranormal phenomena, divided into the following seven sub-scales: 'Traditional religious belief' (Cronbach's Alpha = .87); 'Psi' (extra-sensory perception) (.72); 'Witchcraft' (.87); 'Superstition' (.85); 'Spiritualism' (.79); 'Extraordinary life forms' (.71); and 'Precognition' (.83). Each item is scored on a seven-point Likert scale with participants rating the extent to which they agree with each statement. Scores for each item are: 1 = Strongly disagree; 2 = Moderately disagree; 3 = Slightly disagree; 4 = Uncertain; 5 = Slightly agree; 6 = Moderately agree; 7 = Strongly agree. Example items include: 'The soul continues to exist though the body may die' and 'Black magic really exists'. One item is reverse scored and all responses are summed to give total scores for the whole scale and seven sub-scales. Possible scores range from 26-82 with higher scores indicating greater paranormal belief. The R-PBS has been shown to have excellent validity and test-retest reliability (Tobacyk, 2004) with an overall Cronbach's Alpha of .77 (Huntley & Peeters, 2005).

Superstition questionnaire: This is an eight-item questionnaire constructed by the authors with 'yes' (=1) and 'no' (= 0) answers to each item. The total was summed across all items to give a total superstition score and scores for two 4-item sub-scales ('positive superstitions' and 'negative superstitions'). The questionnaire used the three negative superstition items within Tobacyk's (2004) Paranormal Beliefs Scale (PBS) and transformed the questions into a yes/no format. Recent research by Wiseman and Watt (2004) developed a superstition questionnaire including three 'positive' superstition questions ('Do you say 'fingers crossed' or actually cross your fingers for luck?'; 'Do you say 'touch wood' or actually touch or knock on wood for luck?'; 'Do you sometimes carry a lucky charm or object?'). These three items were subsequently modified by Dagnall, Parker and Munley (2009) to emphasise their association with good or bad luck and he found that they had good internal reliability (Cronbach's Alpha = .84) but that the items were insufficient and required further development. In order to develop this idea, the present study used the above six items plus a further positive one ('Do you have a horseshoe above a door for good luck'?) and a further negative one ('Do you avoid walking under ladders because it is bad luck?').

Gambling Attitudes and Beliefs Scale (GABS): The GABS (Breen & Zuckerman, 1999) is a 35-item measure of affinity for gambling. Each item is scored on a 4-point Likert scale on which participants report the extent to which they agree (1 = strongly disagree; 2 = disagree; 3 = agree; 4 = strongly agree). Example items include, "Gambling makes me feel really alive" and "When I gamble it is important to act as if I am calm, even if I am not", with three items (for example, "Gambling is boring") being reverse scored. A total is calculated for all items (ranging from 35-140). Higher scores indicate a higher affinity for gambling. The GABS items reflect positive social self-presentation through gambling, heuristics such as illusion of control and belief in luck, and the use of gambling to increase positive affect and reduce negative affect (Strong, Breen & Lejuez, 2004). The scale has been positively associated with sensation seeking, impulsivity gambling problems and gambling frequency (Breen, 2000; Lejuez et al., 2003). The GABS has been shown to have excellent reliability (Strong, Breen & Lejuez, 2004) with students (Cronbach's Alpha = .93) and with problem gamblers (.89).

Beliefs about Gambling (BAG) scale: The BAG scale (Jonsson, et al., 2003) comprises 14 items designed to assess irrational beliefs about gambling. Example items include 'Imagine a win on your favourite game' and 'Imagine four consecutive losses. How do you think about the next bet.' Each item has two possible responses, one of which is classed as rational (scoring 0) and the other classed as irrational (scoring 1). The total score is summed across all items and provides a possible range of 0 to 14. Higher scores indicate higher levels of irrational belief about gambling. The questionnaire comprises four sub-scales (Superstition, Skill, Belief in Randomness, and Expectations). The Belief in Randomness and Expectations scales reflect heuristics such as the 'gambler's fallacy' and the 'hot-hand fallacy'. 'Superstition' reflects gambling related superstitious behaviour such as carrying lucky charms

when gambling. Skill reflects gamblers' views on their own ability to influence the outcome of games. Kallmen, Anderson and Andren (2008) have reported that internal consistency is acceptable for the whole scale (Cronbach's Alpha = .65) and for the Skill subscale (.72). However, Cronbach's Alpha scores are poorer for Belief in Randomness (.48), Superstition (.38) and Expectations (.36).

Impulsive Sensation Seeking Questionnaire (ImpSS): The ImpSS (Zuckerman, et al., 1993) is a 19-item scale adapted from Zuckerman's original Sensation Seeking Scale (Zuckerman, Kolin, Price & Zoob, 1964). The eight impulsivity items describe a lack of planning and tendency to act impulsively without thinking (Zuckerman et al., 1993). Eleven sensation seeking items describe a general need to take risks for the sake of thrills and excitement, a preference for unpredictable situations and friends, and a desire for novelty and change (Zuckerman et al., 1993). Example questions include "I like 'wild' uninhibited parties" and "I often do things on impulse". Each item has two possible responses of either true (= 1) or false (= 0). Scores for each item are summed to give a total for the ImpSS and for both sub-scales. The complete scale has a possible range of 0 to 19. The ImpSS has been shown to have excellent test-retest reliability and has a Cronbach's Alpha coefficient of .82 (Zuckerman et al., 1993).

Procedure

Gamblers were mainly recruited via discussion forums on the *Betfair* betting website (www.betfair.com). A few gamblers known to the researchers were also recruited via email. Because of the method of recruitment, the vast majority of gamblers could be described as 'committed gamblers' as they engaged in the activity very regularly. Participants were provided with a link to the web-based survey. An initial page of the survey provided a briefing as to the aims and nature of the research, and participants were asked to indicate that they were over 18 years of age and gave their informed consent to participate. They were made aware that all responses were anonymous and were asked to provide a unique identifier, rather than a name, by which their responses could be identified should they wish to withdraw. On completion, the survey automatically displayed a debriefing section, with more details of the aims and nature of the study and contact details of the researchers for feedback and/or further questions. The study was given ethical approval by the researchers' University Ethics Committee.

Results

Gambling activities, frequency and spending: All gamblers were asked which gambling activities they had engaged in over the past year and could endorse as many forms of gambling as they wanted. Responses indicated that participants had betted on horse races (69.9%), had betted on soccer matches (68.7%), betted on other sports (50.5%), played poker (34.7%), played the lottery (34.7%), betted on dog racing (23.4%), played roulette (8.5%), played scratchcards (8.5%), played fixed odds betting terminals (6.1%), played slot machines (4.3%), played other card games (2.7%), played soccer pools (2.7%), played bingo (1.5%), and gambled on other activities not on the list provided (3.6%). All gamblers were also asked how frequently they gambled. Just below two-thirds of the participants gambled every day (60.2%) and 19.1% gambled four to five times a week. The remainder gambled two to three times a week (11.2%), once a week (4.6%), two to three times a month (0.9%), once a month (0.6%), six to eleven times a year (1.8%), one to five times a year (1.2%), or less than once a year (0.3%). Therefore, over 90% gambled two to three times a week or more. Gamblers were also asked about their typical spend on gambling within a single session. 11.4% spent less than £10, 19.2% spent between £10 and £29.99, 11.0% spent between £30 and £49.99, 13.1% spent between £50 and £99.99, 13.7% spent between £100 and £199.99, 8.8% spent between £200 and £499.99, 4.6% spent between £500 and £999.99, and 18.0% spent over £1000. These data show that the sample was dominated by high-spending gamblers (with 45.1% wagering an average of £100 or more in a single session).

Gambling attitudes, superstition, irrational beliefs, sensation seeking and impulsivity: The number of participants reduced as each of the scales were presented in the survey (i.e., participants withdrawing before all the questionnaires were completed). A total of 281 gamblers completed all the scales in the survey. The total scores on the R-PBS, GABS, BAG, and ImpSS had ranges of responses that covered almost the complete possible range (see Table 1). This shows that a wide range of beliefs and attitudes were included in the sample. The mean for the superstition scale was low (1.48) in comparison with the possible maximum score (of 8), indicating that some of the questions received very few affirmative responses. Because of this, the percentage of 'yes' and 'no' responses to each of these questions is presented in Table 2. These results show that three of the negative superstition questions and one of the positive superstition questions received 'No' responses of 95% or more. However, the standard deviations were similar to the mean for the total scale and sub-scales so the results were normally distributed.

Gambling attitudes and beliefs and relationship with superstition, irrational beliefs, sensation seeking and impulsivity: In order to investigate the relationships between these variables, one-tailed Pearson correlation coefficients were calculated between the Gambling Attitudes and Beliefs Scale (GABS) and all other scales and sub-scales. These results are summarised in Table 3. The results showed significant positive correlations between gambling affinity and all but three of the

Table 1. Mean and Standard Deviation Scores for (i) R-PBS/sub-scales, (ii) Superstition scale/sub-scales, (iii) GABS, (iv) ImpSS/sub-scales, and (v) BAG scale/ sub-scales

Scale and sub-scale	N	Range	Min	Max	Mean	SD
Total R-PBS	329	109	26	135	61.6	26.1
R-PBS religious belief	329	24	4	28	11.6	7.2
R-PBS Psi	329	20	4	24	9.5	4.4
R-PBS witchcraft belief	329	23	4	27	8.8	5.4
R-PBS superstition	329	14	3	17	4.5	2.8
R-PBS spiritualism	329	23	4	27	9.2	5.9
R-PBS extraordinary life forms	329	17	3	20	8.6	3.2
R-PBS precognition	329	20	4	24	8.3	4.8
Superstition	326	6	0	6	1.5	1.5
Positive superstition	326	4	0	4	1.1	1.1
Negative superstition	326	3	0	3	0.4	0.7
Total GABS	305	91	38	129	79.9	12.8
Total ImpSS	291	19	0	19	8.4	5.0
Sensation seeking	291	11	0	11	5.6	3.5
Impulsivity	291	8	0	8	2.9	2.4
Total BAG	281	12	2	14	6.7	2.0
BAG skill	281	5	0	5	3.8	1.3
BAG randomness	281	4	0	4	1.0	1.2
BAG superstition	281	2	0	2	0.6	0.6
BAG expectations	281	3	1	4	1.4	0.7

Table 2. Response Endorsement For Superstition Questions Among Gamblers (n = 326)

Positive superstition question	N	Yes (%)	No (%)
Do you say 'fingers crossed' or actually cross your fingers for luck?	326	38.7	61.3
Do you say 'touch wood' or actually touch or knock on wood for luck?	326	50.6	49.4
Do you sometimes carry a lucky charm or object?	326	14.7	85.3
Do you have a horseshoe above a door for good luck?	326	2.8	97.2

Negative superstition question	N	Yes (%)	No (%)
Black cats can bring bad luck	326	3	97
If you break a mirror you will have bad luck	326	4.3	95.7
The number '13' is unlucky	326	4.3	95.7
Do you avoid walking under ladders because it is bad luck?	326	30.4	69.6

other variables. The only non-significant correlations with gambling affinity were with R-PBS witchcraft belief, R-PBS extraordinary life forms, and BAG skill. The strongest correlations were with Total BAG (r = .438), BAG randomness (p = .433) and total superstition (p = .404).

High and low gambling affinity and relationship with superstition, irrational beliefs, sensation seeking and impulsivity: The GABS data were divided into two groups (high affinity and low affinity beliefs about gambling). Low gambling affinity was defined as those scoring in the bottom 50% of scores on the GABS (38-79), while high gambling affinity was defined as those scoring in the top 50% of scores (80-129). Descriptive statistics for the two groups are shown in Table 4. The results showed that the mean for each scale and sub-scale was higher for the high gambling affinity group, other than for BAG skill. Independent samples *t*-tests were performed on the two groups for each of the scales (see Table 5). As hypothesised, the high gambling affinity group was significantly higher in all the main scales and in all but six of the sub-scales. There was no significant result with the BAG skill scale. Another interesting finding was that impulsivity was not sig-

Table 3. Pearson Correlation Coefficients for GABS with (i) R-PBS/sub-scales, (ii) Superstition scale/sub-scales, (iii) ImpSS/ sub-scales, and (iv) BAG scale/sub-scales

Scale/sub-scale	Pearson correlation coefficient with GABS, degrees of freedom and significance value
Total R-PBS	r = 0.21, df = 303, p < 0.01**
R-PBS religious belief	r = 0.17, df = 303, p < 0.01**
R-PBS Psi	r = 0.11, df = 303, p < 0.05*
R-PBS witchcraft belief	r = 0.06, df = 303, p = 0.14
R-PBS superstition	r = 0.29, df = 303, p < 0.01**
R-PBS spiritualism	r = 0.17, df = 303, p < 0.01**
R-PBS extraordinary life forms	r = 0.07, df = 303, p = 0.10
R-PBS precognition	r = 0.18, df = 303, p < 0.01**
Total superstition	r = 0.40, df = 303, p < 0.01**
Positive superstition	r = 0.39, df = 303, p < 0.01**
Negative superstition	r = 0.28, df = 303, p < 0.01**
Total ImpSS	r = 0.26, df = 289, p < 0.01**
Sensation seeking	r = 0.26, df = 289, p < 0.01**
Impulsivity	r = 0.17, df = 289, p < 0.01**
Total BAG	r = 0.44, df = 279, p < 0.01**
BAG skill	r = - 0.03, df = 279, p = 0.32
BAG randomness	r = 0.43, df = 279, p < 0.01**
BAG superstition	r = 0.42, df = 279, p < 0.01**
BAG expectations	r = 0.25, df = 279, p < 0.01**

Table 4. Descriptive Statistics and T-test Scores for High/Low Gambling Affinity Groups on (i) R-PBS/sub-scales, (ii) Superstition scale/sub-scales, (iii) GABS, (iv) ImpSS/sub-scales, and BAG scale/sub-scales

Scale [t-test score and significance]	High/Low Group	N	Mean	SD
Total paranormal belief [t (303) = - 3.375, p <0.01*]	Low gambling affinity	149	56.5	23.51
	High gambling affinity	156	66.2	26.50
PBS religious belief [t (303) = - 2.060, p = 0.04]	Low gambling affinity	149	10.7	7.18
	High gambling affinity	156	12.4	6.89
PBS Psi [t (303) = - 2.086, p = 0.04]	Low gambling affinity	149	9.0	3.91
	High gambling affinity	156	10.1	4.56
PBS witchcraft belief [t (303) = - 1.408, p = 0.16]	Low gambling affinity	149	8.4	5.52
	High gambling affinity	156	9.3	5.06
PBS superstition [t (303) = - 4.220, p <0.01*]	Low gambling affinity	149	3.8	1.97
	High gambling affinity	156	5.0	3.12
PBS spiritualism [t (303) = - 3.089, p <0.01*]	Low gambling affinity	149	8.1	5.09
	High gambling affinity	156	10.1	6.26
PBS extraordinary life forms belief [t (303) = - 1.752, p = 0.80]	Low gambling affinity	149	8.4	2.94
	High gambling affinity	156	8.0	3.33
PBS precognition belief [t (303) = - 3.205, p <0.01*]	Low gambling affinity	149	7.4	4.64
	High gambling affinity	156	9.2	4.75
Superstition [t (303) = - 5.456, p <0.01*]	Low gambling affinity	149	1.0	1.16
	High gambling affinity	156	2.0	1.59
Positive superstition [t (303) = - 5.456, p <0.01*]	Low gambling affinity	149	0.8	0.92
	High gambling affinity	156	1.4	1.09
Negative superstition [t (303) = - 4.432, p <0.01*]	Low gambling affinity	149	0.3	0.52
	High gambling affinity	156	0.6	0.73
ImpSS [t (289) = - 3.998, p <0.01*]	Low gambling affinity	142	7.3	5.01
	High gambling affinity	149	9.6	4.82
Sensation seeking [t (289) = - 4.065, p <0.01*]	Low gambling affinity	142	4.7	3.38
	High gambling affinity	149	6.3	3.35
Impulsivity [t (289) = - 2.518, p = 0.12]	Low gambling affinity	142	2.5	2.39
	High gambling affinity	149	3.2	2.36
BAG [t (279) = - 5.950, p <0.01*]	Low gambling affinity	140	6.0	1.70
	High gambling affinity	141	7.4	2.09
BAG skill [t (279) = 0.789, p = 0.43]	Low gambling affinity	140	3.8	1.37
	High gambling affinity	141	3.7	1.16
BAG randomness [t (279) = - 6.350, p <0.01*]	Low gambling affinity	140	0.6	0.82
	High gambling affinity	141	1.4	1.29
BAG superstition [t (279) = - 5.660, p <0.01*]	Low gambling affinity	140	0.4	0.52
	High gambling affinity	141	0.8	0.61
BAG expectations [t (279) = - 3.319, p <0.01*]	Low gambling affinity	140	1.3	0.52
	High gambling affinity	141	1.5	0.83

nificantly greater in the high affinity group (p = .12), even though it was significantly positively correlated with gambling affinity. The other four non-significant sub-scales were from the R-PBS.

It was hypothesised that gambling affinity would be predicted by superstitious belief, sensation seeking, impulsivity and irrational beliefs about gambling. A multiple linear regression was performed, with gambling affinity as the outcome variable, and superstition, sensation seeking, impulsivity and irrational beliefs about gambling (measured by the complete BAG scale) as the predictor variables. The model showed a good fit (Multiple R = .57) with the R^2 showing that the predictor variables accounted for 32.5% of the variation in gambling affinity. The overall relationship was highly significant (F (4, 276) = 33.24: p<.01). Analysis of the unstandardised coefficients showed that irrational beliefs about gambling (Beta = 2.26, t(276) = 6.935, p<.01), superstition (Beta = 2.65, t(276) = 5.82, p<.01), and sensation seeking (Beta = .59, t(276) = 2.799, p<.01) were significant predictors of gambling affinity. Impulsivity (Beta = .23, t(276) = .043, p=.45) was not a significant predictor. Analysis of the standardised betas showed that irrational beliefs about gambling (Beta = .35) were the strongest predictor, followed by superstition (Beta = .30) and sensation seeking (Beta = .16). It is interesting to note that impulsivity was not a significant predictor of gambling affinity despite the fact that it was significantly positively correlated.

High and low spend on gambling and relationship with superstition, irrational beliefs, sensation seeking and impulsivity: Low spenders were defined as those in the bottom 50% of session spenders (up to £74.99 per session) and high spenders defined as the top 50% (over £75 per session). Descriptive statistics for the two groups are shown in Table 5. The results showed that low spending gamblers were slightly higher in mean scores for almost all main and sub-scales, including gambling affinity than high spending gamblers. The exceptions were sensation seeking and BAG skill. Independent samples t-tests were performed on the two groups for

Table 5. Descriptive Statistics and T-test Scores for High/Low Spending Groups on (i) R-PBS/sub-scales, (ii) Superstition scale/sub-scales, (iii) GABS, (iv) ImpSS/sub-scales, and BAG scale/sub-scales

Scale [t-test score and significance]	Group	N	Mean	SD
R-PBS [t (326) = 1.302, p = 0.19]	Low spend	166	63.50	26.965
	High spend	162	59.75	25.202
R-PBS religious belief [t (326) = 1.285, p = 0.20]	Low spend	166	12.10	7.152
	High spend	162	11.08	7.257
R-PBS Psi [t (326) = 0.529, p = 0.60]	Low spend	166	9.65	4.368
	High spend	162	9.40	4.383
R-PBS witchcraft belief [t (326) = 0.525, p = 0.60]	Low spend	166	8.98	5.509
	High spend	162	8.67	5.359
R-PBS superstition [t (326) = 1.271, p = 0.20]	Low spend	166	4.68	2.979
	High spend	162	4.29	2.565
R-PBS spiritualism [t (326) = 0.931, p = 0.35]	Low spend	166	9.46	5.788
	High spend	162	8.86	5.998
R-PBS extraordinary life forms [t (326) = 1.120, p = 0.26]	Low spend	166	8.81	3.258
	High spend	162	8.41	3.206
R-PBS precognition [t (326) = 1.199, p = 0.23]	Low spend	166	8.67	4.949
	High spend	162	8.04	4.580
Total superstition score [t (323) = 2.174, p = 0.03]	Low spend	165	1.66	1.532
	High spend	160	1.31	1.401
Positive superstition total [t (323) = 1.508, p = 0.13]	Low spend	165	1.16	1.036
	High spend	160	0.98	1.073
Negative superstition total [t (323) = 2.470, p = 0.14]	Low spend	165	0.50	0.712
	High spend	160	0.33	0.578
Total GABS [t (302) = 1.667, p = 0.10]	Low spend	149	81.13	12.858
	High spend	155	78.68	12.758
Total ImpSS [t (288) = 0.136, p = 0.89]	Low spend	141	8.50	4.917
	High spend	149	8.42	5.156
Sensation seeking [t (288) = 0.010, p = 0.99]	Low spend	141	5.57	3.467
	High spend	149	5.57	3.447
Impulsivity [t (288) = 0.271, p = 0.79]	Low spend	141	2.92	2.252
	High spend	149	2.85	2.525
Total BAG [t (278) = -5.950, p = 0.74]	Low spend	137	6.76	2.123
	High spend	143	6.68	1.930
BAG skill [t (278) = -4.245, p = < 0.01**]	Low spend	137	3.45	1.372
	High spend	143	4.07	1.079
BAG randomness [t (278) = 3.258, p <0.01**]	Low spend	137	1.20	1.207
	High spend	143	0.76	1.061
BAG superstition [t (278) = 1.052, p = 0.29]	Low spend	137	0.61	0.585
	High spend	143	0.54	0.602
BAG expectations [t (279) = 2.250, p = 0.03]	Low spend	137	1.50	0.768
	High spend	143	1.31	0.631

each of the scales (see Table 5). The results show that there were very few significant differences between the two groups on any measures. The exceptions were BAG skill, in which the high spending gamblers were significantly higher (t (278) = -4.245, p<.01) and BAG randomness, in which the low spending gamblers were significantly higher (t (278) = 3.258, p<.01). Another finding of note was that the low spending gamblers approached a significantly higher score for total superstition (t (323) = 2.174, p=.03).

Discussion

The results of this study broadly support the first hypothesis that gambling affinity is associated with superstition, paranormal beliefs, sensation seeking, impulsivity and irrational beliefs about gambling. The particularly high correlation of gambling affinity and the main superstition scale suggested that superstitious beliefs are greater for people with a higher affinity for gambling. This supports the notion that gamblers are superstitious as a group (Aasved, 2002). This may be due to superstitious behaviours becoming associated with previous rewards and therefore repeated in order to cause good fortune to recur. This would lead to the maintenance of gambling behaviour despite continued losses outweighing gains.

The most popular responses to the superstition questions were for two positive items. Half of the gamblers (51%) said that they say 'touch wood' (or actually touch wood) for luck, and just over one-third of the gamblers (39%) said that they say 'fingers crossed' (or actually cross their fingers). A further 15% also said that they carried a lucky charm. These behaviours may provide people with an illusion of control over external events, and this may be of particular importance to gamblers (Langer, 1983). Although participants were not asked about their beliefs in 'luck'

and 'chance', the results suggest that many of them believed that 'luck' can be manipulated by certain actions (Keren & Wagenaar, 1985). The fact that the two positive items were the most popular and that the positive scale correlated more highly with gambling affinity than the negative scale support Wiseman and Watt's (2004) assertion that positive superstitions serve an adaptive purpose of increasing confidence and belief in control. This appears to be of more importance to gamblers than believing that certain objects or actions, such as the number '13' and black cats, can bring bad luck.

Although the negative superstition scale correlated significantly with gambling affinity, it did so to a lesser extent than the positive scale, and only 'avoiding walking under ladders' received a high number of positive responses. This suggests that belief in the ability to attract good luck provides a greater illusion of control than the belief that an event, such as breaking a mirror, unavoidably brings bad luck. Just under one-third of the gamblers avoided walking under ladders, but it could be said that this is a positive action, as the gambler can actually do something about it, and the inclusion of this item in the negative superstition scale may be the reason for its positive correlation. This supports the idea that gamblers perform actions in order to exert control over luck (Darke & Freedman, 1997).

The significant correlations with the R-PBS and all but two of its sub-scales suggest that beliefs in supernatural and 'psychic' phenomena are inherent aspects of gambling affinity (King, 1990; Kaplan, 1988). This is supported by the high correlation with the 'precognition' sub-scale indicating that many gamblers believed that the outcome of future events can be foreseen. This is also suggested by the significant correlation with 'spiritualism' that relates to future events being controllable, and 'Psi' that relates to the ability to control external objects by thought alone. These beliefs would provide the holder with an illusion of control if they performed certain actions in accordance with them.

In terms of irrational beliefs about gambling, the significant correlations of the 'Beliefs about Gambling' questionnaire and the 'Randomness', 'Superstition' and 'Expectations' sub-scales, indicate that gambling affinity is related to susceptibility to illusory correlations, illusion of control, the 'gamblers fallacy' and the 'hot-hand fallacy' (Kallmen, Anderson & Andren, 2008). However, one interesting finding was that the 'Skill' sub-scale did not correlate with gambling affinity. This contradicts the findings of Kallmen et al (2008) who found that problem gamblers had significantly more belief in the role of their own skill and experience in success or failure at gambling. This suggests that problem gambling may not be indicated by higher levels of gambling affinity on the GABS. Alternatively, gambling affinity may be related to irrationality but belief in the role of skill, experience, and knowledge may not be irrational in this sample.

Kallmen, et al (2008) did not specify the games that the problem gamblers in their sample participated in. However, this makes a difference when assessing irrationality because many gambling activities require a high-level of skill and knowledge. The sample in the present study included a wide-variety of gambling types, including 114 poker players and 230 horse race bettors. These events are not decided entirely by chance and the ability to play strategically (in poker) and select according to previous form (in horse race betting) are very important. It is also advantageous to have good knowledge of probabilities and bet only when the odds are weighed in the gambler's favour. Therefore, the slight negative correlation with 'Skill' may reflect the preference for higher skill level games this study's participants.

In relation to sensation seeking and impulsivity, the total ImpSS scale was significantly correlated with gambling affinity, as were the sub-scales of sensation seeking and impulsivity. This supports research showing a correlation between the scales (Breen, 2000; Lejuez, et al., 2003) and previous studies showing that gamblers bet for excitement and risk, rather than just money (Anderson & Brown, 1984; Griffiths, 1993; Gupta & Derevensky, 1998). The higher correlation of sensation seeking suggests that it is more important in gambling affinity than impulsivity. These results may reflect that the sample of participants in this study had more 'active' gamblers than 'passive' ones and supports Bonnaire, Bugener and Varescon's (2006) categorisation of these sub-groups. In the present study, 230 of the participants bet on horse races, 77 bet on dog races, 226 bet on football matches and 114 played poker. These are LL games that demand an active role and a produce a high level of excitement and involvement. The fact that the correlations are weak may reflect the representation of more passive gambling types, such as lottery players (n=114) and scratchcard players (n=28).

The results for the second hypothesis provide further support that superstition, paranormal beliefs, sensation seeking, and irrational beliefs about gambling are important aspects of gambling affinity. Most scales and sub-scales were significantly higher for the high gambling affinity group than the low gambling affinity group. The non-significant results of the R-PBS sub-scales of 'Witchcraft' and 'Extraordinary life forms' suggest that these are less relevant to gamblers. It was particularly interesting to note that high affinity gamblers were in fact slightly lower in the 'Skill' sub-scale of the BAG, again suggesting that those higher in gambling affinity placed less emphasis on the role of their own skill, experience, and knowledge in their gambling activities. Additionally, while sensation seeking was significantly higher in the high gambling affinity group, impulsivity was not. This suggests that the two factors have separate roles in gambling affinity and are not an overlapping trait, contrary to the claims of Hammelstein (2004) and supporting Zuckerman (2005).

Some of the most revealing findings from this study came from the hypothesis that high spending gamblers would be significantly higher on the measures than low spending gamblers. In fact, the results showed no significant differences between the groups except on two of the scales. Interestingly, the low spending group had a slightly higher mean score on gambling affinity, suggesting that the factors measured on the GABS do not relate to at least one important aspect of gambling behaviour, financial outlay. Compared to the high spending gamblers, the low spending group was also slightly higher on impulsivity and equal on sensation seeking, suggesting that gambling large amounts of money does not lend itself to rash and impulsive decisions, otherwise only the very financially wealthy would be able to maintain such behaviour. The only significant differences came in (i) the BAG 'Skill' sub-scale, in which the high-spending gamblers scored more highly than the low spending gamblers, and (ii) the BAG 'Randomness' sub-scale, in which the low spending gamblers scored more highly than the high spending gamblers. These results indicate that the high spending gamblers place a lot more emphasis on their own skill, their knowledge, and their experience, yet are significantly less likely to believe in irrational concepts such as the 'hot-hand' and 'gamblers' fallacies or in illusion of control (Piatelli-Palmerini, 1994; Langer, 1983).

These results provide some support for studies such as Kallmen, Anderson and Andren's (2008) that found that problem gamblers were significantly more likely to believe in the importance of their skill than non-gamblers, but no more likely to endorse other irrational beliefs. The results suggest that those who wager large amounts of money need control and rationality. They also suggest that the 'Skill' sub-scale of the BAG does not necessarily measure irrationality because some games, such as poker, genuinely require skill in order to gamble successfully on them. It is also interesting to note that the low spending gamblers scored higher in all superstition measures than high spending gamblers, and this approached significance on the main superstition scale. This contradicts the findings of Joukhador, Blaszycynski and Mcallum (2004) who found that problem gamblers were more likely to endorse superstitious beliefs than non-problem gamblers. However, problem gambling was not measured in the current study, and problem gamblers and high spending gamblers are not necessarily the same. The high spending gamblers in the present study tended to be more rational than low spending gamblers, and endorsed genuine control rather than an illusion of control. The fact that no higher measure of sensation seeking was found in the high spending gamblers also suggests that this group do not bet more for extra excitement, but do so carefully and for monetary gain. This may reflect the fact that some of the participants would class themselves as professional gamblers.

The final hypothesis of this study was that superstition, sensation seeking, impulsivity and irrational beliefs about gambling would predict level of gambling affinity. The model predicted one-third of the variance in gambling affinity (i.e., 32.5%), therefore the hypothesis was a reasonable one. This finding provides further support to the notion that superstition, sensation seeking, and irrational beliefs about chance and probability are inherent aspects of gambling affinity. One interesting finding was that impulsivity, while being significantly correlated with gambling affinity, was not a significant predictor. In fact, it fell well short of statistical significance. This contradicts some previous research (e.g., Mowen, Fang & Scott, 2009; Myrseth, Pallesen, Molde, et al., 2009). A study by Myrseth and colleagues (2009) found impulsivity to be predictive of pathological gambling, but this study did not look at pathological gamblers. However, the GABS measure used in the present study has been found to correlate with pathological gambling so the results could be seen as contradictory to Myrseth's findings. It is possible that impulsivity is in fact a mediator for another personality factor, and it has previously been found to be a mediator for depression in problem gambling (Clarke, 2006).

Despite the many significant results reported, the present study had a number of limitations. Firstly, the Gambling Attitudes and Beliefs Scale was used as a dependent variable and the items in this scale relate strongly to some of the measures used as independent variables. For example, many of the questions relate to superstition, some to irrational beliefs about probability and chance, and others to the excitement of gambling. This may partly explain the positive correlations and the fact that those high in gambling affinity scored significantly higher on most of the measures.

Additionally, most superstition studies conducted in the past have used the superstition sub-scale of the R-PBS but Wiseman and Watt (2004) reasoned that the negative items in the scale may explain why many studies found high correlations between superstition and poor psychological adjustment such as low self-efficacy (Tobacyk & Schrader, 1991) and neuroticism (Vyse, 1997). Wiseman and Watt added three positive items, reasoning that positive superstitions could serve a different and more advantageous psychological function. However, examination using factor analysis has concluded that further development and refinement is required before a factorial structure to superstitious belief can be verified (Dagnall, Parker & Munley, 2009). In the absence of a more psychometrically robust measure of superstitious belief, the current research employed the items formulated by Wiseman and Watt, and added one more positive and one more negative item. Additionally, the fact that four of the items received positive responses below 5% meant that the scores on the scale may not have accurately reflected the superstitious beliefs of the sample. Furthermore, the two items that received the

largest positive responses were 'Do you say 'fingers crossed?' and 'Do you say 'touch wood?' These are extremely common behaviours and may be culturally based clichés in the UK that may not accurately represent superstitious belief.

Another limitation was the lack of alternative dependent variables (DVs) to the GABS scale. It was intended that various different measures of gambling behaviour could be used as DVs, but the nature of the sample meant that most other measures collected would not have been informative. For example, frequency of gambling would be a very useful DV but the majority of this sample gambled every day or almost every day so there would have been too few participants in the low gambling frequency group. The number of different gambling activities engaged in was also intended as a DV, but the majority of the participants gambled on three or fewer games, so the 'high number of gambling activities' group would have been too small. The main reason for these limitations was the method of sampling, which was done mainly via the online forum of the website *Betfair.* This led to a large proportion of committed, high spending (and seemingly) professional gamblers participating who may not be representative of typical betting shop, casino and/or racecourse gamblers. The participants also comprised a large proportion of males (95%), who have generally been found to be lower in superstition and higher in sensation seeking than women, thus potentially confounding the results.

Other limitations of the study were the (i) reliance on self-report data, meaning that responses might not have been accurate (for example, the number of very high spenders may have been exaggerated), (ii) very long survey that may have led to questionnaire fatigue (which is reflected in the high drop-out rate once participants had started the survey); and (iii) use of a self-selected sample largely gathered from a single online gambling forum. A better representation of gamblers could perhaps have been obtained by also recruiting from betting shops, casinos, and racetracks.

Overall, the findings presented here provide preliminary support for the idea that superstition, paranormal belief, sensation seeking, impulsivity, and irrational beliefs about gambling-related factors, such as probability and chance, are involved in affinity for gambling. Based on the previous research reviewed, the findings of the present study suggest that sensation seeking is involved in the desire to gamble whereas superstition and other irrational beliefs are more involved in the maintenance of gambling behaviour. Future research could attempt to develop and refine the superstition questionnaire in order to provide a better measure of superstition and to further investigate the existence of distinct positive and negative structures of superstition.

Further research could also attempt to employ different behavioural measures of gambling propensity, such as frequency and type of gambling, and these could then be correlated with superstitious beliefs, sensation seeking, impulsivity and the GABS. It would also be useful to develop a more accurate measure of irrational beliefs about gambling than the BAG as this is an important area of study. Better survey measures of such constructs as 'gambler's fallacy' and 'hot-hand' fallacy, that could be used equally well with gamblers and non-gamblers, would be extremely useful in examining whether different types of gamblers are more prone to these beliefs than non-gamblers. Such research should be conducted with a control group of non-gamblers and a broad sample of different types of gamblers gathered from a range of sources. Measures of pathological gambling could also be included in order to further examine the differences between problem gamblers and non-problem gamblers.

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