An exploratory investigation into the erroneous cognitions of pathological and social fruit machine gamblers

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Abstract

Although the literature concerning the association between irrational thinking and gambling continues to grow, a number of methodological problems raise questions about the validity of such findings. The present research examined the cognitions and beliefs of a small convenience sample of pathological ($n = 5$) and social ($n = 5$) fruit machine gamblers using a within- and between-subjects design, employing the think-aloud method, the Gambling Beliefs Questionnaire, and a semistructured interview. Pathological gamblers were found to display greater levels of irrationality than social gamblers on all three measures. However, by undertaking a methodology more rigorous than that of previous research, this study found that irrational thinking may not be as prominent a reason behind gambling as has been suggested.
Key words: erroneous cognitions, fruit machines, multiple assessments

Introduction

Erroneous cognitions related to gambling behaviour have been noted for some time, with Bolen & Boyd (1968) stating that the 'astonishing, illogical conviction that the gambler will eventually win frequently defies comprehension and certainly defies the laws of probability' (p. 622). Cognitive theories of gambling are evident within the gambling literature, with some researchers favouring a cognitive model of gambling in which winning money is the predominant factor underlying gambling behaviour (Walker, 1992b; Ladouceur & Walker, 1996; Sylvain, Ladouceur, & Boisvert, 1997). Aside from the growing body of research providing support for the importance of cognitive factors in those with gambling problems, the effectiveness of treatment interventions aimed at cognitive correction of randomness and chance adds credence to the usefulness of a cognitive model of gambling for research and treatment purposes (Ladouceur, Sylvain, Letarte, Giroux, & Jacques, 1998; Ladouceur et al., 2001; Ladouceur et al., 2003).

A number of methods can be used to assess cognitions and beliefs in gambling samples, with Joukhador, MacCallum, & Blaszczynski (2003) examining the cognitive distortions of 56 problem gamblers and 52 social gamblers using a new instrument they devised called the Gambling Beliefs Questionnaire (GBQ). They found that on all measures (except denial) problem gamblers displayed significantly greater cognitive distortions than social gamblers, e.g., superstitious beliefs about gambling, the illusion of control, and the gambler's fallacy. Such results indicate that pathological gambling is related to a broad range of mistaken beliefs and distorted cognitions. Similar results are reported by studies using the 'think-aloud method' (TAM), which is a different method of investigating gambling thoughts whereby the individual has to speak aloud while gambling (Coulombe, Ladouceur, Desharnais, & Jobin, 1992; Griffiths, 1994; Coventry & Norman, 1998). These studies have found that regular or problem gamblers are significantly more likely to make erroneous verbalisations while gambling than nonregular or social gamblers. Erroneous verbalisations include statements such as 'This machine is making me mad on purpose' [personification] or 'I haven't won for a while, so I must be due a win' [not understanding probability]. In terms of the strategic thinking of gamblers, i.e., thoughts related specifically to gambling, other studies using the

TAM have found irrational thinking to be particularly high—ranging from 75% to 86% (Delfabbro & Winefield, 2000; Walker, 1992a; Gaboury & Ladouceur, 1989). Other methods of assessing gambling thoughts such as observation and interviews with gamblers similarly reveal cognitive distortions to be present (King, 1990; Toneatto, Blitz-Miller, Calderwood, Dragonetti, & Tsanos, 1997).

From the above research it could be argued that erroneous cognitions are integral to problematic gambling behaviour. However, it has to be noted that there are several methodological problems inherent in the techniques used by these earlier studies which have to be addressed before any conclusive argument can be made for the role of distorted cognitions in the development and maintenance of gambling behaviour.

Problems with gambling instruments measuring cognitions and beliefs

Only a handful of instruments assessing gambling-related thoughts exist and most remain untested, such as the Gambling Related Cognitions Scale (Raylu & Oei, 2004). The Gambling Attitudes and Beliefs Scale (GABS; Breen & Zuckerman, 1999) measures gambling attitudes as well as erroneous cognitions and beliefs, although Strong, Breen, & Lejuez (2004) found that only 15 (of the original 35) items effectively discriminated between students and clinical gambling samples. Of these 15 items only a limited number of questions relating to erroneous beliefs or cognitions remain, many addressing similar cognitions or beliefs. The Gamblers' Beliefs Questionnaire (Steenbergh, Meyers, May, & Whelan, 2002) is a 21-item scale measuring gambling-related thoughts, with all items loading upon two factors: Illusion of Control and Luck/Perseverance. Similarly, the 22-item Drake Beliefs about Chance Inventory (DBC; Wood & Clapham, 2005) loads upon only two factors—Illusion of Control and Superstition—and collectively the GABS, Gamblers' Beliefs Questionnaire, and DBC are limited in that they only measure certain gambling-related cognitions. Finally, the GBQ appears a promising instrument as it has questions relating to a wider variety of cognitive distortions than these previous instruments. Of course, it may be that the quantity of irrational beliefs assessed by any of these instruments is not informative of the strength of these beliefs (Delfabbro, 2004), and there is an a priori assumption that the items on these screens are correctly understood.

Problems with sample

A second methodological issue which has to be addressed in the area of erroneous beliefs and gambling is the type of gamblers researched. For example, all the problem gamblers in Joukhador et al.'s (2003) study were seeking treatment at the time of the study, which may have had an impact on the study's findings. Assessing gamblers at an advanced stage of their gambling careers, where treatment is necessitated, may not be representative of the wider population of active gamblers and therefore such findings should be treated cautiously. The reliability of studies examining cognitive processes associated with gambling can also be questioned where there is a reliance on students (Walker, 1992a; Kweitel & Allen, 1998; Côté, Caron, Aubert, Desrochers, & Ladouceur, 2003) or use of retrospective data (Toneatto et al., 1997). Furthermore, Walker (1992a) questions the use of low-frequency gamblers as participants, which is evident in a number of studies (Gaboury & Ladouceur, 1989; Benhsain, Taillefer, & Ladouceur, 2004; Ladouceur & Sévigny, 2005). It could be argued that findings from such samples could not be generalised to a frequent gambling population. In addition, assessment of a single group of gamblers prohibits comparison and therefore does not enable differences between gambling groups to be elucidated.

Problems with TAM

In earlier studies, Griffiths (1994) and Coulombe et al. (1992) used the TAM to examine gambling beliefs over a short time, less than 10 min per participant on average. The regular gamblers in Griffiths's (1994) study had an average of only 61 shots on a fruit machine, which is clearly not representative of the prolonged gambling sessions of problem gamblers. Participants were also paid to play the machine and it is questionable whether this would accurately reflect the actions of gamblers using their own money. Other studies examining gambling-related beliefs do not even involve the staking of money, which would suggest they are not gauging cognitions in relation to gambling per se (Langer & Roth, 1975; Coventry & Norman, 1998; Dixon, Hayes, & Ebbs, 1998; Teed, Finlay, Newby-Clark, & Marmurek, 2006). Financial concerns aside, it is insufficient for research in this area to examine the issue of mistaken gambling beliefs by using a limited number of statements made via the TAM and spanning only a short period of time.

Apart from the methodological issues surrounding the TAM, there is a serious problem with the TAM technique itself. Researchers employing this technique develop coding schemes in order to make sense of the thoughts elicited during the course of the study, which in itself could be construed as problematic given the inherent complexities in attempting to translate these utterances into meaningful psychological constructs (Dickerson & Baron, 2000). This has led researchers to develop often very different coding schemes (e.g., Walker, 1992a; Griffiths, 1994; Coventry & Norman, 1998), making the utility of comparative analysis between different studies using this method questionable. Griffiths's (1994) coding scheme 'was intuitively constructed by the author' (p. 357). Examples of statements categorised as rational include swearing, but those categorised as irrational include swearing at the machine. It does not seem justifiable to label either swearing as rational or swearing at a machine as irrational. In fact, many of the verbalisations considered rational by Griffiths (1994) or irrational by Coulombe et al. (1992) were neither rational nor irrational, but simply commentaries on the event (Coventry & Norman, 1998). Irrationality is a term used vaguely by gambling researchers (Neal, 2005) and the appropriateness of this terminology has to be questioned given that participants are never offered the opportunity to explain the reasoning behind their supposedly illogical beliefs.

Ecological validity

The importance of ecological validity in such studies cannot be overemphasised as attempting to unravel the true extent to which erroneous cognitions maintain gambling involvement can never be realised in laboratory settings. The use of laboratory settings to assess erroneous cognitions (e.g., Kassinove & Schare, 2001; Ladouceur & Sévigny, 2005; McGrath, Finlay, Kanetkar, Londerville, & Marmurek, 2006) is a further methodological issue which has to be addressed. Apart from the problem of reduced participant motivation (Walker, 1992a), laboratory settings are unrealistic environments for gambling research. This is particularly true in the case of Coventry & Norman's (1998) study in which testing took place in a soundproof darkened laboratory. This would be inappropriate for many forms of gambling, particularly fruit machines where the stimulus characteristics of amusement arcades such as the cacophony of noise and the flashing lights play an integral role in the gambling experience (Fisher & Griffiths, 1995). Coventry & Norman's (1998) laboratory setting and other similar settings are completely devoid of such stimuli.

A methodology, which may address the above-mentioned research issues in the area of gambling and erroneous beliefs, is to adopt a multifaceted approach, employing the TAM (in

an ecologically valid setting), a relevant gambling questionnaire, and a semistructured interview. This would enable a more accurate assessment of gamblers' thoughts while gambling and while not gambling and the identification of the most prominent features of their thinking in relation to their gambling. The major aim of this exploratory study was to advance the knowledge of the association between gambling behaviour (specifically fruit machine gambling) and gamblers' mistaken beliefs by undertaking a methodology more rigorous than that of previous research. The study involved an intensive examination of gamblers' beliefs both within and outside a gambling environment using the TAM, the GBQ, and a postexperimental semistructured interview. It was hypothesised that pathological gamblers would display a greater number of mistaken beliefs than social gamblers during the TAM, and also in the GBQ and interview. It was also hypothesised that a number of the so-called erroneous cognitions identified by the TAM and the GBQ would be adequately explained in the interview.

Method

Design and participants

The experiment employed a three-phase within- and between-subjects design, in which participants engaged in the TAM while gambling, completed the GBQ several days later, and finally participated in a semistructured interview 4 weeks later. A total of ten fruit machine gamblers (five pathological and five social gamblers) were recruited, predominantly from the arcade, with there being no refusals. Most fruit machine gamblers were male ($n = 7$), although this is not uncommon in this form of gambling (Griffiths, 1994). The average age of the sample was 24.4 years of age ($SD = 3.2$; range 21–32); pathological gamblers 24.2 ($SD = 1.9$; range 22–27), social gamblers 24.6 ($SD = 4.4$; range 21–32). The average South Oaks Gambling Screen (SOGS) score was 7.0 ($SD = 6.3$; range 1–18); pathological gamblers 12.2 ($SD = 4.6$; range 7–18), social gamblers 1.8 ($SD = 0.8$; range 1–3). No participants had previously sought treatment for gambling problems. In order to avoid the possibility of confounding influences on dysfunctional beliefs, it was ensured that no one was currently receiving selective serotonin reuptake inhibitors (SSRIs) or undergoing psychotherapeutic treatment (see Anholt et al., 2004).

Materials

The revised edition (48 items) of the GBQ (Joukhador et al., 2003) was employed along with the SOGS (Lesieur & Blume, 1987), which is a reliable and valid instrument that has been widely used. A Sony minidisc recorder (MZ-NH900) attached to a small unobtrusive microphone was used to record the participants' verbalisations while gambling. A similar apparatus was used during the semistructured interview.

Procedure

Ethical approval was obtained from the Psychology Department in Glasgow Caledonian University, and permission to approach potential participants was secured from the manager of the gambling arcade. The experimenter previously conducted research in this arcade (Moodie & Finnigan, 2005), going into the arcade on a daily basis for a period exceeding 4 months before the onset of this previous study. During this time, the experimenter was able to observe the gambling behaviour of fruit machine gamblers, from those gambling frequently and excessively to those gambling either frequently or infrequently, but in a controlled manner. By following the methodology of King (1990), through observation and

conversation the experimenter was able to identify and recruit a number of gamblers who appeared to either show signs of pathology or to gamble socially. This form of recruitment is of greater value than the reliance on a gambling screen, although the SOGS was employed to verify pathological or social gambling status. Before the onset of the study potential participants were informed that the study involved three separate but interrelated stages. All participants were given a £20 disturbance fee on completion of the study.

Phase 1 (TAM)

In the first phase of the study the experimenter arranged to meet participants before a gambling session. The verbal instructions the participants received were similar to those used in past research (Gaboury & Ladouceur, 1989; Walker, 1992a), but with subtle differences:

> *State everything that comes to mind during the gambling session, no matter how unimportant you consider it to be. Do not censor your thoughts and do not attempt to justify statements. You do not have to speak in complete sentences, and don't worry if you feel that what you're saying does not make sense. Just act as you normally would when gambling and try to speak in a clear voice. For the task you should try to speak as often as possible, although you do not have to speak continuously.*

In order to enhance ecological validity it was beneficial to remain with the gamblers for a longer period of time than previous research in this area has managed. This was advantageous as it allowed the cognitions displayed throughout the entire session or a significant part of it to be monitored, rather than simply trying to gain an insight into the thinking of gamblers during a brief period of a gambling session. The recording was made via a small microphone attached to a light, small minidisc recorder. Although previous studies (Griffiths, 1994; Coventry & Norman, 1998) have requested participants to speak continuously during the task, this was not considered appropriate on the grounds that it may actually induce irrational statements and therefore inadvertently affect the results. Furthermore, as the intention was to have the participants perform the task for approximately 90 min, this would have been an arduous task. Instead, participants were asked to speak as frequently as possible and were prompted to do so if silent for a minute or so during the task. If the recording was not of a sufficient time, participants were asked if they would consent to being recorded in a subsequent gambling session. This only applied to three pathological gamblers who had lost their money quickly on the first occasion, but who willingly agreed to do the TAM again.

Coding scheme

A coding scheme similar to that of Walker (1992a) was used as it appears potentially more informative than others employed. The verbalisations made fell into one of the following categories:

Inadequate verbalisations included predictions or confirmation of predictions or systems employed; references related to personal control or skill, mentioning cause and effect; references relating to a lack of understanding of probability; and statements regarding personification.

Adequate verbalisations included statements relating to lack of personal control, knowledge of probability, and stating that although their luck should change it does not necessarily mean they are going to win anything.

Descriptive verbalisations included statements describing some aspect of the game. This category seems appropriate where fruit machines are involved, given the high degree of player involvement that exists in modern fruit machines.

Other verbalisations included all remaining verbalisations not classified as adequate, inadequate, or descriptive.

The verbalisations were transcribed within 12 hours of the completion of the TAM and coded according to the previous coding scheme. Ten percent of verbalisations were subsequently independently rated, with 45% being rated identically, indicating a low degree of interrater reliability. As with Griffiths's (1994) study, the naivety of the second rater in terms of fruit machine gambling and associated terminology may account for this. As was also the case with Griffiths (1994), given the experimenter's familiarity with fruit machine terminology and the TAM, the initial codings were subsequently used for analysis.

Phase 2 (GBQ)

Each participant was given the GBQ several days after completing the first phase (the TAM) and asked to carefully complete it and return it at a mutually convenient time. The GBQ was not given directly after the first phase of the study because questionnaires given directly before or after a gambling occasion may not be the most accurate way of studying cognitive activity (Gaboury & Ladouceur, 1989).

Phase 3 (Semistructured interview)

After the participant returned the completed GBQ, a semistructured interview was arranged for a later date, at least 4 weeks after the return of the GBQ. The reasoning behind this delay was to ascertain a temporal view of cognitions, assessed in different ways over a period of time. For this final phase of the study, all participants were given the same questions related to early experiences of gambling and fruit machine gambling, winning, skill, strategies, near misses, probability, reasons behind gambling, etc. All questions were related to experiences of gambling and as they required some thought they were provided a week in advance of the interview. The semistructured interview consisted of these questions and at least 25 additional questions that the participants were unaware of. These additional questions were related to the items initially asked, but tailored specifically for each participant's responses on the GBQ and recorded verbalisations during the TAM. In this way, the interview allowed a degree of internal triangulation, where consistencies or inconsistencies across assessments could be established or addressed.

The main reason behind the interview was to establish the degree to which erroneous cognitions actually exist in fruit machine gamblers. The participants were given the opportunity to provide explanations for statements in the TAM that past studies have deemed irrational. Joukhador et al. (2003) highlight a justifiable criticism that could be directed at this approach, which is that subjective interpretation is required in order to analyse the findings. Without allowing the participant to explain such statements, and no matter what criteria are used to categorise verbalisations, the participant is not given the chance to adequately explain statements made. This is equally true for the GBQ, or any similar questionnaire, where the participant is not given the chance to adequately explain why they endorsed particular items, or if they understood all of the items. The effectiveness of each of the three methods (TAM, GBQ, interview) used to capture gambling-related thoughts is an important issue where past and future research is concerned and was also discussed in the interview. This allowed participants the opportunity to identify the strengths and weaknesses of each of these methods, which may be more informative than having

researchers retrospectively describe the problems they considered particular methods to have.

Results

Phase 1 (TAM)

The 10 participants gambled for a total of 1017 min (mean = 101.7; range 67–147) and produced a total of 2814 verbalisations (mean = 281.4; range 149–377); see Table 1. The five pathological gamblers produced an average of 322.8 statements, which was significantly more than that of the five social gamblers, who produced 240.0 statements (t = 2.4, df = 8, p < .05). The types of verbalisations made were predominantly in the descriptive category. The sample averaged 13.5 adequate and 22.2 inadequate verbalisations, with social gamblers more likely to make adequate verbalisations and pathological gamblers inadequate verbalisations (Table 1).

Table 1.

Time gambled and number (SD and range) and type of verbalizations made by pathological and social gamblers

	Total sample	Pathological gamblers	Social gamblers
Time gambled (minutes)	101.7 (25.8, 67-147)	115.6 (30.5, 67-147)	87.8 (9.3, 75-96)
Verbalisations made*	2814.0 (66.9, 149-377)	322.8 (41.2, 278-377)	240.0 (63.8, 149-310)
Types of verbalisations			
Adequate verbalisations	13.5 (6.2, 6-25)	13.2 (6.1, 6-20)	13.8 (7.0, 6-25)
Inadequate verbalisations	22.2 (12.6, 7-44)	29.6 (13.7, 8-44)	14.8 (6.0, 7-20)
Descriptive verbalisations	214.3 (57.0, 79-280)	243.8 (22.9, 218-280)	184.8 (68.0, 79-254)
Other verbalisations	31.4 (21.1, 10-82)	36.2 (27.5, 14-82)	26.6 (13.8, 1-42)

*Statistically significant as tested by *t*-tests (p < 0.05).

Percentage of inadequate verbalisations: Using the same method employed by Walker (1992a), the percentage of inadequate, adequate, descriptive, and other verbalisations made were calculated (Table 2). All four categories of verbalisations were always included in the bottom line of the expression, and the type of verbalisation examined determined what was on the top line of the expression.

For example, the following expression was used to calculate the percentage of inadequate verbalisations produced:

$$\frac{I}{I+A+D+O}\times100,$$

where *I* = inadequate verbalisations, *A* = adequate verbalisations, *D* = descriptive verbalisations, and *O* = other verbalisations.

Table 2.

Mean percentages of verbalisations made by social and pathological gamblers

	Inadequate	Adequate	Descriptive	Other
Social	6.2%	5.8%	77.0%	11.1%
Pathological	9.2%	4.1%	75.5%	11.2%

Types of inadequate statements made: *Among the sample, predictions or confirmation of predictions were the most common form of inadequate statement made (34.5%), followed by not understanding probability (24.5%), personification (21.4%), cause and effect (13.6%), and finally references to skill or personal control (6.0%). Table 3 provides examples of each type of inadequate verbalisation.*

Table 3.

Examples of inadequate verbalisations made in the TAM

Skill

1) I'm impressed with that, pure skill on my behalf (participant 2).

2) Oh, this is a skills one, skills (participant 6).

3) Oh, as usual my skill never fails to impress me (participant 10).

Predictions

4) I'm predicting this could cost me another 20 pounds for my jackpot (participant 3).

5) The jackpot is guaranteed (participant 3).

6) I'm starting to predict the way it's playing, it's let me back on the board again, I need a red boost, but I don't think it'll give it to me (participant 5).

Cause and effect

7) It's dropping down the back which is a good sign (participant 5).

8) So far so good, landed on a question mark, shouldn't have jinxed myself and said that (participant 7).

9) 9) Feeling confident here, I reckon, I think I'll get £1.70 (participant 10).

Personification

10) Another one in it, gee (*give*) me another red streak, I know you want to,

it has to do it, it just has to do it, the machine makes you put another pound in it (participant 4).

11) And again, another true skill, it (*the machine*) must have heard me (participant 8).

12) It (*the machine*) gees (*gives*) you a hold when you're down to your last ten pence just so you keep playing it (participant 9).

Not understanding probability

13) It (*the machine*) will have to do better than that (participant 1).

14) I should be winning here (participant 2).

15) I've only got five pounds for more than fourteen, it has to give me something better, so I'll keep playing it (p.5)

Phase 2 (GBQ)

The average GBQ score, which can range from 0 to 192, was 61.2 (*SD* = 28.3, range 23-117); pathological gamblers 76.2 (*SD* = 28.4; range 50–117); social gamblers 46.2 (*SD* = 21; range 23–78). Although the mean GBQ scores were higher for pathological gamblers, *t*-tests revealed no significant differences between the social and pathological gamblers on the GBQ.

Phase 3 (semistructured interview)

The sample was asked which of the three methods used in the study was most effective in terms of capturing gambling-related thoughts (Table 4). The TAM, GBQ, and interview were difficult to separate, although all participants rated the GBQ as the best or second-best way of capturing their gambling-related thoughts.

Table 4.

Effectiveness of the TAM, GBQ, and Interview for assessing gambling-related thoughts

Participant	Gambler type	Best method	Second-best method	Third-best method
1	Social	TAM	GBQ	Interview
2	Pathological	GBQ	Interview	TAM
3	Pathological	GBQ	TAM	Interview
4	Social	Interview	GBQ	TAM
5	Social	Interview	GBQ	TAM
6	Pathological	TAM	Interview + GBQ*	---
7	Pathological	GBQ	TAM	Interview
8	Social	GBQ	Interview	TAM
9	Pathological	TAM	GBQ	Interview
10	Social	Interview	GBQ	TAM

*The interview and GBQ were considered joint second-best methods for participant 6.

Predictions: Statements in the TAM regarding predictions, personification, and skill made up more than 60% of all the statements categorised as inadequate, and participants were asked in the interview to explain such statements. Predicting what will happen or confirming predictions in a chance situation would logically be considered irrational, although most of the sample (*n* = 8) did exactly this. However, regardless of gambling group, participants indicated that it was 'just down to experience' (participant 8), with fruit machines being no more than computerised programmes—'it's a programme at the end of the day; it does the same things' (participant 6). Participants did not indicate that they could 'predict 100%' (participant 1) exactly what is going to happen while playing fruit machines, but most believed that after 'you play the machines for so many years' (participant 3) and 'so many times' (participant 6), they have come to know what to expect. As it happened, many of the predictions made by the participants in the TAM were accurate.

Personification: Statements regarding personification were made by all but one of the sample. Only one social gambler failed to satisfactorily explain a statement involving personification, perhaps due to the fact that she had only recently started playing fruit machines and had appeared on many occasions to be uncertain about what to do during the TAM. Perhaps the confusion shown while playing fruit machines was also evident in the interview. The participants were asked in the interview to explain statements they had made during the TAM, such as 'Something about this machine doesn't like me' (participant 2) or 'The machine makes you put another pound in' (participant 4). The participants responded 'I'm not saying the machine has emotional feelings towards me [laughing]' and 'I'm not saying the machine is forcing me to do it, it's just a machine', with both stating that it is just phraseology used within a gambling context. Other common examples of personification were statements such as 'Stupid thing' (participant 1), 'What are you all about machine' (participant 6) or 'It [the machine] must have heard me' (participant 8). Participant 9 actually

had 23 statements categorised as inadequate due to personification, although 22 of these statements were 'Come on machine'. Participants were alike in their responses, explaining personification as nothing more than statements made within a gambling establishment, which 'do not mean anything' (participants 1, 6, 8, and 9).

Skill and strategies: Skill and strategies contribute to the illusion of control and therefore erroneous beliefs. The six participants who considered themselves to be more skilful than others elaborated by saying that this was due to 'experience' (participants 5 and 6), or was 'mostly knowledge and understanding' (participants 1, 2, 3, and 4). For the few participants that stated they had strategies in the interview, such strategies were not actually specific strategies at all, with descriptions of strategies being 'I just stick to what I know' (participant 6), or 'I just make sure I play the ones I know' (participant 7). The last participant claiming to have strategies failed to elaborate on what these strategies actually were and rationally stated, 'bear in mind it's a machine at the end of the day; you're still going to either lose to it or come out winning' (participant 2).

Other inadequate responses addressed in interview: The sample were asked to explain other statements on the TAM or responses on the GBQ that were deemed inadequate, such as those relating to superstition (hunches, lucky signs, rituals), the gambler's fallacy, near wins, cause and effect, and flexible attribution. For example, participant 7, who said 'I shouldn't have jinxed myself and said that' during the TAM, and participant 3, who indicated on the GBQ that 'I believe rituals can help me win', were asked to explain their comments regarding superstition in the interview; see Figure 1. Figure 1 displays brief examples from the semistructured interview, and the response from participant 7 does not suggest that the participant held any superstitious beliefs, and participant 3 was clearly talking about rituals in relation to his Chinese cultural heritage, as opposed to do with gambling. These brief examples reflect many of the responses given by the sample when asked about possible erroneous cognitions that had been identified in the study.

Figure 1.

Sample of interview for participants 7 and 3 (researcher (R:) in plain, subject (S:) in **bold***).*

Participant 7
R: At one point during the gambling phase you said 'so far so good' and then when you landed on a question mark you then said 'I shouldn't have jinxed myself and said that'. Do you have any superstitious beliefs about gambling?

S: Em, not really, no.

R: Anything you can think of?

S: Just don't think you're, as they say don't think you've won until you've actually won, although I suppose that's not really superstitious.

Participant 3
R: You circled 2 for the item on the questionnaire 'I believe rituals can help me win', suggesting that this means something. So what are these rituals you're referring to?

S: Well, you see Chinese have, Chinese people have a saying of rituals right, as in like if you pray to this kind of, eh, Buddha statue, it brings you good luck, where if you do this by the New Year, the day before New Year, all the luck brings, it brings you all the good luck to you, that's what I meant by that.

R: Are you saying that's more a religious thing, rather than to do with gambling?

S: It is, it's more a, how would you say, it's like more of a, eh, tradition, you know, to other cultures, not really gambling.

Comparisons between pathological and social gamblers in terms of explaining inadequate statements: It was hypothesised that pathological gamblers would make more inadequate statements than social gamblers during the TAM and have higher scores on the GBQ, which they did. As a result they were asked more questions in the interview relating to these inadequate responses than were social gamblers. Comparisons, however, can be made between the two groups, with the pathological gambling group adequately explaining 61.0% (36 of 59) of responses categorised as inadequate, compared to the social gambling group who adequately explained 68.1% (32 of 47) of responses categorised as inadequate.

Reasons behind gambling: All five social gamblers indicated that they gambled mainly because of boredom, with two mentioning that they also gambled for excitement (participants 5 and 10).   For the five pathological gamblers, three mentioned that they felt they were 'addicted' to gambling (participants 2, 3 and 9), one stated that he gambled because of the urge, i.e. impulsivity (participant 6) and the final gambler claimed to gamble for social reasons (participant 7).   Mentions of escape, from boredom, problems in life and also from depression, were also made by four of the pathological gamblers (participant 3, 6, 7 and 9).

Discussion

In keeping with previous findings, pathological gamblers displayed a greater number of erroneous cognitions than did social gamblers in the TAM, GBQ, and interview, although in no case reaching significance. Coventry & Norman (1998) employed tighter criteria than previous studies and found that most verbalisations were neither rational nor irrational, but fell under the 'other' category. The present research employed a more comprehensive examination of gambling-related cognitions and likewise found that most statements made while gambling could not be viewed as irrational, but were simply descriptive. Furthermore, each individual was given the opportunity in the subsequent interview to explain responses that were deemed inadequate; e.g., if the participant had alluded to predictions or the confirmation of predictions during the TAM, or had repeatedly indicated that skill was important on the GBQ, then they were asked to explain why they had done so. When provided with this opportunity, the pathological and social gamblers were able to give adequate explanations for more than half of these supposedly irrational beliefs. What was clear from the study, even given the small sample size, was that multiple assessments are necessary to assess so-called erroneous cognitions.

The interview allowed participants the opportunity to highlight the advantages and disadvantages of the various methods of assessing erroneous cognitions, which may be beneficial for future research in this area. The TAM was considered a natural method for capturing exact thoughts instantaneously, which incontrovertibly is the main strength of this method. However, more than half the sample ($n = 7$) raised concerns about its usefulness, considering it to be an 'anxiety-provoking', 'unfamiliar experience' requiring time to become accustomed to. Given that many studies are completed within about 15 minutes or less, with limited or no preparation time (Delfabbro & Winefield, 2000; Griffiths, 1994; Coulombe et al.,

1992), it is questionable as to whether the participants had a suitable period of time to get adjusted to speaking aloud. To highlight this point, two of the participants made significantly more statements after the first 20 minutes of the study, explaining that only after this period of time had elapsed did they feel at ease with the TAM.

Other comments about the TAM included the difficulty associated with the knowledge of being recorded, and the fact that things may be said simply to fill in time. If participants in such experiments are simply saying anything to satisfy demand characteristics then irrationality may well be artifactual (Walker, 1992a). As the TAM is reliant upon the assumption that statements made are directly related to the gambler's thinking then such statements are not accurately measuring thoughts. Highlighting the potential problems associated with this approach, only three participants thought that the TAM was not difficult, and only one person considered their utterances to be completely reflective of their normal thoughts while gambling. Two pathological gamblers claimed in the interview that they did not think while gambling and described gambling as a form of escape from boredom and problems in life. Such gambling may function to fulfil escape as a maladaptive coping strategy employed to avoid thinking about life's problems, or anything else for that matter. As such the TAM may not be particularly revealing for this subset of pathological gamblers. In support of a criticism raised by Joukhador et al. (2003), the TAM was also deemed difficult because some people find it easier to instantly verbalise and express their thoughts than others.

The general consensus of the sample for the GBQ was that it was a useful instrument, being considered accurate and relevant to participants' gambling. It was viewed favourably as it allows the participants time to think about their responses (unlike the TAM) and it has a wide variety of choice. Therefore the GBQ was viewed by some as exploring a range of gambling beliefs including those which may not arise during a single gambling session and would not be captured by the TAM. However, a number of participants ($n = 3$) did indicate problems. One social gambler believed that some questions could be misinterpreted, and this point is supported by two pathological gamblers who thought that the questionnaire was alluding to a single gambling session. When asked in the interview why the two participants highly endorsed the items 'Eventually I can come out ahead from gambling' (item 3), 'I've lost so much money I might as well keep going' (item 36) and 'I can get my losses back' (item 41), both explained that a lot can happen in a single gambling session and they may be able to get their initial stake back, and possibly even more. Although it has been previously mentioned that timing may be an important factor in relation to responses on the GBQ, it may be that certain questions have to be phrased differently to ensure accurate responses. When subsequently informed that the questionnaire was referring to recouping the gambling losses they had accrued through their lives, both pathological gamblers responded that this would never happen. An important point to note is that although the items were clearly and rationally explained in the interview, they would have been deemed irrational in its absence. This echoes many of the statements made during the TAM and suggests that the high levels of so-called irrationality found in many studies may not be entirely accurate. Although there is no currently accepted instrument for measuring cognitive gambling beliefs (Joukhador, Blaszczynski, & MacCallum, 2004), the GBQ appears to be useful with it being considered either the best or second-best way to assess thoughts by all participants.

Regular gamblers have been found to make more references to skill or are more likely to consider themselves more skilful than nonregular gamblers (Coulombe et al., 1992; Griffiths, 1994). The same number of pathological and social gamblers ($n = 3$) in the study considered themselves to have greater skills than others, although two of the social gamblers also

admitted having fewer skills than those with more experience of fruit machines. This was a common theme where skill was concerned, with participants often saying that skill was to a large extent the equivalent of experience or knowledge of machines, with one participant saying 'knowledge of the machine is a skill in itself'. Langer (1975) noted that success in skill tasks is controllable whereas success in luck or chance situations (such as gambling) is uncontrollable. The belief that the opportunity to utilise greater skill or knowledge will allow frequent fruit machine gamblers to win more money than less knowledgeable fruit machine gamblers could be construed as a prime example of the illusion of control. However it is accurate to an extent, with Moodie & Finnigan (2005) finding that in a sample with an equal amount of money provided to each participant, that frequent fruit machine gamblers (*n*=21) won more money than infrequent fruit machine gamblers (*n*=21) who in turn won more than non-gamblers (*n*=21). This would not be expected in a totally random situation.

It has to be stressed that fruit machines are not the equivalent of the video lottery terminals, slot machines, and poker machines found in Canada, the United States, and Australia, respectively, in which outcomes are randomly determined. There is a degree of skill (and predictability) involved in British fruit machines (Moodie & Finnigan, 2005; Parke & Griffiths, 2006), which does give the player a slight element of control. Parke & Griffiths (2006) provide a comprehensive overview of the structural characteristics of British fruit machines, highlighting both the skill involved in playing the machine and also in identifying which machine to play. This means that the amount of money won or lost on most fruit machines can be affected by how the individual plays the machine. Therefore, the problem with the pathological fruit machine gamblers in the present research is not that they are unable to discriminate between chance and skill situations, but as Griffiths (1994) points out, it seems that they believe there to be more skill involved in this form of gambling than there actually is.

Parke & Griffiths (2004) describe a derivation of the near miss called 'credit teasing', where a fruit machine player is confronted with an inviting situation on the last credit and is therefore encouraged to insert more money. Such inviting situations are numerous, including any repeat chances on cash awards or feature awards, and also trail holds and third holds (Parke & Griffiths, 2006). This idea of credit teasing appears to be a common feature of modern fruit machines, being mentioned by a social gambler and a pathological gambler. The pathological gambler made reference several times to the fact that he thought the machine was deliberately inducing him to put more money in to get a repeat or a third hold. Verbalisations such as 'it gees [gives] you a hold when you're down to your last 10 pence just so you keep playing it' were further investigated in the interview when once again the participant stated about the machine, 'I think it does that on purpose'. Griffiths (1994) categorised statements such as these as 'personification', which falls into the irrational category, as suggesting that a machine is intentionally doing something to someone gives it a human quality. When further explored the participant stated that he thought that fruit machines 'were rigged that way'.

Similarly, a social gambler often personified, or attributed human qualities to, a machine by suggesting it's 'having a laugh' or is 'at it' when in a losing situation. However, when given the opportunity in the interview to explain why he considered machines to have human-like qualities, the participant replied that 'the machine is programmed by a human, therefore it must have human qualities to draw and attract humans'. These statements concerning personification were not deemed irrational as fruit machines are obviously cleverly designed, utilising psychological knowledge concerning the near miss, etc., to attract and be as engaging as possible for gamblers. In fact, most statements regarding personification were

more straightforward than the examples previously mentioned, such as 'stupid thing', 'come on machine', and 'what are you all about machine'. These statements were adequately explained in the interview, and it is difficult to justify why they would be construed as irrational in the first place. This, however, is exactly what has been done in previous research.

Cognitive explanations of gambling suggesting that it is sustained by either the belief in winning (Walker, 1992b) or cognitive errors (Coulombe et al., 1992; Breen & Zuckerman, 1999) did not receive support in the study. As an example of this, all pathological gamblers rationally stated in the interview that they would never recoup their losses. Of the three pathological gamblers that stated that they felt they were addicted, one said 'when you're addicted you're not trying to win', with another saying 'sometimes you win, but mostly you're thinking I'm going to lose here'. Aside from mentioning addiction, the reasons underlying gambling behaviour predominantly centred on relieving boredom or escaping from problems. This merits attention because although the reward of winning money is central to cognitive theories, it has been found that only distraction from everyday problems significantly differentiates pathological from subthreshold gamblers (Cox, Enns, & Michaud, 2004). Gambling to relieve dysphoric states is frequently noted in the literature (Specker, Carlson, Edmonson, Johnson, & Marcotte, 1996; Blaszczynski, Wilson, & McConaghy, 1986), and importantly those gamblers seeking relief or escape often have little interest in winning (Rugle, 2004). Therefore, although cognitive factors seem to play a significant role in the development of gambling behaviour (Moodie & Finnigan, 2006; Delfabbro & Thrupp, 2003), they may be less salient in the maintenance of such problems. Once a person has reached a stage where gambling has a detrimental impact on areas of his or her life, escapist reasons may sustain the behaviour.

Limitations

The study has a number of limitations that may have affected the findings, such as the very small sample size employed, the uneven gender distribution, and the limited age range of the sample. The sample was also restricted to fruit machine gamblers, obtained from a single arcade in Glasgow, and as such the results cannot be generalised to other forms of gambling. The sample cannot be considered representative of those gambling on non-British electronic gaming machines either, as the outcomes on these machines are randomly determined.

Conclusions

The study found that although distorted cognitions or erroneous beliefs are evident within fruit machine gamblers, they are not as prominent as researchers favouring a cognitive model would suggest. Most studies assessing gambling-related thoughts falter through a number of methodological weaknesses (single forms of assessment, lab settings, use of only students or occasional gamblers, etc.), which limits the generalisability of their findings. Many studies only use the TAM, and problems with this method have been found with students (Walker, 1992a), nonstudents (Delfabbro & Winefield, 2000), and now active social and pathological gamblers. Little support was found for the notion that gamblers are predominantly concerned with winning, and for pathological gamblers escapist reasons appeared to have a greater influence on gambling maintenance. Cognitive biases and erroneous beliefs do indisputably have a role in gambling, and any theoretical model of gambling (Sharpe, 2002; Blaszczynski & Nower, 2002; Griffiths & Delfabbro, 2001) not incorporating distorted cognitive biases would have limited explanatory power and as such

could be considered untenable. It could be argued, however, that the reliance on a unitary cognitive model is equally untenable. Perhaps cognitive explanations of gambling should supplement alternative gambling theoretical models (Frank & Smith, 1989). Similar larger-scale future research thoroughly investigating erroneous cognitions and beliefs in different forms of gambling, using multiple assessments, could provide an insight into the true role they have in the development and maintenance of gambling behaviour.

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