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Practice Makes Poorer: Practice Gambling Modes and Their Effects on Real-Play in Simulated Roulette

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Abstract The aim of this study was to examine the role of free-play modes on gambling behaviour in computer-based roulette. Eighty participants were randomly allocated to one of four pre-exposure conditions: no exposure (control group), a loss condition, a break-even and a profit condition in which the return to player was greater than 100 %. Behavioural persistence and betting behaviour was subsequently monitored in a period of regular roulette play. The results showed that players given opportunities for free-play sessions bet significantly more per spin and wagered more credits in total than the control group, although no significant group differences in behavioural persistence were observed. The results suggest that the role of free-play modes, as they commonly appear on some Internet gaming sites, may need to be investigated further because of their potential role in altering player perceptions of the activity and their influence on risk-taking behaviour.

Keywords Online gambling · Practice modes · Risk-taking · Persistence · Roulette

Introduction

Although terrestrial modes of gambling remain the predominant source of industry revenue across the world, Internet gambling is growing rapidly. In 2011, it was estimated that Internet gambling revenues accounted for around 8 % of the world gambling market with total revenue of around US$33 billion (Gainsbury 2011). Internet gambling is not a form of gambling per se, but refers to gambling activities which are either facilitated or made available via online technologies. For example, some terrestrial services (e.g., online sports and betting companies) may allow gamblers to place bets on terrestrial events (e.g., the outcome of races or sporting events) using online accounts, whereas others may only operate on the Internet. This latter form of service may offer online gaming produce in the form of casino games or slot-machines which simulate terrestrial activities and which offer various degrees of interactivity. In some countries, Internet gambling is made available by companies (e.g., Svenska Spel in Sweden or Norsk

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Tipping in Norway) which also offer terrestrial gambling services, whereas there may be other operators who only offer Internet-based services.

Research evidence suggests that only a relatively small proportion of the population uses the Internet to gamble (Wardle et al. 2011). In Australia, for example, the typical estimate is around 1–2 %, although evidence from online account monitoring suggests that the true figure is likely to be double this figure (Productivity Commission 2010). Much higher estimates have been reported in other countries such as Canada, the US and in Europe (Wood and Williams 2009; Wood et al. 2007) where figures as high as 30 % have been reported (Gainsbury 2011). As Wardle et al. have shown, Internet gambling is rarely undertaken in isolation. Those who gamble on the Internet also typically gamble on terrestrial activities, so that the proportion of "Internet-only" gamblers tends to be relatively small. On the whole, the profile of these gamblers differs from other gamblers. Over 80 % are male, a high proportion are younger (under the age of 30 years) and a relatively greater proportion have higher socio-economic status and educational attainment than the general population (Wood and Williams 2009).

Given the growing pervasiveness of Internet gambling, much has been written about its potential role in the development of problem gambling (Peller et al. 2008). A consistent finding in this research is that problem gambling rates tend to be higher amongst those who report using the Internet to gamble. For example, studies conducted in the United Kingdom suggest rates of problem gambling amongst Internet gamblers range from 5 % (Griffiths and Barnes 2008) to 18 % (Griffiths et al. 2009). Griffiths and Barnes (2008) found a higher probability of problem gambling amongst Internet gamblers than non-Internet gamblers and that, on average, Internet gamblers spent more time and money gambling than non-Internet gamblers. Internet gambling has been considered particularly problematic because it allows people to gamble 24 h per day and 7 days per week, often without the need for any social interaction (Griffiths 2003; Moody 2001).

Internet gambling is thought to be especially attractive to younger people (under the age of 25 years) because of their familiarity with and exposure to technology (McBride and Derevensky 2009; Potenza et al. 2011; Tsitsika et al. 2011). Internet gambling is heavily promoted via direct Internet advertising, spam emails, messages on smartphones and in sporting events watched by young people. Gambling has also become an increasingly common feature of video games and social media sites popular amongst younger people (King et al. 2012). For example, the popular social networking site *Facebook* features several gambling games including *Zynga poker* where people can gamble against other players for status and chips and where it possible to purchase additional chips to stay in the game. Games such as *Zynga poker* reflect a trend that has often been referred to as technological 'convergence' in which the increasing consistency, transferability and inter-connectedness of technology allows a greater synergy between different media forms (King et al. 2010). Activities (e.g., video gaming and gambling) which previously might have been undertaken using different technology platforms and/or locations can now be undertaken together. Alternatively, one will observe examples of video game features within gambling activities (e.g., gaming machines) or gambling being featured as elements in video games or other electronic activities.

Free-Play Modes

A salient concern about this blurring of categories is that young people are presented with an increasing number of opportunities to practice or be introduced to gambling without necessarily needing to outlay any money. 'Non-monetary gambling' is a broad term encompassing various systems or games based on gambling-like principles, but with no actual money being won or lost. Participation in such non-monetary forms of gambling has also substantially increased, especially amongst adolescents and children (e.g. Ipsos MORI 2009). Non-monetary forms of gambling can be found on social media websites, as stand-alone computer games, and within actual gambling sites themselves, under the guise of "free-play", "demo" or "practice" modes (see King et al. 2010 for a comprehensive review of the different forms of non-monetary gambling). Virtually all currently operational online casinos make available such "free-play" or "Play For Fun" modes for users.

A report prepared for Ipsos MORI by Forrest, McHale and Parke (2009) found that participation in a free-play mode significantly predicted whether a young person had engaged in monetary gambling. Involvement in non-monetary forms of gambling was also found to be a significant predictor of children's problem gambling behaviour. Although these relationships are correlational, it is reasonable to suggest that non-monetary forms of gambling and free-play modes may be a precursor to actual monetary gambling, especially in an online setting. It has also been suggested that excessive playing of computer games, even without monetary reward, is similar to problem gambling in adolescents (Johansson and Gotestam 2004). Moreover, despite minimum age requirements enforced by some providers, recent studies have indicated a large number of children and adolescents have in fact engaged in such free-play modes (Griffiths and Wood 2007; Ipsos MORI 2009). Thus, it is reasonable to speculate that free-play modes have significant potential to shape young people's beliefs and notions about gambling. This may be especially true if free-play modes are among the first forms of gambling young people have experienced and been actively involved in.

Although several researchers have scrutinised some of the practices of Internet gambling providers, including their use of potentially misleading advertising (Griffiths 2005), and the general lack of socially responsible protocols (Griffiths 2003), there is little published empirical research on the effect of free-play modes, unique to the online gambling experience, on later gambling behaviour. According to some researchers (e.g., Gainsbury 2011; King et al. 2010), free modes could be potentially harmful to children and adolescents because they have the potential to enhance the appeal of gambling and promote gambling activities in an idealised manner (Griffiths and Wood 2000, 2007; Griffiths and Parke 2010). Experiencing significant success during the practice mode may foster the idea that gambling is a means of financial freedom, as well as a source of excitement and enjoyment (Griffiths 2003). During free-play, players may also be subjected to pop-up windows or dialog boxes which encourage them to try playing for real (Sevigny et al. 2005). Such messages promote the belief that the free-play and play-for-real modes are equivalent. Advertising presented during free-play modes may appeal to erroneous beliefs about the chance nature of most gambling activities, such as by offering positive feedback about the player's performance. Sevigny et al. (2005) assessed over 100 sites and found that one third of them had practice modes with payout rates that were greater than 100 %, but where standard (<100 %) return rates were applied in the real-play modes.

Given these features alone, free-play modes may have the potential to influence gambling activities/behaviour/attitudes amongst players through several psychological mechanisms. First, it is known from behavioural literature involving animals (e.g., Flora and Pavlik 1990) that situations involving more reliable or consistent reinforcement will be chosen over those where the reinforcement is less consistent.[1] In other words, if given a choice between two potential gambling sites, people will be expected to choose that which presents the greater reinforcement potential. Second, the experience of differentially high rates of reward may encourage an illusion of control (Langer 1975; Rothbaum et al. 1982; Thompson et al. 1998). Gamblers may believe that they have greater skill in controlling or predicting the outcomes than is dictated by the objective odds (primary control), or they may believe that positive outcomes are more likely to occur because of personal luck (secondary control).

The aim of the present study was to examine the behavioural effects of pre-exposure to free-play modes in a computer-based roulette program. Players were randomly allocated to one of three different free-play or pre-exposure conditions (a loss group, a break-even group and a profit group). All three groups were compared to a no pre-exposure control group. Subsequent behaviour (as defined by how long players persisted with the game and their bet sizes) was then examined in a real-play mode where players could vary their bets and play for as long as they like. Student participants who had gambled on commercially available forms of gambling were recruited, such that the sample characteristics were generally similar (younger, more highly educated) to these groups known to have highest usage of Internet gambling and social network sites with gambling games. It was hypothesised that greater persistence and risk-taking would be observed in those given previous free-play exposure and that the strongest differences would be observed in the profit group exposed to an artificially elevated return to player (i.e., greater than 100 %).

Methodology

Participants

The sample comprised 80 participants, 37 males and 43 females sampled from the student population at the University of Adelaide. All participants had to be aged 18 years and over and to have engaged in some form of gambling during the previous 12 months. The age of participants ranged from 18 to 41 years (M=22.0, SD=4.8) with 84 % found to be aged between 18 and 24 years.

Survey Measures

(a) *Demographics and gambling participation*

All participants were required to complete a preliminary survey which included general demographic questions (age, gender, employment status, country of birth) as well as details of how often they gambled on a variety of gambling activities. Participation was captured on a 5-point scale where 1=Never, 2=1–11 times per year, 3=Monthly, 4=2–3 times per month, and 5=Weekly or more often.

(b) *Problem Gambling Severity Index (PGSI).*

Participants completed the 9-item PGSI from the Canadian Problem Gambling

[1] Although many animal studies in the Skinnerian predict greater behavioural persistence following the experience of intermittent reward vs. continuous reward, this refers more to behavioural resistance to extinction (Bradshaw et al. 1976). It is harder to differentiate non-reward following intermittent reinforcement. However, in relation to the choice of schedules, the Flora and Pavlik (1990) study shows that a different rule applies. The more reliable source of reinforcement will be chosen; a finding which is more consistent with the theory of learning advocated by Edmund Tolman based on the activation of learning arising from expectations for reinforcement.

Index (Ferris and Wynne 2001). Items were scored on a 4-point scale, (0=‘Never’, 1=‘Sometimes’, 2=‘Most of the time’ and 3=‘Almost always’). Scores of 8 or more indicate problem gambling, 3–7=moderate risk gambler, 1–2 low risk gambler, and 0= non-problem gambling.

(c) *Drake Beliefs About Chance (DBC) Inventory*

Given the well-documented link between particular cognitive biases, erroneous beliefs, superstitions and gambling behaviour (e.g. Joukhador et al. 2004; Toneatto 1999; Toneatto et al. 1997), respondents completed the Drake Beliefs About Chance (DBC) inventory (Wood and Clapham 2005). The DBC comprises 22 statements concerning erroneous beliefs about games governed by chance and loads on two primary dimensions: (1) the Illusion of Control and (2) Superstition. The statements “I have a special system for picking lottery numbers” and “There are secrets to successful gambling that can be learned” are examples of statements assessing superstition and illusion of control, respectively. Participants indicated their level of agreement with each statement on a 5-point Likert scale, ranging from (5) Strongly agree to (1) Strongly disagree. Scores for each dimension were calculated by summing the ratings from the 11 corresponding items. A total Beliefs About Chance score, ranging from 22 to 110, was also calculated with higher scores indicating greater levels of superstition, illusion of control, or both.

Experimental Design

The study was a between-subjects experimental design with three experimental groups and a control group (Table 1). Participants were randomly allocated to one of these conditions (each with $n=20$). All groups completed the same test phase but after different pre-exposure conditions. Three experimental groups were asked to complete a free-play practice phase to simulate free Internet gambling, whereas the control group completed the test-phase only after having completed a filler task.

The treatment groups were defined as follows. For Losing Free-Play (Group 2), the closing balance at the end of the free-play phase was significantly less than the opening balance. For Break-Even Free-Play (Group 3), the closing balance at the end of free-play was approximately equal to the opening balance, and for Winning Free-Play (Group 4), the closing balance at the end of the free-play phase was significantly greater than the opening balance.

The Internet Gambling Roulette Simulation

The simulation was designed to resemble as closely as possible roulette games found in internet-based casinos (see Fig. 1). The simulation featured a single-zero roulette wheel, a

Table 1 Summary of experimental conditions and phase(s) completed for each group ($N=80$)

Group	1 Control	2 Losing free-play	3 Break-even free-play	4 Wining free-play
Pre-exposure phase: free-play[a]		✓	✓	✓
Test phase: play-for-real money[b]	✓	✓	✓	✓
N	20	20	20	20

[a] $n=60$ [b] $n=80$

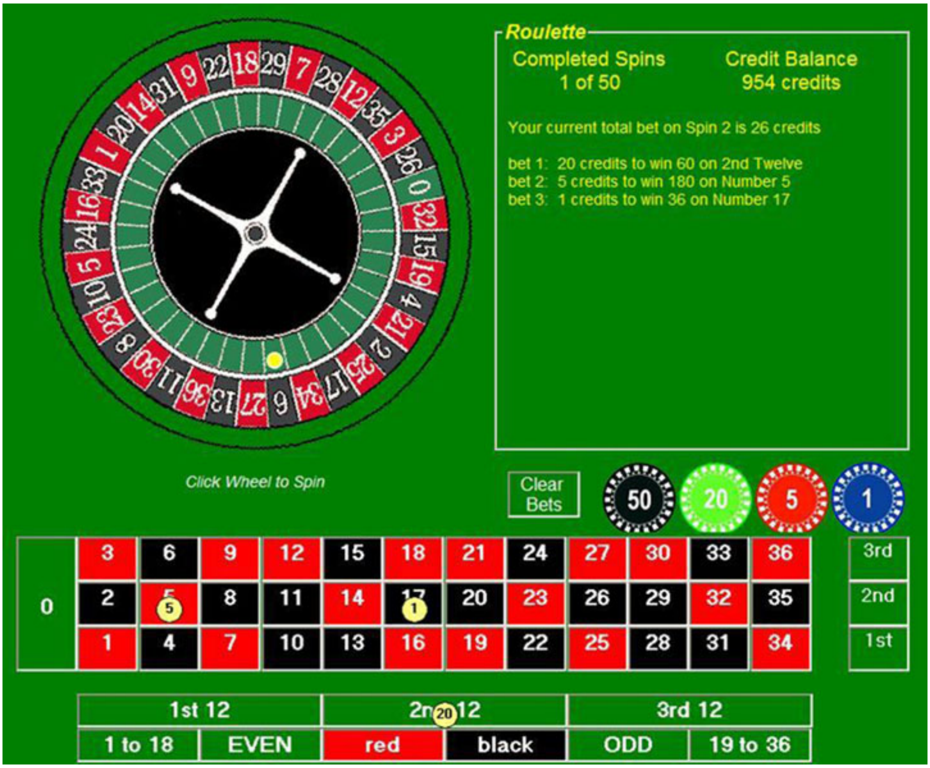

Fig. 1 A screenshot from the roulette simulation

standard betting grid and betting chips in four denominations (1 credit, 5 credits, 20 credits, 50 credits), as shown in Fig. 1. The simulation included sound effects for the action of the roulette wheel spinning as well as to denote successful betting outcomes. All programming was done using Visual Studio (2010).

The simulation comprised two distinct modes: a Free-Play Practice mode, and a Play-For-Real Money mode.

Free-Play Algorithm Manipulations

The opening balance for all free-play modes was set at 1,000 credits and, for each spin, the minimum bet was set at 1 credit with a maximum bet of 50 credits. The target closing balances for each of the Losing Free-Play, Break-Even Free-Play and Winning Free-Play groups were given as a range of credits. For Losing Free-Play, the target closing balance was set between 40 % and 60 % less than the opening balance, and for Winning Free-Play, the target closing balance was set between 40 % and 60 % greater than the opening balance. For the Break-Even Free Play, the target closing balance was set at a maximum of 10 % difference either side of the opening balance. The pre-determined ranges were established using an algorithm that adjusted the probability of outcomes according the difference between the running credit balance and the final target balance after a set number of spins.

For the Losing and Break-Even conditions, if a winning outcome for a particular bet meant that the target balance could not be reached within the remaining spins, the probability for that bet was set to zero. Similarly, win probability was set to zero during the last 10 % of trials (i.e. that last 5 spins) if winning that bet would cause the credit balance to exceed the upper limit by a greater amount that losing that bet would cause the credit balance to fall below the lower limit of the target range. However, if losing that bet would cause the balance to fall below the target range, the probability of winning was significantly amplified.

Play-For-Real Money Mode

The Play-For-Real-Money phase was more naturalistic. The winning number for each spin was determined by a random number generator, and winning probabilities were not altered. Every spin was independent from both previous spins and the current credit balance. For practical and cost reasons, a maximum credit balance of 10,000 was set.

Procedure

Participants completed the survey and then were randomly allocated to one of the four conditions. All participants except those in the control group engaged in both the free-play and the play for real money modes of the roulette simulation. The control group completed a filler task and a single "play for real money" session of roulette. All participants were then asked to complete a brief post-play questionnaire.

Prior to play, the rules of roulette and general program instructions were explained verbally to all participants. A printed set of detailed instructions was available at all times, and participants were free to ask questions and have any issues addressed at any time during the simulation. It was explained that the starting balance for each phase would be 1,000 credits, and that the closing balance from the free-play mode, (where applicable) would not be carried over to the play-for-real-money phase. Negative credit balances were allowed during both modes of play, without penalty. The exchange rate was known to each participant and was set at 1 credit equal to AU $0.01. Therefore, the opening balance of 1,000 credits in the play-for-real money phase was in effect AU $10.00.

At the start of the free-play mode, participants in the 3 experimental groups were told that they had the opportunity to practise playing roulette before playing for real money. They were told to play for 50 rounds and that no actual money could be lost or won. Once this session had been completed, they proceeded to the real play mode. They were told that they had been allocated 1,000 credits and that this amounted to $10. Participants were instructed to play for 50 spins and then if they wanted to play on or stop there. All money won could be kept and they were free to bet as much or little as they liked, within the preset maximum and minimum credit limits per spin

Computerised Data-Tracking [This Section Sounds Confusing, Not Sure How to Clarify]

All trials outcomes, betting amounts, final outcomes and number of trials completed were automatically logged/recorded. The "riskiness" of bets was captured in several ways, including (1) the number of total credits wagered over all spins made, and (2) the average number of credits bet per spin. A number of indices that also took into account the objective odds of winning were also used to assess players' risk-taking tendencies, defined here as (1) Average bet/pay ratio, and (2) Bet/pay x bet size For each spin, an averaged bet to pay ratio, or odds against value was recorded, based on the types of bets placed. The bet-to-pay ratio is a number describing how many credits will be won, per credit wagered, if the bet is successful. A bet such as 'Red' carries an odds ratio of 2, meaning two credits are paid for every credit wagered on this property, if the winning number is a red number. The values for Bet/Pay Ratio, per spin, fall within the range of 2 to 36: the higher this value, the more risky the bets placed. The closer the value is to 2, the greater the tendency towards 'safer' types of bets. The second riskiness index combined the bet size (in terms of number of credits staked per spin) with the odds against value to yield a composite measure that captured both the likelihood of the outcome and the amount staked. Higher values indicated greater risk-taking tendencies.

Persistence at the gambling task was measured using two variables (a) a binary variable that indicated whether participants did or did not persist beyond the 50 trials in the real-play mode, and (b) the actual number of trials played beyond this point.

Post-experimental Questionnaire

A post-experimental questionnaire captured several self-reported perceptions: (1) whether participants believed that the practice round enabled them to enhance their proficiency at roulette and (2) if they felt more confident to play roulette for real money after playing the practice round. The purpose of these questions was to help gauge how the free-play mode may have affected participants' sense of skill and control. Participants were also asked to rate proficiency at roulette compared to other players, on a five-point Likert scale from (1) Very Below Average to (5) Very Above Average.

Results

(a) *Gambling Experience*

Nearly all of the participants (96 %) had gambled at least once in the previous 12 months. The frequency of gambling did not differ between males and females, $t(78)=1.09$, $p>0.05$, or across the experimental groups, $F(3,76)<1$. The most frequently reported form of gambling was card games ($n=64$, 80 %) followed by poker machines ($n=56$, 70 %). Most of the respondents (75 %) had never engaged in Internet gambling and only 10 % of the sample (8 participants) reported taking part in Internet gambling more than 3 times a year.

(b) *Problem Gambling (PGSI)*

Four participants (5 % of the sample) scored 8 or more on the Problem Gambling Severity Index (PGSI) and could therefore be considered problem gamblers. An additional twenty-five participants (31 % of the sample) could be considered moderate risk gamblers. These figures are markedly higher than the rates of problem gambling in Australia: problem gamblers are estimated to represent 0.5 to 1.0 % of the general population, and gamblers at risk an additional 1.4 to 2.1 % of the population (Productivity Commission 2010). There was a small but significant correlation between the frequency of gambling and PGSI score, $r(80)=0.25$, $p<0.05$. PGSI scores did not differ according to the sex of respondents, or to which experimental group they had been allocated.

(c) *Beliefs About Chance*

The Drake Beliefs About Chance (DBC) inventory was included to control for individual differences in beliefs about luck and chance that may have influenced participants' responses to the task. The mean score on the total scale was 52.9 ($SD=13.9$) which is in the middle of the range of possible scores. A one-way ANOVA revealed no significant differences across the experimental groups for either the superstition dimension $F(3,76)<1$, illusion of control dimension, $F(3,76)<1$, or total DBC scores $F(3,76)<1$. Females were found to have significantly higher scores than males for the superstition dimension $t(78)=3.04$, $p<0.05$ and in total DBC scores, $t(78)=2.00$, $p<0.05$. DBC scores were not significantly correlated with PGSI scores, $r(80)=0.09$, $p>0.05$.

(d) *Manipulation check: Free-play model*

For the study to be effective, it is important to show that the final balances at the end of the free-play session were consistent with the group allocation. This was generally found to be the case. The mean closing balance (in credits) for the Losing condition was 460.1 ($SD=88.7$) which was approximately 46 % less than the opening balance, and for the Profit/Winning condition it was 1498.7 ($SD=155.6$) which was approximately 50 % greater than the opening balance For the Break-Even condition, the mean closing balance was 957.8 ($SD=120.5$) credits, or approximately just 5 % different from the opening balance. In other words, the correction algorithms were effective to ensure that one group experienced an outcome significantly below the break-even amount, that another was close to break-even and that one obtained a clear profit. These amounts differed significantly between groups? ($p<0.001$) with very large effect sizes.

(e) *Real-money phase: Validity check*

To confirm that the playing conditions during the play-for-real-money phase were equivalent across all groups (i.e. the groups did not differ significantly in the amount of reinforcement received), the closing credit balances, as well as the minimum and maximum credit balances recorded, and absolute range of credits (difference between maximum balance recorded and minimum balance recorded) were compared across groups. These analyses revealed no significant differences in: closing balance, $F(3,76)=1.48$, $p>0.05$; minimum credit balance reached, $F(3,76)<1$; maximum credit balance reached, $F(3,76)=1.59$, $p>0.05$; or the absolute range of credit balance during the simulation, $F(3,76)<1$, across the experimental groups. In other words, any differences observed between groups could be attributable to chance-determined variations in outcomes.

(f) *Assessment of Risk-Taking*

It was hypothesised that participants who were exposed to a free-Play phase of the roulette simulation would show greater tendency towards risk-taking when playing for real money compared to those in the no free-play control group. This was investigated using one-way ANOVA. As mentioned previously, risk-taking was measured using several variables, including the total number of credits wagered and the bet/pay ratio of the bets placed. The average size of bets placed in terms of credits, and the average number of credits wagered per spin were also used as measures of risk. Players were able to place multiple bets per spin (i.e., different parts of the roulette board), so that the average size of bets and the average number of credits wagered per spin are potentially different. For all measures, higher scores indicated greater tendency towards risk. The descriptive statistics and ANOVA comparisons are summarised in Table 2.

As Table 2 indicates, the differences between groups were, in general, quite small. However, there was a significant main effect of Group on the total number of credits wagered, and on the average number of credits wagered per spin. LSD post-hoc tests indicated that the average number of total credits wagered was significantly lower in the control condition than in both the Break-Even Free-Play condition ($p=0.017$) and Winning Free-Play condition ($p=0.008$). Similarly, there were significantly fewer credits wagered per spin in the control condition than in any of the Free-Play experimental conditions (all $p<0.05$).

Table 2 Mean (SD) risk-taking measures for each group ($n=20$) in play-for-real phase with ANOVA statistics for each measure

Measure of risk-taking	Experimental group				F (3,76)	η^2
	Control	Losing free-play	Break-even free-play	Winning free-play		
Total credits wagered	1712.79 (1038.13)	2054.3 (753.0)	2428.3 (874.5)	2508.8 (1009.1)	3.14*	0.12
Total bets placed	148.55 (116.21)	112.00 (99.14)	148.50 (132.57)	104.50 (43.38)	1.03	0.04
Average bet size (credits)	17.04 (11.45)	26.34 (15.47)	23.63 (14.20)	26.63 (12.30)	2.19	0.08
Average credits / spin	28.27 (13.34)	37.43 (12.71)	41.05 (11.93)	41.08 (9.51)	5.10*	0.17
Bet/pay ratio[a]	6.17 (4.12)	4.92 (3.38)	9.22 (10.33)	4.67 (2.78)	2.34	0.09
Riskiness index[b]	95.71 (91.47)	107.34 (84.25)	171.14 (224.96)	118.08 (77.44)	1.81	0.05

[a] Refers to the types of bets placed. E.g. A bet which pays 2 credits for every credit wagered has a value of 2; a bet which pays 36 credits for every credit wagered has a value of 36. All values fall within the range of 2–36

[b] Riskiness index is calculated by multiplying each participant's average bet size by their average bet/pay ratio

*$p<0.05$

(g) *Changes in Betting Behaviour from Free-Play Phase to Play-For-Real-Money Phase*

For each participant in a free-play condition, the betting behaviours from the free-play and play-for-real-money phases were compared on the following dimensions: (a) average bet size, (b) average bet/pay ratio and (c) average credits wagered per spin. The changes in betting behaviour from the free-play phase to the real-play phase are summarised in Table 3. Positive values indicate that the value of the measure increased in the play-for-real-money phase from the free-play phase. For example, in row 1 of Table 3, the value of +2.85 indicates that those in the losing free-play group increased the average size of each of their bets by approximately 2.85 credits from the free-play to the real-play mode.

Across all of the free-play groups, the average bet size was significantly higher in the play-for-real-money phase ($M=25.51$, $SD=13.9$) than the free-play phase ($M=22.74$, $SD=11.2$) $t(59)=-2.31$, $p<0.05$, Cohen's $d=-0.44$). There were no significant changes from the free-play to play-for-real-money phase in terms of either bet/pay ratio, $t(59)<1$, or the number of credits wagered per spin $t(59)<1$ across all groups.

A within-subjects ANOVA was conducted to compare the effect of free-play group

Table 3 Mean (SD) for changes in betting characteristics from free-play phase to play-for-real-money phase ($n=60$)

	Change from free-play phase to play-for-real-money phase		
	Bet size (credits)	Bet/pay ratio	Credits per spin
Losing free-play	+2.85 (11.3)	−0.069 (9.27)	−2.22 (7.70)
Break-even free-play	+2.11 (9.47)	+0.043(7.47)	+2.23 (8.57)
Winning free-play	+3.35 (6.92)	−1.47 (3.80)	+2.07 (5.89)
All groups	+2.77 (9.27)	+0.500 (5.86)	−0.693 (7.63)

on average bet size across free-play and real-play conditions. There was a significant main effect of Time, Wilk's $\lambda = 0.917$, $F(1, 57) = 5.19$, $p < 0.05$, but neither the main effect of Group nor the interaction of Time and Group were significant. Bivariate correlations further revealed that changes in betting behaviour were not significantly associated with pre-existing levels of superstition, illusion of control (IOC), or total DBC scores (Table 4).

(h) *Assessment of Persistence*

Across all groups, 35 participants (43.8 % of the sample) chose to continue the roulette simulation past the minimum requirement of 50 spins. However, there was no significant association between experimental group and persistence, $\chi^2(3) < 1$.

It was observed that none of the participants in the losing free-play group chose to complete the roulette simulation to the maximum of 100 total spins (50 extra from the minimum). The highest number of extra spins completed in the losing free-play group (25) was only half of the possible number of extra spins (50). A one-way ANOVA showed that there was a significant difference between experimental groups in terms of the number of extra spins completed $F(3,31) = 2.96$, $p < 0.05$, (partial $\eta^2 = 0.22$). Fisher LSD Post-hoc tests applied to these results showed that, of the participants who persisted with the simulation, those in the Losing Free-Play group completed significantly fewer extra spins than those in any of the other experimental groups ($p < 0.05$).

(i) *Post-Experimental Survey*

All participants rated their perceived proficiency at roulette compared to other players, from a scale of 1 (Very Below Average) to 5 (Very Above Average). A one-way ANOVA revealed a significant difference in proficiency scores across the experimental groups $F(3,76) = 2.83$, $p < 0.05$, partial $\eta^2 = 0.10$. Fisher LSD post-hoc comparisons applied to these results showed that the control group reported significantly lower ratings than both the Winning Free-Play group ($p = 0.04$) and Losing Free-Play group ($p = 0.013$). There was also a statistically significant positive correlation between proficiency ratings and final closing balance in the Play-For-Real-Money mode (i.e. the participant's winnings), $r(80) = 0.24$, $p < 0.05$. Pre-existing levels of illusion of control and superstition were not significantly related to proficiency scores; $r(80) = 0.01$, $p > 0.05$ for illusion of control, and $r(80) = -0.04$, $p > 0.05$ for superstition. A hierarchical regression was undertaken to examine whether group members was related to proficiency scores after controlling for the person's closing balance. The results showed that those in the Winning Free-Play group gave higher ratings ($\beta = 2.31$), but that the model only explained a relatively small amount of variance in proficiency scores (adj-$R^2 = 0.082$).

Of the 60 free-play participants 48.3 % believed that the practice round enabled them to enhance their proficiency at roulette and 68.3 % agreed that after the practice round, they

Table 4 Correlations for beliefs about chance measures and change in betting behaviour ($n = 60$)

	M (SD)	IOC	Change from free-play to play for real money		
			Bet size	Bet/pay ratio	Credits per spin
Superstition	23.8 (7.95)	0.59**	0.12	−0.12	0.08
Illusion of control (IOC)	29.2 (7.45)		0.00	0.14	0.02
Change in bet size	2.77 (9.27)			0.15	0.38**
Change in bet/pay ratio	−0.50 (5.86)				0.05

**$p < 0.01$

felt more confident playing for real money. However, there was no significant association between answers to the question and to which free-play group participants had been allocated, $\chi^2(4)=1.94$, $p>0.05$.

Discussion

The principal aim of this study was to examine whether pre-exposure to a free-play mode affected subsequent gambling behaviour in an Internet gambling simulation. Consistent with the hypothesis that exposure to a free-play mode would promote greater risk-taking in subsequent gambling, the results revealed that participant performance in the free-play groups differed significantly from the control group on some measures of risk-taking. However, contrary to predictions, risk-taking following an exposure to a winning free-play phase did not differ significantly from that observed in the other free-play groups. Although there was some evidence that participants exposed to a losing free-play mode persisted less in the real play mode than other groups, the winning pre-exposure group did not persist longer or bet larger amounts than the other groups.

Despite these inconsistencies in the behavioural results, there was some evidence that pre-exposure to differential reinforcement in the free-play modes influenced player perceptions of the activity. Participants in the Winning and Break-Even groups attributed greater significance to skill in roulette as compared to the Losing free-play and Control groups, even after controlling for pre-existing gambling-related beliefs. This finding is consistent with an experiment by Monaghan et al. (2009) which showed that irrational beliefs and erroneous perceptions could be altered through a gambling task even in the absence of any monetary reward. In this study, control was measured using proficiency ratings which could, arguably, be equated with illusory control given that roulette is a game which does not allow any genuine control over outcomes. Proficiency scores were significantly different across experimental groups, with the control group giving lower scores than both the Winning and Losing Free-Play groups.

While it may seem counterintuitive that exposure to a losing outcome confers illusory control to the same extent as exposure to a winning outcome, this phenomenon may be explained in terms of flexible attributions, another cognitive distortion implicated in gambling. Flexible attributions refer to the tendency for gamblers to explain wins and other positive outcomes in terms of their own skills, while explaining away losses or negative outcomes to some other external factor (Gilovich 1983; Griffiths 1994; Oldman 1974). For example, it may be that participants in the losing free-play group attributed the relatively poor outcome of their free-play phases to external factors, such as ‘bad luck’ while attributing their better performances in the real-play mode to their own skill. Alternatively, it could be that the real-play mode was more salient than the free-play mode, and proficiency scores were made based on the outcomes of the real-play mode. Proficiency scores were indeed correlated with the closing credit balance of the real-play mode, but even after controlling for this covariate, group membership remained a predictor of proficiency scores.

Overall, these findings suggest that exposure to elevated payout rates can have an influence on player perceptions of the activity, but that these perceptions do not necessarily translate into variations in player behaviour. A reason for this in the present study may be that participants undertook the task in only a simulated environment where there was a requirement to play a baseline number of trials before they were permitted to stop. In real Internet gambling, it is possible that some players in the losing condition may have stopped much earlier than 50 trials so that stronger differences in persistence would be observed between those pre-exposed to a negative as opposed to positive return to player condition.

In the broader literature, there is some evidence to suggest that people can differentiate between gambling schedules involving different reinforcement characteristics (e.g., Blaszczynski et al. 2001; Delfabbro et al. 2005). However, in both of these studies, players had the opportunity to 'try out' the different schedules or machines before choosing which one on which they would like to spend more of their time. In other studies (e.g., Weatherly and Brandt 2004), this sensitivity has not been observed. Both the findings of this study and Weatherly and Brandt (2004) suggest the need for greater differentiation between the free-play schedules provided, or longer exposure times.

On the whole, the findings of this study were consistent with those of Ladouceur et al. (1987), who demonstrated that risk-taking behaviours for both experienced and inexperienced gamblers increased as a function of exposure to the gambling task. Using Langer's (1975) illusion of control concept, Ladouceur et al. argued that risk-taking increases because people become more confident about the task as they become more familiar with it. Through experience, players may come to develop strategies or see associations between the outcomes and their actions. In the present study, skill ratings were generally higher in the pre-exposure groups as compared with the controls with significant differences found between the Losing and Winning groups. These findings are, therefore, consistent with other studies (e.g., Benassi et al. 1979; Bouts and Van Avermaet 1992; Burger and Schnerring 1982; Langer 1975) which have examined the role of familiarity and practice in illusion of control research.

Given that illusory control was presumably enhanced by the experimental manipulations, it may seem surprising that risk-taking behaviours did not vary significantly across conditions. However, an increase in illusory control is not necessarily associated with increased risk-taking. Martinez et al. (2009) found that when participants were able to choose their own bets, illusion of control was enhanced, but risk-taking did not increase. Similarly, when participants in a roulette game were exposed to messages that functioned to either enhance or decrease illusory control, the observed differences in erroneous beliefs were not associated with significant differences in subsequent gambling behaviour (May et al. 2005). As Martinez et al. (2009) point out, very few gambling studies have included measures of both the illusion of control and risk-taking simultaneously so that evidence concerning the correlation between these two variables is very limited.

Summary and Conclusions

Although the results of this study were not consistently in the direction expected, they nonetheless generally support the view that exposure to practice modes may have the potential to influence player behaviour and perceptions. The findings suggest that giving people (most notably young people) access to practice games may make them more confident about gambling and increase their risk-taking in the short-term. However, it is important take a number of methodological points into account when interpreting these results. First, while this study involved university students, a demographic which has been identified as vulnerable to gambling-related problems (Griffiths and Barnes 2008; Wood et al. 2007), it is potentially unwise to generalise findings from this study to other young people outside the university or to adolescent gamblers. Young people outside the university may not necessarily have the same level of education and may respond to the task in different ways. Second, although all participants were playing for monetary incentives, simulating risk effectively in a laboratory setting poses a continual challenge to researchers. Thus, it is unclear how well the findings can be generalised to real-life internet gambling. Third, it is possible that playing for course credit reduced the motivation for participants to gamble longer and this may have reduced the variability of the persistence variable.

In future studies, it will be important for these findings to be extended by using increasingly realistic simulations, participants with greater gambling experience, and for different types of gambling activities to be considered. An advantage of using roulette is that the free-play conditions can be used to study whether players develop stronger beliefs about the role of strategy and skill in gambling. However, roulette usually allows many different bet types and bet sizes which can lead to greater volatility in outcomes within groups. Using a slot machine simulation would be less effective in generating beliefs about strategy because gamblers generally recognise that there is little genuine skill in slot-machine gambling, but greater experimental control could be achieved over the outcomes if players were asked to play only one play line with only one betting option in the pre-exposure conditions.

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