Journal of Gambling Issues

Open Access Original Research

Skilled poker players provide more accurate responses than amateur poker players to the Gambling Fallacies Measure

Philip W. S. Newall, PhD[1,2,5*], Jian-Qiao Zhu, PhD[3,4]

Citation: Newall, P. W. S., Zhu, J-Q. (2023). Skilled poker players provide more accurate responses than amateur poker players to the Gambling Fallacies Measure. Journal of Gambling Issues.

Editor-in-Chief: Nigel Turner, PhD

ISSN: 1910-7595

Received: 06/23/2022
Accepted: 02/14/2023
Published: 02/20/2023

[1]School of Psychological Science, University of Bristol, UK
[2]School of Health, Medical and Applied Sciences, CQUniversity, Australia
[3]Department of Psychology, University of Warwick, UK
[4]Princeton Neuroscience Institute, Princeton University, USA
[5]ORCiD: 0000-0002-1660-9254
*Corresponding author: Philip Newall, philip.newall@bristol.ac.uk

Abstract: Gambling fallacies are mistaken beliefs about how gambling works, and these form a key part of current theorising about disordered gambling. However, it has been suggested that key self-report scales for gambling fallacies may contain items that are inappropriate for skill-based gambling games. This research explores this topic by comparing amateur and skilled poker players' responses to the Gambling Fallacies Measure (GFM). Skilled players provided an average of 8.97 out of 10 accurate responses, which was significantly higher than amateurs' average score of 6.76. Item five ("A positive attitude or doing good deeds increases your likelihood of winning money when gambling") was the only item where skilled players (87.9%) were not significantly more accurate than amateurs (87.1%). Future research along these lines could increase understanding of the rational cognitions underlying skilled poker play.

Keywords: Fallacy, Gambling, Gambling Fallacies Measure, Poker, Skill.

Introduction

Mistaken beliefs about how gambling works, otherwise known as "gambling fallacies", form a key part of current theorising about disordered gambling (Leonard et al. 2015). Gambling fallacies are specific mistaken beliefs about how gambling works which derive from more general "erroneous cognitions", such as the illusion of control (Goodie & Fortune, 2013; Ladouceur & Walker, 1996). Given the complexity of many gambling games, these fallacies can be numerous, but some of the key fallacies are as follows. The "gambler's fallacy", otherwise known as the "Monte Carlo fallacy" is the mistaken belief that recent past events, for example a roulette wheel ending on the color red, increase the probability of different future outcomes, such as the wheel coming up black on the next spin (Leonard et al., 2015). The "hot hand fallacy" is a related mistaken belief that past wins increase the probability of future wins (Ayton & Fischer, 2004). The "illusion of control" is the mistaken belief that personal control over gambling situations, such as the ability to shake the dice in craps or choose numbers in the lottery, can increase the gambler's chances of winning (Henslin, 1967; Langer, 1975). Previous reviews provide longer lists of gambling fallacies, and provide empirical evidence that disordered gamblers tend to endorse many fallacies (Griffiths, 1994; Leonard et al., 2015; Toneatto et al., 1997).

Gambling fallacies can be measured via a number of self-report scales (Leonard et al., 2015), such as the Gambling Related Cognitions Scale (Raylu & Oei, 2004), the Gambling Attitudes and Beliefs Survey (Breen & Zuckerman, 1999), and the Gambling Belief Questionnaire (Joukhador et al., 2003). The more recent Gambling Fallacies Measure has been designed to try and improve on some weaknesses of earlier measures, which can for example contain items linked to behavioural aspects of disordered gambling, such as gambling to improve one's own mood (Leonard & Williams, 2016). Another potential weakness of earlier gambling fallacy self-report scales is the inappropriateness of certain items to skill-based gambling games (Russell et al., 2019). For example, scales can include items such as, "I have specific rituals and behaviours that increase my chances of winning" (Raylu & Oei, 2004), which are scored as fallacious statements. But this item may be positively endorsed in a non-fallacious way for skilled gamblers in specific games, with for example the technique of "card counting" allowing some gamblers to play blackjack profitably (Thorp, 1966).

Poker is a useful gambling game to explore these issues further, as it has obtained widespread popularity online over recent years (Mihaylova et al., 2013; O'Leary & Carroll, 2013), and also involves enough skill for some poker players to win over time (Laakasuo et al., 2016; Leonard & Williams, 2015; Palomäki et al., 2020; Potter van Loon et al., 2015). Successful poker play involves many skills, such as the ability to size bets relative to the player's "bankroll" of available money, a problem that has an optimal solution as determined by the mathematical Kelly criterion (Chin

& Ingenoso, 2007; Cover & Thomas, 2006). And since profitable poker play involves the detection of weaker players, poker skill also involves accurately assessing the skill of other players (Turner & Fritz, 2001). Poker players can therefore form an interesting group over which to explore patterns of responses to the Gambling Fallacies Measure.

Skill should be a protective factor that enables some poker players to avoid common gambling fallacies, meaning that we should expect skilled poker players to endorse fewer fallacies than amateurs. This would conceptually-replicate previous results showing a negative relationship between skill and fallacy endorsement among an undergraduate poker-playing sample (Leonard & Williams, 2015). But some gambling fallacies will be more stubborn than others, and so we do not expect that even highly-skilled poker players will avoid all fallacies. Furthermore, there may be some fallacies that may be especially important for skilled players to avoid, or other fallacies that skilled players are more susceptible to. This study therefore advances an understanding of gambling fallacy endorsement amongst poker players of varying skill levels, by comparing rates of correct responses with Gambling Fallacies Measure items between a group of skilled and a group of and amateur poker players.

Method

The data for the present research are reused from a previous investigation looking at how poker players' abilities at estimating probabilities vary with their level of poker skill (Zhu et al., 2022). The main task in that study involved estimating, under time constraints, the probabilities of various different "flop" combinations in the most popular poker game of Texas Hold 'em, which forms a core skill for poker players. The two main measures derived from this task were participants' average levels of incoherence and inaccuracy. An "incoherent" probability forecast is one where the sum of probabilities for every potential event exceeds one, while the sum of true probabilities always equal to one. For example, in Texas Hold 'em any given flop of three cards can either have three cards all of the same suit, two cards of the same suit, or contain three cards of different suits, and the probabilities of these three potential events sum to one. The measure of incoherence assessed the extent to which participants' collective probability judgments exceeded one. Each flop combination also has a given probability of occurring, with three cards of the same suit occurring on 5.2% of flops (Chen & Ankenman, 2006). The measure of "inaccuracy" yielded participants' average deviation from these true probabilities.

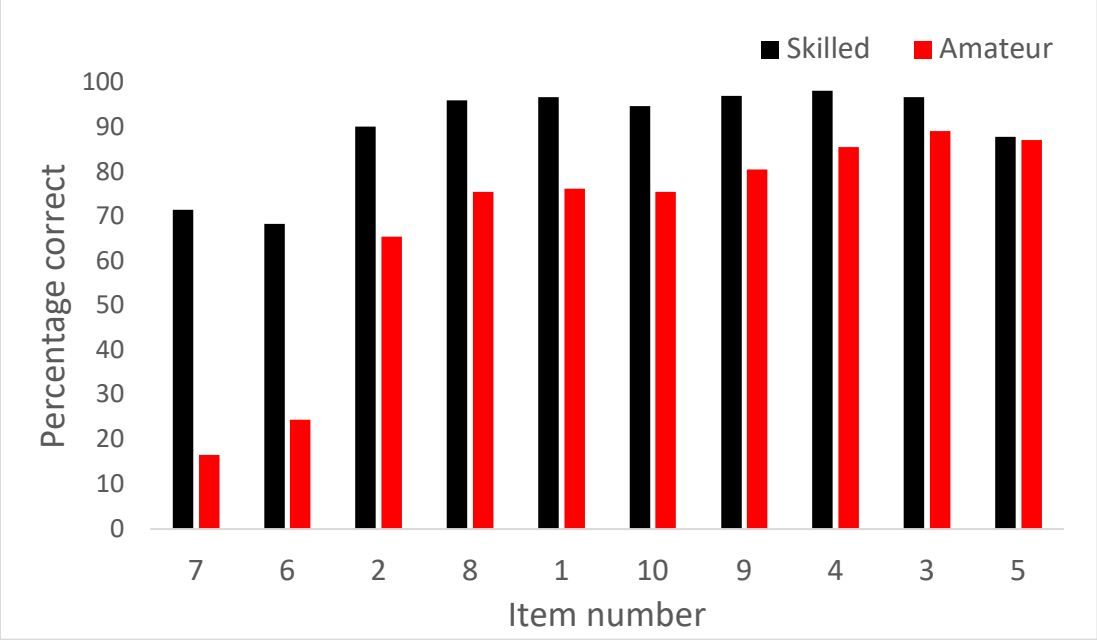
For the present study, we use data from all participants who completed the Gambling Fallacies Measure. Overall, this resulted in a sample of 139 amateurs (38% male, 62% female, and an average age of 33.6, SD=11.2) collected via the crowdsourcing platform Prolific, and a sample of 396 skilled players collected from the poker forum twoplustwo.com. Skilled players had an average age of 37.1 years

(SD=11.0), and reflecting the gender bias in poker, were 93.7% male (3.1% female, 3.3% non-disclosure). The two measures from the main task indicated that there were genuine poker skill differentials across the two groups, with skilled players having flop probabilities estimates that were on average both more coherent ($p < .001$) and more accurate ($p < .001$) than amateurs. Further details can be obtained from Zhu et al. (2022).

Results

The sample of poker amateurs yielded an average score of 6.76 correct answers out of 10 on the Gambling Fallacies Measure, which was significantly lower than the average score of 8.97 amongst skilled players (two-sample *t*-test: $t(533)=12.70$, $p < .001$). Figure 1 shows the descriptive pattern of correct responses, where it can be seen that the skilled player group provided the correct response more often on each item than the amateur group did. However, there was a large degree of variation in this difference across items.

Figure 1. Percentage of each group providing correct response to each group; Items arranged by largest- to smallest-difference.



Item seven ("You go to a casino with $100 hoping to double your money. Which strategy gives you the best chance of doing this?"; See Table 1 for all items, responses, and response frequencies across groups) had the largest difference (54.9%; 71.5% skilled, 16.6% amateur). The correct response, "Betting all your money on a single bet", shows that the skilled players knew that, the "house edge" which acts against gamblers, means

that a single bet provides the best chances of doubling one's money (Turner, 2011). Item six ("A gambler goes to the casino and wins 75% of the time. How many times has he or she likely gone to the casino?") had the second largest difference (43.9%; 68.4% skilled, 24.5% amateur). The correct response, "4 times", showed that the skilled players knew that unusual patterns of results were more likely to appear in small rather than large sample sizes. Item two ("Which gives you the best chance of winning the jackpot on a slot machine?") had the third largest difference (24.7%; 90.2% skilled, 65.5% amateur). This difference stemmed from skilled players being less likely to provide the following *incorrect* response based on the gambler's fallacy: "Playing a slot machine that has not had a jackpot in over a month" (8.6% skilled; 32.4% amateur). Contrastingly, Item five ("A positive attitude or doing good deeds increases your likelihood of winning money when gambling") had the smallest difference (0.8%; 87.9% skilled, 87.1% amateur).

Table 1. Patterns of responding on each individual Gambling Fallacies Measure item

Item number and text	Responses (correct response shown in **bold**)	Percentage of skilled players providing each response	Percentage of amateurs providing each response	Chi-squared test comparing group frequencies
1. Which of the following set of lottery numbers has the greatest probability of being selected as the winning combination?	1, 2, 3, 4, 5, 6	0.8% [0.0%, 1.6%]	2.9% [0.0%, 5.7%]	$\chi 2$ (2) = 55.71, $p < .001$
	8, 18, 3, 55, 32, 28	2.5% [1.0%, 4.1%]	20.9% [14.0%, 27.7%]	
	Each of the above have an equal probability of being selected	96.7% [95.0%, 98.5%]	76.3% [69.1%, 83.4%]	
2. Which gives you the best chance of winning the jackpot on a slot machine?	Playing a slot machine that has not had a jackpot in over a month	8.6% [5.8%, 11.4%]	32.4% [24.5%, 40.2%]	$\chi 2$ (2) = 47.47, $p < .001$
	Playing a slot machine that had a jackpot an hour ago	1.3% [0.2%, 2.4%]	2.2% [0.0%, 4.6%]	
	Your chances of winning the jackpot are the same on both machines	90.2% [87.2%, 93.1%]	65.5% [57.5%, 73.5%]	
3. How lucky are you? If 10 people's names were put into	**About the same likelihood as everyone else**	96.7% [95.0%, 98.5%]	89.2% [83.4%, 94.4%]	$\chi 2$ (2) = 14.48, $p = .001$
	Less likely than other people	1.5% [0.3%, 2.7%]	7.9% [3.4%, 12.5%]	

a hat and one name drawn for a prize, how likely is it that your name would be chosen?	More likely than other people	1.8% [0.5%, 3.1%]	2.9% [0.1%, 5.7%	
4. If you were to buy a lottery ticket, which would be the best place to buy it from?	A place that has sold many previous winning tickets	1.5% [0.3%, 2.7%]	4.3% [0.9%, 7.7%]	$\chi2$ (2) = 40.71, $p < .001$
	A place that has sold few previous winning tickets	0.3% [0.0%, 0.7%]	10.1% [5.0%, 15.1%]	
	One place is as good as another	98.2% [96.9%, 99.5%]	85.6% [79.7%, 91.5%]	
5. A positive attitude or doing good deeds increases your likelihood of winning money when gambling.	**Disagree**	87.9% [84.7%, 91.1%]	87.1% [81.4%, 92.7%]	$\chi2$ (1) = 0.07, $p = .798$
	Agree	12.1% [8.9%, 15.3%]	13.0% [7.3%, 18.6%]	
6. A gambler goes to the casino and wins 75% of the time. How many times has he or she likely gone to the casino?	**4 times**	68.4% [63.8%, 73.0%]	24.5% [17.2%, 31.7%]	$\chi2$ (2) = 91.02, $p < .001$
	100 times	0.8% [0.0%, 1.6%]	8.6% [3.9%, 13.4%]	
	It is just as likely that he has gone either 4 or 100 times	30.8% [26.2%, 35.4%]	66.9% [59.0%, 74.8%]	
7. You go to a casino with $100 hoping to double your money. Which strategy gives you the best chance of doing this?	**Betting all your money on a single bet**	71.5% [67.0%, 75.9%]	16.6% [10.3%, 22.8%]	$\chi2$ (2) = 179.40, $p < .001$
	Betting small amounts of money on several different bets	5.1% [2.9%, 7.2%]	48.9% [40.5%, 57.3%]	
	Either strategy gives you an equal chance of doubling your money	23.5% [19.3%, 27.7%]	34.5% [26.5%, 42.5%]	
8. Which game can you consistently win money at if you use the right strategy?	Slot machines	2.0% [0.6%, 3.4%]	2.9% [0.1%, 5.7%]	$\chi2$ (3) = 66.98, $p < .001$
	Roulette	0.5% [0.0%, 1.2%]	16.6% [10.3%, 22.8%]	
	Bingo	1.5% [0.3%, 2.7%]	5.0% [1.4%, 8.7%]	
	None of the above	96.0% [94.0%, 97.9%]	75.5% [68.3%, 82.8%]	
9. Your chances of winning a lottery are better if you are able to choose your own numbers.	**Disagree**	97.0% [95.3%, 98.7%]	80.6% [73.9%, 87.2%]	$\chi2$ (1) = 40.92, $p < .001$
	Agree	3.0% [1.3%, 4.7%]	19.4% [12.8%, 26.1%]	

10. You have flipped a coin and correctly guessed 'heads' 5 times in a row. What are the odds that heads will come up on the next flip. Would you say ...	**50%**	94.7% [92.5%, 96.9%]	75.5% [68.3%, 82.8%]	$\chi 2$ (2) = 66.46, $p < .001$
	More than 50%	4.0% [2.1%, 6.0%]	3.6% [0.5%, 6.7%]	
	Less than 50%	1.3% [0.2%, 2.4%]	20.9% [14.0%, 27.7%]	

Table 1 quantifies these differences using inferential statistics. Chi-square tests show that the overall pattern of responses differed significantly for nine out of ten items, with only Item five showing a non-significant difference between the groups ($\chi 2$ (1) = 0.07, p = .798). As Item five only has two potential responses, this non-significant chi-square test in this instance also reveals a non-significant difference in the provision of the correct response. Differences in the provision of correct responses for other items can be inferred by comparing the 95% confidence intervals on proportion tests shown in Table 1. Only Item five sees the confidence intervals for the two groups overlap, showing that the differences between the groups were significant for all nine other items.

Overall, this suggests that nine out of the ten Gambling Fallacies Measure items successfully differentiated between skilled and amateur poker players, suggesting that the overall scale was able to differentiate between skilled poker players and amateurs.

Discussion

Gambling fallacies are mistaken beliefs about how gambling works, and these form a key part of current theorising about disordered gambling (Goodie & Fortune, 2013; Ladouceur & Walker, 1996). However, there are many gambling formats, and these can differ markedly from one another, such as roulette (played against a casino), and poker (played against other players). This variability in gambling formats can add complexity to the measurement of gambling fallacies, with for example the Gambling Related Cognition Scale being argued to contain several items that are inappropriate for skill-based formats (Russell et al., 2019). This study explored patterns of responses on the Gambling Fallacies Measure amongst samples of amateur and skilled poker players. Skilled players (M = 8.97) had higher overall rates of correct responses on the Gambling Fallacies Measure than amateurs (M = 6.76), suggestive of the scale being a good differentiator of skill amongst poker players. Differences between the two groups were especially large for Items seven (54.9%; 71.5% skilled, 16.6% amateur), six (43.9%; 68.4% skilled, 24.5% amateur), and two (24.7%; 90.2% skilled, 65.5% amateur). These items may well probe pieces of knowledge that are particularly important for skilled poker players to have, such as an awareness of the house edge in casino games, distinctions based on sample size, and an avoidance of the gambler's fallacy. Item five was the only item

where skilled players (87.9%) did not provide the correct answer for significantly more frequently than amateurs (87.1%).

The present research cannot tell why skilled players failed to answer item five correctly more frequently than amateurs. It may well be that this is a fallacy that is particularly robust among skilled rather than amateur poker players. Additional methodologies, such as experimental or qualitative studies, will be needed to explore various contributing factors toward other plausible drivers of this finding. Item five contains two verbs separated by an "or" clause, "a positive attitude or doing good deeds…", so these might be worth separating out. We speculate that the first verb, "a positive attitude," may have driven down levels of agreement. Poker theorists frequently emphasise psychological aspects of poker, where negative emotions can reduce a player's long-run outcomes (Malmuth, 2015; Schoonmaker, 2000). Poker players experience these negative emotions frequently enough to give them a word, "tilt" (Palomäki et al., 2013), which refers to times when experiencing losses causes a deterioration of play quality and an increased probability of experiencing further losses. It may be that deletion of the words about a positive attitude would result in higher rates of agreement amongst skilled poker players.

These findings are limited, by for example differences in the demographic characteristics of the amateur and skilled samples. The groups were also recruited differently, with the amateurs coming from a crowdsourcing platform (Pickering & Blaszczynski, 2021; Russell et al., 2021), while the skilled players came from a dedicated online community. The two samples were also compensated differently, with the crowdsourcing platform sample receiving a small payment, and the skilled players receiving feedback comparing their performance with the amateurs'.

This paper adds to the critical examination of key gambling survey instruments amongst gamblers engaging in skill-based gambling formats (Laakasuo et al., 2016), and future research along these lines could increase the understanding of the rational cognitions underlying skilled poker play.

Funding
None

Declaration of conflict of interest
None declared (all authors)

Availability of data and material
Data and materials are available from Zhu et al. (2022)

Author's contributions
Both authors conceived of the study. PN conducted the analyses and wrote the first draft of the paper. J-QZ revised the first draft. All authors approved of the final version.

Ethics and informed consent

The present study was approved by the Humanities and Social Sciences Research Ethics Committee, University of Warwick, Poker Probability Estimation, HSSREC 43/19-20, 28th January 2020. Committee approval is in accordance with ethical guidelines detailed in the 1964 Helsinki Declaration or any of its succeeding amendments.

References

Ayton, P., & Fischer, I. (2004). The hot hand fallacy and the gambler's fallacy: Two faces of subjective randomness? *Memory & Cognition*, *32*(8), 1369–1378.

Breen, R. B., & Zuckerman, M. (1999). 'Chasing' in gambling behavior: Personality and cognitive determinants. *Personality and Individual Differences*, *27*(6), 1097–1111.

Chin, W., & Ingenoso, M. (2007). Risk adjustment for poker players. In S. N. Ethier & W. R. Eadington (Eds.), *Optimal play: Mathematical studies of games and gambling*. Institute for the Study of Gambling and Commercial Gaming.

Cover, T. M., Thomas, J. A. (2006). *Elements of information theory*. Wiley.

Goodie, A. S., & Fortune, E. E. (2013). Measuring cognitive distortions in pathological gambling: Review and meta-analyses. *Psychology of Addictive Behaviors*, *27*(3), 730–743.

Griffiths, M. D. (1994). The role of cognitive bias and skill in fruit machine gambling. *British Journal of Psychology*, *85*(3), 351–369.

Henslin, J. M. (1967). Craps and magic. *American Journal of Sociology*, *73*(3), 316–330.

Joukhador, J., MacCallum, F., & Blaszczynski, A. (2003). Differences in cognitive distortions between problem and social gamblers. *Psychological Reports*, *92*, 1203–1214. https://doi.org/10.2466/PR0.92.3.1203-1214

Laakasuo, M., Palomäki, J., & Salmela, M. (2016). Poker players with experience and skill are not '"Ill"': Exposing a discrepancy in measures of problem gambling. *Journal of Gambling and Commercial Gaming Research*, *1*, 1–18.

Ladouceur, R., & Walker, M. (1996). A cognitive perspective on gambling. In P. M. Salkovskis (Ed.), *Trends in cognitive and behavioural therapies* (Vol. 1–Book, Section, pp. 89–120). Wiley-Blackwell.

Langer, E. J. (1975). The illusion of control. *Journal of Personality and Social Psychology*, *32*(2), 311–328.

Leonard, C. A., & Williams, R. J. (2015). Characteristics of good poker players. *Journal of Gambling Issues*, *31*.

Leonard, C. A., & Williams, R. J. (2016). The relationship between gambling fallacies and problem gambling. *Psychology of Addictive Behaviors*, *30*(6), 694–704.

Leonard, C. A., Williams, R., & Vokey, J. (2015). Gambling fallacies: What are they and how are they best measured. *Journal of Addiction Research & Therapy*, *6*(4). https://doi.org/10.4172/2155-6105.1000256

Mihaylova, T., Kairouz, S., & Nadeau, L. (2013). Online poker gambling among university students: Risky endeavour or harmless pastime? *Journal of Gambling Issues*, *28*, 1–18.

O'Leary, K., & Carroll, C. (2013). The online poker sub-culture: Dialogues, interactions and networks. *Journal of Gambling Studies*, *29*(4), 613–630.

Palomäki, J., Laakasuo, M., Cowley, B. U., & Lappi, O. (2020). Poker as a domain of expertise. *Journal of Expertise*, *3*(2).

Palomäki, J., Laakasuo, M., & Salmela, M. (2013). 'This is just so unfair!': A qualitative analysis of loss-induced emotions and tilting in on-line poker. *International Gambling Studies*, *13*(2), 255–270.

Pickering, D., & Blaszczynski, A. (2021). Paid online convenience samples in gambling studies: Questionable data quality. *International Gambling Studies*. https://doi.org/10.1080/14459795.2021.1884735

Potter van Loon, R. J., van den Assem, M. J., & van Dolder, D. (2015). Beyond chance? The persistence of performance in online poker. *PloS One*, *10*(3), e0115479. https://doi.org/10.1371/journal.pone.0115479

Raylu, N., & Oei, T. P. (2004). The Gambling Related Cognitions Scale (GRCS): Development, confirmatory factor validation and psychometric properties. *Addiction*, *99*(6), 757–769.

Russell, A. M. T., Browne, M., Hing, N., Rockloff, M., & Newall, P. (2021). Are any samples representative or unbiased? Reply to Pickering and Blaszczynski. *International Gambling Studies*. https://doi.org/10.1080/14459795.2021.1973535

Russell, A. M. T., Hing, N., & Browne, M. (2019). Risk factors for gambling problems specifically associated with sports betting. *Journal of Gambling Studies*. https://doi.org/10.1007/s10899-019-09848-x

Thorp, E. O. (1966). *Beat the dealer*. Random.

Toneatto, T., Blitz-Miller, T., Calderwood, K., Dragonetti, R., & Tsanos, A. (1997). Cognitive distortions in heavy gambling. *Journal of Gambling Studies*, *13*(3), 253–266.

Turner, N. E. (2011). Volatility, house edge and prize structure of gambling games. *Journal of Gambling Studies*, *27*, 607-623.

Turner, N. E., & Fritz, B. (2001). The effect of skilled gamblers on the success of less skilled gamblers. *Journal of Gambling Issues*, *5*.

Zhu, J. Q., Newall, P. W. S., Sundh, J., Chater, N., & Sanborn, A. N. (2022). Clarifying the relationship between coherence and accuracy in probability judgments. *Cognition, 223*, 105022.