

different from any actual commercial gambling game, so the generalizability of this result to gambling is unknown. An alternative explanation might be the pay tables of the gambling games that they typically play. In real casino games, strategic games typically require larger bets relative to the payoff than non-strategic gambles. Table games often have minimum bets of \$10 or more, whereas EGMs have much lower minimum bets (e.g. \$0.25, \$0.05). Most people play more than the minimum, but none the less a single bet on a table game is typically much larger than on an EGM. In addition, many strategic games have an 'even money' payoff which means that the player has to risk \$100 in order to win \$100,* and the chances of a win are typically slightly less than 50%. In contrast, a bet on an EGM of 75 cents might give the player a one in 60 thousand chance of winning \$2000. This difference in game design might be related to the lower loss aversion found for the strategic gamblers on the IGT; they have to risk more in order to win more. This is another area that needs to be explored further.

The notion of what is strategic gambling also needs further exploration. Do these results apply only to sports bets and poker, or do they apply to other games? Some games, such as craps, are in fact games of pure chance, but are often played by people who think they are games of strategy. In addition, the payoff table is more similar to strategic games such as blackjack and sport betting than to non-strategic games such as an EGM. Do craps players perform on the IGT more like EGM players, or more like sports bettors?

In summary, I like the direction that these authors have taken, both in terms of differentiating different types of problem gamblers and in terms of exploring in more detail the nature of the IGT task. I think this is a promising area of future study.

Declaration of interests

None.

Keywords Ambiguity, decision-making, game type, individual differences, problem gambling, reward processing, risk-taking.

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RESPONSE TO TURNER

Turner's commentary [1] on our paper 'Strategic and non-strategic problem gamblers differ in decision making under risk and ambiguity' [2] highlights several interesting points and future directions that arise from our findings.

Our findings showed that strategic and non-strategic problem gamblers demonstrate striking differences in decision-making styles and underlying cognitive processes, thus advancing our understanding of heterogeneity in problem gambling. Turner points out, however, and we agree, that the 'strategic' and 'non-strategic' subtypes of problem gamblers require closer investigation to determine more precisely what accounts for the decision-making differences in these samples. That is, these subtypes may vary in more ways than their preferred type of gambling. For example, there may be differential levels of actual skill required for the game, or differences in the players' perception of the strategic aspects of the game. In addition, several other methods for subtyping problem gambling are available. In particular, emerging evidence supports Blaszczynski & Nower's [3] three pathways to problem gambling [4,5], which include Behaviourally Conditioned Problem Gamblers, Emotionally Vulnerable Problem Gamblers and Antisocial Impulsivist Problem Gamblers. It would be interesting to determine whether preferred gambling type is associated with these pathways and if neurocognitive differences exist between these subtypes.

Our findings also highlight the importance of gender differences for understanding problem gambling subtypes and the related decision-making patterns in these samples. Because our subgroups differed on more than one attribute (i.e. gambling type and gender), we chose to compare each gambling subgroup to a gender-matched control group. In this way, we were able to examine more clearly the influence of problem gambling subtype on decision making. Nevertheless, the disparities in gender with respect to gambling subtypes is likely to always make it difficult to optimally control all relevant subtypes. However, our control group was non-gamblers (gambling less than monthly), and we agree with Turner [1] that future research should also examine whether strategic

*For sports bets, a common bet is to lay \$11 for a chance to be paid \$21 (a \$10 win).

and non-strategic problem gamblers differ from strategic and non-strategic non-problem gamblers.

Perhaps one of the most important directions for further research is the link between problem gambling subtypes and preferential responsiveness to particular treatments. Our findings that non-strategic problem gamblers demonstrated poor learning and less sensitivity to losses during decision making may indicate that their difficulty in reducing their gambling behaviour is fuelled by an inability to recognize appropriate risk/reward information and poor ability to integrate past experience in making new choices. Novel therapeutic techniques aimed at improving decision making (e.g. metacognitive strategies, cognitive retraining) may be appropriate for non-strategic problem gamblers. In contrast, strategic problem gamblers, who in our sample demonstrated altered reward processing and tendencies towards impulsive choices, may be treated more effectively with pharmacological agents that target reward processing networks (i.e. opioid antagonists).

In conclusion, we share Turner's views that examining heterogeneity in problem gambling and determining appropriate subtypes of problem gamblers is a promising area of future research. Our hope is that this line of research could improve the treatment prospects for problem gambling.

Declaration of interests

None.

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