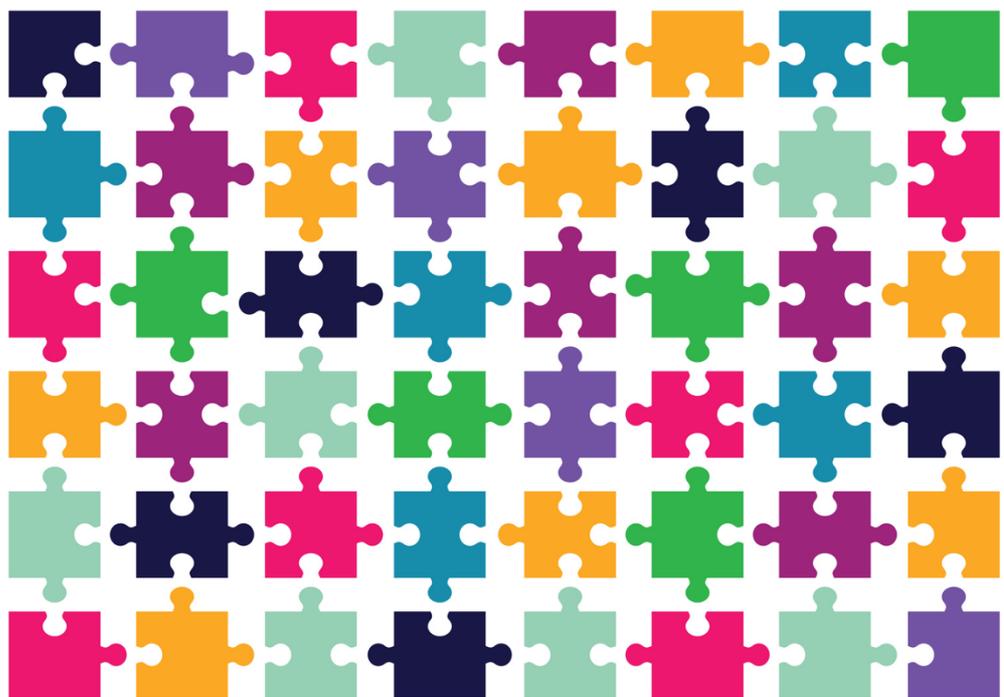


KEY ISSUES IN PRODUCT-BASED HARM MINIMISATION



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Examining theory, evidence and policy issues relevant in
Great Britain

Prepared for: The Responsible Gambling Trust

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Key Issues in Product-Based Harm Minimisation:
Examining theory, evidence and policy issues relevant in Great Britain

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I EXECUTIVE SUMMARY

I.1 Introduction

- The aim of this report is to review evidence and theory regarding the gambling product through its structural characteristics (i.e., the ‘agent’ component of the epidemiological triangle). By providing a better understanding of structural characteristics, stakeholders should be better equipped to promote and evaluate responsible gambling and harm-minimisation strategies.
- Structural characteristics are essentially the building blocks of a gambling game. They are the basis for their differential appeal depending on how they satisfy different needs for different consumers. They combine with environmental and individual factors to determine both positive and negative outcomes of gambling participation. Structural characteristics vary considerably from game to game and evolve quickly in response to changes in technology; this renders associated policymaking challenging.
- The report is structured to consider categories of structural characteristics. Within each section we consider the theory and evidence concerning the possible links between characteristics and gambling problems, together with potential implications for specific interventions that may merit consideration by regulators and commercial gambling providers.
- Evidence and theory in relation to structural characteristics in gambling is among the most inadequate in gambling studies. This probably reflects the inherent methodological challenges in executing ecologically valid research, rather than a lack of will. This report brings together a desk-top review of existing theory and evidence on some of the key issues in this area. It draws out implications for harm prevention and reduction, and considers options for further research. The National Responsible Gambling Strategy (p.15, RGSB, 2016) states that ‘*it is important that desirable practical action is not inhibited by unrealistic expectations about perfect information*’, and on that basis, we recommend areas for policy considerations.

I.2 Game Characteristics

- In-game bonuses such as free spins are reported by the players to be one of the most desirable elements of playing a gaming machine. However, it is important to recognise the lack of behavioral data in contrast to the readily available qualitative data representing players’ opinions and interpretations, regarding the effect of in-game bonuses. Further research is required to establish whether the provision of in-game bonuses, such as free spins, are a causal factor in problematic patterns of reel-based gaming machine play (including online versions).
- With respect to player involvement features such as buttons to stop or hold reels, there are reasonable theoretical arguments to support the idea that such features may increase gambling participation via an increase in players’ illusion of control. However, this hypothesis has, to date, not been supported by empirical evidence.

1.3 Ambient Characteristics

- Overall, it appears that ambient characteristics (e.g., colour, lighting and sounds) may be more relevant to issues of consumer psychology and marketing rather than directly relevant for consideration as a tool to address problem gambling behaviour in commercial settings. Although there are some interesting preliminary studies into the role of ambient factors in gambling behaviour, it is probable that such factors are more peripheral to the issue of addressing problem gambling in contrast to other structural factors.
- The research literature available regarding the impact of ambient characteristics is too disparate and sparse to isolate any clear trends that indicate a causal effect on gambling behaviour. There are a handful of explorative studies that raise several interesting hypotheses that there may be merit in following up. However, the explorative work does not strongly indicate that such factors play a direct, causal role in gambling-related harm. Given the limited available resources, and the more obvious relationships identified between problem gambling and other product-related variables, it is not possible to promote ambient characteristics as a research priority for tackling problem gambling.

1.4 Speed and Frequency of Gambling Opportunities

- Problem gamblers tend to be more motivated to gamble because of the need to detach (i.e., relax or escape) or modify mood; and evidence suggests that faster, more continuous games best accommodate that need.
- Frequency of opportunities to bet appears to be a more important risk factor for problem gambling than the number of different gambling activities one participates in. Therefore, gambling activities that permit high frequency participation are more likely to be associated with gambling-related harm. Gambling activities that permit high frequency participation more readily facilitate highly variable patterns of gambling that may be problematic, such as the chasing of losses.
- Problem gamblers are more likely to be attracted to activities with high event frequency as they present more opportunities to receive reward. Activities with high event frequency produce more punishment than low frequency activities. Counterintuitively, gamblers may also be motivated to persist in gambling as the repeated punishment experienced can create an uncomfortable mood state from which the gambler seeks to detach via continued gambling.
- A gambling activity that does not have a sufficient post-outcome break in play to enable a player to reflect on the gambling outcome (particularly a monetary loss), reduces the likelihood of the player adjusting their gambling behaviour in response to the losses experienced. Emerging evidence indicates that even a relatively brief break in play may reduce gambling persistence in the face of repeated losses.
- Although there is a lack of empirical evidence, there is a strong theoretical foundation to consider automatic play as a risk factor for gambling-related harm. Automatic play maximises event frequency, which enables players to dissociate when playing. Automatic play reduces the opportunity for the player to actively evaluate each gambling outcome and make appropriate behavioural responses to

such information. The act of being made to stop an ongoing activity itself reduces the likelihood of the player wanting to persist in gambling.

- Participating in in-running sports betting is a reliable marker for problem gambling, and this is particularly true for high intensity in-running betting. Furthermore, in-running sports betting essentially increases the event frequency of sports betting and provides further opportunity to continue gambling. It is argued that this may facilitate players in chasing their losses.
- Recommendations from this chapter include: a) further research exploring the impact of removing automatic play capabilities; b) research focusing on developing effective forms of pre-commitment and mandatory breaks in play that are coupled with appropriate self-appraisal messages and; c) exploring options to slow game speed in fast, continuous games.

1.5 Reward Characteristics

- There is a general trend that the larger the reward received, the larger the response in arousal. In addition, larger potential rewards increase the probability of being more willing to take risks and re-evaluate one's strategy towards the gambling activity, as the potential utility of the money becomes the focus of the decision process. The potential to win a large jackpot inadvertently facilitates the chasing of losses, by providing hope that one's current financial situation could be significantly improved.
- When rewards are delivered in a game that has high volatility, and therefore is more unpredictable, players are more likely to continue gambling even when they are repeatedly losing. In effect, more unpredictability may lead to an enhanced gambling experience because there is increased suspense as the next spin may result in a substantial win, in comparison to lower volatility games where smaller wins are provided rather frequently.
- It could be tentatively proposed that moderate volatility may be most related to persistent gambling, because in effect it means there is high unpredictability regarding the delivery of reinforcement, while at the same time, the chances of winning a significant sum are not grossly unrealistic and improbable. There is considerable inconsistency in the literature regarding volatility level and persistent gambling behaviour. It is probable that different patterns of reward distribution can promote persistent gambling depending on the specific motivations for gambling in that instance, for example, for relaxation versus chasing losses.
- Laboratory research clearly demonstrates that Losses-Disguised-as-Wins (LDWs) are interpreted by some players as winning outcomes despite technically being net losses in monetary terms. However, this finding must be interpreted cautiously as existing ecologically valid studies have not replicated this finding. The artificial nature of the laboratory studies may account for the interpretation of LDWs as winning outcomes by the participants.
- Positive, winning-related sensory reinforcement through light and sound effects may facilitate the interpretation of LDWs as winning outcomes despite being a net monetary loss. The increased positive sensory reinforcement that comes with

LDWs is likely to enhance the gambling experience of the players. This may encourage vulnerable players that are gambling for detachment needs to gamble for longer periods of time in response to the enhanced gambling experience. However, for most players, the increased sensory reinforcement will likely improve the gambling experience in terms of leisure and entertainment motivations.

- Near misses occur naturally in many forms of gambling, however it is possible to manufacture digital gambling formats to present near misses considerably more than probability would dictate. Experiencing near misses is believed to encourage further gambling, in contrast to ‘full’ misses. The primary explanations for increased gambling participation relate to the changes in arousal and emotion stimulated by experiencing near misses. Near misses can elicit higher arousal in contrast to full misses, and it has been suggested that this may make the player interpret and process the near miss similarly to a win, and this misinterpretation may encourage further engagement. Although the near miss remains poorly understood, it appears that the most probable risk for persistent gambling is that experiencing near misses creates a change in emotion via an increase in arousal.
- Recommendations from this chapter include conducting: a) research examining the interaction of volatility with various gambling contexts (e.g. current gambling motivation), and the impact of these combinations on gambling behaviour; b) research examining the impact of reducing, or eliminating, winning-related sensory feedback for LDWs on gambling-related harm; and c) research exploring the interaction between near miss outcomes and emotional responses.

1.6 Cost Characteristics

- Significant financial harm is possible on a variety of games available through a variety of channels (digital or in land-based retail environments). When considering how a game may cause financial harm, it is important to consider short-term and long-term perspectives. Accordingly, speed and volatility, and not just stake size and Return-To-Player (RTP), as is the case with theoretical loss, are critically important factors in considering the financial cost of play for any one individual in any one session.
- Assuming no change in game speed, RTP and volatility, a larger stake size will mean a higher cost of play. The relationship between stake size and cost of play is likely to vary considerably as different types of product have different configurations of game speed, RTP and volatility. However, stake is the primary means by which players can vary the financial risk of a gambling game.
- Besides contributing to a higher cost of play, higher stakes gambling is a risk factor for problem gambling in the following ways: a) it can impair decision-making; b) it can be more exciting and thrilling (although the exact relationship with harmful play requires further clarification) and; c) it can make chasing losses easier. On the other hand, it has been proposed that lower stakes gambling could be risky because: a) it becomes more accessible and broadens appeal to all income levels and; b) lower stakes permit longer sessions of play at an equivalent cost, thereby increasing the risk of harms related to time loss.

- Evidence from gaming machine research suggests that there is likely to be a disproportionately higher number of problem gamblers playing at higher staking levels. However, most problem gamblers on average still play at relatively low stake sizes. Evidence also suggests that at least some problem gambling may manifest in an adapted way (e.g., like playing for longer at lower stakes) when stake size becomes restricted. In addition, in some cases, restrictions on stake size may run counter to the interests of the consumer if it restricts the opportunity to bet in favourable situations; although this scenario is likely to be less common.
- Although some evidence suggests that players can detect differences in RTP in similar games, these research scenarios usually involve large RTP differentials and artificial lab conditions. RTP is more difficult to determine in more volatile games, and between games where differences in RTP are minimal.
- RTP combines with speed, stake and volatility to determine cost-of-play over any given period. Volatility is likely to have a more noticeable influence on game outcomes on a session-by-session basis. While a higher RTP generally leads to a lower cost of play (all things being equal) this may also provide a more reinforcing and exciting experience which may encourage excessive play.
- Setting specific guidelines regarding RTPs including a minimum, a maximum or restricting variation across games and venues is complex and further research is required. RTP communications may be perceived as confusing and potentially misunderstood. This is because an individual session may vary considerably from the advertised RTP particularly when playing volatile games or if the player does not consider re-staking wins when considering their own RTP.
- Recommendations from this chapter include: a) promoting better awareness of potential cost of play by including a range of structural characteristics including speed, volatility, stake and RTP; b) ongoing consideration of options to limit financial harms through restricting cost of play particularly if delivered through account-based play; c) consideration of the restriction of incentives (e.g., higher RTP, enhanced game content) to players to increase stakes within the game and; d) further research to explore how staking variability and RTP may influence problem gambling.

1.7 Payment and Accounting Characteristics

- Non-cash payment methods used in gambling are likely to facilitate increased spending and disrupt cognition regarding the perceived impact on wealth. The primary explanations for this non-cash payment effect are that, in general, individuals are less likely to think about the actual cost implications of spending in the absence of the physical transactions of cash and a reduced need to rehearse specific sums when making payment.
- There is growing evidence that access to additional funds in a gambling venue is a significant risk factor for problem gambling. This may be because it facilitates the decision to continue spending more than planned. The requirement to leave the gambling venue to access additional funds may represent a natural break in play and may inhibit unplanned spending. Because of the nature of the non-cash transaction,

and fewer restrictions on the amount that can be deposited, remote loading via debit card may represent a greater risk for problem gambling than ATMs.

- Consumer accounting decisions in gambling directly influence where affordable amounts of time or money are exceeded and thereby directly influence risk of gambling-related harm. Accounting decisions may be influenced by how gambling products and their environments are designed. Therefore, gambling operators should promote responsible gambling by avoiding strategies designed to facilitate deposits and inhibit withdrawals. A consumer's decision to stop gambling or withdraw funds from their gambling account or gambling activity should always be supported.
- Recommendations from this chapter include: a) consideration of meaningful restrictions on access to funds in a gambling venue including the use of debit cards via remote loading, ATMs and digital wallets (e.g., Apple Pay); and b) developing policies around choice architecture to facilitate and apply responsible gambling decisions.

1.8 Information Characteristics

- Dynamic, as opposed to static messages, tend to improve recall, gambling-related cognitions, and behaviours in the short term. Informative and self-appraisal messages appear to have relatively equivalent effects. For messages to be effective, they must readily attract attention, contain personally relevant content, be easily understood, and recommend appropriate actions to be taken.
- Studies using self-report questionnaires have consistently demonstrated that during a session of play on electronic gaming machines, players lose track of time. Clocks on machines have been mandated in some jurisdictions in a bid to increase player awareness of time spent playing. No empirical studies have systematically determined the extent to which players fail to meet obligations because of losing track of time. Qualitative and self-report studies indicate that players consider clocks could be a useful feature but the majority perceive this facility to be ineffective in assisting control over gambling behaviours.
- The provision of warnings and messages are important in informing players of probabilities of winning, cautioning of the potential risks associated with excessive gambling, and directing players to reappraise their behaviour during sessions of play. Although evidence based on self-report data suggests that messages are effective in moderating intentions to reduce gambling in the short term, there remains an absence of empirical data on the longer-term impacts on actual expenditure of time and money.
- Recommendations from this chapter include: a) conduct longer term research into messaging; and b) that all gaming machines are mandated to display on screen personal appraisal messages designed to promote a player's evaluation of expenditure (time and money), and make an informed and deliberate decision to cease or continue a session. Such messages should be displayed at regular but not too frequent times during sessions of play.

1.9 Displacement in Gambling

- There is evidence that suggests that gamblers exhibit variability and instability in how they engage with different products. This may indicate that vulnerability to gambling-related harm may not be unique to one specific form of gambling.
- While it seems that some displacement may be inevitable, the precise extent to which problems may be experienced on other gambling products, following heavy restrictions on gaming machines remains unclear. Evidence from the Norway case study suggests the potential for displacement may be overstated. Complex issues exist relating to individual and situational differences in individual contexts influencing the product preferences of problem gamblers.
- If consumers opt to play other less harmful products because of policy restrictions on riskier products, this may still be considered a success.

1.10 Conclusions

- A stake-only reduction strategy to product-based harm minimisation ignores the role of game speed, game volatility and return-to-player (RTP). A coherent supply-side policy approach targeting cost of play to protect players must account for all parameters contributing to how much a consumer can lose.
- While considerable evidence gaps impede progress in player protection, there are areas where work can start immediately. For example, focus should be given to the presentation of gambling products and their channels to ensure that responsible decision-making is not inhibited by designs intended to maximise revenue and grow business. Additionally, game features which greatly expedite game play (e.g., turbo mode or auto-play) should also be reviewed.
- Perhaps most importantly, the use of debit cards, ATMs and digital wallets to access additional funds in gambling venues requires urgent consideration. If cashless payment systems in gambling are inevitable (as in other consumer contexts), then the associated risks must be acknowledged and adequately addressed. Account-based gambling continues to be a promising option for combining cashless gambling and a strong player protection strategy.
- Some principles for product-based harm minimisation, at face value at least, appear to run counter to the short-term business objectives of maximising revenue and growth. Operator reluctance to accept this point may restrict progress in dealing with conflicts.
- Regulation is key to the convergence of harm minimisation with other corporate objectives. As the emerging culture of research, trialing and evaluation improves, our understanding of structural characteristics in gambling, regulation and policy can benefit from increased specificity, effectiveness and efficiency.

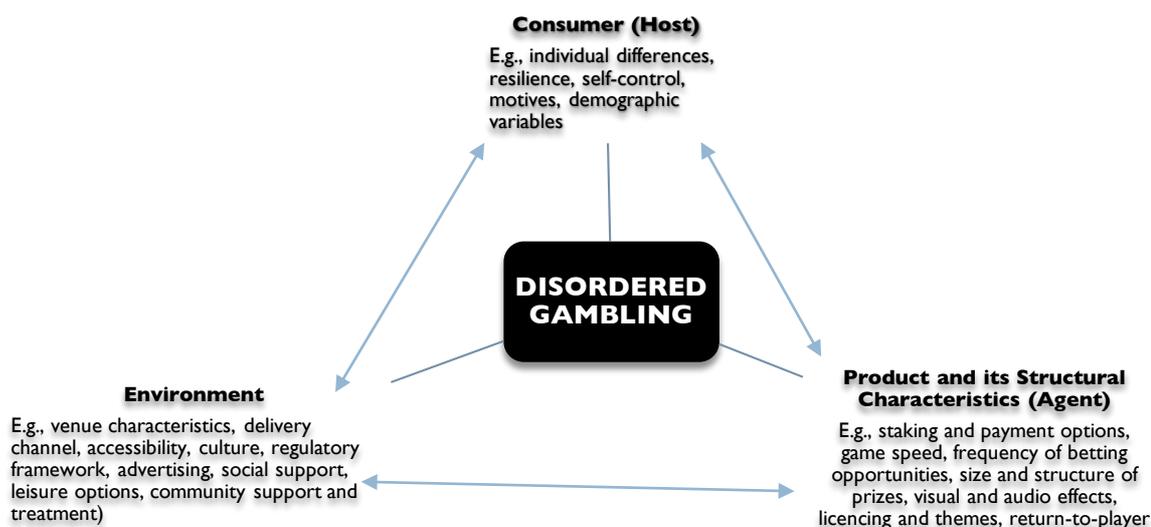
2 INTRODUCTION

2.1 Background and Scope

2.1.1 Gambling, Harm and Public Health

A key aim in adopting a public health approach to problem gambling is to distinguish acceptable from unacceptable risks in the regulation of commercial gambling (Shaffer & Korn, 2002). This is achieved through broad consideration of a wide range of determining factors and multiple opportunities for prevention, reduction and treatment of problem gambling. Korn and Shaffer suggested that the model for communicable diseases could be usefully applied to the study of gambling and its related health outcomes (Korn & Shaffer, 1999; Shaffer & Korn, 2002). As depicted in Figure 1, the epidemiological triangle denotes the interaction between the agent (*i.e.*, the gambling activity and its structural characteristics), the environment (*e.g.*, micro-environmental factors such as venue, or macro-environmental factors such as culture) and the host (*i.e.*, the consumer). We prefer here to use the term consumer rather than gambler to accentuate the point that primary prevention options can apply to all individuals including non-gambler and their initial decision to participate.

FIGURE 1. PUBLIC HEALTH VIEW OF DISORDERED GAMBLING (ADAPTED FROM KORN & SHAFFER, 1999)



In outlining the importance of a public health approach to gambling studies, Shaffer and Korn (2002, p. 204) state, “By understanding the distribution and determinants of gambling problems in the general population and among subgroups, there is opportunity to develop effective strategies to protect vulnerable people, foster healthy gambling where appropriate, and improve the quality of community life.” We suggest that this report contributes to this end by considering the evidence and theory around one of these three determinants: the gambling product and its structural characteristics. We are particularly interested in those structural characteristics that may be most relevant to gambling policy in Great Britain.

2.1.2 Understanding the Product and its Structural Characteristics

Structural characteristics are essentially the building blocks of a gambling game. They are the basis for their differential appeal depending on how they satisfy different needs for different consumers. They combine with environmental and individual factors to determine both positive and negative outcomes of gambling participation. Although not explicitly considering gambling products within the public health model, Cornish (1979) significantly advanced the public health agenda through the initial consideration of structural characteristics. In his description, he states (p.172): *“These features give gambling activities their distinctive natures, determining the ways in which they define and satisfy punters’ expressive (and instrumental) needs and the range of solutions on offer. It is also clear, however, that certain of these features may also be responsible for facilitating excessive expenditure and excessive gambling. By examining the degree to which different forms possess the relevant characteristics it is possible to identify which types of gambling are a priori likely to encourage these consequences.”*

However, the exact characteristics vary considerably from game to game, driven both by consumer preferences and regulatory requirements. Such variation makes examining the impact of any one parameter on gambling-related harm a difficult task. Moreover, gambling products, and the channels¹ through which they are provided, have become vastly more diverse and sophisticated. Since earlier examinations of structural characteristics (e.g., Royal Commission, 1951; Weinstein & Deitch, 1974; Griffiths, 1993, Parke & Griffiths, 2007) new characteristics are emerging (e.g., ‘loss-disguised-as-win’ or LDWs; see Section 6.3); existing characteristics are evolving (e.g. the Near Miss) and previously non-gambling activities are transmuting to become gambling activities (e.g., social gaming and eSports). Building on the taxonomy suggested by Parke and Griffiths 2007, below we identify categories of structural characteristics which will largely dictate the organisation of this report. This list is not exhaustive but is intended to advance British policy considerations around a product’s capability to create harm, and by extension, to illuminate options for product-based harm minimisation.

2.1.3 Challenges for Research on Structural Characteristics

While most research investigating gambling behaviour is subject to methodological limitations, there are specific challenges relevant to research examining the structural characteristics of gambling (Parke & Griffiths, 2007; Peller, LaPlante & Shaffer, 2008). These include:

1. *Inappropriate samples.* This could include the less than optimal use of non-representative populations: undergraduate students; inexperienced or irregular gamblers; or non-gamblers from the general population. Using less experienced gamblers disregards the impact of exposure and learning from previous relevant experiences. To further illustrate the point, to the uninitiated a near miss may simulate a physiological response similar to a real win because of the novelty and uncertainty of the situation. Consider also that, as Dickerson (1979) observed regarding the limitations of laboratory research on gambling over thirty years ago, the period of “tangible loss” may extend over many years as opposed to five minutes in a laboratory setting.
2. *Validity concerns.* To what extent does the experiment (laboratory-based or otherwise) represent gambling in the real world? If we continue with the above example of the near miss, even to a more experienced gambler, a lab-based setting

¹ The term ‘channel’ refers to how gambling products are being delivered (e.g., through the Internet or land-based environments).

may still prompt uncertainty or novelty, such that they might respond differently to near misses or LDWs than they would have normally under more realistic or familiar circumstances. Laboratory settings are not just new environments but often provoke additional scrutiny from research participants regarding the purpose of the experiment. Similarly, responses to the same task derived from undergraduate students are found to differ from those obtained from gamblers (Gainsbury, Russell & Blaszczynski, 2012; Monaghan & Blaszczynski, 2011).

3. *Ethical restrictions.* This is a validity concern. Ethical protocols are critically important, and should always override any other considerations including validity. However, ethics presents some of the more significant threats to ecological validity in gambling studies. Take for example, restrictions regarding participants losing their own money or keeping money won (especially larger sums) in an experiment designed to understand the influence of stake size on gambling behaviour. At best, we suggest that potential learning about stake size from such an experiment is limited. At worst, this 'knowledge' could be counterproductive. Take for example, an experiment, in which a key objective is understanding the impact of betting at higher staking levels. If participants are not permitted to lose their own money and the experiment shows that there is limited impact from playing at higher staking levels, what are we to conclude? The real potential implications of cognition, emotion and behaviour relate to losing money – yet the player, in the least valid experiments, loses only points, and in the more valid experiments, lose the opportunity to win significant sums of money. Admittedly, the later type of experiment may provide some legitimate insights. However, at the risk of overstating the point, divergence from realistic gambling scenarios is not a dichotomy but a spectrum, and one which should require that research findings receive scrutiny regarding their implications for informing policy decisions rather than.
4. *Structural characteristics are evolving and increasing in number.* The need for gambling providers to remain viable in a competitive market continues to drive product innovation. This is achieved through innovative game technologies and fast-evolving channels of delivery. By implication, the 'game' is changing faster than the consumer or environment yet advances in knowledge are arguably the slowest.

Empirical evidence regarding a specific characteristic in relation to a game may not be directly applicable to a different game or the same game offered through a different channel (e.g., digital versus land-based). Additionally, similar classes of games quite often have a similar but ultimately different configuration of structural features. For example, a number draw could be infrequent like a weekly lottery draw or it could be continuous like some forms of Keno or Video Lottery Terminals. While a focus on structural characteristics rather than products helps to manage misattribution, it pays to be mindful that a product of the same name is not always a product of the same outcomes. This point has been emphasized by some commentators in claiming the 'irrelevancy of game type' (Griffiths & Auer, 2012). While we do not concur that game-type is irrelevant (after all a game is still broadly classified according to its structure) we do suggest that its component parts bear closer examination than its game category membership. This is simply a matter of precision in focus. As Shaffer and Korn (2002) suggested, the relationship between the multiple determinants of problem gambling are complex producing myriad outcomes; some healthful, some harmful. While we do our best to comment on both applicability of findings across products and the potential interaction between different determinants - the research evidence prevents definitive conclusions regarding the precise role of structural determinants in the development and maintenance of problem gambling.

On a positive note, there is reason for optimism that the ecological validity of this sort of research can improve. A decade ago, in line with the above concerns, Parke and Griffiths (2007, p. 238) made the following recommendation:

“Perhaps it is time for more pressure to be placed on regulatory bodies that could push for researcher access in actual gambling locations. Just as an example, this might be a stipulation for licensing or could be considered part of an operator’s drive to become more socially responsible. For example, demonstrating commitment to responsible gambling is something that has been given precedence by the new U.K. regulatory body, the Gambling Commission. Alternatively, relationships between the gambling industry and the research/clinical community must be forged and/or further developed.”

Ten years on, there are now improved opportunities in Great Britain for conducting more ecologically valid research. In part, this is because of work done by the Gambling Commission, the Responsible Gambling Trust (RGT) and the Responsible Gambling Strategy Board (RGSB) building such relationships and through leveraging licensing requirements. This has also been achieved with the help of an increased appetite from gambling operators and industry trade bodies for whom harm minimisation is becoming a greater priority. While concerns have been expressed by some commentators (e.g., Livingston & Adams, 2016; Cassidy, 2014) that working with industry inevitably yields unreliable, biased and thereby misleading findings, we disagree. Without doubt, constructive industry involvement in research is embryonic and defining appropriate terms of engagement has barely begun. However, there are now numerous examples of industry research participation that even in acknowledging their limitations are significantly advancing the field². Such studies are now developing a more externally valid understanding of gambling. We would suggest therefore, that despite dissenting voices from some corners in the research community, our understanding of structural characteristics and the potential for product-based harm minimisation will have increased significantly over the next decade. However, for now, and for the current review, we proceed in the knowledge that many of the methodological shortcomings outlined above still apply.

2.2 Structure of Report

We have structured the report by systematically taking each category of structural characteristic in turn. Within each section we consider the theory and evidence concerning potential links between characteristics and gambling problems, together with potential implications for specific public health interventions that may be relevant for regulators and commercial gambling providers.

2.3 Approach

2.3.1 Considering the evidence and theory

The aim of this report is to consider possible mechanisms for harm prevention and minimisation by modifying the structural characteristics of gambling game (or ‘agent’). In doing so, there is potential to consider an extremely broad range of potentially relevant evidence and theory. From the outset we acknowledged a set of challenges in considering

² To name just a few examples: the BWin.Party Division on Addictions research collaborative exploring digital gambling behaviour; Wardle and colleagues evaluating British bookmakers initial harm prevention trials; Auer & Griffiths examining messaging impacts with Win-2-day.

the evidence in relation to the structural characteristics of gambling in order to guide our approach:

1. *Different terminology is often used to refer to the same concept.* A lack of consistency and clarity regarding terms and concepts is a significant challenge when considering structural characteristics. Differences exist between stakeholders, jurisdictions and academic disciplines transmuting into differences in conceptual thinking and terminology. For example, 'return-to-player' (RTP, see Section 7.2) may be referred to as payback percentage, a 'loose-tight' continuum, margin or hold. Locating relevant evidence is made difficult as a result of differences in terminology.
2. *Relevant findings often missed because of irrelevant titles, keywords or tags.* In other words, brief yet important insight may be derived about game speed from a paper where the primary focus was treatment efficacy, for example. In these cases, it is unlikely that speed would feature in the title or in the key words making it more difficult to locate.
3. *Relevant research often exists as grey literature.* Relative to other topics in gambling studies, the study of structural characteristics is often executed for practical reasons with regulatory or commercial objectives in mind. Consequently, some significant evidence may not exist in peer-reviewed journals but as technical reports, working papers, patents or conference presentations.
4. *Relevant research may often be jurisdiction specific.* Given regulatory or commercial interests, the focus of research or product reviews may reflect idiosyncratic game design and product restrictions of a particular jurisdiction.

The authors have worked extensively around structural characteristics in various jurisdictions undertaking research, training and consultancy for a range of academic, regulatory and responsible gambling objectives. This kind of experience is important for reviewing complex evidence where only a minority of evidence comes from protocol driven search strategies (Greenhalgh & Peacock, 2005).

This report assesses the current state of affairs and draws out implications for harm prevention and reduction, and to a lesser extent, further research. While this report does not rely entirely on protocol-driven searches, they did form part of the basis for our search. Web search engines (e.g., Google Scholar) were also used to try to identify any new grey literature or technical reports currently not known to the authors. Appropriate literature identified for this paper was identified in three concurrent phases: a search of online electronic databases; grey literature accessed through web-based searches, personal knowledge and professional contacts and through 'snowballing' where references of references are pursued (Greenhalgh & Peacock, 2005). This report is not a systematic review of all structural characteristics but a critical review of evidence and/or theory relating to a selection of characteristics which may hold promise for gambling harm minimization in Great Britain.

3 GAME CHARACTERISTICS

In this section, we define ‘game characteristics’ as structural features that relate to the content or operation of Electronic Gambling Machines (EGMs). This includes both terrestrial forms of EGMs (for e.g. Cat. D, Cat B1-B4) and simulated gambling machines available within online contexts.

3.1 Bonuses, Free-spins and Feature Awards

In-game bonuses have been developed to significantly increase the psychological involvement of the gambler (Parke & Griffiths, 2006). In other words, to break the monotony and repetitiveness of slot machine events, which may lead to a passive engagement with the product, integrated features such as the awarding of free spins or a bonus game create additional reinforcement for participation. Essentially, bonus content provides further rewards to the player in addition to basic reel order distributed prizes. Because of the value players place on such bonus awards, the frequency level of bonus content awarded to players has increased over time (Parke & Griffiths, 2006). Bonus content now contributes a substantial proportion of the payout structure and return to player in modern EGM gambling (Harrigan et al, 2015; Landon et al, 2016). Harrigan and Dixon (2009) in their analysis of the Lucky Lobster EGM, identified that bonuses contributed to a large proportion of overall prizes awarded making it a central part of the player experience.

Several qualitative studies of slot machine gamblers observed that the bonus feature of free spins was reported to be the primary motivator for extended play, and the ‘most addictive feature’ of slot machines (Blaszczynski et al, 2001; Landon et al, 2016; Livingstone & Woolley, 2008). Participants reported that receiving free spins was effective in boosting one’s spirits and as an indicator that their luck was finally changing (Landon et al, 2016). Participants reported that they perceived free spin awards as an enhanced win because they were effectively getting something for nothing (Blaszczynski et al, 2001), and it was technically a ‘double win’ as you are ‘playing with someone else’s money’ (Livingstone & Woolley, 2008).

The aim of obtaining a bonus award of free spins has been reported to impact gamblers’ playing strategies (Livingstone & Woolley, 2008; Templeton et al, 2015). For example, Harrigan et al (2015) observed that participants were motivated to play more lines during each spin, to maximise the hit frequency of the bonus features, despite the increased cost per play. For many, obtaining a bonus feature has become the primary goal of slot machine gambling (Dow-Schull, 2012; Parke & Griffiths, 2006), as it was recognised as a key determinant of whether they would experience substantial wins (Blaszczynski et al, 2001; Landon et al, 2016). Blaszczynski et al (2001) believed that that eliminating free spin bonuses from EGMs would be one of the most effective approaches to reducing problem gambling in terrestrial gambling environments.

Key Points

- In-game bonuses, such as free spins, are a central feature of the modern EGM gambling experience.
- Players strongly advocate that in-game bonuses are one of the most enjoyable elements of EGM gambling.

3.2 Player Involvement Features

It is proposed that one of the key mechanisms that explains disordered gambling behaviour is that problem gamblers possess distorted or erroneous beliefs regarding their chances of obtaining successful outcomes (Ladouceur & Walker, 1996). There are multiple erroneous heuristics (i.e. *irrational beliefs*) that are common amongst problem gamblers (Toneatto et al, 1997) that enable the justification of further engagement in gambling despite the multitude of negative consequences that can arise from disordered patterns of gambling. One of the most prominent cognitive biases that is regularly observed in problem gamblers is the illusion of control (Blaszczynski & Nower, 2002). The illusion of control can be summarised as a subjective belief that one is likely to be more successful in a task than objective probability would dictate (Langer, 1975), and that there is scope for personal control, even in activities like gambling that are largely chance based.

According to Clark (2010), there are multiple structural characteristics of gambling activities, and EGMs in particular, that knowingly foster the illusion of control in gamblers. When people see a connection between their behaviour and an outcome, no matter if it is purely correlational, they are more like to experience illusion of control, and this is referred to as the *Control Heuristic* (Thompson et al, 2007). Electronic gambling machines in Britain have long promoted structural features that require player interaction, such as the nudge feature, in-game bonus features and the hold function, to foster an illusion of control (Parke & Griffiths, 2006). However, aside from promoting illusion of control, it must be noted that such player features of interaction may also increase the enjoyment of the gambling experience, as it effectively reduces the passivity of the activity (Parke & Griffiths, 2006).

Clark et al (2009) argued that the presence of perceived personal control (*in this example being able to stop a reel at a preferred icon*), may cause players to misinterpret the chance-based outcome of the game as potentially being ‘controllable’. It was argued that the ‘instrumentality’ required i.e. stopping the first reel on the machine, invoked neural processes related to feedback processes (Clark et al, 2009). In other words, the act of having to engage with the machine will, by default, increase the likelihood of misinterpreting such actions as influencing the gambling outcome. However, the empirical findings regarding the effect of such interactive features on disordered gambling behaviour is far from conclusive. As with many areas of gambling research, the available literature is largely deficient in terms of the number of published empirical studies, and furthermore, the research limitations with respect to the validity of the research findings.

Based on the handful of available empirical studies of sufficient quality, it is not possible to make definitive conclusions regarding the effect of stop buttons on problematic patterns of EGM gambling. Loba et al (2001) argued that the ‘stop reels’ function would increase the attractiveness of the game and player motivation to participate because it both shortened the payout interval meaning reinforcement occurred more rapidly, and was likely to increase illusion of control. However, the findings of the study did not support this hypothesis. Loba et al (2001) argued that manipulating whether the stop-reels function was available or not, may not have had an effect because it was a feature that few players regularly used. Loba et al (2001) pointed to research conducted by Focal Research in 1998 that demonstrated that approximately just 5% of casino patrons regularly used the stop reels function when available. In addition, Clark et al (2012) found that although personal involvement did not impact on the arousal experienced by the participants when gambling on a simulator, but it was related to self-reported *willingness to continue gambling*. Ultimately, the research is substantially under-developed and remains in its infancy, and therefore it is

not possible to propose effective conclusions regarding the role of player interaction functions such as ‘stop-reels’ buttons.

Key Points

- EGMs often contain in-game features that require player interaction such as the ability to hold reels or to stop the reels. Such features are believed to increase the illusion of control over gambling outcomes that players may feel when gambling on an EGM.
- To date, there is no convincing evidence to suggest that such interactive features of EGMs are risk factors for harmful patterns of gambling.

3.3 Themes and Licensing

Another structural characteristic of a gambling activity relating to the development and facilitation of illusion of control is the *licensed theme* of the game. It is widely accepted that one of the primary drivers of illusion of control is familiarity with the task (Langer, 1975). The more familiar an individual is in respect of an activity, the more ‘perception of subjective control’ increases, which in turn leads to an increase in level of risk taking (Langer, 1975; Presson & Benassi, 1996). The names and thematic content of a gambling activity not only lead to impression formation (Costa, 1988; Parke & Griffiths, 2005) but if it is a theme that is recognisable to the player, then this familiarity may have implications for their gambling behaviour via an increase in illusion of control.

Ladouceur et al (1987), in a laboratory study, observed that risk taking among participants increased because of direct exposure with the gambling task, and moreover, familiarity with the game increased the total amount bet within the session. However, it must be acknowledged that the impact of familiarity was relatively short lived, because the effect was only observed in the early stages of interaction with the game.

There are only a handful of research studies available that have even considered the impact of themes and licensing on problem gambling, and there are minimal amounts of genuine data. Nevertheless, it is argued that any impact that familiarity of gambling tasks and content have is likely to be a secondary factor, and a substantially less relevant factor, in illusion of control over the long-term than other factors such as rate of reinforcement (Stefan & David, 2013). It is probable that the thematic content of a game is more relevant to machine selection and player enjoyment of the activity, in contrast to being a causal factor of extensive and disordered gambling. It is argued that thematic content, in relation to the other features discussed within this report, is not a primary contributor to problem gambling and therefore not a priority in terms of future research.

Key Points

- It is possible that if the thematic content of an EGM is familiar to the player, they might experience an increase in illusion of control. However, it is argued that any effect of familiarity is likely to be brief and secondary in contrast to other variables such as reinforcement rate.

3.4 Implications for Policy and Research:

In-game bonuses such as free spins are reported by the players to be one of the most desirable elements of EGM gambling. However, it is important to recognise the lack of behavioural data in contrast to the readily available qualitative data representing players’ opinions and interpretations, regarding the effect of in-game bonuses. There is a possibility

that the offering of in-game bonuses is one of the most exciting and enjoyable parts of EGM gambling, whether it is a primary cause of gambling-related harm remains unclear. Effectively, by removing in-game bonuses from EGMs one could substantially reduce the excitement of the game which in turn is likely to reduce level of motivation and participation in EGM gambling. Before such impactful measures are taken, it is prudent to first:

- Conduct further empirical research (rather than relying on players' reports) that demonstrate that in-game bonuses, such as free spins, are related to gambling-related harm.
- Conduct further empirical research to determine the impact that the removal of in-game bonus features have on EGM gambling behaviour of non-problem gamblers.

With respect to player involvement features such as buttons to stop or hold reels, there are reasonable theoretical arguments to support the idea that such features may increase gambling participation via an increase in players' illusion of control. However, this hypothesis has, to date, not been supported by empirical evidence. This does not mean that player involvement features have no effect on gambling behaviour, either in terms of harmful or positive play, but rather that currently there is no valid evidence to strongly support such a position. Therefore, it is proposed that while it is worthwhile to explore the impact of EGM player involvement features on problem gambling, it is not possible to identify this relationship as an urgent area of further research in contrast to variables with a more bona-fide relationship to harm, outlined elsewhere in this report.

The thematic content of an EGM has also been proposed as a feature that may increase a player's illusion of control. As with other game features discussed, there is a substantial lack of empirical research that may be able to support such hypotheses, and therefore it is not possible to conclude with any confidence whether the thematic content of a game impacts gambling behaviour. Moreover, it is proposed that any impact on gambling behaviour from the thematic content is likely to be relatively minor in contrast with other variables such as reinforcement rate. Therefore, although potentially relevant to the debate, the thematic content of EGMs is not proposed as a pertinent area for further research.

3.5 Recommendations

- Further research is required to establish whether the provision of in-game bonuses, such as free spins, are a causal factor in problematic patterns of EGM gambling (including online versions).

4 AMBIENT CHARACTERISTICS

For many, entering a gambling environment such as a casino is often viewed as a pleasurable experience because of the exciting reward-related sounds and warm colours that combine to create a disorientating experience (Finlay et al, 2006, 2010). Dow-Schull (2012) argued that although still relevant in creating a pleasurable experience, the architecture is secondary to the ambience created. Gambling products are presented in ambient environments that are deemed to be rewarding to the player, including environmental factors such as warm lighting and exciting colours, and even manufactured aromas. These ambient characteristics are believed to be used in gambling contexts to elicit an emotional response from the players that increases the probability of extended play or more frequent visits (Mayer & Johnson, 2003).

4.1 Visual Factors

According to Diskin and Hodgins (1999), part of the motivation for problem gamblers to gamble is related to the desire for stimulation that creates 'narrowed attention', and therefore the gambling environment can provide an engaging distraction from everyday life. From this, it can be argued that if narrowed attention is one of the primary goals of problem gamblers, it is likely that they would be more attracted to gambling activities that are more visually stimulating (Loba et al, 2001).

It is widely acknowledged that the application of primary colours and flashing lights are effective tools in creating an impression that the task is fun and exciting (Griffiths & Swift, 1992; Popkin, 1994; White, 1989). With respect to EGMs, Blaszczyński et al (2001) proposed that the real reason players specifically enjoy new models is because of the novel visual and sound effects that increase the subjective enjoyment of gambling task. This point was strongly supported within an EGM-centered focus group, where players reported that part of the motivation of EGM gambling was to seek novelty for enjoyment, and the lighting and sound of the product was central to this process (Landon et al, 2016).

In terms of behavioural research, there are a handful of studies that demonstrate that the lighting and colour of gambling environments may have an impact of gambling behaviour. Stark, Saunders and Wookey (1982) demonstrated players gambling under red lights were more likely to make riskier bets at higher stakes, and more frequently, in comparison to gambling in an environment with blue lighting. However, it must be noted that this research was not conducted in a commercial gambling environment but with an undergraduate population in a laboratory setting, so it is not possible to directly apply such findings to commercial gambling contexts. More recently, Spenwyn et al (2010) observed that in a condition that combined high tempo music with red lighting players made faster bets during the session. In addition, Brevers et al (2015) observed that, in contrast to environments with red lighting and exciting sounds, players gambling in an environment with no sound and white lighting were slower to react to gambling outcomes, suggesting that this condition was more conducive to more rational, measured decision-making. From these studies, it is not possible to conclude the individual effect of visual stimuli (i.e. red lighting) on gambling behaviour because in both studies the effect was only observed when red lighting was combined with exciting sounds. Spenwyn et al (2010) proposed that, like Ward et al's (1992) assertion, pleasurable ambience will only be created when multiple factors are integrated rather than applied in isolation.

Ultimately, once again, it must be stated that there is insufficient research available to make clear conclusions about the potential impact of visual stimuli in the gambling environment on problem gambling behaviour. Not only is there a strictly limited number of empirical articles looking at the impact of visual stimuli on problem gambling, but as previously discussed, there are substantial limitations in the studies that further restrict the application of the findings to commercial gambling contexts.

Key Points

- Players report that visual factors in the gambling environment are important in experiencing enjoyment when gambling
- Explorative research indicates that manipulating the lighting scheme may influence risk taking behaviour when gambling, however such studies require substantial expansion before any theoretical claims can be confidently proposed.

4.2 Auditory Factors

From a consumer psychology perspective, it is widely acknowledged that background music can influence consumer behaviour; namely amount spent and length of time in the consumer environment (Bitner, 1992; Areni, 2003). Both outcomes are relevant to commercial gambling and therefore it is unsurprising that music and sound play a significant role in the construction of gambling environments and gambling products.

Husain et al (2013) identified that sound can relate to gambling in three forms: the ambience of the environment, the sound effects as cues for game performance and finally vocal cues that provide information or guidance to the player. As with other ambient characteristics, the objective of background music to the gambling activity is to create an image of gambling being a fun, exciting and positive leisure experience (Bramley et al, 2013, 2015, 2016). Furthermore, it is argued that the provision of arousing and exciting music and sound can be effective in stimulating gambling engagement once the player is in the environment, and in encouraging longer playing sessions (Griffiths, 1993; Landon et al, 2016).

Caution must be professed when interpreting such conclusions because the evidence base for sound affecting gambling behaviour is rather limited. For example, Muramek et al (2007) observed that in a virtual gambling environment, participants reported to be more willing to take more risks when gambling in an environment that had a 'playful' and stimulating ambience (of which music was a central feature). Ultimately, behavioural data is required to conclude that this is an accurate representation of the impact of sound on gambling behaviour. Behavioural findings can be drawn from experimental research that is laboratory based, but one must acknowledge that it is difficult to replicate realistic gambling contingencies (i.e. meaningful monetary losses and wins) in such contexts. For example, Dixon et al (2007) concluded that when participants were betting in laboratory environments under the condition of high tempo music, they were betting more frequently within that session, in contrast to those gambling in no music or low tempo music conditions. However, this study comprised primarily of non-frequent gamblers (all undergraduate students) and no money was risked, and the rewards were non-monetary (chocolate), raising concerns regarding the generalisability of the findings.

Delfabbro, Falzon and Ingram (2005) in a laboratory study observed that participants preferred to play EGM simulations that had sound effects in contrast to those without sound. However, it must be noted that this effect is solely based on self-report data, and the objective behavioural measures including speed of play and length of session were not

affected by sound. From this, Delfabbro et al (2005) proposed that although sound and other aesthetic features are relevant, it is more of an indirect factor in determining EGM gambling behaviour in comparison to reinforcement features. In addition to this, Brevers et al (2015) observed that casino ambience (including casino sounds and background music) did not increase the time participants spent making gambling-related decisions after losing compared to post-winning events, whereas they did increase reflection time after losing in conditions without the casino-related sensory stimulation. Again, one must be very cautious in applying these conclusions because the effect was a result of a combination of sensory features rather than sound alone, and the gambling tasks did not involve real monetary wins and losses.

One of the primary objectives of sound effects within gambling activities is to identify winning outcomes, and therefore the sound effects also operate as secondary reinforcers when gambling (Bramley & Gainsbury, 2015; Griffiths & Parke, 2005). This proposition is supported by research that observed that players exposed to winning-related sounds when gambling both overestimated the amount of times they had won in a session (Dixon et al, 2013b) and were more likely to miscategorise Losses Disguised as Wins as winning outcomes (Dixon et al, 2013b). Furthermore, Loba et al (2001) observed that problem gamblers found it harder to stop gambling during a session where machines were faster and the sounds were louder. Essentially, in this study, the slower and quieter EGMs were reported to reduce enjoyment, excitation and tension reduction.

Although it is difficult to isolate the individual impact of sound on gambling behaviour, it is reasonable to conclude from the research base that sound and music play a valuable role in creating a pleasurable gambling experience. Music and sound appear to be an integral part of creating a stimulating environment. Brevers et al (2015) raised the interesting possibility that the exciting, high tempo musical ambience of gambling may create more urgency when gambling rather than promoting considered rational evaluation of behaviour. However, proposing this conclusion with any confidence would be premature; at least prior to empirical research utilising real gambling contingencies (i.e. real monetary wins and losses) becoming available. Based on current research, it seems that musical ambience may be more relevant to gambling experience rather than directly linked to problem gambling.

Key Points

- Music and sound are recognised as an important characteristic in terms of creating an exciting and stimulating gambling experience.
- Preliminary research suggests that sound effects may impact gambling-related decisions, however there is an absence of ecologically valid research that supports such conclusions.

4.3 Olfactory Factors

The final ambient characteristic is the smell or aroma of the gambling environment, and at face value, it is unsurprising that this is the least researched ambient characteristic in relation to gambling behaviour, because it appears that it is the environmental characteristic that commercial operators manipulate the least. On closer inspection, this is perhaps not the most effective approach given that the objective of environmental ambience in a commercial environment is to engage customers (i.e. players) emotionally in order to impact their spending behaviour. Of all the senses stimulated in terms of ambient characteristics, smell has the strongest impact on emotion (MacLean, 1973). Nevertheless,

to date, the research literature regarding how olfaction affects gambling and risk-taking behaviour, via emotional transition, is virtually non-existent.

The most prominent, and most ecologically valid, study in this area was conducted in a real Las Vegas gambling environment, where the experimenters manipulated the aroma scent, and the intensity of the scent, and observed the impact on gambling revenues (Hirsch, 1995). In separate gambling areas housing multiple EGMs, three conditions were created; with two distinct odours and an odourless control condition. It was observed that in the area where odour 1 was presented at different intensities, that gambling revenue increased significantly over that period in contrast to the time-period before and after odour 1 was introduced. This effect was not observed with either odour 2 or the control condition; and Hirsch (1995) proposed that odour 1 was effective in creating a positive emotional state in contrast to the other odour conditions, therefore explaining the increased revenue. It was argued that the positive emotional state triggered by odour 1 meant that more players congregated in this area, and for longer periods of time (Hirsch, 1995). However, Hirsch (1995) conceded that it was unlikely that the odour alone was enough to stimulate further gambling, rather the aromatic scent more likely encouraged customers to 'linger' a little longer.

Key Points

- Although olfactory factors are strongly related to emotional transition, there is minimal research available that has investigated the impact of olfaction on real-life gambling and risk-taking.

4.4 Implications for Policy and Regulation

Overall, it appears that ambient characteristics may be more relevant to issues of consumer psychology and marketing rather than directly relevant for consideration as a tool to address problem gambling behaviour in commercial settings. Although there are some interesting preliminary studies into the role of ambient factors in gambling behaviour, it is probable that such factors are more peripheral to the issue of addressing problem gambling in contrast to other structural factors.

The research literature available regarding the impact of ambient characteristics, such as colour, lighting and sounds, is far too disparate and few, to isolate any clear trends that indicate a causal effect on gambling behaviour. Fundamentally, there are a handful of explorative studies that raise several interesting hypotheses that there may be merit in following up. Arguably, it is probable that of all the possible variables that may be related to problem gambling behaviour, ambient characteristics are the most under-researched. Therefore, in simple terms, a large research program is required to investigate the role of each of the ambient characteristics of problematic patterns of gambling behaviour before any informed regulatory decisions can be made. However, it must be noted that the explorative work does not strongly indicate that such factors play a direct, causal role in gambling-related harm. Given the limited available resources, and the more obvious relationships identified between problem gambling and other product-related variables, it is not possible to promote ambient characteristics as a research priority for tackling problem gambling.

4.5 Recommendations

- We recommend that ambient characteristics should not be a priority area for research attempting to improve understanding and interventions regarding problem gambling in Great Britain.

- More specifically however, there is a recommendation to explore the role of sensory feedback in players miscategorising LDWs as a winning outcome. Such recommendations are covered in detail in Sections 6.3 and 6.5.

5 SPEED AND FREQUENCY OF GAMBLING OPPORTUNITIES

Electronic gambling machines (EGMs) are consistently identified as the form of gambling that is most likely to be related to harm for players (Blaszczynski, 2013). It is commonly observed that most of those seeking intervention or treatment for a gambling disorder identified EGM gambling as the primary cause of their problem gambling behaviour (Turner & Horbay, 2004). It is argued that the combination of the opportunity to play for extended periods of time without natural breaks in play, the speed of feedback regarding gambling outcomes and the variable ratio schedule of reinforcement is the reason that EGMs are likely to facilitate gambling-related harm (Coates & Blaszczynski, 2013; Dowling et al, 2005; Productivity Commission, 2010; Williams & Wood, 2004).

However, it must be acknowledged that the vast majority of evidence that identifies EGM gambling as a factor in the development and maintenance of problem gambling is correlational rather than causal (Turner & Horbay, 2004). Although the speed of the game is regularly proposed as the most as the critical factor in encouraging problem gambling (Dow-Schull, 2012), Blaszczynski (2013) acknowledged that most research studies do not evaluate the specific effect of a single structural characteristic, such as speed of play. For example, Norsk Tipping attempted to minimise harm on EGMs by introducing a range of features such as mandatory breaks in play, limited stakes and prizes etc., which was met with an increase in the prevalence of problem gambling and increase in online gambling participation (Biggs, 2011). By relying on research that measures behavioural changes in response to altering multiple structural characteristics simultaneously, it is difficult to conclude with any confidence the potential risk associated with fast and continuous games. This section will review the limited number of studies that evaluate the role of speed and frequency in gambling behaviour, and in addition, evaluate the potential risk-factors for problem gambling that may emerge in relation to these structural characteristics.

5.1 Definitions and Concepts

It is important to isolate and define the individual terms and concepts that will be discussed within this section because, at first look, it may appear that the variables are synonymous and interchangeable, when in fact there are subtle but important differences. Ultimately, there are three distinct concepts discussed in this section, namely; *Event Frequency*, *Event Duration* and finally *Payout Interval*.

In this report, *Event frequency*³ refers specifically to the extent of which there is opportunity to bet on a specific event (e.g., a sporting event, a lottery draw, a spin of slot reels). The event frequency of a gambling product will exist on a spectrum, where some products allow continuous gambling where frequency is only limited through technical or regulatory limitations in terms of what can be offered. This contrasts with gambling activities such as National Lottery *Lotto* draws which have low event frequency in the respect that the events that an individual can bet on is limited to twice per week. Note that frequency of the betting event is integral to the frequency of betting opportunities.

Event duration refers specifically to the length of time between when the gambling event has commenced and when the outcome of the gambling event is determined. Again, event

³ Traditionally, event frequency related to the frequency of an event that one can bet on. However, this concept is becoming outdated and less relevant in modern gambling because it is common for there to be an opportunity to bet during the event itself.

duration exists on a spectrum where some gambling events are determined within seconds, as with EGM gambling, whereas in contrast some large poker tournaments can be spread out over several days without the opportunity to re-stake (or 'rebuy').

Payout interval refers to the length of time between when a bet outcome is determined and when the individual receives their reward or *payout*. Payout interval is a less straightforward concept than event frequency and event duration because although the gambling activity may provide the win instantaneously, as in online gambling, the player will not have instant access to funds as it may take as much as 3-4 days for the funds to reach a customer's account. Therefore, even though the event duration in online gambling may be very short, there may be a relatively long delay until the player can access and spend money won beyond continuing to gamble with the same provider.

5.2 Frequency of Gambling Opportunities and Mood Modification

Thorne, Rockloff, Langham and Li (2016) proposed that individuals will determine what gambling features are most important to them, and through a sequential process of elimination, will select their gambling activity of choice. Thorne et al. (2016) argued that based on previous experience and available information gamblers will identify gambling products that meet their needs. In terms of gambler need satisfaction, it is evident that rapid, continuous games are attractive to individuals who are motivated to gamble for enhancement and coping motivations (to modify mood) and less so to those with social motivations for gambling (Abarbanel, 2014; Stewart & Zack, 2008). More specifically, it has been identified that individuals who gamble for mood modification motivations are more likely to engage frequently in EGM gambling (Clarke et al, 2005; Thomas et al, 2009). Dow-Schull (2012) argued that the rapid process of sequencing stimuli and reward (referred to as *the constant cycling of player action*) would enable the player to receive reward from being in the *zone experience*. The argument is that rapid, continuous gambling can create an immersive experience that is pleasurable to the gambler (Abarbanel, 2014), and ultimately gambling activities that limit scope for active decision-making such as EGM gambling, facilitate the opportunity for the individual to 'escape' every day tensions (Fang & Mowen, 2009; Turner, 2008).

Event frequency is a relevant factor in two domains in relation to gambling behaviour. Primarily, the rapid continuous nature of a gambling activity enables an immersive state, effective for mood modification, and secondly activities with high event frequency, unlike draw lotteries or sports betting, are consistently available opportunities to actively meet mood modification needs. If gambling is being used as a mechanism to improve mood state, via excitement or by eliminating negative and dysphoric states, then the act of gambling is likely to be encouraged through a process of positive and negative reinforcement, respectively (Corr & McNaughton, 2008; Wardell, Quilty, Hendershot & Bagby, 2015). In turn, this may encourage maladaptive patterns of gambling for emotionally vulnerable 'at risk' gamblers (Blaszczynski & Nower, 2002), who are sensitive to the non-monetary rewards that can be acquired through gambling.

Essentially, gambling activities with higher event frequency are more readily available for individuals to shape the gambling experience to their needs. Gambling activities with a very low and/or fixed level of event frequency such as National Lottery draws (or to a lesser extent sports betting on British soccer games), have less scope for gamblers to tailor their experience. Essentially, gambling activities with high event frequency create more

opportunity for gamblers to achieve their preferred intangible rewards from gambling, by enabling the individual to vary their rate of participation as they desire. For example, if EGM gambling is regularly being used as a maladaptive method of changing mood state, imposing restrictions on frequency of participation can limit the scope for the player to experience pleasurable detachment ('escape'). Potentially, the gambler would be less motivated to spend money on EGM gambling if the experience was regularly stopped by externally imposed breaks in play, therefore limiting the pleasurable detachment that can be achieved through EGM gambling. Note that breaks in play per se may be counterproductive in increasing urges if unaccompanied with messages (Blaszczynski, Cowley, Anthony, & Hinsley, 2015). However, one must consider that using EGM gambling to modify mood only can be considered maladaptive if the gambler experiences significant negative consequences as a result of such gambling behaviour.

Key Points

- Many players are motivated to gamble because of the dissociative state achieved, and games with higher event frequency are reported to be more immersive than activities with lower event frequency.
- Gambling activities with higher event frequency provide more opportunity for players motivated to gamble to escape negative mood states, in comparison to gambling activities with lower event frequency.

5.3 High Event Frequency Facilitates Escalation of Gambling

A consistent finding in the literature is that the number of gambling activities that a player engages in is a reliable predictor of problem gambling behaviour (Braverman, LaPlante, Nelson & Shaffer, 2013; Holtgraves, 2009; Nelson, et al, 2008). Furthermore, several studies indicated that an individual's gambling 'involvement' is a better predictor of gambling-related harm than what specific activities they are gambling on (Afifi et al, 2014; LaPlante, et al, 2011; Welte et al, 2008). However, there is inconsistency in how gambling involvement is defined in the literature, and although most studies equate involvement to the number of different activities, recent evidence indicates that frequency of participation is also an important measure of gambling involvement (LaPlante et al, 2014).

Indeed, multiple studies argue that after frequency of participation is controlled for, the number and type of gambling activities one engages in is no longer a viable predictor of problematic gambling behaviour (Welte et al, 2009). However, this claim appears to be over stated, as EGM gambling has been repeatedly identified as an exception, where even moderate frequency of engagement is shown to be a risk factor for harm (Afifi et al, 2014; LaPlante et al, 2011). Fundamentally, it is counter-intuitive to control for frequency of participation when evaluating the risk of event frequency of a game for gambling-related harm. Clearly, frequency of participation is innately linked to event frequency. As one would expect, patterns of high frequency gambling, as an underlying factor of gambling involvement, are predictive of problem gambling (Nelson et al, 2008), and therefore gambling activities that provide an opportunity for high frequency gambling are more likely to be associated with problem gambling.

Inspecting the literature more closely, it is evident that having high variability in patterns of gambling behaviour, particularly variability in size of stakes, is predictive of problem gambling (Braverman et al, 2013; Braverman & Shaffer, 2012). More frequent and more involved gamblers are more likely to rapidly change the game they are playing on (Addicott, et al, 2015). Braverman et al. (2013) argued that high variability in a gambler's staking behaviour

may reflect a high level of emotive reactivity to gambling outcomes, and as a result they may find it difficult to control gambling behaviour. Although currently there is no empirical evidence to conclude that high variability in staking behaviour is a consequence of irrational and emotive reactions to wins and losses, it remains repeatedly identified as a risk factor for problem gambling.

With respect to event frequency, clearly the activities that have high event frequency and therefore offer numerous, if not unlimited, opportunities to participate will be more attractive to gamblers who are motivated to persist in gambling to recoup their losses. This is of importance when considering the positive relationship between chasing losses and problem gambling (Goudriaan, Yucel & van Holst, 2014). For extended periods of chasing losses to be facilitated, the gambling activity must provide frequent opportunities for gamblers to bet. For example, if a sports bettor loses a large bet on American Football on a Monday evening, they may not be able to bet on another American Football game until the following Thursday, and therefore if they intend to chase losses (on the same sport) they will be required to do so gambling on an activity that has a higher event frequency and is more readily available (e.g. EGMs).

Key Points

- Frequency of opportunities to bet appears to be a more important risk factor than the number of different gambling activities one participates in.
- Gambling activities that permit high frequency participation are more likely to be associated with gambling-related harm.
- Gambling activities that permit high frequency participation more readily facilitate highly variable patterns of gambling that may be problematic, such as the chasing of losses.

5.4 Behavioural Learning and Rapid Feedback

Structural characteristics that reinforce gambling behaviour through a learning process are more likely to be related to problem gambling (Linnet, Thomsen, Moller & Callesen, 2010). Individuals can be reinforced for gambling either positively or negatively, through the act of gambling creating a pleasurable consequence or the removal or reduction of a negative stimuli or experience as a consequence (Schultz, 2006). Furthermore, Schultz (2006) identified that the optimal reinforcement in gambling comes from stimuli that have contiguous, random rewards and/or indicate that a reward is approaching. Contiguous rewards in gambling are those that are provided within proximity to the behaviour. EGMs have a very high event frequency, and therefore feedback and rewards (if appropriate) are presented very rapidly (Schultz, 2006).

Previous research has demonstrated that faster reel spins on EGMs are associated with more problematic patterns of gambling behaviour, such as gambling for longer, more expenditure and being more resistant in the face of diminishing rewards (Delfabbro, Katya & Tania, 2005; Ladouceur & Sevigny, 2005). Linnet et al, (2010) observed that problem gamblers found high event frequency games (2 second reel spin) more exciting than the same game with a slightly lower event frequency (3 second reel spin). Not only is higher event frequency more enjoyable for problem gamblers but also they stated that they had an increased desire to play again, and that in addition, they were more likely to gamble for the maximum time permitted (Choliz, 2010; Linnet et al, 2010; Loba et al, 2001) or make larger bets (Mentzoni et al, 2012). It was observed that in the reduced event frequency condition both non-problem and problem gamblers risked less money and gambled for less time,

suggesting that even minor changes in event frequency can produce changes in gambling behaviour. However, most evidence indicating that a reduction in reel spin duration is associated with less time and monetary expenditure has been conducted in laboratory conditions (e.g. Choliz, 2010), and therefore there are external validity concerns when making conclusions regarding the use of reduced event frequency as a mechanism for harm reduction. More specifically, without multiple replication studies in real gambling environments it would be premature to propose appropriate reel speeds.

Sharpe, Walker, Coughlan, Enersen and Blaszczynski (2005) conducted a study into the behavioural impact of reducing event frequency in several EGMs in a real gambling setting, with realistic contingencies for gambling (i.e. the loss of personal money). As well as setting stake limits on various EGMs, the speed of reel spin was set at either once per 3.5 or 5 seconds. The study did not demonstrate that problem gamblers were more likely to play EGMs with a higher event frequency than non-problem gamblers. Furthermore, the study did not show any statistically significant reduction in time spent gambling or net loss for those gambling on EGMs with a lower event frequency. Sharpe et al, (2005) identified that problem gamblers did gamble more rapidly than non-problem gamblers, however they gambled less frequently than the 'low event frequency' condition therefore such differences would not have been observed within the experimental design. In other words, in this specific study problem gamblers were gambling quicker than non-problem gamblers, but it was still slower than the 5-second reel spin condition, so it was not picked up in the analysis. Accordingly, although reel spin speeds may be set at relatively high rates (3.5 sec), it is relevant to determine the actual average rate that players press buttons. To be effective, the reel spin must be slowed at a rate that exceeds the average rate of play.

Given that, to date, only laboratory based studies demonstrated that faster reel speed is related to persistent and potentially problematic gambling behaviour, it may be premature to state that a reduction in EGM event frequency will be effective in reducing persistent gambling. However, although minor differences in event frequency may not readily change monetary and time expenditure, there is overwhelming evidence that gambling activities with high event frequency are associated with problem gambling (Korn & Shaffer, 1999; Productivity Commission, 2010). This association between problem gambling and event frequency is not only true for EGMs, as it has been demonstrated that frequent instant win lottery gambling (Short, Penney, Mazmanian & Jamieson, 2015) and in-running betting (Braverman et al, 2013) are both associated with problematic patterns of gambling. Rather than an absolute linear relationship between the event frequency of a gambling activity and probability of problem gambling, it is more likely that there is a threshold where a gambling activity can be categorised as having high event frequency, and therefore be a risk factor for gambling-related harm. In simple terms, if an activity provides the opportunity to gamble again in a relatively short space of time after the outcome of the previous bet then it could be considered to have a higher risk for gambling-related harm. However, it must be stressed that empirical evidence directly supporting this claim is currently lacking.

Key Points

- The faster the reward is presented in relation to the target behaviour (i.e. gambling) the more reinforced the behaviour becomes through operant conditioning.
- Problem gamblers are less likely to over-spend when gambling on EGMs with lower event frequency. However, this finding has failed to be demonstrated in real

gambling settings where the contingencies of gambling are authentic (i.e. personal money being risked and lost).

5.5 Player Response to Rapid Reward and Rapid Punishment

The impact of rapid delivery of feedback regarding betting outcomes, and the consistent opportunity to gamble further (i.e. high event frequency) on patterns of behaviour could potentially be explained via the Reinforcement Sensitivity Theory (Balodis et al, 2013; Gaher et al, 2015; Jacobsen et al, 2007). The Reinforcement Sensitivity Theory postulates that understanding maladaptive patterns of reward driven behaviour may be a result of differences in an individual's sensitivity to rewards and punishment (Gray, 1991).

Neuropsychological research clearly shows that individuals with abnormalities in dopaminergic functioning and activation in the ventro-medial Prefrontal Cortex, both integral to how one interprets reward and punishment, are at risk for problem gambling (Goudriaan et al, 2004; van Holst, 2010). Research shows that gamblers who demonstrated a higher sensitivity to gambling-related rewards were more likely to risk more money (Brunborg et al, 2012) and be more confident in risking money despite a low probability of success (Kim & Lee, 2011). Therefore, intuitively, gamblers with an increased sensitivity for rewards are more likely to be attracted to gambling activities with a higher event frequency as it permits increased scope to receive rewards. Put simply, faster games provide a faster opportunity to obtain reward. However, the direction of causality between reward sensitivity and behaviour has not been fully elucidated by longitudinal studies, that is, either gambling heightening reward sensitivities or vice versa.

In addition, one's sensitivity to punishment is also believed to impact gambling behaviour; as being sensitive to punishment is believed to be a protective factor as it inhibits further risk-taking in response to punishment (Gaher et al, 2015). Conceptually, one would therefore predict that a gambling activity with a higher event frequency would inhibit gambling persistence in gamblers with a higher sensitivity to punishment (Demaree, et al, 2008; Simons & Arens, 2007), given that the higher the event frequency the more frequent the punishment is likely to be (i.e. monetary loss). In other words, in faster games you are more likely to receive punishment more rapidly in comparison to slower games. However, research has demonstrated that this is not the case for gamblers with both a high sensitivity to rewards and punishment; as high sensitivity to punishment strengthens the association between high reward sensitivity and problem gambling (Gaher et al, 2015). It is argued that individuals with a high sensitivity to punishment are more likely to experience negative mood states in response to losing (Gaher et al, 2015), which in turn stimulates further gambling to try and alleviate these negative states through chasing losses. For example, a gambler with high sensitivity to punishment may be more motivated to continue playing online blackjack after incurring rapid losses because they experience a more negative response to the rapid loss and therefore are more motivated to get rid of the negative emotional state created versus a gambler who is less sensitive to punishment. Wardell et al. (2015) proposed that reward-sensitive and punishment-sensitive gamblers will be motivated to play activities with high event frequency for enhancement goals, including improving mood state. Reward-sensitive gamblers are drawn to high event frequency activities with more scope for more instantaneous rewards, and punishment-sensitive gamblers being drawn to high event frequency activities that facilitate mood modification and elimination of negative mood states (Wardell et al, 2015).

Key Points

- Problem gamblers are more likely to have neurological and cognitive impairments in interpreting and responding adaptively to rewards and punishment in gambling in contrast to non-problem gamblers.
- Problem gamblers are more likely to have higher reward sensitivity than non-problem gamblers. Therefore, problem gamblers are more likely to be attracted to activities with high event frequency as they present more opportunities to receive reward.
- Counter-intuitively, players with high sensitivity to punishment may also be more at risk of experiencing gambling-related harm on activities with high event frequency than non-problem gamblers. Activities with high event frequency produce more punishment than low frequency activities. However, gamblers may be motivated to persist in gambling as the repeated punishment experienced can create an uncomfortable mood state that the gambler is actively seeking to eliminate by continued gambling.

5.6 High Event Frequency and Limited Scope for Decision-Making

Another possible explanatory model that may account for the strong association between high event frequency and gambling-related harm, is that the opportunity for *Response Modulation* is restricted in gambling activities that enable rapid play and reactive betting in response to gambling outcomes. Response Modulation is a cognitive function where the individual briefly shifts attention from engaging in ongoing goal-driven behaviour (such as repeated EGM play) to pause and evaluate the current reinforcement rate of the behaviour (Newman & Wallace, 1993). Vitaro et al. (1999) have demonstrated that persisting in gambling, in the face of diminishing reinforcement is a maladaptive behaviour and is reflective of poor reinforcement learning. Indeed, research clearly shows that persistence in gambling and an inability to learn from punishment and diminishing reinforcement rates is associated with problem gambling (Goudriaan et al, 2005; Thompson & Corr, 2013). Put simply, not recognising, paying attention to or properly responding to monetary loss as punishment is a risk factor for problem gambling.

Essentially, it is argued that if the individual does not pause to reflect on negative feedback (i.e. losing outcomes) then they are less likely to respond adaptively to punishment (Corr & Thompson, 2014; Newman et al, 1987; Paterson et al, 1987). Consistent with the proposition that problem gamblers have poor response inhibition (McCormick, 1993), research has repeatedly shown that problem gamblers persevere in gambling in the face of receiving consistent punishment (Corr & Thompson, 2014; Goudriaan et al, 2005; Thompson & Corr, 2013). However, in a series of laboratory experiments, it was observed that problem gamblers did not persist gambling for longer than non-problem gamblers when they were forced to pause for five seconds after each outcome was revealed when EGM gambling (Corr & Thompson, 2014; Thompson & Corr, 2013). The impact of the five second enforced break in play could potentially be explained by the pause mediating the problem gamblers' elevated sensitivity to reward by making them more aware of the behavioural contingencies of the activity i.e., losing (Corr & Thompson, 2014). Based on these findings, Corr and Thompson (2014) proposed that increasing the time period between bet outcomes and the opportunity to make another bet has potential to reduce gambling-related harm by decreasing gambling persistence.

Although there is some overlap, it is important to note that the duration of a gambling event (e.g. reel speed) is a different variable than event frequency. Whereas event duration relates to how quickly feedback about reward is achieved, event frequency relates more specifically to how quickly a gambler can play again after the previous event has finished. Therefore, when considering whether to slow down a gambling activity, one must consider whether to slow down how quickly feedback and rewards are delivered or, with respect to pausing to reflect, whether to slow down how quickly a player can re-gamble after the previous event. Both variables will affect the potential rate a gambler can play at; however research will need to determine the individual contribution of each variable to any change in gambling behaviour.

Key Points

- A gambling activity that does not have a sufficient post-outcome break in play to enable a player to reflect on the gambling outcome (particularly a monetary loss), reduces the likelihood of the player adjusting their gambling behaviour in response to the losses experienced.
- Evidence indicates that even a relatively brief break in play may reduce gambling persistence in the face of repeated losses.

5.6.1 Automatic Play

Gambling activities with high event frequency, such as EGMs and various online games, are possible to play in Automatic Play mode, where the activity autonomously makes repeated bets on behalf of the player, at a level of risk set by the player. In effect, this maximises the potential event frequency of a gambling activity, as there is no pause between the outcome of the previous bet and the initiation of the next bet. The Gambling Commission has identified the need to regulate the function of automatic play features on digital and electronic forms of gambling. Looking specifically at the specification for remote gambling technical standards (RTS), the Commission insisted that a) automatic play cannot be provided in ‘batches’ of more than 100, b) the player must be able to stop the automatic process at any stage, and c) the player must have the opportunity to set loss limits or winning values that trigger a stop in automatic play.

Dow-Schull (2005) provides a convincing argument regarding why automatic play features have such potential for gambling-related harm, identifying it as a key feature of facilitating gamblers who want to experience trance-like states, which she refers to as the ‘zone’. Based on qualitative interviews with key stakeholders (including game designers and frequent EGM gamblers), she proposed that often gamblers seek uninterrupted play, and that while interaction and gambling decisions may have initially been attractive to the player, they are now perceived merely as speed-bumps on their way to reaching the ‘zone’. Whereas it was previously assumed that an EGM’s capacity to involve the gambler was a key to player motivation, Dow-Schull (2005, page 78) argued that frequent, problem players are instead “seeking recursive forms of disengagement”. An alternative possibility is that the automatic play function is used by players to maximise the chances to win, as it enables the simultaneous operation of two or more gambling terminals. However, it must be emphasised that empirical evidence supporting the relationship between automatic play and problem gambling is not based on behavioural data but on self-report and propositions presented by key stakeholders. Indeed, the primary evidence for its association with problem gambling, is a self-report survey of 995 online gamblers, where 5.6% of the sample admitted regularly using automatic play features, and where the probability of problem

gamblers being more likely to use automatic play was statistically significant (McCormick, et al, 2013).

Parke and Griffiths (2006) proposed that the feature reduces the level of interaction between the game and the gambler, and that this is problematic because it reduces the scope for the gambler to evaluate the most recent betting outcome and evaluate the risk involved in the subsequent bet. During automatic play, gamblers are restricted from engaging in executive control processes that enable an individual to evaluate information and determine an adaptive, rational response to the recent gambling outcome and the available opportunity to continue gambling. Executive control processes involve the organising, monitoring and biasing relevant information regarding one's behavioural goal, and most importantly, adjusting and updating goals and behavioural responses, in response to such information (Verbruggen, McLaren & Chambers, 2014). Effectively, executive control via response inhibition can stall or suppress rewarding behaviour and adjust decision-making when the behaviour has become suboptimal (Miller & Cohen, 2001).

Research into the role of response inhibition and problem gambling provides evidence that engaging stopping-behaviour (i.e. *stop signals*) during an activity decreases their probability of engaging in persistent gambling (Stevens, Brevers, Chambers, Lavric, McLaren, Mertens, Noel & Verbruggen, 2015). Stevens et al, (2015) argued that when gamblers are required to stop behaviour in response to a specific stimulus, it reduces the motivational and hedonic value of that stimulus. For example, in a gambling context, if a player was forced to pause for 10 seconds after experiencing a losing outcome (stimulus A) yet were permitted to immediately continue after experiencing a winning outcome (stimulus B), the *stopping* behaviour would activate the aversive centre. Pairing losing outcomes with a requirement to stop momentarily is likely to reduce the aroused, appetitive response to future gambling (Stevens et al, 2015). Admittedly, although theoretically robust, empirical evidence demonstrating this effect is limited. Nevertheless, automatic play, which eliminates pauses to absorb losing outcomes, is not conducive to rational, thoroughly evaluated responses to gambling outcomes and available gambling opportunities.

Key Points

- Although there is a lack of empirical evidence, there is a strong theoretical foundation to consider automatic play as a risk factor for gambling-related harm.
- Automatic play essentially maximises event frequency rate, which enables players to dissociate when playing.
- Automatic play reduces the opportunity for the player to actively evaluate each gambling outcome and make appropriate behavioural responses to such information.
- The act of being made to stop an ongoing activity itself reduces the likelihood of the player wanting to persist in gambling. Automatic play is the antithesis of forcing gamblers to periodically stop.

5.6.2 In-Running Sports Betting

Gainsbury et al. (2016) identified that the artificial dichotomy of gambling activities into offline and online misrepresents the significant variation of gambling opportunities available within each domain. In-running sports betting is a popular and highly prevalent feature of sports betting that benefits from the mass accessibility and immediacy available through information technology (and to a lesser extent gamblers can access in-running betting opportunities within betting shop venues and via telephones). In-running sports betting,

often referred to as ‘live action’ betting, is the placement of wagers during an event (Braverman, Tom & Shaffer, 2015). Hing, Lamont, Vitartas and Fink (2015) argued that there have been several recent developments in the promotion of sports betting, including the provision of in-running betting odds discussions into match commentary and even live-studio referral to gambling operators offering updated in-running odds. This means that in-running gambling opportunities are saliently promoted, and they appear to be a core offering of the modern sports betting industry.

There is a relatively large body of empirical research that clearly identifies the regular engagement of in-running sports betting as a marker for gambling-related harm (Braverman et al, 2013; Gray, LaPlante & Shaffer, 2012 LaPlante, Schumann, LaBrie & Shaffer, 2008; LaPlante, et al, 2014; Nelson, et al, 2008). It must be noted that the supporting research is limited in its conceptualisation of gambling-related harm. Rather than using a validated measure of problem gambling, much of the evidence identified associations between in-running betting and proxy indicators of harm such as ‘exceeding deposit limits’ and the termination of betting account after a period of extensive play (Gray et al, 2012). Nevertheless, participating in in-running betting, particularly at high intensity, is a persistent and reliable marker for harm; and even when controlling for intensive participation in other gambling activities (Gray et al, 2012; LaPlante et al, 2014).

There is theoretical support that participation in in-running betting could be both a consequence and a cause of gambling-related harm (Gray et al, 2012). For example, it is proposed that impulsive, problem gamblers will be attracted to participate in in-running betting because of the decrease in separation from bet placement to the outcome being determined (Alessi & Petry, 2003). However, it is also probable that the provision of in-running betting is a risk factor for gambling beyond one’s means because of the increased event frequency providing more opportunities to bet, or more realistically, further opportunity to continue betting. The capacity to make multiple bets after the event has started facilitated both the application of cognitive biases such as illusion of control (Langer, 1975), and the opportunity to chase losses which is the core behavioural marker for problem gambling (Goudriaan et al, 2014). In terms of the potential for cognitive bias, if a gambler is afforded the opportunity to observe the opening minutes of a sporting event they may feel that they are now at an advantaged position to make gambling selections. However, the outcome of sporting events remains highly unpredictable and in-running sports betting still carries substantial risk.

In addition, as discussed previously, the high event frequency provided by in-running betting markets negates the natural pauses in gambling that are part of ante post betting. For example, if one places a bet in a correct score or first goal-scorer ante post market, and the bet is beaten in the early stages of the game, previously the individual would not be able to place another similar bet until a new game commenced; but this is not the case with in-running betting.

Key Points

- In-running sports betting is a reliable marker for gambling-related harm, and this is particularly true for high intensity in-running gambling. Thus, many jurisdictions have taken a cautionary approach and prohibited in-running sports betting.
- In-running sports betting essentially increases the event frequency of sports betting and provides further opportunity to continue gambling. It is argued that this may facilitate players in chasing their losses.

5.7 Payout Interval

5.7.1 Rapid Provision of Monetary Rewards

A central assumption of reinforcement and learning theory (Skinner, 1953) is that for a reward to be associated with a behaviour, and therefore be positively reinforcing, it must be relatively contiguous (Lieberman, McIntosh & Thomas, 1979). Lieberman et al. (1979) argued that the immediacy of reward is the most critical factor in its effectiveness as a reinforcer. Choliz (2010) claimed that a primary reason why EGMs are the most addictive form of gambling is the immediacy with which the outcome of the bet is revealed (short event duration), and in addition, the swift presentation of monetary reward (short payout interval). Although, in the literature there are several studies not supporting the importance of contiguity, therefore suggesting that learning can emerge even with significantly delayed rewards (Lieberman et al, 1979), it has been argued that this is merely a result of the existence of immediate secondary reinforcers. In other words, for a gambling activity to encourage further play the behaviour must be rewarded quite soon after the event, but this reward does not necessarily have to be monetary. However, clearly if the player's primary motivation is to win money, a gambling activity that provides monetary rewards rapidly will be more rewarding than if monetary rewards are delayed.

It is important not to oversimplify the role of money as reinforcement in gambling. Gambling presents multiple sources of secondary reinforcements, and in some cases these non-monetary benefits achieved through gambling are more reinforcing than winning money. When gambling, individuals can experience tension relief through dissociation and pleasurable arousal and excitement from auditory, visual and social stimulation, in addition to the potential to lose money. It is argued that arousal experienced near the target behaviour (i.e. gambling) can act as a 'behavioural marker' that associates delayed rewards with the target behaviour (Lieberman et al, 1979). Therefore, even gambling activities that have a significant time delay between the betting event and the delivery of monetary reward can still be learned through positive reinforcement. For example, if an online gambler is playing blackjack and winning, this behaviour will still be reinforcing regardless if it may take a few days to be able to access the monetary reward, because each win is immediately reinforced with a pleasurable sensation (arousal or excitement). Furthermore, the winning of money that cannot be immediately spent on non-gambling products or services can also be reinforcing by providing gamblers funds to continue gambling. Spending time on a specific gambling product in pursuit of leisure can be an objective when gambling independent of being able to obtain or retain money at the end of the gambling session. However, gambling activities that provide monetary rewards very rapidly, in contrast to activities that have a significant delay in providing monetary rewards, are likely to be more reinforcing and appealing to gamblers (Choliz, 2010; Dowling, et al, 2005) and therefore potentially lead to increased behavioural persistence in some players.

Key Points

- Rapid delivery of monetary rewards will be more effective in encouraging further participation in contrast to where there is a significant delay in the presentation of monetary rewards.
- The presence of immediate secondary rewards, such as excitement, means that gambling behaviour can still be conditioned in activities where the presentation of monetary rewards is delayed.

5.7.2 Automatically Adding Monetary Rewards to Total

It has been proposed that the standard interval between gambling outcomes and the provision of monetary reward (approximately 2-4 seconds) is too short to enable appropriate reflection and evaluation of the outcome and time to determine an adaptive response to the outcome, i.e., whether to risk further amounts (Griffiths, 1999a, 1999b; Productivity Commission, 1999). The lack of time for evaluation and reflection on previous gambling outcomes of within session gambling on EGMs is further complicated by a tendency for monetary wins to be automatically converted into credits, which increases the likelihood of 'recycling' the monetary wins (Dowling et al, 2005). Although, admittedly in Great Britain it is prohibited for wins to be converted directly into credits, there are still concerns regarding the presentation of monetary rewards to customers in electronic forms of gambling (both online and offline). Given the very high event frequency in electronic gambling, it is very common for a player to make a very large number of individual transactions, and in addition, receive a relatively large number of low value wins.

In electronic forms of gambling in Great Britain it is possible for monetary wins to be cumulatively added to a *cash total*. For example, with respect to a Category B3 machine, a gambler that put £20 into a machine, playing the maximum stake, will have a cash balance of £14 if they have made three bets and failed to win. If they win £18 in the next spin, and £7 in the spin after that, they will have £35 in their *running cash total*⁴. Even with this very simplistic example of five spins on a Category B3 machine, it would be challenging for the gambler to adequately and quickly determine the reward rate associated with playing that specific machine at that time. There is no record available of how many bets that player has made up to that point (i.e. *what it took to have £35 in the cash total*) to assist the player in making evaluations regarding the reward rate associated with their specific gambling behaviour.

Essentially, the lack of clear accounting of bets made, amount risked and amount won impairs the player from making frequent and accurate assessments of wins and losses (Productivity Commission, 1999; Loba et al, 2001). High event frequency gambling activities that provide monetary (including virtual monetary) reward rapidly after each outcome will be harder to assess in terms of whether to continue or cease gambling, because the rapid fluctuations will be hard to accurately track. It is true that the player should be able to make simplistic evaluations of net profit or loss by comparing the amount they started with and the amount that currently have during a session, but it will be difficult to quickly evaluate the reinforcement rate of the activity. For example, "How many bets out of the 20 spins have I won?" or "How many bets has it taken for me to be £15 in profit?"

Indeed, in a laboratory setting, Loba et al. (2001) observed that problem gamblers found it easier to cease gambling sooner when they were provided with an accurate breakdown of the total amount spent (in contrast to a rapidly fluctuating running monetary total). In a live gambling setting, Schellinck and Schrans (2002) found that although a display of monetary wins was provided in addition to gambling credits did not affect gambling behaviour, customers reported that this intervention was the most valuable tool to help them manage their gambling money effectively.

Key Points

⁴ Player inserted £20 into machine, and plays 5 spins at £2 per spin (£10 played). The player has won £25 in total (£18 on fourth spin, and £7 on fifth spin). Therefore, the cash total displayed would be £35 (i.e. £20-£10+£25).

- The immediate transfer of monetary rewards to additional gambling credits, or integrated with money previously won or deposited, is likely to make it more difficult for the player to make accurate evaluations regarding the reinforcement rate of a specific game. Players are presented with a simplistic and rapid fluctuating net outcome rather than a more detailed breakdown of money bet, lost and won.

5.8 Implications for Policy and Research

The majority of research studies reviewed in this section are exploratory, with many studies conducted within artificial environments devoid of the real contingencies and situational factors one would find in real commercial gambling environments. Not only are there just a handful of studies available, but also there is an overwhelming need for the findings to be replicated before it is possible to conclude confidently and specifically from the observed findings. In summary, the available literature base surrounding the effect of event frequency, duration and payout interval on gambling behaviour is in its infancy, and there is a long way to go before the individual effects of specific speed-related variables on gambling behaviour are determined. Nevertheless, recognising these caveats, there are some consistent trends worth exploring with respect to minimising gambling-related harm and these are described below (see Table 1 for a summary of key points).

Table 1. Summary of Key Points of Speed and Event Frequency

Frequent Betting Opportunities Facilitate Detachment Needs	Continuous or frequent games are 'always there' when you need to use it as a means of escape or mood modification. This is not helpful IF the gambling is causing harm.
High Event Frequency Facilitates Escalation of Gambling	A gambling activity with virtually unlimited opportunity to play will make chasing of losses easier.
Behavioural Learning and Rapid Feedback	The quicker the feedback the more reinforcing. This is not about reward but feedback, as a player may be told they have won but not immediately get the reward.
Player Response to Rapid Reward and Rapid Punishment	Problem gamblers tend to over-react to wins and losses in contrast to non-problem gamblers. Fast games give more opportunity for a) reward and b) punishment, and both can motivate persistent gambling.
High Event Frequency and Limited Scope for Decision-Making	<i>Post-Event Reflection</i> - A short pause after the result of the bet seems to reduce persistent gambling (different than slow 'feedback').
	<i>Autoplay</i> - Lack of (physical) interaction, such as even pressing a button, reduces likelihood of mental engagement and evaluation of whether to keep going or not.
	<i>In-Running Betting</i> - Made a discontinuous form of gambling continuous, and therefore open to same problems as EGMs etc.
Payout Interval	<i>Rapid Provision of Monetary Rewards</i> - Getting paid out quicker is more reinforcing. However, it's not crucial because the arousal felt after a win also reinforces the behaviour even if it's going to take you several days to receive the money.
	<i>Automatically Adding Monetary Rewards to Total</i> - Quick games paid out quickly are harder for players to track (for e.g., simple accounting of wins, losses, current rate of reward etc.). When it is not paid out as money, and just tacked onto a constantly fluctuating on-screen total, it becomes even harder to transparently see what's going on (beyond simple net loss).

5.8.1 Fast, frequent and continuous games are more likely to facilitate problematic play

Gambling activities that can provide monetary reward in the immediate future are more attractive to problem gamblers than those where there is a delay between winning and

receiving reward. Moreover, gambling activities that have a brief event duration are highly reinforcing to problem gamblers even if they delay the provision of monetary rewards, because the notification of the gambling outcome itself is also inherently rewarding. Therefore, in general, it is reasonable to conclude that gambling activities with high event frequency are more attractive to problem gamblers because reward (of some description) is delivered relatively quickly in contrast to other forms of gambling. Thus, such games are likely to encourage more problematic play because the behaviour has been strongly reinforced either through winning, or the rapid delivery of exciting feedback informing the player whether they have won or lost.

Gambling activities with very high event frequency and rapid feedback regarding outcome can be described as continuous forms of gambling, given that one can gamble with minimal delay between individual events. The implication of continuous betting is that gamblers can be exposed to virtually unlimited opportunities to gamble, in contrast to sports betting for example, which is dependent upon the list of pre-determined fixtures.

There are several potential risk factors for gambling-related harm associated with rapid, continuous forms of gambling. For instance, evidence indicates that being able to gamble immediately after the outcome of the previous bet is revealed can reduce the opportunity for reflection and fully engaged decision-making regarding the consequences of previous gambling and the likely effects of further gambling. Furthermore, rapid and continuous forms of gambling, *ceteris paribus*, are associated with a higher rate of loss (see Section 5 for implications for cost of play). This in turn can encourage further gambling participation as the higher rate of loss increases the probability of the player experiencing negative emotions and anxiety in response to losses, and therefore increasing the need and motivation to chase and recoup losses. In addition, rapid and continuous forms of gambling also facilitate emotionally reactive, persistent and escalating gambling engagement, because of the virtually unlimited opportunity to gamble on such products. This is particularly the case with gambling activities that are less likely to be subject to regulatory restrictions with respect to operating hours or that operate through more accessible channels such as the Internet. Essentially, persistent gambling in the face of accumulating monetary losses is predictive of gambling-related harm, and rapid, continuous forms of gambling encourage this behaviour.

There are implications to consider here in relation to In-Running Sports Betting and Autoplay Functions. Essentially, the opportunity to bet continuously throughout a sporting event via the In-Running option has transformed online sports betting (and offline sports betting to a lesser extent) from a lower event frequency gambling activity to a potentially continuous form of gambling. In addition, the opportunity to engage in Autoplay where the player can abdicate the opportunity to make future bets in response to evaluation of the previous gambling outcome, erodes scope for the player to make fully considered gambling decisions for each individual gambling event. Research indicates that when players are forced to have even a very brief pause after the outcome of the previous bet, they are less likely to engage in persistent gambling. Therefore, both In-Running Sports Betting and Autoplay Functions may have inadvertently increased the potential for players to experience gambling related harm.

5.8.2 Further opportunity for detachment needs

With rapid and continuous forms of gambling there is further opportunity to engage in gambling to obtain non-monetary goals such as detachment. Rapid, continuous games are believed to be more conducive to achieving states of detachment which gamblers may find

valuable as means of avoidant coping (i.e., ‘temporary escape’), rest or tension reduction. Using gambling for detachment is not automatically problematic; however, being motivated to gamble as a way of coping with dysphoric and anxious mental states has been consistently linked to gambling-related harm in the research literature. Essentially, if one values the experience and psychological state created from gambling as a way of escaping negative mood states, it is more likely that they will continue to gamble despite incurring losses. Indeed, it is possible for players to accumulate significant monetary losses as they use gambling for detachment needs, whereas it is probable that there are more adaptive and less harmful strategies for rest, recovery and coping. Ultimately, gambling activities with high event frequency and wide availability are always at hand for players with detachment needs in comparison to gambling activities with less opportunity to participate.

5.9 Recommendations

- The Autoplay function available on electronic forms of gambling is, by default, not likely to support informed decision-making during gambling sessions. Therefore, it is recommended that consideration is given to placing further restrictions, or the removal of autoplay functions, within gambling products.
- Participation in In-Running Sports Betting has been repeatedly linked to gambling-related harm. Aside from research demonstrating a clear association between participation and harm, there is very little research available that explains the relationship, and more importantly whether in-running betting is a causal factor for harm. This is a priority area for future research.
- Promising explorative research has indicated that enforcing a relatively brief pause after the bet outcome before a player can continue gambling is promising, and indeed there is strong theoretical support for its effectiveness. However, this research is in its infancy, and before regulatory changes are proposed it is important for this finding to be demonstrated firstly in replication studies, and secondly in real gambling environments with real gambling contingencies that are difficult to replicate in the laboratory.
- Rapid and continuous forms of gambling are often associated with gambling-related harm; therefore, it is recommended that specific attention is given to such forms of gambling when it comes to developing and trialling mechanisms for harm minimisation. There is significant opportunity and motivation for persistent play, and because of the theoretical rate of loss associated with games with rapid turnover there is potential to incur significant losses in a short space of time. Fundamentally, because rapid, continuous games have been shown to be highly immersive and associated with persistent problematic play it is recommended that research focuses on developing effective forms of pre-commitment and mandatory breaks in play that are coupled with appropriate self-appraisal messages. Easily over-ridden self-imposed limits or very brief and infrequent pauses in play are not likely to address the problem because they do not require the player to stand back and dispassionately evaluate whether it is in their best interest to continue gambling. Given the probable psychological state of a player who is aroused and emotionally charged in response to the rapid *turnover* and potential rate of loss, this will likely inhibit calm and informed decision-making.

- Modifying game speed as a harm minimisation strategy is also a possibility. However, this strategy is challenging because a simple reduction in game speed or event frequency may negatively impact game play. For example, by reducing wheel spin speed in virtual roulette from 20 seconds to 40 seconds, it is possible that the game will be less appealing and may encourage product substitution. Further research should examine options for reducing game speed or event frequency while also attempting to maintain the appeal of the game. For example, enhancing graphics to better replicate a real casino environment (e.g., the step-by-step replication of a croupier taking the bets, then spinning the roulette wheel and finally paying out bets) could slow down the game and may eliminate boredom. These are illustrative examples only, and clearly detailed consideration of the potential options along with trialing impacts are required. The substantive point is that speed should not be dismissed outright as a potential means to modify cost of play without closer inspection.
- Some game content offers options to considerably increase the speed of play either using a 'stop reels button' or by enabling 'turbo mode'. Careful consideration should be given to whether players should be able to speed up an already rapid and continuous form of gambling.

6 REWARD CHARACTERISTICS

6.1 Effect of Maximum Prize on Gambling Behaviour

Given that a primary goal of gambling as an activity is to win money, it is logical to assume the importance of the maximum potential prize available within an activity is likely to affect gambling behaviour and the experience of gambling. However, it is notable that there are only a handful of research studies that have addressed the role of potential maximum payouts on gambling behaviour and cognition (Crewe-Brown et al, 2013; Parke & Parke, 2013, Rockloff & Hing, 2003). Furthermore, it is not possible to observe consistent trends within the limited available research because there is substantial variation in the parameters of what constitutes a *jackpot* within each study. Ultimately, this is reflective of reality where the maximum prize available within one game-type can differ quite substantially. For example, a category D EGM in the UK currently has a maximum monetary prize of £8 available, whereas in North America some progressive EGMs have jackpots of millions of dollars (Parke & Parke, 2013). Therefore, at present, one must be cautious when interpreting the widely disparate jackpot research studies that are currently available, particularly when it relates to policy recommendations.

Research into the motivation of gambling clearly shows that while winning money is consistently reported as a key motivation, it is certainly not the only reward that players seek when they gamble. For some types of problem gambler, such as the Emotionally Vulnerable subtype proposed by Blaszczynski and Nower (2002), winning money is less of a motivating factor in comparison to enhancement motives such as mood modification. However, it is proposed that the prospect of winning money remains integral to achieving other potential rewards through gambling, as often it is the arousal and excitement from the potential to win money that stimulates desirable affective states (Parke & Parke, 2013). Therefore, the maximum prize that the player could potentially win remains a relevant factor in understanding gambling motivation, even when winning money is not the primary motivating factor. Magnitude of reward does affect the level of excitement and arousal a player experiences when gambling, however clearly there will be variation in how individual players perceive and interpret potential monetary wins (Parke & Parke, 2013). Essentially, all monetary return, even losses-disguised-as-wins, have been shown to generate arousal at some level, but it is evident that arousal increases as the magnitude of reward increases (Wulfert et al, 2005, 2008).

Traditionally, it has been accepted that achieving a substantial win early in one's gambling 'career' was a risk factor for problem gambling (Turner, 2011). However, when examining the data more closely it is possible that this conclusion is over-emphasised in relation to the empirical evidence base. The primary source of evidence for winning a substantial jackpot as a risk factor for problem gambling stems from trends observed in clinical findings (Custer & Milt, 1985; Turner, 2011). However, it is important to interpret the descriptive clinical data with caution because it is acknowledged that a large proportion of individuals with clinical disorders, including addictive disorders, are not in the clinical system (Goldberg & Huxley, 2000), therefore it is unlikely that clinical patients are a representative sample of problem gamblers. Furthermore, there will be a lack of standardisation in the clinical data regarding what constitutes a substantial win. The interpretation of an early substantial win as a risk factor for pathological gambling is predicated upon the belief that a win of this size is anomalous to the vast majority of commercial gambling experiences, and the player may develop a faulty schema (i.e. understanding) of gambling in response that is not reflective of the probability of being successful in the long-term. In contrast, there is evidence that

experiencing a large win when gambling makes some players become more risk-averse, as they do not wish to risk their newly acquired, unexpected resources (Demaree et al, 2012; Kassinove & Schare, 2001). Ultimately, it is probable that there will not be a linear effect of large potential wins on gambling behaviour. Rather, the effect of potential win magnitude is likely to modulate gambling behaviour based on the current context and disposition of the player, and their primary motivation for gambling at that time.

Economic models suggest that a single large jackpot would be more attractive to players (Haruvy, et al, 2001). The concept of Expected Utility suggests that a very large potential win would stimulate more risk taking in a gambler, as it would result in a significant increase of economic power that an individual can apply across multiple situations (Robson, 1996; Saddler, 2000). Kahneman and Tversky (1979) proposed that the potential to win a large, significant monetary prize may stimulate irrational and less objective thinking and behaviour, making players more vulnerable to erroneous cognitions. It is the desirability of the vast, life changing sum that promotes the use of biased cognitions that enables the player to rationalise continued gambling as they overstate the value and utility of a large potential sum (Kahneman & Tversky, 1979).

In experimental research using the Iowa Gambling Task (IGT: Bechara et al, 1994), it was observed that increasing the magnitude of potential wins increases the propensity for players to make more risky selections rather than '*less-risky but predictably profitable*' selections (van den Bos, et al, 2006). The IGT is a psychological task that is thought to simulate real life economic decision-making. Essentially, in the IGT participants are presented with four virtual decks of cards on a computer screen. They are informed that each time they select a card they will win some money but every so often choosing a card can cause them to lose some money. The 'decks' differ from each other in the number of trials over which the losses are distributed. Thus, some decks are "bad decks", and other decks are "good decks", because over the long-term some decks will lead to losses, and others will lead to gains. van den Bos et al. (2006) argued that when learning the structure of the IGT, i.e., learning which decks are best to choose from, dopaminergic systems⁵ play the primary role as players are evaluating the reward available within each deck in the task. After the learning phase, and players have settled on which decks are best to take cards from, this strategy is 'maintained' primarily by serotonergic systems⁶ that promote self-control and inhibit the urge to make more risky choices in the game. However, van den Bos et al. (2006) proposed that by increasing the magnitude of potential reward available the dopaminergic system became more prominent again in determining behaviour, as players became more willing to tolerate higher volatility to potentially win this new highly desirable sum. In simple terms, as the size of potential wins increase, the player appears to re-adjust their behaviour, and essentially become more open to taking risks rather than maintaining a safer, well-established pattern of behaviour.

It is unsurprising that larger potential rewards result in increased desirability in players, and in turn this increased desirability stimulates increased risk taking (van den Bos, et al, 2006; Donaldson et al, 2016; Kahneman & Tversky, 1979, Rockloff et al, 2015). At face value, this may have implications for problem gambling in terms increased behavioural persistence despite accumulating losses; however, it is probable that the impact of large potential wins on gambling behaviour is not straight-forward. Beyond the stimulation of cognitive biases

⁵ Dopaminergic systems in the brain are responsible for regulating responses to rewards and incentives.

⁶ Serotonergic systems in the brain are responsible for regulating self-control, and essentially assist with inhibiting impulsive responses to rewards.

that facilitate the irrational continued participation in gambling when losing (Kahneman & Tversky, 1979), the potential to win a large jackpot may be most impactful when it comes to chasing losses. The chasing of losses i.e., increasing the frequency and/or size of betting attempting to recoup money lost from gambling, is recognised as a salient component of problem gambling (American Psychiatric Association, DSM-IV-TR, 2000; DSM-5, 2013). A large potential jackpot provides an opportunity, or at least hope, of being able to repair considerable financial damage, and the probable ensuing negative social consequences of large losses, and this potential may overcome any skepticism a gambler may have regarding their chances of obtaining the jackpot (Turner et al, 2011). Put simply, if there is at least a possibility of obtaining a prize that would erase the significant monetary problems that the gambler currently finds themselves in, then the player can find justification in continued, persistent gambling despite the repeated, accumulative losses.

Given the relatively limited empirical evidence base regarding the impact of potential win magnitude on gambling behaviour, and more specifically problem gambling, several recent expert panels have been convened in response to evaluate the probable theoretical impact. However, there was considerable inconsistency regarding the perceived potential risk for harm for different reward sizes; whether large jackpots were a bigger risk factor for harm than frequent small pay-outs (Parke, 2009; White et al, 2006). In addition, several empirical studies indicated that more frequent, smaller pay-outs are more reinforcing and more likely to lead to persistent gambling in contrast to larger, less frequent pay-outs (Haw, 2009; Leino et al, 2015). Leino et al. (2015), from their data, interpreted that very large wins are 'disruptive' to the pattern and consistency of the game by creating longer post-reinforcement pauses⁷ whereas smaller, frequent wins promoted further responding. Potentially, it may be ineffective to evaluate the impact of substantially large potential wins on gambling behaviour and experience in isolation, when in practice, the magnitude of the maximum payout in a gambling activity is likely to directly affect several other structural characteristics, not least cost of play and reinforcement rate i.e., 'hit' frequency (Parke & Parke, 2013). For many commercial gambling activities, it is likely that the maximum available prize is just one element of a multi-level prize structure, and therefore, in order to maintain commercial margins ('house-edge') any adjustment in the magnitude of the top-prize will have knock-on effects for the rest of prize structure. Most likely, an increase in the magnitude of the top prize available will likely reduce the reinforcement frequency of smaller wins. Essentially, when making recommendations regarding the impact on problem gambling of lowering or increasing the magnitude of the potential jackpot, to minimise harm, one must also evaluate the probable knock on effects of this change on the rest of the prize structure and on co-existing structural characteristics.

Key Points

- There is a general trend that the larger the reward received, the larger the response in arousal.
- In addition, larger potential rewards increase the probability of being more willing to take risks and re-evaluate one's strategy towards the gambling activity, as the potential utility of the money becomes the focus of the decision process.
- The potential to win a large jackpot inadvertently facilitates the chasing of losses, by providing hope that one's current financial problems could be ameliorated. Effectively, this can provide justification for continued gambling in the face of repeated and accumulating losses.

⁷ A post-reinforcement pause (PRP) is a delay in responding immediately after receiving rewards.

- In general, there is inconsistency regarding the risk for harm associated with large infrequent jackpots in contrast to small frequent prizes. This suggests that the impact of jackpots, and therefore prize distribution, on problem gambling behaviour, will be dependent on individual and situational context.

6.2 Volatility

Volatility within gambling refers to the dispersion of winning outcomes (i.e. monetary reinforcement) across a gambling activity. The volatility of a game will vary in terms of the frequency of monetary reinforcement that it provides across a session. Gambling activities with a lower volatility, providing more frequent wins, will provide wins that are smaller on average in relation to the stake, than a similar game with a higher volatility. Volatility, therefore, is inherently linked to reinforcement and the prize structure of a gambling activity in terms of the variety of winning amounts that are available within the game.

In a qualitative study of EGM gamblers in Australia, Livingstone and Woolley (2008) found that most players reported that the structural characteristics that most attracted them were the reward characteristics, in terms of the size and frequency of wins. As identified previously, it is the prize structure as a whole, rather than individual reward-related structural characteristics that will most likely impact upon player preferences and behaviour.

6.2.1 Partial Reinforcement

Reinforcement refers to the rewards that are provided in response to engaging in a behaviour, and in turn such rewards encourage further engagement in that behaviour. With respect to gambling, reinforcement can come from primary (money, prizes) and secondary (sound effects, lighting effects) sources. A behaviour that is rewarded in every instance that it occurs can be described as continuously reinforced. However, most gambling activities do not provide continuous reinforcement; rather, they provide occasional rewards and this is referred to as partial reinforcement.

Operant conditioning, which is *the shaping of behaviour through punishment and incentives*, is recognised as a central factor of the development and maintenance of problem gambling (Blaszczynski & Nower, 2002). Skinner (1958) identified that in the social world some behaviours are never invariably or continuously rewarded. Indeed, research has clearly demonstrated that partial reinforcement (i.e. occasional rewards) is more resistant to extinction⁸ than continuous reinforcement (Dickerson, 1979; Horsley et al, 2012). Dickerson (1979) proposed that sports betting operated on a variable ratio and fixed interval schedule of reinforcement. The monetary rewards are provided occasionally, however the excitement of risking money on sporting events, which is considered as reinforcement, is delivered in tandem with each sporting event (for e.g., the schedule of horse racing), independent of winning or losing. With respect to modern EGM gambling, rewards are delivered via a variable ratio schedule of reinforcement, with many operating via random number generation, therefore making the game highly unpredictable.

It is widely accepted that during periods of losing, individuals that were previously partially reinforced will engage in more persistent responding (in this case gambling) in comparison to individuals who were previously continuously reinforced, and this is referred to as the Partial Reinforcement Extinction Effect (PREE: Pittinger et al, 1988). Lewis (1952) argued

⁸ Extinction refers to the cessation of a behaviour, *in this case gambling*, in response to diminishing or elimination of rewards.

that a partially reinforced individual will see less contrast between the acquisition phase and the extinction phase, if they were previously partially, rather than continuously, reinforced. In simple terms, the individual who previously only obtained winning outcomes occasionally will be used to losing, and therefore experiencing repeated losses in subsequent gambling sessions is unlikely to stimulate any immediate consternation, and under these conditions continued behavioural persistence becomes more understandable. Games with higher volatility are more likely to produce longer periods of losing, and because of the longer 'runs' without providing wins, players will receive larger winning amounts if, and when, they do experience a winning outcome.

With specific reference to gambling situations, research demonstrates that sustained and persistent gambling was most prevalent in conditions of maximum uncertainty regarding the distribution of rewards (Fiorillo et al, 2003; Horsley et al, 2012). It is argued that when wins are more unpredictable it may be harder for a player to stop playing because of a powerful combination of a) larger wins and b) the acknowledgement that the next bet or spin could be the winning one (Haw, 2008a; Johansson et al, 2009; Turner & Horbay, 2004). This position is consistent with research showing that suspense and uncertainty play an important role in intrinsic motivation regarding games generally (Abuhamdeh, Csikszentmihalyi & Jalal, 2015) and gambling more specifically (Ely, Frankel & Kamenica, 2015; Hahn, Wilson, McRae & Gilbert, 2013).

Key Points

- When rewards are delivered in a game that has high volatility, and therefore is more unpredictable, players are more likely to continue gambling even when they are repeatedly losing.
- In effect, more unpredictability may lead to an enhanced gambling experience because there is increased suspense as the next spin may result in a substantial win, in comparison to lower volatility games where smaller wins are provided rather frequently.

6.2.2 Volatility and Distribution of Rewards

Turner (2011) proposed that EGMs are designed to maximise the 'brief play experience'⁹, and that by employing a multi-level prize structure, EGMs can simultaneously deliver relatively frequent small wins and provide a remote possibility of a substantial win. Effectively, this relates to the concept of volatility (or 'hit-rate'). Gambling activities such as blackjack that are close to even money probability (i.e. a 50/50 chance) are described as having a low level of volatility, in the sense that there are not usually long periods of losing (Turner, 2011). In contrast, draw lotteries would be classified as having very high volatility in the sense that winning is a remote possibility, and indeed highly improbable. It could be argued that gambling activities with moderate volatility are most attractive to players, because they often combine high unpredictability, with a realistic opportunity of winning and a remote opportunity to win a substantial sum. Haruvy et al. (2001) demonstrated that players were more willing to risk money gambling for a low probability large prize if there was also a possibility of winning a higher probability small prize as well, rather than just the large prize on its own.

According to Turner (2011), the delivery of frequent small wins is important in keeping the player interested and motivated to continue gambling. There is a relatively large body of

⁹ Brief play experience relates to the expectation that the majority of players will gamble within a limited time frame, in contrast to more intensive players, such as problem gamblers.

research suggesting that players prefer rewards to be distributed through regular small wins rather than via larger but much less frequent wins (Coates & Blaszczynski, 2013; Dixon et al, 2006; Griffiths, 1999; Livingstone & Woolley, 2008). However, it is important to interpret this finding with caution in terms of generalising to the wider population, given that there are significant methodological limitations including using samples of inexperienced gamblers, self-report and the use of brief and unfamiliar gambling tasks. Indeed, research from a population level study of experienced gamblers using real monetary, traditional gambling tasks demonstrated that more gambling behaviour was predicted by a higher RTP and less frequent winning i.e., a lower hit rate (Leino et al, 2015).

There is some theoretical support for more behavioural responding to lower levels of reinforcement (i.e. a lower hit rate) from an evolutionary perspective. Zentall (2016) argued that it is adaptive to respond to a low reinforcement rate, particularly if unexpected, with more behavioural persistence because it stimulates 'activation' in the organism, which is likely to lead to more opportunity for potential rewards. Zentall (2016) provided the simplistic example that it would not be adaptive for an individual to discontinue looking for food if they were not rewarded in their initial attempts to obtain food. Therefore, it is understandable to engage in persistent gambling during periods of losing, as the player continues to seek the rewards that are potentially available, but have yet to be provided.

It must be acknowledged that research regarding the impact of volatility and prize structure is in its infancy, and there is significant uncertainty regarding its impact on gambling-related harm. Ultimately, it is not currently clear whether small, frequent rewards or less frequent larger rewards are more likely to stimulate persistent gambling behaviour, that may lead to spending more time or money that one can reasonably afford to lose. The inconsistency is most likely reflective of the probability that there is no uniform pattern of reinforcement that promotes persistent behaviour across all gambling situations. It is probable that specific contextual factors regarding the disposition, and current gambling motivations, of the individual will determine whether regular small wins or a more volatile reward schedule are more likely to stimulate further gambling. For example, an individual wanting to gamble for leisure goals or for enhancement motives such as 'zoning out' (Dow Schull, 2012) may be more responsive to frequent reinforcement and less sensitive to the overall monetary amount awarded. In contrast, a player who is chasing losses in response to accumulating substantial gambling losses over an extended gambling session, is likely to be less interested in frequent small wins as they seek a large win to repair their financial situation.

It is evidently clear from the existing research studies that we are unlikely to find a simplistic uniform trend that enables the determination of whether low or high volatility and reinforcement rate are most likely to lead to problem gambling. It is highly probable that different volatility and reinforcement distribution rates will have different potential for harm, across different gambling situational and personal contexts, and this is proposed as key area for future research.

Key Points

- It could be tentatively proposed that moderate volatility may be most related to persistent gambling, because in effect it means there is high unpredictability regarding the delivery of reinforcement, and that the chances of winning a significant sum are not totally unrealistic and improbable.
- There is considerable inconsistency in the literature regarding volatility level and persistent gambling behaviour. It is probable that different patterns of reward

distribution can promote persistent gambling depending on the specific motivations for gambling in that instance, for e.g., for tension reduction versus chasing losses.

- Understanding the interaction between volatility and contextual factors, such as current gambling motivation, and the impact on gambling-related harm appears to be a key direction for future research.

6.3 Losses-Disguised-as-Wins (LDWs)

An LDW occurs when a player wins a monetary amount that is smaller than their initial wager (Clark & Sharman, 2014). Modern EGMs have progressed from simple, single line reel order operation to digital formats, where it is possible to bet on multiple different winning lines, and because of this it is now possible to win an amount less than the amount wagered for that spin (Harrigan, Dixon & Brown, 2015). Because of multi-line operation and high event frequency, modern EGMs are the primary producer of LDWs; however, it is important to note that LDWs can occur in other forms of gambling such as multi-permutation sports bets, or even on roulette (Clark & Sharman, 2014).

Experimental laboratory research has indicated that some individuals experience LDWs, in terms of arousal, approximating those associated with small wins, and importantly significantly differently to losses (Clark et al, 2009; Dixon et al, 2010; Luo et al, 2011). There is additional support for the erroneous categorisation of LDWs as winning outcomes, with players engaging in post-reinforcement pauses (PRPs) to an extent that is like post-winning outcomes, and significantly different to post-losing outcomes (Dixon et al, 2014). From this, there is scope to argue that frequent delivery of outcomes that are interpreted as wins despite being net monetary losses, is an explanatory factor for persistent gambling in the face of repeated loss (Dixon et al, 2010, 2014). An LDW outcome on an EGM is presented with sensory feedback synonymous with winning, such as flashing lights and vivid music, which may account for the misinterpretation of the outcome (Murch & Clark, 2015). Dixon et al. (2014) argued that even this brief sensory feedback may trigger 'reward associated positive affect' to drive persistent gambling.

In evaluating the literature base, it is important to note that LDWs are different to regular losses, and therefore one would anticipate a player to interpret LDWs differently to regular losses. As identified previously, although ultimately a net loss, the LDW does provide some monetary value to players, and rewarding sensory reinforcement that is likely to enhance the experience of the player. Taking this further, it could be argued that once the player has committed their stake and pressed the button, the money is no longer their possession, therefore a return of money, albeit smaller than the amount risked could still be considered a positive outcome in contrast to a full loss. In summary, it may be overly simplistic to assume that LDWs are equivalent to full losses, devoid of any reinforcement or value, with the expectation that players should not experience reward and/or arousal in response to these outcomes.

More generally, at this nascent stage of research, it is prudent to conduct research under laboratory conditions to isolate causal effect, and hence the specific relationships to focus upon in real gambling environments, later down the line. However, a limitation of using simulated gambling tasks in laboratory settings is the need to maintain strict ethical procedures that minimise any harm to the participant. Thus, often participants are not permitted to risk personal money, or if real money is being used it is often at very low, unrealistic levels for stakes and prizes. It is probable that the real contrast experienced in the laboratory between LDWs and clear losses is the difference in sensory feedback, rather

than very small differences in monetary costs. This is supported by the findings of an investigation of arousal responses to various gambling outcomes, including LDWs, in a real gambling environment where participants risked their own personal funds gambling. It was observed that neither problem nor non-problem gamblers experienced different arousal responses between LDWs and losses (Lole et al, 2014). This finding in an ecologically valid gambling environment clearly contradicting lab-based studies of LDWs, strongly emphasises the need to replicate lab-based findings in real world settings.

According to Dow-Schull (2005), the real value of LDWs is that they 'smooth' periods of extended losses by offering rewarding sensory reinforcement; and by attenuating long sequences of losing through LDWs, players have a less aversive gambling experience. Dixon et al. (2014) argued that by providing some monetary reward (albeit a net loss) and sensory reinforcement, LDWs effectively increase the 'hit' rate of the game, which encourages continued gambling. Furthermore, Templeton et al. (2015) proposed that the vast majority of gaming machine players play maximum lines in order to shape their gambling experience to receive the maximum hit rate. In one study, Harrigan et al. (2012) found that by playing maximum lines on an EGM the player increases the reinforcement rate from 16% to 48% (i.e. 48% of spins now result in a monetary payout), while not affecting the payback percentage of the game. It is argued that the effect of dramatically increasing the perceived reinforcement rate through LDWs, is that players are more likely to over-estimate their frequency of winning outcomes in a session, by erroneously categorising LDWs as winning outcomes (Dixon et al, 2013; Jensen et al, 2013; Templeton et al, 2015).

Perhaps the real significance of LDWs increasing the reinforcement rate (but not the payback percentage) is the enhanced experience of the gambling sessions. Loba et al. (2001) identified that when removing the sound effects of an EGM, problem gamblers reported significantly reduced ratings of enjoyment, excitement and tension reduction. Furthermore, it was also observed that by pairing LDWs with a negative sound effect, rather than winning-related sensory feedback, players did not over-estimate how many times they won in the previous gambling session (Dixon et al, 2014). Clearly, sensory feedback through music and light affectations are an integral part of the gambling experience. Potentially, given that the presence of LDWs do not impact RTP across gambling sessions, the potential risk associated with LDWs could be the more pleasurable and rewarding gambling experiences created through frequent sensory reinforcement. In effect, for some players, the delivery of frequent small monetary amounts alongside sensory reinforcement may be effective in creating the 'zoning out' experience (Dow-Schull, 2012).

The argument proposing that the enhanced sensory experience of gambling through the high prevalence of LDWs is a risk for extended gambling behaviour, must be balanced with the point that the sensory experience is likely to be a core part of the leisure (i.e. non-problematic) experience of gambling. It cannot be assumed that enhancing the gambling experience through LDWs automatically creates more risk for gambling-related harm. Arguably, lower volatility, and therefore the provision of frequent small wins and LDWs, may extend the gambling experience without increased net expenditure. Put simply, with lower volatility, the non-problematic player is receiving a more entertaining leisure experience with LDWs creating sensory rewards, at effectively a reduced rate of loss.

Key Points

- Laboratory research clearly demonstrates that LDWs are interpreted by some players as winning outcomes despite technically being net losses in monetary terms. However, this finding must be interpreted cautiously as existing ecologically valid studies have not replicated it. There is an argument that the artificial nature of the laboratory studies may account for the interpretation of LDWs as winning outcomes by the participants.
- Positive, winning-related sensory reinforcement through light and sound effects may facilitate the interpretation of LDWs as winning outcomes despite being a net monetary loss.
- Increased positive sensory reinforcement that comes with LDWs is likely to enhance the gambling experience of the players. This may encourage vulnerable players that are gambling for escape-motivations, to gamble for longer periods of times in response to the enhanced gambling experience. However, for most players, the increased sensory reinforcement will simply improve the gambling experience in terms of leisure and entertainment motivations.

6.4 Near Miss Events

A near miss is a gambling outcome that is very close to being a win, and perhaps is more accurately described as a near-win (Clark, Crooks, Clarke, Aitken & Dunn, 2012). There is no single definition of the structure of a near miss, and indeed it is probable that it not only differs between gambling types but also differs within a gambling type (Delfabbro & Winefield, 1999); however, it is expected that the underlying effect will be largely comparable (Cote, Caron, Aubert, Desrochers & Ladouceur, 2003). The near miss effect has been observed empirically across multiple gambling formats including roulette (Sundali, Safford & Croson, 2012) and blackjack (Dixon, Nastally, Hahs, Homer-King & Jackson, 2009). It has been repeatedly studied in relation to electronic forms of gambling, such as slot machines (Ghezzi, Wilson & Porter, 2006), and this is because electronic forms of gambling are most likely to produce near misses, as gambling outcomes can be artificially manipulated to produce more losing outcomes that appear proximal to winning outcomes (Harrigan, 2008; Harrigan, 2009; Witts, Ghezzi & Manson, 2015). Much like many structural characteristics of gambling activities, because the research is in its infancy in relative terms, the emergent theory does not appear immediately congruent (Witts et al, 2015), and ultimately the near miss effect remains poorly understood (Billieux, van der Linden, Khazaal, Zullino & Clark, 2012; Clark et al., 2012).

In addition, as technology develops the nature of near miss events are evolving in terms of how they are presented (Parke & Griffiths, 2004). Much of the initial conceptualisation and experimentation of the effect of near misses on gambling behaviour has been conducted via looking at simplistic reel order EGMs, where near misses can be clearly and easily identified. As previously discussed, modern digital forms of EGMs support the use of multiple 'pay-lines' that often provide a multitude of overlapping and non-linear pay-lines. In effect, this makes it considerably more challenging for the player to distinguish and identify near misses from full-misses (i.e. losing outcomes that are not close to a potential win). Furthermore, many modern digital forms of EGMs contain mini 'feature' games (or bonus games) within the activity, and this provides another opportunity to present near misses, in addition to more traditional pay-line near misses. It is important to acknowledge that the concept of near misses is evolving in relation to developing information technology, and to consider this when attempting to apply research findings to the modern commercial gambling industry, in trying to minimise gambling-related harm.

It has been repeatedly observed that near misses are perceived to be closer to winning outcomes than full misses (Dixon & Schreiber, 2004). The primary concern in relation to near miss outcomes is that their presence has been demonstrated to be linked to persistent gambling (Cote et al, 2003; Kassinove & Schare, 2001; MacLin, Dixon, Daugherty & Small, 2007) and in simple terms, linked to not responding adaptively to repeated, incurred losses by ceasing gambling. Furthermore, it has also been reliably observed that experiencing near misses increases a player's motivation to continue gambling (Billieux et al, 2012; Clark et al, 2013; Clark, 2009; Clark, 2013). This observed increase in behavioural persistence to continue after a near miss in the face of repeated losses has implications for responsible gambling in terms of not spending more time or money than one can reasonably afford. Indeed, this appetitive response to near misses has been shown to be elevated in problem gambling samples (Habib & Dixon, 2010). However, in contrast, it must be noted that research did not demonstrate that gamblers increased the magnitude of bets in response to near misses (Wu et al, 2016).

The specific ratio of near misses to full misses, i.e., the *clustering ratio* (Dixon, et al, 2011), creates a different behavioural response in gamblers; with a moderate frequency (e.g. 33% rather than 0% or 66% of losing outcomes) observed to be the most effective in motivating continued gambling versus lower and higher frequencies of near misses (Chantal et al, 1996; Kassinove & Schare, 2001; Reid, 1986). Reid (1986, p36) explained this phenomenon by outlining that too many 'false alarms', in terms of receiving gambling outcomes proximal to winning, will extinguish over time as players will repeatedly observe that near misses are not rewarded, and therefore "will reduce their value as signals that success is on the way."

There are multiple potential theoretical explanations of why near miss outcomes stimulate persistence in gambling in spite of repeated losses being incurred. Dixon and Schreiber (2004) attempted to account for the observed increase in gambling persistence and motivation in response to near misses as a reflection of the aversive nature of losing (including near misses), in that gamblers would seek to remove the unpleasant experience of almost winning. It has been repeatedly observed that participants find near misses to be more unpleasant than full misses (Clark et al., 2009), although not all studies have observed this (Billieux et al, 2012).

Furthermore, it is possible that near misses stimulate persistent gambling via an increase in arousal (Clark et al., 2012). Foxall and Sigurdsson (2012) contend that the real reinforcement experienced in gambling sessions stems from the capacity to change the arousal levels of individuals. Existing research has also demonstrated that both heart rate and electrodermal activity (as robust markers of arousal) are sensitive to near misses as well as wins (Clark et al, 2012; Dixon et al, 2011). Given that arousal can produce greater reinforcement than monetary rewards (Wulfert et al, 2005), it is possible that near misses motivate persistent play through providing rewarding changes in arousal, independent of making monetary gains (Clark et al, 2012). This is supported by evidence showing that problem gamblers experience greater arousal responses to gambling than non-problem gamblers (Moodie & Finnegan, 2005; Sharpe et al, 1995). This suggests that increased persistence in gambling in response to near misses could be a result of the capacity of near misses to stimulate desired arousal in the individual.

Another proposition, related to the psychophysiological account, is that the near miss may be erroneously perceived as a cue that success is quite probable soon, as outcomes that are

proximal to wins indicate that the gambler is ‘getting closer’ to success (Reid, 1986). However, for this explanation to be supported, the gambling activity must include a skill component, or at least make individuals perceive that skill has relevance in determining outcomes (Clark et al, 2013). Clark et al. (2009) observed that near misses increased motivation to continue when the participant had a modicum of control in determining outcomes (through determining when the last reel would stop). This hypothesis, despite initial empirical support, may ultimately be overly simplistic, as it does not account for the inverted U-shape effect of near misses on motivation (Kassinove & Schare, 2002). The inverted U-shape effect reflects that near misses are reinforcing, but only up to a certain point, and when the prevalence of near misses exceeds this point a reduction in motivation to continue gambling is observed. Essentially, if near misses encouraged continued gambling because they were seen a cue for forthcoming success, then one would expect that motivation to continue would be linearly associated with the proportion of near miss outcomes, and this has been demonstrated not to be the case (Kassinove & Schare, 2002).

Finally, Dixon et al. (2011) contends that a near miss creates an emotional response, of either positive or negative valence¹⁰, that stimulates the desire to continue gambling. In support of this argument, Bossuyt et al. (2014) proposed that the intensity of emotional responses to near misses are influenced by not only how close a win was in terms of proximity, but also how expected a win was in terms of probability (Bossuyt et al., 2014). This suggests that there are different mechanisms supporting continued play in response to near misses across different gambling contexts. It is probable that whether the player experiences the near miss as something exciting and pleasurable or as frustrating, is likely to be affected by the player’s level of expectation regarding winning. For example, just missing the jackpot after only a handful of attempts may be unexpected and exhilarating because it encourages the player to contemplate what winning the jackpot might be like, because they were so close. In contrast, after an extended period of losses, and therefore receiving a substantially lower than anticipated level of wins, just missing a jackpot might create frustration in the player given that they probably expect that winning is ‘over-due’. The impact of near misses on gambling behaviour remains poorly understood, and significantly more research is required before any recommendations for minimising gambling-related harm can be made. Fundamentally, now that laboratory based research consistently demonstrates that near misses stimulate motivation to persist in gambling, it is recommended that near miss research is conducted in live gambling environments, with regular gamblers (non-naïve) experiencing the real contingencies of gambling, i.e. winning and losing personally significant sums of money. The interaction between experiencing near misses and the gambling situational context (such as whether the player is winning or losing), and its impact on gambling behaviour appears to be the most pertinent area in which to focus research.

Key Points

- Near misses occur naturally in many forms of gambling, however it is possible to manufacture digital gambling formats to present considerably more than probability would dictate.
- Experiencing near misses is believed to encourage further gambling, in contrast to ‘full’ misses. The primary explanations for the increased gambling participation relate to the changes in arousal and emotion stimulated by experiencing near misses.

¹⁰ Valence relates to the attractiveness (positive valence) or aversiveness (negative valence) of an event, object or situation.

- Near misses can elicit higher arousal in contrast to full misses, and it has been suggested that this may make the player interpret and process the near miss similarly to a win, and this misinterpretation may encourage further engagement.
- Although the near miss remains poorly understood, it appears that the most probable risk for persistent gambling is that experiencing near misses creates a change in emotion via an increase in arousal.
- The change in emotion driving further gambling created by near misses can be either positive or negative. Positive emotion is likely to be created through the stimulated contemplation of potential wins in response to the near miss, and therefore increasing motivation to continue gambling. In contrast, negative emotions such as frustration can be stimulated through just missing a win, when by having an expectancy to win because of previously undergoing an extended period of losing.

6.5 Implications for Policy and Research

There is very little accepted knowledge and understanding in the reward and reinforcement-related literature, and there are no obvious simplistic, uniform trends to address through harm-minimisation strategies. Indeed, the amount of conflicting evidence is stark, and emphasises the challenges ahead in terms of developing policy in absence of a solid evidence base. It is also clear however that the availability and quality of reward-related structural characteristic research has increased substantially over the last five years, and this trend is likely to continue.

Table 2. Summary of Key Points on Reward Characteristics

Effect of Maximum Prize (Jackpot) on Gambling Behaviour	Higher jackpots are more desirable and arousing. Change of maximum prize will have knock-on effects of other structural characteristics; therefore, any change must consider these knock-on effects.
Volatility (Partial Reinforcement)	Random, unpredictable reinforcement increases gambling persistence, even when repeatedly losing.
Volatility (Distribution of Rewards)	Moderate volatility that creates significant unpredictability, alongside a not entirely unrealistic opportunity to win a significant monetary amount, may be the most effect level of volatility to encourage continued gambling. Moderate volatility, that provides lots of suspense and engagement through unpredictability, and yet provides hope of recouping accumulated losses, could be argued to facilitate chasing of losses.
Losses-Disguised-as-Wins (LDWs)	LDWs can be erroneously interpreted as net monetary gains (clear wins) and can lead players to over-estimate the amount of wins they received in a gambling session. The winning-related sensory feedback that accompanies LDWs is believed to be responsible for players misinterpreting LDWs as net monetary gains rather than net monetary losses.
Near Miss Events	Near misses can elicit arousal in players, creating heightened emotional states (both positive and negative), that may increase motivation to continue gambling.

Key findings for this chapter are presented in Table 2. With respect to the role of jackpot, or maximum prize, in the development or maintenance of problem gambling, there is no clear evidence to suggest that a reduction would be an effective harm minimisation approach. This is because that in commercial gambling, if profit margins are to be maintained, an increase (or decrease for that matter) in size will have knock on effects for the distribution of prizes elsewhere in the game, therefore affecting the reinforcement rate of the gambling activity. Put simply, an increase in jackpot size is likely to be paired with a lower probability of achieving that jackpot and/or a lower probability of receiving prizes of lower value. Although, it is reasonable to assume larger potential prizes will be more

desirable and arousing for some players at face value, in practice the lower probability of winning the jackpot and therefore the expected reduction in 'hit' rate may simultaneously make the activity less attractive.

In terms of distribution of prizes, it is evident that players will be more persistent (gambling further despite repeatedly incurring losses) when gambling on activities that have unpredictable pay-outs. It is harder for players to terminate gambling sessions when there is uncertainty regarding whether the next bet will be a win. Unpredictability and uncertainty regarding reinforcement relates to the volatility of a gambling activity, however it is not simply a case of *'the more volatile a game is, the more it encourages persistent gambling'*. It appears to be the case that the player needs to perceive that winning a substantial amount is not entirely unrealistic in terms of probability, or indeed has previous experience of winning a substantial amount, in order to facilitate further gambling and chasing of losses.

It is evident that LDWs may be misinterpreted and experienced as net monetary gains, which effectively increases the hit rate of the gambling activity, leading some players to overestimate how many times they had won in a previous gambling session. However, it is argued that the primary reason why LDWs are erroneously interpreted as net monetary gains is because they are delivered alongside winning-related sensory feedback, such as light and sound effects. The misinterpretation of LDWs as wins rather than net losses appears to be reduced through the elimination of winning-related sensory feedback, and even eliminated when paired with aversive sound effects that indicate a negative outcome. In addition, it is also argued that the frequent presentation of LDWs, and their accompanying positive sensory feedback, are an integral part of what makes gambling an enjoyable and mood modifying experience for some players. If the positive sensory feedback provided with LDWs, or LDWs themselves, are reduced or eliminated there is potential for this change to impact negatively on non-problem gamblers in terms of their leisure experience. Therefore, real gambling environment research is required to determine to what extent the reduction of positive sensory feedback for LDWs impacts on the gambling experience for non-problem players, and more importantly, is this harm minimisation approach effective in reducing gambling-related harm.

Although near misses occur naturally in many forms of gambling, it is possible within digital forms of gambling to increase the occurrence of near misses to substantially higher levels than one would expect regarding normal probability. Evidence indicates that after experiencing a near miss players are more likely to be motivated to continue gambling. Rather than players misinterpreting near misses as an indicator of almost winning or skill development, evidence suggests that it is the emotional response created by an increase in arousal that motivates players to gamble further. Given that the effectiveness of near miss provision on gambling motivation exists on an inverted U curve, it does not make immediate sense to restrict the number of near misses that could be programmed into a game. This is because the excessive provision of near misses reduces gambling motivation. There is scope to consider the elimination of near misses as a harm minimisation strategy, however as near misses will occur naturally in games of chance this appears to be an artificial restriction on the game, and indeed very challenging to regulate with any effectiveness. The most prudent approach may be to limit the provision of near misses to be reflective of the probability of them naturally occurring, to not artificially manipulate the programme design to increase gambling motivation by the increased arousal experienced in response to near misses. However, it is recommended that this step is made only after the laboratory findings are

replicated in real gambling environments, and therefore experienced in the context of real gambling contingencies (e.g. risking significant amounts of personal money).

The overwhelming conclusion from the review of reward-related structural characteristics is that the research must progress from laboratory based studies to real gambling environments with realistic contingencies of gambling. The substantial inconsistency observed in the research literature is likely to stem from methodological variation in the research characteristics. For example, many of the experimental tasks used are not consistent across studies, and they often are not representative of modern commercial gambling forms. Furthermore, to develop an accurate understanding of the behavioural impact of various reward-related structural characteristics, realistic gambling outcomes such as losing personal money and the potential to win substantial sums is required. In addition, existing behavioural and cognitive theory identify that the 'stage of one's gambling career' or gambling experience, affects the impact of various structural characteristics, therefore it is important to focus research within specific subgroups (e.g. novices, non-problem gamblers, frequent gamblers, problem gamblers). It was certainly prudent to begin research into structural characteristics such as reinforcement schedule, LDWs and near-misses, in the laboratory to establish variable relationships with experimental control. Nevertheless, before policy recommendations can be made with any confidence regarding the emergent trends from laboratory research, replication from real gambling environments is required.

6.6 Recommendations

- Research should be conducted into the interaction of volatility with various gambling contexts (e.g. current gambling motivation), and the impact of these combinations on gambling behaviour, in particular, persistent gambling.
- Research should be conducted into the impact of reducing, or eliminating, winning-related sensory feedback for LDWs on gambling-related harm. The aim is to determine whether providing different sensory feedback for LDWs, to reflect its distinct outcome as neither a clear loss nor clear win, will assist players in differentiating between LDWs and wins that are net monetary gains. In addition, it is recommended to examine the impact of reducing, or eliminating, winning-related sensory feedback for LDWs on the gambling experience of non-problem gamblers.
- Research should be conducted into understanding the interaction between near miss outcomes and emotional responses, and furthermore how this relationship impacts on gambling behaviour in real commercial gambling environments.

6.7 End Notes for Reinforcement and Reward

The following arguments are not included within the main body of the report, because they are currently peripheral to the core aims of the report, either because they require further empirical support or are not currently directly applicable to the UK commercial gambling regulatory context. Nevertheless, they have been presented as end notes to provide context and increase the comprehensiveness of the report.

6.7.1 Variable versus Random Ratio Reinforcement

Technically, it is more accurate to state that most gaming machine gambling is operating at random ratio schedules of reinforcement rather than variable ratios of reinforcement (Hulbert, Knapp & Knowles, 1980; Turner & Horbay, 2004). Essentially, variable ratio schedules of reinforcement have a much shorter delivery of reinforcement, where specific wins are programmed to be delivered within a finite number of responses (in this example the pressing of the spin button) in contrast to random ratio schedules of reinforcement

(Haw, 2008a, Turner & Horbay, 2004). As Haw (2008) pointed out, with variable ratio schedules of reinforcement, cognitive biases such as the gambler's fallacy technically may not be entirely erroneous, as essentially each spin that is not a win does bring the player closer to winning. Random ratio schedules of reinforcement are not determined upon a fixed number of responses, and therefore the gambling activity is considerably more volatile than variable ratio reinforced games (Turner, 2011). Haw (2008a) identified that with a random ratio of reinforcement it is probable that there will regularly be extensive periods of non-reinforcement, or more accurately, punishment via monetary loss. Essentially, a random ratio of reinforcement means that the distribution of reinforcement is more unpredictable, which may in turn stimulate persistent gambling. However, given the very extensive 'run times' (period when RTP is met) it is highly unlikely that players will notice, or change behaviour in relation to variable and random ratio schedules of reinforcement, therefore it is not seen as a priority area in which to focus attention.

6.7.2 Learning in Response to Volatility

Given the probability that different reinforcement 'hit' rates and prize distribution are likely to have different impacts on problem gambling behaviour across different gambling contexts, it is also likely that the impact of these structural characteristics will vary in importance across different stages, in terms of how experienced the gambler is. In other words, the preference and behavioural impact of low and high volatility in a gambling activity is likely to change as the player becomes more experienced with gambling. One possible account of the differential impact of volatility on the gambling behaviour of players with different levels of gambling experience relates to Expected Value (EV). In the initial interactions with a gambling activity the player creates an EV for the activity in terms of likely outcomes of participation. Expected Value for an activity is developed through early interactions with the activity, where the player interprets consequences and outcomes in the context and produces Value Prediction Error Terms (VPET: Sutton & Barto, 1998). If the activity repeatedly produces positive outcomes (Positive VPETs), the player learns that the activity is of value, and looks positively towards it, and this is where EV is determined (Redish et al, 2007).

The capacity to predict or identify activities with positive EV is useful for everyday functioning, and the individual will adapt the EV as outcomes that violate the existing EV emerge (Redish et al, 2007). Individuals develop EVs through this process as it reduces the requisite conscious decision-making when determining everyday behaviour. The EV created is essentially a *short-hand* method of understanding risk and reward in one's everyday environment. Essentially, the EV process helps an individual predict which activities are rewarding and worthwhile, and which are not, and therefore to avoid.

Early interaction with the gambling activity is important in determining the EV, and likelihood of continued gambling over the long term. Potentially, in the early stages of a gambling career, a lower volatility gambling activity that delivers frequent (albeit small) wins, is more likely to produce repeated positive VPETs that may develop a robust positive association and EV of that activity. It is also true that repeated experiences of losing will stimulate negative VPETs and therefore reduce the positive EV of the activity. If the initial interaction with the gambling product produces enough small wins, it is probable that a more positive EV will have been 'laid down' in these early stages.

As the gambling career progresses, it is highly probable that frequent gambling will lead to a point where the negative consequences are becoming more obvious and significant to the

individual (as losses accumulate and become more conspicuous). It is reasonable to assume that EV in relation to gambling would adjust in response to the more prominent negative consequences of gambling. However, this does not appear to be the case, because the positive association is robust and resistant to change after it has been created in the learning stages of interaction with the gambling activity. It appears that instead of losses removing the positive expectancy of gambling on this activity the individual creates a new ‘context’ (Redish et al, 2007). Therefore, rather than updating the old positive EV that now appears inaccurate, the individual perceives the significant negative financial consequences as a new situation. Effectively, the player develops multiple and conflicting attitudes to the gambling activity. In other words, rather than the activity being simplistically categorised as being either positive or negative, and therefore readily predictable, the creation of multiple EVs creates ambiguity and uncertainty and conflicting attitudes towards gambling (Redish et al, 2007).

Once already developed, updating the EV of gambling activities to reflect the negative consequences of long-term frequent participation is likely only to occur in response to significant negative events. Gambling activities with low volatility that deliver frequent small wins is not likely to be significant enough to stimulate change in behaviour, because the frequent wins are neither unexpected nor large. Moreover, regular losses are also not likely to be unexpected for an experienced gambler, and therefore are unlikely to adjust developed positive association of the activity. A gambling activity with a much higher volatility is more likely to produce large, unexpected wins, or indeed extended periods of sustained loss, that will have much more impact on personal context, and therefore be more likely to adapt the EV of a gambling activity. Essentially, the acquisition or learning of behaviour is significantly quicker than its extinction through non-reinforcement and punishment (Zentall, 2016). Therefore, the frequency of reinforcement of activity is likely to shape behaviour much more significantly during the early stages of their interaction with the gambling activity.

Although this research is promising in terms of helping to understand the potential impact of different volatility levels on gambling behaviour for players at different levels of gambling experience, the research is not developed enough to be confidently applied to regulatory recommendations regarding minimisation of gambling-related harm. Frequent wins, regardless of size, reflective of low volatility, do appear to be more effective in shaping behaviour as the player initially ‘learns’ the nature of the gambling activity. However, these arguments are currently only conceptual and therefore extensive empirical examination is required before one can confidently apply these arguments.

6.7.3 Exploratory Concepts relating the Near Miss

A promising, but currently under-developed, explanatory model to account for the near miss effect is the application of *counterfactual thinking* and *deficient sequential updating* (Clark et al., 2013; Sharman & Clark, 2015). It has been observed that the specific location of the near miss outcome can have differential effects on a player’s experience of the near miss and their motivation to continue gambling despite incurring monetary losses (Clark et al., 2013; Sharman & Clark, 2015). In simple terms, on a three-reel slot simulation game, if two winning symbols are on the pay-line in the first two reels and the winning symbol on the third reel stops just before the pay-line, a different effect is created than if it stops just after the pay-line. Clark et al. (2013) argued that through counterfactual thinking (Kahneman & Varey, 1990), the near miss before the pay-line mentally *upgrades* the loss as being approximate to a win, or at least a step in the processing of winning. Sharman and Clark

(2015) argued that such additive counterfactual thinking, where the near miss before the pay-line mentally stimulates the player to perceive an alternative outcome (in this case a win), will stimulate the continuation of gambling. Wu et al. (2016), attempting to explain the effects of near misses before the pay-line, proposed that these additive forms of counterfactual thinking will amplify the emotional response to the near miss, and therefore create deficiency in behavioural control. Put more simply, the near miss before the pay-line making the player contemplate the experience of winning, 'over-excites' and thus increasing the risk-taking of the player.

In contrast, a near miss where the winning symbol on the third reel is located after the pay-line, has been demonstrated to have a non-significant effect on motivation to continue gambling (Clark et al, 2013). Near misses after the pay-line were rated as more unpleasant than those before the pay-line (Clark et al, 2013; Sharman & Clark, 2015), and were observed to produce an increase in arousal which could be interpreted as negative affectivity emerging in response to the near miss (Clark et al, 2013; Dixon et al., 2011). Sharman and Clark (2015) proposed that 'after the pay-line' near misses stimulate a negative emotional response because the outcome, having passed through the pay-line, creating a perception that the opportunity to win has also passed. Essentially, the differential effects on motivation of near-miss locations indicates that emotional factors, as an expression of arousal, may be integral to explaining the near miss effect on persistent gambling. Clearly, if the near miss effect was a result of erroneously perceiving near winning outcomes as an indication that one is getting closer to winning via developing skill, the location of the winning symbol to the pay-line will be irrelevant as it ultimately presents the same feedback in either location.

Despite the promising nature and quality of this research it is not prudent to attempt to apply the findings regarding recommendations for minimisation of gambling-related harm until further empirical support is available to support the propositions. Fundamentally, given the radically different structure of modern multiline EGMs, both online and offline, in comparison to simplistic single pay-line reel order machines in these studies where near misses are easily identifiable, one must be cautious in applying the findings to real world settings.

7 COST CHARACTERISTICS

The harm arising from gambling participation emanates from excessive expenditure of time or money such that it has negative implications for the gambler's family life, career, health and well-being or community (Blaszczynski, Sharpe & Walker, 2004; Delfabbro, 2013; Korn & Shaffer, 1998; Neal, Delfabbro & O'Neil, 2005; Productivity Commission, 2010).

Accordingly, it is important to consider how structural characteristics contribute directly to money expenditure and indirectly to time expenditure.

When we refer to 'cost of play' in this report, we are specifically referring to the resultant 'financial cost' or net expenditure. Fundamental to estimating cost of play over a specific period is recognizing that it is the product of a variety of structural characteristics including stake size, speed of play, return-to-player (RTP) and game volatility. Table 3 provides definitions and a brief explanation for how these contribute to cost of play.

Table 3. Determinants of the Cost of Gambling Participation

Structural Characteristic	Definition	Implications for Cost of Play ¹¹
Stake	Something of value (usually money) which is put at risk to initiate a gamble	The higher the stakes, the higher cost of play per hour
Return-to-player (RTP)	Value of prizes redistributed to players of the same game as a proportion of the total amount wagered on that game over the long-term	The lower the RTP, the higher the cost of play per hour
Volatility	The probability of winning different prizes; less frequent but higher value prizes means higher volatility; more frequent but lower value prizes means lower volatility	Higher volatility (i.e., offering less frequent but higher value wins), will typically mean most players experience a faster rate of loss and a higher overall cost of play per hour with a small minority who benefit from the less frequent but higher value wins giving a lower cost of play per hour
Speed & event frequency	These combine to determine the continuity of the game and opportunities for re-staking. See Section 5 for explanation.	The faster the game, and the greater the number of opportunities to bet again, the higher the cost of play per hour

'Theoretical loss' has been identified as a metric for describing how much a gambler is prepared to risk and is operationally defined as the 'product of stake size and RTP' (Auer & Griffiths, 2014; Auer & Griffiths, 2015). In their example, Auer and Griffiths highlight that staking \$100 on French roulette at an RTP of 97.3% will yield a lower long term cost of play (i.e., \$2.70) than playing Keno at \$100 with an RTP of 90% (i.e., \$10). However, this metric, while primarily useful to operators in assessing revenue potential, offers less utility for individual players when estimating the potential cost or play of a game in a particular session.

Significant financial harm is possible on a variety of games available through a variety of channels (digital or in land-based retail environments) that can have a significant negative financial impact. When considering how a game may cause financial harm, it is important to consider short-term and long-term perspectives. Accordingly, speed and volatility, and not just stake size and RTP (as is the case with theoretical loss), are critically important factors in considering the financial cost of play for any one individual in any one session.

This chapter specifically considers stake size and RTP. Speed and event frequency are covered separately in Section 5, and volatility under reward characteristics in Section 6. At

¹¹ Assuming all other structural characteristics remain the same

the end of this chapter, we examine the merits of an example of a potential harm prevention strategy aimed at reducing cost to consumers by restricting stake size on Category B gaming machines in betting shops, and will draw on the importance of considering speed, volatility and RTP when seeking to minimize harm.

7.1 Stake Size

7.1.1 Definitions and context

We define stake as “*something of value (usually money) which is put at risk to initiate a gamble*”. The concept of stake can also be referred to as ‘bet size’, ‘price point’ or ‘wager size’. What follows is an examination of the theory and evidence regarding the subtle and complex relationship between stake size and problem gambling.

7.1.2 Higher stake contributes to a higher cost of play

Assuming no change in other structural characteristics, a higher stake size will carry a higher average cost of play. While this may be a self-evident claim, and one which has been widely endorsed (e.g., Productivity Commission, 2010; Responsible Gambling Strategy Board, 2013; Williams, West and Simpson, 2012), it is perhaps the most widely recognised dimension of risk associated with stakes in gambling contexts and therefore merits emphasis.

It should also be acknowledged that while stake size is only one of the factors affecting cost of play, it remains is the primary mechanism by which the player themselves can modify the risk of the bet (Cornish, 1978). In most gambling contexts, there is usually an opportunity to vary stake within the same game; either by moving to different games within the same channel or by moving to a different environment or channel altogether. RTP and volatility are usually set by the manufacturer and operators within parameters determined by the regulator. There would likely be only minor variations in game speed as a result of individual differences in playing styles due to post-reinforcement pauses or selective uptake of the automatic play feature available on most digital game formats. Stake manipulation is a fundamental means by which a player interacts with a game but it is also one of the most significant factors affecting the potential for financial harm.

7.1.3 Higher stakes gambling may impair decision-making

Specific structural characteristics may, in the short term, affect an individual’s self-control, by impairing the performance of several key cognitive processes. Response Inhibition (Billieux et al. 2012; Con-versano et al. 2012; Goudriaan et al. 2006; Kertzman et al. 2008) and Reflection Impulsivity (Lawrence et al. 2009; Clark et al. 2009a; Cohen et al. 2010; Quednow et al. 2007) are cognitive processes that have been shown to be impaired in addiction populations. Response inhibition refers to the ability to withhold or terminate a harmful behaviour even if it might satisfy certain needs. Reflection impulsivity refers to the careful evaluation of options as people seek to make behavioural decisions. Deterioration in either of these faculties could, in the short term, increase the probability of problem gambling through excessive financial spending or time loss. Specifically, in relation to stake size, Parke et al., (2016) found that a player’s ability to make accurate decisions (i.e., reflection impulsivity) deteriorated as the level of stake increased. Importantly, decision-making quality deteriorated as stake size increased even at lower levels (i.e., moving from £0.00 in the control group to £2.00 in the low stake group). However, the player’s ability to withhold inappropriate behaviours (i.e., response inhibition) did not significantly vary across stake levels. An important finding of this study was that a player’s level of self-

control can vary even in the short term (e.g., within a 20-minute period) because of playing at different stake sizes.

7.1.4 Inducements for increasing stake size may increase risk

In Great Britain, for some forms of gambling, betting at higher stakes can be rewarded with a higher return-to-player or additional in-game bonus content (see Section 3 for a more detailed explanation). To the best of our knowledge this practice and its potential implications for gambling-related harm has not been examined empirically. However, even in the absence of empirical evidence, we suggest that upselling in a gambling context carries with it an ethical responsibility to know your customer and their affordability, knowledge not easily determined in most gambling contexts. Encouraging a customer to take greater risk playing slots is not the same as upselling an ocean view room to a holiday maker. Given that gambling is a behaviour that can involve impaired self-control (Blaszczynski & Nower, 2002; Corless & Dickerson, 1989; Dickerson & O'Connor, 2006) it appears that attempts to upsell within a game, by enticing stake increases, do not represent responsible gambling, and player protection unless a clear case can be made to the contrary.

7.1.5 Higher stakes gambling may be more exciting

In addition to winning money, excitement is a common motive expressed for participating in gambling (Brown, 1986; Cotte, 1997; Lee, Chae, Lee & Kim, 2007; Lloyd et al., 2009; Loroz, 2004; Platz & Miller, 2001; Wulfert, Franco, Williams, Roland & Maxon, 2008). However, there exist considerable conceptual and methodological challenges in trying to disentangle the potential relationship between excitement and stake size and the potential implications for problem gambling. Concepts of arousal and excitement are generally poorly understood in relation to gambling. While indices of arousal (e.g. heart rate) have consistently been found to be higher when gambling it is not necessarily clear why this is the case (Wulfert et al., 2005).

While research has shown that arousal is primarily associated with winning prizes rather than losing stakes this may simply reflect the nature of the studies being carried out. For example, in research where arousal was more commonly associated with winning (Coventry & Constable, 1999; Coventry & Hudson, 2001; Moodie & Finnigan, 2005), therefore, we suggest that no real loss would have been simulated (participants were not losing their own money; e.g., Moodie & Finnigan, 2005). Therefore, in situations where participants do not lose their own money, the 'losing outcomes' do not induce real consequences of losing money, but only represent an absence of reward. Even in experiments where participants were gambling with their own money (e.g., Coventry & Constable, 1999) it is unlikely that observed play would have been sustained long enough to pose significant financial risk. Perhaps more importantly, increases in risk through increased stake sizes were associated with overall higher levels of arousal (Anderson & Brown, 1984; Studer & Clarke, 2011). Research has also demonstrated that in situations where players can actively choose their own staking levels, the arousal experienced is higher both making the bet and when they lose (Studer & Clarke, 2011).

Forrest, McHale & Wardle (2015) in their examination of an increase in stakes and prizes in Category B1 gaming machines speculate that stake size may play a role in giving meaning to an activity through providing suspense. Specifically, the larger the stake, the greater the importance, the greater the level of suspense and investment in the outcome. Indeed, there is support for the claim that suspense and uncertainty play an important role in intrinsic

motivation regarding both games (Abuhamdeh, Csikszentmihalyi & Jalal, 2015) and gambling (Ely, Frankel & Kamenica, 2015; Hahn, Wilson, McRae & Gilbert, 2013).

While gambling at higher stakes may be more exciting the exact causes and consequences of this relationship remains unclear. Excitement, thrills and suspense provided by gambling are likely to satisfy consumer needs to some extent, but for some, the need for excitement may also encourage excessive play and problem gambling.

7.1.6 Within-game variability in staking may facilitate loss chasing

Loss chasing is a distinctive behavioral feature of problem gambling (Dickerson, 1984; Lesieur, 1979, 1984). Most commonly, loss chasing strategies involve placing bets at higher stakes (Dickerson, 1984; Lesieur, 1979, 1984; Xuan & Shaffer, 2012). However, in certain circumstances, other strategies may include placing bets at longer odds (Dickerson, 1984) or modifying playing style (e.g., bluffing in poker). In some circumstances, chasing losses may reflect breakdown in self-control because of the negative emotional impact on decision-making (Dickerson et al., 1987; Lesieur, 1984). In games of skill such as poker, this process is sometimes referred to as 'tilt' (Palomäki, Laakasuov & Salmela, 2014).

Cornish (1979) was one of the first to argue that offering multiple staking options within a gambling game may facilitate loss chasing. He argued that granting gamblers an opportunity to exercise choice in how they vary their level of financial risk may increase gambler vulnerability in situations where stakes can be increased to quickly boost winnings or recoup losses. Cornish suggested that when multiple staking opportunities are combined with fast, continuous games there may be greater risk of financial harm.

More recently, Studer et al., (2015) found evidence that following a series of losing 'even money' bets on roulette, gambling at higher stakes was more likely in subsequent play. Importantly, this study provided initial evidence that loss chasing was, at least to some extent, a 'within-game' phenomenon. What this means is that part of the decision to increase stakes relates directly to the most recent outcomes of that specific game, in that specific situation. Therefore, the extent to which motivation to chase losses may transfer across different games during a specific session of play may be limited. Moving to a new game would necessarily mean that the gambler has no immediate losing history with that game, therefore removing a potential motive to increase stakes for the purposes of chasing a result of a losing streak. If this true, then there is some evidence to suggest that removing the option to increase stake within any one game may thereby limit the potential for financial harm. This may be particularly important where the gambler's decision-making ability may be compromised. In other words, having the option to vary stake within a game may pose greater risk than games in which the stake size is fixed. This is because, in fast continuous games, events unfold which may impair judgement (see Section 5), produce negative emotions and prompt greater risk-taking; where options exist for the player to easily and immediately increase financial risk for a game then we would argue that this game is more likely to be associated with problem gambling.

7.1.7 Do problem gamblers play at higher stakes?

Most evidence suggests that higher levels of staking may be indicative of problem gambling, loss chasing, or eventual self-exclusion (Blaszczynski, Sharpe & Walker, 2001; Braverman & Shaffer, 2010; LaBrie & Shaffer, 2011; Sharpe, Walker, Coughlan, Enersen & Blaszczynski 2005; Wardle et al., 2014; Wardle, 2016; Xuan & Shaffer, 2009). However, some research

has also demonstrated that in some jurisdictions (e.g. casino gamblers in Macao¹²) that problem gamblers are more likely to play at lower staking levels (Prentice & Woodside, 2013). Other research, examining sports betting, has demonstrated that for some bet types (i.e., handicap betting¹³) higher stakes bets are associated with better net financial outcomes for the player (Gainsbury & Russell, 2015).

When considering policy options, it is important to understand the exact nature of the relationship between stake and problem gambling. For example, what staking levels best distinguish between problem and normal gamblers? Are these differences marginal or considerable? Is the relationship between staking and problem gambling linear? Recent research on Category B2 gaming machines provides some useful insight into these issues. Using player data from a large sample (N = 4001) of loyalty card holders for Category B2 gaming machines in licensed betting offices (Wardle et al., 2014), there was evidence to suggest that problem gamblers play gaming machines using a wide range of stake sizes. While it was true that problem gamblers were more likely to play at higher stakes, it was noted (p. 104) that:

“Although there is some variation in the proportion of problem gamblers at each staking level, problem gamblers have a range of staking behaviour. For example, nearly one in five of those with the lowest average stake per bet (53p) were problem gamblers and two in five were non-problem gamblers. The rest were at-risk gamblers. Even at the highest level of stakes (the 10th decile [...] representing an average stake of £13.40 per bet or more), nearly one in five people (18%) were non-problem gamblers¹⁴. Because of this overlap it is unlikely that stake size alone would sufficiently discriminate between problem and non-problem gamblers.”

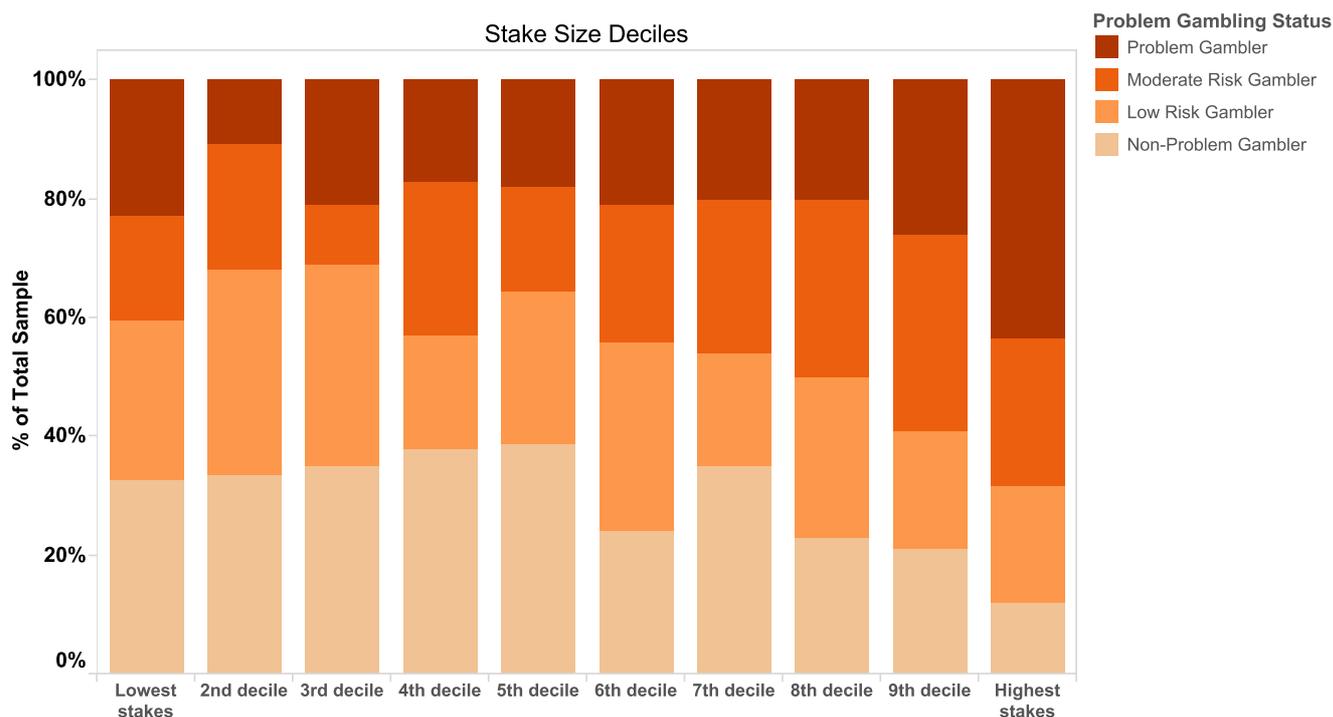
Wardle (2016) carried out further analysis of these data, finding that staking differences between problem and non-problem gamblers on Category B2 gaming machines appear to manifest more at the highest staking levels (see Figure 2). For example, problem gamblers represented 23% of those with the lowest average stake compared with 44% of those with the highest stake. Other findings (Wardle, 2016) in relation to maximum staking behaviour included:

- Players with higher problem gambling scores (using the PGSI) were significantly associated with greater frequency of use of the £100 stake;
- Members of potentially vulnerable groups (such as ethnic minorities, the unemployed) were more likely to bet at the maximum stake and to do so regularly;
- Players having ever placed a maximum stake bet reported playing with greater frequency and experiencing larger losses than those players having never placed a maximum stake bet.

¹² It could be that the finding that non-problem gamblers play at higher stakes is reflective of the location and nature of the research. At destination resorts, such as Macao, higher stakes gambling may reflect less frequent visits of tourists, social or infrequent gamblers whose profile of expenditure may reflect infrequent high stakes gambling rather than frequent lower stakes gambling.

¹³ Handicap betting involves giving a virtual deficit which must be overcome for the bet to be successful (e.g., betting on a handicap of ‘-1 goal’ requires the selected team to win by more than one goal to win the bet).

¹⁴ At the 10th decile, 36% were problem gamblers and the rest were ‘low-risk’ or ‘moderate risk’ gamblers.

Figure 2. Stake Size Per Problem Gambling Status among B2 Gaming Machine Players

Source: Wardle, (2016). Reproduced with permission.

Nevertheless, it is important to note that maximum staking behaviour represents a small proportion of problem gambling with only 4% of problem gamblers in the sample placing bets at the maximum stake in at least 5% of their bets. Furthermore, problem gamblers¹⁵ (accounting for 23% of the total sample) only accounted for 26% of total losses – a figure that is considerably lower than many might have expected. However, as Wardle and colleagues rightly caution, this finding may reflect a sampling strategy which drew exclusively from loyalty card users. Arguably, this was a sub-group of more engaged gamblers where problem and non-problem gamblers may display more similar behaviour.

These studies (Wardle et al., 2014; Wardle, 2016) demonstrated that problem gamblers on average play at higher stakes but also play in significant numbers across the full range of staking levels. Consistent with Blaszczynski et al., (2001), specific restrictions on stake size as a player protection measure would overlook most problem gamblers. However, it should be noted that these results, derived from a sample of loyalty card users, may not be representative of all gaming machine players, nor all loyalty card holders.

7.1.8 Restrictions on stake size to minimise harm

On the basis that problem gambling is more prevalent at higher staking levels, restrictions on stake size are often considered as a potential strategy to minimise gambling-related harm. An early laboratory study examined restrictions on staking and its impact on gambling behaviour and cognitions (Ladouceur & Gaboury, 1988). While the restrictions on stake did not impact erroneous cognitions or motivation, it resulted in participants changing their staking behaviour to compensate for the restrictions. When participants were restricted to a fixed or constant number of tokens per trial, they adjusted their strategy by placing riskier

¹⁵ Note that these figures were not representative as problem gamblers were over-sampled for the purposes of the research.

bets with a fixed amount of money. When gamblers were restricted from engaging in their usual style of gambling, they adapted their play by manipulating other game parameters, such as placing bets at longer odds. However, as often highlighted with this kind of research, participants did not lose their own money, thereby limiting how much we can learn from this study about willingness to risk money.

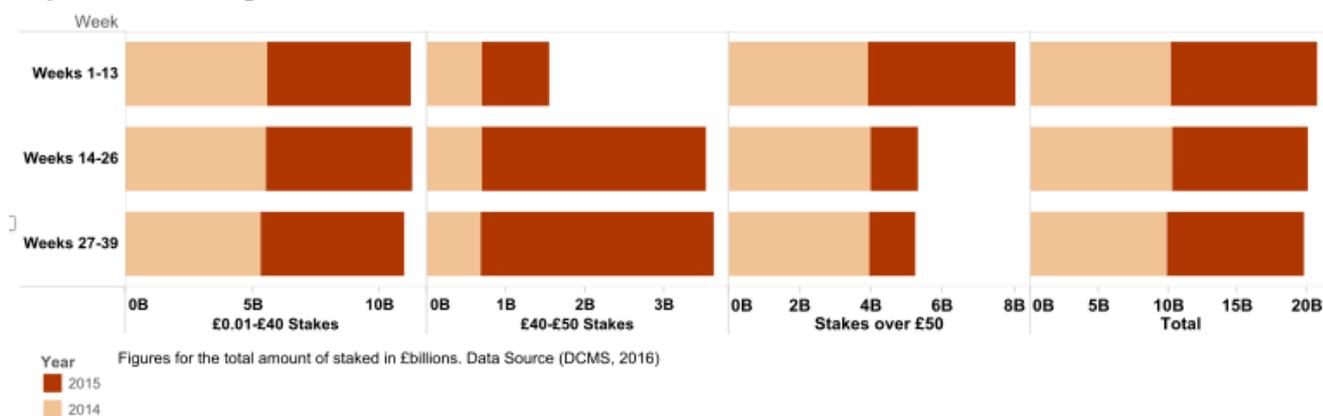
Research in gambling venues in Australia, where experimental conditions more closely approximated real gambling, also assessed the behavioural impacts of harm minimisation modifications on gaming machines (Blaszczynski, Sharpe & Walker, 2001; Sharpe, Walker, Coughlan Enersen & Blaszczynski 2005). One modification included reducing maximum stake size from \$10 to \$1 on some of the gaming machines. Thus, participants, on average, had fewer spins, shorter sessions and lower net expenditure. However, there were also some notable limitations to the study: more heavily-involved gamblers declined to participate in the experiment; and identical machines with no modifications were also available to play in the same venue at the same time. Consequently, the observed reductions in play among the experimental machines could reflect players migrating to unmodified machines rather than reducing overall play in that session. Another important finding from the study was that problem gamblers playing gaming machines were almost three times more likely to bet at higher stakes. However, only a minority of problem gamblers (7.5% of the 20% in the total sample who were problem gamblers) were betting above the \$1 limit. This has two important implications. First, that a mandatory reduction in stake size would likely result in some reduction in financial harm for the minority of problem gamblers betting above \$1 stake size. Second, it would be unlikely to have any impact on most problem gamblers betting under the \$1 stake size.

In April 2015, the Department for Culture, Media and Sport (DCMS) introduced a new regulation¹⁶ designed to improve player control by partially restricting staking behaviour through requiring one of two possible authorisation mechanisms for all stakes over £50: either through a) staff interaction ‘over the counter’ (OTC) or; b) registered account-based play as a verified user. It was anticipated that these measures would help improve player control by providing greater insight through access to player account histories or through interactions with trained staff. While the uptake for either of these mechanisms was relatively low (i.e., between 1-7%), there were several interesting outcomes from this intervention. The findings (DCMS, 2015) which emerged from their evaluation of the regulations included:

- The total number of sessions having at least one £50 bet in a session fell from around 6-7% (of all gaming machines) to below 2%;
- The total number of sessions that were verified via account-based play was between 4.5-7% and the total number of sessions verified OTC was below 1%;
- the overall amount staked at £40-£50 stake level increased by over 300% (see Figure 3) but;
- the overall amount staked at over £50 stake level decreased by about two thirds (see Figure 3);
- the duration of sessions increased, with growth fluctuating between 5-20% over the period following implementation;
- the overall amount staked in the initial period following implementation fell by around 2% compared to the same period in 2014.

¹⁶ This regulation is referred to as Gaming Machine (Circumstances of Use) (Amendment) Regulations 2015.

Figure 3. Gaming Machines (Circumstances of Use) (Amendment) Regulations 2015 – Impact on Staking 2014-2015



Importantly, this real-world example provides tentative evidence in support of those experimental findings by Ladouceur and Gaboury, such that gamblers may modify playing strategy in response to external restrictions placed on their play. In this case, it could have been that players opt to spend more time at lower stakes, rather than adopt either of the two authorisation mechanisms (albeit with a slight decrease in overall level of spend).

We would suggest that given the low engagement with authorisation, and that the vast majority of revenue appears to be displaced immediately below the £50 limit (i.e., not in the £0.01-£40 range) two possible explanations for the change in staking behaviour may be a result from either of the following:

- A preference to retain anonymity by avoiding OTC interactions or signing up for a card;
- A preference to avoid the inconvenience of OTC interactions or signing up for a card¹⁷.

Interestingly, it was also reported that significant number of customers were seeking authorisation in advance of play but were not necessarily using it. This might suggest that the inconvenience of seeking OTC authorisation following the commencement of a session increases. For example, this could reflect concern regarding the terminal being taken by another customer. Alternatively, players could be seeking to avoid disrupting the experience of detachment, a need which is commonly associated with gambling on gaming machines (see Section 5).

7.1.9 Lower stakes may encourage the decision to participate

While there has been some suggestion that lower staking levels may encourage a broad level of gambling participation through increased affordability (Corney et al., 2010; Parke, 2009), these claims are tentative and currently with limited empirical basis. The emergence of social gaming and practice options in digital gambling have created opportunities whereby consumers now are potentially exposed to, and can engage with, gambling-related content, not only at lower stakes, but at no cost, through ‘freemium’ models of social gaming (Parke et al., 2013). Other research, drawing on views from an expert panel (White et al., 2007), ranked ‘placing a minimum stake limit’ (i.e., a lowest stake size permitted) as the least effective harm minimisation approach out of a total of 40 other possible approaches.

¹⁷This has been found to be the case in other jurisdictions and research studies (Parke et al., 2008)

7.1.10 Lower stakes may increase time loss

Disordered gambling may also lead to harm by exceeding discretionary leisure time (Blaszczynski, Ladouceur & Moodie, 2008) such that it impacts other domains including work and family. In theory, gambling at higher stakes will reduce playing time for any given bankroll¹⁸. It could also be the case that where players have been restricted to lower stakes, gamblers may seek an equivalent level of gambling intensity of risk and there has been some support for this in the laboratory (Ladouceur & Gaboury, 1988). While loss of money is typically viewed as a greater risk than loss of time, this issue may be particularly relevant for consumers with considerable disposable income but limited disposable leisure time.

7.1.11 Restrictions on stake size may in some circumstances disadvantage the consumer

There may be circumstances in which more skillful gamblers may identify good value bets¹⁹ and seek to optimise such opportunities by betting in larger amounts. Indeed, there have been anecdotal reports (e.g., Cave, 2015, 18 October) that operators restrict stake size with certain bets or certain individuals deemed to be 'unprofitable' for the operator, and in these circumstances consumers have been campaigning for a 'minimum limit on maximum stakes' (i.e., wanting more freedom to bet in larger amounts). In research exploring staking behaviour and financial outcomes of actual internet sports betting behaviour in Australia, bets representing the highest average stake size were associated with the most the profitable financial outcomes (Gainsbury & Russell, 2015). However, it should be noted that these bets were more specialist (e.g., handicap bets) and represented a small proportion of bets being placed. The point being argued here is that, in some circumstances, restrictions on stake size may run counter to the interests of the consumer; highlighting that the link between stake size and gambling-related harm is both subtle and complex.

7.2 Return-To-Player²⁰

7.2.1 Definitions and Context

In Great Britain, the Gambling Commission require that: "*the theoretical target percentage return to player must be clearly displayed to the player on the machine*". For example, (p. 19, Gambling Commission, 2012²¹): "*This machine has an average percentage payout of at least (value) %.*"

For the purposes of this report we define RTP as the 'value of prizes redistributed to players of the same game as a proportion of the total amount wagered over the long-term'. Depending on jurisdiction, various terms are used to refer to RTP by a variety of different stakeholders. These terms may be consumer-focused (e.g., return-to-player, payout ratio, payback percentage, price) or operator-focused (e.g., hold, house edge, and par).

The extent to which any individual session deviates from the RTP depends on game 'volatility' (see Section 6). Accordingly, the distribution of wins (i.e., volatility) is independent

¹⁸ Bankroll in this context refers to money set aside for gambling. It can refer to money allocated for a session or over longer periods of time.

¹⁹ A bet may be considered good value if the consumer considers that the betting odds are more generous than their perception of the true probability of that outcome becoming a reality.

²⁰ This structural characteristic is considered under the heading of 'cost characteristics', though like many of the structural characteristics, it could be legitimately considered elsewhere (e.g., under 'reward characteristics').

²¹ Machines standards category B2 (Gambling Commission) available here

<http://www.gamblingcommission.gov.uk/pdf/machine%20standards%20category%20b2%20june%202012%20revision%202.pdf>

of the RTP. To illustrate this point, a game with an RTP of 99% could return all prize money in the form of one jackpot, which would mean that all players experienced hit frequency of 0% except for the jackpot winners. In contrast, in a game with an RTP of 50%, all players could experience a win frequency of 100% if wins were only worth half of the original stake.

For those interested in understanding gambling behaviour, the roles of RTP and volatility are arguably among the most complex in gambling research. Findings from research examining the direct link between RTP and gambling behaviour are inconsistent, and in some cases, contradictory. Most of the evidence from the laboratory (Brandt & Pietras, 2008; Gillis, McDonald & Weatherly, 2008, Haw, 2008; Lucas & Singh, 2008; Schreiber & Dixon, 2001; Weatherly & Brandt, 2004) and from real gambling activity (Lucas & Brandmier, 2005; Lucas, Dunn, Roehl and Wolcott, 2004; Woolley, Livingstone, Harrigan & Rintoul, 2013) has found that varying rates of RTP do not significantly impact playing behaviour. In more recent lab-based research, findings again have been inconsistent with players preferring to play games with higher RTPs in one study (Coates & Blaszczynski, 2013) and lower RTPs in another study (Coates & Blaszczynski, 2014).

Some studies have relied upon deliberations from expert panels. In 2009 in Great Britain, a panel of 11 international academic specialists failed to reach any meaningful consensus regarding the relationship between RTP and problem gambling (Parke, 2009) while expert panels convened from Canada (White et al., 2006) and Australia (Productivity Commission, 1999) found that RTP was among the least important structural characteristics contributing to problem gambling. Despite the limitations in the relevant literature, key considerations are outlined below which describe and explain the relationship between RTP, problem gambling and harm minimisation.

7.2.2 Can consumers detect RTP in gambling games?

Some laboratory-based evidence has suggested that players can detect differences in RTP when playing gaming machines. However, in one of the studies (Coates & Blaszczynski, 2013) there were vast differences in RTP between the machines being tested (60% v 120%) and relatively low volatility (a win rate of around 20-40%). Consequently, these lab-conditions would likely represent a relatively easy 'detection task' relative to real world gambling scenarios. In the other study, using real gamblers, play was restricted to one type of game operating on two machines again with a relatively high RTP differential (85% v 98%) over a 60-hour period (Dixon, Fugelsang, MacLaren & Harrigan, 2013). In this more realistic example, the difference in RTP is still considerable relative to the differences one might find in the British gambling context. Perhaps more importantly, scenarios in which gamblers would play the same machine side by side at different RTP levels for a 60-hour period are unlikely to occur. These are important limitations to bear in mind when assessing to what extent players can get an accurate sense of RTP on gaming machines in real gambling environments in Great Britain.

In contrast, research exploring actual gambling behaviour suggests gamblers may be less able to detect smaller differences in RTP in real gambling scenarios (Woolley et al., 2014); especially when games are more volatile (Turner, 2011). Specifically, Turner (2011, p. 620) suggested: "*The high volatility of multi-level prize games hides the house edge so that the player cannot tell during any short period of play that the game has a built-in advantage for the casino*". Another possible explanation is that in a more volatile game experienced players may come to expect extended periods of losing thus making it difficult to differentiate between what is lower RTP and what is simply the downswing of variance on a high volatility game. In Great

Britain, where differences in RTP in the same machine category are relatively smaller than those examined in the research (e.g., Category B2 machines vary from 88%-92%), it will be less likely that players can detect differences. Players are also likely to move between a choice of dozens of different game formats (e.g., slots, blackjack, roulette) and/or game titles (e.g., Thai Princess, Winstar).

7.2.3 Should there be minimum RTP requirements?

In Great Britain, there are currently no regulations that specify a minimum RTP as a harm minimisation strategy. Any theoretical basis for setting a minimum RTP would lie in ensuring a fair price for participating consumers. However, it may be the case that RTP levels of games naturally adjust to market conditions where consumers reject RTPs if they become too low and operators reject RTPs if they become too high (Schwartz, 2013). This may remove the need for specific regulatory intervention in price setting. Indeed, in some jurisdictions, setting minimum RTP requirements are considered to have little utility since players 'vote with their feet', which may explain why RTPs operate significantly above the mandated minimum in the United States (Schwartz, 2013). One important caveat to this claim is the extent to which fair and open competition exists. To this end, suggestions have been made that there is a need for consumer protection policies on RTP where there is an absence of operator competition resulting in undetectable price rises in form of falling RTPs (Woolley et al., 2014).

7.2.4 Higher RTP games usually associated with lower volatility

There is usually an inverse relationship between RTP and the volatility of commercial gambling games (Turner, 2011). Specifically, games with a lower volatility (e.g., even money games like blackjack) usually operate at a higher RTP. For example, blackjack using optimal strategy may offer a 98.7% RTP whereas for some gaming machines (e.g., Category C) in Great Britain the RTP can be as low as 75%. Lotteries, which are usually among the most volatile games will often have the lowest levels of RTP (sometimes as little 50%). From an operational perspective, a higher RTP is required in low volatility games where players may identify a poor RTP more easily. Turner argues that the gambling industry operates a lower RTP on more volatile games to manage risk. Offering a very high RTP on a volatile game increases the operator's risk as irregular massive wins paid out to the customer may mean significant, albeit short-term, losses.

However, it remains unclear whether players continue to play because they cannot detect the lower RTP or simply because they are willing to 'pay the price' to win larger prizes or play games which facilitate the need for excitement and suspense brought about by a more unpredictable game. It should also be noted that the market might bear a lower RTP for certain EGM games that offer higher levels of entertainment and player interaction (and thereby more time). To accentuate the point, in some cases, players may even choose to play games with zero RTP such as social games offered through social media provided these games are sufficiently engaging (Parke et al., 2013). Volatility and reward are discussed in more detail in Section 6.

7.2.5 Higher RTP contributes to a lower cost of play

RTP along with game speed, stake and volatility combine to determine cost of play over any given period (e.g., cost per hour). Assuming no change in other structural characteristics, a lower RTP will generally permit less playing time or fewer bets on average than a higher RTP game for a given bankroll. Put another way, lower rates of RTP increase the probability of potential losses assuming no changes in other structural characteristics (Weatherly &

Brandt, 2004, p. 48): “...if people gamble at a similar rate despite large differences in their overall payback percentage, then there is potential for huge losses when payback percentages are low. Even if sensitivity does appear with extensive experience, the loss of money that may occur while gaining that experience could be immense”.

However, it should be noted that while RTP is a determinant of cost of play, ‘volatility’ is more influential in shaping the player’s experience at the individual session level (Lucas & Singh, 2008). This is because games with a greater number of larger prizes and fewer smaller prizes will return, on average, a larger proportion of losing spins. A game operating with high volatility could produce playing periods yielding few, or perhaps no, wins in a single session.

7.2.6 Higher RTP contributes to more generous reward characteristics

Having a larger pot of money to be redistributed as wins implies either a greater number of prizes (i.e., less volatility) or higher value prizes. Harrigan and Dixon (2009) demonstrated using computer simulations that some consumers receive different levels of reward playing the same version of an EGM with either an 85% or 98% RTP. They reported that participants in the 98% condition obtained a greater number of total spins, winning spins, and bonus plays (e.g., free spins). While the rewards will not differ significantly for most players, in both conditions, the number of simulated players who had a peak balance of \$1000 (ten times their original stake) within the session increased from 5 out of the 1000 in the 85% RTP condition to 54 out of the 1000 in the 98% RTP condition. In a later study using real gamblers (Dixon, Fugelsang, MacLaren & Harrigan, 2013) higher RTP machines were shown to produce a larger final balance and a greater number of large wins, but not a greater number of free spin features. Consideration has also been given to variations in RTP where they may temporarily exceed 100%. In one experimental study (Gillis, McDonald & Weatherly, 2008), an RTP of 105% prompted participants to place bets either at a higher stake, or in greater number than under lower RTPs of 85% or 95%. These higher levels of positive reinforcement have been argued to pose increased risk for problem gambling through early career big wins, exposure to free spin features and social reinforcement in the form of praise (Harrigan and Dixon, 2009). Reward characteristics are examined in Section 6.

7.2.7 Micro-level Variations in Target Theoretical RTP

By ‘micro-level variations’, we mean strategic changes to the target theoretical RTP operating on the same game (e.g., on a day-to-day basis) while maintaining the appropriate long-term average (see Table 4). Consistently having an RTP over 100% is an unsustainable business practice in the long run for operators because, in practical terms, this means that a game is operating at a loss. However, in theory, it would be possible to change the target theoretical RTP at a micro-level (either across machines in the same venue or on the same machine) where the advertised RTP level is maintained *on average*.

Table 4. Simplified Example of Micro-level Variations in RTP in a Gaming Machine with an Advertised Target Theoretical RTP of 90%

Day	RTP
Monday, Tuesday, Thursday	50%
Wednesday, Friday, Saturday, Sunday	120%
Weekly Average RTP (Corresponding to Advertised RTP)	90%

Thus the target theoretical RTP could vary including variations temporarily exceeding 100%. This situation could potentially be commercially sustainable²² and would intermittently expose players to periods of enriched rewards. The implications of such variations on risky gambling behavior remain unclear. However, a possible outcome may be that the role of expectations could facilitate excessive play in cases where RTPs operate considerably below the expected level. Gamblers who employ the gambler's fallacy²³ when playing gaming machines may be most at risk here. For example, a gaming machine player who rationalises that the absence of a win increases the probability of a win soon, maybe more inclined to persevere particularly during sustained losing periods which could have disastrous consequences under very low RTPs.

Concerns have also been expressed about the potential implications of variations in RTP for facilitating cognitive biases among vulnerable players. Recall that in one study, after 60 hours of play, nine out of ten regular gamblers correctly distinguished between different RTP levels between two test machines; one set at 98% RTP and the other at 85% RTP (Dixon et al., 2013). By implication, in situations where similar games have considerably different RTPs, players could employ legitimate skill in machine selection which could improve the chances of winning. Importantly, Dixon and colleagues have expressed concerns because, for most machines, in most jurisdictions, skill usually has little or no role in determining outcomes. Indeed, research has shown that players often overestimate skill components (Griffiths, 1994), or wrongly attribute the role of skill where it does not exist (Delfabbro, Lambos, King & Pugliese 2009; Walker, 1992). Since overestimations of skill have been identified as a potential risk factor for problem gambling, correcting biases is normally an important component in cognitive behavioral therapies. Accordingly, Dixon et al., argue that such situations promote ambiguity regarding the precise role of skill in gaming machine play. Because of one's belief in skill involvement being correct, it may consequently be more difficult to convince gamblers that other erroneous beliefs about perceived skills are incorrect. This so-called 'confirmation bias' may make the task of player education more difficult, and biased thinking more resistant to change.

7.2.8 RTP communications are perceived as confusing

While communicating RTP on EGMs to consumers is not required in some jurisdictions (Schwartz, 2013), in Great Britain, RTP information on EGMs is a licensing requirement intended to ensure gambling is 'fair and open'. Recent research in Great Britain has found that consumers are often confused by the concept of RTP and how it is communicated (Collins, Green, d'Ardenne, Wardle & Williams; 2014). Reasons given by players for confusion included the use of technical, mathematical or ambiguous language, and language barriers for players whose first language was not English. Parke et al., (March, 2010) examined player attitudes to responsible gambling in digital environments and found similar misunderstandings, for example:

"I would really like to have more clarification on when you say "Payout Percentages". What does the casino and the powers that be consider as "payouts". How do you figure it and what do you base your information on? Does payout percentages mean actual money that people cashed out with

²² Assuming that the high levels of volatility and variable implementation on different days prevents more experienced players gravitating to days set at 120%

²³ 'Gamblers fallacy' refers to the belief that random events should revert to typical outcomes over the short term. For example, if after a series of 5 coin tosses there have been 5 'head outcomes', it would thus be interpreted that 'tail outcomes' should now be 'due' to correct the pattern that should typically be observed in the ratio of 50:50 (Tversky & Kahneman, 1971).

from what they spent or what the casino paid out over and above what was spent at the casinos? That is not clear and therefore "payout percentages" has no meaning for me because that could mean anything." [Female, aged 46-55, USA, Retired]

A potential concern in these circumstances is failing to account for the smaller wins being re-staked within-session when estimating RTP. Furthermore, players may fail to understand the subtler concept of volatility. To illustrate this point, consider the example presented in Table 5. A total of £30.00 is deposited to play a Category B3 gaming machine at £2 stake. At a real spin speed of approximately 3 seconds the below example would yield a playing time of approximately 90 seconds, a total of £4.00 in wins (subsequently re-staked) and an end balance of £0.00. In this scenario, a potential concern is that players could proceed with the mistaken belief that the advertised RTP will soon be honoured and they will be able to collect 90% of their original stake (i.e., £27.00).

Discrepancies between observed and target theoretical RTPs may be exacerbated on games with higher volatility, where in some instances, individual sessions may return an extremely low observed RTP (as displayed in Table 5). Operators may also want to consider the potential negative impacts relating to customer satisfaction if consumers are left feeling cheated and confused because of misunderstanding the RTP concept. To what extent misunderstanding RTP poses a risk for problem gambling remains unclear. Evidence from a small-scale study of machine players suggests that players do not necessarily notice these messages or use them to decide which machine to play (Collins et al., 2014). If this finding is representative of the wider population of machine players, then it poses an interesting dilemma. On the one hand, it is believed that players should attend to, and consider, RTP guidance as an indication of a fair and open game; but they generally do not. However, there is also some indication that even if players do attend to this information it may encourage risky play through misinterpretation of RTP information. Accordingly, RTP information presented to consumers should be examined through further research to determine suitable content and delivery and to explore the behavioural impacts.

Table 5. Example Outcome with £30 bankroll at £2 stake on a B3 machine

Spin number	Stake	Win	Balance	Spin number	Stake	Win	Balance
1	£2.00	£0.00	£28.00	11	£2.00	£0.00	£10.00
2	£2.00	£0.00	£26.00	12	£2.00	£0.00	£8.00
3	£2.00	£0.00	£24.00	13	£2.00	£0.00	£6.00
4	£2.00	£0.00	£22.00	14	£2.00	£0.00	£4.00
5	£2.00	£0.00	£20.00	15	£2.00	£0.00	£2.00
6	£2.00	£0.00	£18.00	16	£2.00	£2.00	£2.00
7	£2.00	£0.00	£16.00	17	£2.00	£0.00	£0.00
8	£2.00	£0.00	£14.00				
9	£2.00	£2.00	£14.00				
10	£2.00	£0.00	£12.00				

Note. For those unfamiliar with gambling games this very basic example demonstrates how an actual experience in a session can deviate substantially from the 'average expected theoretical loss'.

7.2.9 Higher RTP associated with higher stake games

RTPs for gaming machines generally increase at higher stakes because less ‘take-out’ is required to retain revenues comparable with lower stake games (Schwartz, 2013). Specifically, in Great Britain, minimum RTPs of 88%, 90% and 92% are offered at staking options of £0.50, £1.00 and £2.00 respectively. Using qualitative interviews with EGM players in Great Britain, Collins et al., (2014, p.26) reported that certain players interpreted such information as meaning: “*The more you put in the greater your chance of winning*”. This claim is not necessarily true. Playing at higher stakes even at a higher RTP can result in an increased expected average theoretical loss per hour. For example, as demonstrated in Table 6, playing a B3 machine at 92% RTP at a £2 stake yields an average theoretical loss per hour of £230. Playing a B1 machine at 94% RTP at a £5 stake yields an expected average theoretical loss per hour of £432.

Consequently, excessive spending may result from players misinterpreting the impact of a slight increase in RTP if they are persuaded to move to less affordable staking levels. This may be particularly true where additional bonus games are only available at higher stakes. Bonus games such as free spins have been found to be among the most attractive structural characteristics provided by EGMs (Livingstone & Woolley, 2008) and therefore this may entice players to play beyond their means to access exclusive content like bonus games.

7.3 Excessive Losses May Encourage Further Risk-taking

A financial loss may impact how a gambler may feel and behave more than a reward of a similar size. Indeed, previous research has shown that risky choices are considered to be more likely to be taken to avoid monetary losses than to seek monetary gain (Kahneman and Tversky, 1979; 1984; Tversky & Kahneman, 1991). Evidence also suggests that when consumers spend money to purchase goods or service they will not experience loss aversion if they have appropriately budgeted for that amount (Novemsky & Kahneman, 2005; Tversky & Kahneman, 1991). Such within-budget gambling is likely to apply to the majority of gamblers who do not experience problems and who set aside an affordable amount to gamble, viewing this as simply the cost of this particular leisure choice. In contrast, Novemsky & Kahneman (2005) found that ‘loss aversion’ is more likely when there is a perceived ‘wealth effect’ where there are negative implications for future consumption because of the loss, particularly when that loss is unplanned or unexpected. It has also been shown that emotional reactions to losses are more immediate and significant than emotional reactions to positive events (Cacioppo & Gardner, 1999; Taylor, 1991) and individuals are less inclined to take risks when in a positive mood for fear of decreasing positive experience compared to when they are in a negative mood (Demaree et al., 2012).

Moreover, survey research exploring gamblers’ perspectives on losing control concluded that negative affective states, such as frustration and depression, were perceived to be the most significant determinants for impaired control among problem gamblers (Corless & Dickerson, 1989). Further evidence for the potential impact of loss aversion on gambling behaviour has been found in a series of gambling experiments, where the accumulation of losses was directly related to increased risk-taking and the larger the size of that loss, the greater the subsequent risk-taking (Gehring and Willoughby (2002). Research suggests the negative impact of excessive net expenditure on mood and decision-making may have a downward cyclical effect on problematic behaviour.

7.4 Current Issues in Policy: Examining the Proposed £2 Stake Restriction on Category B2 Gaming Machines

7.4.1 Background

There is general support for the claim that gaming machines are a form of gambling associated with higher rates of problem gambling (Afifi et al., 2014; MacLaren, 2015). More specifically, this empirical support extends to Category B2 gaming machines (e.g., LaPlante, Nelson, LaBrie & Shaffer, 2009; Michalczuk, Bowden-Jones, Verdejo-Garcia & Clark, 2011). In recent years, there has been a call by some stakeholder groups (e.g., Campaign for Fairer Gambling²⁴) to reduce the stake size on Category B2 gaming machines from £100 to £2 as a gambling harm minimisation strategy. This has been pitched by proponents, including many local councils, as the ideal public health intervention by restricting the amount of money the consumer can lose. In 2013, the Responsible Gambling Strategy Board (RGSB) provided formal advice to the Gambling Commission regarding stake size restrictions in advice of a forthcoming Triennial Review on stakes and prizes in Great Britain. The key conclusion (RGSB, 2013, p.20²⁵) was:

“Given the limits in our understanding of machine play in general and play on B2 machines in particular, we do not consider that there is ‘quantifiable’ or ‘sufficient’ evidence (the criteria set by DCMS) to warrant reductions in stakes / prizes for B2 machines. We are however, aware of public concern and are equally clear that there is a powerful case for the inception of a research programme to examine how players play these and other machines.”

In 2015, following receipt of additional evidence, RGSB concluded again²⁶ that stake restriction would be unlikely to be the most effective harm minimisation approach.

What follows are a set of arguments, informed by evidence and theory considered in this chapter, which set out the potential limitations of a £2 stake restriction to minimise gambling-related harm. The arguments being suggested in support of this proposed policy are relatively simple – reduce stakes from £100 to £2 to considerably reduce the amount of money players can lose.

7.4.2 Limitation 1. Fails to adequately target problem gamblers

Restricting stake size in Category B2 machines to £2 will fail to reach many problem gamblers, and impact many non-problem gamblers. As outlined in this chapter, previous research has demonstrated that problem gamblers tend to engage at higher stakes. However, as demonstrated in this chapter, the nature of this relationship is complex. Figure 2 shows that there are significant numbers of problem gamblers at lower staking levels and significant numbers of non-problem gamblers at higher staking levels. However, it is important to acknowledge that this specific sample could have failed to capture more of the lower intensity non-problem gamblers who do not own loyalty cards (remember that this survey was limited to loyalty card holders). An implication of this sampling limitation could be that differences in staking levels are underestimated to some extent. However, even taking this into consideration, the research shows that problem gamblers are distributed across the full range of staking behaviours, and therefore a £2 stake restriction will be

²⁴ For information on the Campaign for Fairer Gambling, visit <http://www.stopthefobts.org>

²⁵

<http://www.gamblingcommission.gov.uk/pdf/letter%20to%20rt%20hon%20maria%20miller%20re%20triennial%20advice.pdf>

²⁶ <http://www.gamblingcommission.gov.uk/pdf/Recent-research-into-Gaming-Machines.pdf>

limited in its reach. Even for those it reaches, there are further limitations and these are discussed in turn below.

7.4.3 Limitation 2. Game Speed and RTP are Ignored

Assuming the justification behind mandating a £2 stake restriction is to limit net expenditure (i.e., how much consumers can lose), it ignores other key determinants of cost. Cost characteristics have been the key focus of this chapter where we have argued that the cost of play per hour is not determined by stake size in isolation but also game speed, RTP and volatility. Specifically, in the context of gaming machines in Great Britain, Table 6 clearly outlines how expected average theoretical loss per hour is determined by more than stake alone.

This table clearly demonstrates that speed and payback percentage are also important determinants of cost of play. Using the table to illustrate the point, a Category C game at £1 (but with a considerably lower RTP and considerably faster game speed) is expected to be more expensive to play, on average, than a Category B2 at a 50 times greater stake size (i.e., £50). Category B2 and Category B3 gaming machine data were analysed (Wardle, Ireland, Sharman et al., 2014), and while the mean stake size was considerably different across the two categories (B2 = £14.08; B3 = £0.83) the mean net expenditure was roughly the same (B2 = £6.31; B3 = £6.37). Interestingly, for sessions involving a combination of B2 and B3 formats, the mean net expenditure was considerably higher at £14.16.

Table 6. Expected Average Theoretical Loss/Hour for Gaming Machines in Great Britain

Category	Stake	Game Speed (secs)	Payback	Expected average theoretical loss per hour
B1(slots)	£5	2.5	94%	£432
B2 (roulette)	£100	20	97.30%	£486
B2 (roulette)	£50	20	97.30%	£243
B2 (roulette)	£20	20	97.30%	£97
B3 (slots)	£2	2.5	92%	£230
B4 (slots)	£1	2.5	80%	£288
C (slots)	£1	2.5	75%	£360

Source. Gambling Commission, personal communication, February 23 2016

This shows that a £2 staking restriction which ignores game speed and RTP, will be less successful if its aim is to limit how much a player can lose in a session of play.

7.4.4 Limitation 3. Game Volatility is Ignored

To extend this argument further, the “expected average theoretical loss per hour” is only an average over tens of thousands of sessions and does not take into consideration the volatility of a game and how players may experience the game on a session-by-session basis. Recall the earlier example of a game with an RTP of 99%. This game could return all prize money in the form of one jackpot, resulting in all players, except the jackpot winners, losing all of their money. Compare this to a game with an RTP of 50%, where all players could get a win on every occasion, if wins were only worth half of the original stake. This hypothetical example illustrates that volatility is a critical factor influencing how the typical session of play for a B2 or B3 game is being experienced, including how much money the player may lose.

Now, if we consider roulette games specifically, the most popular form of Category B2 game by a substantial margin (Wardle et al., 2014), volatility is determined by the player's choice of bets. For example, if they make an 'outside bet' – betting on an outcome of either red or black - this is almost an even-money bet. This is a low volatility bet. Alternatively, a player may select a riskier bet - choosing a number from 0-36 – representing a lower win rate of around 2.7%. This is a higher volatility bet. Considering Category B3 games, these usually do not permit players to have any control over the volatility of game. Different B3 games vary in terms of volatility according to a preset game profile – often referred to either a 'soft' (less volatile) or 'hard' (more volatile) profile. However, on average, B3 games are more volatile because they pay out higher prizes relative to the initial stake (i.e., £500 prize for stakes of £2 or less). Furthermore, some B3 games permit the option for players to immediately gamble all of the winnings up to a maximum value of £500. For example, there may be options to immediately re-gamble a winning outcome 'double or nothing'. Taking these two factors into consideration, Table 7 provides a useful example of game volatility for various gaming machine categories²⁷. The table clearly demonstrates that B3 games have the potential to be considerably more volatile.

Table 7. Volatility comparisons for Cat B2, B3 and C Gaming Machines (NMI, 2013)

Number of games played	C (compensated reels game)		B3 (random reels game)		B2 (Roulette)	
	25p / 78%	£1 / 78%	25p / 86% without gambles	£2 / 92% with gambles	Low Risk e.g. Red, 97.3%	High Risk Straight Bet, 97.3%
10	+/- 42.84%	+/- 28.00%	0 to +352.97%	0 to +733.23%	+/- 61.96%	0 to +361.83%
100	+/- 13.55%	+/- 8.85%	0 to +111.62%	0 to +231.87%	+/- 19.59%	0 to +114.42%
1,000	+/- 4.28%	+/- 2.80%	+/- 35.30%	+/- 73.32%	+/- 6.20%	+/- 36.18%
10,000	+/- 1.35%	+/- 0.89%	+/- 11.16%	+/- 23.19%	+/- 1.96%	+/- 11.44%
100,000	+/- 0.43%	+/- 0.28%	+/- 3.53%	+/- 7.33%	+/- 0.62%	+/- 3.62%
1,000,000	+/- 0.14%	+/- 0.09%	+/- 1.12%	+/- 2.32%	+/- 0.20%	+/- 1.14%

Reproduced with the with the permission of NMI²⁸

We argue that a £2 stake restriction which ignores game volatility (in addition to game speed and RTP) will be less successful if its aim is to limit how much a player can lose in a session of play.

7.4.5 Limitation 4. Players may behaviourally adapt to staking restrictions

Evidence discussed in this report, both from the lab (Ladouceur and Gaboury, 1988) and from the actual Category B2 and B3 gaming environment (DCMS, 2016) demonstrates that players may modify their playing strategy in response to restrictions on stake size. In both of these studies (detailed in Section 7.1.8) there was evidence to suggest that players adapted to the restrictions on stake size by playing for longer periods of time at lower staking levels. Evidence, while preliminary, suggests that at least some problem gambling may manifest in an adapted way which still fulfills the gamblers needs yet may still expose to some level of harm.

²⁷ The data in this table pre-dates the law change permitting £100 maximum stake for Category C machines. The data was originally based on a £70 maximum prize.

²⁸ NMI is a Gambling Commission approved test house accredited to ISO 17025 and ISO 17020 for the testing and inspection of gaming machines, software and systems. For further details please see <http://www.nmi-gaming.com/> or contact gaming@nmi-gaming.com.

BOX 1. Contradiction in the House the Lords

The use of a £2 stake restriction to minimise gambling related harm was debated at the Gambling (Categorisation and Use of B2 Gaming Machines) Bill [HL] Second Reading in the House of Lords on March 11 2016. Lord Clement Jones, who moved for the bill argued:

“The essence of my Bill is to reduce the stake to £2 a spin. This is the maximum stake on gambling machines in all other easily accessible venues such as arcades and bingo halls. It will reduce gambling-related harm, prevent further betting shop clustering and restrict high-street money laundering.”

It was interesting to note, however, that in the same comments, debating this issue, Lord Clement Jones was critical of the recent DCMS attempt (discussed in in this report in Section 7.1.8) to minimise harm by requiring authorisation on bets over £50; this was in effect also a staking restriction, and importantly a softer restriction than an outright ban.

The criticism had been made that these specific staking restrictions were simply causing players to gamble for longer periods of time at lower stakes. Later, in support of his argument, Lord Clement Jones, regarding the intervention argued:

“The DCMS argues that increased session length may have led to more considered decision-making, but the time between spins increased only vary marginally. It is much more likely that players who used to stake up to the £50 to £100 range are simply losing their money more slowly. This would not represent more controlled play. The report concludes that the DCMS evaluation is flawed and cannot realistically be used as a reliable guide to policy.”

These two positions are contradictory. If the response to staking restrictions at £50 is to change playing style rather than stop play, there is a reasonable possibility that similar adaptation will emerge if restrictions were placed at £2. It is a concern that this evidence is being used as a supporting argument rather than being acknowledged as a caveat that ultimately weakens the position of the proposed bill.

In highlighting this example, we wish to draw attention to apparent misunderstanding that exists at a fundamental level among influential actors in this debate. As we argue below, taking poorly informed decisions threatens the long-term potential of harm minimisation efforts in gambling.

7.4.6 Limitation 5. Players may satisfy higher staking needs elsewhere

It is possible that following a £2 restriction on stake, players would substitute 'stake-restricted' gaming machine products for other gambling products available through other channels (e.g., Internet gambling). While the theory and evidence regarding displacement in gambling is limited, in Section 10, we consider potentially relevant evidence that might suggest that at least some displacement would occur, however, this is likely to be lower than some might suggest (see Section 10.1).

7.4.7 Conclusions: Restrictions on a £2 stake

The lack of valid and reliable evidence informing debate on this issue has frustrated stakeholders on all sides. However, drawing what we can from theory, evidence and some cautious interpretation, we suspect the positive impact of £2 stake restriction on Category B2 machines will likely be low. For the avoidance of doubt, we are not stating that a £2 stake restriction would not have any impact on reducing and preventing gambling-related harm. On the contrary, probably such staking restrictions will likely have at least some impact. Rather, we are saying that this strategy may:

- Not reach many of those experiencing problems;
- Have at least some unintended consequences for problem gamblers (e.g., longer sessions, substituting play to other forms of gambling);
- Have at least some negative impact on the playing experience of non-problem gamblers (e.g., by removing the value some would get from playing at higher stakes; see Forrest et al., 2015);
- Create complacency if the positive impacts on gambling-related harm has been overestimated. Complacency may stem from finally conceding to considerable pressure to reduce stake sizes. This has been perceived by some to be a 'silver bullet' response. In the likely event that this does not provide a miraculous fix, considerable momentum and goodwill may be lost, impeding ongoing harm minimisation efforts;
- Most importantly, require considerable resources which may divert attention, time and money away from potentially more effective, more efficient harm minimisation options.

Therefore, consistent with the advice given by RGSB in 2013 and in 2015, we suggest that a £2 stake restriction is not the most effective option for minimising gambling-related harm. Indeed, we go further to suggest that this would likely be among the more ineffective options particularly when prioritising the potential long-term impact. Each time policy makers yield to pressure in absence of any convincing argument or evidence (even if well-intended) progress in minimising gambling related harm becomes impeded.

At the end of this report, following our consideration of the key theory and evidence, we make broader recommendations for promising lines of enquiry for harm minimisation strategies and directions of further research.

7.5 Implications for Policy and Research

7.5.1 Stake: Implications for Policy and Research

The key issues to consider in relation to stake size are set out in Table 8, however, like much of the literature on structural characteristics, the evidence is relatively weak and the theory is under-developed. However, there are some basic assumptions and consistent findings that can immediately inform current choices regarding harm minimisation and directions for future research. First and foremost, restricting the cost of play may be a legitimate consideration for minimising gambling-related harm as it may impede the potential to experience financial harm. However, to do so requires careful consideration of the full range of determinants of cost of play: game speed, RTP, volatility and not just stake size in isolation. Restricting one structural characteristic while failing to consider the other factors may likely prove ineffective.

Table 8. Example Outcome with £30 bankroll at £2 stake on a B3 machine

Higher stake contributes to a higher cost of play	This assumes no other change in other determinants including game speed, RTP and volatility. Stake is the primary means by which players can vary the financial risk of a gambling game.
Higher stakes may impair decision-making during gambling	Initial evidence suggests that decision-making ability may be impaired by gambling for money and that this effect is more pronounced as stake increases. This is an interesting line of enquiry and should be examined in real gambling settings where participants are losing their own money.
Inducements for increased stake size may be a risk factor	Offering a higher RTP or access to exclusive game content at higher staking levels within the same game may encourage players to play at higher stakes than they can afford
Higher stakes may be more exciting	Higher staking behaviour may render gambling more exciting; however, the exact causes and consequences of this relationship remain unclear. Excitement, thrills and suspense are likely to attract consumers to gambling participation but may also encourage excessive play.
Within-game variability in staking may encourage loss chasing	When chasing losses, gamblers may vary their strategy to recoup money lost even if the conditions of the bet have not improved. Evidence suggests that raising stakes is a critical means by which players can chase their losses on a game in a particular session. Accordingly, stake variability permits players to increase their level of financial risk to chase losses, in real time, as they receive feedback on game outcomes.
Disordered gamblers play across the full range of stake sizes	At the highest staking levels, there is likely to be a disproportionately higher number of problem gamblers. However, problem gamblers play at a wide range of staking levels with the majority still playing at relatively lower staking levels.
Restricting stake size may prompt players to adapt their playing strategy	Preliminary evidence from real world and laboratory settings suggest that at least some problem gambling may manifest in an adapted way (e.g., like playing for longer at lower stakes) which still fulfills the gamblers needs yet may still expose gamblers to some level of harm.
Lower stakes gambling opportunities may increase the decision to participate	In theory, lower stakes gambling options may increase accessibility to a wider range of new players through increased affordability. However, opportunities to engage in gambling-related content are increased because of technology and social media.
Lower stakes gambling may increase time loss	Whether harm from time loss can be considered equivalent to harm from financial loss remains unclear. However, this is likely to be a more prominent risk factor for those consumers with higher disposable income and lower disposable leisure time.
Restrictions on stake size may in some circumstances disadvantage the customer	Restrictions on stake size may run counter to the interests of the consumer if it restricts the opportunity to bet in favourable situations.

Given that gambling losses are also determined by game speed, RTP, volatility (and not just stake size), it unsurprising that research using industry data on gaming machine behaviour revealed that problem gambling exists at the full range of staking levels. However, one of the

most interesting and potentially useful findings from the various research projects examining behavioural data from the Category B2 gaming machine data was that it added further context to nature of the relationship between stake size and problem gambling. As Parke and Parke (p.104, 2013), in their review of stake size concluded regarding range of staking:

“If a relationship with gambling-related harm exists in relation to stakes or prizes it may not necessarily be linear. For example, a low or moderately sized prize may alone be sufficient to provide optimal conditions for within-session chasing. It is also possible that excessive monetary loss may be possible at low to moderate staking levels even in the absence of high stakes gambling. For these reasons, depending on where such thresholds exist, restrictions on stakes and prizes may be less meaningful. Again a complicating factor is likely to be that such thresholds may vary across consumers according to individual (e.g., risk preferences, or trait-based arousal) and situational differences (e.g., disposable income, social support, state-based arousal). This should invoke due consideration from policy makers and guard against making simplistic harm minimisation decisions which potentially wrongly assume that increases will necessarily increase risk and/or reductions will necessarily reduce risk.”

For example, an important distinction emerged that around the £30 average staking level and higher there are a proportionally greater number of problem gamblers (Wardle, 2016). On that basis, it could be argued that regulatory intervention around the £30 stake size may be a more promising threshold for regulatory intervention relative to a £2 stake restriction. However, there are two reasons why this may not necessarily be the case. First, while more problem than non-problem gamblers play at higher stakes, most problem gamblers play, on average, at relatively lower stake sizes (Blaszczynski et al., 2001; Gainsbury & Russell, 2015; Wardle et al., 2014, Excel et al., 2014, Excel & Grudzien, 2016; Prentice & Woodside, 2013; Wardle, 2016). In relation to Category B2 gaming machines, note that only 4% of problem gamblers are betting at the maximum stake in at least 5% of their bets (Wardle, 2016).

Second, the outcome of the recent DCMS intervention (i.e., the Circumstances of Use Amendment; see Section 7.1.8) does not provide satisfactory evidence that restrictions at this staking level will be sufficiently effective in mitigating harm. In their evaluation, the DCMS (2015, p. 3) remain open to the possibility that the reduction in the amount staked over £50 could be a result of “the authorisation mechanisms have given them [players] greater control over their staking behaviour”. However, we see no justification for this claim. Rather it appears likely that, in order retain anonymity and avoid disruption, players changed strategy to play for longer periods at lower stakes, to some extent at least. This suggest that, while player behaviour has changed (in some way) in response to this intervention, there is little evidence that the intervention successfully mitigated harm. In our view, this initial trend of players adapting their play undermines the potential effectiveness of stake restrictions for minimising harm.

Beyond simply determining cost of play, staking behaviour may influence the cognitive processes governing how gamblers regulate their behaviour. Evidence is emerging that decision-making ability becomes impaired, to some extent, when gambling for money and that this impact increases as the stakes increase. While this is an important finding, we consider that at this stage, it is premature for this finding to directly inform harm minimisation initiatives before replication studies have been conducted. This finding requires experimental replication in similar laboratory conditions. More importantly, replication in real world gambling is required before the findings can be applied to harm minimisation

strategies with any real confidence. This preliminary evidence underlines the complexity of considering the impact of game structure.

Staking behaviour also appears to influence arousal. However, the relationship between arousal and problem gambling remains unclear. This is to be expected given the considerable ethical and methodological challenges of observing gamblers in heightened states of vulnerability (i.e., when they are losing more money than they can afford). Currently, experimental paradigms better approximate a 'freeroll' situation or 'playing with house money' gambling. Put simply, laboratory experiments often reflect a 'win/no win' situation as opposed to a 'win/lose' situation. We suggest a priority for research should be to develop a better understanding of the link between stake size, financial loss and arousal. What makes these issues so complicated is that these consequent states that increase vulnerability among some gamblers are also the same states that motivate participation and provide enjoyment to others.

There is mounting evidence to suggest that within-game staking variability is strongly associated with problem gambling. However, the exact process by which staking variability either leads to or reflects problem gambling remains unclear. Theory and emerging evidence has suggested that, in response to losses, an escalation in the size of stakes could be because of:

- a) the desire to recoup unplanned, excessive losses;
- b) the deterioration in ability to think clearly and/or;
- c) erroneous thinking that a greater probability of immediate future success because of a recent history of losing outcomes (e.g., that winning outcomes are now due).

However, there remains insufficient evidence reflecting real gambling behaviour to confirm that these propositions are valid, that they reflect most problem gamblers in most situations, and practically, provide sufficient guidance for effective intervention. One of the most compelling arguments for this is the fast rate of change in gambling products and the environment in which they are offered. Accordingly, further exploration of the link between staking variability and problem gambling is a priority for seeking a better understanding the value of staking restrictions.

This is particularly needed in real gambling settings where the sums of money being staked (and observed) are considerably higher than the amounts being staked in gambling research experiments. Importantly, it is not clear at this time whether there may be unintended consequences from creating restrictions in staking variability. For example, on one hand, mandating a fixed stake of £0.20 may be too low to be effective particularly if it drives gamblers to other forms of gambling by reducing appeal to the broader population of gamblers. On the other hand, mandating a higher fixed stake size may draw consumers into a cost of play higher than they can reasonably afford. Considering the potential for unintended consequences further, restricting staking variability may also remove the option to decrease risk by reducing stake size among some players. If robust and reliable evidence points to the increase of stake by problem gambling over the course of the session, then higher fixed stake options may, perhaps counterintuitively, pose less risk than variable staking options. In practical terms, offering only one staking option of £100 may facilitate less harm than a gaming machine with a much wider staking range (i.e., £0.20 to £100).

In summary, stopping players from spending more than they can afford is important. However, restricting stake size while failing to consider the other cost determinants will

likely prove ineffective. That is not to say that stake size is unimportant in the overall gambling experience. On the contrary, the size of a bet appears to be very important in the very broadest sense including not just its effect on cost but also on satisfying needs (e.g., excitement), extracting value (e.g., bets identified as favourable), or even disrupting a player's ability to exert self-control over their gambling.

7.5.2 RTP: Implications for Policy and Research

The key issues to consider in relation to RTP are set out in Table 9. First, it is likely in the British context that players may find it difficult to determine RTP when playing gaming machines; particularly at higher levels of volatility. When playing more volatile games, players may come to expect extended losing periods (and enriched winning periods) as part of play. In situations where it may be difficult to determine RTP, it is important to protect players either through a mandated minimum or by ensuring that cost of play is clearly communicated to players. The current policy position in Great Britain aspires to the latter.

In some ways, the devil will be in the detail regarding precisely how operators must adhere to the RTPs being advertised and to what extent there should be consistency in how RTPs are being achieved. As discussed, it may prove problematic to offer a low target theoretical RTP at one point in time for a particular machine, but a high target theoretical RTP at another point in time. This may be the case even if, on average, RTP conforms to the RTP being advertised on the game. Micro-level variations in RTP may cause confusion, frustration and may encourage a skill-based component to machine selection may lead to problems. There may be negative implications of micro-level variations in RTP. However, these require considerably more research to better understand the nature of the problem and its impact on problem gambling. A first action would be to observe whether these practices do indeed exist, and determine their exact nature and extent. If such 'micro-level variations' in RTP do exist, then it will be important to critically understand the implications for problem gambling specifically, and for all gamblers more generally, in the interest of providing 'fair and open gambling.'

It remains unclear whether minimum RTPs should be mandated for the purposes of consumer protection. This may, in part, be a consequence of the potentially counteracting impacts of RTP on player behaviour. On one hand, a higher RTP generally offers the consumer an opportunity to gamble at an average lower cost (i.e., a protective factor) while simultaneously offering a more rewarding or exciting experience which for some may facilitate excessive play (i.e., a risk factor). Moreover, RTP contributes to price, and like most consumer goods, a higher price (i.e., a lower RTP) may indicate more value through better entertainment. Even in social gaming contexts, where consumers can pay to play yet do not win real money (effectively a 0% RTP) this may prove less problematic because it removes the financial incentive to chase losses (Parke et al., 2013). The challenge for protecting players however is one of disentangling conscious decisions to pay for a 'better product' from exploitative tactics. Persuading customers to increase spending is a necessity of business; however, in contexts where risks are high, conditions for marketing and requirements for transparency demand careful consideration.

Table 9. Summary of Key Points on RTP

RTP is likely to be difficult for players to detect in real gambling scenarios	Although some evidence suggests that players can detect differences in RTP in similar games, these research scenarios usually involve large RTP differentials and artificial lab conditions. RTP is more difficult to determine in more volatile games.
Optimum range of RTP for player protection is complex	Setting specific guidelines regarding RTPs including a minimum, a maximum or restricting variation across games and venues is complex and further research is required.
Higher RTP is associated with lower game volatility	Volatile games can make it harder to detect differences in RTP. However, players may also be willing accept lower RTPs if other rewards are on offer such as a high jackpot or entertaining game content.
A higher RTP contributes to a lower cost of play	RTP combines with speed, stake and volatility to determine cost-of-play over any given period. However, volatility usually has the more noticeable influence on game outcomes on a session-by-session basis.
A higher RTP yields more wins or higher value wins	This may provide a more reinforcing and exciting experience which may encourage problem gambling (see Section 6 on reward characteristics).
Variations in RTP at a micro-level may be problematic	Variations in RTP on similar games may stimulate perseverance or an over-estimation of skill both of which may be related to excessive play.
RTP communications perceived as confused and potentially misinterpreted	An individual session may vary considerably from the advertised RTP; particularly when playing volatile games or if the player does not consider re-staking wins when considering their own RTP.
Higher RTP games associated with higher stakes	Players may be tempted to play at stake levels they cannot afford if up-staking means a higher RTP or better game content.

There are however, some areas for suggested improvement that we consider to be more straightforward. For example, consideration should be given to whether increases in stake size should be encouraged by offering a higher RTP or the opportunity to win exclusive bonus game content within the same game. While offering enhanced content at a higher price is a reasonable pricing strategy in most consumer contexts, this is not ideal where significant consumer protection concerns exist. This is particularly important in situations where over-estimating the positive effects of RTP increase may result (Collins et al., 2014).

Two potential options are worth considering here:

- a) establishing a principle that RTP and game content remain the same across all staking levels for identical games, or alternatively, in lieu of the first option;
- b) games should not directly advertise uplifts in RTP or enhancing game content based on increases in stake.

Indeed, Harrigan and Dixon (2010, p. 173) argued that: “*based on the concerns that we have raised in this paper regarding multiple versions of the same game, we feel that jurisdictions should consider approving only games with a certain payback percentage such as 85%, or perhaps a small range such as from 85.0 to 87.0%*”. For this reason, concealing small increases in RTP may be just as effective as maintaining RTP levels of across all stakes. The reason being that based on evidence presented here, it is unlikely customers could detect differences between 88%-92% RTP between games and terminals.

Notwithstanding the need for an operator to communicate cost in the absence of a minimum RTP, we question both the utility and feasibility of communicating RTP in isolation as a solitary metric. There are concerns that players do not necessarily attend to RTP information and that if consumers do use this information they may do so incorrectly with potentially harmful consequences. For this reason, it may be premature to take a policy decision on this issue without further research that examines optimal strategies for delivering RTP information and its behavioural impact. It is clear however that existing content and delivery of RTP messaging is not achieving its intended purpose. Indeed, future considerations around RTP should include reviewing its intended purpose in relation to player protection. Until we know precisely what we want consumers to know about RTP it is difficult to know precisely how this should be achieved.

In terms of future directions for research and policy, it will likely be more meaningful to the consumer to provide an indication of the typical cost of play in an individual session. Accordingly, communications should include a combined metric which may integrate RTP, game speed, stake size and game volatility to provide an indication of the typical cost of play. Communicating the typical cost of play is a difficult task because the player experience can vary widely even though it may be the same game, played at the same stake, played at the same RTP. While the ‘average theoretical expected loss per hour’ would be an improvement versus a solitary RTP metric, it may still be misinterpreted as it ignores volatility. The precise nature and delivery of this information should be a research priority. Additionally, we suggest that emphasis on cost in any communication would reinforce that a gambling activity is a form of amusement and not a source of income. We will revisit the issue of communicating structural characteristics to customers in the report conclusions where we consider all game characteristics.

7.6 Recommendations

- A first step in helping gamblers control their spending is promoting awareness of potential cost. This necessitates information from a variety of structural characteristics including speed, volatility, stake and RTP. The inherent challenge is striking the right balance between the need to make it perceptible and comprehensible, while not compromising the accuracy or meaning of the message. For example, while specific recommendations on this point are beyond the scope of this review, statements such as “*in around 80% of sessions someone staking £2 per spin will lose between £50-£200 in 30 minutes.*” A similar message could be constructed for typical expectations for winning sessions. If gambling is to be seen as a legitimate leisure activity, it is imperative to be as transparent as possible regarding the costs to engage in that leisure activity.
- Despite outlining the limitations of a restriction of £2 stakes on Category B gaming machines, ongoing consideration of options to limit financial harms through restricting cost of play is important. Evaluating the potential effectiveness of this option requires not only a detailed understanding of the relevant structural characteristics but also weighing up whether restrictions on cost of play could be managed more effectively and efficiently through account-based play rather than blanket restrictions on game design.
- Marketing products where there is an element of risk to the consumer requires careful consideration. With specific regard to RTP and stake size, there is merit in considering the restriction of incentives (e.g., higher RTP, enhanced game content), intended or unintended, to players to increase stakes within the game. Content should be broadly similar across different staking levels in the same games. It could

be presented as a requirement for all newly designed games to avoid issues associated with the considerable costs of redesigning all existing games. Upselling in gaming machine contexts presents critical challenges for promoting responsible gambling. We recommend that specific consideration should be given to guidelines in this area.

- More research is needed to better understand the relationship between RTP and problem gambling. We believe that success in protecting consumers using RTP will be achieved through providing an improved understanding of how RTP affects game play and ensuring it does not mislead or confuse players. Those tasked with educating consumers require a clear understanding of the potential effects of RTP on gambling behaviour both in the long-term and short-term if this is to be passed on to customers.
- Recent evidence suggests that variable staking behaviour is strongly associated with problem gambling. Various logical explanations exist for why this may be the case; however, the evidence supporting these explanations is lacking. It is important that future research, especially using industry held data in real gambling environments, gives focus to better understanding this association. Research should also explore the potential of restricting variation in stake rather than simply placing a ceiling on stake size.

8 PAYMENT AND ACCOUNTING CHARACTERISTICS

This section considers some of the key payment options for gambling activities in Great Britain and how these may be associated with problem gambling and gambling-related risk. Design issues that might affect decision-making regarding collecting (i.e., stopping play in a game with funds available) or withdrawing funds (i.e., remove from a betting account or gaming terminal) will also be considered.

The issues of account-based gambling and pre-commitment are critical to the harm minimisation debate; however, these operations-based issues are beyond the scope of this current review and have been covered in a previous report by the current authors (Blaszczynski, Parke, Rigbye & Parke, 2014) and in reviews in other jurisdictions (e.g., see Thomas et al., 2016 for a thorough review focusing specifically on account-based gambling and pre-commitment).

8.1 Payment Transparency and Gambling Expenditure

As early as 1978, researchers have been speculating that using non-cash payment instruments in gambling may lead to over-spending relative to cash payments because they 'disrupt financial value' or 'suspend judgement' (Cornish, 1979; Griffiths, 1993, Griffiths, 1999a; Parke & Griffiths, 2006; 2007; Griffiths, Parke, Wood & Parke, 2006). There has been subsequent empirical support for these claims in relation to poker chips (Lapuz and Griffiths, 2010) and internet gambling (Cole, Barret & Griffiths, 2011). However, initial research suggests that this effect does not vary according to problem gambling status (Nower & Blaszczynski, 2010).

While evidence of this effect in gambling is growing, theoretical explanations have been lacking. In other words, it is important to understand *how exactly does financial value become 'disrupted' when gambling*. The evolution of payment characteristics in recent years means that the convenience of purchasing has improved considerably. An implication of this advancement is increased difficulty in tracking spending and evaluating affordability (a process referred to as 'mental accounting'; see Thaler, 1985). In turning to the empirical evidence in the broader field of consumer research, there seems to be three processes at work which contribute to this effect:

- A "*decoupling effect*": Non-cash payments obscure (or 'decouple') the true cost of consumption from the financial transaction (Prelec & Lowenstein, 1998). The mechanism behind this effect is a lower level of transparency with electronic methods relative to the physicality of cash payments (Prelec & Lowenstein, 1998; Raghuram & Srivastava, 2008). This may occur through a sensory process whereby the visual and physical tangibility of notes and coins reinforces the financial loss (Khan, Belk & Craig-Lees, 2015); contributing therefore to an increase in the 'pain of paying' (Zellermayer, 1996; as cited in Prelec & Lowenstein, 1998).
- A *reduction in the "rehearsal effect"*: Payment characteristics which require the sum to be articulated or written down, better reinforce the value and impact of a financial transaction (Soman, 2001). Relative to cheque or cash, electronic methods of payment may generate a more passive payment process. In cash payments, for example, it is necessary for the user to attend to the specific amount owed and then search, calculate and count before transacting. In contrast, when using a debit card,

for example, the user can be less engaged as they hand over the card without necessarily needing to attend to the specific details of cost, count out money owed, or generally engage in a more elaborate financial transaction.

- *A reduction in the “immediacy” of wealth depletion:* Electronic payment methods may involve a delay in wealth depletion relative to cash which may reduce the intention to purchase (Soman, 2001). This intertemporal effect is yet more pronounced with payment instruments providing credit as wealth depletion may be further delayed until debts are repaid (e.g., credit cards).

While this literature relates to consumer spending in general, it does provide a useful theoretical basis to better understand the emerging findings and associated concerns relating to electronic payment methods in gambling. A potential exception, however, may be the issue of rehearsal. Debit card payments in gambling will usually require the user to take a more active role in the transaction; specifically, they must decide and articulate the amount they are willing to deposit before spending. This contrasts with debit card transactions in most other retail contexts where spending precedes payment thereby committing the consumer to pay a specific amount, thus, enabling a more passive role in the transaction as discussed above. It is also true that in most cases a debit card transaction will have an immediate effect on wealth since purchasing ability is often immediately restricted even though the transaction may not appear on the account for a few days.

Key Point

- The use of non-cash payment instruments may lead to overspending because the wealth impact of a transaction is argued to be less obvious, less tangible and requires less thinking on actual amount being spent.

8.2 Remote Loading via Debit Card

8.2.1 Remote Loading via Debit Card and Problem Gambling

In Great Britain, some venues offer the option to pay for bets or to play gaming machines by using a debit card. However, it is important to note that using a debit card directly at the gaming machine terminal is prohibited by the Gambling Act, 2006. Instead, debit card payments must be made remotely from the shop counter by a member of staff; this is a process referred to as ‘remote loading’. Remote loading can either be done using cash or debit card. Like Automated Teller Machines (ATMs) and some forms of electronic funds transfer, remote loading using debit card (RLDC) offers access to additional funds direct from a bank account.

There is currently little empirical research which directly examines the link between RLDC and problem gambling. White et al., (2006), in an international stakeholder consultation study, reported that direct electronic fund transfers at a gaming machine was identified as a likely contributor to problem gambling. This payment mode was one of the highest ranked game characteristics that experts viewed as most likely to contribute to problem gambling. Furthermore, out of 76 potential game modifications, experts rated the removal of this payment method as most the important machine modification for reducing problem.

More recently, in Great Britain, there have been suggestions that the short break in play and staff interaction required in RLDC transactions could facilitate self-control, improve decision-making and ultimately serve as a ‘reality check’. For example, DCMS have suggested

that the requirement to remote load payments for all stakes of £50 or more (see Section 7.1.8 for a detailed description) were in part driven by this rationale (p. 8, DCMS, 2015): *“The intended effect of the policy is that customers will benefit from improved interaction and more conscious decision-making and therefore greater control. Making staff interaction a component of high staking machine play ensures greater opportunities for intervention where patterns of behaviour indicate that someone may be at risk of harm from their gambling, or for other reasons, such as preventing crime. Stakeholders have indicated regular interaction can give players a reality check.”* Further, in a stakeholder consultation reported by Parke et al., (p. 61, 2008), the Association for British Bookmakers (ABB) concluded in their submission that: *“...where debit cards are used, there is no greater ‘reality check’ than, having lost your money, to revisit the counter to ask a human to allow you to spend more”*.

Further explanation of the theoretical and empirical bases of the claims are required in order to adequately justify this position. Presently, there appears to be a lack of the following:

- Clear guidance in licensing conditions about how and when staff should ‘interact’ with customers who appear to be experiencing gambling problems;
- Valid and reliable evidence that staff are indeed interacting in a timely and effective way and;
- Valid and reliable evidence that staff interaction is having sufficient impact through reducing associated risks and harms, and promoting responsible gambling.

Without further justification, it is not clear that RLDC interactions would necessarily have the harm minimisation impact being suggested. Moving across the shop floor to hand staff a debit card seems unlikely to be sufficient on its own to promote awareness and facilitate self-control among customers.

8.2.2 Remote Loading and Access to Additional Funds

There is a growing body of evidence suggesting that providing access to additional funds in a gambling venue is a potential risk factor for problem gambling. Further, problem gamblers are more likely to use an ATM to withdraw additional funds to continue gambling which may lead to overspending (Blaszczynski, Parke, Rigby & Parke, 2014; Ladouceur, Blaszczynski & Moodie, 2008; McMillen, Marshall & Murphy, 2004; White et al., 2006); and withdrawals were also found to be larger and recurrent among problem gamblers (McMillen, Marshall & Murphy, 2004; Productivity Commission, 1999).

Problem gamblers report that the removal of ATMs from gambling venues is one of the most effective harm minimisation options available (Caraniche Pty Ltd., 2005; Alberta Gaming and Liquor Commission, 2007: *as cited in* Williams, West and Simpson, 2012). Consistent with this finding, a large-scale evaluation of ATM restrictions has demonstrated a range of initial positive impacts on problem gambling. Specifically, in Victoria, Australia, a ban was reported to be effective in reducing the amount time and money spent, and improving control among moderate and problem gamblers (Thomas, Pfeifer, Moore, Meyer, Yap & Armstrong, 2013). Theoretically, it is argued that without immediate access to additional funds to continue gambling, individuals would need to forward plan spending intentions; a concept comparable to a pre-commitment responsible gambling strategy (Blaszczynski et al., 2014). Gamblers seeking additional funds to continue gambling would need to access an ATM outside the venue; a situation which, depending on proximity, may constitute a break in play (Productivity Commission, 2010). This ‘break-in-play’ argument does have some empirical support. Interviews with problem gamblers in Australia have suggested that the

necessity to leave a venue to get additional funds to continue gambling provides a ‘cooling-off period’ which may allow gamblers the opportunity to consider the implications of their gambling (McMillen et al., 2004; Thomas et al., 2013). One participant stated: “*When I’m away from the club I can see the stupidity of it all. In my lucid moments I’m determined not to do it again but it’s all too easy, the way the whole system is set up*” (McMillen, et al., 2004, p.168).

It should be noted, however, that player interviews revealed that a minority of participants felt that severe problem gambling would persist with less convenient means to obtain more funds for gambling: “*Whether the [ATM] machines are there or not is ‘irrelevant’ for serious gamblers who would find other ways of obtaining money if they needed to*” (McMillan et al, 2004, p. 168).

8.3 Choice Architecture and Accounting Decisions

There are grounds to suggest that gamblers, and problem gamblers would benefit from help in making appropriate decisions about affordability while gambling. This is, in part, because impulsive decisions may be taken to continue gambling because of deficits in emotional regulation, the effects of conditioning, or financial pressure to chase losses (Delfabbro, 2014; Lesieur, 1984; Williams, Grisham, Erskine & Cassidy, 2012). Thus, helping gamblers to make, and adhere to, appropriate decisions may hold promise for responsible gambling strategies.

To explore this possibility further, we draw here on the emerging principles of choice architecture. Choice architecture refers to how variations in the presentation and design of situations requiring a decision may yield different decision outcomes (Thaler & Sunstein, 2008; Thaler, Sunstein & Balz, 2012). For example, presenting fruit at eye-level at a supermarket checkout (rather than sweets, for example) may increase the probability fruit being purchased. In a similar way, the presentation and design of gambling opportunities and their environments (both online and offline) may impact upon gambling-related decisions around affordability, mental accounting and stopping behaviour. In this regard, gambling operators and gambling software providers are ‘choice architects’ (Johnson et al., 2012; Thaler et al., 2012) based on how games and environments are presented.

While some see choice architecture as being a new policy lever to promote public health and consumer well-being (Johnson, et al., 2012) there remain serious concerns about the ethical challenges in how choice architecture is used in commercial settings. Perhaps the most obvious of these challenges is the assessment of whether designs ultimately serve consumers’ or sellers’ best interests (Munscher et al., 2015; Thaler et al., 2012).

It is with these principles in mind that we examine some of the key structural features that may influence accounting decisions in online or offline gambling contexts.

8.3.1 Deposit Defaults

For any given decision, a default option exists. The simple yet impactful nature of a default is explained particularly well in the following extract (p. 430, Thaler et al., 2012):

“For reasons of laziness, fear, and distraction, many people will take whatever option requires the least effort, or the path of least resistance. All these forces imply that if, for a given choice, there is a default option—an option that will obtain if the chooser does nothing—then we can expect a large number of people to end up with that option, whether or not it is good for them. These behavioural tendencies toward doing nothing will be reinforced if the default

option comes with some implicit or explicit suggestion that it represents the normal or even the recommended course of action.”

Figure 4 is illustrative of how the principles of least effort and normative influences, alluded to above, may be used in a gambling context. The example image illustrates an interface for a deposit facility where a default deposit size has been pre-selected. The default is positioned as ‘popular’ although there is no explanation for what popular means. However, it could be argued that normative values such as these are unlikely to promote responsible gambling. Defaults exceeding a customer’s typical deposit amount (e.g., this customer typically deposits less than £50) are unlikely to promote responsible gambling. In this example, based on the principles of choice architecture, this design would potentially increase the chance of the customer escalating the deposit amount. Furthermore, emphasis should be placed on the customer making a conscious decision in relation to evaluation of current affordability and not just typical behaviour. Additionally, as a responsible gambling strategy, the default deposit limited could be set at the minimum deposit amount requiring that the consumer must actively decide to deposit more than the minimum.

Figure 4. Example of Default Options for a Deposit in Remote Gambling

The screenshot shows a deposit form with the following elements:

- Card Number: [Redacted]
- Expiry Date: [Redacted]
- Card Verification Number: [Input field]
- Charge Amount (GBP): Three buttons labeled 30, 50, and 100. The 50 button is highlighted in yellow and has a red ribbon with the word 'Popular' above it.
- Custom: A button labeled 'Custom'.
- Your account will be credited: \$64.69
- (USD max 640)

8.3.2 Facilitating Withdrawal Decisions

Gambling-related harm refers to any significant negative consequences which result from gambling more than what the consumer can afford in terms of either time or money (Blaszczynski, 2013; Blaszczynski, Ladouceur and Moodie, 2008; Neal Delfabbro and O’Neil, 2005). Critically, therefore, facilitating and not inhibiting the consumer’s decision to stop and collect during a gambling session, should be at the heart of promoting responsible gambling.

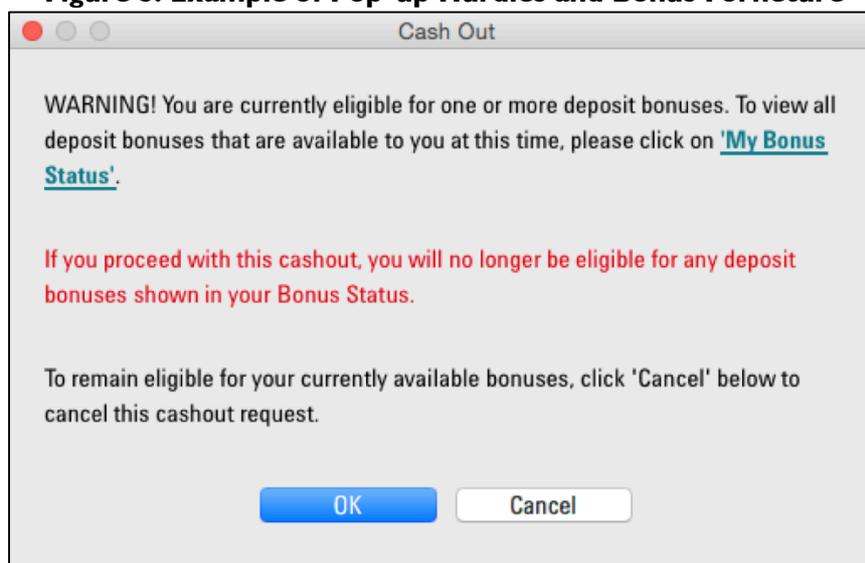
Choice architecture can help consumers adhere to their decisions if important or obvious information is overlooked because of deficits in attention or cognitive capacity (Munscher et al., 2015). Given that impulsivity, and deficits in attention and cognitive capacity, are strongly associated with problem gambling (Goudriaan et al., 2006; Lawrence et al., 2009; Sharpe, 2003), this suggests that decision assistance may be well suited to a gambling context. Accordingly, design features promoting decision assistance may be an important addition to the RG tool kit. As Munscher et al., (2015) explained: “Facilitating commitment is thus a way to help people to overcome constrained self-control and bridge the intention-behaviour gap”. Thus, there should be no restrictions placed on the consumer’s decision to collect or withdraw funds, unless there is a compelling reason to do otherwise.

Examples of design principles that could be argued to inhibit withdrawal decisions include:

- *Pop-up hurdles and bonus forfeiture.* Bonuses which encourage players to reconsider withdrawal intentions should be carefully examined (see Figure 5). Even in trying to prevent abuse of promotions, it is important to ensure that this is not used inappropriately to dissuade the gambler's intention to collect or withdraw.
- *Unnecessary limits on the number of withdrawals or unnecessary delays in processing withdrawals.* Limits or delays applied to customer withdrawals may reflect certain compliance requirements such as anti-money laundering checks. Alternatively, these restrictions may reflect costs associated with financial transaction.
- *Choice architecture emphasising deposits rather than withdrawals.* This is explained below.

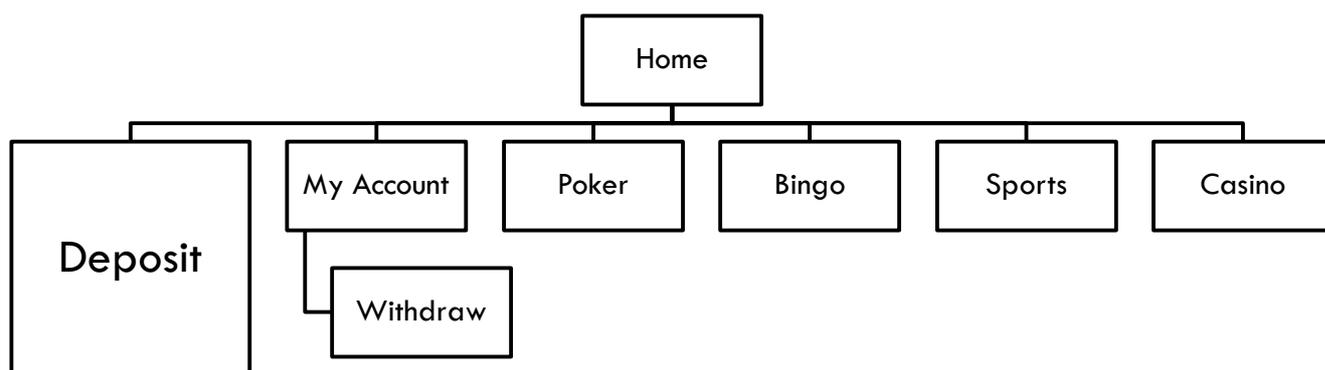
It is important to note that these examples are illustrative only and intended to demonstrate how choice architecture may inhibit rather than facilitate responsible gambling decisions. While these examples are genuine, the extent to which they are adopted across the gambling industry remains unclear.

Figure 5. Example of Pop-up Hurdles and Bonus Forfeiture



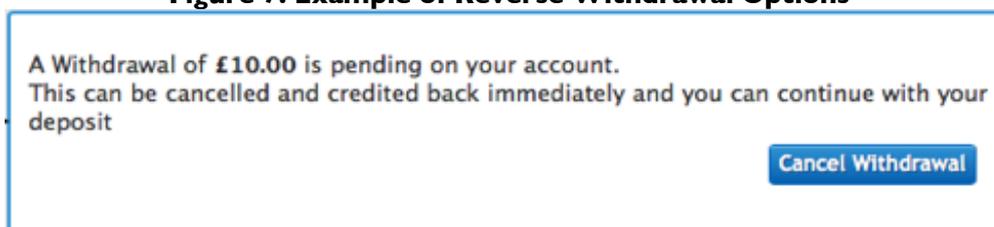
8.3.3 User Interface and Accounting Decisions in Gambling

Choice architecture may 'pad the path of least resistance' for decision-making (p. 430, Thaler et al., 2012). Whether gambling on a website or at a gaming machine terminal (offline) the user interface is a basic feature of choice architecture guiding a wide range of choices including accounting decisions. Consider the following hypothetical site map of a user interface for gambling (see Figure 6). Here, deposits are prioritised by making the deposit facility immediately available and prominent on the home page or main menu. By contrast, the withdrawal facility is two clicks away and initially concealed in the sub-menu options. According to the principles of choice architecture, facilitating deposits in this way through increased accessibility via the user interface could make it easier to redeposit funds and continue playing.

Figure 6. Example of Choice Architecture Prioritising Deposits

8.3.4 Reverse Withdrawals

The term ‘reverse withdrawal’ refers to the option for a customer to cancel a pending withdrawal request (see Figure 7) and emerging evidence suggests that use of this feature may be a risk factor for problem gambling. Haeusler (2016) analysed the transactional data generated by 2696 customers from the online gambling operator Bwin.com and reported that self-excluders (a proxy that was used for problem gambling) were more likely than a matched control group of non-self-excluders to use this function and to reverse larger sums.

Figure 7. Example of Reverse Withdrawal Options

There may be various explanations for this association. Consistent with concerns expressed in this section around decision assistance, the permitting of reversals do not facilitate adherence to an initial decision with withdraw.

8.4 Implications for Policy and Regulation

In the field of gambling studies, an absence of evidence often restricts policy development and can limit the level of specificity used in regulation and licensing conditions (Błaszczynski et al., 2014). However, relative to other strategies at least, restricting access to additional funds does have empirical support for having some positive impacts on behaviours associated with problem gambling. While evidence often relates to ATMs these findings will likely also have implications for RLDC. Both permit further access to funds within the gaming venue. Because of the nature of the non-cash transactions, and fewer restrictions on the amount that can be deposited, remote loading via debit card may represent a greater risk for problem gambling than ATMs

In our view, given the available theory and evidence, we consider RLDC to play category B2 and B3 gaming machines is very likely to substantially increase the risk for problem gambling behaviour and subsequent gambling-related harm. At the very least, we believe that this is an

issue that warrants a focused investigation by the regulator. There are a number of potential options to consider for mitigating risk here including but not limited to:

- Removing the option to use debit cards in remote loading altogether;
- Restricting the number of times debit cards can be used;
- Placing a daily limit on the amount that can be withdrawn using debit cards and;
- Exploring options to permit customers to voluntarily block gambling-related payments using relevant merchant category codes associated with debit card transactions.

By contrast, there appears to be little available empirical support for the effectiveness of staff interactions as a harm minimisation strategy during remote loading payments; at least at this present time. If the impact of remote loading via debit card is a trade-off between the protective factors associated with staff interaction and the risk factors associated access to additional funds, then there is an urgent need to demonstrate the appropriate development, operation and impact of ‘interventions’ (not just ‘interactions’) from staff.

The role of decision assistance using choice architecture was discussed. While there is little directly relevant research examining choice architecture and problem gambling, there appears to be a strong case that the design features of a user interface could influence gambling-related accounting decisions.

It seems reasonable to suggest that a gambling operator purporting to be socially responsible should not adopt strategies designed to push deposits and frustrate withdrawals; particularly when the accounting decisions of its customers play such an important role in associated risks and harms.

However, there are challenges that need to be considered:

1. The conflict of interest between the operator (to maximise revenue) and the customer (to satisfy leisure needs in an affordable way) needs to be acknowledged and appropriately managed;
2. A deep understanding of potential impacts of decision assistance or decision thwarting is not known. For example, to what extent, does the requirement to search for the withdrawal or collect button inhibit the gambler’s decision to stop and collect?

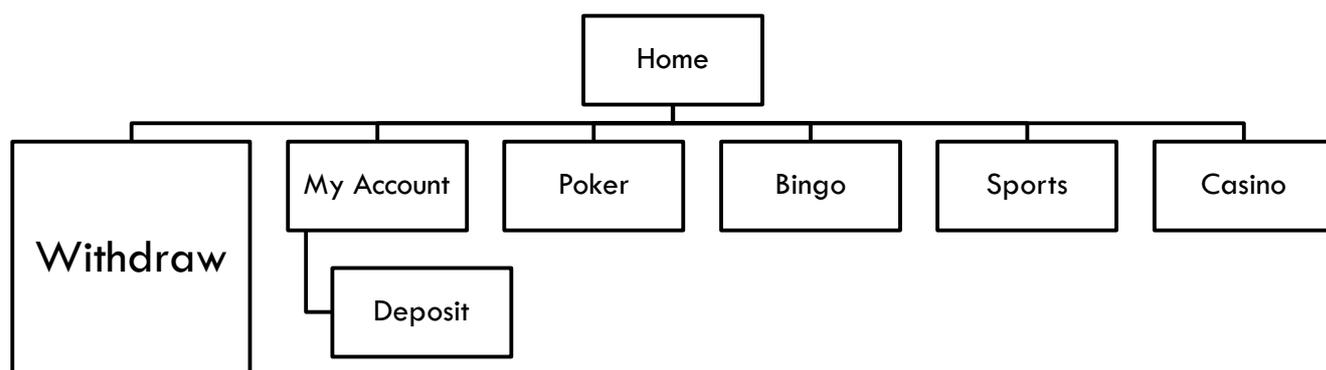
Regarding the use of decision assistance, it is important to acknowledge concerns regarding the possibility that sellers may tip choice architecture in their favour, and not consumers (Thaler et al., 2012). Indeed, gambling executives may argue that they are within their rights, and indeed obligated, to use design strategies to drive business growth. This is unquestionably true, and as consumers, we are increasingly finding ourselves grappling with designs in consumer transactions (in other, non-gambling domains) that try to lead us one way while we seek out another. However, some qualifications of such a position are required:

1. Gambling products and services occupy special status, given the potential for associated risks or harms. For this reason, businesses must comply, as a condition of license, to protect the vulnerable;
2. If a gambling business is positioned as a proponent of responsible gambling, (or even a leader as some operators claim) then player protection is an obligation much like business growth.

As regulations and codes of practice evolve, a priority should be to specify best practice in relation to responsible design principles. Accepting there is much to learn about the role of choice architecture, we believe operators should adhere to some basic principles. First, products and environments should be designed to facilitate, rather than challenge a consumer's decision to stop gambling and withdrawal. There may be some legitimate reasons (e.g., anti-money laundering protocols) for an operator to place restrictions on customers wanting to withdraw their money. However, such reasons should be robustly verified by regulators and clearly communicated to players. Where restrictions are deemed legitimate, consideration should be given as to whether restrictions (e.g., verifying identification) should also apply to deposits and not simply withdrawals. Where processing delays for withdrawal requests are unavoidable, consumer led options to block funds immediately following a withdrawal request could also be considered.

Second, clicks required for withdrawals should not exceed those required for deposits. Indeed, a case could be made that withdrawals should be prioritised to promote responsible gambling. In other words, nudge the customer to think twice about decisions related to spending rather than collecting (in Figure 8, by comparison with Figure 6, the withdrawal button has now been prioritised by making it more accessible). By placing the deposit hyperlink in a sub-menu, this may prompt more considered decisions in relation deposits and reloads.

Figure 8. Example of Choice Architecture Prioritising Withdrawals



Some examples of what this may look like in the British context include:

- A requirement for a prominent collect button on all categories of gaming machine terminals (e.g., it should not be concealed in sub-menus on the touchscreen);
- A requirement for a prominent withdraw option on gambling websites which is immediately available at all times (either via home screen or via the game interface).

Ultimately, fair and ethical applications of choice architecture in the gambling industry may hold promise for developing and promoting responsible gambling. While empirical evidence would be useful to better understand exactly how and to what extent this influences problem gambling, we would suggest that accepting the principle to facilitate rather than frustrate consumer decisions to withdraw is a reasonable starting point.

8.5 Recommendations

- There is reasonable evidence to suggest that the option to use debit cards to play gaming machines through remote loading in venues is a significant risk factor for problem gambling. Similar concerns also exist in relation to ATM use and

contactless payment from digital wallets (e.g., Apple Pay). We therefore suggest that more restrictions (see above) should be considered in relation to these facilities.

- Policies around choice architecture to facilitate and enforce withdrawal decisions should be required. This could start with the general requirement to avoid facilitating deposits more than withdrawals. Subsequent research should then develop the specific aspects of these policies (most effective and efficient ways to support withdrawal decisions).
- Options to cancel pending withdrawal requests should be restricted. Some operators offering this option to reverse withdraw also permit this option to be removed as a responsible gambling option. This should be a minimum requirement including promoting the availability of this option to players.

9 INFORMATION CHARACTERISTICS

9.1 Definitions and context

Cognitive factors account for erroneous and irrational beliefs related to concepts of randomness, probabilities, mutual independence of chance events, and failure to understand return to player percentages and machine volatility resulting in illusions of control, gambler's fallacy and superstitious behaviours (Walker, 1992). Attempts to mitigate risk have taken the form of informational/educational campaigns that are designed to inform players of (a) the inherent 'addictive' nature of gambling and its potential to cause harm, (b) display probabilities of winning, (c) foster reappraisal of within session expenditure to encourage informed decision-making regarding continuation of play, and (d) personalised feedback allowing players to compare behaviours against normative standards. Additional information on available treatment facilities and telephone helpline services are also offered. For informed choices in decision-making to be made, information provided to players must be relevant to the product, full and accurate in content, readily accessible and understood, and delivered in timely manner and location (Blaszczynski, Ladouceur, Nower, & Shaffer, 2008).

Setting aside public media educational campaigns, informative messages are generally made available in venues through the prominent placement of brochures and leaflets in various locations on the gaming floor, on printed stickers physically located on machines, or presented on-screen in the form of pop-up or dynamic messages scrolling across the gaming machines screen. Static or dynamic messages may cause a temporary suspension of play, or appear in translucent form allowing continued play. Additional information describing the operation of certain forms of gambling, return to player percentages, and concepts related to probabilities are also available online.

It can reasonably be argued that the pop-up messages can potentially exert a positive effect through multiple modes of action. At the basic level, printed and electronically delivered messages are deemed to inform individuals of the probability of winning instilling a more realistic expectation of outcomes, or to caution/raise awareness of the possible negative consequences and addictive nature of gambling. These messages are predicated on the assumption that individuals typically are ignorant of the probability of winning jackpots, and/or the risk associated with excessive play, and that drawing attention to these aspects will improve knowledge and subsequently, reduce risky behaviours. These messages are directed towards reducing illusion of control that contribute to players overestimating personal skills and probabilities of winning. The primary aim is to maximise informed choice in decision-making.

Personal appraisal messages are hypothesised to influence play by drawing attention to the amount of time and/or money already spent on the machine. In so doing, individuals are then required to evaluate their decision as to whether to resume continued play. This contributes to players making informed choices, that is, a deliberate conscious decision made in the context of awareness of their level of current expenditure (money and time spent).

Pop-up or dynamic messages scrolling across the screen can serve to distract players by shifting attention from the screen to the message, particularly if play is concomitantly temporarily suspended. In this regard, the display can be conceptualised as forming a 'break in play' complementing and/or reinforcing the positive effect of the message content; interrupting dissociation and forcing attention to current behaviours. Breaks in play may be

counterproductive in increasing urges if imposed on players and not accompanied by informative or personal appraisal messages (Blaszczynski, Cowley, Anthony, & Hinsley, 2015).

Personalised feedback interventions are designed to provide players with a normative standard against which they can compare their own behaviour (Marchica & Derevensky, 2016). Players can determine the extent to which their behaviour deviates from the typical patterns exhibited by appropriate peer-group sub-populations.

9.2 Warning and Messaging

Online gambling offers an ideal medium through which personalised messages and feedback can be displayed to account holders. Behavioural tracking tools allow monitoring of frequency, duration of sessions and intensity of expenditure using algorithms to detect deviation from personal typical patterns of play, and comparisons against similar demographic account holders. Early intervention benefits accrue from the tool forewarning and offering player insights into shifts towards more risky patterns of play (Griffiths, Wood & Parke, 2009). In addition, real time feedback on expenditure and patterns of play is offered across the full spectrum of players irrespective of their gambling status. Deleting identified players displaying risky behaviours from promotional material/advertising mailing lists may also reduce incentives to continue.

Given the voluntary nature of enrolling in online responsible gambling tools, and reliance on players to self-modify their behaviour in response to information provided, at best such tools may assist a small to moderate proportion of players in making more optimal informed choices (Auer & Griffiths, 2015a, 2015b; Griffiths, Wood & Parke, 2009). For example, Auer and Griffiths (2015a) found that exposure to either simple compared to enhanced self-appraisal pop-up messages influenced the behaviour of 1.39% and 0.67% of highly involved account holders, respectively. However, part of the difficulty in ascertaining the impact on player behaviours is the fact that those enrolling in online responsible gambling programs, it is reasonable to argue, exhibit higher levels of motivation and readiness to commit to control over gambling behaviours than those electing not to opt-in. Differences in outcome may be accounted for by motivation rather than personalised feedback or self-appraisal messages.

Imposing mandatory enrollment in responsible gambling behavioural tracking programs and enforcing temporary suspension of play for those breaching limits or exhibiting risk behaviours represents one approach to maximising program reach. However, this requires legislation requiring all operators to introduce such programs, and runs the risk of migrating players to offshore sites outside the legislated jurisdiction.

Although online behavioural tracking include real gamblers and actual gambling behaviours, most land-based studies incorporate cross-sectional designs on analogue student populations using self-report estimates of predicted effects on behaviour, awareness or cognitive beliefs (Cloutier, Ladouceur, & Sevigny, 2006; Gainsbury, Aro, Ball, Tobar, & Russell, 2015; Ladouceur & Sevigny, 2003; Monaghan & Blaszczynski, 2007, 2010). In addition, there are significant methodological difficulties in evaluating the effects of messages in in-vivo settings with real gamblers. This is because in laboratory studies it is relatively easy to schedule and manipulate the number and frequency of messages to which participants are exposed. In real settings, exposure is more sporadic and uncertain. The extent to which an individual is exposed to a message is subject to the frequency with which messages are displayed within a session. Options include set times (e.g., every 15, 30 or 60

minutes) independent of player behaviour, set time characteristics triggered by the commencement of a session of play (insertion of credits or player card), or a threshold set by the individual (precommitment) being approached or met. In the former option, exposure will be random while in the latter two exposure will be dependent on the duration and/or extent of play on that machine. Thus, individuals frequently switching machines or engaged in relatively short periods of play per machine may be exposed to a minimum of pop-up messages, if at all, during a total session of play.

Blaszczynski, Gainsbury and Karlov (2014) evaluated a series of modified EGM machine in in-vivo settings with a sample of 299 gamblers. Although 38% of participants reported that a dynamic responsible gambling message appearing in the panel above the playing screen would make a positive difference to their gambling, only 4% indicated that the message influenced their actual behaviour. Interestingly, the messages did not affect the enjoyment of non-problem and low risk players or were associated with any negative outcomes, finding consistent with Gainsbury, Aro, Ball, Tobar and Russell (2015a, b). However, in Blaszczynski, Gainsbury and Karlov's (2014) study, significantly more problem gamblers compared to non-problem gamblers reported a significant reduction in their enjoyment of play in response to the messages suggesting a differential response by this subgroup of gamblers. Whether such messages induce guilt or negative reactions among problem gamblers resulting in their playing less or simply shifting to machines without messages is yet to be elucidated.

Findings from studies conducted in laboratory settings are consistent in suggesting that personalised feedback interventions (Auer & Griffiths, 2015b; Marchica & Derevensky, 2016), self-appraisal messages delivered in dynamic compared to static mode (Gainsbury, Aro, Ball, Tobar, & Russell, 2015a, 2015b; Monaghan & Blaszczynski, 2007, 2010a), and those promoting self-appraisal (Monaghan & Blaszczynski, 2010b) and adherence to pre-set monetary limits (Stewart & Wohl, 2013) exert limited but positive effects on a minority of players. These have shown promising outcomes; at least on intention to reduce gambling behaviours, restrict expenditure to pre-set limits, and overall expenditure at least in the short term.

What is lacking is any data on the durability of awareness and its impact on actual gambling in in-vivo settings over the long term, and if there are any differential effects on players meeting criteria for a gambling disorder. There is some evidence from one more ecologically valid in-vivo study to suggest that there are no differences in responses to informative versus self-appraisal messages between non-problem and problem gamblers (Gainsbury, Aro, Ball, Tobar, & Russell, 2015a). Disconcertingly, less than half the sample of respondents in this study reported recalling seeing the messages, with slightly over half of this subsample able to accurately recall the content of at least one message. These findings indicate that for messages to be informative, they must be presented in a manner that attracts attention, are displayed prominently, interrupt play and direct attention to behaviours, resonate with and have personal meaning or relevance, and outline potential actions to be taken (Gainsbury, Aro, Ball, Tobar, & Russell, 2015).

In summary, there is evidence that dynamic compared to static messages enhance recall, gambling-related cognitions, and behaviours in the short term, with both informative and self-appraisal messages appearing to have relatively equivalent impacts on these variables. The positive effects are observed among a minority of gamblers in general, with some suggestion that these effects might reflect more motivational variables rather than messages

per se among real gamblers. However, uncertainty remains as to whether or not the messages in their various guises (content and mode of delivery) have any substantive durable impact on actual patterns of behaviour or expenditure (money and time) exhibited by real gamblers in in-vivo settings in the longer term.

Key Points

- Personalised messages based on player behaviour can be readily implemented in online forms of gambling.
- Dynamic compared to static messages tend to improve recall, gambling-related cognitions, and behaviours in the short term.
- Informative and self-appraisal messages appear to have relatively equivalent effects.
- For messages to be effective, they must readily attract attention, contain personally relevant content, be easily understood, and recommend appropriate actions to be taken.

9.3 Clocks

Several jurisdictions mandate the placement of clocks on electronic gaming machines. The rationale for such legislated requirements is predicated on empirical evidence that players lose track of time spend on devices. Several studies have demonstrated that players obtain elevated scores on instruments measuring dissociation (Delfabbro, & Panozzo, 2004; Diskin, & Hodgins, 1999; 2001; Kofoed, Morgan, Buchowski, & Carr, 1997; Kuley, & Jacobs, 1988). It is argued that the structural characteristics of a gaming machine are such that the excitement generated by the anticipation of winning/wins coupled with the non-skill repetitive nature of play fosters permits the player to enter a 'zone' or state of 'dissociation' (Schull 2012). As a consequence of a narrowing of focus of attention and being immersed and totally absorbed in play, players lose awareness of time spent (Anderson & Brown, 1984; Jacobs, 1986). Involvement in electronic gaming machines by a subpopulation of gamblers appears to be motivated by psychological needs to emotionally escape from negative affective states through dissociation (Jacobs, 1986; Scannell, Quirk, Smith, Maddern, & Dickerson, 2000).

Dissociation has multiple meanings ranging from a pervasive trait, altered state of consciousness, avoidance coping strategy, and transient stress-related state, with the concept residing along on a continuum from benign common experiences to pathological states (Garcia, 2006). Setting aside the imprecision of the concept, the premise is that interruptions to the psychological state of dissociation and drawing attention to time spent could represent an effective approach to minimising excessive expenditure in respect to both time and money (Ladouceur & Sevigny, 2009). Interventions, such as imposed breaks in play with messages designed to draw attention to current behaviours appear effective in moderating behavioural patterns of gambling by directing the player to evaluate session play (time and money spent). In this context, clocks might assist increasing player awareness of estimated time spent.

Setting time limits prior to commencement of play is not contingent upon the player's awareness of time per se; attention is only drawn to the duration of play being approached or exceeded irrespective of time displayed on a clock. By this is meant that the fundamental consideration is to have clocks interrupt play or draw attention to the approaching time limit by an alarm, not simply having the time or duration displayed. Blaszczynski, Gainsbury and Karlov (2014) found that less than 10% set the clock to monitor duration of play, with very few leaving the machine on expiration of time or reporting or reporting any effects on

total amount of time or money spent gambling. These observations suggest that clocks and time in and of themselves, are insufficient in either breaking dissociation or influence players to modify behaviour.

In most circumstances, the precise role of clocks in fostering awareness of time spent as a responsible gambling tool remains poorly researched. The question arises as to whether or not the provision of clocks in the absence of accompanying breaks in play with messages or pre-set limits contribute to increased awareness of time, and subsequently, reducing session duration. In addition, as indicated by Ladouceur and Sevigny (2009), it is important to determine that iatrogenic effects are not produced by the placement of clocks on machines; that is, awareness of time may result in the player increases rate of play and bet size.

Several conditions are required if clocks can be considered to be effective in exerting any beneficial impacts on play. Clocks must be prominently visible, a player must be motivated to know the current time or to calculate the duration of play, and must take some action in response to knowing the time; for example, ceasing play to meet an obligation, or in response to concern over the time already spent playing.

Although evidence indicates that players lose track of time, no studies have systematically investigated the prevalence rate of players failing to meet obligations, for example, returning to work, picking up children. Anecdotal reports suggest that some players do so but it remains unclear what proportion this applies to, or whether this is the result of intense absorption or a decision to continue gambling rather than attend to their obligation.

Of the few studies evaluating the singular effects of clocks as a responsible gambling intervention in in-venue situations with non-analogue populations, results suggest that the majority of players do not perceive this facility as useful in controlling gambling behaviours (Focal Research, 2002, 2004; Ladouceur & Sevigny, 2009). Using a convenience sample of 38 VLT players, Ladouceur and Sevigny (2009) found that the majority (89%) noticed and used the clock to determine time, with 73% reporting time was not an important consideration moderating play. Although half suggested clocks to be useful, consistent with the findings of Focal Research (2002, 2004) and Delfabbro and Panozzo (2004), three quarters indicated the feature would not assist in behavioural control over their gambling. These findings are inconsistent with the data reported by Hing (2004) where a third of players failed to notice clocks with an unknown proportion expressing a preference for the presence of more visible clocks.

In the absence of behavioural measures of the impact of clocks on session duration, or on players ceasing play to meet obligations, reliance is placed on elicited subjective reports in determining any impacts. Players consider clocks could be useful. At present however, it would appear that clocks, in isolation from imposed breaks in play coupled with messages, are not perceived positively as a responsible gambling tool that would effectively support behavioural control.

Key Points

- Studies using self-report questionnaires have consistently demonstrated that during a session of play on electronic gaming machines, players lose track of time.
- Clocks on machines have been mandated in some jurisdiction in a bid to increase player awareness of time spent playing.

- No empirical studies have systematically determined the extent to which players fail to meet obligations as a result of losing track of time.
- Qualitative and self-report studies indicate that players consider clocks could be a useful feature but the majority perceive this facility to be ineffective in assisting control over gambling behaviours.

9.4 Implications for Policy and Research

The provision of warnings and messages are important in informing players of probabilities of winning, cautioning of the potential risks associated with excessive gambling, and directing players to reappraise their behaviour during sessions of play. Although evidence based on self-report data suggests that messages are effective in moderating intentions to reduce gambling in the short term, there remains an absence of empirical data on the longer-term impacts on actual expenditure of time and money. Online forms of gambling lend themselves readily amenable to the display of personalised messages triggered by specific behavioural tracking characteristics: duration of session, frequency of play, level of expenditure, and/or deviation from personally calculated average play. For electronic gaming machines, dynamic informative and personal appraisal messages that interrupt play should be a core feature on all machines. For table, cards, and betting (offline sports and horses) forms of gambling, the provision of information is restricted to brochures, pamphlets and signage located or clearly posted in venues.

9.5 Recommendations

- Conduct longer term research into the type of message contents that optimally promotes responsible gambling practices.
- Conduct research into determining both the mode of delivery and physical characteristics of that maximally attract a player's attention during play.
- For online forms of gambling, determine which behavioural tracking data represents the best parameter to trigger informative or personal appraisal messages during sessions of play.
- For gaming machines, evaluate the physical characteristics, content, location and access to responsible gambling messages that attract attention and personally resonate with players.

10 PRODUCT DISPLACEMENT IN GAMBLING

For purposes of this report, we define ‘displacement’ in gambling as ‘switching gambling products because of game modifications or restrictions’. Displacement in gambling may be an unintended consequence of policy or regulatory changes, and therefore, we considered that some speculation may be useful for this report. However, it should be noted that the authors invite caution when considering this section. Directly relevant literature regarding displacement in gambling in the social sciences literature is virtually non-existent. As psychologists, the authors did not venture into the economics literature. Some concepts such as price elasticity may be instructive here and warrant additional investigation.

10.1 Assessing the Potential for Product Displacement

Arguments which may have some bearing on the issue of product displacement in gambling include:

1. *Problem Gamblers have a Broader Product Profile.* One of the most consistent findings emerging in the gambling studies literature is that problem gamblers are more likely to engage in a greater number of different types of gambling (Braverman et al., 2013; LaPlante, Affifi & Shaffer, 2013; Welte, Barnes, Tidwell, & Hoffman, 2009). Thus, a case could be made that problem gamblers may have readily available substitutes at hand, and that they are not rigid consumers of gambling but rather are flexible and adaptable in responding to their environment. Problem gamblers are also less likely to engage in other social activities (Bergh & Kuhlhorn, 1994) and often think of gambling as their only pleasurable activity (Petry 2005). This, this might suggest that narrow restrictions on one type of gambling may lead to seeking alternative replacements elsewhere.
2. *Gambling involvement is changeable and adaptable.* Evidence from longitudinal research demonstrates that gambling careers, including those of problem gamblers, tend to be non-linear and highly variable over time because of factors such as employment, environment and social context (Reith & Dobbie, 2013). Further, heavy gambling sessions are often episodic rather than a stable feature of an individual’s involvement (Forrest & McHale, 2016). Evidence also suggests that problem gambling may, in some individuals, be typified by binge-like behavior (Nower & Blaszczynski, 2003; Griffiths, 2006); consequently, their playing patterns may be more volatile, and potentially more adaptable.
3. *The object of an addiction is non-specific.* There has been evidence over the last 50 years to suggest that addiction is not necessarily linked to a substance or behaviour. Shaffer et al. (2004) proposed a syndromal model of addiction, one understood as having multiple biopsychosocial antecedents and multiple manifestations (e.g. substance use disorders, internet addiction, pathological gambling). Circumstantial opportunity has been shown to play a more influential role in the development of addictive behavior than individual preference for certain drugs (Harford, 1978). It has also been shown that individuals may switch between different types of addictions (e.g. from opioids to alcohol, gambling or exercise) over time before successfully recovering from all addictions (Shaffer et al., 1992; Blume, 1994; Cepik et al., 1995; Hser, Anglin & Powers, 1998). Addictions have also been shown to co-occur; in one study 23% of a sample of participants with 11 different addictions (e.g. drugs, tobacco, alcohol, gambling, internet use, sex) had co-occurring addictions (Sussman,

Lisha & Griffiths, 2011). Non-specificity of addiction, if it applies between different categories of gambling product, suggests that product displacement following policy changes would be more likely. Currently, however, there is no evidence available to conclude this with any confidence.

4. *Motives to gamble are product-specific.* Juxtaposed to the theory of ‘object non-specificity’ discussed above, there is emerging evidence that gamblers may satisfy different psychological needs using different products. If we assume that consumers purchase products or services to satisfy needs, then consumers may elect to switch products if they are cheaper, more accessible or more effective in need satisfaction. Emerging evidence from motivation research in gambling studies suggests that:
- The ability to detach to cope with stress or negative emotional states has been identified as an important outcome from slots or gaming machines (Binde, 2013; Dow-Schull, 2012; Sundqvist et al., 2016; Wood & Griffiths, 2007);
 - Fast, continuous games like slots or gaming machines may facilitate detachment (Abarbanel, 2014; Dow-Schull, 2012; Fang & Mowen, 2009; Turner, 2008);
 - Needs such as mastery and skill development are more likely to apply to gambling products requiring a skill component (Sundqvist, Jonsson & Wennberg, 2015);
 - Social needs have been associated with sports betting and poker (Sundqvist, Jonsson & Wennberg, 2015).

Therefore, it may be that player needs (healthy or unhealthy) could be met through similar gambling content delivered through other channels, and in these scenarios, product displacement could be more likely (i.e., offline slot content moving to online slot content).

5. *National restrictions on gaming machines in Norway suggest low levels of displacement.* Norway has, over the last 10 or so years, introduced extensive restrictions and regulations in relation to the structural characteristics of gaming machines. Gaming machine provision in Norway was thought to be particularly linked to problem gambling (Fekjaer, 2006; Lund & Norland, 2003 as cited in Rossow & Hansen, 2016). In response to growing concerns, gaming machines in Norway became subject to a ban on note acceptors, a temporary ban on availability, and the subsequent re-introduction of fewer, ‘less aggressive’ machines (e.g., fewer audio-visual stimuli, automatic game abruption, no cash acceptor or cash payout, and card based play with fixed upper losses per day and per month; Hansen & Rossow, 2012; Rossow and Hansel, 2016). After the introduction of these policy restrictions: industry revenue, gambling participation and calls to the national helpline, all in relation gaming machines, fell considerably. A fall in overall problem gambling prevalence was also observed but this was less pronounced with the trend being more variable (Rossow and Hansen, 2016). In the 6 months after the ban on banknote receptors was introduced, the revenue from gaming machines play fell by 17%. However, revenue on all other games increased by 3% in that same period. The following year, revenue from gaming machines continued to decrease by a further 55%, but revenue on all other games increased by 13% (Rossow and Hansen, 2016). There was an overall decrease in the net revenue from gambling, but it appears that at least some of the player engagement in gaming machine play was displaced to other forms of gambling after regulatory changes were made. There are limitations to what can be

inferred from the Norway case study given the complexity of the changes (e.g., maximum stake increased in the suite of changes being made) and the differences with the British landscape (e.g., Britain has one of the most saturated markets and highest levels of engagement with remote gambling). However, the level of displacement seems lower than some might have anticipated (Rossow and Hansen, 2016).

10.2 Current Issues: £2 Stake Reduction and Displacement

Usually, the games content available through Category B gaming machines relative to remote gambling websites is similar in terms of their structural features; however, there are exceptions (e.g., higher limits on stake sizes are often available in remote settings). Importantly though, the process and experience of gambling offline in LBOs is likely to be 'situationally different' from gambling online through a PC, laptop, tablet or smart phone. For example, one might speculate that the betting shop environment, because of the greater privacy afforded, may be more conducive to satisfying needs such as 'escape'. For example, a customer who resides in a busy household may not satisfy the need to 'escape' by gambling through a tablet in their own crowded living room rather than the privacy of the betting shop. Alternatively, the reverse may be true, whereby gamblers find online gambling more conducive to satisfying such motives. Note that variations in individual differences (e.g., gambling motives) and situational differences (e.g., living situation) may be relevant here and is illustrative of the complexity in understanding the issue of displacement.

Ultimately, a close examination of situational factors is beyond the scope of the report. However, it is reasonable to suggest that situational characteristics may diverge considerably when comparing the gambling experience offline in the betting shop compared to online through a remote gambling provider. These differences merit consideration and should feature prominently in future research examining the issue of displacement and product switching in gambling.

10.3 Conclusions

In lieu of sufficient relevant research dedicated to understanding the nature and extent of product displacement in gambling, we have drawn from other potentially relevant evidence in other topic areas in gambling studies. In doing so, we have identified factors suggesting that at least some displacement may be likely. For example, pockets of evidence hinting at product ambivalence and long-term variability in engagement with products relative to other addiction disorders, do make a case supporting at least some displacement in gambling.

However, estimating the extent to which displacement may occur, and in what circumstances, remains more difficult. It is also important to remember that, from a harm minimisation perspective at least, we are primarily interested in the displacement of risk or harm from other gambling products, and not simply the displacement of gambling participation. In other words, if consumers opt to play other less harmful products because of policy restrictions on riskier products, this may still be considered a success.

Developing a better understanding of the behavioural impacts of changes in how gambling products are supplied is crucially important in forming effective and efficient policy and regulation. Relevant research priorities include:

- Using tracked behavioural data to better understand how players engage with different products and examine potential causes and impacts of product switching and;
- Adding self-report components to all harm minimisation trials asking players about impacts, particularly those not examined in the tracked data (e.g., migration to other gambling products, or other gambling operators).

11 FINAL CONCLUSIONS

The aim of this report was to assess the theory and evidence regarding potential links between structural characteristics and problem gambling; and consequently, recommend priorities for harm minimisation policies and future work in research, trialing and evaluation. This report focused on key topics that were most relevant for the emerging policy landscape in Great Britain. To permit easy navigation throughout the report, detailed consideration has been given to the potential implications and recommendations within each section of the report.

Academic researchers, by training, learn to avoid speculation and rather, to provide careful observation and remain on the side of cautious interpretation. Conclusions should be made only the basis of robust empirical evidence, and preferably following valid replication of findings. Before concluding, we should reiterate that this report deviates from this approach with aim to drive ideas and ‘get off the fence’. However, some bridging between our traditional role as academics, and our role as consultants, is required given stakeholder needs as expressed in the National Responsible Gambling Strategy (p.15, RGSB, 2016):

“Better understanding of how to minimise or mitigate harm is likely to flow from improved knowledge about the nature and determinants of gambling behaviour. Interventions should always be based on the best evidence available. But it is important that desirable practical action is not inhibited by unrealistic expectations about perfect information, or the temptation to demand ever more research before doing anything. Pace of delivery is important.”

Thus, this report represents our considered, albeit imperfect, views on pushing the harm minimisation agenda forward.

Further, at the time of concluding this review (October 24, 2016), the DCMS has called for evidence to inform a review of gaming machines and social responsibility in Great Britain (DCMS, 2016²⁹). The terms of reference of the review are included in the following (p. 7, DCMS, 2016):

“The Government is reviewing the maximum stakes and prizes for gaming machines across all premises licensed under the Gambling Act 2005; the number and location of gaming machines across all licensed premises; and social responsibility measures to protect players from gambling-related harm.”

We are reviewing these areas with the aim of striking the right balance between enabling socially responsible growth across the industry and the protection of consumers and communities, including those who are just about managing. The Gambling Act 2005 allows for regulations to be updated by secondary legislation to reflect developments in the industry.”

Driven by this call for evidence, and accepting that we are constrained by a limited and often weak evidence base, we have developed two tables to draw out some relevant insights arising from our review. Table 10 provides estimates regarding the potential value and

²⁹ For more information on the call for evidence see https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/562122/Call_for_evidence_-_Review_of_Gaming_Machines_and_Social_Responsibility_Measures.pdf

efficiency of various product-based options for gambling-related harm minimisation and Table 11 identifies priorities for research, trialing and evaluation.

In concluding, we draw attention to the following points:

1. An area requiring urgent attention, and supported with a growing body of empirical evidence, is the use of debit cards through remote loading to play gaming machines in LBOs. We consider that focusing on such restrictions may hold greater promise than many of the other proposed strategies to reduce gambling-related harm on B2 gaming machines. Restrictions on ATMs, and digital wallets giving access to further funds in all gambling venues (not just LBOs), should also be considered.
2. Restrictions on stake size alone fail to adequately address concerns in relation to cost of play. A stake-only approach ignores the role of game speed, game volatility and return-to-player (RTP). Different configurations for these characteristics can lead to very different implications for the size of losses a player can experience. A coherent supply-side policy approach targeting cost of play to protect players must account for all characteristics contributing to how much a consumer can lose.
3. While it seems that some displacement may be inevitable, the precise extent to which problems may be experienced on other gambling products, following heavy restrictions on gaming machines remains unclear. This is not surprising given the paucity of directly relevant evidence. The argument against heavy restrictions on gaming machines, that someone can '*pull out their mobile and just continue playing*', seems overly simplistic. This is because of complex issues relating to individual and situational differences in individual contexts influencing the product preferences of problem gamblers.
4. Efficiency of harm minimisation is important. Ideally, the positive impact from any intervention on harm minimisation would be high, and negative impacts on player enjoyment and industry growth would be low. For example, options which only marginally reduce harm but significantly disrupt the enjoyment of games, or penalize industry may be counter-productive longer term. Industry interests should not drive harm minimisation policies. Equally, however, disabling industry interests to satiate disaffected stakeholders does not necessarily imply protection of the vulnerable. In other words, solutions should be prioritized according to minimizing harm not by how much industry is made 'to pay'.
5. While considerable evidence gaps impede progress in player protection, there are areas where work can start immediately. For example, focus should be given to the presentation of gambling products and their channels to ensure that responsible decision-making is not be inhibited by designs intended to maximise revenue and grow business.
6. Some principles for product-based harm minimisation, at face value at least, appear to run counter to the short-term business objectives of maximising revenue and growth. Operator reluctance to accept this point may restrict progress in dealing with conflicts.

7. Regulation is key to the convergence of harm minimisation with other corporate objectives. Without an operating license, there will be no revenue or growth. The challenge for regulators, however, is the absence of clear evidence about what works and this prevents specificity in guidelines to industry. However, there is reason for optimism. In Great Britain, collaboration between stakeholders has now instigated a culture of trialing and evaluation with growing industry participation. Knowledge and understanding is set to grow considerably. Where initiatives do not deliver adequate impact, there will be immediate pressure on industry to improve provision. Action is no longer sufficient; impact is the new metric for compliance in player protection.

This report is by no means an exhaustive consideration of all potentially relevant issues related to product-based harm minimisation. However, it does urge greater consideration of important issues that have been somewhat neglected in the past. Further, it lays out options that could be immediately implemented, based on sufficient evidence and theory, and where required, trialed and evaluated.

This report does not focus on harm minimisation options that do not relate directly to a products structural characteristics. Perhaps the most pertinent omission, therefore, is account-based gambling, and the advantages that it may afford for harm minimisation including self-exclusion, age restrictions, pre-commitment, player tracking and breaks-in-play. Account-based options could offer greater flexibility relative to blanket restrictions on stake size, for example. Account-based options would have the benefit of preserving some game appeal because flexible restrictions are placed on *how* much is consumed and not *what* is consumed. However, issues relating to cost, infringement on privacy, inconvenience and the potential for unintended consequences require close inspection.

As indicated in detail throughout this report, there are serious methodological limitations with existing directly relevant research. However, we believe a strength of this report is the attempt to consider issues in the absence of directly relevant evidence (e.g., decision assistance with withdrawals) and make reasoned arguments drawing on theory and evidence from related areas. We also would reiterate our optimism that the quality of research will improve as the pressure continues to grow on trialing and evaluating impacts in real gambling settings.

The inadequate evidence currently available on the association between structural characteristics and problem gambling will inevitably require some interpretation on its usefulness and application. For example, in opposition to positions taken in this report, some academics will argue strongly in favour of prioritising restrictions on game characteristics such as LDWs and near misses. However, such disagreement can ultimately prove helpful if open and constructive dialogue can take place while more empirical evidence continues to emerge.

Table 10. Estimated Impact of Selected Product-Based Harm Minimisation Strategies

Harm Minimisation Strategy	Estimated Impact on Gambling-Related Harm		Speculative Impact on Player Enjoyment or Convenience	Speculative Negative Impact on Industry Revenue and Growth ³⁰	Summary Explanation
	Impact	Confidence level			
Restrictions on access to funds in gambling venues	High	High	Low-Moderate	High	Evidence suggests that access to additional funds in a venue is a significant risk factor for problem gambling. This includes 'remote loading' using debit card, ATMs and digital wallets.
Isolated £2 Stake Reduction	Low-Moderate ³¹	Moderate	High	High	Ignores other important contributing factors to cost of play. On its own, unlikely to be effective or efficient. Some displacement is possible.
Facilitate rather than inhibit withdrawal decisions	Moderate	Moderate	Low	Low	Support for withdrawal-related decisions may prove useful for problem gamblers who have difficulty making appropriate decisions and executing self-control while gambling.
Restrict incentives which may encourage increasing stake size	Low-Moderate	High	Low	Low	Offering enhanced bonus game content or a higher RTP on the same game at higher stakes may encourage staking beyond one's means.
Removal of auto-play, turbo mode and stop buttons	Moderate	Moderate	Moderate	Moderate	May facilitate greater awareness by engaging player in every betting decision and therefore having more scope for control by reducing game speed
Restrictions on Losses-Disguised-as-Wins (LDWs)	Low	Moderate	Moderate	Moderate	LDWs are likely to contribute to game appeal and reduce game volatility. Evidence remains inconclusive regarding whether removal will reduce problem gambling.

³⁰ This column should be considered with extreme caution as impact on industry revenue and growth is well beyond the scope of this report and should be estimated by those much better equipped. We do NOT advocate consideration of industry revenue and growth at the expense of protecting vulnerable. However, such considerations remain relevant for assessing efficiencies and priorities. In other word, options which are likely to have a low impact on harm minimisation but a high negative impact on players or industry can be considered to be inefficient and lower priority.

³¹ To improve chances of impact, comprehensive consideration must be given to all contributors to cost (i.e., RTP, volatility and game speed) not just stake.

Table 11. Suggested Priorities for Research, Trialing and Evaluation

Research Topic Area	Product Parameter Addressed	Estimated Potential Application to Policy and Regulation	Summary Explanation
Restricting immediate re-betting after event (post-event pause)	Various	High	This may hold promise for addressing cognitive and emotional impacts of various parameters including game speed. To date, limited empirical evidence in valid settings. Research to focus on how to increase evaluation of bets made and future spending when gambling, to increase informed decision-making.
In-running sports betting and problem gambling	Speed of Play	High	Research needs to explore the role of in-running sports betting opportunities as facilitators of problematic patterns of gambling; namely, the ability to chase losses at a faster rate within sports betting.
Restrictions on Game Speed	Speed of Play	Moderate	Research needs to evaluate whether shorter event durations are related to problematic patterns of gambling in real gambling environments, with realistic rewards and losses. This has yet to be demonstrated. If this hypothesis is supported, research can focus on trialling moderation of event duration and evaluating the impact on problematic play and player experience.
Volatility and Problem Gambling	Reward	Moderate	It is proposed that levels of volatility will have different impacts on gambling behaviour depending on contextual factors of the player (for e.g. current gambling motivation). Research must focus on understanding the impact of various patterns of reward distribution on gambling behaviour in different contexts, as current research is inconsistent.
LDWs	Reward	Low-Moderate	Laboratory studies suggest that LDWs encourage problematic patterns of play. Given the limitations of currently available research, it is important to test the impact of LDWs in real gambling settings where players are risking their own money, with real personal monetary implications, to understand the potential impact of LDWs on problematic patterns of gambling.
Near Miss	Reward	Moderate	Laboratory studies suggest that near misses motivate persistent gambling. As above, because of the limitations of laboratory research, it is imperative to observe this consequence of near misses on gambling behaviour in settings where players are risking their own money, and where the personal monetary implications of persistent gambling, in response to near misses, are realistic.
Communicating Cost of Play	Cost	High	Explore best means to communicate cost of play to consumer. If a legitimate leisure activity, this should be transparent. Potentially high impact for modest investment in this research.
Account-based play to manage spending	Cost	Very High	Ongoing consideration of options to limit financial harms through restricting cost of play is important. Explore account-based gambling as an alternative to blanket restrictions (e.g., £2 stake). Dedicated feasibility study would be useful.
RTP and Problem Gambling	Cost	Moderate	Understanding of how RTP affects game play and ensuring it does not mislead or confuse players. Those tasked with educating consumers require a clear understanding of the potential effects of RTP on gambling behaviour both in the long-term and short-term.
Stake Variation and Problem Gambling	Cost	Moderate	Continue to explore emerging relationship between stake variability and problem gambling. Explore if causal link exists and in which direction. Depending on further research options for restricting variability in staking behaviour may hold promise despite being overlooked to date.
In-game bonuses	Game	Low-Moderate	Although qualitative research emphasises that in-game bonuses affect gambling behaviour, this must be demonstrated behaviourally within real gambling contexts before this feature is considered a priority area of concern.
Messaging	Information	Moderate	Conduct longer term research into the type of message contents that optimally promotes responsible gambling practices and how this may vary across products and across channels.

12 REFERENCES

- Abarbanel, B. (2014). Influence of motivational dimensions on gambling purchase frequency, game choice, and medium of play in the United Kingdom. *International Gambling Studies*, 14, 3, 472-491. doi: 10.1080/14459795.2014.966131.
- Abuhamdeh, S., Csikszentmihalyi, M., & Jalal, B. (2015). Enjoying the possibility of defeat: Outcome uncertainty, suspense, and intrinsic motivation. *Motivation and Emotion*, 39(1), 1-10.
- Addicott, M.A., Pearson, J.M., Kaiser, N., & Platt, M.L. (2015). Suboptimal foraging behaviour: a new perspective on gambling. *Behavioural Neuroscience*, 129, 5, 656-665.
- Afifi, T.O., LaPlante, D. A., Taillieu, T.L., Dowd, D. & Shaffer, H. J. (2014). Gambling involvement: considering frequency of play and the moderating effects of gender and age. *International Journal of Mental Health and Addiction*, 12, 283-294.
- Alessi, S. M., & Petry, N. M. (2003). Pathological gambling severity is associated with impulsivity in a delay discounting procedure. *Behavioural Processes*, 64, 345–354.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed., text rev.). doi:10.1176/appi.books.9780890423349.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders (DSM-5®)*. American Psychiatric Pub.
- Anderson, G. & Brown, R. I. F. (1984). Real and laboratory gambling: Sensation-seeking and arousal. *British Journal of Psychology*, 75, 401-410.
- Areni, C. S. (2003). Exploring managers' implicit theories of atmospheric music: Comparing academic analysis to industry insight. *Journal of Services Marketing*, 17(2), 161–184.
- Auer, M., & Griffiths, M. D. (2014). An empirical investigation of theoretical loss and gambling intensity. *Journal of Gambling Studies*, 30(4), 879-887.
- Auer, M., & Griffiths, M. D. (2015). Theoretical loss and gambling intensity (revisited): A response to Braverman et al. (. (2013). *Journal of Gambling Studies*, 31(3), 921-931.
- Australian Government (2016). Government Response to the 2015 Review of the Impact of Illegal Offshore Wagering. 1-13.
- Balodis, S.S., Thomas, A.C., & Moore, S.M. (2013). Sensitivity to reward and punishment: delay discounting procedure. *Behavioural Processes*, 64, 345–354.
- Balodis, S. R. S., Thomas, A. C., & Moore, S. M. (2014). Sensitivity to reward and punishment: Horse race and EGM gamblers compared. *Personality and Individual Differences*, 56, 29-33.
- Bechara, A., Damasio, A.R., Damasio, H., Anderson, S.W., 1994. Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition* 50, 1, 3, 7–15.

Bergh, C., & Kühnorn, E. (1994). Social, psychological and physical consequences of pathological gambling in Sweden. *Journal of Gambling Studies*, *10*(3), 275-285.

Biggs, A. (2011) *Electronic gaming machines: What lessons learnt from Norway?* Parliamentary Library (21 November). Department of Parliamentary Services: Parliament of Australia.

Billieux, J., Van der Linden, M., Khazaal, Y., Zullino, D., & Clark, L. (2012). Trait gambling cognitions predict near-miss experiences and persistence in laboratory slot machine gambling. *British Journal of Psychology*, *103*, 412–427. doi:10.1111/j.2044-8295.2011.02083.x

Binde, P. (2013). Why people gamble: A model with five motivational dimensions. *International Gambling Studies*, *13*(1), 81-97.

Bitner, M. J. (1992). Servicescapes: The impact of physical surroundings on customers and employees. *The Journal of Marketing*, *56*(2), 57–71.

Blaszczynski, A. (2013). A Critical Examination of the Link Between Gaming Machines and Gambling Related Harm. *The Journal of Gambling Business and Economics*, *7*, 3, 55-76.

Blaszczynski, A., Cowley, E., Anthony, C., & Hinsley, K. (2015). Breaks in Play: Do they achieve intended aims? *Journal of Gambling Studies*, 1-12.

Blaszczynski, A., Gainsbury, S., & Karlov, L. (2014). Blue Gum gaming machine: An evaluation of responsible gambling features. *Journal of Gambling Studies*, *30*(3), 697-712.

Blaszczynski, A., Ladouceur, R., & Moodie, C. (2008). The Sydney Laval Universities Gambling Screen: Preliminary data. *Addiction Research & Theory*, *16*(4), 401-411.

Blaszczynski, A., Ladouceur, R., Nower, L., & Shaffer, R. (2008). Informed choice and gambling: Principles for consumer protection. *The Journal of Gambling Business and Economics*, *2*(1), 103-118.

Blaszczynski, A., & Nower, L. (2002). A pathways model of problem and pathological gambling. *Addiction*, *97*, 5, 487–499. doi:10.1046/j.1360-0443.2002.00015.x

Blaszczynski, A., Parke, A., Parke, J., & Rigbye, J. (2014). Operator-based approaches to harm minimisation in gambling: summary, review and future directions. Responsible Gambling Trust: Great Britain.

Blaszczynski, A., Sharpe, L., & Walker, M. (2001). *The assessment of the impact of the reconfiguration of electronic gambling machines as harm minimisation strategies for problem gambling*. The University of Sydney Gambling Research Unit, University Printing Service.

Blume, S. B. (1994). Pathological gambling and switching addictions: Report of a case. *Journal of Gambling Studies*, *10*(1), 87-96.

Bossuyt, E., Moors, A., & De Houwer, J. (2014). Unexpected and just missed: The separate influence of the appraisals of expectancy and proximity on negative emotions. *Emotion*, *14*, 284-300. doi:10.1037/a0034675

Brandt, A. E. and Pietras, C. J. (2008). Gambling on a simulated slot machine under conditions of repeated play. *The Psychological Record*, 58, pp. 405-426.

Bramley, S., Dibben, N. & Rowe, R. (2016). The Utilisation of Music by Casino Managers: An Interview Study. *Journal of Gambling Studies*. doi:10.1007/s10899-016-9604-z

Bramley, S, Dibben, N. & Rowe, R. (2013). The presence, experience and influence of background music in gambling situations. In Poster displayed at the 3rd international conference of music and emotion. Finland, June 2013.

Bramley, S. & Gainsbury, S.M. (2015). The Role of Auditory Features within Slot-Themed Social Casino Games and Online Slot Machine Games. *Journal of Gambling Studies*, 31, 1735–1751.

Brandt, A. E., & Pietras, C. J. (2008). Gambling on a simulated slot machine under conditions of repeated play. *The Psychological Record*, 58(3), 405.

Braverman, J. & Shaffer, H. J. (2012). How do gamblers start gambling: Identifying behavioral markers for high-risk Internet gambling. *European Journal of Public Health*, 22, 2, 273-278. doi:10.1093/eurpub/ckp232.

Braverman, J., LaPlante, D. A, Nelson, S. E, & Shaffer, H. J. (2013). Using cross-game behavioral markers for early identification of high-risk Internet gamblers. *Psychology of Addictive Behaviors*, 27, 3, 868-877. doi: 10.1037/a0032818

Braverman, J., Tom, M. & Shaffer, H. J. (2015). Tilting at windmills: A comment on Auer and Griffiths. *Journal of Gambling Studies*, 31, 2, 359-365.

Brevers, D., Cleeremans, A., Verbruggen, F., Bechara, A., Kornreich, C., Verbanck, P., Noël, X., (2012). Impulsive action but not impulsive choice determines problem gambling severity. *PLoS ONE* 7, 11, e50647.

Brevers, D., Noel, X., Bechara, A., Vanavermaete, N., Verbanck, P. & Kornreich, C. (2015). Effect of Casino-Related Sound, Red Light and Pairs on Decision-Making During the Iowa Gambling Task. *Journal of Gambling Studies*, 21, 409-421.

Broos, N., Schmaal, L., Wiskerke, J., Kostelijk, L., Lam, T., Stoop, N., et al. (2012). The relationship between impulsive choice and impulsive action: A cross-species translational study. *PLoS One*, 7, e36781.

Brown, R. I. F. (1986). Arousal and sensation-seeking components in the general explanation of gambling and gambling addictions. *International Journal of the Addictions*, 21(9-10), 1001-1016.

Brunborg, G., Johnsen, B., Mentzoni, R., Molde, H., & Pallesen, S. (2011). Individual differences in evaluative conditioning and reinforcement sensitivity affect bet-sizes during gambling. *Personality and Individual Differences*, 50, 5, 729–734.

- Brunborg, G.S., Johnsen, B.H., Mentzoni, R.A., Myrseth, H., Molde, H., Lorvik, I.M., Bu, E.T., Pallesen, S. (2012). *Diminished aversive classical conditioning in pathological gamblers*. *Addiction*, *107*, 1660–1666. doi:10.1111/j.1360-0443.2012.03891.x, pmid:22429452.
- Cacioppo, J. T., & Gardner, W. L. (1999). Emotion. *Annual review of psychology*, *50*(1), 191-214.
- Caraniche Pty. Ltd: Rodda, S., & Cowie, M. (2005). Evaluation of electronic gaming machine harm minimisation in Victoria. *Report prepared for the Victorian Department of Justice, Melbourne*
- Cassidy, R. (2014). Fair game? Producing and publishing gambling research. *International Gambling Studies*, *14*(3), 345-353.
- Cave, R. (2015, 18 October). Banned from the bookies. BBC News. Retrieved from <http://www.bbc.co.uk/news/business-34550617>.
- Çepik, A., Arıkan, Z., Boratav, C., & Lşik, E. (1995). Bulimia in a male alcoholic: A symptom substitution in alcoholism. *International Journal of Eating Disorders*, *17*(2), 201-204.
- Chantal, Y., & Vallerand, R. J. (1996). Skill versus luck: A motivational analysis of gambling involvement. *Journal of Gambling Studies*, *12*(4), 407-418.
- Chase, H. W., & Clark, L. (2010). Gambling severity predicts midbrain response to near-miss outcomes. *Journal of Neuroscience*, *30*, 6180-6187.
- Choliz, M. (2010). Experimental analysis of the game in pathological gamblers: Effect of the immediacy of the reward in slot machines. *Journal of Gambling Studies*, *26*, 249-256.
- Clark, L. (2010) Decision-making during gambling: an integration of cognitive and psychobiological approaches. *Philosophical Transactions of the Royal Society B*, *365*, 319-330.
- Clark, L., Crooks, B., Clarke, R., Aitken, M. R. F., & Dunn, B. D. (2012). Physiological responses to near-miss outcomes and personal control during simulated gambling. *Journal of Gambling Studies*, *28*, 123–137. doi: 10.1007/s10899-011-9247-z.
- Clark, L., Lawrence, A.J., Astley-Jones, F., Gray, N. (2009). Gambling near-misses enhance motivation to gamble and recruit win related brain circuitry. *Neuron*, *61*, 481–90.
- Clark, L., Liu, R., McKavanagh, R., Garrett, A., Dunn, B. D., & Aitken, M. R. F. (2013). Learning and affect following near-miss outcomes in simulated gambling. *Journal of Behavioral Decision-making*, *26*, 442– 450.
- Clark, L. & Sharman, S. (2014). Commentary on Dixon *et al.* (2014): Understanding the abuse liability of modern electronic gaming machines. *Addiction*, *109*, 1929–1930. doi: 10.1111/add.12697
- Clarke, D. (2005). Motivational differences between slot machine and lottery players. *Psychological Reports*, *96*, 843-848.

Cloutier, M., Ladouceur, R., & Sévigny, S. (2006). Responsible gambling tools: Pop-up messages and pauses on video lottery terminals. *The Journal of Psychology, 140*(5), 434-438.

Coates, E. & Blaszczynski, A. (2013). Predictors of return rate discrimination in slot machine play. *Journal of Gambling Studies, 631-45*. doi 10.1007/s10899-013-9375-8.

Coates, E., & Blaszczynski, A. (2014). Predictors of return rate discrimination in slot machine play. *Journal of Gambling Studies, 30*(3), 669-683.

Cohen, J. R., & Lieberman, M. D. (2010). The common neural basis of exerting self-control in multiple domains. *Self control in society, mind, and brain, 141-162*.

Cole, T., Barrett, D. J., & Griffiths, M. D. (2011). Social facilitation in online and offline gambling: A pilot study. *International Journal of Mental Health and Addiction, 9*(3), 240-247.

Collins, D., Green, S., d'Ardenne, J., Wardle, H. & Williams, S. (2014). Understanding of return to player messages: findings from user testing. Report prepared for the Responsible Gambling Trust. London: Responsible Gambling Trust.

Conversano, C., Marazziti, D., Carmassi, C., Baldini, S., Barnabei, G., & Dell'Osso, L. (2012). Pathological gambling: a systematic review of biochemical, neuroimaging, and neuropsychological findings. *Harvard review of psychiatry, 20*(3), 130-148.

Corless A., & Dickerson M.G. (1989) Gambler's self-perceptions of determinants of impaired control. *British Journal of Addiction, 84, 1527-1537*.

Cornish, D. B. (1978). *Gambling, a review of the literature and its implications for policy and research: a Home Office research unit report*. Her Majesty's Stationery Office.

Corr (ed.), *The Reinforcement Sensitivity Theory of Personality*. Cambridge: Cambridge University Press, pp. 155–87.

Corr, P.J. & Thompson, S.J. (2014). Pause for Thought: Response Perseveration and Personality in Gambling. *Journal of Gambling Studies, 30, 889–900*. doi:10.1007/s10899-013-9395-4

Corr, P.J. and McNaughton, N. (2008). 'Reinforcement sensitivity theory and personality', in P.J.

Cosenza, M. & Nigro, G. (2015). Wagering the future: Cognitive distortions, impulsivity, delay discounting, and time perspective in adolescent gambling. *Journal of Adolescence, 45, 56-66*.

Costa, N. (1988). *Automatic pleasures: The history of the coin machine*. London: Kevin Francis.

Côté, D., Caron, A., Aubert, J., Desrochers, V., & Ladouceur, R. (2003). Near wins prolong gambling on a video lottery terminal. *Journal of Gambling Studies, 19, 433–438*. doi: 10.1023/A:1026384011003

Cotte, J. (1997). Chances, trances, and lots of slots: Gambling motives and consumption experiences. *Journal of Leisure Research, 29*(4), 380.

- Coventry, K. R., & Constable, B. (1999). Physiological arousal and sensation-seeking in female fruit machine gamblers. *Addiction*, 94(3), 425-430.
- Coventry, K. R., & Hudson, J. (2001). Gender differences, physiological arousal and the role of winning in fruit machine gamblers. *Addiction*, 96(6), 871-879.
- Crewe-Brown, C., Blaszczyński, A., & Russell, A. (2013). Prize level and debt size: Impact on gambling behaviour. *Journal of Gambling Studies*, 1-13.
- Custer, R. L., & Milt, H. (1985). *When luck runs out: Help for compulsive gamblers*. New York: Facts on File Publications.
- Donaldson, P., Langham, E., Rockloff, M.J. & Browne, M. (2016). Veiled EGM jackpots: The effects of hidden and mystery jackpots on gambling intensity. *Journal of Gambling Studies*, 32, 487-498.
- De Ruiter, M.B., Veltman, D.J., Goudriaan, A.E., Oosterlaan, J., Sjoerds, Z. & van den Brink, W. (2009). Response perseveration and ventral prefrontal sensitivity to reward and punishment in male problem gamblers and smokers. *Neuropsychopharmacology*, 34, 4, 1027–1038, <http://dx.doi.org/10.1038/npp.2008.175>.
- Delfabbro, P., King, D., & Griffiths, M. D. (2014). From adolescent to adult gambling: An analysis of longitudinal gambling patterns in South Australia. *Journal of Gambling Studies*, 30(3), 547-563.
- Delfabbro, P., Falzon, K., & Ingram, T. (2005). The effects of parameter variations in electronic gambling simulations: Results of a laboratory-based pilot investigation. *Gambling Research: Journal of the National Association for Gambling Studies (Australia)*, 17(1), 7.
- Delfabbro, P., Lambos, C., King, D., & Puglies, S. (2009). Knowledge and beliefs about gambling in Australian secondary school students and their implications for education strategies. *Journal of Gambling Studies*, 25(4), 523-539.
- Delfabbro, P.H., & Panozzo, S. (2004). *Informing the codes of practice: A summary of findings from the 2002 focus groups undertaken by the Independent Gambling Authority of South Australia*. South Australia: Report commissioned by the Independent Gambling Authority (SA).
- Delfabbro, P. & Winefield, A.H. (1999). Poker machine gambling: An analysis of within session characteristics. *British Journal of Psychology*, 90, 425-439.
- Demaree, H.A., Burns, K.J., DeDonno, M.A., Agarwala, E.K. & Everhart, D.E. (2012). Risk dishabituation: In repeated gambling, risk is reduced following low probability surprising events wins or losses. *Emotion*, 12 (3), 495.
- Demaree, H.A., DeDonno, M.A., Burns, K.J., & Everhart, D. (2008). You bet: How personality differences affect risk-taking preferences. *Personality and Individual Differences*, 44, 7, 1484–1494.
- Department for Culture, Media and Sport (2016). *Evaluation of Gaming Machine (Circumstances of Use) (Amendment) Regulations 2015*. London: Department for Culture, Media and Sport.

Dickerson, M., Hinchy, J., Legg-England, S., Fabre, J. and Cunningham, R. (1992). On the determinants of persistent gambling behaviour. I. High frequency poker machine players. *British Journal of Psychology*, 83, 237-248.

Dickerson, M. (1979). Fixed interval schedules and persistence at gambling in the UK betting office. *Journal of Applied Behavior Analysis*, 12, 315-323.

Dickerson, M. (1993). Internal and external determinants of persistent gambling: Problems in generalizing from one form to another. In W. R. Eadington and J. Cornelius (Eds.), *Gambling behavior and problem gambling*. Reno: Institute For the Study of Gambling and Commercial Gaming.

Dickerson, M. G. (1979). FI Schedules and persistence at gambling in the UK betting office. *Journal of Applied Behavioural Analysis*, 12, 315-323.

Dickerson, M. G., & O'Connor, J. (2006). *Gambling as an addictive behaviour: Impaired control, harm minimisation, treatment and prevention*. Cambridge University Press.

Diergaarde, L., Pattij, T., Poortvliet, I., Hogenboom, F., de Vries, W., et al. (2008). Impulsive choice and impulsive action predict vulnerability to distinct stages of nicotine seeking in rats. *Biological Psychiatry*, 63, 301–308.

Diskin, K. & Hodgins, D.C. (1999). Narrowing of attention and dissociation in pathological video lottery gamblers. *Journal of Gambling Studies*, 15, 17-28.

Diskin, K.M., & Hodgins, D. (2001). Narrowed focus and dissociative experiences in a community sample of experienced video lottery gamblers. *Canadian Journal of Behavioural Science*, 33(1), 58-6.

Dixon, M. J., Fugelsang, J. A., MacLaren, V. V., & Harrigan, K. A. (2013). Gamblers can discriminate 'tight' from 'loose' electronic gambling machines. *International Gambling Studies*, 13, 98–111.

Dixon, M. J., Harrigan, K. A., Sandhu, R., Collins, K., & Fugelsang, J. A. (2010). Losses disguised as wins in modern multi-line video slot machines. *Addiction*, 105, 1819–1824.

Dixon, M.J., Graydon, C., Harrigan, K.A., Wojtowicz, L., Siu, V. & Fugelsang, J.A. (2014). The allure of multi-line games in modern slot machines. *Addiction*, 109, 1920-1928.

Dixon, M.J., MacLaren, V., Jarick, M., Fugelsang, J.A. & Harrigan, K. (2013). The frustrating effects of just missing the jackpot: slot machine near misses trigger large skin conductance responses, but no post reinforcement pauses. *Journal of Gambling Studies*, 29, 661-674.

Dixon, M.R., Jacobs, E.A. & Sanders, S. (2006). Contextually controlled delay discounting of pathological gamblers. *Journal of Applied Behavior Analysis*, 39, 413–422.

Dixon, M.R., Nastally, B. L., Hahs, A. D., Homer-King, M., & Jackson, J. W. (2009). Blackjack players demonstrate the near miss effect. *Analysis of Gambling Behavior*, 3, 56–61.

- Dixon, M.R., & Schreiber, J. E. (2004). Near-miss effects on response latencies and win estimations of slot machine players. *The Psychological Record*, *54*, 335–348.
- Dow Schüll, N. (2005). Digital Gambling: The Coincidence of Desire and Design. *American Association of Political and Social Science: The Annals*, *597*, 65-81.
- Dow Schüll, N. (2012) *Addiction by Design: Machine Gambling in Las Vegas*. Princeton, NJ: Princeton University Press. DOI: 10.1111/add.12326.
- Dowling, N., Smith, D., & Thomas, T. (2005). Electronic gaming machines: Are they the ‘crack-cocaine’ of gambling? *Addiction*, *100*, 1, 1–33. doi:10.1111/j.1360-0443.2005.00962.x.
- Finlay, K., Kanetkar, V., Londerville, J., & Marmurek, H. H. C. (2006). The physical and psychological measurement of gambling environments. *Environment and Behavior*, *38*, 570–581.
- Excell, D., Bobashev, B., Gonzalez-Ordenez, D., Wardle, H., Whitehead, T., Morris, R.J. & Ruddle, P. (2014). *Predicting Problem Gambling: Analysis of industry data*. Report prepared for the Responsible Gambling Trust. London: Responsible Gambling Trust.
- Ely, J., Frankel, A., & Kamenica, E. (2015). Suspense and surprise. *Journal of Political Economy*, *123*(1), 215-260.
- Fang, X., & Mowen, J. C. (2009). Examining the trait and functional motive antecedents of four gambling activities: Slot machines, skilled card games, sports betting, and promotional games. *Journal of Consumer Marketing*, *26*, 121-131.
- Fekjær, H. O. (2006). Putting gambling problems on the agenda-Some Norwegian experiences. *Journal of Gambling Issues*, 107-109.
- Figner, B., Knoch, D., Johnson, E.J., Krosch, A.R., Lisanby, S.H., Fehr, E. & Weber, E.U. (2010). Lateral prefrontal cortex and self-control in intertemporal choice. *Nature Neuroscience*, *13*, 5, 538–539, <http://dx.doi.org/10.1038/nn.2516>.
- Finlay, K., Londerville, J., Kanetkar, V., & Marmurek, H. H. C. (2007). Effects of slot machine characteristics on problem gambling behavior. Final report submitted to Ontario Problem Gambling Research Center.
- Finlay, K., Marmurek, H. H. C., Kanetkar, V. & Londerville, J. (2010) Casino Décor Effects on Gambling Emotions and Intentions, *Environment and Behavior*, *42*, 524-545.
- Fiorillo, C.D., Tobler, P.N. & Schultz, W. (2003). Discrete coding of reward probability and uncertainty by dopamine neurons. *Science*, *299*, 1898-1902.
- Focal Research Consultants. (2002). *Atlantic Lottery Corporation video lottery responsible gaming feature research – Final report*. Halifax, NS: Focal Research Consultants Ltd.
- Focal Research Consultants. (2004). *NS VLT responsible gaming features evaluation – Final report*. Halifax, NS: Focal Research Consultants Ltd.

- Forrest, D., & McHale, I. (2016). Tracked play on BI gaming machines in British casinos. Report prepared for the Responsible Gambling Trust. London: Responsible Gambling Trust.
- Forrest, D., McHale, I. & Wardle, H. (2015). Evaluating the impact of the uplift of stakes and prizes on BI gaming machines in casinos. Report prepared for the Responsible Gambling Trust. London: Responsible Gambling Trust.
- Foxall, G.R & Sigurdsson, V. (2012). When loss rewards: The near miss effect in slot machine gambling. *Analysis of Gambling Behaviour*, 6, 5-22.
- Gaher, R.M., Hahn, A.M., Shishido, H., Simons, J.S. & Gaster, S. (2015). Associations between sensitivity to punishment, sensitivity to reward and gambling. *Addictive Behaviors*, 42, 180–184.
- Gainsbury, S. M., Aro, D., Ball, D., Tobar, C., & Russell, A. (2015). Optimal content for warning messages to enhance consumer decision making and reduce problem gambling. *Journal of Business Research*, 68(10), 2093-2101.
- Gainsbury, S., Aro, D., Ball, D., Tobar, C., & Russell, A. (2015). Determining optimal placement for pop-up messages: evaluation of a live trial of dynamic warning messages for electronic gaming machines. *International Gambling Studies*, 15(1), 141-158.
- Gainsbury, S., & Russell, A. (2015). Betting patterns for sports and races: A longitudinal analysis of online wagering in Australia. *Journal of Gambling Studies*, 31(1), 17-32. DOI: 10.1007/s10899-013-9415-4.
- Gainsbury, S., Russell, A., & Blaszczynski, A. (2012). Are psychology university student gamblers representative of general student and adult gamblers? A comparative analysis. *Journal of Gambling Studies*. DOI: 10/2012; DOI: 10.1007/s10899-012-9334-9.
- Gainsbury, S.M., Liu, Y., Russell, A. & Teichert, T. (2016). Is all Internet gambling equally problematic? Considering the relationship between mode of access and gambling problems. *Computers in Human Behavior*, 55, 717–728.
- Gambling Motives Questionnaire. *Addiction*, 103, 1110–1117. doi:10.1111/j.1360-0443.2008.02235.x.
- Gambling Simulations: Results of a Laboratory-based Pilot Investigation. *Gambling Research: Journal of the National Association for Gambling Studies*, 17, Issue 1.
- Gehring, W. J., & Willoughby, A. R. (2002). The medial frontal cortex and the rapid processing of monetary gains and losses. *Science*, 295(5563), 2279-2282.
- Ghezzi, P. M., Wilson, G. R., & Porter, J. C. K. (2006). The near-miss effect in simulated slot machine play. In P. M. Ghezzi, C. A. Lyons, M. R. Dixon, & G. R. Wilson (Eds.), *Gambling: Behavior theory, research, and application* (pp. 155–170). Reno: Context Press.

- Gillis, A., McDonald, D. J., and Weatherly, J. N. (2008). American Indians and non-Indians playing a slot machine simulation: effect of sensation-seeking and payback percentage. *American Indian and Alaska Mental Health Research*, 15 (1), 18-32.
- Goldberg, D. & Huxley, R. (2000). *Mental Illness in the community: The pathway to psychiatric care*. Routledge: London.
- Goudriaan, A. E., Oosterlaan, J., de Beurs, E. & van der Brink, W. (2004). *Pathological gambling: a comprehensive review of biobehavioral findings*. *Neuroscience and Biobehavioral Reviews*, 28, 123-141.
- Goudriaan, A. E., Oosterlaan, J., de Beurs, E., & van den Brink, W. (2005). Decision-making in pathological gambling: A comparison between pathological gamblers, alcohol dependents, persons with Tourette syndrome and normal controls. *Cognitive Brain Research*, 23, 137–151.
- Goudriaan, A. E., Oosterlaan, J., de Beurs, E., & Van Den Brink, W. (2006). Neurocognitive functions in pathological gambling: A comparison with alcohol dependence, Tourette syndrome and normal controls. *Addiction*, 101, 534–547.
- Goudriaan, A.E., Yücel, M. & van Holst, R.J. (2014). Getting a grip on problem gambling: what can neuroscience tell us? *Frontiers in Behavioral Neuroscience*, 20, 8, 141.
- Gray, H. M., LaPlante, D. A., & Shaffer, H. J. (2012). Behavioral characteristics of Internet gamblers who trigger corporate responsible gambling interventions. *Psychology of Addictive Behaviors*, 26, 3, 527-535. doi: 10.1037/a0028545
- Gray, J.A. (1991). The neuropsychology of temperament. In J. Strelan, & A. Angleitner (Eds.), *Explorations in treatment: International perspectives on theory and measurement* (pp. 105–128). NY: Plenum Press.
- Green, L. & Myerson, J. (2004). A discounting framework for choice with delayed and probabilistic rewards. *Psychological Bulletin*, 130, 5, 769. <http://dx.doi.org/10.1037/0033-2909.130.5.769>.
- Greenhalgh, T., & Peacock, R. (2005). Effectiveness and efficiency of search methods in systematic reviews of complex evidence: audit of primary sources. *BMJ*, 331(7524), 1064-1065.
- Griffiths, M. D. (1993). Fruit machine gambling: The importance of structural characteristics. *Journal of Gambling Studies*, 9(2), 101-120.
- Griffiths, M. D. (1994). The role of cognitive bias and skill in fruit machine gambling. *British journal of Psychology*, 85(3), 351-369.
- Griffiths, M. D. (1999a). Gambling technologies: Prospects for problem gambling. *Journal of Gambling Studies*, 15, 265–283.
- Griffiths, M. D. (1999b). The psychology of the near miss (revisited): A comment on Delfabbro and Winefield. *British Journal of Psychology*, 90, 441–445.

Griffiths, M.D. (2006). A case study of binge problem gambling. *International Journal of Mental Health and Addiction*, 4, 369-376.

Griffiths, M. D., & Auer, M. (2012). The irrelevancy of game-type in the acquisition, development, and maintenance of problem gambling. *Frontiers in psychology*, 3.

Griffiths, M., Parke, A., Wood, R., & Parke, J. (2006). Internet gambling: An overview of psychosocial impacts. *UNLV Gaming Research & Review Journal*, 10(1), 27.

Griffiths, M.D. & Swift, G. (1992). The use of light and color in gambling arcades: A pilot study. *Society for the Study of Gambling Newsletter*, 21, 16-22.

Habib, R., & Dixon, M. R. (2010). Neurobehavioral Evidence for the “Near-Miss” Effect in Pathological Gamblers. *Journal of the Experimental Analysis of Behavior*, 93, 3, 313–328.

Haeusler, J. (2016). Follow the money: using payment behaviour as predictor for future self-exclusion. *International Gambling Studies*, 1-17.

Hahn, C., Wilson, T. D., McRae, K., & Gilbert, D. T. (2013). “Show Me the Money” Vulnerability to Gambling Moderates the Attractiveness of Money Versus Suspense. *Personality and Social Psychology Bulletin*, 39(10), 1259-1267.

Hansen, M. B., & Rossow, I. M. (2012). Does a reduction in the overall amount of gambling imply a reduction at all levels of gambling? *Addiction Research & Theory*, 20(2), 145-152.

Hare, T.A., Hakimi, S., & Rangel, A. (2014). Activity in dlPFC and its effective connectivity to vmPFC are associated with temporal discounting. *Frontiers in Neuroscience*, 8, 3, 1–15,

Harrigan, K. A. (2008). Slot machine structural characteristics: creating near misses using high award symbol ratios. *International Journal of Mental Health*, 6, 353–368.

Harrigan, K. A. (2009). Slot machines: pursuing responsible gaming practices for virtual reels and near misses. *International Journal of Mental Health Addiction*, 7, 68–83.

Harrigan, K. A., & Dixon, M. (2009). PAR Sheets, probabilities, and slot machine play: Implications for problem and non-problem gambling. *Journal of Gambling Issues*, 81-110.

Harrigan, K. A., & Dixon, M.J. (2010). Government sanctioned “tight” and “loose” slot machines: How having multiple versions of the same slot machine game may impact problem gambling. *Journal of Gambling Studies*, 26(1), 159-174.

Harrigan, K., Dixon, M. & Brown, D. (2015). Modern multi-line slot machine games: The effect of lines wagered on winners, losers, bonuses and losses disguised as wins. *Journal of Gambling Studies*, 31, 423-439.

Harrigan, K.A., Dixon, M.J., MacLaren, V.V., Collins, K. & Fugelsang, J.A. (2011). The maximum rewards at the minimum price: reinforcement rates and payback percentages in multi-line slot machines. *Journal of Gambling Issues*, 26, 11–29. doi: 10.4309/jgi.2011.26.3.

- Haruvy, E., Erev, I. & Sonsino, D. (2001). The medium prize paradox: Evidence from a simulated casino. *The Journal of Risk and Uncertainty*, 22, 3, 251-261.
- Haw, J. (2008). The relationship between reinforcement and gaming machine choice. *Journal of Gambling Studies*, 24, 55-61.
- Haw, J. (2009). The multiplier potential of slot machines predicts bet size. *Analysis of Gambling Behavior*, 3, 1, 1-6.
- Hing, N. (2004). The efficacy of responsible gambling measures in NSW clubs: The gamblers' perspective. *Gambling Research*, 16(1), 32-46.
- Hing, N., Lamont, M., Vitartas, P. & Fink, E. (2015). Sports embedded gambling promotions: A study of exposure, sports betting intention and problem gambling amongst adults. *International Journal of Mental Health & Addiction*, 13, 115-135.
- Hirsch, A.R. (1995). Effects of ambient odours on slot machine usage in a Las Vegas casino. *Psychology and Marketing*, 12, 585-594.
- Holtgraves, T. (2009). Gambling, gambling activities, and problem gambling. *Psychology of Addictive Behaviors*, 23, 295-302.
- Horsley, R.R., Osborne, M., Norman, C. & Wells, T. (2012). High frequency gamblers show increased resistance to extinction following partial reinforcement. *Behavioural Brain Research*, 229, 438-442.
- Hser, Y. I., Anglin, M. D., & Powers, K. (1993). A 24-year follow-up of California narcotics addicts. *Archives of General Psychiatry*, 50(7), 577-584.
- Hulburt, R. T., Knapp, T.J. & Knowles, S.H. (1980). Simulated slot machine play with concurrent variable ratio and random ratio schedules of reinforcement. *Psychology Reports*, 47, 635-639.
- Husain, F., Wardle, H., Kenny, T., Balarajan, M. & Collins, D. (2013). *Exploring machine player behaviour: A qualitative exploration*. Retrieved September 22, 2015, from: <http://www.natcen.ac.uk/media/205544/exploring-machine-characteristics-report-final-2-.pdf>
- Jacobs, D. F. (1986). A general theory of addictions: A new theoretical model. *Journal of Gambling Behavior*, 2(1), 15-31.
- Jacobsen, L.H., Knudsen, A.K., Krogh, E., Pallesen, S., & Molde, H. (2007). An overview of cognitive mechanisms in pathological gambling. *Nordic Psychology*, 59, 4, 347-361.
- Jensen, C., Dixon, M.J., Harrigan, K.H., Sheepy, E., Fugelsang, J.A., Jarick, M. (2013). Misinterpreting "winning" in multiline slot machine games. *International Gambling Studies*, 13, 112-126. doi: 10.1080/14459795.2012.717635
- Johansson, A., Grant, J.E., Kim, S.W., Odlaug, B.L. & Gotestam, K.G. (2009). Risk factors for problematic gambling: A critical literature review. *Journal of Gambling Studies*, 25, 67-92.

- Johnson, E. J., Shu, S. B., Dellaert, B. G., Fox, C., Goldstein, D. G., Häubl, G., Larrick, R. P., Payne, J.W., Peters, E., Schkade, D. & Wansink, B. (2012). Beyond nudges: Tools of a choice architecture. *Marketing Letters*, 23(2), 487-504.
- Joutsa, J., Voon, V., Johansson, J., Niemela, S., Bergman, J. & Kaasinen, V. (2015). Dopaminergic function and intertemporal choice. *Translational Psychiatry*, 5, e491. doi: 10.1038/tp.2014.133.
- Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, 47 (2) 263-291.
- Kahneman, D., & Varey, C. A. (1990). Propensities and counterfactuals: The loser that almost won. *Journal of Personality and Social Psychology*, 59, 6, 1101.
- Kassinove, J. I., & Schare, M. L. (2001). Effects of the near miss and the big win on persistence at slot machine gambling. *Psychology of Addictive Behaviors*, 15, 2, 155–158.
- Kertzman, S., Lowengrub, K., Aizer, A., Vainder, M., Kotler, M., & Dannon, P. N. (2008). Go–no-go performance in pathological gamblers. *Psychiatry Research*, 161(1), 1-10.
- Khan, J., Belk, R. W., & Craig-Lees, M. (2015). Measuring consumer perceptions of payment mode. *Journal of Economic Psychology*, 47, 34-49.
- Kim, D., & Lee, J. (2011). Effects of the BAS and BIS on decision-making in a gambling task. *Personality and Individual Differences*, 50, 7, 1131–1135.
- Kofoed, L., Morgan, T., Buchowski, J. & Carr, R. (1997). Dissociative experiences and MMPI-2 scores in video poker gamblers, other gamblers, and alcoholic controls. *Journal of Nervous and Mental Disease*, 185, 58-60.
- Korn, D.A., & Shaffer, H.J. (1999). Gambling and the health of the public: Adopting a public health perspective. *Journal of Gambling Studies*, 15, 4, 289-365.
- Kuley, N.B. & Jacobs, D. (1988). The relationship between dissociative-like experiences and sensation seeking among social and problem gamblers. *Journal of Gambling Behavior*, 4, 197-207.
- Ladouceur, R. & Mayrand, M. (1987). The level of involvement and the timing of betting in roulette. *The Journal of Psychology: Interdisciplinary and Applied*, 121, 169–176.
- Ladouceur, R., & Sévigny, S. (2003). Interactive messages on video lottery terminals and persistence in gambling. *Gambling Research: Journal of the National Association for Gambling Studies (Australia)*, 15(1), 45.
- Ladouceur, R., & Sévigny, S. (2005). Structural characteristics of video lotteries: effects of a stopping device on illusion of control and gambling persistence. *Journal of Gambling Studies*, 21, 2, 117-131.
- Ladouceur, R., & Sévigny, S. (2009). Electronic gambling machines: Influence of a clock, a cash display, and a precommitment on gambling time. *Journal of Gambling Issues*. 23, 31-41. <http://www.camh.net/egambling/issue23/pdfs/02ladouceur.pdf>.

- Ladouceur, R. & Walker, M. (1996) A cognitive perspective on gambling. In: Salkovskies, P. M., ed. *Trends in Cognitive and Behavioural Therapies*, pp. 89–120. Chichester: John Wiley and Sons.
- Landon, J., Palmer Du Preez, K., Page, A., Belringer, M., Roberts, A. & Abbott, M. (2016). Electronic gaming machine characteristics: it's the little things that count. *International Journal of Mental Health and Addiction*. ISSN: 1557-1874.
- Langer, E. (1975). The illusion of control. *Journal of Personality and Social Psychology*, 32, 311–328.
- LaPlante, D. A., Afifi, T. O., & Shaffer, H. J. (2013). Games and gambling involvement among casino patrons. *Journal of Gambling Studies*, 29(2), 191-203.
- LaPlante D. A., Nelson S. E., Gray H. M. (2014). Breadth and depth involvement: understanding Internet gambling involvement and its relationship to gambling problems. *Psychology of Addictive Behaviours*, 28, 396–403. doi: 10.1037/a0033810.
- LaPlante, D.A. Nelson, S.E., LaBrie, R.A., & Shaffer, H.J. (2011). Disordered gambling, type of gambling and gambling involvement in the British Gambling Prevalence Survey 2007. *European Journal of Public Health*, 21, 532–537.
- LaPlante, D.A., Schumann, A., LaBrie, R.A., & Shaffer, H.J. (2008). Population trends in Internet sports gambling. *Computers in Human Behavior*, 24, 5, 2399-2414.
- Lawrence, A.J., Luty, J., Bogdan, N.A., Sahakian, B.J. & Clark, L. (2009). Impulsivity and response inhibition in alcohol dependence and problem gambling. *Psychopharmacology*, 207 (1), 163-172.
- Lapuz, J., & Griffiths, M. D. (2010). The role of chips in poker gambling: An empirical pilot study. *Gambling Research: Journal of the National Association for Gambling Studies (Australia)*, 22(1), 34.
- Lee, H. P., Chae, P. K., Lee, H. S., & Kim, Y. K. (2007). The five-factor gambling motivation model. *Psychiatry Research*, 150(1), 21-32.
- Leino, T., Torsheim, T., Blaszczynski, A., Griffiths, M., Mentzoni, R., Pallesen, S., & Molde, H. (2015). The relationship between structural game characteristics and gambling behavior: A population-level study. *Journal of Gambling Studies*, 31(4), 1297-1315.
- Lesieur, H. R., & Custer, R. L. (1984). Pathological gambling: Roots, phases, and treatment. *The Annals of the American Academy of Political and Social Science*, 146-156.
- Lewis, D.J. (1952). Partial reinforcement in a gambling situation. *Journal of Experimental Psychology*, 43, 6, 447-450.
- Lieberman, D.A., McIntosh, D.C. & Thomas, G.V. (1979). Learning when reward is delayed: A marking hypothesis. *Journal of Experimental Psychology: Animal Behavior Processes*, 5, 3, 224-242.

Linnet, J., Thomsen, K.R., Møller, A. & Callesen, M.B. (2010) Event frequency, excitement and desire to gamble, among pathological gamblers. *International Gambling Studies*, 10, 2, 177-188. doi: 10.1080/14459795.2010.502181.

Liu, Y., Nelson, L.D., Bernat, E.M. & Gehring, W.K. (2014). Perceptual properties of feedback stimuli influence the feedback-related negativity in the flanker gambling task. *Psychophysiology*, 51, 782-788.

Livingstone, C. H., & Woolley, R. (2008). *The relevance and role of gaming machine games and games features on the play of problem gamblers*. Report prepared to Independent Gambling Authority South Australia.

Livingstone, C. H., & Woolley, R. (2008). *The relevance and role of gaming machine games and games features on the play of problem gamblers* (Report prepared to Independent Gambling Authority South Australia). Retrieved from <http://www.iga.sa.gov.au/pdf/0801/final%20report.print.feb08.pdf>.

Livingstone, C., & Adams, P. J. (2016). Clear principles are needed for integrity in gambling research. *Addiction*, 111(1), 5-10.

Lloyd, J., Doll, H., Hawton, K., Dutton, W. H., Geddes, J. R., Goodwin, G. M., & Rogers, R. D. (2010). Internet gamblers: A latent class analysis of their behaviours and health experiences. *Journal of Gambling Studies*, 26(3), 387-399.

Loba, P., Stewart, S.H., Klein, R.M. & Blackburn, J.R. (2001). Manipulations of the Features of Standard Video Lottery Terminal (VLT) Games: Effects in Pathological and Non-Pathological Gamblers. *Journal of Gambling Studies*, 17, 4, 297-320.

Lole, L., Gonsalvez, C.J., Barry, R.J. & Blaszczynski, A. (2014). Problem gamblers are hyposensitive to wins: An analysis of skin conductance responses during actual gambling on electronic gaming machines. *Psychophysiology*, 51, 556-564.

Loroz, P. S. (2004). Golden-age gambling: Psychological benefits and self-concept dynamics in aging consumers' consumption experiences. *Psychology & Marketing*, 21(5), 323-349.

Lucas, A. F. and Brandmier, K. (2005). Short-term effects of a change in par on reel slot machine performance. *Gaming Research and Review Journal*, 9 (2), 1-14.

Lucas, A. F. And Singh, A. K. (2008). Decreases in a slot machine's coefficient of variation lead to increases in customer play time. *Cornell Hospitality Quarterly*, 49 (2), 122-133.

Lucas, A. F. Dunn, W. T., Roehl, W. S. and Wolcott, G. M. (2004). Evaluating slot performance: A performance-potential model. *Hospitality Management*, 23, 103-121.

Luo, Q., Wang, Y. & Qu, C. (2011). The near-miss effect in slot machine gambling: modulation of feedback related negativity by subjective value. *Neuroreport*, 22, 18, 989-993.

- MacLaren, V. V. (2015). Experienced EGM players know how to control the reinforcement rate and time on device. *Journal of Gambling Studies*, 31, 1789-1798. doi:10.1007/s10899-014-9498-6.
- Maclean, P.D. (1973). *Triune concept of the brain and behaviour*. Toronto: University of Toronto Press.
- MacLin, O. H., Dixon, M. R., Daugherty, D., & Small, S. L. (2007). Using a computer simulation of three slot machines to investigate a gambler's preference among varying densities of near-miss alternatives. *Behavioral Research Methods*, 39, 237-241.
- Marchica, L., & Derevensky, J. L. (2016). Examining personalized feedback interventions for gambling disorders: A systematic review. *Journal of Behavioral Addictions*, 5(1), 1-10.
- Marmurek, H. H. C., Finlay, K., Kanetkar, V., & Londerville, J. (2007). The influence of music on estimates of at-risk gambling intentions: An analysis by casino design. *International Gambling Studies*, 7(1), 113-122.
- Martin, R.S., Manes, F., Hurtado, E., Isla, P. & Ibanez, A. (2010). Size and probability of rewards modulate the feedback error related negativity associated with wins but not losses in a monetarily rewarded gambling task. *NeuroImage*, 51, 1194-1204.
- Mayer, K., & Johnson, L. (2003). A customer- based assessment of casino atmospherics. *UNLV Gaming Research & Review Journal*, 7(1), 21-31.
- McCormack, A., Shorter, G.W. & Griffiths, M.D. (2013). Characteristics and Predictors of Problem Gambling on the Internet. *International Journal of Mental Health and Addiction*, 11, 634-657. doi:10.1007/s11469-013-9439-0
- McCormick, R. A. (1993). Disinhibition and negative affectivity in substance abusers with and without a gambling problem. *Addictive Behaviours*, 18, 331-336.
- McMillen, J., Marshall, D., & Murphy, L. (2004). *The use of ATMs in ACT gaming venues: An empirical study*. Centre for Gambling Research, ANU.
- Mentzoni, R.A., Laberg, J.C., Brunborg, G.S., Molde, H. & Pallesen, S. (2012). Tempo in electronic gambling machines affects behaviour among at risk gamblers. *Journal of Behavioural Addictions*, 1, 3, 135-139.
- Michalczuk, R., Bowden-Jones, H., Verdejo-Garcia, A., & Clark, L. (2011). Impulsivity and cognitive distortions in pathological gamblers attending the UK National Problem Gambling Clinic: a preliminary report. *Psychological Medicine*, 41(12), 2625-2635.
- Miedl, S.F., Peters, J. & Büchel, C. (2012). Altered neural reward representations in pathological gamblers revealed by delay and probability discounting. *Archives of General Psychiatry*, 69, 2, 177-186, <http://dx.doi.org/10.1001/archgenpsychiatry.2011.1552>.
- Miller, E. K., & Cohen, J. D. (2001). An integrative theory of prefrontal cortex function. *Annual Review of Neuroscience*, 24, 167-202. <http://dx.doi.org/10.1146/annurev.neuro.24.1.167>.

- Monaghan, S., & Blaszczynski, A. (2007). Recall of electronic gaming machine signs: A static versus a dynamic mode of presentation. *Journal of Gambling Issues*, 253-267.
- Monaghan, S., & Blaszczynski, A. (2010). Impact of mode of display and message content of responsible gambling signs for electronic gaming machines on regular gamblers. *Journal of Gambling Studies*, 26(1), 67-88.
- Monaghan, S. & Blaszczynski, A. (2011). The appropriateness of using laboratories and student participants in gambling research. *Journal of Gambling Studies*, 27(1), 83-97. DOI: 10.1007/s10899-010-9190-4.
- Moodie, C. & Finnigan, F. (2005). A comparison of the autonomic arousal of frequent, infrequent and non-gamblers while playing fruit machines. *Addiction*, 100: 51-59.
- Münscher, R., Vetter, M., & Scheuerle, T. (2015). A review and taxonomy of choice architecture techniques. *Journal of Behavioral Decision Making*. DOI: 10.1002/bdm.1897.
- Murch, W.S. & Clark, L. (2015). Games in the brain: Neural substrates of gambling addiction. *The Neuroscientist*, 1-12.
- Neal, P. N., Delfabbro, P. H., & O'Neil, M. G. (2005). *Problem gambling and harm: Towards a national definition*. Report prepared for Office of Gaming and Racing, Victorian Government Department of Justice.
- Nelson, S. E., LaPlante, D. A., Peller, A. J., Schumann, A., LaBrie, R. A., & Shaffer, H. J. (2008). Real limits in the virtual world: Self-limiting behavior of Internet gamblers. *Journal of Gambling Studies*, 24, 4, 463-477.
- Newman, J. P. & Wallace, J. F. (1993). Diverse pathways to deficient self-regulation: Implications for disinhibitory psychopathology in children. *Clinical Psychology Review*, 13, 699-720.
- Newman, J. P., Patterson, C. M., & Kosson, D. S. (1987). Response perseveration in psychopaths. *Journal of Abnormal Psychology*, 96, 145-148.
- Novemsky, N., & Kahneman, D. (2005). The boundaries of loss aversion. *Journal of Marketing research*, 42(2), 119-128.
- Nower, L., & Blaszczynski, A. (2003). Binge gambling: A neglected concept. *International Gambling Studies*, 3, 23-35.
- Nower, L., & Blaszczynski, A. (2010). Gambling motivations, money-limiting strategies, and pre-commitment preferences of problem versus non-problem gamblers. *Journal of Gambling Studies*, 26(3), 361-372.
- O'Connor, J., & Dickerson, M. (2003). Definition and measurement of chasing in off-course betting and gaming machine play. *Journal of Gambling Studies*, 19(4), 359-386.

O'Connor, J., Dickerson, M., & Phillips, M. (1995). Chasing and its relationship to impaired control over gambling. In J. O'Connor (Ed.), *High stakes in the nineties* (2nd ed.). Melbourne: National Association for Gambling Studies.

Odum, A. L. (2011). Delay Discounting: I'm a k, you're a k. *Journal of the Experimental Analysis of Behavior*, 96, 3, 427–439.

Ofcom. (2013). *Trends in Advertising Activity - Gambling*. London: Independent Regulator and Competition Authority for the UK Communications Industries

Palomäki, J., Laakasuo, M., & Salmela, M. (2014). Losing more by losing it: Poker experience, sensitivity to losses and tilting severity. *Journal of Gambling Studies*, 30(1), 187-200.

Parke, J. (2009). A medium to long-term programme of research for investigating gaming machines in Great Britain: Recommendations from international and British panels. Report prepared for the UK Gambling Commission.

Parke, J. & Griffiths, M.D. (2006). The psychology of the fruit machine: The role of structural characteristics (revisited). *International Journal of Mental Health and Addiction*, 4, 151-179.

Parke, J. & Griffiths, M.D. (2007). The role of structural characteristics in gambling. In G. Smith, D. Hodgins & R. Williams (Eds.), *Research and Measurement Issues in Gambling Studies*. New York: Elsevier.

Parke, A., Harris, A., Parke, J., & Goddard, P. (2016). Understanding within-session loss-chasing: an experimental investigation of the impact of stake size on cognitive control. *Journal of Gambling Studies*, 1-15.

Parke, J. & Parke, A. (2013). Does size really matter? A review of the role of stake and prize levels in relation to gambling-related harm. *The Journal of Gambling Business and Economics*, 7, 3, 77-110.

Parke, J., Rigbye, J. Parke, A., Williams, L. V., Sjenitzer, J., Wood, R., & Winder, B. (September 2008). An Exploratory Investigation into the Attitudes and Behaviours of Internet Casino and Poker Players. Paper presented at the 7th European Conference on Gambling Studies and Policy Issues, Nova Gorica, Slovenia.

Paterson, C. M., Kosson, D. S., & Newman, J. P. (1987). Reaction to punishment, reflectivity, and passive avoidance learning in extraverts. *Journal of Personality and Social Psychology*, 52, 565–567.

Peller, A. J., LaPlante, D. A., & Shaffer, H. J. (2008). Parameters for safer gambling behavior: Examining the empirical research. *Journal of Gambling Studies*, 24(4), 519-534.

Petry, N. M. (2005). *Pathological gambling: Etiology, comorbidity, and treatment*. American Psychological Association.

Pittenger, D.J., Pavlik, W.B., Flora, S.R. & Kontos, J. (1988). Analysis of the partial reinforcement extinction effect in humans as a function of sequence of reinforcement schedules. *American Journal of Psychology*, 10, 371-382.

- Platz, L., & Millar, M. (2001). Gambling in the context of other recreation activity: A quantitative comparison of casual and pathological student gamblers. *Journal of Leisure Research*, 33(4), 383.
- Popkin, J. (1994, March 14). Tricks of the Trade. *U.S. News & World Report* 161(10), 48–52.
- Presson, P. K., & Benassi, V. A. (1996). Illusion of control: A meta-analytic review. *Journal of Social Behavior and Personality*, 11, 493-510.
- Prelec, D., & Loewenstein, G. (1998). The red and the black: Mental accounting of savings and debt. *Marketing Science*, 17(1), 4-28.
- Prentice, C., & Woodside, A. G. (2013). Problem gamblers' harsh gaze on casino services. *Psychology & Marketing*, 30(12), 1108-1123.
- Productivity Commission (1999). *Australia's gambling industries*. Canberra: Productivity Commission.
- Productivity Commission (2010). *Gambling. Productivity Commission Inquiry Report. Volume 1*. Report no. 50 Canberra: Productivity Commission. Available at: www.pc.gov.au/projects/inquiry/gambling---2009/report
- Quednow, B. B., Kühn, K. U., Hoppe, C., Westheide, J., Maier, W., Daum, I., & Wagner, M. (2007). Elevated impulsivity and impaired decision-making cognition in heavy users of MDMA ("Ecstasy"). *Psychopharmacology*, 189(4), 517-530.
- Rachlin, H. (1990). Why do people gamble and keep gambling despite heavy losses? *Psychological Science*, 1, 294–297.
- Rachlin, H. (2000). *The science of self-control*. Cambridge, MA: Harvard University Press.
- Rachlin, H., Safin, V., Arfer, K.B. & Yen, M. (2015). The attraction of gambling. *Journal of the Experimental Analysis of Behavior*, 103, 260-266.
- Raghubir, P., & Srivastava, J. (2008). Monopoly money: the effect of payment coupling and form on spending behavior. *Journal of Experimental Psychology: Applied*, 14(3), 213.
- Redish, A.D., Jensen, D., Johnson, A. & Kurth-Nelson, Z. (2007). Reconciling reinforcement learning models with behavioral extinction and renewal: Implications for addiction, relapse, and problem gambling. *Psychological Review*, 114, 3, 784-805.
- Reid, R. L (1986). The psychology of the near miss. *Journal of Gambling Behavior*, 2, 32–39.
- Reith, G., & Dobbie, F. (2013). Gambling careers: A longitudinal, qualitative study of gambling behaviour. *Addiction Research & Theory*, 21(5), 376-390.
- Responsible Gambling Strategy Board. (2016) *Responsible Gambling Strategy 2016-17 to 2018-19*. Birmingham: Responsible Gambling Strategy Board.

- Robson, A. (1996). The evolution of attitudes to risk: Lottery tickets and relative wealth. *Games and Economic Behavior*, 14, 190-207.
- Rockloff, M.J. Donaldson, P. & Browne, M. (2015). Jackpot expiry: An experimental investigation of a new EGM player protection feature. *Journal of Gambling Studies*, 31, 1505-1514.
- Rockloff, M.J. & Hing, N. (2013). The impact of jackpots on EGM gambling behaviour: A review. *Journal of Gambling Studies*, 29, 775-790.
- Rosow, I & Hansen, M.B. (2016) Gambling and gambling policy in Norway – an exceptional case. *Addiction*, 111, 593-598.
- Royal Commission. (1951). *Report of the Royal Commission on Betting Lotteries and Gaming 1949–1951*.
- Sadler, M. (2000). Escaping poverty: Risk-taking and endogenous inequality in a model of equilibrium growth. *Review of Economic Dynamics*, 3, 704-725.
- Scannell, E., Quirk, M., Smith, K., Maddern, R., & Dickerson, M. (2000). Females coping styles and control over poker machine gambling. *Journal of Gambling Studies*, 16, 417-432.
- Schellink, T., & Schrans, T. (2002). *Atlantic Lottery Corporation video lottery responsible gaming feature research: Final report*. Focal Research Consultants Limited.
- Schrieber, J and Dixon, M. R. (2001). Temporal characteristics of slot machine play in recreational gamblers. *Psychological Reports*, 89, 67-72.
- Schull, N. (2012). *Addiction by design*. Princeton: Princeton University Press.
- Schultz, W. (2006). Behavioral theories and the neurophysiology of reward. *Annual Review of Psychology*, 57, 87–115.
- Schwartz, S. (2013, May). Value Priorities and Behavior: Applying. In *The psychology of values: The Ontario symposium* (Vol. 8).
- Shaffer, H. J., & Korn, D. A. (2002). Gambling and related mental disorders: A public health analysis. *Annual review of public health*, 23(1), 171-212.
- Sharman, S., & Clark, L. (2016). Mixed emotions to near-miss outcomes: a psychophysiological study with facial electromyography. *Journal of Gambling Studies*, 1-12.
- Sharman, S., Aitken, M. & Clark, L. (2015) Dual effects of ‘losses disguised as wins’ and near-misses in a slot machine game. *International Gambling Studies*, 15, 2, 212-223.
- Sharpe, L. (2003). Understanding pathological gambling: Distinct pathways or individual formulations? In P. Fittskirk & S. P. Shohov (Eds.), *Focus on behavioral psychology* (pp.169– 184). New York: Nova Science.

Sharpe, L., Tarrier, N., Schotte, D., and Spence, S. (1995). The role of autonomic arousal in problem gambling. *Addiction*, *90*, 1529-40.

Sharpe, L., Walker, M., Coughlan, M.J., Enersen, K., & Blaszczynski, A. (2005). Structural changes to electronic gaming machines as effective harm minimisation strategies for non-problem and problem gamblers. *Journal of Gambling Studies*, *21*, 4, 503–520.

Short, M., Penney, A., Mazmanian, D., & Jamieson, J. (2015). Lottery ticket and instant win ticket gambling: Exploring the distinctions. *Journal of Gambling Issues*, *30*, 1-16.

Simons, J.S., & Arens, A.M. (2007). Moderating effects of sensitivity to punishment and sensitivity to reward on associations between marijuana effect expectancies and use. *Psychology of Addictive Behaviors*, *21*, 3, 409–414. <http://dx.doi.org/10.1037/0893-164X.21.3.409>.

Skinner, B. F. (1953). *Science and human behavior*. Simon & Schuster.

Skinner, B.F. (1958). Reinforcement Today. *American Psychologist*, *13*, 3, 94-99.

Soman, D. (2001). Effects of payment mechanism on spending behavior: The role of rehearsal and immediacy of payments. *Journal of Consumer Research*, *27*(4), 460-474.

Spence, K. W. (1947). The role of secondary reinforcement in delayed reward learning. *Psychological Review*, *54*, 1-8.

Spenny, J., Barrett, D. J. K., & Griffiths, M. D. (2010). The role of light and music in gambling behaviour: An empirical pilot study. *International Journal of Mental Health and Addiction*, *8*, 107–118.

Stark, G.M., Saunders, D.M. & Wookey, P. (1982). Differential effects of red and blue lighting on gambling behaviour. *Current Psychological Research*, *2*, 95-100.

Stefan, S., & David, D. (2013). Recent developments in the experimental investigation of the illusion of control. A meta-analytic review. *Journal of Applied Social Psychology*, *43*(2), 377–386.

Stevens, T., Brevers, D., Chambers, C.D., Lavric, A., McLaren, I.P.L., Mertens, M., Noel, X. Stewart, M.J., Stewart, S.H., Yi, S. & Ellery, M. (2015) Predicting gambling behaviour and problems from implicit and explicit positive gambling outcome expectancies in regular gamblers. *International Gambling Studies*, *15*, 1, 124-140, DOI:10.1080/14459795.2014.1000357

Stewart & Wohl 2013

Stewart, S. H., & Zack, M. (2008). Development and psychometric evaluation of a three-dimensional Gambling Motives Questionnaire. *Addiction*, *103*(7), 1110-1117.

Studer, B., & Clark, L. (2011). Place your bets: psychophysiological correlates of decision-making under risk. *Cognitive, Affective, & Behavioral Neuroscience*, *11*(2), 144-158.

Sundali, J., & Croson, R., (2006). Biases in casino betting: The hot hand and the gambler's fallacy. *Judgment and Decision-making*, *1*, 1–12.

- Sundqvist, K., Jonsson, J., & Wennberg, P. (2016). Gambling Motives in a Representative Swedish Sample of Risk Gamblers. *Journal of Gambling Studies*, 1-11.
- Sussman, S., Lisha, N., & Griffiths, M. (2011). Prevalence of the addictions: a problem of the majority or the minority? *Evaluation & the health professions*, 34(1), 3-56.
- Sutton, R. S., & Barto, A. G. (1998). *Reinforcement learning: An introduction*. Cambridge, MA: MIT Press.
- Templeton, J. A., Dixon, M. J., Harrigan, K. A., & Fugelsang, J. A. (2015). Upping the reinforcement rate by playing the maximum lines in multi-line slot machine play. *Journal of Gambling Studies*, 31, 3, 949-64. doi: 10.1007/s10899-014-9446-
- Thaler, R. (1981). Some empirical evidence on dynamic inconsistency. *Economics Letters*, 8, 3, 2.
- Thaler, R. (1985). Mental accounting and consumer choice. *Marketing Science*, 4(3), 199-214.
- Thaler, R., & Sunstein, C. (2008). *Nudge: The gentle power of choice architecture*. New Haven, Conn.: Yale.
- Thaler, R. H., Sunstein, C. R., & Balz, J. P. (2014). Choice architecture. *The behavioral foundations of public policy*.
- Thomas, A., Christensen, D., Deblaquiere, J., Armstrong, A., Moore, S., Carson, R., & Rintoul, A. (2016). *Review of electronic gaming machine pre-commitment features: Limit setting*. Melbourne: Australian Institute of Family Studies.
- Thompson, S. J., & Corr, P. J. (2013). A feedback-response pause normalises response perseveration deficits in pathological gamblers. *International Journal of Mental Health and Addiction*, 11(5), 601-610.
- Thompson, S. C., Nierman, A., Schlehofer, M. M., Carter, E., Bovin, M. J., Wurzman, L., Tauber, P., Trifskin, S., Marks, P., Sumner, J., Jackson, A., & Vonasch, A. (2007). How do we judge personal control? Unconfounding contingency and reinforcement in control judgments. *Basic and Applied Social Psychology*, 29(1), 75 – 84.
- Thomas, A., Pfeifer, J., Moore, S., Meyer, D., Yap, L., & Armstrong, A. (2013). Evaluation of the removal of ATMs from gaming venues in Victoria, Australia. *Evaluation*.
- Thorne, H. B., Rockloff, M. J., Langham, E., & Li, E. (2016). Hierarchy of gambling choices: A framework for examining EGM gambling environment preferences. *Journal of Gambling Studies*, 1-13.
- Toneatto, T., Blitz-Miller, T., Calderwood, K., Dragonetti, R., Tsanos, A. (1997). 'Cognitive distortions in heavy gamblers. *Journal of Gambling Studies*, 13, 253–261.
- Turner, N., Zangeneh, M., and Littman-Sharpe, N. (2006). The experience of gambling and its role in problem gambling. *International Gambling Studies*, 6(2), 237-266.

- Turner, N. E. (2008). Games, gambling, and gambling problems. In *In the pursuit of winning* (pp. 33-64). Springer US.
- Turner, N.E. (2011). Volatility, house edge and prize structure of gambling games. *Journal of Gambling Studies*, 27, 607-623.
- Turner, N.E., & Horbay, R. (2004). How do slot machines and other electronic gambling machines actually work? *Journal of Gambling Issues*, 11, 10-50.
- Tversky, A. & Kahneman, D. (1971). Belief in the law of small numbers. *Psychological Bulletin*, 76, 105–110.
- van den Bos, R., Houx, B.B. & Spruijt, B.M. (2006). The effect of reward magnitude differences on choosing disadvantageous decks in the Iowa Gambling Task. *Biological Psychology*, 71, 155-161.
- Verbruggen, F., McLaren, I. P., & Chambers, C. D. (2014). Banishing the control homunculi in studies of action control and behavior change. *Perspectives on Psychological Science*, 9(5), 497-524.
- Verbruggen, F. (2015). How Does Response Inhibition Influence Decision-making When Gambling? *Journal of Experimental Psychology: Applied*, 21, 1, 15–36.
- Vitaro, F., Arseneault, L., & Tremblay, R. E. (1999). Impulsivity predicts problem gambling in low SES adolescent males. *Addiction*, 94(4), 565-575.
- Walker, M. B. (1992). *The psychology of gambling*. Pergamon Press.
- Ward, J. C., Bitner, M. J., & Barnes, J. (1992). Measuring the prototypicality and measuring of retail environments. *Journal of Retailing*, 68, 194–220.
- Wardell, J. D., Quilty, L. C., Hendershot, C. S., & Bagby, R. M. (2015). Motivational pathways from reward sensitivity and punishment sensitivity to gambling frequency and gambling-related problems. *Psychology of Addictive Behaviors*, 29(4), 1022.
- Wardle, H. (2016). *People who play machines in bookmakers: secondary analysis of loyalty card survey data*. Report prepared for the Responsible Gambling Trust. London: Responsible Gambling Trust.
- Wardle, H., Excel, D., Ireland, E., Ilic, N., & Sharman., S. (2014). *Report 2: Identifying problem gambling - findings from a survey of loyalty card customers*. Report prepared for the Responsible Gambling Trust. London: Responsible Gambling Trust.
- Weatherly, J. N. and Brandt, A. E. (2004). Participants' sensitivity to percentage payback and credit value when playing a slot-machine simulation. *Behaviour and Social Issues*, 13, pp 33-50.
- Weinstein, D., & Deitch, L. (1974). *The impact of legalized gambling: the socio-economic consequences of lotteries and off-track betting*. New York: Praeger.
- Welte, J. W., Barnes, G. M., Tidwell, M.-C. O., & Hoffman, J. H. (2009). The association of form of gambling with problem gambling among American youth. *Psychology of Addictive Behaviors*, 23(1), 105–112.

- White, S. (1989). Against the odds. *Young People Now*, April, 26–27.
- White, M. A., Mun, P., Kauffman, N., Whelan, C., Regan, M. and Kelly, J.E. (2006). *Electronic Gaming Machines and Problem Gambling*. Toronto: Responsible Gaming Council.
- Williams, A. D., Grisham, J. R., Erskine, A., & Cassedy, E. (2012). Deficits in emotion regulation associated with pathological gambling. *British Journal of Clinical Psychology*, 51 (2), 223-238
- Williams, R. J., & Wood, R. T. (2004). *The demographic sources of Ontario gaming revenue*. Ontario Problem Gambling Research Centre.
- Williams, R. J., West, B. L., & Simpson, R. I. (2012). *Prevention of problem gambling: A comprehensive review of the evidence and identified best practices*. Ontario Problem Gambling Research Centre and the Ontario Ministry of Health and Long Term Care.
- Witts, B.N., Ghezzi, P.M. & Manson, M. (2015). Simultaneously Observing Concurrently-Available Schedules as a Means to Study the Near Miss Event in Simulated Slot Machine Gambling. *Psychological Records*, 65, 115–129
- Wood, R. T., & Griffiths, M. D. (2007). A qualitative investigation of problem gambling as an escape-based coping strategy. *Psychology and Psychotherapy: theory, research and practice*, 80(1), 107-125.
- Woolley, R., Livingstone, C., Harrigan, K., & Rintoul, A. (2013). House edge: hold percentage and the cost of EGM gambling. *International Gambling Studies*, 13(3), 388-402.
- Wu, Y., Van Dijk, E., Aitken, M., & Clark, L. (2016). Missed losses loom larger than missed gains: Electrodermal reactivity to decision choices and outcomes in a gambling task. *Cognitive, Affective & Behavioral Neuroscience*, 16, 353–361. <http://doi.org/10.3758/s13415-015-0395-y>.
- Wulfert, E., Franco, C., Williams, K., Roland, B., & Mason, J. (2008). The role of money in the excitement of gambling. *Psychology of Addictive Behaviors*, 22 (3), 380–390.
- Wulfert, E., Roland, B., Hartley, J., Wang, N., & Franco, C. (2005). Heart rate arousal and excitement in gambling: Winners versus losers. *Psychology of Addictive Behaviors*, 19 (3), 311–316.
- Xuan, Z., & Shaffer, H. (2009). How do gamblers end gambling: Longitudinal analysis of Internet gambling behaviors prior to account closure due to gambling related problems? *Journal of Gambling Studies*, 25(2), 239-252.
- Zentall, T.R. (2016). Resolving the paradox of suboptimal choice. *Journal of Experimental Psychology: Animal Learning and Cognition*, 42, 1, 1-14.