

Empirical evidence for the differential impact of gambling outcome on behaviour in electronic gambling: Implications for harm-minimisation strategies.

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Abstract

There is growing concern surrounding Electronic Gambling Machines (EGMs) and their potential contribution towards disordered gambling. As a result, gambling authorities have called for investigations assessing the efficacy of measures aimed towards increasing player protection during electronic gambling. Losses, compared to equivalent gains, have been shown to have greater impact on emotion and behaviour in a wide array of human experiences outside of gambling. If this is found in electronic gambling, and if losses negatively impact gambling behaviour, e.g. by facilitating loss-chasing behaviours, this supports the use of measures aimed at early detection of losses to prevent problematic gambling behaviours escalating. Thirty participants took part in a repeated-measures experiment, where they gambled on the outcome of a computer-simulated EGM. The series of wins and losses were manipulated by the experimenter to induce winning and losing streaks. Participants gambled at a significantly faster speed, a higher average stake size, and an overall higher betting intensity in the loss condition compared to the win condition, demonstrating losses as having a negative impact on within session gambling behaviour during electronic gambling. The use of algorithmic software to detect losing streaks during EGM play, which triggers gambling harm-minimisation strategies accordingly, thus, receives empirical support.

Key Words Betting Intensity; Electronic Gambling Machines; Gambling outcome; Harm-Minimisation; Loss-Chasing; Self-Appraisal

Introduction

While gambling may be viewed by many as a legitimate form of entertainment and an enjoyable leisure pursuit, its very nature means there are of course inherent risks involved. Problem gambling (PG) behaviours occur when an individual gambles in a manner that exceeds their means, for example, gambling more money than they can afford and spending excessive time gambling, both of which can cause deleterious effects on the lives of the gambler. Such effects may include neglecting family, health, hygiene, and employment (Monaghan, 2009), as well as financial obligations, which highlights PG as not only an issue at the individual level, but also for wider society. Indeed, for every PG there is potential for a multitude of individuals to be negatively impacted.

Electronic Gambling Machines (EGMs) are attracting ever increasing media and political attention, due to the uncertainty surrounding these gambling platforms and their potential contribution towards disordered gambling. Approximately 13% of EGM gamblers meet diagnostic criteria for problem gambling (PG) which is one of the highest rates among all other forms of gambling (Responsible Gambling Strategy Board; RGSB, 2013). Essential then, is the need to implement strategies that allow a gambler to remain in control during a gambling session so that gambling-related decisions are made both consciously and rationally.

EGMs are interactive, computerised gambling platforms found in many licensed betting offices, casinos, and other leisure facilities (Reed, 2013). They adopt variable ratio schedules of reinforcement that subject a player to addictive patterns of gambling behaviour (Breen & Zimmerman, 2002). EGMs have been shown to instil and maintain irrational and superstitious beliefs, as well as distort concepts of randomness and probability that can contribute to illusions of control (Ladouceur et al., 2001). Such features may act in maintaining or indeed contribute to the onset of PG behaviours. In addition, EGMs offer high maximum stake and prize sizes, where an individual can bet up to £100 on a gambling event and win jackpots equalling £500 (for review of stakes and prizes see Parke & Parke, 2013), and the fact that accessibility of EGMs are abundant on the high-street (Reed, 2013), means even inexperienced and leisure gamblers are at risk of increased rate and volume of loss, irrespective of whether they would be classed as a PG or not.

A rapid speed of play provided by EGMs offer fewer opportunities between bets to break trance-like dissociative states that gamblers experience (Blaszczynski, Ladouceur, & Shaffer, 2004), as well as less time to consider one's decisions in an informed and controlled manner. The rapid event cycle in EGM play also allows for a high rate and volume of loss, which is allowed to further exacerbate if one engages in loss-chasing behaviour- a core characteristic of PG (Gainsbury, Suhonen, & Saastamoinen, 2014). Loss chasing may not however, be limited to PGs, and there is potential for the fast-paced characteristics of EGM play to negatively impact on recreational and less experienced gamblers.

The current research investigates how these EGM characteristics interact with winning and losing outcomes and the resulting gambling behaviour, as there is a wide body of evidence outside of gambling research that suggests gains and losses have an asymmetrical impact on affect and arousal (e.g. Leith & Baumeister, 1996), as well as cognitive capacity and decision making (e.g. Yechiam and Hochman, 2013)

- essential components to controlled and rational gambling decisions. If wins and losses do indeed result in an asymmetrical impact on a gamblers' behaviour during EGM gambling, it is important to understand what these differences are and which behaviours are more likely to produce gambling-related harm, then it may be the case that current harm-minimisation interventions, such as time-cued self-appraisal pop-up messaging (see ABB, 2013), may be best implemented on an algorithmic basis, where problematic behaviours are detected and the appropriate interventions are implemented in a timely manner before harmful behaviours escalate.

Excessive risk-taking has been argued to result from negative affective states which manifest as a loss of self-regulation (Leith & Baumeister, 1996). In translation to gambling, negative affect caused by losing outcomes may result in a loss of self-regulation leading to loss-chasing behaviour. On the contrary, it has been demonstrated that positive affect leads to 'risk-averse' behaviours, which is characterised as an extra sensitivity to losses and thus, cause individuals to act in ways aimed at minimising the chance of losing (Isen, Nygren, & Ashby, 1988). This pattern of behaviour Isen and colleagues (1988) labelled 'risk aversion'.

McGraw, Larsen, Kahneman, and Schkade (2010) showed that participants who were instructed to imagine scenarios where they had lost or gained an amount of money reported higher retrospective distress about losing than excitement about winning. Diary studies, such as David, Green, Martin, and Sul' (1997), also support this finding. They found greater effects of negative than positive daily events on subsequent mood the next day.

This phenomenon is not limited to conscious psychological processes. It has been demonstrated that losses, compared to wins, have a larger effect on physiological arousal. Hochman and Yechiam (2011) reported significantly larger pupil diameter and increased heart in response to losses compared to equivalent sized wins. The impact of arousal on human performance is assumed to be an 'inverted U' (Yerkes & Dodson, 1908), therefore, in a gambling context, if losses lead to a greater increase in physiological arousal, this may result in the gambler's optimal level of arousal being surpassed, which may be detrimental to rational decision making and lead to a loss of control during gambling, where the fast-paced and high stakes features of EGM play may exacerbate the harm caused by a loss of control.

The independent variable for the current analyses will be *gambling outcome*, which will be manipulated at 2 levels, *win* and *loss* group. The dependent variable being measured, broadly speaking, is *gambling behaviour*, which will consist of *speed of betting* (measured as number of bets placed per minute; BPM), *average stake size* (the average amount bet per round of gambling), and *betting intensity* (defined as the total amount bet on average per minute and is calculated by multiplying average stake size by BPM). These dependent variables were chosen as speed and size of betting have been previously used in investigations assessing gambling behaviour (e.g. Monaghan & Blaszczynski, 2010). In addition, a measure of betting intensity allows a clear analysis of how these two components of gambling behaviour interact and gives an overall indication of potential gambling-related harm.

It is predicted that overall, losing gambling outcomes will lead to more problematic gambling behaviour compared to winning outcomes, which will

manifest as an escalation in bet size over time, a greater overall average stake size, speed of play, and betting intensity in the loss condition.

Method

Participants

A stratified sampling technique was used to recruit a sample size of N=30. It has been consistently reported that significantly more males play EGMs compared to females and that the modal average age category for EGM participation is 16-24 (see British Gambling Prevalence Survey, 2007; 2010). Both of these criteria were met using the stratified sampling method, with 18 males compared to 12 females being recruited, and the mean participant age was 23.8 (SD=5.81). To meet this specification, recruitment was targeted at the student population at the University of Lincoln as well as local sports clubs. All participants had English as their first language and had normal or corrected to normal vision. Participants all had experience playing EGMs and had participated in at least one gambling session in the last 12 months prior to participation. Using a semi-structured interview, all confirmed they were not part of any gambling self-exclusion programme or had ever experienced any problems with their gambling.

To ensure motivation for play, all participants were informed they would receive a £5 high-street retailer voucher upon completion of the experiment in return for their participation. Those participants who attended university also received five course credit points upon completion of the study. In addition, all participants were informed that the overall 'winner', which was stated as the individual with the highest score at the end of the experiment, would receive an additional £20 high-street retailer voucher.

Procedure and Apparatus

Participants were told the study consisted of a series of questions following a gambling activity to learn about the emotional experience of gambling; a necessary deception to conceal the true dependent and independent variables. The interactive electronic gambling simulator was created using Superlab 4.5™ software and featured a 50/50 chance game designed in the form of a computerised coin flip. The game was operated via use of a standard PC keyboard. Participants were given 100 chips with which to gamble on the outcome of the coin toss, heads or tails, and could bet any amount between one and 100 on any round and could reload their chip balance at any time to ensure they could always bet up to the 100 chip maximum; the amount reloaded however would be deducted from their final score. Participants could choose to stop gambling at any point, but unknowingly, the simulator ran for a maximum of 16 rounds. Participants were informed that the individual who had accumulated the most chips over two independent gambling sessions, conducted on separate days, would win a £20 monetary prize.

Unknowingly to participants, outcome was manipulated by the experiment to produce a 75% winning and 75% losing outcome in the win and loss condition

respectively. The order in which each condition was experienced was counterbalanced across participants.

Throughout the gambling game, the amount of chips the participant risked on each gambling event, as well as the gambling session duration was recorded. These recordings were used to calculate betting speed, average stake size, and betting intensity in both the winning and losing outcome conditions.

Ethics

Prior to commencement, the current research was approved by the University of Lincoln's School of Psychology Research Ethics Committee.

Results

A Pearson product-moment correlation coefficient was computed to assess the relationship between betting round number and average stake size. As predicted, a significant and strong positive correlation was found between round number and average stake size in the loss condition ($r=.973$, $n=16$, $p<.001$). Unexpectedly however, a significant and strong positive correlation was also found in the win condition ($r=.933$, $n=16$, $p<.001$).

Paired-samples t-tests revealed that participants on average gambled statistically significantly more chips per betting event, gambled at a significantly faster speed, and had a significantly higher betting intensity in the loss condition compared to the win condition. Table 1 summarises the key findings.

Table 1. Summary of means (SD) for gambling behavioural variables according to outcome condition. Mean stake size, mean speed of play, and mean betting intensity were all significantly higher during the loss condition.

Behavioural Measure	Outcome Condition		<i>t</i> -value	<i>p</i> -value
	<i>Win</i>	<i>Loss</i>		
Stake Size	14.61 (8.41)	20.76 (16.58)	$t(29) = 2.15$	$p = .04$
BPM	2.70 (.29)	2.95 (.36)	$t(29) = 3.04$	$p = .005$
Betting Intensity	39.38 (22.65)	63.46 (56.71)	$t(29) = 2.46$	$p = .02$

Discussion

It was correctly predicted that during losing outcomes, participants would demonstrate an escalation in bet sizes over time, indicating an attempt to chase losses. This was demonstrated by a strong positive correlation between round number and stake size. Chasing losses is one of the defining characteristics of problem gambling (American Psychiatric Association, 1994), and the fact that such behaviour was evident in the loss condition, despite the laboratory conditions and

the possibility of participants being less emotionally involved than they would have been if they were losing real money, indicates a strong need for effective EGM gambling intervention to prevent such behaviour when real money is involved.

The same pattern of behaviour was also, unexpectedly, found in the winning outcome condition. It was predicted that participants would show a more consistent stake sizing in the win condition, therefore demonstrating a greater degree of control over their decision making pertaining to stake sizing. Hypothesis 1 is thus, not fully supported. The fact that the same patterns of results were found regarding bet size escalation in both gambling outcome conditions suggests different mechanisms may be working to produce the same behaviour. Whereas escalation in the loss condition can be attributed to chasing losses, this is clearly inapplicable during the winning condition.

One explanation is that the high rate and volume of wins experienced by participants in the win condition caused later wins to provide diminishing returns. This is applicable to other appetitive behaviours outside of gambling, such as drug taking or emotional overeating for example, where the initial dose of the drug or mouthful of food is much more rewarding than subsequent consumption (Orford, 2001). Frequent winning in gambling may reduce an individual's sensitivity to the same level of reward, which would lead to an escalation in gambling stake sizes in an attempt to receive a larger win just to provide the same level of satisfaction. Therefore, while it has been argued that winning is less arousing than losses and leads to positive affect, these factors alone may not predict increased control in gambling behaviour.

The results provide support for hypothesis 2, 3, and 4 in that participants had a significantly higher average stake size, faster speed of play, and greater betting intensity in the loss condition compared to the win condition. This highlights losing as having a greater within-session potential to produce gambling-related harm, in that individuals are risking more and giving themselves less time to consider their actions in comparison to winning situations. Because of this, effective intervention during periods of loss appears to be more critical than equivalent periods of wins.

The current research therefore suggests that a potentially effective way to intervene with problematic gambling behaviour, such as an increase in betting intensity, is to implement algorithmic software to EGMs with the ability to detect win/loss ratios and deliver interventions and responsible gambling information accordingly. For example, once an extended period of loss or a high volume of loss is detected, this could alarm staff behind the counter in betting premises to interact with the customer, having the immediate effect of breaking dissociation from the gambling game, as well as offering interpersonal advice on whether one should continue gambling or whether to take a break.

This could also be implemented via the use of pop-up messaging on the EGMs, where periods of loss are detected which triggers the activation of a message that delivers responsible gambling information, such as the dangers of loss chasing and losing control, or getting the gambler to engage in self-appraisal of their behaviour by asking self-reflective style questions (see e.g. Monaghan, 2009). This would likely be more effective than time-cued intervention, as time-cued messaging does not account for the differential impact of gambling outcome on gambling

behaviour, and may thus fail to intervene with problematic behaviours before they have escalated.

It has also been demonstrated that losses lead to significantly faster rates of play compared to wins. This may be due to the fact that losses induce negative affect, resulting in participants attempting to rapidly regain their losses to escape their negative mood-state. Further more, increasing levels of negative affect, which is likely induced by continuous losses, have been shown to be inversely related to level of activation in brain areas associated with response inhibition (Phan et al., 2005), meaning gamblers on losing streaks may begin to carry out undesirable behaviours including rapid and continuous play as a result of a failure in executive control capacities such as prepotent response inhibition. Software that detects losing periods of gambling has the capacity to slow the speed of the game down by increasing the time allowed between bets. The duration between bets on EGMs can be extended during periods of loss to allow more time for the gambler to make rational decisions and facilitate self-awareness between bets. Importantly however, the efficacy of such a concept will need to be tested empirically for the effect it has on gambling behaviour, so as to ensure it does not create undesired effects. For example, increasing the time between bets during periods of loss may create cravings, which could result in higher betting amounts to compensate for the slower game speed. Alternatively, it may have the desired positive effect of allowing gamblers more time to make rational gambling decisions and break the build-up of prepotent responses that may develop through rapid and continuous machine gambling.

Caveats

It must be stressed that to exert higher levels of experimental control to directly assess the impact of gambling outcome on behaviour has reduced the ecological validity of findings and how much the results can be extrapolated to 'real-world' EGM gaming. For example, the current simulation used a very basic 1:1 payout ratio, with low gambling volatility.

In addition, there are specific features on EGMs, unmatched by the gambling simulation in the current experiment, which can ultimately influence gambling behaviour. One such factor identified by Parke and Griffiths (2007) is 'playability factor' – features such as bonus games, near misses, and interactive/engaging graphics that make a game fun; features that were limited or absent in the current experiment. Also, the gambling game used in this study had much lower volatility characteristics compared to some variations of EGM games, where volatility is higher as a result of having less frequent but higher value wins (Parke & Parke, 2013). These two factors alone can dramatically influence the time spent gambling, the level of risk an individual is willing to take, and ultimately produce faster rates of loss and increased harm. However, the experimental control exerted does allow an insight into the isolated impact of gambling outcome on gambling behaviour in this experimental context and highlights losses having a significantly greater effect on behaviour than wins.

Despite the incentive to play for a £20 prize, participants were not as financially and potentially as emotionally invested in the gambling game, and their decision to gamble was riskless. As a result, the impact of wins and losses may have

been muted in the current findings. One would argue however, that in real world EGM gambling, the pattern of results demonstrating the negative impact of losses on gambling behaviour would be exacerbated and is thus an important area of investigation for future research.

The fact that participants were informed there would be one overall winner of the £20 monetary prize may have exacerbated the escalation in stake sizes over time, which may potentially explain the high positive correlation between betting round number and stake size. For future replications or variants of the current experiment, it may be more appropriate to implement a more subjective monetary award scheme for each participant, as opposed to a prize structure that might promote inter-participant competition.

Implications for Industry and Policy Makers

To apply these findings in a responsible gambling context in live gambling venues, the gambling industry and policy makers may wish to apply the following steps. Firstly, software able to detect the ratio of wins to losses needs to be applied to the gambling platform as an initiating mechanism to trigger responsible gambling intervention. This should include the triggering of 'pop-up' messages that act to both deliver responsible gambling information and provide a brief break in play.

The advantage of having loss ratio as a trigger for the pop-up messaging over a time-cued policy is that this study shows losses as being more detrimental to gambling behaviour than equivalent wins, and therefore, the responsible gambling intervention will be delivered during a period of play where it is most needed.

Concurrently, loss ratio can be used as a trigger to flag betting shop staff via their computer terminal, resulting in staff engaging with the customer and offering them a drink for example. This will likely facilitate breaking any dissociative state or loss of control the customer may be experiencing by providing a break in play through interaction and dialogue. This will likely curb the escalation in bet size and loss chasing that losses have been demonstrated to cause, allowing the customer to avoid maladaptive gambling behaviours and avoid heavy losses that come as a result of a loss of self-control.

Conclusion

Losing gambling outcomes on EGMs have been demonstrated as having a greater negative impact on within session gambling behaviour compared to winning outcomes. This was manifested as a tendency to bet higher amounts, gamble at a faster speed, which in combination produced a significantly higher betting intensity in losing outcomes. As a result, it has been suggested that the application of software able to detect extended periods or high volumes of losses should be implemented as a means of triggering gambling interventions. Such interventions might include flagging staff members in betting offices to engage with the customer, or to trigger responsible gambling messages that are generated by the EGM itself, thus intervening at a critical point before bet sizes and speed of play escalates to problematic levels, meaning such an approach may be more effective than time-cued interventions.

References

- Association of British Bookmakers (2013). *The ABB's Code for Responsible Gambling and Player Protection in Licensed Betting Offices in Great Britain*. Retrieved November 11, 2013, from www.abb.uk.com.
- Blaszczynski, A., Ladouceur, R., & Shaffer, H. (2004). A Science-Based Framework For Responsible Gambling: The Reno Model. *Journal of Gambling Studies*, 20,3, 301-317.
- Breen, H., & Zimmerman, M. (2002). Rapid onset of pathological gambling in machine gamblers. *Journal of Gambling Studies*, 18, 31-43.
- British Gambling Prevalence Survey (2007). Retrieved December 11, 2013, from <http://www.gamblingcommission.gov.uk/PDF/British%20Gambling%20Prevalence%20Survey%202007%20-%20Sept%202007.pdf>.
- British Gambling Prevalence Survey (2010). Retrieved December 11, 2013, from <http://www.gamblingcommission.gov.uk/PDF/British%20Gambling%20Prevalence%20Survey%202010.pdf>.
- David, J. P., Green, P. J., Martin, R., & Suls, J. (1997). Differential roles of neuroticism, extraversion, and event desirability for mood in daily life: An integrative model of top-down and bottom-up influences. *Journal of Personality and Social Psychology*, 73, 149–159.
- Gainsbury, S. M., Suhonen, N., & Saastomoinen, J. (2014). Chasing losses in online poker and casino games: characteristics and game play of Internet gamblers at risk of disordered gambling. *Psychiatry Research*, 217, 3, 220-225.
- Hochman, G., & Yechiam, E. (2011). Loss aversion in the eye and in the heart: The autonomic nervous system's responses to losses. *Journal of Behavioral Decision Making*, 24, 140–156.
- Isen, A. M., Nygren, T. E., & Ashby, F. G. (1988). Influence of positive affect on the subjective utility of gains and losses: It is just not worth the risk. *Journal of Personality and Social Psychology*, 55, 710-717.
- Ladouceur, R., Sylvain, C., Boutin, C., Lachance, S., Doucet, C. Leblond, J., et al. (2001). Cognitive treatment of pathological gambling. *Journal of Nervous and Mental Disease*, 189, 774-780.
- Leith, K. P., & Baumeister, R. F. (1996). Why do bad moods increase self-defeating behaviour? Emotion, risk taking, and self-regulation. *Journal of Personality and Social Psychology*, 71, 6, 1250-1267.
- McGraw, P. A., Larsen, J. T., Kahneman, D., & Schkade, D. (2010). Comparing gains and losses. *Psychological Science*, 21, 10, 1438-1445.
- Monaghan, S. (2009). Responsible gambling strategies for internet gambling: The theoretical and empirical base of using pop-up messages to encourage self-awareness. *Computers in Human Behaviour*, 25, 202-207.
- 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.
- Orford, J. (2001). *Excessive Appetites: A Psychological View of Addictions* (2nd ed.). Chichester: Wiley.

- Parke, J., & Griffiths, M. D. (2007). The role of structural characteristics in gambling. *Research and Measurement Issues in Gambling Studies*, 211-243.
- Parke, J., & Parke, A. (2013). Does size really matter? A review of the role of stake a prize levels in relation to gambling-related harm. *The Journal of Gambling Business and Economics*, 7,3, 77-110.
- Phan, L. K., Fitzgerald, D. A., Nathan, P. J., Moore, G. J., Uhde, T. W., & Tancer, M. E. (2005). Neural substrates for voluntary suppression of negative affect: A functional magnetic resonance imaging study. *Biological Psychiatry*, 57,3, 210-219.
- Reed, H. (2013). *The economic impact of fixed odds betting terminals*. Retrieved September 15, 2013, from <http://www.landman-economics.co.uk/Research.html>.
- Responsible Gambling Strategy Board. (2013). *RGSB advice to the Commission on the triennial review consultation*. Retrieved August 22, 2013, from <http://www.rgsb.org.uk/publications.html>.
- Yechiam, E., & Hochman, G. (2013). Losses as modulators of attention: Review and analysis of the unique effects of losses over gains. *Psychological Bulletin*, 139, 2, 497-518.
- Yerkes, R.M., & Dodson, J.D. (1908). The relation of strength of stimulus to rapidity of habit information. *Journal of Comparative Neurology of Psychology*, 18, 459-482.