Facilitating Limit Setting and Limit Adherence

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Abstract

Herein, we report the results of two separate lines of research that address means to advance informed decision making among Electronic Gambling Machine (EGM) players. Both lines of research focus on understanding means to facilitate money limit setting and adherence. This is because these responsible gambling (RG) practices are central to harm minimization strategies. In Chapter 1, we focus research attention on whether limit adherence improves when RG education is provided at the moment a decision is being made (compared to when the player initiates a gambling session). Specifically, EGM players (N=98) were shown an educational animation that explained the odds of winning and the benefits of pre-commitment either before play or when their pre-set money limit was reached. As predicted, players were more likely to endorse limit setting behaviour when they viewed the animation when their pre-set limit was reached rather than when it was viewed prior to the gambling session. Importantly, disordered gambling symptomology moderated the effect—watching the animation at the time a decision needed to be made only facilitated responsible gambling intention among those low in disordered gambling symptomology. In Chapter 2, we report the results of two studies that addressed whether the kind of information provided to players about their limit (i.e., amount money and/or credits lost) influences limit adherence among EGM players. In both Studies 1 (N=131) and 2 (N=141), players who hit their pre-set money limit were told via pop-up message on the slot machine either how many credits they had lost or how many credits and dollars they lost. Contrary to predictions, limit adherence did not vary by condition in either study. Of importance, players had difficulty recalling the content of the pop-up message in both conditions and in both studies. These results suggest that gamblers may not attend to nuanced information within pop-up messages. Results of this program of research suggest that limit adherence increases when RG information is presented when a player is about to make a RG-related decision. However, RG information presented in a pop-up message is unlikely to influence limit adherence because players do not play attention to the content of the message.

Keywords: responsible gambling, informed decision making, pop-up messaging, limit setting, limit adherence

Chapter 1: When Should Players Be Taught to Gamble Responsibly? Timing of Educational Information Alters Limit Setting Intentions

Risking money on the outcome of a chance-based game can be an exciting way to spend time (and perhaps win some money at the same time). Indeed, seeing a wager placed can yield a positive outcome (i.e., a win) and provides an alluring rush of excitement for many people (Wulfert et al., 2005). Unfortunately, players often become captivated by play, resulting in a continuance of gambling in the face of mounting losses (i.e., excessive gambling; see Young & Wohl, 2009). Players who gamble excessively are at heightened risk for a range of psychological, interpersonal, and financial problems (Currie et al., 2006; Griffiths, 1999).

The tendency to gamble excessively is elevated among electronic gambling machine (EGM) players (see Breen & Zimmerman, 2002; Wiebe, Mun, & Kauffman, 2006). This is due, in part, because EGM players misunderstand how EGMs work—they falsely believe that the odds of winning improve after a loss (Delfabbro & Winefield, 2000; Walker, 1992; Wohl, Christie, Matheson, & Anisman, 2010; Wohl, Kim, & Sztainert, 2014; Wohl, Stewart, & Young, 2011). The result is often impaired decision-making whilst playing (e.g., excessive play; Auer & Griffith, 2013, 2014; McCusker & Gettings, 1997), which is associated with the progression toward and maintenance of disordered gambling (Toneatto, Blitz-Miller, Calderwood, Dragonetti, & Tsanos, 1997).

In light of harms associated with EGM play, researchers and policy makers have emphasized the need to educate players about the importance of making well-informed decisions about their gambling behaviour (Bernhard, 2007; Reith, 2009; Wood & Griffiths, 2010). This expressed need has resulted in the creation and testing of an array of responsible gambling (RG) tools to help minimize the risks associated with EGM play. For example, Wohl and colleagues (2010, 2013), in association with Ontario Lottery Corporation and the Interprovincial Lottery Corporation, created an education-based animation that informs players about the odds of winning and the benefits of pre-commitment (i.e., setting a limit on the amount of money spent on gambling). This animation was shown to improve limit adherence among EGM players. As a result, the animation is available to players in all gambling jurisdictions in Canada and many outside of Canada. However, research attention has not been paid to the ideal time to provide such RG information to players.

The timing of RG information, especially information pertaining to how slot machines work, is of importance given the cognitive switching that occurs whilst gambling (Coates & Blaszczynski, 2013; Sévigny & Ladouceur, 2003)—players understand the odds of winning both before and after play, but discount this information during the highly arousing gambling session (Benhsain, Taillefer, & Ladouceur, 2004; Sévigny & Ladouceur, 2003). As such, although players may express a desire to set and adhere to a pre-set money limit after viewing the animation before they play, this information may be replaced by erroneous cognitions about gambling when at pre-set limit is reached. In the current research, we tested the idea that RG information about how slot machines work will have more RG utility (i.e., heighten limit setting and adherence intentions) when viewed at the time an RG decision needs to be made (i.e., when the player is deciding whether or not to adhere to a pre-set limit).

Electronic Gaming Machines and Disordered Gambling

Over the last three decades there has been a dramatic increase in the availability of, and expenditures on legalized forms of gambling (Blaszczynski, 2012; Dickerson & Baron, 2000; Smith, 2013). In Canada, for example, wagering increased from $2.7 billion in 1992, to about $11.2 billion in 2002, and then $13.9 billion in 2011 (Marshall, 2003; Smith, 2013)—a reflection of the normalization of gambling in Canadian society. Indeed, a large majority of Canadians (~75%) report that they gamble (at least) occasionally (see Azmier, 2000; Dalton, Stover, Vanderlinden, & Turner, 2012; Marshall & Wynne, 2004). For most players, engagement is simply an enjoyable recreational activity. However, a small but significant portion of the player population fails to limit their involvement and consequently experiences adverse psychological, social, and physical health outcomes (Burge, Pietrzak, Molina, & Petry, 2004). The situation is especially bleak for EGM players: relative to other types of gamblers, EGM players have a higher prevalence rate of disordered gambling (Wiebe et al., 2006) and exhibit more rapid onset of gambling problems (Breen & Zimmerman, 2002). Indeed, progression toward

disordered play occurs almost four times faster than among those who prefer other forms of gambling (e.g., blackjack, pokers, and horse racing).

Unfortunately, the structural characteristics of EGMs (e.g., a highly addictive reinforcement schedule, rapid and continuous play, reward immediacy, among others) that contribute to their popularity also contribute to persistence in play and the development of excessive and disordered gambling behaviours (Dowling, Smith, & Thomas, 2005). Advances in EGM design have arguably exacerbated the problem. Indeed, EGMs have come a long way since the days of the "one-armed bandit" three-reel slot machine. Today, EGMs are sophisticated electronic games that use computers and monitors to allow the player to engage with a wide array of games, including the traditional reeled (albeit via video) slot machine. Moreover, EGMs use random number generators that continually generate numbers corresponding to outcomes. Thus, there is no way to determine the outcome of any single play.

Critically, however, EGM players often exhibit erroneous cognitions about gambling on EGMs. For instance, with the advent of computer-based EGMs (as opposed to mechanical reels), some players believe the operator can change outcomes "on the fly" to "cheat" the player out of winnings. More harmful, however, is that many EGM players fail to understand that previous outcomes have no bearing on subsequent outcomes. Instead, they hold the belief that a big win is likely to follow from prolonged loss, which results in chasing behaviour (i.e., persistent play in the face of financial loss) and other gambling-related harms (Bandura 1977; Kim, Wohl, Stewart, Sztainert, & Gainsbury, 2014; Toneatto, et al., 1997; Walker 1992; Wohl, Christie, Matheson, & Anisman, 2010; Young & Wohl, 2009).

Misunderstanding How EGMs Work: Education as a Facilitator of Responsible Gambling

EGM gambling can be problematic for some players. This is due, in part, because they hold misconceptions about how EGMs function. In particular, they tend to believe that EGM outcomes sample without replacement (i.e., dependent events occur when an action removes a possible outcome, and the outcome is not replaced before a second action takes place; see Tversky & Kahneman, 1992; Walker, 1992). In this understanding of how EGMs work, the odds of a win increase as game play progresses. In actuality, EGMs sample with replacement (i.e., outcomes are independent, and the odds never change). A lack of understanding about how EGMs outcomes are sampled is not benign. People who believe that EGM outcomes sample without replacement are apt to continue gambling despite mounting loss and exceed their financial limit (Sharpe & Tarrier, 1993), which has been identified as a foundation for the development and maintenance of disordered gambling (e.g., Griffiths, 1993; Ladouceur & Walker, 1996; Ladouceur & Sevigny, 2005; Wohl et al., 2010).

Additionally, in modern multi-line slot machine-styled EGMs, outcomes are expressed as wins, losses, or losses disguised as wins (i.e., credits gained on an outcome of a gamble that are less than the original wager). Importantly, players experience all outcomes (save the loss) as rewarding, which fosters craving to continue gambling (Clark, Lawrence, Astley-Jones, & Gray, 2009) and increased EGM playing durations (Cote et al., 2003; Kassinove & Schare, 2001). This is, in part, because wins lead some players to erroneously believe that subsequent wins are more probable than the objective odds of a win imply (Giroux & Ladouceur, 2006; Young, Wohl, Matheson, Baumann, & Anisman, 2008). As such, it is important for gambling operators to provide RG tools in order to prevent players' progression toward disordered gambling.

A promising approach to prevent gambling problems among EGM players involves providing players with educational material that explains how EGMs work and the true odds of winning (Williams, Connolly, Wood, Currie, & Davis, 2004; Wohl et al., 2010, 2014). Specifically, this information explains that the odds of winning do not improve with each loss and that the odds of winning the jackpot are very low. Importantly, to transform EGM players into informed decision-makers, educational materials must occur via cognitively simple tools that first present the erroneous cognitions and then systematically undermine them (see also Epstein & McGaha, 1999; Lowe, 1999; Mayer, & Moreno, 2002; Wohl et al., 2010, 2013) in an engaging multimedia format (see Wohl,

Parush, Kim & Warren, 2014). In the spirit of this educational approach, Wohl et al. (2010) created an education-based animation resource: *The Slot Machine: What Every Player Needs to Know*. This 9-minute animation was designed to educate players on how EGMs function (e.g., the independence of outcomes in slot machine play or the "replacement feature"), the prudence of setting expenditure limits when playing, and strategies to avoid exceeding those limits. Importantly, they also tested the efficacy of this animation as a preventative resource in non-problem gamblers before and after EGM play at two different time points (24 hours and 30 days) after viewing the educational animation versus a neutral video. They found that at the 24-hour follow-up participants who watched the educational animation before gambling compared to a neutral animation, demonstrated a reduction in erroneous cognitions, perceived habits for limiting problematic play as effective, and were more likely to report staying within their pre-set money limit.

　　　　Despite the 9-minute animation's effectiveness as an RG tool, its practicality is undermined by its length. This is because players tend to have a short attention span (Grall-Bronnec et al., 2011; Specker, Carlson, Christenson, & Marcotte, 1995). Additionally, most popular videos online, and on YouTube in particular, are 3-4 minutes in duration (see Cheng, Liu, & Dale, 2007; Sysomos Inc., 2010). As such, Wohl, Santesso, and Harrigan (2013) created a three-minute version of the nine-minute video, and showed participants one of the two videos before their gambling session. Importantly, the short and long versions were equally effective at reducing erroneous cognitions and increasing limit adherence.

　　　　Practically, however, the education-based animation will only have real-world RG utility if players watch it. Players in the Wohl et al. (2013) study voiced this sentiment clearly. Specifically, they reported that the benefit of the 3-minute animation was its short length. Even though the shorter version was preferred, the RG utility of both versions waned over time. As time distanced the player from watching the animation, cognitive distortions returned to pre-viewing levels and money limit adherence decreased. Based on these results, Wohl and colleagues (2010, 2013) suggested that attention be devoted to the development of strategies that sustain and enhance the positive effects of viewing the education-based animation.

When Should Responsible Gambling Information be Presented to Players?

　　　　According to Benhsain, Taillefer, and Ladouceur (2004), players are able to recognize their gambling-related erroneous cognitions and understand concepts like probability and randomness when they are not actively participating, but they abandon rational thought when they engage in a gambling game. Sévigny and Ladouceur (2003) have referred to this process as a form of cognitive switching, whereby specific idiosyncratic beliefs (e.g., that one can control the outcomes) come to over-ride more objective considerations (the objective odds) *whilst* gambling. One reason this may occur is that players tend to dissociate while playing (see Jacobs, 1988; Stewart & Wohl, 2013). Players tend to become so absorbed in the game that they become detached from their current lived experience. A consequence of dissociation when playing EGMs is excessive gambling (Diskin & Hodgins, 1999; Stewart & Wohl, 2013). Importantly, in-game RG messaging breaks this dissociation, facilitating limit adherence (Stewart & Wohl, 2013). Taken together, we contend that RG education just prior to EGM gambling (i.e., outside play) may be less effective than education when the player is making an RG-relevant decision (i.e., during play).

　　　　Our supposition that RG information is best presented when the player is about to make an RG-relevant decision is further supported by research in the field of judgment and decision-making as well as human factors. According to Hogarth and Einhorn (1992), the decisions people make are effected by biases in memory. Because people have improved memory for information that is most salient, decisions made will be determined, in part, on information that has been most recently brought to mind (i.e., the recency effect; see Murdock, 1962). In the context of gambling, due to cognitive switching, erroneous cognitions likely come to the fore when a player reaches her or his pre-set money limit. Thus, educational material (e.g., the education-based animation) should have its greatest utility when a decision is *about to be made*. Such is the case for the gambler who has to decide whether or not to continue playing when a money limit has been reached. Should the education-based

animation be viewed just prior to a player's decision about whether (or not) to adhere to a pre-set money limit, the information provided will be highly salient and capture attention, which should lead to improved decision-making (see Nisbett & Ross, 1980). The current research assessed this heretofore untested idea in a community sample of EGM players. We anticipate that limit adherence will be greatest when the player is informed *during the decision-making process*.

RG Tools are for Prevention not Intervention: The Moderating Role of Problem Gambling Severity

RG tools are typically geared toward the prevention of disordered gambling and not a means to intervene once a player has developed problems (see Blaszczynski, Ladouceur, & Shaffer, 2004). For most disordered gamblers, assistance from a treatment provider is required. Indeed, once a gambling disorder is established, problem gambling behaviours are difficult to reverse. For example, when disordered gamblers are taught probability theory, their beliefs about gambling probability tend to remain incorrect, whereas similar education of non-disordered gamblers tends to translate to more accurate beliefs about their probability of success whilst gambling (Delfabbro, Lahn, & Grabosky, 2006).

In this light, perhaps unsurprisingly, research that has tested the utility of RG tools to promote informed-decision making has shown that they are either ineffectual for disordered gamblers or less effective than they are for non-disordered gamblers (see Stewart & Wohl, 2013, Wohl et al., 2010, 2013). For example, Wohl et al., 2010 found that the animation had a greater impact on reduction of erroneous cognitions among non-disordered gamblers compared to disordered gamblers. Likewise, Stewart and Wohl (2013) found that in-play messages that inform players that a pre-set money limit has been reached did not influence limit adherence among disordered gamblers. As such, we hypothesized that presenting educational materials at the time a decision is being made about limit adherence will likely not have the expected positive impact on responsible decisions (e.g., intention to gamble responsibility) among those with elevated disordered gambling symptomology. Conversely, non-disordered gamblers should be more apt to understand and utilize the information conveyed in the animation and should thus show its greatest effect on RG when presented at the time an RG-related decision is being make.

Overview of the Current Research

In the current study, we tested the idea that intention to gamble responsibly (i.e., set and adhere to a pre-set money limit) increases when decision-relevant RG information is presented at the time that a decision is being made. Specifically, we recruited players upon entering a local EGM venue and asked them to participate in a study on their gambling behaviour. Participants watched an education-based animation before gambling on a virtual reality slot machine or when a pre-set limit on play was reached.

It was hypothesized that those who viewed the animation when the pre-set limit was reached would report greater intentions to gamble responsibility than participants who viewed the animation prior to initiating gambling. It was also hypothesized that disordered gambling symptomology would moderate this timing effect—watching the animation immediately before reporting RG intentions should only facilitate RG-oriented decisions among players who lack symptoms of disordered gambling. This is because RG information is helpful in preventing the progression toward disordered gambling, but not as an intervention among those who have already developed disordered patterns of play (Cowlishaw et al., 2012; Toneatto & Millar, 2004)

Methods

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Participants

A sample of 98 slot machine players (Male = 42) ranging in age from 18 to 88 years old (M = 50.25) were recruited from the Rideau Carleton Raceway (n = 44; Male = 20) in Ottawa, Ontario, and the Club Regent (n = 54; Male = 22) in Winnipeg, Manitoba.

Participants were eligible to participate if they were at their respective casinos to play slots, but had not gambled yet. Each participant was compensated with a $20 gift card to Tim Hortons.

Procedures

Participants were recruited upon entering the Rideau Carleton Raceway (RCR) and the Club Regent (CR). Specifically, an experimenter approached a player as he or she entered the casino and asked if he or she was interested in participating in a study on gambling attitudes and behaviour. Those who were interested were told that they would be filling out surveys and playing on a virtual reality slot machine on a laptop, where they would have the opportunity to win money (in the form of gift cards). If they decided to participate, they were shown to a nearby conference room to begin the study. Participants were then placed at individual desks, where the study was explained in further detail.

Participants were told that although $20 would be uploaded onto the virtual slot machine, $10 would be compensation for participating in the study, and up to $10 would be theirs to gamble with. They were then asked how much of the $10 allocated to the gambling session they would like to play with. This would act as the participant's money limit. All machines in the virtual reality casino used 25 cent credits. Once they decided on the amount and granted informed consent, they completed a set of questionnaires. After completing the questionnaires, all participants selected which slot machine they wanted to play on in the virtual reality casino. Once they chose a machine, the number of credits (corresponding to the dollar amount they set earlier) was entered as their limit. The participants then gambled on a pre-programmed slot machine until they reached their money limit.

All participants watched an education-based animation entitled *Slot machines: What every player needs to know*, that explains how EGMs function (e.g., the independence of outcomes in slot machine play or the "replacement feature"), the prudence of setting expenditure limits when playing, and strategies to avoid exceeding those limits (for more information, see Wohl et al., 2010). Participants were randomly assigned to watch the video prior to beginning their gambling session or when they reached their money limit.

In the pre-gambling condition, participants were asked verbally if they wanted to keep playing (past their limit) immediately following the gambling session. In the limit reached condition, participants watched the video once they reached their pre-set limit, and were then asked if they wanted to keep playing. In reality, neither groups were allowed to keep playing past their pre-set money limit. Afterward, both groups completed a second set of questionnaires. They were then debriefed and awarded a $20 Tim Hortons gift card as compensation.

This research received approval from the research ethics board at both Carleton University and University of Manitoba.

Measures

Problem Gambling Severity. Problem gambling severity was assessed using the PGSI (Ferris & Wynne, 2001). The scale consists of nine items (α = .95) that are anchored from 0 (*never*) to 3 (*almost always*). Participant scores are then summed to obtain a total score ranging from 0 to 27. Participants with a score of 0 are classified as 'non-problem' gamblers, 1–2 as 'low-risk' gamblers, 3–7 as 'moderate-risk' gamblers, and 8–27 as 'problem gamblers'.

Future Limit Setting Intentions. The impact of the video on players' intentions to set limits in the future was measured using two items (r = .56) anchored at 1 (*strongly disagree)* and 7 (*strongly agree*). The items were: "The information provided during this study will make me more cautious of how much money I spend playing the slot machines in the [Rideau Carleton Raceway/ Club Regent]

today" and "The information provided during this study will ensure I set a limit on the amount of money I spend playing the slot machines in the [Rideau Carleton Raceway/ Club Regent] today".

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Results

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Preliminary Analyses

There were no between condition effects of age or sex (both ps > .23). Therefore, both of these variables were collapsed in the subsequent analyses. The mean for disordered gambling severity was 2.47 (SD = 4.28) with a range of scores from 0 to 26. The mean for limit setting intentions was 4.94 (SD = 1.76), which was significantly above the mid-point of the scale, t(97) = 8.07, p < .001. There was no correlation between PGSI and limit setting intentions, r =.16, p = .13.

Main Analyses

To assess the theorized moderating influence of disordered gambling severity on the association between responsible gambling educational video timing and intention to set a money limit, the timing manipulation (coded 0 = pre-gambling, coded 1 = limit reached) and disordered gambling severity (centered), as well as their product were entered into a regression as predictors of future limit intentions (see Figure 1). The omnibus test of the model was significant, R^2 = .11, F(3, 91) = 3.93, p = .01. There was a main effect of timing, b = .76, t = 2.17, p = .03, CI = [.06, 1.46], such that those who watched the video when they reached their money limit were more likely to endorse future limit setting (M = 5.36, SD = 1.79) than those who watched the video before gambling (M = 4.57, SD = 1.67). There was also a main effect of disordered gambling severity, b = .09, t = 2.14, p = .04, CI = [.007, .18], such that those higher in disordered gambling severity were more likely to endorse limit setting than those lower in disordered gambling severity.

The presence of a significant interaction qualified the main effect results, b = -.18, t = -2.13, p = .04, CI = [-.35, -.01]. A moderation analysis showed that the timing of the video had a significant impact on future limit setting at 1 SD below the mean of disordered gambling severity, b = 1.21, t = 2.97, p = .004, CI = [.40, 2.02] and at the mean mean of disordered gambling severity, b = .76, t = 2.17, p = .03, CI = [.06, 1.46], but not 1 SD above the mean of disordered gambling severity, b = -.02, t = -.04, p = .97, CI = [-1.03,.99]. In other words, watching the educational video when the money limit was reached was only related to increased future limit setting intentions among those who reported low to moderate levels of disordered gambling severity. The timing of the video made no difference among those who were reported high levels of disordered gambling severity.

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Discussion

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To address overspending among EGM players, researchers have tested various RG tools to help them make informed decisions about their play. Included in the array of RG tools are education-based videos that, among other things, teach players about their odds of winning and the importance of setting and adhering to a pre-set limit on the amount of money gambled. One such education-based video, an animation entitled *Slot machine: What every player needs to know* (Wohl et al., 2010; 2013), has demonstrated RG utility in that players who watch the animation are more likely to set and adhere to a pre-set money than those who do not watch the animation. Yet until now, no research has examined the ideal time to show players RG information. Should it be viewed before a gambling session begins or when the player is about to make a decision about their gambling (e.g., when deciding whether to adhere to a pre-set money limit)? The goal of the current study was to address this gap in the literature.

It was hypothesized that players who viewed an educational animation once their limit was reached, as opposed to before the gambling session, would be more inclined to gamble responsibly (i.e., set a limit) in the future. The results confirmed this hypothesis. Players who viewed the animation when their limit was reached reported significantly greater intentions to set and adhere to a pre-set

limit in their next gambling session than players who watched the animation before their gambling session began.

It is possible that players who watched the animation prior to their gambling session understood and absorbed the RG information conveyed to them but neglected it in the heat of the gambling session. Such an explanation is in line with research on cognitive switching—a situation whereby specific idiosyncratic beliefs (e.g., that one can control the outcomes) come to over-ride more objective considerations (the objective odds) *whilst* gambling (Sévigny & Ladouceur, 2003). When participants were asked immediately after the gambling session about their limit setting intentions, their idiosyncratic beliefs likely dominated the RG information learned via education-based animation. Watching the animation when a pre-set limit had been reached may have served as a *de facto* break in play, which is known to facilitate the processing of RG information (see Stewart & Wohl, 2013).

Importantly, as predicted, disordered gambling severity moderated the relation between when the animation was viewed and limit setting intentions. Specifically, watching the video when the pre-set money limit was reached only facilitated limit setting among players low in disordered gambling symptomology. This was expected because education-based RG initiatives appear to be effective only as prevention, rather than as intervention for disordered gambling (Cowlishaw et al., 2012; Toneatto & Millar, 2004). This is exemplified by the fact that even when problem gamblers theoretically understand their odds of winning, they often discount these odds and become highly irrational during play (Delfabbro, Lahn, & Grabosky, 2006).

Of note, players with an elevated number of symptoms of disordered gambling were more likely to endorse limit setting than those with little to no symptoms of disordered gambling. This result is akin to research by Moore, Thomas, Kyrios, and Bates (2012), who showed that 52.9% of non-problem gamblers reported setting a target budget for gambling, while over 66% of disordered gamblers reported this budgeting strategy. It is possible participants high is disordered gambling symptoms understand that they overspend, and that limit setting may be a way to protect against overspending. However, they are not willing or able to adhere to that limit when it is reached. Conversely, those with little to no symptoms of disordered gambling are less likely to spend more than they can afford on gambling. They may not see the value in setting a limit since they rarely have problems associated with gambling more than they can afford to lose. However, when presented with RG information at the time a RG decision is being made, they express a greater willingness to engage in RG behaviours.

Implications

The results from the current research suggest that players may benefit from being provided RG information at the time they are deciding on their imminent gambling behaviour. Having this information at hand encourages informed decisions (i.e., responsible gambling). This holds real world implications for promoting limit setting. Specifically, this suggests that gambling venue operators should provide RG information at times when players must decide on their upcoming gambling behaviour, rather than before play.

Existing responsible gambling tools could be repositioned to be shown at a time when gambling decisions are being made. Aside from watching an education-based animation when a money limit is reached (and before allowing the player to continue play), RG-oriented information could be placed on the splash page of Automated Teller Machines (ATM) that are in casinos. When at an ATM in a casino, a player is typically withdrawing money to initiate play or to continue play (when money in hand has been lost). Providing RG information at this point may help players make informed decisions about how much (additional) money he or she is willing to lose. Among players who are thinking of withdrawing money to continue playing, placing RG information in ATMs may create psychological tension about continued play, which may lead them to reconsider their withdrawal of additional funds.

Limitations

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It is important to note some limitations of the current research. First, intention to gamble responsibility is not equivalent to engaging in RG behaviours (e.g., setting and adhering to a pre-set money limit). Although players who watched the animation at the time they had to make a RG-relevant decision expressed greater intentions to set a limit in a subsequent gambling session, this does not mean these players will set a limit the next time they gamble. Whether intentions lead to actions needs to be assessed in subsequent research in this area.

Second, limit setting intentions as well as limit setting behaviour does not necessarily lead to limit adherence. Although many EGM players do set limits, some surpass these limits (Ladouceur, Blaszczynski, & Lalande, 2012; Wohl et al., 2010, 2013). Specifically, many players stop their gambling session out of guilt or excessive loss, rather than because they reached their pre-set money limit (Wohl et al., 2008). Such money limits are only useful if players adhere to them. Thus, future research in this area should examine if players adhere to limits when intending to do so. This could be assessed using modified EGMs on gaming floors, as discussed earlier.

Lastly, this study was underpowered. A post-hoc power analysis revealed that 160 participants would have been required to achieve 80% power. This type of gambling research is extremely time consuming and expensive due to the special population and can only be conducted at a casino. As such, it was not feasible to have 160 gamblers participate in this study.

Conclusion

Setting a financial limit is a key part of avoiding gambling related harms. The results of this study suggest that the timing of RG information is critical to its effectiveness in promoting limit setting. Specifically, gamblers should view RG information at the point when they are making a decision about their gambling behaviour. Doing so will facilitate RG and thus help minimize gambling-related harms.

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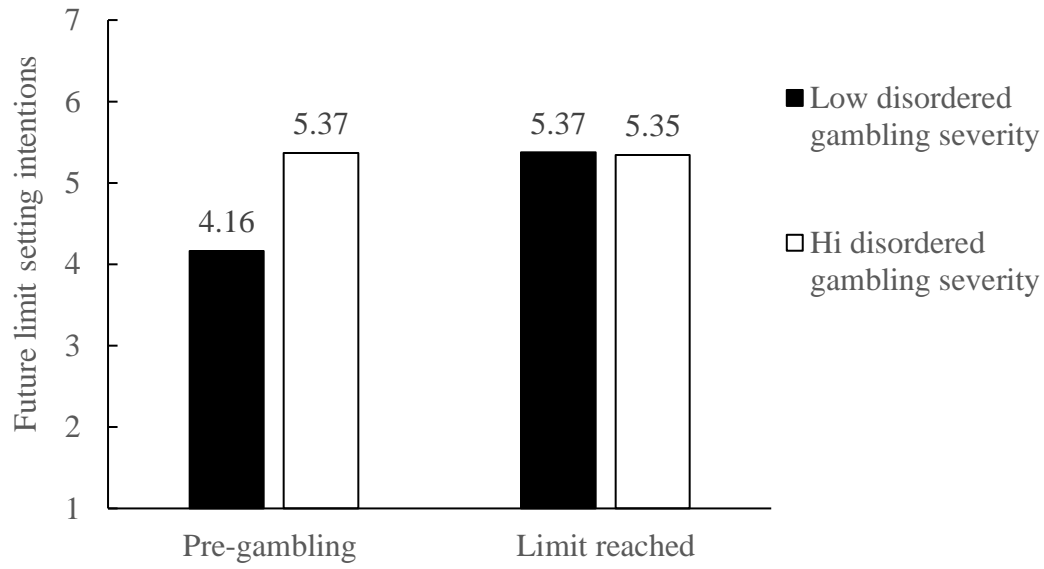
Figure 1. Moderating Influence of Problem Gambling Severity on the Association Between Timing of Educational Animation and Future Limit Setting Intentions.

Note. 1 SD above and below the mean of disordered gambling severity

Authors' Note

Chapter 2 and the research reported therein does not follow from the research reported in Chapter 1. It should be read as a standalone report.

To ensure the sample independence, we asked players whether or not they participated in previous gambling-related studies at the gambling venue. If they responded in the affirmative, they were ineligible to participate. Moreover, to receive remuneration, participants needed to sign a form. We cross-checked participant signatures to ensure they didn't participant in a previous study. There were no duplicate signatures.

Chapter 2: Does Pop-up Message Content Matter? An Examination of the Effectiveness of Informing Gamblers about their Monetary Losses on Player Limit Adherence

Gamblers who play electronic gaming machines (EGMs; e.g., slot machines) are at an increased risk for developing disordered patterns of play (Breen & Zimmerman, 2002; Currie et al., 2012; MacLaren, 2016). This is largely because the structural characteristics of EGMs make them highly addictive. Among other problematics characteristics, EGM gameplay is very quick (it takes only a few seconds to determine the outcome of a wager), wins are determined on a highly addictive reinforcement schedule (i.e., a win occurs after an unpredictable number of spins; Dixon, Harrigan, Sandhu, Collins, & Fugelsang, 2010; Harrigan, Dixon, MacLaren, Collins, & Fugelsang, 2011), and EGMs are constructed to have appealing sounds, animations and lights that enthral the player (Finlay, Marmurek, Kanetkar, & Londerville, 2005; Fisher & Griffiths, 1995). Such structural characteristics not only attract players, but also facilitate excessive play (i.e., spending more money or time than can be afforded; Griffiths, 1993)—a hallmark of disordered gambling and its associated negative consequences (e.g., psychological and financial distress; Lesieur & Custer, 1984; Petry, 2005; Suurvali, Hodgins, Tonneatto, & Cunningham, 2008). In light of the mounting evidence demonstrating the harms associated with EGM gambling, researchers and policy makers have expended a great deal of effort developing and testing means to promote responsible gambling habits among players.

According to the Reno Model (Blaszczynski, Ladouceur, & Shaffer, 2004), the term responsible gambling refers to policies and practices designed to restrict a player's expenditure (money and time) within an affordable limit (i.e., spending only money that can afford to be lost). Paramount in this model is pre-commitment (i.e., setting a pre-determined amount of money and/or time that one is willing to spend gambling). In the spirit of the Reno Model, responsible gambling tools have been developed and incorporated into EGM play that allow players to set money and/or time limits on their upcoming gambling session. Most commonly, this is accomplished via pop-up message on an EGM. Specifically, a display area, usually a small window, suddenly appears (or "pops up") in the foreground of the EGM. The player is either told the benefits of setting a limit prior to play or the player is given the option to select a limit. Importantly, setting a limit through such an RG tool has responsible gambling utility (Auer & Griffiths, 2013; Kim, Wohl, Stewart, Sztainert, & Gainsbury, 2014; Wohl, Gainsbury, Stewart, & Sztainert, 2013; Stewart & Wohl, 2013). Specifically, players who receive a message informing them that their pre-set limit has been reached are less likely to gamble excessively.

EGMs that provide players with the option of setting a limit also inform players (via pop-up message) when their limit has been reached. Typically, the message simply informs the player that their limit has been reached. No personalized information is provided (i.e., how much money has been lost)—a situation that may hinder its RG potential. This is because personalized behavioural feedback has been shown to facilitate responsible gambling (Wood & Wohl, 2015; Wohl, Davis, & Hollingshead, 2017), in part, because a better informed player is typically a more responsible gambler (Blaszczynski et al., 2004). Personalized behavioral feedback is also helpful because players are remarkably poor at keeping track of how much money they spend gambling, which undermines responsible gambling (Wohl, Davis, & Hollingshead, 2017; Auer & Griffiths, 2017). In the current research, we tested the responsible gambling utility of a pop-up limit reminder message that included specific personalized information about how many credits *as well as* how much money had been lost gambling at the time the player's limit had been reached. Specifically, we examined whether the inclusion of detailed information about players' money losses would upregulate limit adherence.

The Risks of EGM Play and the Need for More Informed Decision Making

EGMs are one of the most popular forms of gambling (Dickerson & O'Connor, 2006). In Canada, the number of EGMs has increased from roughly 15,000 in 2000 to over 93,000 in 2016 (Rustey, 2009; Canadian Partnership for Responsible Gambling [CPRG], 2018). This expansion is due, in part, to increased social acceptability of gambling (Cosgrave & Klassen, 2001), with the large

majority of Canadians (~75%) reporting that they gamble occasionally (see Statistics Canada, 2003; CPRG, 2018). However, expansion of EGMs can also be attributed to the revenue they generate (Smith, 2014), which approximates 60% of the total gambling revenue in Canada (MacLaren, 2016). The popularity of EGMs is likely resultant from their structural characteristics. They are fast-paced to play, require minimal skill and feature the use of exciting lights and sounds (see Dixon & Schreiber, 2004; Griffiths, 1991; 1993; Kassinove & Schare, 2001). These features make them accessible and appealing to a wide variety of gamblers.

Unfortunately, the structural characteristics that make these games entertaining can also contribute to the development of problem gambling among their users (See Dixon et al., 2010; Griffiths, 1999; Harrigan et al., 2011; Parke & Griffiths, 2006). In fact, players who engage with EGMs are more likely to develop disordered levels of gambling at a faster rate compared to those who play other forms of gambling (Breen & Zimmerman, 2002). The prevalence of disordered gambling among EGM users takes a toll on the Canadian health system. Indeed, 1 in 4 disordered gamblers in Canada report EGMs as their game of choice (Statistics Canada, 2003), and the majority of disordered gamblers entering treatment facilities are seeking help to overcome their addiction to EGMs (Jackson, Thomas, & Thomason, 2005; Rodda & Lubman, 2014). With a growing body of empirical support demonstrating the potential addictive quality of engaging in EGM play, they have received the ominous nickname of the 'crack-cocaine' of gambling (See Dowling, Smith, & Thomas, 2005).

To facilitate responsible EGM gambling, some research was focused on educating players about the odds of winning (Ladouceur & Sevigny, 2003; Gallagher, Nicki, Otteson, & Elliott, 2011) and irrational beliefs that some players hold about the probability of winning (e.g., outcomes have a predictable pattern; Monaghan, Blaszczynski, & Nower, 2009). However, the success of such responsible gambling initiatives has not been robust. Particularly problematic for education-based responsible gambling initiatives is that educated players demonstrate a tendency to cognitively switch to irrational beliefs during play (Sevigny & Ladouceur, 2003). Thus, researchers and policy makers have shifted focus to pre-commitment or the notion of encouraging players to set a limit on the amount of money (or time) they spend gambling (i.e., pre-commit) and then adhere to that limit (Blaszczynski et al., 2004; Kim et al., 2014; Ladouceur, Blaszczynski, & Lalande, 2012;; Productivity Commission, 2001; Responsible Gambling Council, 2010, Stewart & Wohl, 2012—a switch that has yielded a moderate level of success in terms of advancing responsible gambling.

Pop-up Messages: A Technological RG Tool to Help Facilitate Pre-Commitment

A large body of empirical evidence supports the idea that gamblers who pre-commit to a limit on the amount of money or time they are willing to lose are less likely to gamble excessively (i.e., gamble more than they can afford to lose; see Ladouceur, Blaszczynski, & Lalande, 2012 for a review). In part, as a result, tools have been developed that help players set a money or time limit. Most commonly, this is accomplished on EGM with a pop-up message (i.e., display of text that suddenly appears on the foreground of screens). For example, a player may be offered the opportunity to set a money limit on their upcoming gambling session (typically the limit can be set by selecting an option in the pop-up). Upon reaching their money limit, a second pop-up message appears that informs the player that the pre-determined limit has been reached. Importantly, players that set a money or time limit when provided an opportunity via pop-up message, are less apt to gamble excessively (Auer, Malisching, & Griffiths, 2014; Kim et al., 2014). For example, Kim and colleagues (2014) found that players spent significantly less time gambling when they received a pop-up on an EGM that provided the opportunity to set a time limit on their gambling session (compared to a control group that were not provided this opportunity) . Responsible gambling is further facilitated when an EGM is programed to inform the player (via pop-up message) when their pre-determined limit is reached (Stewart & Wohl, 2013).

The responsible gambling utility of the pop-up resides, in part, on the forced break in play that is a by-product of their appearance. When players use an EGM, they tend to enter a state of dissociation (i.e., detachment from one's current lived experience; Diskin & Hodgins, 1999; 2001; Grant & Kim, 2003; Stewart & Wohl, 2013). When players dissociate they become unaware of the

passage of time (Diskin & Hodgins, 1999, 2001), which can lead to excessive gambling. Importantly, dissociation can be interrupted by the appearance of a pop-up message, which provides the player an opportunity to decide whether to continue gambling. As shown by Stewart and Wohl (2013), the opportunity provided by the presence of a limit reminder pop-up message leads to more responsible decisions (i.e., limit adherence).

Room for Improvement: The Inclusion of Personalization in Pop-up Messages

According to the Reno Model (Blaszczynski et al., 2004), informed players are more responsible gamblers. However, not all responsible information is created equal. Information that is personally relevant should have a greater positive effect on responsible gambling attitudes and behaviours than information that is not self-relevant. This is because people are uniquely motivated to consider information that is self-relevant (Noar, Benac, & Harris, 2007; de Vries, Kremers, Smeets, Brug & Eijmael, 2008). Indeed, Monaghan and Blaszczynski (2010) found that messages that encouraged self-appraisal (i.e., reflecting on one's game play) had more positive influence on gambling thought and behaviour than informative messages (i.e., the odds of success) or blank pop-up signs. Problematic is that players poorly self-appraise the amount of money they have lost gambling (Auer & Griffiths, 2017; Volberg et al., 1998, 2001; Wohl, Davis, & Hollingshead, 2017). Specifically, many players systematically over or underestimate the amount of money they spend, which can lead to excessive gambling (Auer & Griffiths, 2017; Wohl et al., 2017). It is possible that this tendency can be counteracted by providing the player with personalized behavioural feedback (i.e., the player can be provided personal information about the amount money and time they spent gambling).

Personalized play information is typically available to any player who is a member of a loyalty program in the gambling industry (for a review see Wohl, 2018). However, this information is often difficult to locate on the player's member page. That said, even when information about one's gambling expenditure is easy to access (one, highly visible button), players forgo this information (see Wohl et al., 2014, 2017). Thus, to reap the benefits of personalized behavioural feedback, it may be necessary to automatically provide this information at a critical time for decision making—when a pre-set limit on play has been reached. This can be accomplished via pop-up message. We test this idea in the current research.

Overview of the Current Research

In two studies, we examined whether money limit adherence increases when personalized behavioural feedback pertaining to the amount of money lost is provided when a player's limit has been reached. In both studies, a community sample of gamblers who were able to start a gambling session at a local casino were invited to participant in a gambling study on a virtual reality EGM. Whilst some players received general information via pop-up when their limit was reached (i.e., a message that simply informs the player that a pre-set money limit was reached), other participants were provided personalized behavioural feedback (i.e., a message that informs the player how many credits and how much money was lost).

In Study 1, we tested the hypothesis that players who received the personalized information about how much money was lost would be more apt to adhere to their limit compared to players who were simply told that their limit was reached. In Study 2, in addition to manipulating the information provided in the pop-up, we introduced a feature to the pop-up that disabled the player's ability to immediately discard the pop-up message. It was hypothesized that the players who were unable to discard the pop-up immediately would be apt to recall the content of the message, which should have a positive downstream influence on limit adherence, particularly for players who were provided personalized behavioural feedback within the pop-up.

Study 1

The purpose of Study 1 was to test the efficacy of an EGM pop-up message that contains personalized behaviour feedback in the form of information about the amount of money and credits players lost during play. A community sample of gamblers played a virtual EGM. Previous research using this virtual EGM has demonstrated that its visuals and sound effects mimic those of a real slot machine and its play elicits similar behaviour and cognitions among gamblers (Kim et al., 2014; Stewart & Wohl, 2013; Wohl et al., 2014). They were provided $20 and told that half of the funds was the limit they could spend gambling (the other $10 was for remuneration). Participants were randomly assigned to either receive a general information or a personalized feedback pop-up message about their limit when it was reached. In the general information pop-up condition, players were told only that their money limit was reached. In the personalized behavioural feedback pop-up condition, players were also told the amount of money and credits lost whilst playing. After viewing the pop-up message, players were asked whether they would like to use any of their participation money to continue playing. We hypothesized that players who received personalized behavioural feedback by way of the pop-up message would be more apt to decline the possibility of continued play with their remuneration funds than those who received the general information pop-up message.

Methods

Participants

A community sample of EGM players (n = 131) were recruited from a slots and racetrack venue in Ontario (n = 66; 31 males) as well as a casino in Manitoba (n = 65; 31 males). Participation was limited to those players who were over the age of 18 and had not now nor ever sought treatment for their gambling. Additionally, participation was restricted to players who were at the venue to play slots and had yet to gamble that day. They ranged in age from 18 to 86 years (*M* = 56.94, *SD* = 16.47). Participants were compensated with a $20.00 gift card to a national coffee and donut chain. The study took an average of 30 minutes to complete.

Procedure

Upon entering the gambling venue, patrons were approached and asked if they would be interested in participating in psychological research on gambling. Eligible participants were then directed to the location of the experiment. After granting consent, participants completed a filler battery of questionnaires and were asked for demographic information (age, sex). After completing the questionnaires, participants were directed to a computer on which a virtual reality casino was loaded (see Young, Wohl, Matheson, Bauman, & Anisman, 2008 for a detailed description). A single-line, slot machine styled EGM was displayed. Participants were told that $20 or 80 credits had been pre-loaded into the game. Of this $20, $10 (the equivalent of 40 credits on the EGM) was compensation for their participation which they would receive in the form of a gift card to a national coffee and donut chain and the other $10 (the equivalent of 40 credits on the EGM) was seed gambling funds. Importantly, they were told they could spend up to $10 gambling and that any money remaining at the end of the session would be added to their gift card.

Upon losing the $10, participants received one of two pop-up messages. In the general information limit reminder condition (n = 63), participants received a message that only informed them their limit was reached ("You have reached the maximum budget you set for yourself today"). In the personalized behavioural feedback condition (n = 68)[1], participants received a message that informed them that their limit was reached as well as how much money and credits they had lost ("You have reached the maximum budget you set for yourself today ($10 = 40 credits)." Critically, all participants

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[1] The imbalance between conditions was due to five participants withdrawing after granting consent.

were given the opportunity to continue playing using their ($10) compensation funds, which were already loaded into the EGM. Their decision to adhere to the pre-set limit (or not) was recorded and served as the central dependent measure.

Immediately after making the decision to adhere to the $10 pre-set limit (or not), participants were asked to complete a close-ended, multiple choice item that asked them to report the content of the pop-up message they received. This item served as a check on the manipulation. Lastly, participants were asked to complete the Problem Gambling Severity index (PGSI; Ferris & Wynne, 2001).

Participants were fully debriefed. Because deception was used, all participants were asked for consent to use their data (all granted consent). They were then compensated for their time.

This research received approval from the research ethics board at both Carleton University and University of Manitoba.

Measures

Manipulation Check. To test the efficacy of the manipulation, participants were provided a multiple choice item that asked them to indicate the message they received in the pop-up. This item was: "What message did you receive when you reached your limit?" The response options were "*I was NOT reminded when my limit was reached*", "*I was told I reached my limit INCLUDING number of credits played AND how much money I played*", and "*I was ONLY told I reached my limit.*"

Limit Adherence. To assess limit adherence, participants were asked "Now that you have spent your $10 worth of credits, would you like to use any of your participation money that remains in the machine to keep playing?" Response options included "*Yes*" or "*No*".

Problem Gambling Symptomology. Problem gambling symptomology was assessed using the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001). The PGSI contains nine items that assess disordered gambling behaviour (e.g., "Have you needed to gamble with larger amounts of money to get the same feeling of excitement?") and consequences of disordered gambling (e.g., "Have you felt guilty about the way you gamble or what happens when you gamble?"). The items were measured on a scale anchored at 0 (*never*) and 3 (*almost always*). Participants' scores were summed to obtain a total score (ranging from 0 to 27). Higher scores indicated higher levels of disordered gambling severity(α = .96).

Results

Five participants did not answer the manipulation check and were removed from all subsequent analyses. Additionally, two participants were removed from analyses because they ended their gambling session prior to reaching their pre-set limit and thus did not receive a pop-up message. The final sample size consisted of 124 (64 = Ontario, 30 males; 60 = Manitoba, 28 males) gamblers (59 = general information condition, 65 = personalized behavioural feedback condition). These participants ranged in age from 18 to 86 (M = 57.45, SD = 15.87). Of these participants, two reported gambling more than once a day (1.6%), 31 (25.2%) reported gambling more than once a week, 50 (40.7%) reported gambling more than once a month, 16 (13%) reported gambling more than once every three months, and 24 (19.5%) reported gambling less than once every three months. Moreover, years spent gambling ranged from less than a year to 71 years (M = 15.21, SD = 12.13).

There were no statistically significant differences between condition on either age, $t(114)$ = -1.10, p = .64 or sex, $\chi^2(1)$ = .26 p = .61, as such, analyses were collapsed across these variables. Additionally, there were no significant differences between conditions on problem gambling severity, $t(113)$ = -.75, p = .41. Therefore, we also collapsed across this variable for all subsequent analyses. Informatively, however, participants had an average score of 3.29 (SD = 4.46) on the PGSI, suggesting that (on average) participants were moderate to problem gamblers (see Ferris & Wynne, 2001).

We also examined whether there was a main effect of recruitment location as well as whether there were any interactions between recruitment location and condition on any of the measured

variables of interest. There were no statistically significant differences between recruitment location on the participant's success on the manipulation check, $\chi^2(1) = 2.65$ $p = .10$, or their level of gambling pathology, $t(113) = .78$, $p = .43$. As well, there were no interaction effects between recruitment location and condition on correctly answering the manipulation check, Wald's χ^2 (3) = 2.85, $p = .09$, $B = 1.26$, $SE = .74$, $OR = 3.52$, 95% CI = [.82, 15.16] or level of gambling pathology, $F(3, 111) = 2.02$, $p = .11$.

There was a significant main effect of location on participant's limit adherence, $\chi^2(1) = 5.51$ $p = .02$. Players were more apt to adhere to their limit in Winnipeg (57/60, 95%) compared to Ottawa (52/64, 81.3%). However, there was no interaction effect between recruitment location and condition on limit adherence, Wald's χ^2 (3) = .08, $p = .78$, $B = -.40$, $SE = 1.41$, $OR = .67$, 95% CI = [.04, 10.66]. That said, due to the main effect of location, we controlled for location of recruitment in all subsequent analyses.[2]

Manipulation check. Approximately half of all participants (49.2%) failed the attention check item. To probe this finding, a binary logistic regression was conducted with failing the manipulation check as the dependent variable and condition (coded as 0 = general information pop-up message, 1 = personalized behavioural feedback pop-up message) as the predictor. This was done to assess whether there were differences between conditions. Results demonstrated that condition did not significantly predict failing the manipulation check, Wald's χ^2 (2) = 3.22, $p = .07$, $B = .66$, $SE = .37$, $OR = 1.94$, 95% CI = [.94, 4.00] (simple: n = 24/59 or 40.7%, detailed: n = 37/65 or 56.9%, see Table 1 for a breakdown of response option counts by condition). The high rate of failure to the manipulation check suggests the manipulation failed, thus, results should be interpreted with caution.

Main analyses. A binary logistic regression was conducted with limit adherence as the dependent variable and condition (coded as 0 = general information pop-up condition, 1 = personalized behavioural feedback pop-up condition) as the predictor. Results indicated that condition did not significantly predict limit adherence, Wald's χ^2 (2) = .37, $p = .55$, $B = .35$, $SE = .57$, $OR = 1.41$, 95% CI = [.46, 4.35] (simple: n = 53/59; detailed: n = 56/65).

Discussion

Typically, the only information that players are provided when they reach their money limit is that their limit has been reached. In order to facilitate informed decision making, thereby (ideally) increasing limit adherence, we put forth the proposition that limit adherence would be upregulated if players were provided personalized behavioural feedback about how much money they lost when their money limit was reached compared to being provided with general information (i.e., information that a money limit has been reached). Contrary to expectations, manipulating message content did not influence limit adherence. Participants who received a reminder message that included personalized behavioural feedback did not differ in the extent to which they adhered to their money limit compared to those who were given general information that a money limit was reached.

A cursory examination of the results from Study 1 may lead to the conclusion that responsible gambling is not upregulated when personalized behavioural feedback is presented to players via pop-up when their limit has been reached. An alternative interpretation of the results, however, comes into focus when taking responses to the manipulation check item into consideration. In both conditions, approximately half of the participants failed the manipulation check. Specifically, participants were unable to accurately recall the content of the message, which suggests that they were not paying attention to the content of the message. If participants were not paying attention to the content of the message, the type of message provided would have no bearing on informed decision making and thus responsible gambling.

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[2] Although location was controlled for in all main analyses, the results do not change when location is not included in the model.

A methodological limitation of Study 1 may provide a possible explanation for participants failure to attend to the message. Participants had the ability to discard the pop-up message (in both conditions) immediately by simply clicking a "continue" button. If a participant did discard the message immediately, it is unlikely they read the content of the message, thus undermining any responsible gambling utility of the message. Unfortunately, the virtual reality casino does not track the amount of time the pop-up is visible. As such, we have no direct way to assess this possibility. Another potential methodological issue in Study 1 was that participants did not set their own money limit, rather they were assigned a limit of $10. The fact that we assigned participants a pre-set limit of $10 may have elicited demand characteristics within our participants. Specifically, they may have felt pressured to play to the entirety of the assigned $10 limit. As such, they may have disregarded the information contained in the pop-up because they were aware their pre-assigned limit was reached. Additionally, because the participants did not set their own limit, the limit reminder could be viewed as unimportant to their play.

Study 2

To address the methodological limitation of Study 1, a second study was conducted to provide a sounder test of our general hypothesis that personalized behavioural feedback in a pop-up message has responsible gambling utility. In Study 1, players were able to discontinue the pop-up message immediately. However, Cloutier, Ladouceur and Sevigny (2006) found that wagering decreased when players were forced to pause their gambling session for seven seconds. Additionally, Stewart and Wohl (2013) showed that pop-up messages that stop play reduce dissociation, which is a strong predictor of excessive gambling among EGM players (see Diskin & Hodgins, 1999, 2001). Thus, it is possible that delaying players' ability to close the pop-up immediately would facilitate limit adherence. It would also provide the necessary time to read the content of the pop-up message. Thus, in Study 2, we manipulated whether participants were able to immediately close the pop-up message window. We hypothesized that players whose ability to discard the pop-up was delayed by 10 seconds would a) be more likely to correctly recall the content of the message and thus b) be more likely to adhere to their limit (compared to those who could discard the message immediately). We also hypothesized that the inability to quickly discard the message and message content would have additive effects whereby, those who received the more informative message and were also temporarily delayed play would have the highest likelihood of limit adherence.

Additionally, conducting a second study allowed us to enhance the realism of the experiment. In Study 1, participants were assigned a $10 limit which may have potentially elicited demand characteristics in our sample. To correct for this limitation, in Study 2, participants pre-set their own money limit. Participants were, akin to Study 1, told they would be given $10 to play with in the virtual reality casino, however, they were also told they did not need to spend the $10 in its entirety (i.e., they could set a limit below the $10 provided) and that any money not played would be theirs to keep.

Methods

Participants

A community sample of gamblers (n = 141; 52 male, 81 female, 8 unreported) were recruited from a slots and racetrack venue in Ontario. As in Study 1, potential participants were approached upon entering the venue and asked if they would like to participate in a study on gambling behaviour. Patrons of the venue were eligible to participate if they had never sought nor were currently enrolled in treatment for gambling-related problems and if they were of legal age to gamble. Additionally, participants were not eligible if they had previously gambled that day or had participated in Study 1. They ranged in age from 19 to 90 years ($M = 59.46$, $SD = 15.02$). As in Study 1, participants were compensated with a $20.00 gift card to a national coffee and doughnut chain. The study took approximately 30 minutes to complete.

Procedure

After participants were recruited (see Study 1 for recruitment methodology) and granted consent, they were told that they could gamble with up to $10 on a virtual EGM. Participants were then asked how much of this $10 in gambling seed money they would like to spend. This value acted as the participants' limit. After setting their money limit, the participants filled out questionnaires that included demographic items (age, sex). This provided an opportunity for the experimenter to program the pop-up message in the virtual reality EGM with the participant's self-imposed limit.

Participants were then randomly assigned to one of the four conditions corresponding to the 2 (pop-up message content manipulation: general information vs. personalized behavioural feedback) x 2 (ability to discard the message manipulation: immediately vs. delayed) between-participants design. Message content was manipulated in the same way as in Study 1. To manipulate whether participants had the ability to immediately discard the pop-up message, some participants were provided with a "continue" button that allowed the participant to discard the pop-up message immediately whilst for other participants, the "continue" button was inactive for a duration of 10 seconds. A counter was also included so participants were aware when the button would become active.

After clicking the continue button, participants were asked whether they would like to use any of their remaining funds to continue playing. Their response served as the central dependent measure of limit adherence. As a check on the manipulation, akin to Study 1, participants were asked to select the content of the message from a list of possible answers.

Participants were fully debriefed. Because deception was used, all participants were asked for consent to use their data (all granted consent). They were then compensated for their time.

This research received approval from the research ethics board at Carleton University.

Measures

Manipulation Check. Recall of the pop-up message was measured using the same manipulation check item used in Study 1.

Limit Adherence. Limit adherence was assessed by asking participants orally, "In this casino we have a lot of different games, such as, different slot machines, electronic poker and at the back we have blackjack and poker tables. Now that you have played your [STATE LIMIT] on the slot machine, would you like to use any your remaining money to gamble on any of the other games?" Response options were "*Yes*" or "*No*".

Problem Gambling Symptomology. As in Study 1, problem gambling severity was assessed with the PGSI (α = .91; Ferris & Wynne, 2001).

Results

See Table 1 for response frequencies by condition and Table 2 for participant limit adherence by condition.

Two participants used extreme responding and two participants ended their participation in the study early, as such, these four participants were excluded from all analyses. An additional 28 participants were excluded for failing to answer the manipulation check. The final sample consisted of 109 gamblers (40 = male, 66 = female, 3 = unreported). Participants ranged in age from 21 to 90 (M = 59.12, SD = 14.53). One participant reported gambling more than once a day (0.9%), 24 participants reported gambling more than once a week (20.6%), 34 participants reported gambling more than once a month (32.1%), 26 participants reported gambling more than once every three months (24.5%) and lastly, 21 participants reported gambling less than once every three months (19.8%). Years having gambled ranged from 1 to 50 (M = 14.28, SD = 10.07). There were no significant differences between condition on age, years having gambled or symptoms of disordered gambling. As such, these

variables were collapsed across all subsequent analyses. There were however significant differences in the distribution of sex between conditions. Therefore, sex was controlled for in all main analyses.[3]

Participants set an average limit of $8.71 ($SD$ = 2.23, range from $1.50 to $10.00) however, modal limit set was $10 (n = 75/108 or 68.8%). The average limit set did not differ by condition, F(3, 105) = .77, p = .50.[4] Additionally, there was no main effect of limit reminder message content, β = -.13, t(105) = -.93, p = .35, or ability to discard the message, β = .09, t(105) = -.67, p = .50, on the money limit set by players. As well, there was not a significant interaction effect, β = .24, t(105) = 1.45, p = .15. See Table 2 for average limit set by condition.

Manipulation Check. Similar to Study 1, in both conditions, a large portion of the participants failed the manipulation check (40.4%). A chi-square test was conducted to examine whether there was an effect of condition on failure of the manipulation check. The results indicated there was no such effect, χ^2(3) = .42, p = .94 (see Table 1 for failure of manipulation check by condition). Given the high rate of failure, results from all subsequent analyses should be interpreted with caution.

Limit Adherence. A binary logistic regression was conducted with limit adherence as the dependent variable and the limit reminder message manipulation (coded as 0 = general information pop-up message, 1 = personalized behavioural feedback pop-up message), the ability to discard the message manipulation (coded 0 = immediately, 1 = delayed) and their interaction term as the predictor variables. The results from the omnibus test of the model were insignificant, χ^2 (4) = 3.52, p = .47. There was neither a significant main effect of pop-up message content, Wald's χ^2 (4) = .20, p = .66, B = -.57, SE = 1.29, OR = .56, 95% CI = [.04, 7.04], nor the ability to discard the message immediately, Wald's χ^2 (4) = 1.15, p = .28, B = .99, SE = .93, OR = 2.70, 95% CI = [.44, 16.61]. Additionally, there was not a significant interaction effect, Wald's χ^2 (4) = .40, p = .52, B = -1.11, SE = 1.75, OR = .33, 95% CI = [.01, 10.17].

Discussion

Results from Study 2 mimicked those of Study 1. Participants who received personalized behavioural feedback via a pop-up message about the amount of money lost gambling were no more likely to adhere to their pre-set limit than those who received general information via pop-up that a limit had been reached. Additionally, the inability to discard the pop-up message immediately did not facilitate limit adherence. There was also no evidence for the hypothesized interaction between pop-up message content and the inability to discard the pop-up message immediately. Gamblers who viewed the more detailed pop-up limit reminder message were not more likely to adhere to their limit when this message was paired with a 10 second temporary delay in play.

Of importance, akin to Study 1, a large proportion of players failed to correctly answer the manipulation check, thus indicating that they were not paying attention to the content of the pop-up limit reminder message. This is troubling from a responsible gambling perspective. If gamblers do not pay attention to the content of the pop-up message, informed decision making cannot be improved through changes to the content of responsible gambling messages by way of pop-up windows on EGMs.

General Discussion

EGMs are an immensely popular form of gambling, and one of the most addictive games to play (Breen & Zimmerman, 2002; Dowling, Smith, & Thomas, 2005). As a result, responsible gambling tools have been developed and tested to help minimize the harms associated with EGM gambling.

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[3] Although sex was controlled for in all main analyses, the results do not change when sex is not included in the model.

[4] The results are unchanged when the players' monetary limit is entered in as a covariate and controlled for in the model.

One of the most ubiquitous responsible gambling tools available to EGM players allows them to set a limit on their gambling. For example, gamblers are provided the opportunity to set a limit on how much money they spend gambling in a given session. If a limit is set, the tool reminds the player once that limit is reached. The opportunity to set a limit is typically provided via a pop-up message (i.e., a text box that appears on the foreground of the EGM during play) before play begins. Similarly, a pop-up message informs the player when their limit has been reached. Typically, the pop-up limit reminder only provides general information (i.e., a notice that a pre-set limit has been reached). Herein, across two studies, we tested the idea that limit adherence could be upregulated by providing players with a personalized behavioural feedback, via pop-up message, about the amount of credits and money lost gambling when their money limit is reached.

In Study 1, providing players with personalized behavioural feedback about the amount of money and credits lost did not increase limit adherence relative to a general information limit reminder message. These null findings may suggest that providing personalized behavioural feedback when a pre-set limit is reached does not have responsible gambling utility. An alternative explanation for the results comes from analysis of the manipulation check item. In Study 1, participants in both conditions failed to accurately recall the content of the pop-up message. This high rate of failure implies that participants did not pay attention to the information contained in the message, which would undermine any responsible gambling utility of personalized behavioural feedback.

We were not prepared to draw strong conclusions about the results of Study 1 due to some methodological limitations. First, players did not set their own money limit. Pop-up messages are more effective when the information is self-relevant (Monaghan & Blaszcyznski, 2009). Thus, if players determine their own money limit, they may be more likely to attend to the information contained in the pop-up message. Second, players could exit out of the pop-up message immediately after it appeared, thus potentially reducing the participants' exposure to the message. To address these potential issues with Study 1, a second study was conducted in which 1) all players set their own money limit and 2) some participants were unable discard the pop-up message for 10 seconds.

Despite these methodological changes, the results of the second study mimicked those of the first. Neither pop-up message content nor the inability to immediately discard the limit reminder pop-up message manipulation influenced limit adherence. Additionally, there was no interaction between the two manipulations. Specifically, in contrast to our hypothesis, pairing a pop-up message that contained personalized behavioural feedback with an inability to discard the message for 10 seconds did not increase limit adherence (compared to the other conditions). Importantly, as in Study 1, approximately half of the participants (in both conditions) failed to accurately recall the content of the pop-up message received. These results are similar to those reported by du Preez, Landon, Bellringer, Garrett, and Abbott (2016). They found that approximately half of the participants they interviewed about the efficacy of responsible gambling tools on EGMs reported that they do not read pop-up messages when they appear on EGMs.

The results of Studies 1 and 2 are troubling from a responsible gambling perspective. Responsible gambling tools are built to improve informed decision making. If players are not paying attention to the content of responsible gambling messages provided to them via pop-up windows on EGMs, then pop-up messages may be a poor vehicle for conveying responsible gambling information. Why players were not paying attention to the content of the message is unknown. However, it is possible that players did not pay attention to the information received because they believe they are in control of their spending and are knowledgeable about exactly how much they are spending (see Auer & Griffiths, 2017; Braverman, Tom, & Shaffer, 2014; Wohl et al., 2017; Wohl & Davis, 2017). For such people, the information provided in the pop-up may be deemed redundant with the information they think they already possess. Put another way, players may have registered that the pop-up was a limit reminder message, but then ignored the content of the message because they felt they were already aware of the information provided.

Another possible explanation for participants' failure to process the content of the message in that pop-up messages have become ubiquitous in today's advanced technological world (Edwards, Li, & Lee, 2002). People receive pop-up messages almost every time they search the Internet or activate a new app or program (pop-ups are frequently used to get new users to sign a licensing agreements).

A consequences of the ubiquity of pop-up messages is that their content is ignored (Bakos, Marotta-Wurgler, & Trossen, 2014; Hillman, 2006) and increasing the amount of relevant information does not increase the extent to which people pay attention to the content (Marotta-Wurgler, 2011). This tendency may generalize to other types of pop-up messages, even those that contain personalized behaviour feedback.

Surprisingly, we were not able to increase players' attention to the content of the message by adding an inability to discard the message for 10 seconds. It is possible, however, that the players' attention was drawn to the countdown timer that was located in the bottom right-hand corner of the pop-up dialogue box. Dynamic pop-up messages (i.e., messages that move) are recalled to a greater extent than static messages (i.e., those that simply appear on the screen; Monaghan & Blaszczynski, 2010) because they draw attention. The pop-up used to institute the delay in the players' ability to discard the message contained both a static component (the message) and a dynamic component (the countdown clock). Players' eyes may have been drawn to the dynamic countdown timer instead of the static message. If this was the case, it would not be surprising that players were unable to accurately recall the content of the message. Unfortunately, the current research was not able to empirically assess the players' gaze. It would behoove researchers to test the proposed reasoning using eye-tracking equipment.

Implications

According to the Reno Model (Blaszczynski et al., 2014), gambling-related harms can be minimized by improving players' informed decision making. Central to this model is educating players about the need to set and adhere to a pre-set limit on their gambling. One way that gambling jurisdictions have sought to increase limit setting and adherence is by providing players with an opportunity to set a limit prior to play and then informing them when that limit has been reached. For EGM play, this information is provided to players via pop-up messages on the EGM's display. Herein, we argued that the utility of such information can be enhanced when that information contains personalized behaviours feedback about how much money has been spent gambling (not simply information that a limit has been reached).

Results from the current research suggest, however, that players are not paying attention to the content of the pop-up message. A large proportion of players did not recall the content of the pop-up message they received. Although there is a large body of empirical evidence that suggest limit-oriented pop-up messages facilitate limit adherence (Auer, Malischnig, & Griffiths, 2014; Auer & Griffiths, 2013; Harris & Griffiths, 2017; Kim et al., 2014; Stewart & Wohl, 2013), it could be that the content of the message is irrelevant to its success. Specifically, players may simply infer that the presence of the pop-up means that their limit has been reached. In this light, changes to the type and content of the message may do little to influence limit adherence. Moreover, it also appears that altering the content of the pop-up message does little for making players more informed about their play. Therefore, pop-up messages are likely not an appropriate vehicle for facilitating informed decision making. Instead, it may be beneficial for responsible gambling researchers and gambling operators to explore other ways to inform players about their gambling.

One potential method to provide players with detailed, personalized information about their play is through their player loyalty account. Loyalty programs in the gambling industry grant players rewards (e.g., free spins, cash back, access to new games) in exchange for money spent gambling (and occasionally for money spent elsewhere in the gambling venue). These programs track information about the player's gambling expenditure over time via their player account card. That is, whenever players use their loyalty card to accumulate points when they gamble, their spending behaviour (e.g., total dollars gambled, bet size, gambling frequency) is recorded and tracked. This behavioural tracking data has potential responsible gambling utility. Specifically, providing players with their player-account information (e.g., how money they have spent gambling in a specified period of time), may help players to downregulate their gambling behaviour. Wohl and colleagues (2017) found empirical support for this notion. When loyalty program members were told via their player account how much money they had lost gambling over the previous three months, the players decreased their money wagered. Although informing players about their gambling behaviour via their player account

appears to be an effective responsible gambling tool, encouraging players to access their player account may be difficult. Indeed, gamblers tend not to access responsible gambling tools on their own accord (Lubman et al., 2015).

One possible way to increase responsible gambling tool use is by providing players with an incentive for engagement. For example, players who are members of a gambling venue's loyalty program could be given rewards points for accessing their personal behavioural profile. It should be noted, however, there may be unintended negative consequences for rewarding players for using responsible gambling tools. When people are incentivized to change their behaviour rather than internally motivated, behavioural change may eventually wane (Gneezy, Meier, & Rey-Biel, 2011). This is because the changed behaviour becomes tied to receiving the reward as opposed to being motivated by a personal desire for growth and change (Promberger & Marteau, 2013). As such, behaviour tends to regress to old patterns when the reward is removed.

In the context of responsible gambling, if the reward structure of the loyalty program was to change so that using responsible gambling tools was no longer rewarded (or rewarded to a lesser degree), responsible gambling behaviour may wane or cease all together. One way to ameliorate the use of responsible gambling tools may be to capitalize on a variable-ratio reinforcement schedule—the very schedule that contributes to problem gambling. Instead of rewarding players with a specific number of points for setting a limit or watching a responsible gambling educational video, players who set a limit could receive rewards at random intervals. Doing so may maintain players' interest in the tool longer than providing points that eventually lead to a reward or rewarding the player each time they engage with a responsible gambling tool.

Limitations

There were some limitations of note to the current research. First, the duration of the gambling session was short. The players in the current study only had $10 to gamble with which resulted in a gambling session that was approximately 10 minutes long. Although it is known that gamblers tend to be poor at recalling their gambling expenditure (Auer & Griffiths, 2017; Braverman et al., 2014; Wohl et al., 2017), this phenomenon may only occur after a long duration of time has passed. That is, 10 minutes may not be long enough for players to lose track of their gambling expenditure. If players were aware of their spending, the additional information about money and credits played would have been rendered pointless because all participants, regardless of condition would already know how many dollars they had lost. However, this likely is not the case because previous research using the same EGM demonstrated that a short, 10-minute gambling session was sufficient to place players into a state of dissociation (Kim et al., 2014; Stewart & Wohl, 2013; Wohl et al., 2014). When players dissociate, they commonly lose track of their spending (Diskin & Hodgins, 1999, 2001; Jacobs, 1988).

Second, participants did not gamble with their own money. We provided them with $10 in gambling funds. As such, the participants may not have viewed the monetary risks the same way they would have if they were using their own money in a real casino. That said, participants were also given $10 for participating in the research – funds that were described as unrelated to the funds provided for gambling. Limit adherence was assessed as a function of participants' willingness to use these funds to continue playing. It is likely participants who decided to use this money to continue gambling viewed the money as their own funds. If so, the paradigm used approximated a real-world gambling-related decision (i.e., "do I go into my pocket and spend more money gambling?"). Nonetheless, future studies should examine the effect of personalized feedback pop-up messages in real-world gambling settings.

Along the same vein, an analogue gambling task (i.e., virtual reality EGM) was used as opposed to a real-life gambling task (i.e., playing on an actual slot machine with real money). However, the analogue nature of the task likely does not explain the lack of significance found in our results. Stewart and Wohl (2013) as well as Kim and colleagues (2014) have found significant effects using the same virtual reality analogue gambling task and limit reminder messages. Moreover, Auer and Griffiths (2015) found similar effects of limit reminder pop-up messages in real-world settings. Thus, it is likely the pop-up limit reminder messages used in the current study (i.e., personalized

feedback vs. general information) would have elicited the same effects (or rather lack thereof) using a real-world gambling setting.

Lastly, the reported studies were underpowered. In order to achieve 80% power a sample size of 2000 would have been required for Study 1 and 460 for Study 2. Given that this research is expensive, time consuming, uses the specific population of gamblers and can only be conducted on site, recruiting the required number of participants would not have been possible. Gambling studies are often underpowered due to the difficulties that are associated with conducting community-based research with a special population. As such, caution should be exercised when interpreting the results.

Conclusion

In the current paper, the results from two studies suggest that reminding gamblers that their limit has been reached with the added information about exact money and credits lost is not more effective at causing limit adherence than simple reminder messages. Moreover, lack of efficacy is not improved by pairing the limit reminder pop-up messages with an inability to immediately discard the message. Of particular importance however, was that in both studies nearly half of the gamblers could not correctly recall the content of the pop-up message reminder. Thus, the null results may be a function of players not paying attention to the information they are provided. They may simply recognize that their limit has been reached (by virtue of receiving the pop-up message) and ignore the content of the message they are provided. As such, pop-up messages may not be an appropriate vehicle to provide players with personalized behavioural feedback—feedback that has been shown to advance responsible gambling.

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Table 1

Frequency of responses to the manipulation check by condition for Studies 1 and 2.

	I was NOT reminded when my limit was reached	I was ONLY told reached my limit	I was reminded I reached my limit INCLUDING number of credits played AND how much money I lost
Study 1			
Simple Message	3 (5.1%)	36 (61%)	20 (33.9%)
Detailed Message	5 (7.7%)	32 (49.2%)	28 (43.1%)
Study 2			
Simple Message, Temporary Delay	0 (0%)	14 (56.0%)	11 (44.0%)
Simple Message, No Delay	2 (6.7%)	19 (63.3%)	9 (30.0%)
Detailed Message, Temporary Delay	2 (7.1%)	10 (35.7%)	16 (57.1%)
Detailed Message, No Delay	0 (0%)	10 (38.5%)	16 (61.5%)

Table 2.

Demographics, gambling characteristics and limit adherence by condition for Study 2.

	Temporary Delay, Detailed Message	Temporary Delay, Simple Message	No Delay, Detailed Message	No Delay, Simple Message	p
	($n = 28$)	($n = 25$)	($n = 26$)	($n = 30$)	
Mean (SD) Age	61.54 (12.07)	57.17 (15.67)	57.08 (16.60)	60.21 (14.09)	.61
Mean (SD) PGSI	2.14 (3.92)	2.96 (5.62)	2.33 (3.23)	1.71 (2.17)	.71
Mean (SD) Years gambled	15.30 (8.84)	13.84 (9.91)	11.71 (10.57)	15.81 (10.96)	.47
Mean (SD) Monetary limit set	9.14 (1.67)	8.46 (2.56)	8.31 (2.48)	8.87 (2.18)	.50
% Male	46.4	33.3	16.0	51.7	.04
% Failed Manipulation check	42.9	44.0	38.5	36.7	.94
% who Adhered to their limit	96.4	84.0	92.3	93.3	.52