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Exploring the Effectiveness of an Intelligent Messages Framework for Developing Warning Messages to Reduce Gambling Intensity

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Abstract

Warning messages are a common tool used in public health initiatives in an attempt to minimize consumer harm. Electronic gaming machines provide a unique opportunity to deliver messages that are personalized, that is, based on player behaviour, gambling history, and personal characteristics. This study explores whether messages that respond to player behaviour may be effective in reducing gambling intensity on the basis of the Intelligent Messages Framework (Langham, Thorne, Rockloff, & Donaldson, 2017). One-hundred and seventy-two participants (82 males, 90 females) from 20 to 88 years of age ($M = 48.95$, $SD = 16.06$) played a computerized gambling simulation. Participants were presented with a pop-up message following the 21st spin during game play, which varied according to message purpose (informative, self-monitoring, self-evaluative) and message frame (positive, challenging, negative). Results showed that female participants had faster betting speeds, greater betting persistence, and greater total losses in the negative, self-evaluative condition than in the other conditions. Findings suggest that messages need to be tailored appropriately to the consumer's characteristics to be effective. Messages that do not consider the individual needs of the consumer may increase gambling intensity and therefore fail to be an effective harm-minimization tool. More sophisticated methods of delivering messages to consumers need to be developed and tested, particularly given that ineffective messages have the potential to be counterproductive in reducing gambling intensity.

Keywords: warning messages, intelligent, gambling

Résumé

Les messages d'avertissement sont un outil souvent utilisé dans les initiatives de santé publique pour minimiser les préjudices causés aux consommateurs. Les machines de jeux électroniques offrent une possibilité unique de livrer des messages personnalisés, c'est-à-dire basés sur le comportement des joueurs, l'historique de jeu et les caractéristiques personnelles. Cette étude évalue si les messages qui répondent au comportement des joueurs peuvent être efficaces pour réduire l'intensité du jeu sur la base du cadre de travail de messages intelligents (Intelligent Messages Framework) (Langham, Thorne, Rockloff et Donaldson, 2017). Cent-soixante-douze participants (82 hommes, 90 femmes) âgés de 20 à 88 ans ($M = 48,95$, $SD = 16,06$) ont participé à une simulation de jeu informatisée. Les participants ont reçu un message contextuel à la suite du 21^e tour de jeu, qui variait en fonction du but du message (informatif, auto-surveillance, auto-évaluation) et du cadre du message (positif, stimulant, négatif). Les résultats ont montré que les participantes avaient des vitesses de pari plus rapides, une plus grande persistance de paris et des pertes totales plus importantes dans la condition négative d'auto-évaluation, comparée à d'autres conditions. Les résultats indiquent que pour être efficaces, les messages doivent être adaptés de manière appropriée en fonction des caractéristiques du consommateur. Les messages qui ne tiennent pas compte des besoins individuels du consommateur peuvent augmenter l'intensité du jeu et ainsi n'être d'aucune utilité pour minimiser les dommages. Il est nécessaire de concevoir et de tester des méthodes plus sophistiquées pour livrer des messages aux clients, d'autant plus que les messages inefficaces peuvent être contre-productifs pour réduire l'intensité du jeu.

Introduction

Electronic gaming machines (EGMs) offer a unique opportunity to deliver public health messages that are relevant to consumers during game play. The technological capabilities of EGMs and the introduction of player tracking systems mean that messages can be highly dynamic or “intelligent.” Messages can be tailored to the players' characteristics and patterns of consumption (Gainsbury, 2011; Wood & Wohl, 2015), while considering recent play behaviour, personal limits (Auer & Griffiths, 2014; Edgerton, Biegun, & Roberts, 2016), and machine behaviour (Harris & Parke, 2016; Landon, Palmer du Preez, Bellringer, Page, & Abbott, 2016). *Intelligent messages* are defined here as “messages that are displayed to the gambler during an EGM play session, that are tailored to the gambler's individual characteristics, and/or respond to recent, or longer term, patterns of player behaviours” (Langham, Thorne, Rockloff, & Donaldson, 2017, p. 2). An understanding of what types of messages are likely to be most effective is necessary in order to develop large-scale trials designed to assess the validity of messaging systems that incorporate these player account data or pre-commitment data.

Background

Warning messages are a common feature of many public health approaches and have proven successful in generating health knowledge, increasing perceptions of risk, and promoting safer health behaviours (Al-Hamdani, 2013; Hammond, 2011). Studies exploring the utility of messaging systems in gambling have demonstrated that static (posters, pamphlets, etc.; Miyazaki, Brumbaugh, & Sprott, 2001; Monaghan & Blaszczynski, 2005, 2007; Monaghan, Blaszczynski, & Nower, 2009) and dynamic messages (those that change and can be presented intermittently on a fixed schedule; Cloutier, Ladouceur, & Sévigny, 2006; Wynne & Stinchfield, 2004) are largely ineffective in generating safer gambling behaviour despite influencing players' knowledge or gambling beliefs. Message ineffectiveness is likely due to how a message is displayed and presented, the content of the message, and overexposure or repetition of the message premise (Al-Hamdani, 2013; Hammond, 2011; Pettigrew et al., 2014). Messages are more likely to be successful if they remain brief and direct, are personalized, and are made the focal point for consumers (Al-Hamdani, 2013; Hammond, 2011).

Substantial research exploring features of dynamic messages and gambling suggests several elements that need to be considered for a message to be effective in promoting behaviour change, similar to the case in other public health fields (Al-Hamdani, 2013; Pettigrew et al., 2014). These elements include the content and delivery of the message (Auer & Griffiths, 2014, 2015; Gainsbury, Aro, Ball, Tobar, & Russell, 2015a, 2015b; Mizerski et al., 2012; Munoz, Chebat, & Borges, 2013; Munoz, Chebat, & Suissa, 2010; Palmer du Preez, Landon, Bellringer, Garrett, & Abbott, 2016; Riley-Smith & Binder, 2003; Warren, Parush, Wohl, & Kim, 2014), the perceived relevance of the message (Hare, 2006; Monaghan & Blaszczynski, 2005), and the individual characteristics of the consumer that the message is intended for (Mizerski et al., 2012).

Munoz et al. (2010, 2013) suggested that, for messages to be effective, the protection process proposed by the message in order to minimize problem gambling risk should seem effective, gamblers need to feel that they can follow the proposed process, and the warning must trigger enough cognitive activity to facilitate a change. A number of studies have demonstrated the potential of self-appraisal messages (Auer & Griffiths, 2015; Gainsbury et al., 2015b; Monaghan & Blaszczynski, 2010; Riley-Smith & Binder, 2003), demonstrating easier recall (Gainsbury et al., 2015b) and shorter play sessions compared with the use of simple messages (Auer & Griffiths, 2015). Messages that interact with player behaviour and promote achievable limit-setting strategies are also effective in promoting safer gambling behaviours (Kim, Wohl, Stewart, Sztainert, & Gainsbury, 2014; Stewart & Wohl, 2013). However, focus groups with gamblers suggest that message impact is likely to be influenced by message positioning, with messages that are displayed following losses likely to be more successful than messages following wins in generating safer gambling behaviours (Harris & Parke, 2016; Landon et al., 2016).

Caution is needed when adopting a one-size-fits-all approach to messaging systems because message effectiveness is likely to vary depending on individual characteristics.

For instance, messages targeted at individuals who gamble beyond their means may be considered relevant only for problem gamblers, and, as a result, gamblers may ignore any messages that they do not consider relevant to themselves (Hare, 2006). Conversely, some messages are likely to have a detrimental impact on those who do not experience problems, with exposure to weaker messages resulting in greater gambling intensity (Mizerski et al., 2012). Messages that are not tailored or “framed” appropriately to a given audience may therefore contribute to gambling harm rather than minimizing it.

Demographic characteristics can also determine how people react to messages (Al-Hamdani, 2013; Gainsbury et al., 2015a; Hammond, 2011; Pettigrew et al., 2014). Perceptions of convincingness and personal relevance differ depending on gender and message frame; males find messages involving numerical evidence to be more relevant than females do, who respond to messages that are based on fear (Pettigrew et al., 2014). Female non-smokers have also demonstrated greater message recall accuracy than female smokers, a finding that was not replicated with male participants (Al-Hamdani, 2013). Responses are also likely to vary with age, with younger respondents more likely to believe warning messages, to find messages more convincing and personally relevant (Pettigrew et al., 2014), and to consider messages effective (Hammond, 2011). A study by Gainsbury et al. (2015a) suggests that demographic differences in response to gambling messages is likely to exist among gamblers as well. Compared with males, female participants were more likely to read messages, and compared with older adults, younger respondents were more likely to report reflecting on time spent playing and expenditure. These findings support the need for intelligent messaging systems that consider individual characteristics in message delivery for gamblers.

A Framework for Intelligent Messages

Langham et al. (2017) proposed a framework to guide the development and evaluation of intelligent messages that are tailored to individual characteristics and gambling behaviour (Figure 1). The framework suggests that messages should vary along two dimensions: message purpose and message frame. Message delivery is then determined according to patterns of game play, changes in symptoms, and problem gambling risk level.

According to the recommendations by Monaghan and Blaszczynski (2010), message purpose should change from informative to self-monitoring to self-evaluating, depending on changes in risk. Higher risk takers are encouraged to reflect on the consequences of their behaviour (self-monitoring, self-evaluating) and on ways to modify their gambling to avoid experiencing these consequences (self-evaluating). The message frame is based on work by Munoz and colleagues (2010, 2013) and suggests that messages should vary from positive to challenging to negative, according to risk status and message purpose. For instance, positive messages are better suited to recreational or non-problem gamblers, as they are designed to reinforce protective

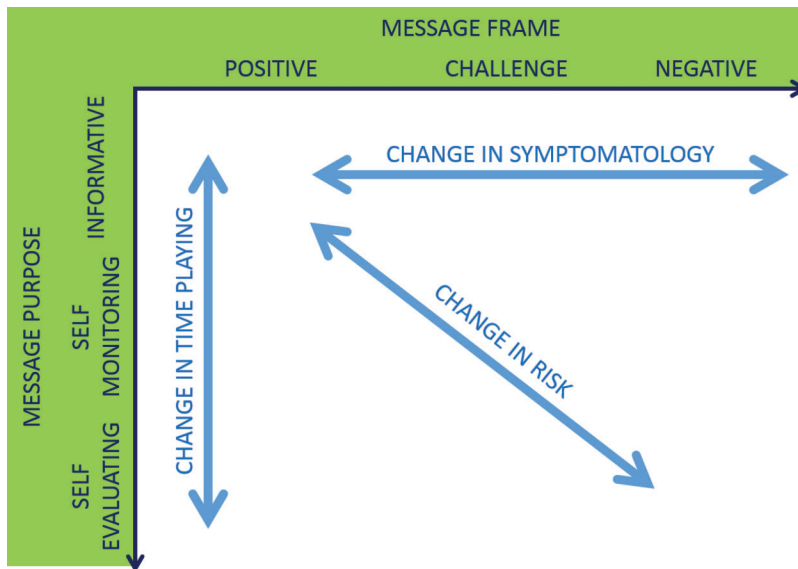


Figure 1. A proposed framework for intelligent messages. Taken from Langham et al. (2017, p. 10).

behaviours and to establish resistance to cognitive distortions (Bartels, Kelly, & Rothman, 2010; Lemarié & Chebat, 2013).

Aims and Purpose

The aim of this study was to explore the effectiveness of pop-up messages on the basis of the Intelligent Messages Framework proposed by Langham et al. (2017) in reducing gambling intensity during a simulated gambling task. Messages were expected to result in smaller bet sizes and losses and to reduce betting speed and persistence past the 21st spin. From the premise that message frame and purpose should vary depending on gambling severity (Langham et al., 2017), problem gambling severity was expected to moderate the impact of warning messages on gambling intensity. That is, those presenting a lower risk of problem gambling would be more responsive to messages at the positive or informative end of the framework than would those presenting a moderate to severe risk, who would more likely respond to messages that were challenging or negative and self-monitoring or evaluative. According to the findings of previous studies exploring warning messages (Al-Hamdani, 2013; Gainsbury et al., 2015a; Hammond, 2011; Pettigrew et al., 2014), demographic characteristics of participants may result in difference responses to warning messages. Gender and age were therefore treated as covariates to identify whether individual characteristics were likely to play an important role in responses to warning messages.

Method

Participants

Two-hundred and thirty-seven South Australian residents over the age of 18 years were recruited via community newspaper flyers ($n = 166$) and a research recruitment

agency, McGregor Tan ($n = 71$), to participate in a gambling study. Thirty-two participants chose not to continue with the experiment. As the study was interested in player behaviour following the presentation of a warning message, only participants who played past the 21st spin were included in the study. The final sample consisted of 172 participants (82 males, 90 females) from 20 to 88 years of age ($M = 48.95$, $SD = 16.06$). Most of the sample were Australian (80.2%), English (5.2%), and Indigenous Australian (2.9%). Problem gambling status was computed from the Problem Gambling Severity Index (PGSI; (Ferris & Wynne, 2001). The sample consisted of 48.3% no-risk, 26.7% low-risk, 19.8% moderate-risk, and 5.2% problem gamblers. Females tended to have lower PGSI scores than males did (Spearman's $\rho = -.21$, $p < .01$).

Measures

Participants completed a self-report measure of problem gambling and demographic questions that captured age, gender, and birthplace. They also completed the Lie/Bet Questionnaire (Johnson et al., 1988), a screening tool used to identify those who are likely to have experienced a gambling problem. The questionnaire consists of two items to which participants answer either yes or no: "Have you ever had to lie to people important to you about how much you gambled?" and "Have you ever felt the need to bet more and more money?" A response of yes to either question indicates probable problem gambling. The Lie/Bet Questionnaire was used to assign participants to conditions, as it provides a dichotomous measure of gambling problems that is fast to score. For the main analysis, problem gambling was measured by using the PGSI (Ferris & Wynne, 2001), a nine-item measure of gambling severity in the general population. The PGSI provides four levels of problem gambling severity: non-problem gamblers (score of 0), low-risk problem gamblers (score of 1-2), moderate-risk problem gamblers (score of 3-7), and problem gamblers (score of ≥ 8).

Messages were developed according to the Intelligent Messages Framework outlined by Langham et al. (2017) and considered the nine possible combinations of the framework's two dimensions: message fame and message purpose. Message content was related to advice about betting speed to ensure that content was comparable across the nine dimensions of the framework. Messages were ipsative and appeared to respond or relate to participants' prior in-session play behaviour. Table 1 shows the nine messages for each of the nine possible combinations of framework dimensions.

Procedure

Upon arrival at the Appleton Institute research centre, Adelaide, participants were given the information sheet outlining the purpose of the study and \$20 AUD compensation for participating in the project. After reading the information about the study, participants provided informed consent and completed a brief demographic questionnaire that included the Lie/Bet measure. Participants were then

Table 1

Matrix of Messages According to the Intelligent Messages Framework Developed by Langham et al. (2017)

Message Purpose	Message Frame		
	Positive	Challenging	Negative
Informative	Gambling at slower speeds leads to greater enjoyment.	Betting quickly equals losing quickly.	Betting too fast leads to problem gambling.
Self-Monitoring	Did you know your play speed has increased? Are you enjoying every spin?	Did you know your play speed has increased? Betting quickly equals losing quickly.	Did you know your play speed has increased? Betting too fast leads to problem gambling.
Self-Evaluative	You're playing faster than most people. Are you enjoying every spin?	You're playing faster than most people. Betting quickly equals losing quickly.	You're playing faster than most people. You're playing at similar speeds to most problem gamblers.

asked whether they were ready to wager their \$20 AUD compensation on the EGM. The \$20 AUD compensation was retrieved from the participants, and they were informed that it would be added to the EGM as 2,000 credit points.

We used a crossed design to assign participants to conditions. Randomized block assignment to conditions was used to balance conditions according to gender, age, and problem gambling status as measured by the Lie/Bet Questionnaire. The blocking variables came from the brief pre-experiment questionnaire scores. The randomized block assignment was used to match participants evenly with 1 of 10 conditions according to message frame and purpose. There were three positive, three negative, and three challenging conditions that varied according to message purpose, as well as a control condition (see Table 1 for an example of the messages presented to participants according to their allocated condition).

Following condition allocation, participants were introduced to the simulated EGM and were instructed to play the game as long as they liked until they chose to stop or they ran out of credits. The simulated EGM was a three-reel game created in Visual Basic designed to be played on a standard laptop (Figure 2). The EGM was programmed with a fixed sequence of wins on spins 2, 6, 8, 13, and 20 and infinite losses thereafter. Subjects could choose to bet 25, 50, or 100 credits (or cents) on each spin, and all wins paid 10 times the amount bet for a theoretical maximum payout of \$61.25. The EGM produced the typical sights and sounds of EGM play, including the musical sounds of spinning reels and winning bells. Player behaviour was measured in terms of bet speed (average time per spin in seconds), average bet size, and betting persistence (total spins played) following the 21st spin.



Figure 2. A screenshot of the simulated electronic gaming machine (EGM; left); and the simulated EGM with a “positive-informative” pop-up message (right).

During the play session and immediately following the 21st spin, participants were presented with a pop-up message. For the experimental conditions, the messages informed participants that their betting speed had increased, but these messages varied in frame and purpose according to condition. Those in the control condition were presented with a neutral pop-up message requesting participants to “click to continue.” The 21st spin occurred after the final winning spin (20th spin) and one losing spin (i.e., the 21st). All subsequent trials were designed to lose. When participants wanted to stop playing or ran out of credits, they could signal to the researchers that they wished to end the session. Participants then completed a post-experiment survey that assessed enjoyment of the game and whether they could recall the message that they were presented with, as well as the PGSI (Ferris & Wynne, 2001) to determine problem gambling severity. The PGSI was administered following the play session to ensure that awareness of gambling problems would not have an impact on participants’ play behaviour. Participants who finished with more than 2,000 credits left on the simulation were paid the total payout figure of credits remaining in AUD. Those who had less than 2,000 credits, including those with zero, received \$20 AUD compensation as a surprise consolation prize for their participation in the study.

Analysis

The primary focus of this study was to explore the effects of warning messages on three behavioural outcomes: average bet size, bet speed (average time per spin in seconds), and betting persistence (total spins played) past the 21st spin following the presentation of a message. The analysis also considered losses past the 21st spin.

For each of these outcomes, the data analysis calculated two models: a full factorial analysis of covariance (ANCOVA) model and a control ANCOVA model. The full factorial model included all potential interactions between the message framing (positive, challenging, or negative) and message purpose (informative, self-monitoring, or self-evaluative) conditions as the primary predictive variables in a crossed design, but consequently could not include the control condition (irrelevant message), as it had

neither a message frame or purpose. In this model, problem gambling status (PGSI), gender, and age were entered as covariates. ANCOVA models were run with each of these dependent measures and the crossed conditions of message framing (positive, challenging, or negative) and message purpose (informative, self-monitoring, or self-evaluative) as the primary independent variables. In addition, all models included age, gender, and dichotomized PGSI (0 vs. ≥ 1) as covariates.

In contrast, the control ANCOVA model analyzed each of the 10 ($3 \times 3 + 1$) conditions of the experiment as the primary independent variable, with age, gender, and dichotomized PGSI as covariates without crossing conditions, and it included the irrelevant message control condition. No interactions were used in these models. Fisher's least significant difference (LSD) was used to test for potential differences between conditions.

Results

Average Bet Size

Average bet size was significantly smaller after the 21st spin for female participants than for male participants ($M = 49.43$ cents, $SD = 22.9$), $F(1, 172) = 4.84$, $p = .03$, $\eta_p^2 = .04$. No other main effects or interactions in the full factorial model were significant. Fisher's LSD test revealed no significant main effects between conditions for average bet size following the 21st spin. A main effect of age was observed, with older players making smaller bets on average, $F(1, 159) = 5.8$, $p = .02$, $\eta^2 = .04$.

Speed of Betting (Average Time per Bet)

A significant three-way interaction was observed between message framing, message purpose, and gender, $F(4, 172) = 2.99$, $p = .02$, $\eta_p^2 = .08$. Males who were presented with the negative self-evaluative message bet more slowly following presentation of the message compared with all other combinations, with the exception of males who were presented with the negative-informative message, females who were presented with the negative-informative message, and males who were presented with the positive-informative message. No other main effects or interactions were significant. See Figure 3 for means and standard errors for speed of betting.

Fisher's LSD test revealed no significant main effects between conditions for average bet speed following the 21st spin. An effect for age was observed, with older players tending to make smaller bets, $F(1, 159) = 5.8$, $p = .02$, $\eta_p^2 = .04$. In addition, there was a main effect of gender, with males betting more slowly following the 21st spin ($M = 7.42$ s per spin, $SD = 1.52$) than females did ($M = 6.98$ s per spin, $SD = 1.04$), $F(1, 159) = 4.45$, $p = .04$, $\eta_p^2 = .03$.

Betting Persistence (Number of Spins)

A significant effect of age on the number of spins played after the 21st spin was observed, with older players being more persistent in their betting than younger

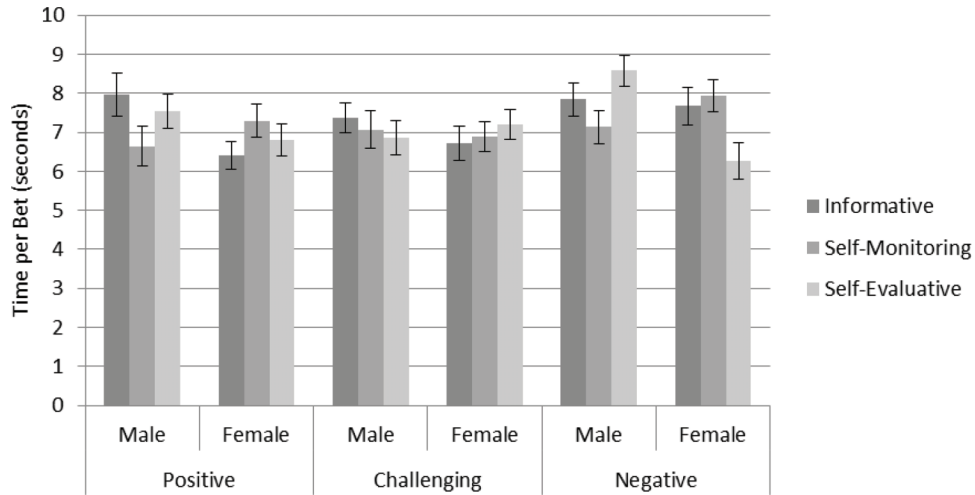


Figure 3. Speed of betting by message framing, message purpose, and gender (error bars show ± 1 SE).

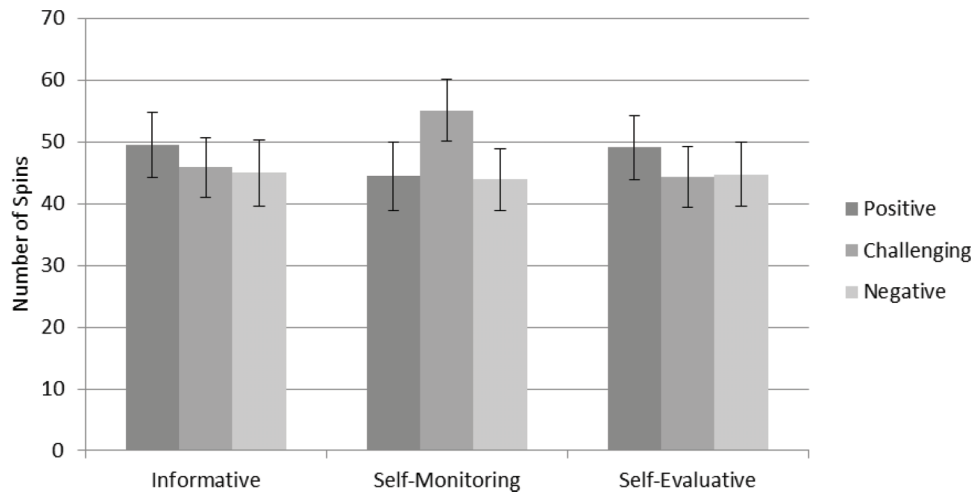


Figure 4. Persistence of betting (number of spins) past the 21st spin as a function of message framing and message purpose (error bars show ± 1 SE).

players, $F(1, 172) = 9.99, p = <.001, \eta_p^2 = .07$. A two-way interaction between message framing and message purpose was also observed on betting persistence past the 21st spin, such that participants who were presented with a challenging self-monitoring message persisted for a greater number of spins following the pop-up message than did those who were presented with a negative self-monitoring message, $F(4, 172) = 3.39, p = .011, \eta_p^2 = .09$ (see Figure 4 for means and standard errors).

A three-way interaction was observed between message framing, message purpose, and gender, $F(4, 172) = 2.73, p = .03, \eta_p^2 = .08$. When the message framing was positive, males who were presented with a self-monitoring message persisted longer than did males who read an informative message and males who read a self-evaluative message. When the message framing was challenging, males who were presented with a self-monitoring message completed fewer spins after the 21st spin

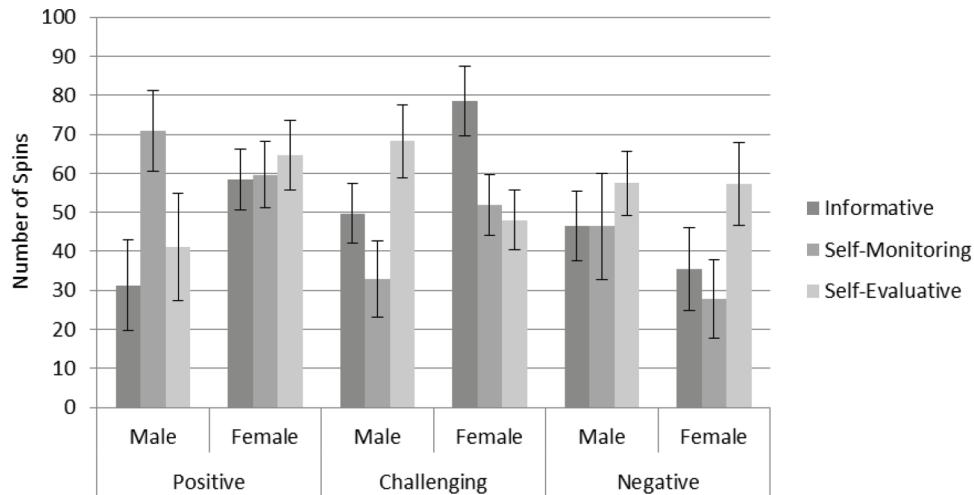


Figure 5. Persistence of betting (number of spins) past the 21st spin as a function of message framing, message purpose, and gender (error bars show ± 1 SE).

than did males who read an informative message and males who read a self-evaluative message.

In addition, when the message frame was challenging, females who were presented with an informative message persisted longer than did females who were presented with both self-monitoring messages and self-evaluative messages or males who were presented with informative and self-monitoring messages. When the message frame was negative, females who were presented with a self-evaluative message completed more spins than did females who read an informative message or a self-monitoring message. Figure 5 shows the means and standard errors for message frame and message purpose conditions by gender.

Losses Past the 21st Spin

Message framing, message purpose, and gender interacted in their effects on average losses following the 21st spin, $F(4, 172) = 2.97, p = .02, \eta_p^2 = .08$. When the message framing was negative, females who were presented with self-evaluative messages experienced significantly greater losses following the 21st spin than did females who read informative or self-monitoring messages or males who read self-evaluative messages, as depicted in Figure 6. Fisher's LSD test revealed no significant main effects between conditions for losses following the 21st spin.

Discussion

The current study aimed to explore the effectiveness of pop-up messages to reduce gambling intensity on the basis of the Intelligent Messages Framework proposed by Langham et al. (2017). We expected that problem gambling severity would moderate the impact of warning messages depending on message frame and purpose and that participants would respond differently to messages depending on their

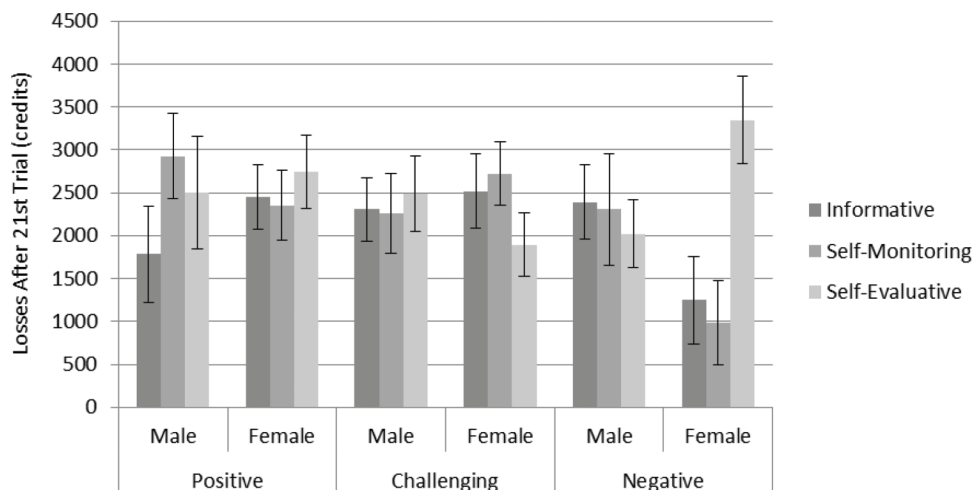


Figure 6. Losses past the 21st spin as a function of message framing, message purpose, and gender (error bars show ± 1 SE).

age and gender. Although it is impossible to validate a comprehensive intelligent messaging system within a single simulated gambling session, the current study does not support the proposition that problem gambling severity moderates the effectiveness of warning messages, as proposed by the Intelligent Messages Framework (Langham et al., 2017). In contrast to the findings reported by Hare (2006) and Mizerski et al. (2012), no significant differences were found in gambling intensity according to message frame and message purpose for those with different problem gambling severity indexes.

Despite other research demonstrating the effectiveness of self-appraisal methods (Auer & Griffiths, 2015; Gainsbury et al., 2015b) and personalized feedback (Landon et al., 2016; Palmer du Preez et al., 2016) in changing gambling behaviours, the current study suggests that this may be largely dependent on how messages are framed and may not be universal for all gamblers. Male participants who viewed challenging self-monitoring messages had fewer spins after the 21st than did males who viewed challenging informative or self-evaluative messages. However, when positively framed, self-monitoring messages resulted in greater gambling persistence. Messages that encourage people to reflect on the consequences of their gambling may be effective in generating behaviour change for male gamblers, but the direction of this change is dependent on message framing.

Gender differences in response to messages support the core proposition of the framework that suggests that an effective intelligent messaging system requires messages to be tailored to player characteristics. Female participants showed a consistent resistance to negative self-evaluative messages (i.e., you're playing faster than most people; you're playing at similar speeds to most problem gamblers). Females had relatively faster betting speeds, greater betting persistence, and greater total losses in the negative self-evaluative condition compared with other conditions. A number of studies have explored gender differences in gambling (Hing & Breen, 2001;

Hing & Haw, 2009), highlighting that gender can be associated with differences in risk, initiation, sustainment, and recovery from gambling problems. Findings from Pettigrew et al. (2014) showed that females found fear-laden messages to be more personally relevant. However, it appears that when presented with information that is challenging and that suggests problematic behaviour, females react counterintuitively and hence gamble more intensely. It could be that females have a stronger self-presentation bias (as responsible gamblers), leading them to disregard messages that potentially portray them in a negative light. This could be due to the distribution of problem gambling severity for males and females in the current sample. Given that the sample consisted of a large proportion of no-risk gamblers (48.3%) and females were less likely to report gambling problems, it may be that those without problems respond negatively to being compared with problem gamblers.

Different cohorts are likely to respond differently to warning messages, suggesting that messages not tailored or “framed” appropriately may be counterproductive. Findings from this study are consistent with conclusions generated by Mizerski et al. (2012) that suggest that inadequate messages are likely to contribute to rather than to minimize gambling harm. Failure to test the effectiveness of these messages may result in greater gambling intensity for women if the messages are negatively framed and designed for self-evaluation. Fundamental to reducing harm caused by gambling is an understanding that the factors that initiate and sustain gambling differ and that these influences also vary among age groups, genders, and cultures (Ariyabudhiphongs, 2012; Oh & Hsu, 2001; Song, Lee, Norman, & Han, 2012; Welte, Barnes, Tidwell, & Hoffman, 2011; Wohl et al., 2008). Standardized messages that do not consider the personal characteristics of the consumer are unlikely to be effective in reducing gambling intensity and to minimize gambling-related harm.

Given that a large-scale trial of intelligent messages has not yet been undertaken, the current study adds to the growing body of knowledge depicting what an effective messaging system should look like. We found that females respond differently than males when presented with negatively framed messages. Future research should therefore focus on how messages are delivered and how messages are framed according to personalized information such as gender. Other factors such as in-game playing behaviour, machine outcomes, and personal characteristics beyond problem gambling severity should also be considered in constructing an effective intelligent messaging system. A database of effective and non-effective messages could provide a solid basis for building a theory of intelligent messages from an analysis of message content and a well-developed understanding of who responds best to specific messages. It would then be possible to conduct research in real venues by using player identification technology (such as smart cards or loyalty cards) to explore the effectiveness of different messages according to personal characteristics and gambling experiences.

Limitations

Research suggests that in laboratory settings, gamblers may be more likely to ignore messages that they perceive as not being relevant to themselves (Monaghan &

Blaszczynski, 2005). Without conducting a large-scale, in-venue trial of intelligent messages, it is impossible to explore the entire scope of intelligent messages in an ecologically valid setting. A major limitation of this study is the use of a messaging framework that has yet to be validated. Although the framework by Langham et al. (2017) is based on substantial research, it requires testing to be considered a valid tool for developing an intelligent messaging system. Further, the message content in the present study was limited to focusing on gambling speed. It was believed that players would find it difficult to track their own speed and therefore were apt to believe the messages relating to how fast they were gambling. Participants may have reacted differently or engaged better with messages that focused on other gambling indices such as bet size or gambling losses, assuming such a manipulation could be made credibly. In addition, specification of three-way interactions between gender, message framing, and message purpose yielded small cell sizes, ranging from 5 to 19. This affected the power of the tests of three-way effects, limiting the analysis to detection of only large effect sizes.

Previous research suggests that delivery of these messages in terms of machine behaviour may be a significant factor in determining whether and how messages impact on player behaviour (Harris & Parke, 2016; Landon et al., 2016). In this case, messages were delivered before an indefinite losing streak and following a number of wins. Perhaps messages would have been more influential in generating behaviour changes if provided during a string of losses rather than following episodes of winning. It is also possible that involvement with a simulated gambling activity could have influenced self-reported experiences of problem gambling. As the PGSI was measured following the experiment, in-game experiences may have biased participant responses compared with administering the measure before game play.

Conclusion

Although the findings did not directly support the framework proposed by Langham et al. (2017), the current study illustrated the need for a message system that accounts for personal characteristics of the gambler. A more sophisticated way of delivering messages to consumers than those used in current harm-minimization practices also needs to be developed and tested, particularly given that ineffective messages have the potential to be counterproductive in reducing gambling intensity. Future research should look towards developing a database of messages that are sensitive to consumer characteristics that could be used in large-scale in-venue trials of intelligent messaging systems.

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