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Recall of electronic gaming machine signs: A static versus a dynamic mode of presentation

Sally Monaghan

Affiliation: School of Psychology, University of Sydney, Sydney New South Wales, Australia. E-mail: alexb@psych.usyd.edu.au

Alex Blaszczyński

Affiliation: School of Psychology, University of Sydney, Sydney New South Wales, Australia. E-mail: alexb@psych.usyd.edu.au

For correspondence: Professor Alex Blaszczyński, School of Psychology A18, University of Sydney, Sydney NSW 2006, Australia. Phone: +61 2 9036 7227; fax: +61 2 9351 7328; e-mail: alexb@psych.usyd.edu.au

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Contributors: SM collected and analysed the data and wrote up the findings as part of her honours thesis. AB helped with the development of the research idea and methodology and reviewed drafts and the final submission.

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Sally Monaghan is undertaking a doctorate of clinical psychology/master of science degree at the University of Sydney after completing a bachelor of psychology (Honours Class One) at the same university. Sally has presented her research at several national and international conferences

and was the recipient of the National Association for Gambling Studies (NAGS) Student Award in 2005. Sally is the student representative for the NSW Board of the Clinical College of the Australian Psychological Society and the NSW state representative for NAGS. She is currently continuing her research in the field of gambling under the supervision of professor Alex Blaszczynski and is working as a registered Psychologist in NSW.

Alex Blaszczynski is a professor of psychology (School of Psychology, University of Sydney) and co-director of the University of Sydney's Gambling Research Unit. He is a clinical psychologist with a long history of involvement in gambling treatment and clinical research and has published extensively on pathological gambling. He is a founding member of the Australian National Council for Problem Gambling and the National Association for Gambling Studies and a foundation director of the Australian Institute of Gambling Studies. He is on the Advisory Board, International Centre for the Study, Treatment and Prevention of Youth Gambling Problems, McGill University, Canada; and International Advisory Committee member for the *Journal of Gambling Issues*. In 1995, Professor Blaszczynski was a co-recipient of the American Council of Problem Gambling Directors Award for his contributions to research in the field of pathological gambling. He was awarded the National Centre for Responsible Gambling senior investigator's research award in 2004.

Abstract

This study compared differences in rates of free and cued recall for messages displayed on electronic gaming machines (EGMs) delivered in one of two display modes: static or dynamic. Rates of recall were investigated in a laboratory setting using 92 university students (75.0% female) with a mean age of 19.3 years ($SD = 2.4$ years). The static mode consisted of a fixed government-mandated message placed on the frame of an EGM directly next to the gaming buttons. In the dynamic mode, an identical message was presented in the form of a translucent display scrolling across the screen during play.

Results showed that significantly more of the information presented in dynamic mode was recalled, and with greater accuracy, in both free recall and cued recall conditions compared with static government-mandated messages. It was concluded that the method of displaying signs influences awareness and recall of harm minimization messages.

Introduction

In response to the major public health issue of problem gambling, governments have introduced a range of responsible gambling strategies and harm minimization interventions ([Korn & Shaffer, 1999](#); [National Research Council, 1999](#); [Productivity](#)

[Commission, 1999](#)). Extending the findings and the framework offered by various health and behavioural decision-making theoretical models ([Ajzen & Fishbein, 1980](#); [Fishbein & Ajzen, 1975](#); [Janz & Becker, 1984](#); [Ladouceur & Walker, 1996](#), [Langer, 1983](#); [Prochaska & DiClemente, 1982, 1983](#); [Rosenstock, Strecher, & Becker, 1988](#)), regulatory agencies and the gaming industry have focused heavily on initiatives designed to educate and promote informed choice among players ([Blaszczynski, Ladouceur, Nower, & Shaffer, 2005](#)). These initiatives include the provision of signs, messages, brochures, and booklets within venues describing the potential risks associated with gambling, odds and probabilities of winning, and resources available for access in response to problems that emerge, as well as the incorporation of course segments on gambling or probabilities in school curricula.

The principle underlying this focus is derived from the argument that the ultimate decision on whether or not to commence or continue to gamble remains with the individual and represents a choice, but that to properly make such an informed choice requires sufficient, necessary, and timely information ([Blaszczynski, Ladouceur, & Shaffer, 2004](#)). This position is consistent with trade practice legislation and forms the foundation for public health campaigns relevant to other consumer products: food, tobacco, alcohol, and medications.

From a cognitive behavioural etiological model of problem gambling, irrational beliefs, erroneous perceptions, and misunderstood concepts of randomness and the mutual independence of chance events contribute to illusions of control, illusory correlations, illusions of predictability, and biased evaluations that cause gamblers to overestimate chances of winning and ultimately to foster persistence in continued gambling behaviour ([Ladouceur & Walker, 1996](#); [Langer, 1983](#); [Myers, 2002](#); [Walker, 1992](#)).

As empirically demonstrated by clinical ([Echeburua, Baez, & Fernandez-Montalvo, 1996](#); [Ladouceur, Sylvain, Boutin, & Doucet, 2002](#); [Sylvain, Ladouceur, & Boisvert, 1997](#)) and laboratory studies ([Dixon, 2000](#)), information leading to the correction of cognitive errors is effective in improving the accuracy of estimates of winning and reducing excessive gambling behaviours, although the true functional relationship between cognitive changes and gambling behavioural outcomes remains to be established.

Electronic gaming machines (EGMs) is a term applied to any form of gambling offered via terminal screens and typically includes slot machines or its variants (video lottery terminals, poker machines, and fruit machines), keno, video draw-poker and blackjack, and electronic roulette. These forms of gambling in aggregate account for the largest proportion of gambling revenue and are the primary form of activity reported by treatment-seeking problem gamblers ([Productivity Commission, 1999](#)). Accordingly, government agencies and industry operators have acted to introduce primary and secondary information campaigns specifically targeting

EGMs. One important initiative relates to the requirement to display “responsible gaming” messages on, or in close proximity to, EGMs that describe probabilities of winning major prizes, as well as to display warnings of the potential addictiveness and harm risk that gambling may produce ([Australian Gaming Council, 2001](#); [NSW Gaming Machines Regulation Act, 2002](#); [Schrans, Schellinck, & Grace, 2004](#)). The provision of such signs should improve knowledge and accurate estimates of the probability of winning and, through the facilitation of awareness and informed choice, subsequently modify gambling behaviour.

Studies show that individuals are aware of, and recall messages currently displayed on, EGMs in venue settings ([Hing, 2003, 2004](#)). In a survey designed to assess member awareness, perceived adequacy, and perceived effectiveness of responsible gambling strategies in Sydney clubs, over 67% of respondents indicated they had noticed signs relating to chances of winning major prizes on EGMs. However, despite recognition of responsible gambling measures in respondents, these messages were shown to be generally ineffective in that results revealed that, for all of the responsible gambling measures implemented in clubs, changes were made in only 44% of players' thinking patterns and 12% of players' feelings about gambling, with 18% of players reducing frequency of gambling, 17% reducing duration of gambling, and 19% reducing amount of money spent ([Hing, 2003, 2004](#)). Furthermore, the extent and accuracy of such recalled information was not evaluated, leaving open the possibility of demand characteristics and leading respondents to report awareness without being fully cognizant of the specific content of messages displayed. These results indicate that mandated responsible gaming strategies have a limited impact on changing gambling-related thoughts and behaviour.

[Steenbergh, Whelan, Meyers, May, and Floyd \(2004\)](#) investigated the impact of warning and brief intervention messages on knowledge of gambling risk, irrational beliefs, and behaviour by comparing control subjects with those who received a brief audio-visual message prior to a session of play explaining the odds of winning roulette and the risks associated with gaming. These authors found that audio-visual messages increased participants' ability to nominate the correct response from a selection of possible answers regarding odds and risks associated with gambling when questioned immediately after play, but did not produce significant cognitive or behavioural changes. Although this study provides some support for using informative messages targeting incorrect beliefs to correct erroneous perceptions, thereby reducing the initiation of further gaming sessions and prolonged play, further empirical studies are necessary.

Accordingly, there is a need to determine the optimal mode of delivery of text messages in gambling research. There are a number of options available with respect to gaming machines: placement of static messages on machines, “pop-up”

dialogue boxes, or translucent messages that scroll across the screen. Research on the effective design for warning labels has yielded some empirically based guidelines. For example, to have any impact, messages must attract attention, be resistant to the effects of habituation, be relevant to the targeted activity, and be comprehensible ([Malouff, Schutte, Wiener, Brancazio, & Fish, 1993](#); [Stewart & Martin, 1994](#)).

Dynamic as opposed to static messages appear to meet these requirements. Dynamic messages are capable of attracting attention in the presence of competing visual stimuli ([Johnston & Dark, 1990](#)), interrupting attention to primary tasks (gambling) by captivating attentional focus to the sign, and affecting performance on the primary task over a longer duration; in addition, dynamic messages have a longer lasting effect on cognitions ([Bailey, Konstan, & Carlis, 2001](#)). Motion cues appear to outperform static representations with regard to speed and accuracy of responses to displays in a screen's periphery ([Bartram, Ware, & Calvert, 2001](#)), and studies have demonstrated that signs placed in central locations where they attract attention increased recall and distracted consumers from processing surrounding product information ([Clark & Brock, 1994](#); [Laughery, Young, Vaubel, & Brelsford, 1993](#)). Additionally, attentional shifts can be enhanced through the use of several techniques, including large, bold print; high contrast; colour; borders; and special effects such as flashing lights ([Wogalter, Conzola, & Smith-Jackson, 2002](#)).

A vital element of informational displays is comprehension, which is being able to remember and understand information that is conveyed. Comprehension in a multi-line paragraph format was found to be not significantly different from rapid serial presentations of constantly changing textual displays ([Juola, Ward, & McNamara, 1982](#)). Additionally, secondary animated displays in a dual-task situation did not significantly interrupt users from a primary task but still effectively communicated information ([McCrickard, Catrambone, Chewar, & Stasko, 2003](#)). To be an effective harm-minimization strategy, allowing informed choice in gambling-related decisions, signage must communicate information to the player. However, as harm-minimization strategies aim to reduce possible harm caused to the individual and the community by problem gambling without reducing recreational gambling, a dynamic display allowing comprehension without disturbing play achieves this goal.

The aim of the current study was to investigate the differential extent to which gamblers recall informative and dynamic signs as compared with government-mandated messages on EGMs. The specific objective was to determine the extent to which gamblers can recall information freely and in response to prompted cues and to determine whether modifying the mode of delivery of information contained in signs leads to improved recall.

The following hypotheses were tested:

1. Dynamic translucent scrolling as compared with static messages during play will result in greater free and cued recall of information contained in the message.
2. Exposure to dynamic messages will be associated with greater accuracy of recall.

Method

Participants

Participants were 100 undergraduate psychology students from the University of Sydney . Data from 8 subjects were excluded from analysis because of a malfunction in one machine that invalidated play, leaving a final sample of 92 participants. All participants spoke fluent English and received credit in their psychology course for participation. Of the sample, 75.0% were female, and ages ranged from 18 to 33 years ($M = 19.3$, $SD = 2.4$). Slightly less than half (47.8%) of the participants reported EGM play in the past year.

The University of Sydney's Ethics Committee approved this study under a group application for research involving first-year psychology students. Participants were recruited using the School of Psychology's on-line system, Experimentrix.

Procedure

Two Mk VI Series 2 EGMs provided by Aristocrat Leisure Industries were used in the study. The NSW Liquor Administration Board (LAB) approved the use of these EGMs for research purposes under section 8(2) (b) of the NSW Gaming Machines Regulation Act (2002). The EGMs were standard configuration machines with graphic designs displaying payout schedules. One machine displayed a static message and the other machine displayed a modified sign according to the experimental conditions described below. The procedure took place in a laboratory setting within the Department of Psychology. Participants were randomly allocated to one of the two following conditions:

1. *Static standard message* ($n = 45$): Standard unmodified static sign containing information on the chance of winning in the text, the size of wording mandated by the NSW Gaming Machines Regulation Act of 2002, section 21: "Your chance of winning the maximum prize on a gaming machine is generally no better than one in a million." The message was printed on a sticker fixed to the left of the screen, written in bold black font on a white background containing a red BetSafe logo, as displayed in [Figure 1](#).
2. *Dynamic standard message* ($n = 47$): A translucent display designed to scroll

across the middle of the screen from right to left at intervals of 3 min that included the same information and wording as the standard static sign. The design of the display was based on empirically established guidelines for effective warning messages and was not intended to replicate the mandated message, but rather to enhance the capacity of the sign to attract attention and facilitate comprehension. The message, as shown in [Figure 2](#), appeared in a white-bordered box, which took up approximately 7% of the total area of the screen, in bold yellow letters on a translucent grey background in the middle of the screen. It took 15 s to scroll across the screen, allowing normal play to continue throughout its progression across the screen.

Participants were requested to play an EGM for a session lasting 10 min. Machines were preloaded with credit points, given that money was not to be used under the condition of approval prohibiting the use of machines for purposes of gaming imposed by the LAB.

Condition 1: Free recall of information

Participants were requested to freely recall and record all information that they remembered was displayed on EGM screens and machines during the session of play and were given 2 min to record their responses on a blank piece of paper. No prompts or hints were given related to what information was to be recalled. Responses received a score of 2 if participants recorded responses that indicated full awareness of the content, judged as responses replicating the exact wording of the message; 1 for partial information, judged as responses indicating correct knowledge of the content of the message without replicating the exact wording; and 0 for no or erroneous information.

Condition 2: Cued recall of information

Participants were then asked to complete a memory and awareness task in a questionnaire format designed to specifically target the harm-minimization message displayed on the EGM and to assess the extent to which that information was recalled by participants. Participants were cued by a question asking if they recalled a sign relating to outcomes of play or chances of winning and indicated yes or no before being asked to write down the exact content of the message. This step allowed a measure of claimed recall as compared with accuracy of recall. Similar to the free recall condition, participants were allocated a score of 0 for no or erroneous information recognized, 1 for partial recognition, and 2 for accurate recognition of information. Participants were also asked to indicate on a 0-to-100 scale their level of confidence in remembering accurately the information displayed in the messages.

Statistical analyses

The dependent variables were free and cued recall, accuracy, and confidence of recall of message content. The independent variable manipulated between subjects was the mode of presentation. Independent sample *t* tests were used to determine significant differences between groups. To test the hypotheses that dynamic messages scrolled across the screen during play would result in greater recall of messages than would static messages, the mean scores for free and cued recall and accuracy of recall for the dynamic condition were compared with mean scores for these variables in the static condition, using independent sample *t* tests.

Results

Display mode and recall

As shown graphically in [Figure 3](#), the dynamic mode of delivery resulted in significantly more of the messages being recalled under conditions of free, cued, and estimated confidence of accuracy as compared with static message displays.

Participants in the dynamic condition were able to freely recall messages to a significantly greater extent ($M = 1.66$, $SD = 0.76$) compared with those exposed to the static condition ($M = 0.31$, $SD = 0.73$; $t(90) = -8.66$, $p = 0.01$). The proportion of participants who freely recalled the dynamic message was 83.0% ($n = 47$), compared with 15.6% ($n = 45$) of those who saw the static message.

Cued recall associated with the dynamic condition ($M = 1.79$, $SD = 0.55$) was also significantly greater than that found under the static condition ($M = 0.62$, $SD = 0.86$; $t(90) = -7.78$, $p = 0.01$), with 85.1% ($n = 47$) of participants in the dynamic condition recalling messages compared with 24.4% ($n = 45$) of those in the static condition.

Information was recalled significantly more accurately when presented in dynamic ($M = 1.06$, $SD = 0.53$) as compared with static mode ($M = 0.40$, $SD = 0.65$, $t(90) = -5.37$, $p = 0.01$).

Participants demonstrated significantly greater confidence in their recollection of the message content for the dynamic ($M = 75.78$, $SD = 29.34$) compared with static modes ($M = 26.80$, $SD = 33.53$, $t(90) = -7.46$, $p = 0.001$).

Effects of previous gaming experience on recall

A chi-square analysis failed to detect any significant differences in the distribution of experienced and inexperienced players between groups, suggesting that differences in results were not caused by pre-existing differences in player experience. An analysis of data revealed that all differences in recall scores for inexperienced and experienced players were non-significant.

Effect of gender on recall

A chi-square analysis failed to reveal a significant difference in the distribution of gender across conditions. Furthermore, there were no significant differences in recall scores for males and females.

Discussion

Consistent with the hypothesis proposed, the results of the present study indicate that significantly greater free and cued recall and accuracy of cued recall, as well as confidence in cued recall, is associated with dynamic modes of presentation, in contrast with static displays of messages. Dynamic displays appear to attract and absorb the attention of players in the presence of multiple sources of competing audio and visual stimuli more effectively than static signs, as shown by players' capacity to accurately and confidently recall the information, and therefore represent a more effective mode through which information influencing rates of EGM play may be presented to players. Rates of free and cued recall tasks, as well as increased accuracy of and confidence in recall, following play with dynamic modes imply that this method has significant advantages in capturing and retaining attention, as well as in efficiently communicating information to players, which results in greater comprehension.

The responsible gaming messages and mode of delivery used in this study conform with the [Productivity Commission \(1999\)](#) recommendations on the need to provide accurate and easily accessible information to players and is designed to increase knowledge and awareness of risks and probabilities associated with gaming. The low mean recall scores for static messages indicate that this mode of delivery fails to generate any strong awareness of information contained in displayed messages.

However, it is important to bear in mind that responsible gaming messages, as in other public health initiatives, including smoking and alcohol consumption ([Krugman, Fox, Fletcher, & Rojas, 1994](#); [Parker, Saltz, & Hennessy, 1994](#)), may not effectively modify actual gambling-related cognitions or behaviours. Disconcertingly, for all conditions, the average accuracy of cued recall was relatively low despite participant's positive response indicating cued recall, suggesting that although participants become aware of the content of messages to some extent, not all relevant information is retained.

Compared with the rate reported by [Hing \(2003, 2004\)](#) for awareness of signs displayed in club venues in Sydney, Australia, rates in the current study were lower for static but higher for dynamic modes of delivery. This result suggests the possibility that static signs are initially associated with low immediate recall, with such recall increasing following repeated exposure associated with regular play. In

contrast, the high number of participants in this study immediately recalling dynamic signs suggests that this mode of presentation has a far greater capacity to draw attention to information during first exposure. Given that recall of static signs may increase over repeated exposure, the same should apply to dynamic signs, suggesting that dynamic signs have the advantage over static signs in attracting attention more rapidly and resulting in greater awareness following repeated exposure in comparison to static signs. If replicated, this is a significant finding, as the dynamic signs represent a more effective means of rapidly informing players of the risks and probabilities of gambling to foster informed choice.

Conclusions drawn from this study are limited by several methodological difficulties. Pursuant to section 8(2) (b) of the [NSW Gambling Machines Regulation Act \(2002\)](#), approval for use for research purposes prohibited players from using their own money to play. Although considered not to have had a major effect on attention and recall of information, the use of money may have affected cognitions and style of play. Participants were not using their own money and therefore unconcerned about losses and unmotivated to play in a rational manner. This attitude may have resulted in information contained in signs to be ignored or considered irrelevant.

Furthermore, although subjects chose to participate in this study, their goal was to gain credit for their psychology course and consequently they may not have been interested in attending to perceived ancillary aspects of the study's environment. This possibility would have the effect of causing participants to not pay attention during play or place efforts on the recall of information. However, the majority of participants gave positive feedback and indicated they enjoyed the experience, expressing interest in the research outcomes, suggesting that disinterest may not have been a great source of contamination.

The use of laboratory rather than in vivo settings limits the extent of findings and conclusions drawn, particularly with respect to habituation and long-term changes in recall. Longitudinal empirical investigation for in vivo settings with regular gamblers is required to effectively determine the impact of variable modes of information delivery and retention of information. Substantially, it is imperative that longitudinal studies are conducted to determine the link between effective attention to, and retention of, information presented to players and changes in actual gambling behaviour. Participants' successes at free and cued recall tasks, as well as increased accuracy of and confidence in recall following play with dynamic messages, imply that the sign made significant improvements in capturing and maintaining attention as well as in efficiently communicating information, resulting in greater comprehension of the message. These highly significant findings establish that dynamic displays may provide an effective mechanism for allowing informed choice in responsible gambling strategies.

This study may inform policy decision makers and key stakeholders, as it established that dynamic messages increase the extent to which EGM players can recall information freely and in response to prompted cues compared with government-mandated static signs. Although future research is needed regarding the most suitable content of messages, this study highlights the importance of using a dynamic mode of display to maximize the effectiveness of responsible gambling messages.

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Figures



Figure 1.

Location and size of static sign on standard electronic gaming machine as used in study.

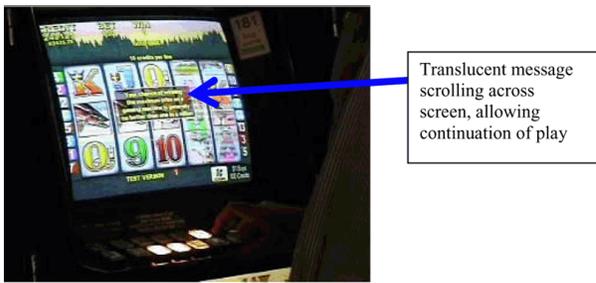


Figure 2.

Dynamic message scrolling from right to left on standard electronic gaming machine as used in the study.

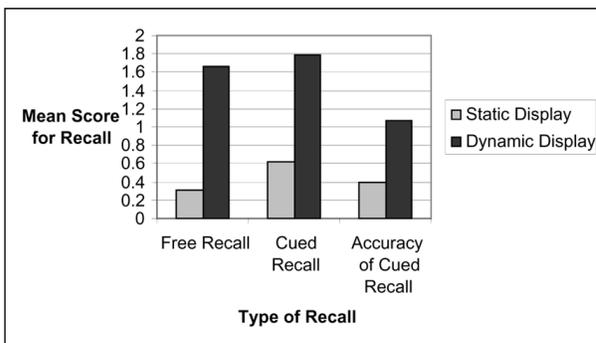


Figure 3.

Mean score for free recall, cued recall, and accuracy of cued recall for n = 92

undergraduate psychology students,
under conditions of static and dynamic
modes of message displays on electronic
gaming machines.

Keywords:

Keywords

electronic gaming machines

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gambling

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responsible gaming signage

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free recall

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