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Highlights

- Responsible gambling tools have not been created with the end-user in mind.
- A new RG tool was created using HCI and PSD principles (Study 1).
- Responsible gambling improved with the new HCI and PSD-inspired tool (Study 2).
- Findings have implications for building effective responsible gambling tools.
Building it better: Applying human–computer interaction and persuasive system design principles to a monetary limit tool improves responsible gambling

Michael J.A. Wohl, Avi Parush, Hyoun (Andrew) S. Kim, Kristen Warren

ABSTRACT

In two studies, we aimed to improve the responsible gambling (RG) utility of monetary limit tools for non-disordered Electronic Gambling Machine (EGM) players – the target population for such prevention-oriented RG tools. To this end, based on feedback from focus groups with non-disordered EGM players, we created a new monetary limit tool that incorporated EGM players’ desired functionality coupled with design fundamentals of Human Computer Interaction (HCI) and Persuasive Systems Design (PSD; Study 1). We then tested the newly created HCI and PSD inspired tool and compared its RG utility (limit adherence) against a standard monetary limit tool (Study 2). Non-disordered EGM players were randomly assigned to experience the HCI and PSD inspired or the standard monetary tool prior to gambling in a virtual reality casino. As predicted, participants adhered to their pre-set monetary limits more (92%), when exposed to the HCI and PSD inspired pop-up tool than the standard monetary limit tool (62.2%). Improving RG tools through the use of HCI and PSD principles is discussed.

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1. Introduction

Against the backdrop of economic downturns and budget short-falls, governments around the world have legalized gambling as a means to generate public funds (see Campbell & Smith, 1998). Unfortunately, the expansion of legalized gambling results in the increased availability and access to gambling activities, not to mention the normalization of gambling behaviors (Seelig & Seelig, 1998; Volberg & Wray, 2007) – factors, which heighten rates of disordered gambling (Room, Turner, & Ialomiteanu, 1999; Temcheff, St-Pierre, & Derevensky, 2013; for a review see Vasiliadis, Jackson, Christensen, & Francis, 2013). To counteract the harms of legalized gambling, gambling jurisdictions have increasingly turned their attention to the development of responsible gambling (RG) tools that help non-disordered gamblers keep their spending within affordable means and thus hinder or halt possible progression toward disorder (Ladouceur, Blaszczynski, & Lalande, 2012; Wohl, Sztainert, & Young, 2013).

While empirical research has shown a meaningful effect of pop-up messages in terms of RG knowledge (Cloutier, Ladouceur, & Sevigny, 2006; Floyd, Whelan, & Meyers, 2006; Monaghan & Blaszczynski, 2007) and RG behavior (Stewart & Wohl, 2013; Kim, Wohl, Stewart, Sztainert, & Gainsbury, in press; Wohl, Kim, & Sztainert, 2014). One such RG tool that has been incorporated into EGMs and garnered much attention from stakeholders in the gambling arena (e.g., policymakers, regulators, and operators) is pop-up messages (see Monaghan, 2008; Schellink & Schrans, 2002).

To-date, most RG tools have been developed as a primary prevention tool for use on Electronic Gambling Machines (EGMs). The focus on EGMs is due, in large part, to the strong association between EGM play and disordered gambling (see Griffiths, 1993; Productivity Commission, 2010; Williams & Wood, 2004). However, EGMs have also served as a conduit for RG tools because of their electronic displays. Specifically, EGMs have been modified to incorporate a variety of RG tools with the intent of reducing problematic EGM play among non-disordered gamblers (typically it is assumed that intervention by means of professional treatment is needed for disordered gamblers; see Blaszczynski, Ladouceur, & Shaffer, 2004; Christie, Wohl, Matheson, & Anisman, 2010; Wohl, Kim, & Sztainert, 2014). One such RG tool that has been incorporated into EGMs and garnering much attention from stakeholders in the gambling arena (e.g., policymakers, regulators, and operators) is pop-up messages (see Monaghan, 2008; Schellink & Schrans, 2002).

In two studies, we aimed to improve the responsible gambling (RG) utility of monetary limit tools for non-disordered Electronic Gambling Machine (EGM) players – the target population for such prevention-oriented RG tools. To this end, based on feedback from focus groups with non-disordered EGM players, we created a new monetary limit tool that incorporated EGM players’ desired functionality coupled with design fundamentals of Human Computer Interaction (HCI) and Persuasive Systems Design (PSD; Study 1). We then tested the newly created HCI and PSD inspired tool and compared its RG utility (limit adherence) against a standard monetary limit tool (Study 2). Non-disordered EGM players were randomly assigned to experience the HCI and PSD inspired or the standard monetary tool prior to gambling in a virtual reality casino. As predicted, participants adhered to their pre-set monetary limits more (92%), when exposed to the HCI and PSD inspired pop-up tool than the standard monetary limit tool (62.2%). Improving RG tools through the use of HCI and PSD principles is discussed.
Electronic gambling machines and disordered gambling

While it is true that most EGM gamblers do not develop disordered patterns of gambling behavior, a small but significant portion will (Williams & Wood, 2004). The development of problematic EGM play is due, in part, to the fact that EGMs are the most accessible and addictive form of gambling (Azmier, 2005; Collier, 2008). In fact, relative to other types of gamblers, those who play EGMs exhibit a more rapid onset of gambling problems (Breen, 2005; Breen & Zimmerman, 2002) and experience more gambling related harm (Cox, K Wong, Michaud, & Enns, 2000; Doiron & Nicki, 2001; Wiebe & Cox, 2001; Wiebe, Mun, & Kaufman, 2006). Moreover, EGMs are disproportionately represented as the preferred form of gambling reported by problem gamblers seeking treatment (Monaghan & Blaszczynski, 2007). Monaghan and Blaszczynski (2007) found empirical support for the contention that pop-up messages functioned to reduce the EGM gambler's dissociative state. Specifically, they found that a pop-up message that (a) asked EGM gamblers to set a monetary limit and then (b) reminded them when their pre-set monetary limit had been reached, reduced the extent to which they dissociated. Moreover, this reduction in dissociation helped the EGM gambler adhere to their pre-set limit. By grabbing the gambler's attention and focusing on it their pre-set monetary limit, the pop-up message was able to facilitate adherence and help gamblers play responsibly. Thus, it would appear that pop-up messages oriented to limit setting and adherence has significant RG utility.

Improving the efficacy of RG pop-up message with HCI and PSD

Despite the fact that pop-up messages on EGMs have shown considerable promise in helping gamblers avoid losing more money than they can afford, there is considerable room to improve a pop-up message's RG utility. Indeed, while pop-up messages may help capture the attention of gamblers (Monaghan, 2008; Monaghan & Blaszczynski, 2007) and facilitate the setting of a pre-set monetary limit (Stewart & Wohl, 2013), a significant number of gamblers exceed their limit despite the presence of such tools (see Wohl et al., 2010). This reflects a limited efficacy of pop-up messages as they are presently designed. Herein, we argue that the efficacy of pop-up messages can be improved by applying knowledge and experience from HCI – a discipline that examines people's engagement with interactive technology to increase technology's usability and uptake.

The basic philosophy of HCI is that designing the look and feel of interactive technology must incorporate feedback from the end-user. Indeed, according to O'Brien and Toms (2008), the incorporation of end-user feedback engages the technology, which leads to a satisfying human–computer interactive experience whilst achieving the goals of the user. Aside from the simple and yet powerful notion of having the user inform designers of their needs, a user-oriented approach is also characterized by continuous involvement of the end-user throughout the design, evaluation, and testing phases.
process (Nielsen, 1993; Preece, Sharp, & Rogers, 2011; Shneiderman, Plaisant, Cohen, & Jacobs, 2009). Within the context of creating a monetary limit tool, the end-user would be an EGM gambler. As such, in order to follow the best-practice protocols, feedback from EGM gamblers should be obtained when designing and implementing a new monetary limit pop-up tool. To this end, recreational gamblers (i.e., the end-user) are involved in the entire design and testing process.

Other HCI principles and guidelines relevant to the creation of pop-up messages on EGMs is the presence of (a) an aesthetic visual design, (b) a system-status update tool (e.g., a display that informs the gambler how much money is left), (c) a tool that provides the end-user with a sense of control over functionalities (e.g., the ability to set a monetary limit of any amount), and (d) the use of simple language to convey information to the end-user (e.g., clearly articulate instructions for setting a monetary limit; see Hewett et al., 1992; Nielsen, 1993; Preece et al., 2011; Shneiderman et al., 2009).

Although the application of HCI principles are frequently successful in increasing user satisfaction and engagement with an interface, it is hypothesized that HCI principles alone are insufficient to motivate end-users to adhere to a pre-set monetary limit. Therefore, social psychology principles of attitude and behavior change in the form of persuasive systems design were also included (Fogg, 2003). Specifically, principles of PSD should be integrated along with the HCI guidelines. We contend that PSD principles relevant to the creation of a new pop-up message include, among other things, tunneling (i.e., lead users through a series of steps to achieve their goal), tailoring (i.e., provide target user specific design or information to help them achieve their goal), suggestion (i.e., intervene at the opportune moment to increase the target action), and self-monitoring (i.e., give users the capability of monitoring their own progress towards achieving a desired attitude or behavior).

When PSD principles are applied alongside HCI principles it is possible to create technologies that are more engaging and thus, motivate users to adopt positive behavioral change and achieve previously set goals (Lockton, Harrison, & Stanton, 2010). Herein, we hypothesized that when HCI principles are applied to a monetary limit pop-up message, alongside PSD principles, monetary limit setting and adherence will be improved beyond that achieved by standard money limit RG tools. Moreover, akin to dissociation disrupting quality of standard pop-up messages (see Stewart & Wohl, 2013), an HCI and PSD inspired pop-up message should undermine dissociation, thus allowing the gambler to be better attuned to his or her pre-set limit, which should facilitate limit adherence.

2. Overview

The aim of the current study was to design and implement a new HCI and PSD inspired monetary limit tool that has greater RG utility for non-disordered gamblers than a standard monetary limit tool currently used in gambling jurisdictions. To create the new pop-up limit tool, Study 1 followed HCI protocols by obtaining feedback from potential users (i.e., gamblers), to uncover how to create a persuasive technology tool that will facilitate monetary limit adherence. This was achieved by having non-disordered gamblers relate issues with a standard pop-up message tool (the one used in Stewart and Wohl (2013)). We then applied this knowledge to the design and creation of a new pop-up message tool. Moreover, principles of PSD were included in order to enhance the likelihood of non-disordered gamblers meeting their goals (i.e., adherence to limits). In Study 2, we compared the RG utility of the newly designed, HCI and PSD inspired pop-up message tool against the standard pop-up message tool. It was hypothesized that (1) non-disordered gamblers would find the HCI and PSD inspired tool more engaging than the standard tool, (2) that the HCI and PSD inspired tool would be equally effective in undermining dissociation as the standard tool, and most importantly, (3) non-disordered gamblers would be persuaded to adhere to their preset monetary limit more when using the HCI and PSD inspired tool than the standard tool.

3. Study 1: Focus groups and design process

In order to examine issues that might undermine the RG utility of standard monetary limit pop-up message tools, trained professionals who were blind of the hypothesis and research goals conducted two focus groups. Our goal for these focus groups was to pinpoint the aspects of monetary limit pop-up message tools that will be most effective in persuading users to gamble responsibly. Once this information was in-hand, we then incorporated the information in guiding the creation of a new HCI and PSD inspired monetary limit tool.

3.1. Method

3.1.1. Participants

Seventeen young adult EGM gamblers (male = 7, female = 10) were recruited from a large Canadian University to participate in one of two focus group sessions (Session 1: male = 3, female = 6; Session 2: male = 4, female = 4). Each session was approximately two hours in length. All participants had previously completed the Problem Gambling Severity Index (PGSI, Ferris & Wynne, 2001) assessing disordered gambling symptomatology during a mass-testing session. The PGSI is the standard measure to assess disordered gambling symptomatology in the general population (Arthur et al., 2008; Stinchfield, 2013; Young & Wohl, 2011). Eligibility for the current study was restricted to non-disordered gamblers (i.e., recreational or low risk EGM gamblers) as determined by their PGSI categorization (score of 0–2). As already noted, the reason for this recruitment restriction was that monetary limit-oriented pop-up message tools are effective as a primary prevention, rather than an intervention tool (see Blaszczynski et al., 2004; Christie et al., 2010; Wohl et al., 2014). Participants ranged in age from 18 to 22 years old (M = 19.53, SD = 1.33) and received $40 as remuneration.

3.1.2. Procedure

Participants were exposed to the standard pop-up message tool in a highly realistic virtual reality (VR) casino during EGM play. Although no participant wagered money during this interaction, they were asked to visualize engaging in EGM play. All participants informed the focus group facilitator that they were able imagine gambling in the VR casino. Upon accessing an EGM in the VR environment, a standard pop-up tool was activated that asked the gamblers to indicate a monetary limit on their play and reminded the gambler when they reached their limit (see Stewart & Wohl, 2013; Wohl et al., 2013). Following the session, participants were asked to generate a list of aspects they liked and disliked about the tool. At the conclusion of the focus group, participants were provided with a debriefing form detailing the purpose of the focus groups and the overall study.

3.2. Results

3.2.1. Reaction to standard RG pop-up monetary limit tool

After interacting with a standard monetary limit pop-up message (see Fig. 1) tool in a VR casino, participants were asked for
their initial impression. All participants mentioned that presence of such a tool on an EGM would likely assist them to set and stay within a monetary limit. Moreover, most participants indicated that they would use such a tool. However, they also mentioned that pop-up messages should be used sparingly — if pop-up messages occurred too frequently they would prevent enjoyment of the gambling activity, thus nullifying their effectiveness.

When asked what if any aspect of the tool they would change, participants expressed the desire to be notified at intervals which are based on the percentage of money left (of their limit), rather than based on set times. Additionally, they suggested that a RG tool should incorporate a way of tracking one’s spending and gambling activities over time (in a chart). Lastly, they argued that imposing a delay before the gambler is able to continue playing once their limit has been reached would make the gambler “think twice” before exceeding their pre-set limit.

3.3. Discussion: Implications for tool development and testing

Based on the issues uncovered via the focus groups, in addition to existing knowledge about pop-up message tools (Ladouceur et al., 2012; Monaghan & Blaszczynski, 2007; Stewart & Wohl, 2013; Wohl et al., 2013), and our knowledge of HCI and PSD principles, we were able to determine the key design directions for a new RG-oriented pop-up tool. According to HCI principles, for an interactive technology to be user-centered, the end-users’ (e.g., non-disordered EGM gamblers) should be involved in the design, evaluation and the testing process. This was achieved through conducting focus groups to determine the end-user’s desired functionality as it relates to monetary limit pop-up tools and having the end-users’ as the sample group to test the new RG tool. In addition, according to HCI, the visual appearance is an important part of any interface, as users quickly make decisions as to whether they like or dislike an interface (less than 1 s), and subsequently look for confirming evidence only to support their original impression (Lindgaard, Fernandes, Dudek, & Brown, 2006). Therefore, a professional graphic designer was hired to create the visual design of the monetary limit pop-up message tool with an eye toward an aesthetic and minimalist design that would be appealing to users.

In terms of PSD principles, we first identified a need to include some form of self-monitoring on a newly created pop-up message tool. The self-monitoring principle was implemented in the newly designed monetary limit tool by introducing an interim “monitoring point” where gamblers could get information about their spending status relative to the limit they set, before they actually reached that limit. This was implemented by having an additional pop-up message when they have 10% credit left from the pre-set limit. Moreover, this interim point served to incorporate the PSD principle of “suggestion” which involves intervening at opportune moments (e.g., 10% of limit) to increase likelihood of target behavior. In addition, we delayed the continuation of play for those who wished to continue by 5 s to ensure that gamblers had enough time to note their credit status.

Self-monitoring was also implemented by providing an on-screen dashboard with a traffic light visual metaphor (see Fig. 2: safe to continue = green, caution for continuation is needed = yellow, and stop = red). In addition, the traffic light was also included in the pop-up messages to indicate whether participants were safe or at risk of reaching their limits (see Figs. 3 and 4 for an illustration). Moreover, participants were given access to their win/loss data by pressing F7 on the keyboard (see Fig. 2). This provided the gambler with the ability to constantly monitor their own progress towards their pre-set monetary limit. We also included a clear persuasive message on responsible gambling. This was accomplished by placing a phrase “Know Your Limit, Play Within It” at the bottom of each pop-up window (see Fig. 3). Past research, however, suggests that gamblers do not pay attention to such static responsible gambling messages (Monaghan & Blaszczynski, 2007). We placed this message merely to mimic the type of message that is typically provided to EGM players on RG tools. With that said, according to HCI heuristics, the message appeared in a distinct color and font to attract gamblers attention towards the message.

In accordance with feedback from the focus group we wanted to use pop-up messages sparingly to avoid them becoming an irritation. As such, it was decided to educate the gambler during their session about where their play was in relation to their pre-set limit, but not with such frequency that the gambler would become frustrated and disregard the message provided. To this end, players were reminded when they had reached 10% of their limit with only a single pop-up message (a percentage suggested to us in the focus groups). At this point, the traffic light shifted from green to yellow and gamblers were given the option to stop or continue play after a delay of 5 s. When a gambler’s limit was reached, a second pop-up message appeared informing them of such and the traffic light turned red. At participants’ urging, a 1-min delay was instituted such that players who reached their limit could not continue playing until 1-min lapsed – a counter was included on the pop-up message (see Fig. 4).

We also ensured all information presented on each pop-up message was stated in clear language (e.g., “You are approaching your limit”) instead of with jargon (e.g., “To gamble responsible, remember how much you intended to spend”). Presenting specific information (e.g., responsible gambling messages) follows the principle of “tailoring”, in which users are presented with information that is...
4. Study 2: Comparison of RG pop-up tool

To test the relative RG utility of the newly created HCI and PSD inspired monetary limit tool, we conducted a controlled lab experiment in which the new tool was examined alongside standard monetary limit tool (black dialogue box with white text) that is typically used in research as well as in gambling jurisdictions (see Stewart & Wohl, 2013). It was hypothesized that the new HCI and PSD inspired monetary limit pop-up message tool would undermine dissociation to the same extent as the standard monetary limit pop-up tool (for a discussion of the dissociation-reducing effect of pop-up messages see Stewart & Wohl, 2013; Wohl et al., 2013). However, it was hypothesized that EGM gamblers would be more engaged by the HCI and PSD inspired tool than the standard pop-up message tool. Lastly, and most importantly, it was predicted that EGM gamblers would adhere to their set monetary limit more when interacting with the new HCI and PSD inspired monetary limit pop-up tool than the standard monetary limit pop-up tool.

4.1. Method

4.1.1. Participants

At the onset of the academic year, psychology students at a large Canadian University participated in a mass-testing session in which they completed a broad range of questionnaires. As part of this session, they completed the PGSI (Ferris & Wynne, 2001) to assess symptom of gambling pathology. We randomly selected fifty-six EGM gamblers (19 males and 37 females) who reported that they currently engage in EGM gambling activities and were classified as being non-problem or low-risk gamblers. Once again, participation was restricted to non-disordered (i.e., recreational and low-risk) EGM gamblers as assessed by the PGSI (Ferris & Wynne, 2001). Participants ranged in age from 18 to 39 years ($M = 20.38$, $SD = 4.27$).

4.1.2. Procedure and measures

Upon entering the laboratory, participants were greeted and were randomly assigned to one of two conditions, our HCI and PSD inspired pop-up tool ($N = 29$) or a standard pop-up tool ($N = 27$; see Wohl & Stewart, 2013 for a description of this tool). Participants were informed that they would be given a total of $20$ dollars ($80$ credits) to gamble with on a VR EGM and were informed the odds of winning in the VR casino were identical to Casino’s in and around the local region. The participants were informed that they were allowed to leave anytime they desired and will be able to keep any winnings and or remaining money that they had.

Upon entering the VR casino, participants were asked to insert all of their $20$ dollars into any EGM of their choice to ensure that the credit display on the counter was the same for all participants. However, participants’ were told that they did not have to gamble with the full amount (e.g., if they only wanted to gamble with $10$ of those dollars they could do so and, if they lost those $10$, they would be able to cash out the remaining $10$ and leave the laboratory with that amount). Just prior to engaging in EGM play, a message box appeared on the screen asking participants to indicate how many of the $80$ credits they were willing to lose in this gambling session. The participants were informed they were free to set any limit they wished. Only then were they allowed to start gambling.

To ensure participants hit their limits, the outcome of the each spin was predetermined to ensure all participants experienced the same sequences of wins and losses. Importantly, participants were not aware that the outcomes on the EGMs were predetermined and thus, to the participants, the outcomes of the EGMs were random. Specifically, participants were told that the odds of winning on the EGMs in the VR casino mimicked the odds of winning on EGMs in the local (i.e., real world) casino.

In the standard pop-up tool condition, once the participant hit their limit, a black and white text box appeared on the screen that read: “You have reached your preset limit of 40. Would you like to continue gambling?” Regardless of their response, the participant received a notification via a pop-up window on the screen. Importantly, participants were exposed to two pop-up messages. The first pop-up message appeared on the screen asking participants to indicate if they wished to continue gambling by clicking a “yes” or “no” button. Regardless of their response, participants received a notification via a pop-up window to tell the experimenter of their decision.

In the HCI and PSD inspired pop-up tool condition, a traffic light system was included, indicating how close they were to their limit. A green light indicated that the participant was not near their preset limit. A yellow light indicated that the participant had 10% of their allocated credit remaining. Finally, a red light indicated that their preset limit had been reached. In addition, participants had the option of viewing their amount of credits won or lost as well as the amount of time played by clicking the F7 key on a keyboard (noted to the participant via text string). Importantly, participants were exposed to two pop-up messages. The first pop-up appeared when participants had 10% of their allocated credits remaining. This message asked if they would like to continue gambling after a 5 s delay. Participants were able to indicate their response by clicking a “yes” or “no” button. If participants indicated “no” they were asked to notify the experimenter, if they indicated “yes” they were allowed to gamble after 5 s. Participants who reached their preset limit were presented with a second pop-up message. This message indicated to the participant that they had reached their preset limit and asked if they wished to continue gambling by clicking a “yes” or “no” button. Regardless of their response, participants received a notification via a pop-up window to tell the experimenter of their decision.
All participants then completed a brief questionnaire that assessed engagement with the pop-up tool and dissociation whilst playing. At the conclusion of the gambling session, all participants were compensated $30 for their time, regardless of how much money they had remaining at the end of the gambling session, and were then debriefed.

4.1.3. Dependent variables

4.1.3.1. Adherence to the pre-set limit. Whether or not participants adhered to their preset monetary limit was tracked (0 = stayed within pre-set limit; 1 = exceeded pre-set limit).

4.1.3.2. Engagement with pop-up tool. Three items (α = .61) were developed to assess the extent to which the end-user engaged with the pop-up tool. These items were: “I found the monetary limit tool to be engaging,” “The monetary limit tool helped me stick to my pre-set limit,” and a reverse coded item “I found the monetary limit tool hard to use.” Items were anchored at 1 (strongly disagree) and 7 (strongly agree) such that higher scores indicate greater engagement with the tool.

4.1.3.3. Dissociation. Jacobs’ (1988) four-item dissociation scale (α = .78) was used to assess participants’ experiences of dissociation during the session of EGM play. All items began with the stem “During your period of play just now, how much did you.” Participants were then asked to report the extent to which they (1) lost track of time, (2) felt like a different person, (3) felt like they were outside themselves, and (4) felt like they were in a trance. Responses were anchored at 0 (not at all) and 4 (all the time) such that higher score indicate greater dissociation whilst playing.

4.2. Results

Seven participants stopped before they reached their limit (3 = HCI and PSD inspired monetary limit tool; 4 = Standard monetary limit tool). Because we were interested in whether participants stopped once they saw the pop-up that reminded them that their limit was reached, these eight participants were not included in the subsequent analyses.

4.2.1. Adherence to the pre-set limit

A Chi-Square found that there was a difference in adherence to a pre-set limit, χ²(1) = 5.51, p = .02, Cramers V = .34. Specifically, participants who interacted with the HCI and PSD inspired monetary limit tool adhered to their pre-set limit more (N = 24; 92.0%) than participants who interacted with the standard monetary limit tool (N = 15; 62.2%; see Fig. 5). Of note, two participants (one in each condition) stopped prior to reaching their pre-set limit. This occurred immediately after viewing their player statistics (using the F7 key). It should also be noted that these were the only two participants to access their player statistics during play.

4.2.2. Engagement with pop-up tools

One-way ANOVA was conducted on extent to which end-user (the participant) found the tool to be engaging. This analysis revealed that participants who used the HCI and PSD inspired monetary limit tool perceived more engagement (M = 5.77, SD = .21) than participants who used the standard monetary limit tool (M = 4.94, SD = .23), F(1,47) = 8.21, p = .009, η² = .14. Importantly, however, the mean for both pop-up tools were significantly above the mid-point of the scale, ps < .001. As such, participants in both conditions found the pop-up tools to be engaging but the level of engagement was greater when participants used the HCI and PSD inspired monetary limit tool.

4.2.3. Dissociation

One-way ANOVA showed no significant between-group effect on the extent to which participants dissociated, F(1,47) = .007, p = .93, η² = .001. In fact, neither participants who were exposed to the HCI and PSD inspired monetary limit tool (M = 1.26, SD = .18) nor those exposed to the standard monetary limit tool (M = 1.24, SD = .18) reported experiencing much dissociation as evidenced by both means being significantly below the mid-point of the scale, ps < .001.

4.3. Discussion

As predicted, participants who used the HCI and PSD inspired monetary limit pop-up perceived the tool to be more engaging and adhered to their preset monetary limits than participants in the standard pop-up limit tool. Importantly, Study 2 also showed that regardless of tool used, participants were not apt to dissociate. This lack of dissociation is to be expected as participants in both conditions received pop-up messages, which are known to break any dissociation that might be experienced during play (see Stewart & Wohl, 2013; Wohl et al., 2013). These results support the use of HCI and PSD principles for the creation of RG technologies. Indeed, although both tools were equally effective in breaking dissociation, the newly created HCI and PSD inspired monetary limit pop-up tool was found to be significantly more engaging and importantly, facilitated greater adherence to pre-set limits.

5. General discussion

Many EGM players persistently bet in the face of significant personal and social losses (Sevigny & Ladouceur, 2004; Toneatto, Blitz-Miller, Calderwood, Dragonetti, & Tsanos, 1997). Failure to set and adhere to a pre-set monetary limit on play may be key contributing factors in the development of disordered EGM gambling (Lesieur, 1979). It has been argued and empirically demonstrated (see Ladouceur et al., 2012; Stewart & Wohl, 2013) that providers of EGM gambling can help the gamblers set and adhere to a monetary limit by installing a pre-commitment tool into EGMs. This pre-commitment tool would explicitly ask gamblers to set a monetary limit before play begins and remind the player when that limit is reached. Based on theory and research, some gambling jurisdictions in Canada (e.g., Alberta) have incorporated monetary pre-commitment tools into their EGMs (see Wynne, 2006). The RG utility of these tools, however, has been hampered because they violate fundamental HCI and PSD principles that take aesthetic visual design, usability and persuasive elements into consideration. For example, current limit setting tools fail to display information to the EGM gambler.
The present research combined knowledge from the psychological literature on gambling and knowledge accrued from the HCI discipline to develop and test a new HCI and PSD inspired monetary limit tool. The aim was to build a new tool that would have greater RG utility than what is currently being used in the responsible gambling research and practice today. To this end, we involved non-disordered EGM gamers (the end-user) in every stage of the development process and design – design that used basics tenants of HCI. Specifically, non-disordered EGM gamers were continually involved in all aspects of the design including early prototyping, evaluations, and testing (Nielsen, 1993; Preece et al., 2011; Shneiderman et al., 2009). In addition, principles of PSD were incorporated into the newly created monetary tool in order to increase the likelihood that the tool would have the intended effect of helping gamblers adhere to their monetary limits.

In Study 1, we conducted focus groups in which non-disordered EGM gamers interacted with a standard monetary limit-setting tool. In line with Nielsen (1993), these end-users provided valuable information that was then applied to build a user-friendly and aesthetically pleasing monetary limit tool. Moreover, PSD principles were integrated along with HCI guidelines to create a monetary limit tool that would persuade the non-disordered EGM gamer to set and adhere to their pre-set monetary limits. Specifically we included principles of self-monitoring (via traffic light and player stats), suggestion (via a pop-up message warning gamblers when they reached 10% of their limit) and tailoring (providing RG messages).

Results of Study 2 suggest that the new monetary limit tool designed according to HCI and PSD principles had a critical impact on behavioral change. Indeed, results showed that a RG tool designed with HCI and PSD principles was found to be more engaging than the standard monetary limit tool. More importantly, the new HCl and PSD inspired monetary tool was more effective in helping non-disordered gamers adhere to their pre-set monetary limit than one without such functionalities. The combined implementation of HCI and PSD design principles resulted in two influential factors. First, the introduction of an additional reminder (PSD principle of self-monitoring and suggestion) informing that the player was close to reaching the pre-set limit likely influenced engagement with the tool. In addition to providing an opportunity for the player to be aware of where they are relative to the pre-set limit, it also provided a “cool down” opportunity, which in turn could have facilitated a change in behavior was achieved. Second, the visual design of the pop-up messages, including better layout, use of colors, icons, and additionalPlain-language educational messages, rendered them more pleasant and appealing, and thus, potentially more persuasive.

EGMs have been called the ‘crack cocaine’ of gambling (Dowling et al., 2005; Productivity Commission, 1999), in part, due to the rapid and severe problems associated with disordered EGM play (Williams & Wood, 2004). The seeds of disorderly play often stem from the inability to keep their monetary expenditures in check. The results of the current research suggest that an HCl and PSD inspired monetary pop-up limit tool can help gamblers set and adhere to a pre-set monetary limit. To the point, HCl and PSD can play a role in advancing responsible gambling. Using HCl and PSD guidelines to build a new monetary limit pop-up tool significantly improved responsible gambling compared to a standard pop-up tool. This provides support for the contention that simple factors such involving the end-user and taking into consideration visual design and persuasive elements can have a profound effect on promoting responsible gambling. In this light, it may be prudent for gambling jurisdictions to examine whether their RG tools adhere to the guidelines of HCl and principles of PSD. If they do not, the new HCl and PSD inspired monetary limit tool tested herein could be used as a guide for redesigning exiting monetary limit tools.

### 6. Limitations

Some limitations of the current research should be noted. First, non-disordered EGM gamers were recruited from an undergraduate population – a population that may limit the generalizability of the results. Indeed, undergraduates EGM gamers may not be representative of EGM gamers in general (Gainsbury & Blaszczynski, 2011; Gainsbury, Russell, & Blaszczynski, in press). With that said, Study 2 used a between-group, experimental design with random assignment to condition. As such, the population used cannot properly account for the between-group effects. In addition, the research was conducted in a laboratory setting as opposed to a gambling establishment. Again, there is no reason to believe that the observed difference between groups can be accounted for by the location in which the study took place. Nonetheless, future research should examine whether the effects of a HCl and PSD inspired tools in a real-world setting (i.e., EGM play within the walls of a casino).

Third, it is possible that individual differences (i.e., personality) might have influenced the impact of the pop-up message design on monetary limit adherence. Impulsivity, for example, heightens EGM players’ inability to adhere to a pre-set monetary limit (Gainsbury, 2012). Thus, it might be the case that more impulsive gamblers happened to be in the standard pop-up message condition, which would lead to fewer participants adhering to their pre-set limit in that condition. Minimizing this possibility is that fact that participants were randomly assigned to condition. As such, influence of personality on limit adherence should be nullified via random assignment. With that said, people with certain a personality makeup might wish to dynamically adjust the interim monitoring point where gamblers could get information about their spending status relative to the limit they set, before reaching the limit set. In the current study, we set this point at 10%. That is, a pop-up message informed gamblers when they had 10% credit left from the pre-set limit. Impulsive gamblers might benefit from having the interim monitoring point occur earlier (e.g., 20% credit left from the pre-set limit). This is because an earlier interim monitoring point would provide impulsive players with more time to adjust to their nearing limit and thus reduce the impact of impulsive thought (i.e., more time to thinking about their approaching limit might induce more rational patterns of thought regarding limit adherence). For the same reason, some types of people might benefit from being able to dynamically adjust the post-limit delay in continued EGM play to be longer than the imposed 1 min that was set in the current research.

Forth, due to the small sample size used in the current study, some caution should be taken when interpreting the results of the current research. However, confidence in the current results is restored due to the moderate effect size observed (Cramers V = .34). According to Cohen (1988), a moderate to large effect is needed to achieve statistical significance using a small sample. Moreover, one concern with a small sample size is that outliers can have a large impact on between-group difference. This was not the case in the current research. All participants fell within 3 standard deviations on the measured variables.
7. Conclusion

By using HCI principles coupled with PSD principles, we were able to create a monetary limit tool that was more effective in helping gamblers adhere to their pre-set monetary limit than a basic, traditional monetary limit tool. The manner in which we created the new tool should be a guide to help the gambling industry create RG tools with the greatest RG utility. However, any new tool created should undergo rigorous empirical testing before it is adopted as it was done in the present research. The field of HCI is oriented toward the building of user-friendly and persuasive computer tools that will pass this test. At the end of the day, a goal of any RG tool is to maximize the responsible play of the people who use it. Herein, we showed an avenue for improving RG tools to achieve this end.

8. Uncited references


Blackwell handbook of disordered gambling (pp. 206–235). West Sussex, UK: John Wiley & Sons Ltd..


