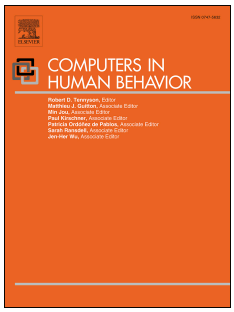

The use of personalized messages on wagering behavior of Swedish online gamblers: An empirical study

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The use of personalized messages on wagering behavior of Swedish online gamblers: An empirical study

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Abstract

Over the past few years, online gambling has become a more commonplace leisure time activity. However, for a small minority, online gambling can become problematic. Consequently, the gambling industry has started to acknowledge their role in player protection and harm minimization and some online gambling companies have introduced responsible gambling tools such as targeted personalized messages as a way of helping players stay in control. The present study evaluated the effectiveness of targeted messages among 7,134 Swedish online gamblers who played at one of five sites within the *ComeOn Group* between July 2019 and January 2020. The results showed that online gamblers receiving personalized feedback (i.e., feedback concerning their own actual gambling behavior in the form of text messages) wagered significantly less money on both the day they read a personalized message and seven days after they read a personalized message. The data support the results found by previous laboratory and real-world studies showing that targeted personalized information can be an effective tool for online gambling companies to reduce gambling expenditure among their clientele. The findings will also be of interest to other stakeholders including gambling regulators, policymakers, and researchers.

Keywords: online gambling; responsible gambling tools; personalized messaging; gambling harm-minimization; player protection

Introduction

Online gambling has become increasingly commonplace in many countries since its inception in the late 1990s. While most individuals gamble without any problems, a small minority within most populations have a gambling problem (Calado & Griffiths, 2016). For susceptible and vulnerable individuals, there are many situational and structural characteristics that can make gambling via the internet potentially risky including 24/7 accessibility, convenience, anonymity, and high event frequency (McCormack & Griffiths, 2013). Some types of online game appear may be more problematic for individuals than others such as online casino games and online sports betting (particularly in-play sports betting) (Killick & Griffiths, 2019; Wardle et al., 2011).

Studies have consistently shown that compared to land-based gambling, there is typically a higher prevalence rate of problem gambling among those that gamble via internet (e.g., Gainsbury, Russell, Hing, Wood & Blaszczynski, 2014a; Griffiths & Barnes, 2008; Griffiths, Wardle, Orford, Sproston, & Erens, 2009; Wood & Williams, 2011; Wood, Williams, & Lawton, 2007). However, most land-based gamblers also gamble online (Wardle et al., 2011). Furthermore, the severity of problem gambling is associated with overall gambling engagement. However, Philander and MacKay (2014) found that gambling via the internet is not a predictor of problem gambling when the volume of gambling is controlled for.

Gambling in Sweden

The present study was conducted with Swedish online gamblers. Therefore, a quick overview of the Swedish market is presented in this section. A report by Folkhälsomyndigheten (2015) noted that among the gamblers who called the national problem gambling helpline (and for whom information on the main form of gambling causing problems was recorded), 43% specifically had problems with online casino games, and a further 10% had problems with online poker, and 13% had problems with online sports betting. Abbot, Romild and Volberg (2018) reported findings from a Swedish longitudinal study with a stratified random sample of 8165 participants (aged 16–84 years at baseline) and re-assessed a year later (n=6021). They found that utilizing the Problem Gambling Severity Index (PGSI), combined current problem

and moderate-risk gambling prevalence rates were 2.2% at baseline and 1.9% at follow-up. Combined incidence rates (IRs) were 1.0% (with the revised South Oaks Gambling Screen [SOGS-R]) and 1.4% (with the PGSI), with more than three-quarters being new cases. Widinghoff, and Håkansson (2018) reported that the national prevalence of problem gambling in Sweden was 2%, including 0.4% meeting the criteria for gambling disorder. They also reported that incidence numbers were substantially higher due to the dynamic pattern of the disorder with individuals moving into and out of the problem gambling group. Rapid internet games, such as internet casino games and online sports betting, comprised a predominant share of problem gambling.

It should also be noted that the Swedish gambling market changed at the start of January 2019 because the Swedish monopoly changed into a license-based market. There were several reasons for this but according to a government report (Staten Offentliga Utredningar, 2017), a major reason was that international online gambling companies had been operating in Sweden to the extent that the monopoly system had eroded. Furthermore, the Swedish Gambling Act is one of very few acts of legislation which specifically requires licensed operators to counteract problematic gambling through continuous monitoring of gambling behavior (Ministry of Finance, 2018).

Messaging and feedback tools in responsible gambling

Over the past decade, responsible gambling tools have become more utilized by gambling operators in an attempt to help their online clientele gamble more responsibly (Harris & Griffiths, 2017). Such tools include various types of direct messaging to gamblers which can include general messaging concerning on how to gamble more responsibly, information about the gambler's actual gambling behavior in-session and/or over time, or information about erroneous perceptions and common misbeliefs about gambling (Auer, Hopfgartner & Griffiths, 2018). However, studies investigating the efficacy of such tools has been mixed, especially those concerning messaging that attempts to correct or change erroneous beliefs (Dixon, 2000; Hing 2003; Focal Research, 2004; Ladouceur, 2003; Williams & Connolly, 2006).

Some empirical studies have shown that education and prevention programs targeting erroneous gambling beliefs can help both adult and adolescent gamblers (e.g., Calado

et al., 2019; Wohl et al., 2010; Wulfert et al., 2006). Empirical studies (mainly experimental laboratory-based research) highlight that the way targeted messages are presented can also influence gamblers' behavior and thinking. For instance, animated, interactive and/or pop-up messaging and information appear to be more effective in changing both irrational belief patterns and gambling behavior than static messaging (e.g., Cloutier, Ladouceur, & Sevigny, 2006; Ladouceur & Sevigny, 2003; Monaghan & Blaszczynski, 2007 & 2010a; Monaghan, Blaszczynski & Nower, 2009), Schellink & Schrans, 2002; Stewart & Wohl, 2013; Wohl et al., 2013) and messaging on slot machines that includes the capacity for gamblers to engage in self-appraisal and self-regulation help change gambling thoughts and behavior (Monaghan et al., 2010a, 2010b). Use of graphic messaging has also been reported as being more effective for gamblers than static messaging in adhering to gambling warning signs (Munoz et al., 2013). Wohl et al. (2014) found that messaging systems employing Human Computer Interaction (HCI) and Persuasive System Design (PSD) led to a pop-up tool (for monetary limit-setting) being significantly more effective than a tool that not incorporating HCI and PSD principles.

However, two recent experimental studies by Hollingshead et al. (2019) with slot machine gamblers (n=124; n=109) who played on a virtual slot machine at a local Canadian gambling venue found that players did not adhere to a pre-determined limit more often when they received a pop-up message about their monetary loss. Additionally, approximately 50% of players were unable to recall the content of the pop-up message, even when the pop-up message remained on the slot machines for a 10-second period.

In addition to experimental research showing that messaging can effectively change thoughts about gambling and the gambling behavior itself, research has also suggested that the content of messages is important (Monaghan & Blaszczynski, 2010a, b). In a focus group study with young adults (18–24 years), seniors (60+ years), frequent (weekly) gamblers, and gamblers of skill-based games (poker, sports betting), Gainsbury et al. (2018) found that the wording of message content also influences the effectiveness of messages. Findings showed that seniors preferred messages concerning limit setting, whereas young adults and frequent gamblers responded more positively to messages concerning their own play and expertise. Skill-based game

gamblers were more interested in the odds of winning and their own outcomes over time.

One of the limitations of all the aforementioned studies is that they were experiments comprising very small sample sizes. However, there have now been a number of real world studies examining the effects of messaging with real gamblers, in real time, on real gambling sites. For example, two studies evaluated the efficacy of pop-up messaging. The first was by Auer, Malischnig and Griffiths (2014) who examined the efficacy of a pop-up message among players at the *win2day* website who played online slot machine games. The pop-ups only appeared if gamblers had played 1,000 consecutive games during a single gambling session (approximately one hour of slot machine playing). The study examined 200,000 playing sessions prior to the pop-up's introduction and 200,000 playing sessions after the pop-up's introduction. Auer et al. reported that less than 1% of players stopped gambling after seeing the message and concluded that pop-up messaging has a limited effect among a small minority of players.

Auer and Griffiths (2015a) carried out a follow-up study (again using data from gamblers at the *win2day* website), and examined the efficacy of a newly designed pop-up message which included normative and self-appraisal information. This enhanced message was compared to the simple (i.e., non-enhanced) pop-up message that was examined in the previous study by Auer et al. (2014). The follow-up study was much larger and examined 1.6 million online slot machine sessions and compared two conditions (the enhanced pop-up message vs. the simple pop-up message) comprising two representative random samples of 800,000 gambling sessions. Auer and Griffiths reported that the newly designed ('enhanced') pop-up message was twice as effective in getting gamblers to cease their online slot machine playing (1.39% vs. 0.67%). However, like the previous study, the efficacy of pop-up messaging was limited and only facilitated a minority of online slot machine gamblers to stop their in-session gambling.

A study by the Behavioural Insights Team in cooperation with GambleAware (2018) tested the effect of electronic messages on the frequency of using RG tools in a sample of online gamblers. They found that messages which contained the link of the

RG tool increase the number of players who used the RG tool. However, normative feedback, which compares a player's time and money spent with other players did not change the usage of RG tools.

In another study, Auer and Griffiths (2015b) evaluated the efficacy of *mentor* (i.e., a behavioral tracking tool that provides personalized messages to players based on their actual gambling behavior). The study investigated 1,358 gamblers who had voluntarily signed up to use *mentor* at an unnamed European online gambling website. Using a matched pairs design they compared players who used mentor with players who did not use it. The study found that gamblers who used *mentor* and received personalized messages spent significantly less time and money gambling compared to the gamblers who did not.

The only experimental study regarding the effects of personalized feedback in a real-world setting was conducted by Auer and Griffiths (2016) with players from the state owned Norwegian gambling operator *Norsk Tipping.* A total of 5,528 online players participated in an experiment and received a combination of personalized and normative feedback about the amount of money that they had recently lost gambling. They found that personalized behavioral feedback enabled behavioral change in gambling but that normative feedback did not change gambling behavior significantly more than personalized feedback.

The present study

The present study examined the efficacy of personalized feedback (i.e., feedback concerning their own actual gambling behavior in the form of text messages) in the form of digital text messages given to players after they logged on to a gambling session via a pop-up window. More specifically, the aim was to investigate the effects of personalized feedback about past gambling behavior on future gambling. It was hypothesized that gamblers receiving targeted personalized feedback about their online gambling behavior would be more likely to change (i.e., reduce) their behavior (as measured by the amount of money wagered) compared to before receiving the feedback. This study also aimed to confirm the findings of previous similar studies (e.g., Auer and Griffiths [2015b, 2016]) which found that personalized feedback led to a significant reduction in gambling expenditure.

Except for the two studies by Auer and Griffiths (2015b, 2016), no other study has investigated the effect of text messages informing players about their own behavior and providing specific recommendations. Very few previous studies have been conducted with real-world players on real gambling sites. Two previous studies with real-world players conducted by Auer and Griffiths (2014, 2015a) investigated pop-up messages which appeared after 60 minutes of consecutive play and informed players that they had played 1000 consecutive slot machine games (equating to approximately one hour's continuous play). In the present study, players were informed about specific aspects of their own gambling behavior and were provided with recommendations that could help change their behavior.

The present study used the amount wagered as a proxy for gambling intensity. However, problem gambling was not directly measured. Braverman et al. (2013) compared problem and non-problem gamblers' online wagering and found that problem gamblers had a higher average wager amount. Several other studies have found correlations between amount wagered and problem gambling (e.g. Boldero et al., 2010; Clarke, 2008). The present study was conducted with gamblers from Sweden. As far as the present authors are aware, no previous studies examining personalized messaging have ever examined Swedish gamblers. It is important to test responsible gaming tools across different cohorts in different locations and languages to evaluate whether laboratory results also hold true in real-world settings.

Method

Participants and procedure

The present study comprised anonymized, secondary data provided to the authors by the online gambling company *ComeOn Group*. The researchers were given access to behavioral tracking data from 7,134 Swedish gamblers (37.5% female; average age 42 years; SD=12 years) from five online gambling sites licensed under the Swedish regulation. *ComeOn* offers a behavioral feedback system (i.e., *mentor*) to all customers on the five listed Swedish online gambling sites. *mentor* analyses each players' behavior according to money spent, time spent, and more specific variables such as failed deposit attempts, withdrawals which were cancelled by players, and deposit limit-setting. Based on rules and machine learning algorithms, the system

provides personalized messages to players via a pop-up window which appears immediately after a player logs into their online gambling account. The messages inform players about their own behavior and the messages are triggered following indications of risky or problematic play. The messages also recommend specific actions that can be taken such as taking a break from gambling or setting a deposit limit. Messages are based on behavior up to the previous six months of an individual's gambling behavior (e.g., *"It seems like you have been depositing more money into your account lately. Setting a suitable deposit limit can help you avoid overspending"*). Messages appear to players in a pop-up window after they have logged into their online gambling account. Only one message is displayed in the pop-up window. Players receive (at most) one message per week and one specific message can only be sent to a player once every three months. If a player has not logged in for three weeks, an existing message is deleted because it is not relevant to the player anymore.

It should also be noted that Griffiths and Whitty (2010) argued that behavioral tracking tools could potentially be used to identify problematic gambling. Behavioral aspects of problematic gambling such as tolerance (increase in session lengths and stakes over time), and chasing losses (increasing stake sizes after losses), could potentially be detected. Some messages in the present study specifically addressed increased time or monetary expenditure (i.e., tolerance and salience). Tolerance associated with gambling disorder (GD) is defined as the need to "*gamble with increasing amounts of money in order to achieve the desired excitement*" (Lee at al., 2020), and is a key diagnostic criterion for problem gambling (Lesieur, 1988; Griffiths, 1993). Salience describes a high preoccupation with an activity and can be an indicator of addiction (Griffiths, 2005). Consequently, some messages addressed the large amounts of time and money expenditure which correspond to the diagnostic criterion of salience in the DSM-5 (American Psychiatric Association, 2013). Another message is sent out to players if they have won a larger amount of money than they normally do (i.e., €1,000) because several studies have reported a correlation between a big win and gambling persistence (Dowling, 2017; Kassinove, 2001; Weatherly, 2004). The actual message was *"Happy to see that you have recently won! Why don't you use some of that money on a nice dinner or buy yourself something you want?*

Otherwise it could be gone faster than you think". In order to get a better understanding, the analytical rules for each message is described below:

- *High losses:* This message is sent to the players with a high recent net loss. The net loss is the difference between amount won and amount of money gambled.
- *High deposit amount:* This message is sent to the players if they significantly increase the amount of money they have deposited.
- *Increased bet amount:* This message is sent to players if they significantly increase the amount they have gambled over the past few months.
- *Increased deposit amount:* This message is sent to players if they significantly increase the amount of money deposited over the past few months.
- *High playing frequency:* This message is sent to players who play at least five days a week for longer periods of time than usual.
- *High playing duration:* This message is sent to players who play on average at least four hours a day.
- *Increased playing frequency:* This message is sent to players who significantly increase their playing frequency over the past few months.
- *Increased playing duration:* This message is sent to players who significantly increase their playing duration over the past few months.
- *Winning streak:* This message is sent to players who won recently won a larger amount than normal and recommending the player withdraws some of the winnings.
- *Withdrawal recommendation:* This message is sent to high intensity players who rarely or never withdraw any winnings from their online gambling account.
- *Deposit limit recommendation:* This message is sent to high intensity players who have a very high deposit limit recommending they lower their deposit amount.

Each of the 7,134 players received at least one message between 14 July 2019 and 8 January 2020. Players had to have placed at least one bet in the seven days before they read a message, on the day they read the message, and on the seven days after they read a message. In order to study the effect of a message, players' average daily

amount of money gambled seven days before a message was read was compared to the daily amount of money gambled the day a message was read. Additionally, the total amount of money gambled seven days before a message was read was compared to the total amount of money gambled seven days after a message was read. It was possible for players to receive more than one message between 14 July 2019 and 8 January 2020. This led to 15,512 records, where each record represented one player and one day on which a specific message was read by the player.

If a player's average daily amount of money gambled in the seven days before the message was read was larger than the amount of money gambled on the day the message was read, it was concluded that there was a positive effect with respect to the personalized message. For each of the 15,512 messages, a binary variable was computed which assessed the effect of reading a message on the amount of money gambled that day. The same was done with respect to the effect of money expenditure seven days after the message was read compared to the seven days before the message was read. Another binary variable assessed the respective effect. Across all players or specific subgroups of players, this binary effect variable is a percentage between 0 and 1. Zero indicates the amount of money gambled after the message was read was higher for all players and 1 indicates that the amount of money gambled after the message was read was lower for all players. 0.5 indicates that for half the players the amount of money gambled was higher after the message was read and for the other half it was lower.

It was assumed that any difference in the gambling behavior before and after the message was read could be due to chance and would be similar to the tossing of a coin. For that reason, it was assumed under the null hypothesis, in 50% of players the amount of money gambled would be higher after the message was read and in 50% of players it would be lower. Consequently, any deviation from this distribution is due to the effect of the personalized feedback. In the present study, the difference between the actual observed percentage to the expected percentage of amount of money gambled (i.e., 50%) was statistically tested.

Results

Message frequency

Between July 2019 and beginning of January 2020, 3,595 players (50%) received one message, 1,525 players (21%) received two messages, and 804 players (11%) received ten or more messages. Figure 1 displays the distribution of the number of messages per player. Table 2 reports the number of times eleven different messages were sent and read by players. High playing duration messages (n=2,782) and high playing frequency messages (2,417) were the most frequent, followed by high deposit amount messages (n=1,916), and high loss messages (n=1,733).

Risk distribution

On a daily basis, the behavioral tracking tool *mentor* computes gambling-related risk for every player and classifies each player into one of four categories (no-risk, low-risk, medium-risk, high-risk). Players can view their risk score at any time in a specific section of the online-gambling website. The risk score is based on money spent gambling, time spent gambling, and more specific variables such as failed deposit attempts, withdrawals which were cancelled by players, and high deposit limit-setting. The risk score takes into account behavior up to the past six months. Two-thirds of players were in the no-risk category (67%), 20% in the low-risk category, 8% in the medium-risk category, and 5% were in the high-risk category.

Message effect

In order to assess the effect of personalized messages, the amount gambled on the day a message was read was compared to the daily amount of money gambled seven days before the message was read (see Table 2). As noted above, the null hypothesis assumes that 50% of the players gamble less money and 50% of the players gamble more money. Any deviation towards 100% supports the hypothesis. Results demonstrated that every message showed a significant reduction in the amount gambled on the day a message was read compared to average daily amount of money gambled on the seven days before a message was read (apart from messages concerning a withdrawal recommendation). The largest reduction was for the message concerning high losses (informing players they had lost a larger amount of money than they did normally). Nearly three-quarters of the players who read this message (71%) gambled less money on the day they read the message compared to their average daily amount of money gambled seven days before they read the message.

Across all players and all messages, 65% of the players reduced the amount of money they gambled on the day they read a message compared to their average daily amount of money gambled seven days before they read a message. Table 3 also reports the average amount of money gambled daily seven days before a message was read. Given a return to player (RTP) of 5%, players who read a message concerning their high losses are expected to have lost about €465 per day. The highest average expected loss (i.e., €531) was observed for players who read a message concerning a winning streak. However, these players recently won more than they lost. This is due to the fact that losing and winning are random and the formula 'amount of money gambled*RTP' only delivers what would be expected for an infinite amount of games played. The lowest daily amount of money gambled (and therefore expected loss) was observed among players who read the messages concerning significantly increased playing frequency. increased playing duration, and high playing frequency.

In order to study whether personalized messages also change behavior on the days following the reading of a message, the total amount of money gambled seven days after a message was read was compared to the total amount of money gambled seven days before a message was read (see Table 4). Across all players and all messages, the total amount of money gambled was reduced in 60% of the cases which was statistically significant. The message concerning high losses showed the highest reduction in amount of money gambled (i.e., 71%). The two messages concerning increased playing frequency and increased playing duration did not lead to a significant reduction in total amount of money gambled seven days after a message was read.

Table 5 reports the effect of messages on the amount of money gambled the day a message was read and the total amount of money gambled seven days after a message was read grouped by the four gambling risk categories. Because every player can potentially receive multiple messages (see Figure 1), the numbers for each risk category in Table 5 are not the same as in Table 1 where the number of unique players for each risk category are reported. The behavioral change was significant in each risk category, both for the effect on the amount of money gambled the day a message was read and the total amount of money gambled seven days after a message was read. The lowest percentage of players who reduced their gambling expenditure occurred in

the high risk category. A logistic regression (Table 6) showed that age and gender were not significantly predictors of behavioral change on the day the message was read.

Another question to investigate was whether high amounts won or lost prior to reading a message influenced the behavioral change. In order to do this, the 15,512 records were categorized into three groups. After a careful analysis of the distribution of the amount of money lost, the players were categorized into those who lost more than €10,000 seven days before a message was read and players who won more than €10,000 before a message was read. The 'average' player's loss seven days prior to reading a message was between those two values. Table 7 shows that out of the 15,512 players, 218 players lost more than €10,000 in the seven days prior to reading a message and 181 players won more than €10,000 in the seven days prior to reading a message. On average, the remaining 15,112 players lost €153 in the seven days prior to reading a message (25% lost at least €274 and 25% won at least €580). However, these figures are not representative of the population of active players, because only a fraction of players (the ones with the highest spending and frequency) received personalized messages.

Three-quarters of players who lost a large amount of money seven days prior to reading a message (76%) reduced the amount of money gambled on the day they read a message as well as seven days after a message was read. The respective values for players who won a large amount of money were 70% and 74%. Out of the 218 players with the largest amounts lost, 35% were high-risk gamblers, and 40% of the players with the largest amount won were high-risk gamblers.

Discussion

The present study evaluated the effectiveness of eleven personalized text messages on subsequent gambling behavior in a real-world population of 7,134 Swedish online players from five online gambling sites. The sample is not representative of the entire player population of the five online gambling sites, because only players who received at least one personalized message between 14 July 2019 and 8 January 2020 were analyzed. Receiving a message requires a higher intensity of play, which means

that players with a higher intensity of play were overrepresented in the present study. However, the lower percentage of females (37.5%) is in line with previous research findings that (excluding bingo and lottery games) males are more likely to engage in gambling than females (e.g. Calado & Griffiths, 2016). Braverman et al. (2013) who used a sample of *bwin.com* players for their behavioral tracking study, also found the majority of players to be male (90%).

The personalized messages that players received provided information about specific gambling behaviors that players had recently been engaged in. The present study examined the amount of money gambled on the day that a message was read and seven days after a message read and compared it to the amount of money gambled seven days before a message was read. Results indicated that the personalized feedback achieved the anticipated effect and that the amount of money gambled was significantly reduced after a message was read. The results support previous findings of similar real-world studies (i.e., Auer & Griffiths, 2015b, 2016) and suggests that personalized feedback approaches may help the clientele of gambling operators to gamble more responsibly, and may be of help those who gamble intensely.

The short-term effect (reduced gambling expenditure on the day a message was read) of the personalized feedback was higher than the long-term effect (reduced gambling expenditure in the seven days after a message was read). Compared to the amount of money gambled seven days before, the reduction was larger on the day a message was read than during the seven days after a message was read. However, the amount of money gambled was also significantly reduced during the seven days after a message was read. This is in line with the findings by Auer and Griffiths (2015b) who used a matched pairs design to evaluate the effects of personalized feedback about personal gambling behavior on the 14 days after signing up to a behavioral tracking feedback system. The study also supports the findings of another study of online players by Auer and Griffiths (2016) who found a significant reduction in amount of money gambled seven days after receiving loss information. The highest effect in the present study was achieved by a message informing the players about high monetary losses over the past couple of weeks prior to sending the personalized message.

Three previous real world empirical studies have found a minor effect of in-session pop-up messages which appear after players have gambled continuously for about an hour (Auer & Griffiths, 2014, 2015a, 2019). The messages in the present study appear at the start of a gambling session (rather than during one) and address a specific type of behavior which occurred over a longer period of time (up to six months before). It might be that in-play pop-ups during a long session might not be able to break the dissociative state players are in. On the other hand, personalized information at the start of a session which informs players about recent gambling behavior before they begin a gambling session might be more effective.

Although the present study did not assess problem or disordered gambling, responsible gambling tools may also be of help to this group of gamblers. The online gambling sites that provided the data for this study use a behavioral tracking tool (i.e., *mentor*) which assesses player risk. Several studies have shown that problematic gambling can be identified with the help of player tracking (Adami et al., 2013; Philander, 2014; Braverman & Shaffer, 2012; Dragicevic, 2011). Experiences with a similar behavioral tracking tools (i.e., *PlayScan*) were described by Forsström et al. (2017).

However, none of the previous player tracking studies have aimed to change the gambling behavior of players who have been identified as being at risk with the help of a player tracking tool. The eleven messages used in the present study informed players about significant increases in time and/or money expenditure. This is in line with the diagnostic criteria of tolerance (increasing intensity over time) and salience (high intensity and preoccupation) which are important indicators in the majority of problem gambling screening instruments (American Psychiatric Association, 2013; Ferris & Wynne, 2001; Jonsson et al., 2017; Lesieur & Blume; 1987).

In the present study, players were classified by a machine learning algorithm into four groups according to their recent gambling behavior (no-risk, low-risk, medium-risk, high-risk) with high-risk players showing the most intense gambling behavior. The reduction in amount of money gambled on the day a message was read and seven days after a message was read was significant in each of the four groups. However, high-risk players showed the lowest reduction in amount of money gambled. This is

in line with findings by Auer and Griffiths (2016), who found that personalized feedback had the lowest effect among a group of highly intense online casino players.

The phenomenon of `chasing' has been identified as one of the central characteristics of the behavior among disordered gamblers (American Psychiatric Association, 2013). In a survey of 10,838 online gamblers, Gainsbury et al. (2014b) found that online casino players had a greater tendency to report chasing losses than poker players. They also found that players who reported chasing losses were more likely to hold irrational beliefs about gambling and spend more time and money gambling than those who reported that they were unaffected by previous losses. The effectiveness of personalized feedback would be further supported if chasing losses could be reduced. For that reason, the present study investigated whether there was a difference between players who won a large amount of money compared to players who lost a large amount during the seven days before a message was read. Players who had lost heavily showed a higher reduction in amount of money gambled than players who had recently won a large amount of money. This finding underlines the importance of personalized feedback and could potentially be an indicator that players can be prevented from chasing after their losses by using a personalized message.

Limitations

The present study was conducted with real-world players across five Swedish online gambling sites. Consequently, there might be other factors that influenced the behavioral change after a message was read. This could involve situational characteristics such as the location of where a player is, the device a player uses to gamble, the social setting a player is in, the psychological state of the individual, and other factors such as alcohol or tobacco consumption. Apart from personalized messages the *ComeOn Group* also interacts in various other ways with players that show signs of problematic play. This information was not available to the authors and could thus also affect the results. Furthermore, the present study used amount wagered as a proxy for gambling intensity (which some studies have used as a proxy for problem gambling). However, previous studies have shown that amount wagered does not account for all the variance in gambling intensity (Auer & Griffiths, 2014; Auer, Schneeberger & Griffiths, 2012), and players with high gambling intensity may not necessarily be problem gamblers.

It should also be noted that personal information about players is not shared between the five gambling websites from which the data in the present study were derived. Therefore, players could theoretically gamble on more than one platform. The present authors did not have access to personalized data such as names or addresses so this limitation could not be addressed. The present authors believe that an experimental design in a real-world setting is the best way to study responsible gaming tools. However, even then, there are factors which cannot be controlled for. In their experimental study with real-world players, Auer and Griffiths (2016) reported that not all players opened an email or navigated to a site which contained their personalized information. It should also be noted that the present study did not use a matched pairs design because all the players on the five sites received personalized feedback. However, the present authors would argue that it is important to test responsible gaming tools such as personalized feedback in real-world settings because ultimately this is the environment where such tools will be implemented. Three real-world in-session pop-up message studies (Auer & Griffiths, 2014, 2015a, 2019) have shown that the efficacy of responsible gambling tools is much lower compared to findings in laboratory studies (Kim et al., 2014; Wohl et al. 2013, 2014). Online gambling operators can never be aware of all the factors and circumstances influencing the gambling of their clientele. The present study was conducted with Swedish players who gambled on five Swedish sites. Although the results support two previous studies' findings (conducted with Austrian and Norwegian players), it is important that similar studies are conducted in other countries and regions.

Conclusions

To the present authors' knowledge, this is the first real world online gambling study that has investigated the effects of personalized feedback in the form of personalized messages on actual gambling behavior within real-world online gambling websites. The study takes into account many of the findings from previous research, such as presenting information in a non-confrontational way (e.g., Miller & Rollnick, 1991) and displaying them in an appealing and HCI-inspired interactive environment (Wohl et al., 2010; Wohl et al., 2014). The findings from two previous studies (Auer & Griffiths, 2015b; 2016) which used a matched pairs design and a randomized experimental design are also supported along with assumptions by several previous

studies claiming that personalized feedback can reduce gambling intensity (Monaghan et al., 2007; 2009; 2010a; 2010b).

Future research should also combine behavioral data with self-reported problem gambling and investigate the effect of personalized messages on problem gambling. Further insights could also be gained by additional qualitative information, such as reasons for playing, use of multiple operators, and the attitude towards personalized messages. In the present study each message effect was studied. However, players who receive multiple messages might react differently, and the effect of messages might change over time. The mode of display could also be important and should be subject to future research. It could make a difference if players receive messages online within the game, via smartphone or email.

Online gambling operators have the technical capabilities to introduce behavioral feedback systems such as the one described in the present study, and the results presented here suggest that the desired effect of helping players limit the amount of money spent gambling can be achieved. Future research should investigate behavioral feedback in more detail in order to better determine which player attributes (e.g., personality traits, beliefs about the nature of games, motivations to gamble, etc.) are associated with positive behavioral changes and whether there are interactions with other variables such as types of games played or intensity of gambling. Furthermore, research should continue to focus on investigating the efficacy of personalized messages, and more specifically, at which point in time players should receive messages to best optimize behavioral change. Taken as a whole, the findings will be of interest to a number of different stakeholders including the online gambling industry, gambling regulators, policymakers, and researchers.

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Figure 1: Number of messages (x-axis) and number of players (y-axis) between 14 July 2019 and 8 January 2020

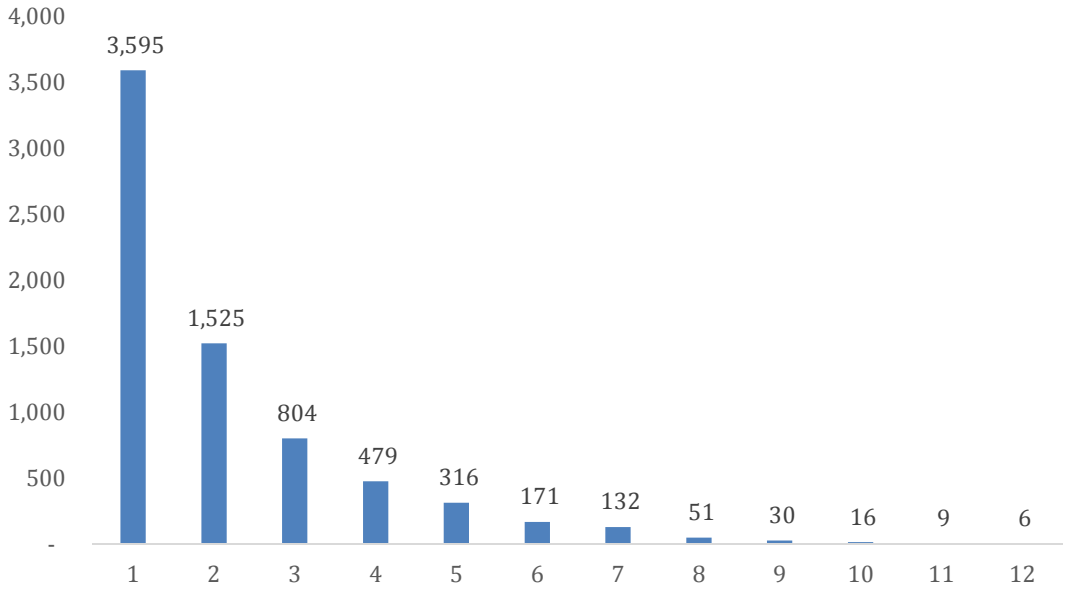

Table 1: Risk distribution of players at the time of message reading

Risk Type	N	%
No risk	4747	67%
Low risk	1425	20%
Medium risk	572	8%
High risk	390	5%

Table 2: Number of sent and read messages between 14 July 2019 and 8 January 2020

	Message Name	N	%
1	High losses	1733	11%
2	High deposit amount	1916	12%
3	Increased bet amount	722	5%
4	Increased deposit amount	735	5%
5	High playing frequency	2417	16%
6	High playing duration	2782	18%
7	Increased playing frequency	1681	11%
8	Increased playing duration	685	4%
9	Winning streak	489	3%
10	Withdrawal recommendation	291	2%
11	Deposit limit recommendation	2061	13%
		15512	

Table 3: Effect of messages on amount bet on the day the message was read compared to the daily bet seven days before the message was read

	N	Effect with respect to amount of money gambled on day messages was read	Average daily amount of money gambled seven days before message was read	Z-value	*p*
High losses	1733	71%	9293	17.7	<0.001
High deposit amount	1916	64%	8052	11.9	<0.001
Increased bet amount	722	65%	2287	8.0	<0.001
Increased deposit amount	735	63%	2410	7.3	<0.001
High playing frequency	2417	64%	1128	13.8	<0.001
High playing duration	2782	65%	2362	15.4	<0.001
Increased playing frequency	1681	60%	842	8.3	<0.001
Increased playing duration	685	66%	1105		<0.001

				8.5	
Winning Streak	489	59%	10626	4.1	<0.001
Withdrawal Recommendation	291	54%	7601	1.2	0.10
Deposit Limit Recommendation	2061	67%	2805	15.7	<0.001
	15512	65%		36.5	<0.001

Table 4: Effect of messages on amount bet seven days after the message was read compared to amount bet seven days before the message was read

	N	Effect on the total amount bet seven days after a messages was read	Average daily bet seven days before message was read	Z-value	*p*
High Losses	1733	71%	9293	17.4	<0.001
High Deposit Amount	1916	61%	8052	9.7	<0.001
Increased bet amount	722	59%	2287	5.0	<0.001
Increased deposit amount	735	57%	2410	3.9	<0.001
High playing frequency	2417	56%	1128	6.3	<0.001
High playing duration	2782	59%	2362	9.4	<0.001
Increased playing frequency	1681	52%	842	1.7	0.04

Increased playing duration	685	54%	1105	2.0	0.02
Winning streak	489	59%	10626	4.1	<0.001
Withdrawal recommendation	291	57%	7601	2.5	<0.001
Deposit limit recommendation	2061	62%	2805	11.0	<0.001
	15512	60%		23.7	<0.001

Table 5: Effect of messages grouped by the four risk categories

Risk category	N	Effect with respect to amount bet on day messages was read	Z-value	*p*	Effect on the total amount bet seven days after a messages was read	Z-Value	*p*	Average daily bet seven days before message was read
No risk	8392	66%	29.6	<0.001	61%	20.8	<0.001	3 275
Low risk	3833	65%	18.3	<0.001	58%	10.5	<0.001	1 926
Medium risk	1899	63%	11.5	<0.001	58%	6.7	<0.001	3 873
High risk	1388	57%	5.6	<0.001	54%	3.0	<0.001	12 533
	15512	65%	36.5	<0.001	60%	23.7	<0.001	

Table 6: Logistic regression with binary effect (amount of money gambled on the day was message read lower/higher than average daily bet seven days before) as dependent variable and gender and age as independent variables

	Estimate	Std. Error	t-value	*p*
Intercept	0.6475	0.0139	47	<0.001*
Gender	0.0044	0.008	0.55	0.58
Age	-1.59	0.00032	-0.05	0.96

Table 7: Effect of messages for players with highest amount lost and highest amount won seven days previous to message reading

Win/loss group	N	Effect with respect to amount bet on day a message was read	Z-value	*p*	Effect on the total amount bet seven days after a message was read	Z-value	*p*
High amount lost	218	76%	7.6	<0.001*	76%	7.6	<0.001
Normal	15113	64%	35.5	<0.001*	59%	22.4	<0.001
high amount won	181	70%	5.3	<0.001*	74%	6.4	<0.001
Total	15512	65%	36.5	<0.001*	60%	23.7	<0.001

The use of personalized messages on wagering behavior of Swedish online gamblers: An empirical study

Highlights

- Personalized messages (PMs) are used to prevent online gamblers over-spending money
- This study evaluated the efficacy of targeted PMs among 7134 online gamblers
- Gamblers bet significantly less money on the day they read a PM
- Gamblers bet significantly less money seven days after they read a PM
- PMs appear an effective tool in reducing gambling expenditure at online websites

The use of personalized messages on wagering behavior of Swedish online gamblers: An empirical study

Michael Auer[1] and Mark D. Griffiths[2]

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