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Examining Responsible Gambling Program Awareness and Engagement Trends and Relationships with Gambling Beliefs and Behaviors: A Three-Wave Study of Customers from a Major Gambling Operator

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Abstract
A considerable body of literature has examined elements of responsible gambling (RG) programs in land-based gambling venues. The present pre-registered study examines GameSense RG program awareness and engagement trends and relationships with gambling beliefs and behaviors, at MGM's U.S.-based casino properties using three samples of MGM's loyalty program members. We used a repeated cross-sectional approach including observational data collected from one sample ($N=3748$) shortly before the rollout of GameSense in 2017–2018, and from two samples collected 1 year ($N=4795$) and 2 years ($N=3927$) after the program's implementation. We found that awareness of the GameSense program increased between pre- and 1-year post-implementation, yet did not increase further at 2-years post-implementation. Bivariate analyses showed that respondents who were aware of more GameSense components had a better understanding of gambling concepts and used more RG strategies, whereas respondents who engaged with GameSense used more RG strategies than those who did not, but did not display a better understanding of gambling concepts. The relationship between GameSense awareness and self-reported use of RG strategies remained significant in multivariate analyses with covariates. Moderation analyses indicated that a positive effect of overall GameSense engagement on gambling literacy was only found for respondents who had attended a regional property, as compared to respondents who attended Las Vegas or metropolitan properties. All effect sizes were weak, which suggests that practical impacts of the program currently are limited. Our findings have implications for research on land-based RG programs and we provide recommendations for enhancing such programs.

Keywords Gambling · Responsible gambling · Land-based responsible gambling programs · Gambling information centers · Repeated cross-sections

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Introduction

Responsible gambling (RG) initiatives have proliferated around the world (Fiedler, Kairouz & Reynolds, 2021; GameSense, 2021; Ji & Kale, 2020; van der Maas, Nower & Saniewski, 2021; Svenska Spel, 2015). Researchers have begun to complete independent evaluations of popular RG programs to help determine the impact of programs elements on individuals and communities (Abarbanel et al., 2019; Boutin et al., 2009; Finkenwirth et al., 2021; Hing et al., 2018; Mouneyrac et al., 2017; see reviews in Forsström et al., 2020 and Ladouceur, Shaffer, Blaszczynski, & Shaffer, 2017). Yet, much remains to be done. RG programs are important for public health because they are designed to educate gamblers about positive gambling beliefs and are intended to reduce the potential for gambling-related harm (Blaszczynski et al., 2004, 2011). GameSense[1] is a branded RG scheme originally developed by the British Columbia Lottery Corporation to provide RG programming in land-based casinos in Canada (BCLC, 2021). The GameSense program comprises several program features designed to encourage RG, including GameSense Advisors who discuss potentially risky play and assistance for gambling problems with patrons, brochures about how gambling games work and support resources, referrals to the voluntary self-exclusion (VSE) program, and information about help resources such as the state gambling helpline (MGC, 2021). Gambling operators and regulators have implemented programs such as GameSense to promote player safety, respond to regulatory requirements, and enhance corporate social responsibility in recent years (Fiedler et al., 2021; Shaffer et al., 2019). MGM Resorts International (MGM), for example, implemented GameSense in all of its U.S.-based properties in 2017.

Despite the large scope and presence of the GameSense program in U.S. casinos, its implementation was—prior to the launch of the present research program—studied only at a single casino site (e.g., Gray, Juliver, et al., 2021; Gray, LaPlante, et al., 2021). Louderback, Gray, et al. (2021) was the first study to examine the implementation of the GameSense program across multiple casinos. Moreover, no studies to our knowledge have examined: (1) population-based trends in RG program effectiveness over time across multiple casino sites or (2) how different property types (i.e., regional casinos vs. metropolitan casinos vs. Las Vegas casinos) might vary in terms of perceived RG program effectiveness among patrons. To fill these gaps in the literature, the present observational study[2] examines awareness of and engagement with the GameSense RG program—and associations with gambling beliefs and behaviors—at MGM's U.S.-based properties using three cross-sectional samples of MGM's loyalty program members, including data collected from one sample ($N=3,748$) shortly before the rollout of GameSense and from two samples collected 1 year ($N=4,795$) and 2 years ($N=3,927$) after the program's implementation.

[1] Casino operators can decide on the different RG program elements within the GameSense brand that they would like to include. These elements range from a more limited version with an RG video kiosk that shows educational videos, to the more comprehensive version implemented at MGM's U.S.-based properties, which includes educational brochures about how gambling works, GameSense Advisors who are trained to help educate patrons, and referral resources for at-risk gamblers (e.g., for the voluntary self-exclusion program).

[2] Importantly, we collected observational data from cross-sectional samples and not a longitudinal panel sample, so our findings should not be assumed to represent causal relationships. We discuss this point in more detail in the Discussion section.

Background

RG Programs and the GameSense RG Program

RG programs have proliferated worldwide since the development of the Reno model (Blaszczynski et al., 2004), which provides standards for effective multi-modal RG programs for gambling operators. Many RG programs are voluntary, but RG programs also have been developed and implemented in response to regulator directives (e.g., the Massachusetts Gaming Commission [MGC]). Some research has reviewed existing studies on RG programs[3] (Beckett et al., 2020; Forsström et al., 2020; Ladouceur et al., 2017). In the most recent review article, Forsström et al. (2020) examined 28 studies of RG educational and consumer protection features, showing that only personalized feedback tools and long-term educational programs were effective in influencing gambling behavior. Another review by Ladouceur et al. (2017) included 29 methodologically rigorous studies on different RG features with gamblers in real-world environments (e.g., surveying casino patrons). They observed that the most studied RG features were self-exclusion, behavioral characteristics (e.g., tracking of potentially risk play), setting gambling limits for time and/or money spent, specific RG features (e.g., popup warning messages on Electronic Gaming Machines [EGM]), and gambling operator staff responding to patron RG concerns (Ladouceur et al., 2017). These two reviews suggest that more research on land-based educational RG programs is needed, particularly for onsite RG programs such as GameSense. The present study's pre-registered analysis of three waves of primary data from MGM customers before and after the U.S.-based GameSense program provides a unique opportunity to contribute to empirical research in this area.

Despite its large scope and widespread implementation in both U.S.-based and Canadian land-based gambling venues, the GameSense program has been the focus of few studies examining customer perceptions and engagement (Gray et al., 2020; Louderback, Gray, et al., 2021; Zhou et al., 2019). In a lab-based experimental study, Zhou et al. (2019) found that GameSense-branded animated videos helped college students to enhance their gambling knowledge, and reduced their gambling fallacies and intentions to continue gambling. Gray et al. (2020) examined the programs' reach among actual patrons at a MA casino, finding that although program reach was low overall (approx. 1% of daily patrons spoke with GameSense Advisors), patrons who did speak with GameSense Advisors had positive opinions about them and their presence at the casino. Finally, Louderback, Gray, et al. (2021) examined the GameSense program at 21 MGM casinos in the United States and found that general awareness of GameSense was low (i.e., ~ 10%), and engagement with the program (operationalized as picking up a GameSense brochure) was even lower (~ 2%). Their study also showed that patrons who picked up a GameSense brochure were slightly more likely to report using more RG strategies while gambling.

[3] Another review article by Beckett et al. (2020) examined research on RG training among employees of land-based gambling venues in 22 included studies, yet the present study is on customer experiences only and is not focused on gaming industry employees.

RG Programs: Examining Change Over Time

Research on RG features like those in the GameSense program has primarily relied on cross-sectional data from one sample, instead of pre- and post-analysis with data from multiple time points. Two exceptions include experimental studies that have examined such features on gambling knowledge and behavioral outcomes. For example, Wohl et al. (2013) found that slot machine players who viewed a 3-min educational video about how gambling works and the actual odds of winning were less likely to hold erroneous gambling cognitions and more likely to adhere to financial limits at follow-up. Similarly, Jonsson et al. (2020) showed that gamblers who received telephone or letter-based motivational RG interventions had lower gambling losses at 1-year follow up, and those who received the telephone intervention took more RG actions (e.g., taking a break, limit setting) at follow up. Although these studies did not evaluate the GameSense program directly, the former study did include graphical elements similar to the GameSense brochures that educate about how gambling works, and the latter included motivational elements similar to those used by GameSense Advisors who seek to motivate patrons to gamble in healthier ways within their own personal limits for money and time. However, to our knowledge, there have been no in vivo studies that have examined the effects of actual RG features similar to those in the GameSense program across time.

The Present Study

In the present study, we conducted a large-scale, three-wave survey of members of MGM Resorts International's (MGM) M life loyalty program to measure levels of awareness of and engagement with the GameSense RG program, as well as its associations with six validated measures of gambling beliefs and behaviors. This data is unique, as MGM provided our research team access to their M life program participants. We analyzed three repeated cross-sectional survey datasets collected prior to (i.e., "Year 1" data; $N = 3748$) and following (i.e., "Year 2" data; $N = 4795$; and "Year 3" data; $N = 3927$) the implementation of the GameSense program at MGM properties in the U.S. to evaluate the following pre-registered (https://osf.io/mn7hq) research questions and hypotheses:

Research Questions and Hypotheses

For H1 and H2, we hypothesized that the longer-term development of the GameSense program and greater potential customer exposure to the program would result in increases in awareness and engagement over time.

1. What is the level of awareness of GameSense over a three-year period?
    1. *H1.1: GameSense awareness will increase from Year 1 to Year 2.*
    2. *H1.2: GameSense awareness will increase from Year 2 to Year 3.*

2. How has customer engagement with GameSense changed over time following the program's implementation?

1. *H2*: *GameSense engagement will increase from Year 2 to Year 3*.

For H3 and H4, we hypothesized that due to the maturity of the program, including more employees trained in GameSense, expanded RG tool offerings and larger reach, there will be a positive association between GameSense awareness/engagement, and positive gambling beliefs and behaviors two years post-implementation. Knowledge about GameSense and its program components should be associated with healthier gambling beliefs and behaviors (e.g., better understanding of odds and how gambling works, higher scores on the Positive Play Scales), and more limited gambling involvement. We also hypothesized that there will be a negative association between GameSense awareness/engagement and potentially risky gambling behaviors (i.e., depth and breadth of gambling involvement; LaPlante et al., 2014).

3. What is the relationship between GameSense awareness, and gambling beliefs and behaviors, three years[4] after the program's implementation?

    1. *H3.1: GameSense awareness will be positively associated with measures of healthier gambling beliefs and behaviors (i.e., Positive Play Scale: behavior, Positive Play Scale: gambling literacy, understanding of gambling concepts, and use of responsible gambling strategies) three years after the program's implementation.*
    2. *H3.2: GameSense awareness will be negatively associated with frequency of gambling (i.e., depth) and the number of different gambling games played (i.e., breadth) three years after the program's implementation.*

4. What is the relationship between GameSense engagement, and gambling beliefs and behaviors, three years after the program's implementation?

    1. *H4.1: GameSense engagement will be positively associated with measures of gambling beliefs and behaviors (i.e., Positive Play Scale: behavior, Positive Play Scale: gambling literacy, understanding of gambling concepts and use of responsible gambling strategies) three years after the program's implementation.*
    2. *H4.2: GameSense engagement will be negatively associated with frequency of gambling (i.e., depth) and the number of different gambling games played (i.e., breadth) three years after the program's implementation.*

5. Are there differences in the relationship between GameSense engagement, and gambling beliefs and behaviors, across property types (i.e., regional casinos vs. metropolitan casinos vs. Las Vegas casinos)?

    1. *Given the exploratory nature of this research question, we have not formulated any hypotheses*.

[4] We use the time period of "three years" in research questions 3 and 4 as an approximation of the time between when GameSense was implemented at each property and the conclusion of the Year 3 customer survey data collection. Due to slight differences in the GameSense implementation process across properties, the actual duration might not be exactly 3 years for all properties.

Methods

We pre-registered our study protocol and analysis plan on the Open Science Framework ([OSF]; https://osf.io/mn7hq) after data collection but before data analysis. We analyzed data collected in January, February, and March of 2020 (i.e., Year 3); February and March of 2019 (i.e., Year 2); and in Fall 2017 (i.e., Year 1) from surveys of customers who were part of the MGM's M life loyalty program in the United States.

Data Collection

This study is part of a longitudinal, multi-site and multi-method analysis of the GameSense program and its implementation in the United States (see our Year 2 OSF project folder here: https://osf.io/pu6hc/ and our Year 3 OSF project folder here: https://osf.io/c5ef6/). The pre-registration document at the link above and the project folders provide more detailed information about the methodology and data collection for the three waves of data collection, and much of this information is included in this section as well.

For Year 1, during Fall 2017, prior to the rollout of GameSense at MGM properties, MGM's Direct Marketing team e-mailed potential participants and invited them to complete the survey. For some MGM properties, the team invited the entire M life participant database; for others, they created a participant pool that was demographically representative and randomly selected potential respondents from this pool for this study. The Direct Marketing team sent the email via the Qualtrics survey platform on behalf of "a team of researchers from the University of Nevada, Las Vegas" who were "working with MGM to complete an evaluation of GameSense, an RG program." No incentive was provided for participation in the survey. The University of Nevada, Las Vegas Institutional Review Board approved the study protocol.

A second year of data collection (i.e., Year 2) was conducted during February and March of 2019, ~ 16 months after the initiation of the GameSense RG program at MGM properties other than Springfield, Massachusetts (MA) and ~ 6 months after the opening of the MGM Springfield, MA property in August 2018. MGM's Direct Marketing department emailed a survey to M life loyalty program subscribers.

A third year of data collection (i.e., Year 3) was conducted in January, February, and March of 2020, ~ 28 months after the rollout of GameSense at MGM properties other than Springfield and ~ 18 months after the opening of the Springfield property/implementation of GameSense there, when MGM's Direct Marketing team e-mailed potential respondents and invited them to complete a survey.

Participants

The MGM Direct Marketing team sent the survey invitation to 73,799 M life subscribers in Year 1, 105,814 in Year 2, and 130,000 in Year 3. Respondents were informed that the survey would take 10–15 min and that they were eligible to take the survey because they were members of the M life program. A reminder email was sent out ~ 1 week after the original survey invitation for each year. Sample sizes and response rates were 3748/5.1% in Year 1, 4795/4.5% in Year 2, and 4336/3.4% in Year 3. In Year 3, we excluded respondents who only attended either the MGM Northfield Park casino and/or the MGM Empire

City casino, and/or MGM corporate properties,[5] resulting in an analytic sample of 3927 respondents for Year 3. We compared the overlap between survey respondents for each year by examining IP addresses,[6] and most respondents did not appear in multiple samples. Therefore, we treated each year's sample as independent samples. Because this is an observational study, we did not use any randomization and the results should be understood within the study design.

Measures

We summarize all variables below. Readers can refer to the "Year 1 Customer Survey", "Year 2 Customer Survey", and "Year 3 Customer Survey" documents in the associated OSF project folders for more information. For all measures, respondents who selected "Prefer not to answer" or "Prefer not to say" for any survey question were coded as missing for that particular question.

GameSense Awareness/Engagement

Respondents were asked, "Have you heard of GameSense?" (i.e., general GameSense awareness). Those who answered affirmatively were asked whether they were aware of specific components of the GameSense program, including the (1) gambling helpline, (2) GameSense advertising materials, (3) GameSense Advisors, and (4) brochures.[7] Respondents who indicated that they were aware of GameSense Advisors and brochures were asked if they had engaged with them (i.e., "Have you spoken to a GameSense Advisor onsite at MGM properties?" and "Have you picked up the brochures that talk about responsible gambling?"). We coded all "yes" responses as "1" and all "no" responses as "0". We coded "0" for the four components if respondents indicated that they were not familiar with GameSense generally.

GameSense Component Awareness

To measure GameSense component awareness, we summed the responses to the four GameSense component awareness measures. The resulting measure had a range of 0–4, with higher values indicating awareness of more GameSense components.

[5] The first two properties were added in the Year 3 survey because they were purchased by MGM between the Year 2 and Year 3 data collection periods, yet they did not have the GameSense program in place at the time of the survey. Moreover, MGM corporate is not a gambling venue. For these reasons, we pre-registered our intent to exclude respondents who only visited any of these three properties.

[6] We observed that 16 Year 3 participants' IP addresses appeared in the Year 1 dataset, and 55 appeared in the Year 2 dataset. This indicates a very small degree of overlap in the study samples from year-to-year, so we treated them as repeated cross-sections and independent samples.

[7] The survey also included questions about whether respondents were aware of or had used the VSE program. However, because so few respondents reported that they had taken part in the VSE program (e.g., 4 respondents in Year 2), we decided to omit both VSE variables from our analyses. Moreover, these individuals would have been VSE program participants *prior* to the data collection for each respective year, because all individuals on the VSE list are excluded from M life marketing email communications.

Overall Summed GameSense Engagement

To measure GameSense component awareness, we summed the responses to the two GameSense component engagement measures. The resulting measure had a range of 0–2, with higher values indicating engagement with more GameSense components.

Gambling Beliefs/Behaviors

We measured six variables tapping gambling beliefs and behaviors, including: (1) Positive Play Scale: Behavior, (2) Positive Play Scale: Gambling Literacy, (3) use of RG strategies, (4) understanding of gambling concepts, (5) frequency of gambling in the past year and (6) number of different gambling games played.

Positive Play Scale: Behavior (7 items)

Positive Play Scale (PPS): behavior was measured as a mean scale of seven Likert-type questions tapping the concept of RG behaviors based on the validated measure in Wood et al. (2017). Responses ranged from 1 (never) to 7 (always). The questions included different RG behaviors, such as "I considered the amount of MONEY I was willing to lose BEFORE I gambled" and "I considered the amount of TIME I was willing to spend BEFORE I gambled." The alphas were 0.86 for Year 1, 0.85 for Year 2, and 0.81 for Year 3.

Positive Play Scale: Gambling Literacy (3 items)

We adapted this subscale from the original PPS, created by Wood et al. (2017). Each respondent answered three questions related to beliefs regarding gambling literacy, with responses ranging from 1 (never) to 7 (always). The questions included different RG beliefs, such as "If I gamble more often, it will help me win more than I lose." (reverse coded) and "Gambling is not a good way to make money." These three items were averaged to create a scale. The alpha for Year 1 was 0.51, for Year 2 was 0.49 and for Year 3 was 0.52.

Use of RG Strategies (6 Items)

We presented the following question: "Some people use strategies to keep their gambling within personally affordable limits. Which of these strategies, if any, have you used in the past year?" Respondents answered "Yes, I did this" or "No, I didn't do this" for seven RG strategies (e.g., "I didn't spend more than I planned to"; "I left the casino while I was ahead"; "I took a break to cool off"). To construct our measure of use of RG strategies, we coded yes as "1" and no as "0", and then summed the responses to all six questions for each respondent (possible range = 0–6, with higher scores indicating greater use of RG strategies). Respondents who selected "None of the above" were coded as "0" for this measure.

Understanding of Gambling Concepts (7 Items)

We measured understanding of gambling concepts by summing the correct responses to seven true/false questions that tap respondents' comprehension of how gambling works, such as the illusion of control and the independence of random events. We coded correct responses as "1" and incorrect responses as "0", and then summed the responses to all seven questions for each respondent (possible range = 0–7, with higher scores indicating better understanding of gambling concepts).

Frequency of Gambling in the Past Year (1 Item)

We measured the depth of gambling involvement by using a question that asked respondents to report their frequency of gambling in the past year. Response categories ranged from "I never gamble" which we coded as "1" to "Daily" which was coded as "6".

Number of Different Gambling Games Played (1 Item)

We measured the breadth of gambling involvement by using a question that asked respondents to report the types of gambling games that they play. Respondents were asked to select all items that applied for the following question: "When you gamble, what games do you play?", with response options including "Poker, Table Games (e.g., blackjack, roulette, craps), Bingo, Slot machine games, Sports betting, Race betting, Lottery, Other games: _____". To create a measure of the breadth of gambling involvement, we summed the number of games endorsed, with a possible range from 0 to 7. To ensure that we include gambling games with a common format across properties and to limit the maximum possible value for this variable to 7, we did not include the "Other games: _____" response option in our calculation of this measure. Respondents who did not select any games were coded as "0" for this measure.

MGM Properties Attended

Respondents were asked to report which MGM properties that they had visited in the prior 12 months, using a multiple-selection drop-down menu. In the Year 2 and Year 3 surveys, respondents who selected "MGM Springfield" were asked to keep this property in mind when they answered the survey questions.

Property Type Attended

Based on the MGM properties attended variable, we created three new variables that identify the type of property each participant attended based on the Year 3 survey responses. We created a variable equal to "1" if a respondent attended one or more regional casinos (i.e., Beau Rivage, MGM Springfield,[8] Northfield Park, Gold Strike or Grand Victoria) and

[8] As described in Louderback, Gray, et al. (2021), the way GameSense is implemented in the Springfield, MA casino is meaningfully different from the way it is implemented in MGM casinos outside MA, including these four other regional properties. These analyses should be understood within this context and the results are described with this program element consideration in the Discussion section.

"0" if they only attended other MGM properties. Next, we created a variable equal to "1" if a respondent visited a metropolitan casino (i.e., MGM National Harbor, Borgata, Empire City Casino or MGM Grand Detroit) and equal to "0" if a respondent only attended other MGM casinos. Finally, we created a variable equal to "1" if a respondent attended one or more MGM properties in Las Vegas (i.e., Bellagio, New York New York, Aria, Luxor, Vdara Hotel & Spa, Excalibur, MGM Grand Las Vegas, Circus Circus, The Signature at MGM Grand, Mirage, Monte Carlo, Park MGM [including the T-Mobile Arena], Mandalay Bay or Delano Las Vegas) and equal to "0" if a respondent attended only non-Las Vegas MGM properties.

Control Variables

We measured five control variables: (1) age, (2) gender, (3) race/ethnicity, (4) educational attainment, and (5) total number of MGM properties visited in the past 12 months. We include controls for demographic variables because gambling behavior has been found to vary across demographic groups (Gainsbury et al., 2012; Potenza et al., 2006). We control for the total number of MGM properties visited in the past 12 months because research has shown that one's exposure to varying amounts of opportunities to gamble can influence gambling behaviors (e.g., St-Pierre et al., 2014).

Analytic Strategy

All analyses were conducted in R version 3.6.2. We first calculated descriptive statistics including the mean, median, standard deviation, and range for all continuous variables. Next, we calculated bivariate Spearman correlations for variables later included in multivariate models. For the multivariate regression models, we analyzed the outcome variables using an ordinary least squares (OLS) regression approach and checked that necessary statistical assumptions and conditions (i.e., lack of excessive multicollinearity, absence of influential outliers, homoscedasticity and normality of errors, and a continuous outcome variable without extreme skewness) were met. We tested for multicollinearity in each model with Variance Inflation Factors (VIFs) and no VIFs exceeded the >4 criteria described in Hair et al. (2010).

To test how levels of GameSense awareness might have varied over time, we used five 2 X 3 Chi-square tests, with year on the columns (i.e., Year 1, Year 2, and Year 3), and general GameSense awareness and each of the four specific GameSense awareness components on the rows. We next examined pairwise comparisons to compare proportions for each year (i.e., Y1 vs. Y2 and Y2 vs. Y3) and we used the Holm approach to correct for multiple comparisons.

To test how levels of GameSense engagement might have varied over time following the program's implementation, we used two 2 X 2 Chi-square tests, with year on the columns (i.e., Year 2 and Year 3) and the two specific GameSense engagement measures on the rows (i.e., engaged with GameSense brochures/Advisors and did not engage with GameSense brochures/Advisors). We next examined pairwise comparisons with the Holm correction to compare proportions for Y2 vs. Y3.

To test how GameSense awareness is related to measures of gambling beliefs and behaviors three years following the rollout of GameSense using the Year 3 customer survey data (H3.1 and H3.2), we first examined the bivariate correlations between general GameSense awareness, GameSense component awareness, and (1) PPS: behavior, (2) PPS: gambling

literacy, (3) understanding of gambling concepts, (4) use of RG strategies, (5) frequency of gambling in the past year and (6) number of different gambling games played. Next, to determine if each relationship was robust to the addition of covariates, we fit twelve separate linear regression models. The first six models included general GameSense awareness as the predictor; age, gender, race/ethnicity, educational attainment, and total number of MGM properties visited in the past 12 months as the control variables; and each of the six gambling belief and behavior measures as outcome variables. Models 7 through 12 included the same control variables and outcome variables, but instead included the GameSense component awareness as the predictor variable.

To test how GameSense engagement is related to measures of gambling beliefs and behaviors three years following the rollout of GameSense using the Year 3 customer survey data, we first examined the bivariate correlations between overall summed GameSense engagement, and (1) PPS: behavior, (2) PPS: gambling literacy, (3) understanding of gambling concepts, (4) use of RG strategies, (5) frequency of gambling in the past year and (6) number of different gambling games played. Next, to determine if each relationship was robust to the addition of covariates, we fit six separate regression models. These six models included overall summed GameSense engagement as the predictor, age, gender, race/ethnicity, educational attainment, and total number of MGM properties visited in the past 12 months as the control variables, and each of the six gambling belief and behavior measures as outcome variables.

Finally, to test if the magnitude of the relationship between GameSense engagement, and gambling beliefs and behaviors, varies across property types, we conducted multivariate exploratory analyses using the Year 3 customer survey data. First, we fit the same six multivariate regression models described in the previous paragraph for RQ4 with the addition of the dummy variable for regional properties, and an interaction term between overall GameSense engagement and the dummy variable for regional properties. Second, we fit the same six multivariate regression models described above for RQ4 with the addition of the dummy variable for metropolitan casinos, and an interaction term between overall GameSense engagement and the dummy variable for metropolitan casinos. Third, we estimated the same six multivariate regression models described above for RQ4 with the addition of the dummy variable for Las Vegas casinos, and an interaction term between overall GameSense engagement and the dummy variable for Las Vegas casinos. The total number of regression models was 18. We did not correct for multiple comparisons because we were not evaluating a confirmatory hypothesis and corrections for multiple comparisons (e.g., Bonferroni) can be overly conservative for this type of exploratory research question (Bender & Lange, 2001).

Covariates and Significance Criteria

We used five measures as covariates in multivariate models: (1) an ordinal measure of age, categorical measures of (2) gender and (3) race/ethnicity, (4) an ordinal measure of educational attainment, and (5) an integer measure of the total number of MGM casinos visited in the past 12 months. More details about the coding of these variables are provided in this study's pre-registration. We regarded p-values of $p < 0.05$ as criteria for statistically significant results. All reported p-values were based on two-tailed tests of significance.

Table 1 Descriptive statistics for Year 3 ($N=3,927$)

	Valid *n*	Mean/Percent (*n*)	SD	Median	Minimum	Maximum
PPS: behavior	3341	6.20	1.02	6.57	1	7
PPS: gambling literacy	3193	6.12	1.08	6.67	1	7
Understanding of gambling concepts	3048	5.48	1.43	6	0	7
Use of RG strategies	3083	3.49	1.26	4	0	6
General GameSense awareness	2984	11.33 (338)				
GameSense component awareness	2984	0.24	0.81	0	0	4
Overall summed GameSense engagement	2984	0.02	0.16	0	0	2
Gambling Breadth (number of different gambling games)	3545	1.97	1.11	2	0	7
Gambling Frequency	3545					
I never gamble		0.71 (25)				
Less than once a month		43.22 (1532)				
Once a month		29.62 (1050)				
Once a week		13.26 (470)				
A few times per week		11.37 (403)				
Daily		1.83 (65)				
Gender	2704					
Male		54.29 (1468)				
Female		43.64 (1180)				
Self-identify		2.07 (56)				
Age	2810					
21 to 25		1.1 (31)				
26 to 34		5.52 (155)				
35 to 44		15.55 (437)				
45 to 54		20.60 (579)				
55 to 64		28.15 (791)				
65 to 74		23.67 (665)				
75 and Up		5.41 (152)				
Race/Ethnicity	3823					
White/Caucasian		55.60 (2126)				
Hispanic		4.24 (162)				
Black/African American		5.96 (228)				
Native American		0.42 (16)				
Asian		3.06 (117)				
Pacific Islander		0.42 (16)				
Other		1.20 (46)				
2 or more races/ethnicities		2.09 (80)				
No race/ethnicity identified		27.00 (1032)				
Educational attainment	2838					
Some high school or lower		1.30 (37)				
High school graduate or equivalent		12.72 (361)				
Some college		27.45 (779)				
Associate's degree		12.40 (352)				
Bachelor's degree		27.38 (777)				
Graduate degree or higher		18.75 (532)				
Number of MGM properties visited	3868	3.14	2.88	2	0	16

Table 1 (continued)

Race/ethnicity was collected as a multiple response variable. Descriptive statistics are reported for Year 1 in Gray, LaPlante, et al. (2021) and Year 2 in Louderback, Gray, et al. (2021). *PPS* = Positive Play Scale. *RG* = Responsible gambling. *SD* = Standard Deviation

Results

Planned Descriptive Analyses

Table 1 shows descriptive statistics. Five features of this table are important to note. First, about 1 in 10 (11.3%) respondents in Year 3 were aware of the GameSense program. Second, the means for GameSense component awareness ($M = 0.24$; $SD = 0.81$) and overall GameSense engagement were both low ($M = 0.02$; $SD = 0.16$), with ranges from 0–4 and 0–2, respectively. Third, respondents had generally high levels of understanding of gambling concepts ($M = 5.48$; $SD = 1.43$) and scored high on the two PPSs for behavior ($M = 6.20$; $SD = 1.02$) and gambling literacy ($M = 6.12$; $SD = 1.08$) on scales from 1–7. Fourth, most respondents tended to gamble once a month or less than once a month (73.55%), and respondents reported playing a limited number of game types, with a median breadth involvement value of 2 game types ($M = 1.97$; $SD = 1.11$). Fifth, the Year 3 sample was predominantly White/Caucasian (55.60%), with considerable proportions of Black/African American (5.96%), Hispanic (4.24%), and Asian (3.06%) respondents.

Confirmatory Analyses

Table 2 shows the percentages of respondents for each of the three waves who were generally aware of GameSense, aware of specific components of GameSense, and who engaged with GameSense. The Year 1 to Year 2 comparisons showed a significant increase from the pre-implementation to the post-implementation period for the GameSense awareness variables.

Specifically, in line with *H1.1: GameSense awareness will increase from Year 1 to Year 2,* we observed year-over-year increases between Year 1 and Year 2 in the proportion of respondents who were generally aware of GameSense (5.97% vs. 9.87%; χ^2 (2 df) = 54; $p < 0.001$; $V = 0.08$), aware of the gambling helpline (3.42% vs. 6.89%; χ^2 (2 df) = 52; $p < 0.001$; $V = 0.07$), aware of the GameSense advertising materials (3.21% vs. 6.75%; χ^2 (2 df) = 51; $p < 0.001$; $V = 0.07$), and aware of GameSense Advisors (0.98% vs. 3.48%; χ^2 (2 df) = 46; $p < 0.001$; $V = 0.07$). For *H1.2: GameSense awareness will increase from Year 2 to Year 3*, none of the Year 2 and Year 3 differences were significant. Also, contrary to *H2*: *GameSense engagement will increase from Year 2 to Year 3*, none of the year-over-year differences between Year 2 and Year 3 were significant. Thus, only H1.1 was supported.

H3.1: GameSense awareness will be positively associated with measures of healthier gambling beliefs and behaviors (i.e., Positive Play Scale: behavior, Positive Play Scale: gambling literacy, understanding of gambling concepts, and use of responsible gambling strategies) three years after the program's implementation.

Table 3 shows the bivariate Spearman rank-order correlation analyses with all variables for Year 3. General GameSense awareness was significantly but weakly positively correlated with the use of RG strategies ($\rho = 0.07$), significantly but weakly negative correlated with PPS: gambling literacy subscale ($\rho = -0.04$), and unrelated to the PPS: behavior

Table 2 Frequencies for all three years of data collection (Y1: 2017, Y2: 2019 and Y3: 2020)

	Year 1	Year 2	Year 3	χ^2 (df)	Cramer's *V*	Y1 vs. Y2	Y2 vs. Y3
	% (*n*)	% (*n*)	% (*n*)			*p*-value	*p*-value
General GameSense awareness	5.97 (171)	9.87 (347)	11.33 (338)	54.00 (2)	0.08	< 0.001	0.06
Gambling helpline awareness	3.42 (98)	6.89 (240)	7.61 (227)	52.00 (2)	0.07	< 0.001	0.30
GameSense advertising materials awareness	3.21 (92)	6.75 (235)	7.14 (213)	51.00 (2)	0.07	< 0.001	0.60
GameSense Advisors awareness	0.98 (28)	3.48 (121)	3.35 (100)	46.00 (2)	0.07	< 0.001	0.80
GameSense brochure awareness	–	5.20 (181)	5.60 (167)	0.40 (1)	0.01	–	0.50
GameSense Advisor engagement	–	0.26 (9)	0.20 (6)	0.05 (1)	0.00	–	0.80
GameSense brochure engagement	–	2.38 (83)	2.18 (65)	0.20 (1)	0.01	–	0.60

Pairwise comparisons are adjusted for multiple comparisons with the Holm correction. Questions regarding GameSense brochure awareness, and GameSense Advisor and brochure engagement were only asked in Year 2 and Year 3

Table 3 Bivariate correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. PPS: behavior	–															
2. PPS: gambling literacy	0.18*	–														
3. Under. of gambling concepts	0.15*	0.28*	–													
4. Use of RG strategies	0.09*	−0.04*	−0.01	–												
5. Gambling frequency	−0.17*	−0.12*	−0.03	−0.03	–											
6. Breadth	−0.03	−0.02	0.03	0.05*	0.06*	–										
7. General GS awareness	0	−0.04*	0.03	0.07*	0.06*	0.01	–									
8. GS comp. awareness	−0.01	−0.02	0.04*	0.08*	0.05*	0.03	0.91*	–								
9. Overall GS engagement	0.01	0	0.03	0.05*	0.04	0.01	0.43*	0.49*	–							
10. Age	0.08*	0.14*	0.04*	−0.07*	0.07*	−0.19*	−0.08*	−0.07*	−0.01	–						
11. Male	−0.04*	−0.01	0.11*	0.02	0.04	0.21*	0.04*	0.03	0	−0.02	–					
12. Black	−0.03	−0.07*	−0.11*	0	0.04*	−0.05*	0.01	0.03	0.03	−0.07*	−0.18*	–				
13. White	0.08*	0.13*	0.18*	0	−0.07*	0.09*	−0.01	0.01	−0.01	0.19*	0.07*	−0.29*	–			
14. Hispanic	0.01	−0.02	−0.07*	0.01	−0.02	0.03	−0.02	−0.04*	0	−0.16*	0.02	−0.04*	−0.19*	–		
15. Asian	−0.06*	−0.05*	−0.09*	0.04	−0.02	−0.01	−0.02	−0.03	0	−0.09*	0.04	−0.03*	−0.19*	−0.02	–	
16. Educ. attainment	0	0.03	0.06*	0.04*	−0.09*	0.04*	0	0.01	0	−0.02	0.03	−0.04*	0.03	−0.03	0.07*	–
17. # of MGM properties visited	0.02	0.01	0.08*	0.08*	−0.04*	0.19*	0.03	0.04	−0.01	−0.18*	0.11*	−0.05*	0.21*	0.10*	0.06*	0.06*

*Correlation is significant at the $p < 0.05$ level (two-tailed). Correlations reported are nonparametric Spearman's rank-order correlation coefficients and were calculated with pairwise deletion. *PPS* = Positive Play Scale. *RG* = Responsible Gambling. *GS* = GameSense

subscale ($\rho = 0.00$) and understanding of gambling concepts ($\rho = 0.03$). A similar pattern emerged when we considered the overall sum of GameSense components of which respondents were aware, except that this measure was also significantly and weakly correlated with understanding of gambling concepts ($\rho = 0.04$), and not significantly correlated with the PPS: gambling literacy subscale ($\rho = -0.02$).

We examined relationships among variables other than GameSense awareness. The PPS: behavior subscale was negatively associated with frequency of gambling ($\rho = -0.17$) and positively associated with understanding of gambling concepts ($\rho = 0.15$). These same patterns were observed for the PPS: gambling literacy subscale. Educational attainment was positively associated with understanding of gambling concepts ($\rho = 0.06$) and use of RG strategies ($\rho = 0.04$), but the relationships were weak.

H3.2: GameSense awareness will be negatively associated with frequency of gambling (i.e., depth) and the number of different gambling games played (i.e., breadth) three years after the program's implementation.

Contrary to H3.2, general GameSense awareness was positively and weakly correlated with gambling frequency ($\rho = 0.06$), as was the sum of GameSense components of which respondents were aware ($\rho = 0.05$), but both measures were unrelated to the number of games played.

Turning to the multivariate analyses with covariates, Table 4 shows the results from the OLS regression models for Year 3 with predictors including general GameSense awareness and control variables, and outcome variables including the PPS: behavior (model 1), PPS: gambling literacy (model 2), understanding of gambling concepts (model 3), use of RG strategies (model 4), gambling frequency (model 5), and breadth involvement (model 6). The first four models further test H3.1, and the last two models further test H3.2. Table 4 also displays the models for GameSense component awareness and control variables with the same six outcome variables (models 7–12).

Model 4 shows that the positive relationship between general GameSense awareness and use of RG strategies remained significant when controlling for covariates (b = 0.204; SE = 0.077). Moreover, model 10 indicates that GameSense component awareness was still positively related with use of RG strategies (b = 0.097; SE = 0.029) when adding control variables. However, for both models, the effect sizes were small; respondents who were aware of GameSense more generally or who were aware of one additional GameSense component used fewer than one more RG strategy on average. Therefore, empirical support of H3.1 for general and GameSense component awareness, and use of RG strategies, was also found in the multivariate models. H3.2 was not supported.

H4.1: GameSense engagement will be positively associated with measures of gambling beliefs and behaviors (i.e., Positive Play Scale: behavior, Positive Play Scale: gambling literacy, understanding of gambling concepts and use of responsible gambling strategies) three years after the program's implementation.

H4.2: GameSense engagement will be negatively associated with frequency of gambling (i.e., depth) and the number of different gambling games played (i.e., breadth) three years after the program's implementation.

Whereas overall GameSense engagement was significantly and positively associated with use of RG strategies ($\rho = 0.05$) in the bivariate analyses, it was not significantly associated with other aspects of gambling beliefs/behaviors, or with frequency of gambling or number of games played in the bivariate analyses. These bivariate results provide partial empirical support for H4.1 and they do not support H4.2.

For the multivariate analyses testing H4.1, Table 5 presents the results from the OLS regression models with predictors including overall GameSense engagement and control

Table 4 OLS regression models of general GameSense awareness, GameSense component awareness, and gambling beliefs/behaviors

	PPS: behavior	PPS: gambling literacy	Understanding of GC	Use of RG strategies	Gambling frequency	Breadth involvement	PPS: behavior	PPS: gambling literacy	Understanding of GC	Use of RG strategies	Gambling frequency	Breadth involvement
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
General GS awareness	−0.016	−0.122	0.133	0.204*	0.230*	−0.018						
	(0.061)	(0.065)	(0.088)	(0.077)	(0.069)	(0.068)						
GS comp. awareness							0.002	−0.013	0.061	0.097*	0.069*	0.003
							(0.023)	(0.025)	(0.033)	(0.029)	(0.026)	(0.026)
Age	0.056*	0.102*	0.067*	−0.064*	0.061*	−0.127*	0.056*	0.104*	0.066*	−0.066*	0.058*	−0.126*
	(0.015)	(0.016)	(0.021)	(0.019)	(0.017)	(0.016)	(0.015)	(0.016)	(0.021)	(0.019)	(0.017)	(0.016)
Male	−0.036	−0.025	0.248*	−0.009	0.110*	0.391*	−0.037	−0.028	0.248*	−0.009	0.112*	0.390*
	(0.039)	(0.042)	(0.056)	(0.050)	(0.044)	(0.043)	(0.039)	(0.042)	(0.056)	(0.050)	(0.044)	(0.043)
Black	−0.079	0.041	−0.134	0.154	−0.073	−0.078	−0.080	0.039	−0.134	0.153	−0.072	−0.078
	(0.103)	(0.111)	(0.150)	(0.132)	(0.116)	(0.115)	(0.103)	(0.111)	(0.150)	(0.132)	(0.116)	(0.115)
White	0.161	0.411*	0.392*	0.162	−0.407*	0.119	0.161	0.410*	0.390*	0.160	−0.408*	0.119
	(0.085)	(0.091)	(0.124)	(0.108)	(0.096)	(0.095)	(0.085)	(0.091)	(0.124)	(0.108)	(0.096)	(0.095)
Hispanic	0.138	0.165	−0.204	0.094	−0.304*	0.026	0.139	0.168	−0.200	0.101	−0.303*	0.027
	(0.094)	(0.101)	(0.137)	(0.120)	(0.106)	(0.105)	(0.094)	(0.102)	(0.137)	(0.120)	(0.107)	(0.105)
Asian	−0.270*	0.045	−0.262	0.283*	−0.424*	−0.121	−0.269*	0.049	−0.263	0.281	−0.428*	−0.120
	(0.113)	(0.122)	(0.164)	(0.144)	(0.127)	(0.126)	(0.113)	(0.122)	(0.164)	(0.144)	(0.127)	(0.126)
Educ. attainment	0.033*	0.030*	0.042*	0.040*	−0.066*	0.020	0.033*	0.030*	0.042*	0.039*	−0.066*	0.020
	(0.014)	(0.015)	(0.020)	(0.018)	(0.016)	(0.015)	(0.014)	(0.015)	(0.020)	(0.018)	(0.016)	(0.015)
# of MGM props. visited	0.012	0.014*	0.028*	0.021*	0.009	0.048*	0.012	0.014	0.027*	0.021*	0.009	0.048*
	(0.007)	(0.007)	(0.010)	(0.009)	(0.008)	(0.007)	(0.007)	(0.007)	(0.010)	(0.009)	(0.008)	(0.007)
Constant	5.700*	5.190*	4.520*	3.400*	3.190*	2.070*	5.700*	5.170*	4.530*	3.400*	3.210*	2.070*
	(0.126)	(0.135)	(0.183)	(0.160)	(0.141)	(0.140)	(0.125)	(0.135)	(0.182)	(0.160)	(0.141)	(0.139)

Table 4 (continued)

	PPS: behavior (1)	PPS: gambling literacy (2)	Understanding of GC (3)	Use of RG strategies (4)	Gambling frequency (5)	Breadth involvement (6)	PPS: behavior (7)	PPS: gambling literacy (8)	Understanding of GC (9)	Use of RG strategies (10)	Gambling frequency (11)	Breadth involvement (12)
Observations	2,537	2,539	2,537	2,539	2,514	2,514	2,537	2,539	2,537	2,539	2,514	2,514
R^2	0.024	0.045	0.050	0.016	0.031	0.090	0.024	0.044	0.051	0.018	0.029	0.090
Adjusted R^2	0.020	0.042	0.047	0.013	0.027	0.087	0.020	0.040	0.047	0.015	0.026	0.087
Residual Std. Error	0.955 (df = 2527)	1.030 (df = 2529)	1.390 (df = 2527)	1.220 (df = 2529)	1.070 (df = 2504)	1.060 (df = 2504)	0.955 (df = 2527)	1.030 (df = 2529)	1.390 (df = 2527)	1.220 (df = 2529)	1.070 (df = 2504)	1.060 (df = 2504)
F Statistic	6.810* (df = 9; 2527)	13.300* (df = 9; 2529)	14.900* (df = 9; 2527)	4.700* (df = 9; 2529)	8.870* (df = 9; 2504)	27.500* (df = 9; 2504)	6.810* (df = 9; 2527)	12.900* (df = 9; 2529)	15.000* (df = 9; 2527)	5.150* (df = 9; 2529)	8.400* (df = 9; 2504)	27.500* (df = 9; 2504)

*$p < 0.05$. Cells contain unstandardized regression coefficients and standard errors. *PPS* = Positive Play Scale. *GC* = Gambling Concepts. *RG* = Responsible Gambling. *GS* = GameSense

Table 5 OLS regression models of overall GameSense engagement and gambling beliefs/behaviors

	PPS: behavior	PPS: gambling literacy	Understanding of GC	Use of RG strategies	Gambling frequency	Breadth
	(1)	(2)	(3)	(4)	(5)	(6)
Overall GS engagement	0.039	−0.016	0.223	0.245	0.302*	0.069
	(0.118)	(0.127)	(0.171)	(0.151)	(0.134)	(0.132)
Age	0.056*	0.105*	0.064*	−0.068*	0.056*	−0.126*
	(0.015)	(0.016)	(0.021)	(0.019)	(0.017)	(0.016)
Male	−0.037	−0.028	0.251*	−0.004	0.116*	0.391*
	(0.039)	(0.042)	(0.056)	(0.050)	(0.044)	(0.043)
Black	−0.080	0.038	−0.133	0.156	−0.071	−0.078
	(0.103)	(0.111)	(0.150)	(0.132)	(0.117)	(0.115)
White	0.161	0.410*	0.392*	0.163	−0.406*	0.119
	(0.085)	(0.091)	(0.124)	(0.109)	(0.096)	(0.095)
Hispanic	0.139	0.170	-0.210	0.086	−0.314*	0.027
	(0.094)	(0.102)	(0.137)	(0.121)	(0.107)	(0.105)
Asian	−0.269*	0.050	−0.267	0.275	−0.433*	−0.120
	(0.113)	(0.122)	(0.164)	(0.144)	(0.127)	(0.126)
Educ. attainment	0.033*	0.030*	0.042*	0.039*	-0.066*	0.020
	(0.014)	(0.015)	(0.020)	(0.018)	(0.016)	(0.015)
# of MGM props. visited	0.012	0.014	0.028*	0.022*	0.010	0.048*
	(0.007)	(0.007)	(0.010)	(0.009)	(0.008)	(0.007)
Constant	5.700*	5.170*	4.540*	3.430*	3.220*	2.070*
	(0.125)	(0.135)	(0.182)	(0.160)	(0.141)	(0.139)
Observations	2,537	2,539	2,537	2,539	2,514	2,514
R^2	0.024	0.044	0.050	0.015	0.029	0.090
Adjusted R^2	0.020	0.040	0.047	0.011	0.025	0.087
Residual Std. Error	0.955 (df = 2527)	1.030 (df = 2529)	1.390 (df = 2527)	1.220 (df = 2529)	1.070 (df = 2504)	1.060 (df = 2504)
F Statistic	6.820* (df = 9; 2527)	12.900* (df = 9; 2529)	14.800* (df = 9; 2527)	4.210* (df = 9; 2529)	8.170* (df = 9; 2504)	27.500* (df = 9; 2504)

*$p < 0.05$. Cells contain unstandardized regression coefficients and standard errors. *PPS* = Positive Play Scale. *GC* = Gambling Concepts. *RG* = Responsible Gambling. *GS* = GameSense

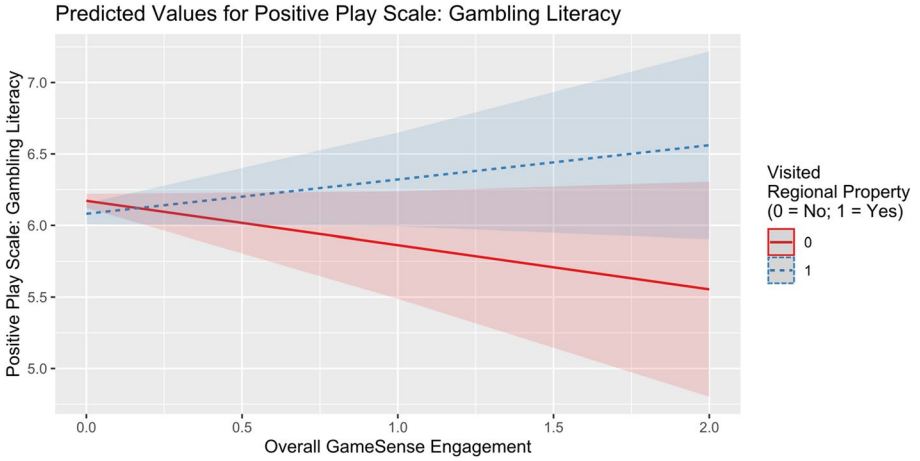

Fig. 1 Interaction of overall GameSense engagement and visited regional property dummy variable on the Positive Play Scale: gambling literacy outcome variable

variables, and outcome variables including the PPS: behavior (model 1), PPS: gambling literacy (model 2), understanding of gambling concepts (model 3), use of RG strategies (model 4), gambling frequency (model 5), and breadth involvement (model 6). These results reveal that the significant relationship between overall GameSense engagement and use of RG strategies from the bivariate analyses was not found after controlling for covariates. Thus, H4.1 and H4.2 were not supported in multivariate analyses.

Planned Exploratory Analyses

Next, we examined the exploratory research question with no pre-specified hypothesis: *Are there differences in the relationship between GameSense engagement, and gambling beliefs and behaviors, across property types (i.e., regional casinos vs. metropolitan casinos vs. Las Vegas casinos)?*. The full results for these models are reported in the Online Supplement for this article (see Supplemental tables 1-3 in Online Supplement). Across all 18 regression models with overall GameSense engagement, control variables, and an interaction term between overall GameSense engagement and each of the three property grouping variables (i.e., 6 models for each of the three groupings), the only model with a significant interaction term was for respondents who attended a regional property and the PPS: gambling literacy outcome variable. Specifically, these moderation results (see Fig. 1) indicate that respondents who had visited a regional property experienced a significant and positive association of overall GameSense engagement and the PPS: gambling literacy subscale, whereas respondents who only visited other property groups did not experience this same PPS-enhancing benefit.

Unplanned Exploratory Analyses

We also conducted one set of additional unplanned exploratory analyses in response to a reviewer request (see Supplemental tables 4-6 in Online Supplement). These analyses used the same approach as the planned exploratory analyses with interaction terms described immediately above, but instead included GameSense component awareness as the key predictor, with the three interaction terms across three sets of six models. Across all 18 models, we found that none of the GameSense component awareness and property type interaction terms were statistically significant, suggesting no differences in the association between GameSense awareness and gambling beliefs or behaviors across property types.

Discussion

Using data from three repeated cross-sectional surveys of subscribers to MGM's M life loyalty program collected between 2017 and 2020, we found that awareness of the GameSense RG program increased between pre- (i.e., Year 1) and post-implementation (i.e., Year 2), yet did not increase further two years post-implementation (i.e., Year 3). Levels of engagement with the program were generally low during both the post-implementation and two-year post-implementation follow-up period and did not increase further during this period.

We found evidence in bivariate analyses that respondents who were aware of or engaged with the program reported using more RG strategies, yet these relationships were weak and only the relationship between GameSense awareness and use of RG strategies remained significant in multivariate models with covariates. Multivariate analyses also showed that awareness of and engagement with the program were positively associated with frequency of gambling, potentially suggesting that more involved gamblers—who might be at greater risk of gambling-related problems (Binde et al., 2017; LaPlante et al., 2014)—are more likely to have knowledge of and to take part in elements of the GameSense program. As with the previous associations, these relationships were weak.

Moderation analyses showed that a weak positive effect of overall GameSense engagement on gambling literacy was found for respondents who had patronized a regional property, which tend to be smaller, repeater-market properties with fewer on-property entertainment options and a more localized customer base of potentially more frequent gamblers (Lucas & Kilby, 2008). Thus, it is possible that fewer distractions from other activities at such properties allows patrons to have more opportunities to gain awareness of and to engage with the GameSense program, which in turn might help promote healthier gambling beliefs. There might also be features of specific regional casinos that enhance awareness of and engagement with the program, as was shown in Louderback, Gray, et al. (2021), who found that the GameSense program at MGM Springfield had considerably higher awareness and engagement than at other MGM properties. These differences were partially explained by the fact that MGM Springfield uses a state-regulated model of the GameSense program with highly visible branding in a designated on-site GameSense RG information center and includes GameSense Advisors who wear conspicuously branded green shirts and walk the casino floor. Thus, it is possible that the GameSense program at the MGM Springfield, as a regional property, might explain part of the significant interaction findings for GameSense engagement and the PPS: gambling literacy subscale at regional properties.

An important caveat to these findings is the fact that fewer than 1% of respondents across all properties reported engaging with GameSense Advisors and less than 3% reported taking a GameSense brochure; in other words, engagement with the program was low even at Year 3. Likewise, observed effect sizes were generally quite small. Therefore, although we did observe many statistically significant differences for our planned analyses, the practical significance of the findings remains limited. This suggests that the GameSense program, as implemented in MGM casinos in the United States, likely needs meaningful revision to positively impact players' RG behaviors.

Practical Implications

Programs designed to encourage RG beliefs and behaviors should be subjected to routine evaluation to ensure that they are effective in achieving their goals. Otherwise, they risk misdirection of resources and the illusion of responsibility. The present study suggests that there might be limitations in land-based RG programs that rely on individual gamblers to either be passively exposed to RG messaging (e.g., helpline numbers on EGMs) or to take initiative to interact with RG materials or request help resources (e.g., picking up a brochure or speaking with a GameSense Advisor). However, our findings should not be interpreted to suggest that the GameSense program is limited in its impact on individuals who might be in need of help resources (e.g., an educational brochure on limit setting or money management skills) or who are in immediate distress due to gambling. Although we did not collect data on specific interaction instances, qualitative research on the GameSense program (Abarbanel et al., 2018) has shown that GameSense Advisors can build relationships with frequent gamblers and intervene with at risk gamblers; therefore, it is important to recognize both the quality (i.e., content and outcome) and quantity (i.e., reach and engagement) of program engagements.

Thus, based on these observations and our findings, two potential policy implications are important to discuss. First, programs should consider more active engagement with customers such as speaking with patrons who appear intoxicated or who are visibly distressed after losing money on gambling games. Indeed, research by Giroux et al. (2008) suggests that a more active approach might be more effective if it includes contacting a supervisor and initiating a referral as part of a "Help Chain" to guide distressed patrons to problem gambling help or treatment resources. Second, as described above, RG programs should be examined by using a randomized experimental or quasi-experimental approach (White & Sabarwal, 2014) that compares pre- and post-gambling beliefs and behaviors for customers who were exposed to the program and similar customers (e.g., matched on demographics characteristics and gambling involvement measures) who were not exposed to the program. Such an approach would move closer to assessing causality in the effectiveness of RG programs. This type of methodological approach would be costly, both in time and financial investment, yet its results would provide more valid and reliable data on the actual impacts of programs such as GameSense on responsible and risky gambling belief and behavioral outcomes.

Theoretical Implications

The results of this study have two implications for RG theoretical frameworks, including the Reno Model. First, they suggest that even when an RG program is present and customers are

aware of it, engagement, and the actual impact on encouraging healthier gambling behaviors, can be limited. However, this does not mean that casino-based RG programs do not have a positive impact on customers who experience issues with problem gambling or Gambling Disorder. Indeed, other research on the GameSense program at land-based casinos in the U.S. (e.g., the Plainridge Park casino in MA; see Gray et al., 2020) suggests that whereas about 1% of daily patrons interacted with a GameSense Advisor, 97% of those patrons reported that they would feel comfortable with asking a GameSense Advisor for help if they were starting to lose control over their gambling. Interestingly, this 1% value is similar to the estimates of the prevalence of problem gambling in the U.S. (Williams, Volberg & Stevens, 2012), so a key area of interest is whether the 1% who interacted with Advisors (or the 0.2% engaging with Advisors/~2% picking up brochures in the present study) are indeed in need of services for emerging or current gambling problems when they engage with the program.

Second, our findings have implications for theories of health promotion aimed at encouraging healthier gambling behaviors (Sapthiang et al., 2020) and expose some potential limitations in these current approaches. Importantly, providing valid knowledge about how gambling works and information about help resources might be ignored by the most vulnerable and riskiest populations of gamblers due to psychosocial characteristics of these groups. Individuals experiencing problem gambling or who meet DSM-5 clinical criteria for Gambling Disorder (APA, 2013) often exhibit cognitive distortions about the actual likelihood of winning money and illusions of control over their personal role in controlling winning in gambling games (Brooks et al., 2020; Ledgerwood et al., 2020). In effect, these cognitive distortions as well as the strong preoccupation with gambling among high-risk gamblers (McBride et al., 2010) might result in "inattention blindness" (Kreitz et al., 2015), which in turn, could lead to ignoring the presence of the program (i.e., limited awareness) and limited use (i.e., low engagement) of GameSense help resources.

Conclusion

Based on our findings showing limited awareness of and engagement with a land-based RG program, and weak associations between those metrics and gambling beliefs and behaviors, we recommend further work be conducted to enhance program elements and outreach efforts for customers. However, these results must be interpreted carefully due to our observational design and cross-sectional research methodology (VanderWeele, 2021). Thus, we conclude in this section by discussing our limitations and directions for future research on GameSense and RG programs more generally.

Study Limitations

We identify four primary limitations. First, our study relied on self-reported awareness and engagement with the GameSense program, as well as gambling beliefs and behaviors, which research (e.g., Braverman, Tom & Shaffer, 2014; Heirene, Wang & Gainsbury et al., 2021) suggests might not be fully accurate due to social desirability bias or recall bias (van der Mass, Nower, Matheson, et al., 2021). Similarly, because the final wave of data was collected in early 2020 when COVID-19 was spreading across Asia and Europe, it is possible that the impending risk of a pandemic might have influenced respondents' response patterns. Approaches that measure gambling behavior with electronically collected player records (e.g., with loyalty card or online gambling records) might improve on

self-report-based methods (see a similar approach in Louderback, LaPlante, et al., 2021). Second, given that our samples were repeated cross-sections and respondents were not followed up over time in a prospective or retrospective cohort design, we are unable to make strong claims about causality for our hypotheses. Third, our analysis only included loyalty program members from one land-based gambling operator in the United States, MGM, so our results might not generalize to subgroups of customers from other U.S.-based or international gambling operators. Fourth, our response rate for each of the three years was low, so the results might not represent all MGM loyalty program members and the findings might not generalize to other populations of land-based gamblers.

Directions for Future Research

Based on our findings and the implications and limitations described above, there are three potential avenues for future research. First, the extent to which RG resources are delivered in different modes of communication and in different locations in the casino is important to consider, especially given the low levels of program awareness and engagement in the present study and other studies examining facets of the GameSense RG program (e.g., Louderback, Gray, et al., 2021). For example, placing GameSense RG resources in clearly visible locations in land-based casinos might help to enhance awareness of what educational or help resources are available, which in turn could increase engagement for those at risk or who might want to take proactive steps to gamble in healthier ways. Such an approach might also reduce inattention blindness to these GameSense resources, while empowering patrons with tools to help them manage their gambling behavior by building self-efficacy (see Quinn et al., 2019).

Second, additional studies should conduct analyses with other casino-based RG programs in the United States and internationally to determine how our results for the GameSense program compare with other types of RG initiatives with varying types of program elements and customer bases. It is unclear whether the observed patterns of findings are typical of RG programs generally, or are specific to this implementation of GameSense. Specifically, the use of a randomized controlled trial methodology (Devereaux & Yusuf, 2003) or quasi-experimental approaches (Bärnighausen et al., 2017) with pre- and post-test assessment of gambling beliefs and behaviors of individuals exposed to GameSense and those not exposed would help to provide stronger evidence for tentative causality of program exposure and outcomes relevant to RG and player safety.

Third, additional research inquiries into the role of the nature and content of the interaction between GameSense Advisors and customers, and how this might be associated with different types of gambling beliefs and behavior outcomes, would also be a fruitful avenue for future research. It is possible that GameSense Advisor engagement might occur among those with specific prior gambling beliefs. If this were the case and those most in need of knowledge gains failed to engage, then program designers will need to target and design interventions accordingly.

Concluding Thoughts

GameSense shows the potential for promise as an RG tool to increase gambling literacy and the use of RG strategies. However, enhancements are needed to increase both awareness and engagement, and to ensure that program elements make a meaningful (and quantifiable) impact on customers' RG habits while visiting a land-based casino. Providing new

and innovative player safety tools for people who wish to gamble is important to maintaining a healthier gambling environment. Central to such innovation is proper, routine empirical evaluation. The absence of independent evaluation can lead to a proliferation of well-intentioned but ineffective RG programs, which have limited impact on reducing the harms of problem gambling among casino customers.

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Declarations

Conflict of interest When this paper was published, the Division on Addiction was receiving funding from DraftKings, Inc., a sports betting and gaming company; Entain PLC (formally GVC Holdings PLC), a sports betting and gambling company; EPIC Risk Management; the Foundation for Advancing Alcohol Responsibility, a not-for-profit organization founded and funded by a group of distillers; Massachusetts Department of Public Health, Office of Problem Gambling Services via Health Resources in Action; MGM Resorts International via the University of Nevada, Las Vegas; National Institutes of Health (National Institute of General Medical Sciences and National Institute on Drug Abuse) via The Healing Lodge of the Seven Nations; and Substance Abuse and Mental Health Services Administration via the Addiction Treatment Center of New England. During the past five years, the Division on Addiction has also received funding from David H. Bor Library Fund, Cambridge Health Alliance; Fenway Community Health Center, Inc.; Greater Boston Council on Alcoholism; Integrated Centre on Addiction Prevention and Treatment of the Tung Wah Group of Hospitals, Hong Kong; Massachusetts Department of Public Health, Bureau of Substance Addiction Services; Massachusetts Department of Public Health, Bureau of Substance Addiction Services via St. Francis House; the Massachusetts Gaming Commission, Commonwealth of Massachusetts; and Substance Abuse and Mental Health Services Administration via the Gavin Foundation. During the past five years, the UNLV International Gaming Institute (IGI) has received research funding from MGM Resorts International, Wynn Resorts Ltd, Las Vegas Sands Corporation, Caesars Entertainment Corporation, Ainsworth Game Technology, Sightline Payments, Global Payments, U.S.-Japan Business Council, State of Nevada, Knowledge Fund, and State of Nevada Department of Health and Human Services. IGI runs the triennial research-focused International Conference on Gambling and Risk Taking, whose sponsors include industry, academic, and legal/regulatory stakeholders in gambling. A full list of sponsors for the most recent conference can be found at https://www.unlv.edu/igi/conference/17th/sponsors. During the past five years, Eric R. Louderback has received research funding from a grant issued by the National Science Foundation (NSF), a government agency based in the United States. His research has been financially supported by a Dean's Research Fellowship from the University of Miami College of Arts & Sciences, who also provided funds to present at academic conferences. He has received travel support funds from the Hebrew University of Jerusalem to present research findings and has provided consulting services on player safety programs for Premier Lotteries Ireland. During the past five years, Debi A. LaPlante has served as a paid grant reviewer for the National Center for Responsible Gaming (NCRG; now International Center for Responsible Gaming [ICRG]), received travel funds, speaker honoraria, and a scientific achievement award from the ICRG, has received speaker honoraria and travel support from the National Collegiate Athletic Association, received honoraria funds for preparation of a book chapter from Université Laval, received publication royalty fees from the American Psychological Association, and

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Ethics Approval All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent The study was approved by the University of Nevada, Las Vegas (UNLV) Institutional Review Board (IRB) and was assigned Protocol #1111182–2. All participants provided informed consent before taking part in the study.

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