



Online interventions for problem gamblers with and without co-occurring unhealthy alcohol use: Randomized controlled trial



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ABSTRACT

Background and aims: Problem gambling and unhealthy alcohol use often co-occur. The current trial sought to establish whether adding a brief online intervention for unhealthy alcohol use to an online problem gambling intervention would lead to improvements in gambling and drinking among those with both of these concerns. **Methods:** Participants were recruited from across Canada using an advertisement targeting those concerned about their gambling who were interested in online help. No mention of unhealthy alcohol use was made in the advertisement. Participants meeting criteria for problem gambling were randomized to either receive just an online intervention for gambling (G-only) or to receive an online gambling intervention plus a brief personalized feedback intervention for unhealthy alcohol use (G + A). Participants were followed up at 3 and 6 months.

Results: A total of 282 participants were recruited for the trial. Follow-up rates were good (80% and 84% at 3 and 6 months). There were significant reductions in gambling ($p < .001$) across time but no significant differences ($p > .05$) between those who received either the G-only or G + A interventions. Further, for those with unhealthy alcohol use (41% of the sample), there were no significant reductions in alcohol consumption ($p > .05$) across time or differences between condition.

Discussion and conclusion: The addition of a brief intervention for unhealthy alcohol use to an online intervention for gambling did not appear to improve either gambling or drinking outcomes among people concerned about their gambling. Further research is merited to examine whether a combined intervention (with gambling and drinking components integrated) might result in improved outcomes and whether such an intervention might benefit the subgroup of participants who would specifically seek help for both gambling and alcohol concerns.

Trial registration: [ClinicalTrials.gov NCT03323606](https://clinicaltrials.gov/ct2/show/study/NCT03323606); Registration date: October 24, 2017.

1. Introduction

Gambling can result in considerable harm to an individual as well as to those around them (Gainsbury et al., 2013). While many people with gambling concerns might benefit from help, the large majority do not access treatment (Cunningham, 2005; Slutske, 2006; Suurvali et al., 2008). There are several possible reasons for this, including a lack of treatment availability, concerns about stigma, a lack of problem recognition, and the perception of a poor match between treatments that are offered and what the person wants (Suurvali et al., 2009). However, many people with gambling concerns who do not access face-to-face treatment are interested in other means of receiving assistance

(Cunningham et al., 2008). Further, other options for accessing care are available, including written self-help materials (Abbott et al., 2012; Hodgins et al., 2004; Hodgins et al., 2009; Hodgins et al., 2001), helplines (Ferland et al., 2013; Kim et al., 2016), and a growing range of Internet-based interventions (Cunningham, Godinho et al., 2019a; Cunningham, Hodgins et al., 2019; Hodgins et al., 2019; van der Maas et al., 2019).

An additional challenge to providing help to those with gambling concerns is that gambling problems often do not occur in isolation. Mental health distress is common among people with disordered gambling, as are the experience of other addictive behaviours (Bischof et al., 2013; Desai and Potenza, 2008; Kessler et al., 2008; Lorains et al.,

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2011; Martin et al., 2014; Petry et al., 2005). While there is an emerging literature on whether there are benefits associated with providing assistance for other mental health concerns and/or other addictions alongside care for gambling concerns (Dowling et al., 2016; Geisner et al., 2014; Hodgins and el-Guebaly, 2010; Stea and Hodgins, 2011; Toneatto and Ladouceur, 2003; Wynn et al., 2014), this area is still in its infancy (Yakovenko and Hodgins, 2018). In the domain of assisted self-change for gambling (i.e., self-help books, internet interventions), there is little or no published literature to-date on interventions specific to concurrent disorders (Cunningham, Godinho, et al., 2019).

This project is the second of two randomized controlled trials (RCTs) to examine the potential benefits of combining online help for gambling with assistance for mental health or addictions concerns (Cunningham et al., 2016; Cunningham et al., 2018). In the first study, participants who gambled in a risky fashion were randomized to receive either just a gambling online intervention or the gambling intervention plus a research validated intervention for depression (MoodGYM) (Cunningham, Hodgins et al., 2019). All participants displayed reductions in severity of gambling from baseline to follow-up. In addition, there were significant reductions in mental health distress. However, these reductions were not significantly different ($p > .05$) between those who were provided access to MoodGYM and those who were not. Challenges with the study included a limited use of both interventions (but particularly only a very limited use of MoodGYM). In addition, about three-quarters of participants displayed levels of mental health distress at baseline that were indicative of current depression or anxiety, making it challenging to explore any impact of adding MoodGYM to participants who did not have co-occurring gambling and mental health concerns. It was concluded that, while many people seeking access to online interventions for gambling might be experiencing mental health distress, there did not appear to be any added benefit to providing access to a mental health intervention (such as MoodGYM) alongside a gambling intervention (Cunningham, Hodgins et al. 2019).

The current trial used the same methods to examine whether there was any benefit to adding a brief online intervention for unhealthy alcohol use to an online intervention for gambling. Unhealthy alcohol use was targeted because these issues frequently co-occur (Cunningham-Williams et al., 1998; Petry et al., 2005), and because heavy alcohol consumption and gambling problems may be functionally interrelated among those who engage in both behaviours (Barnes et al., 2015; el-Guebaly et al., 2006; Kessler et al., 2008; Martins et al., 2010; Petry et al., 2005; Welte et al., 2015). The hypotheses were:

Hypothesis 1. For problem gamblers with co-occurring unhealthy alcohol use, it was predicted that participants provided access to the online gambling and alcohol interventions (G + A) website would display significantly reduced gambling outcomes at three- and six-month follow-ups as compared to those provided access to just the online gambling intervention (G-only) website. Problem gamblers without co-occurring unhealthy alcohol use would display no significant difference between the G-only and G + A websites at three- and six-month follow-ups.

Hypothesis 2. For participants with unhealthy alcohol use, it was predicted that participants provided access to the G + A website would display significantly reduced drinking outcomes at three- and six-month follow-ups as compared to those provided access to the G-only website. Participants without unhealthy alcohol use would display no significant difference in drinking between the G-only and G + A websites at three- and six-month follow-ups.

Hypothesis 3. Problem gamblers with co-occurring unhealthy alcohol use who receive the G + A intervention and reduce the amount they drink between baseline and three-month follow-ups would display significantly improved gambling outcomes at six-month follow-up as compared to participants without unhealthy alcohol use who receive the G + A intervention but experience no decrease in their drinking.

2. Methods

2.1. Recruitment

Full details of the study protocol are published elsewhere (Cunningham et al., 2018). Briefly, potential participants were recruited from across Canada using online advertisements asking for people who were “concerned about your gambling? Study includes online help for your gambling.” The advertisement also stated that this was a research study and not a treatment program and that compensation would be provided. As with the first study (examining the combination of online gambling and mental health interventions), the recruitment of participants for the trial required a varied and sustained set of online advertisements placed on several different platforms (e.g. Facebook, Google AdWords, Kijiji) and targeting all of Canada. In addition, print and radio advertisements were placed in Manitoba (the primary target population). After reading a brief description of the study, participants completed an eligibility screener to identify those who were 18 years or older and who scored 3 or more on the Problem Gambling Severity Index (PGSI) (Ferris and Wynne, 2001). Participants who were found eligible provided their email address and were sent a link to an online consent form that described the study in more detail. No mention of the brief alcohol intervention was made during the advertisement or consent component of the trial recruitment (on the consent form, potential participants were informed that they would be accessing a website that provided help to gamblers and that not everyone would receive access to the same website). Those interested were asked to provide their postal address and telephone contact information. Research staff then manually checked the postal address of each potential participant to confirm that it was a real address and that no other person from the same address had already registered for the trial. This postal address check was intended to promote the chances of having only genuine participants registered for the trial (as opposed to those interested in payment and gaining multiple registrations) and to reduce the chances of contamination between experimental conditions. In addition, the postal address check was an attempt to improve the poor follow-up rate obtained in the previous trial (where only 47.2% completed at least one follow-up).

2.2. Randomization, experimental conditions

Participants who passed the postal address check were emailed a link to the baseline survey. On completion of the survey, prospective participants were asked to log into the intervention portal. Those who logged into the portal were randomized to one of two groups (1:1 ratio) and provided access to the respective intervention for the entire duration of the study. Randomization was automated and stratified by participant sex, age group, and prior use of treatment for gambling problems. To encourage intervention usage, participants also received up to 2 reminders to log into the study intervention website. Participants were then followed-up at 3 and 6 months, post baseline, to assess changes in amount of gambling and level of mental health distress and were provided 30 days to complete the questionnaire before it expired. Participants were provided with a \$10 gift certificate from Amazon.ca on completion of the baseline survey (to promote retention at this stage) and with a \$20 and a \$30 gift certificate for completing each of the 3- and 6-month follow-ups respectively.

2.2.1. Intervention groups

2.2.1.1. Gambling intervention only (G-only). The G-only online intervention consisted of a study specific version of the self-change booklets developed by Hodgins et al. (Hodgins and Makarchuk, 2002) modified to an online format. The paper versions of these materials have demonstrated an impact on gambling in three separate trials (Abbott et al., 2012; Hodgins et al., 2009; Hodgins et al., 2001). As with the paper version, the online intervention provides the user with

behavioural and cognitive strategies to promote reductions in gambling (Hodgins et al., 2019). These strategies are divided into 4 different modules which users can complete at their own pace, in any order and as many times as they would like: (1) Self-assessment, (2) Making your decision (i.e. goal setting activities), (3) Reaching your goal (i.e. understanding how thinking patterns affect gambling), and (4) Maintaining your goal (i.e. relapse prevention strategies).

2.2.1.2. *Gambling plus alcohol intervention (G ± A)*. Participants assigned to the G + A intervention were provided with the same online gambling intervention. In addition, they were provided with a brief personalized feedback report summarizing their alcohol use and comparing it to others of the same age, sex, and country of residence (Cunningham et al., 2009). This was a study-specific version of the Check Your Drinking intervention, which has been subjected to seven RCTs demonstrating support of its efficacy in reducing alcohol consumption (Cunningham et al., 2017; Cunningham et al., 2002; Cunningham et al., 2014; Cunningham et al., 2009; Doumas and Hannah, 2008; Doumas and Haustveit, 2008; Doumas et al., 2009). The alcohol feedback was located under a separate icon on the online gambling intervention homepage.

2.3. Content of surveys

2.3.1. Baseline

The baseline survey assessed two outcome variables – gambling frequency (number of days gambled in the past 30 days), and gambling severity (past three month version of the NORC DSM-IV Screen for Gambling Problems [NODS] which indicates DSM-IV defined severity) (Toce-Gerstein and Volberg, 2004; Wulfert et al., 2005). Prior use of treatment was assessed using a comprehensive list from previous research trials (Hodgins et al., 2009; Hodgins et al., 2001). Unhealthy alcohol consumption in the past 3 months was measured using the Alcohol Use Disorders Identification Test, with the frequency of heavy drinking occasions modified for Canadian female and male participants (i.e. 5 or more drinks for males, 4 or more drinks for females) (Saunders et al., 1993). A score of 8 or more was used to define current unhealthy alcohol consumption. The primary outcome variable for alcohol consumption was number of drinks consumed in a typical week during the past 3 months. Finally, demographic characteristics (e.g. age, sex, education, marital status, income, employment status) were collected.

2.3.2. Three- and six-month follow-up surveys

Post baseline, the 3- and 6-month follow-up surveys assessed the same gambling and drinking outcome variables, framed for the past 3 months.

2.4. Sample size estimate

The estimated sample size for the current study was based on the work of Hodgins et al. evaluating self-help booklets (Hodgins et al., 2009; Hodgins et al., 2001). Assuming correlations between baseline and follow-up assessment measures of 0.5, and using the conventions of a two-tailed test with an alpha of 0.05 and a power of 0.80, a sample size of 112 participants per group (G-only and G + A) was needed in order to detect a differential reduction of 2 gambling days per month between groups. We allowed for a 20% loss to follow-up by the 6-month follow-up, resulting in a planned sample size of 280 participants.

2.5. Data analysis

Hypotheses 1 (impact on gambling) and Hypothesis 2 (impact on drinking) were analysed using linear mixed-effects models with the random effect of intercepts. That is the fixed effect of time, intervention, and time by intervention on changes in gambling (and drinking) severity and/or frequency over time were estimated. For all outcome

variables not normally distributed in hypotheses 1 and 2 (i.e. number of days gambled, # drinks in a typical week), general estimated equations with negative binomial loglink were conducted in addition to mixed-effects models. For ease of interpretation, mixed-effect models were reported when model outcomes did not differ and residuals of the model were normally distributed. Hypothesis 3, comparing the potential moderating effect of reductions in drinking on gambling severity among participants in the G + A condition, were examined using a moderation analysis via Hayes' Process macro (Hayes, 2013). In particular, intervention (i.e. G-only and G + A) was set as the predictor, change in weekly drinking from baseline to 3 months as the moderator variable, and change in gambling severity (NODS) or frequency (# days gambled in the past 30) as the outcome. Missing data was handled using a maximum likelihood approach to estimate covariances, variances, and means. All analyses were conducted using SPSS 25.0.

2.6. Ethical approval

This study, including the methods and design, has been approved by the standing ethics review committee of the Centre for Addiction and Mental Health (CAMH) (REB protocol 010/2017).

3. Results

A total of 282 participants were recruited for the trial from November 2017 to October 2018. Table 1 provides a summary of participants' demographic, gambling, and drinking characteristics for those in the G-only and G + A conditions. There were no significant differences (p > .05) between conditions on any of these variables. Participants exhibited substantial gambling severity at baseline, with a mean (SD) PGSI score of 13.1 (6.4; 80.5% scored 8 or more on the PGSI). The most common types of gambling endorsed by participants as causing problems were slot machines (51.8%), VLTs (45.4%), instant or scratch tickets (30.9%), table games in a casino (29.8%), lottery tickets (24.5%), and bingo (14.5%). Unhealthy alcohol use was common, with 41.1% scoring 8 or more on the AUDIT. Follow-up rates were good,

Table 1 Differences between G-only and G + A interventions on baseline demographic and clinical characteristics.

Variable	Intervention		p
	Gambling intervention only (n = 143)	Gambling + A (n = 139)	
Age, mean years (SD)	38.8 (11.7)	39.2 (12.7)	0.793
Males, % (n)	51.0 (73)	49.6 (69)	0.813
Some post-secondary or greater, % (n)	62.2 (89)	58.3 (81)	0.496
Married/Common law, % (n)	46.9 (67)	51.1 (71)	0.478
Full/Part-time employed, % (n)	74.8 (107)	81.3 (113)	0.190
Family Income > \$30,000, % (n)	76.8 (106)	80.1 (109)	0.502
PGSI, mean (SD)	13.4 (6.3)	12.8 (6.5)	0.384
NODS, mean (SD)	5.8 (2.8)	5.4 (2.7)	0.147
days gambled in last 30, mean (SD)	13.6 (8.4)	12.2 (8.1)	0.162
Ever attended formal treatment, % (n)	46.2 (66)	49.6 (69)	0.558
Unhealthy alcohol use, % (n) ^a	46.2 (66)	53.6 (89)	0.082
AUDIT (SD)	8.8 (8.7)	7.5 (7.9)	0.214
# of drinks per week (SD)	12.0 (16.6)	9.0 (11.9)	0.081

Note: Group differences were computed using chi-squares and t-tests. PGSI; Problem Gambling Severity Index. NODS; NORC DSM-IV screen for past 3 month gambling problems. AUDIT; Alcohol Use Disorders Identification Test.

^a Unhealthy alcohol use defined as scoring 8 or greater on the AUDIT.

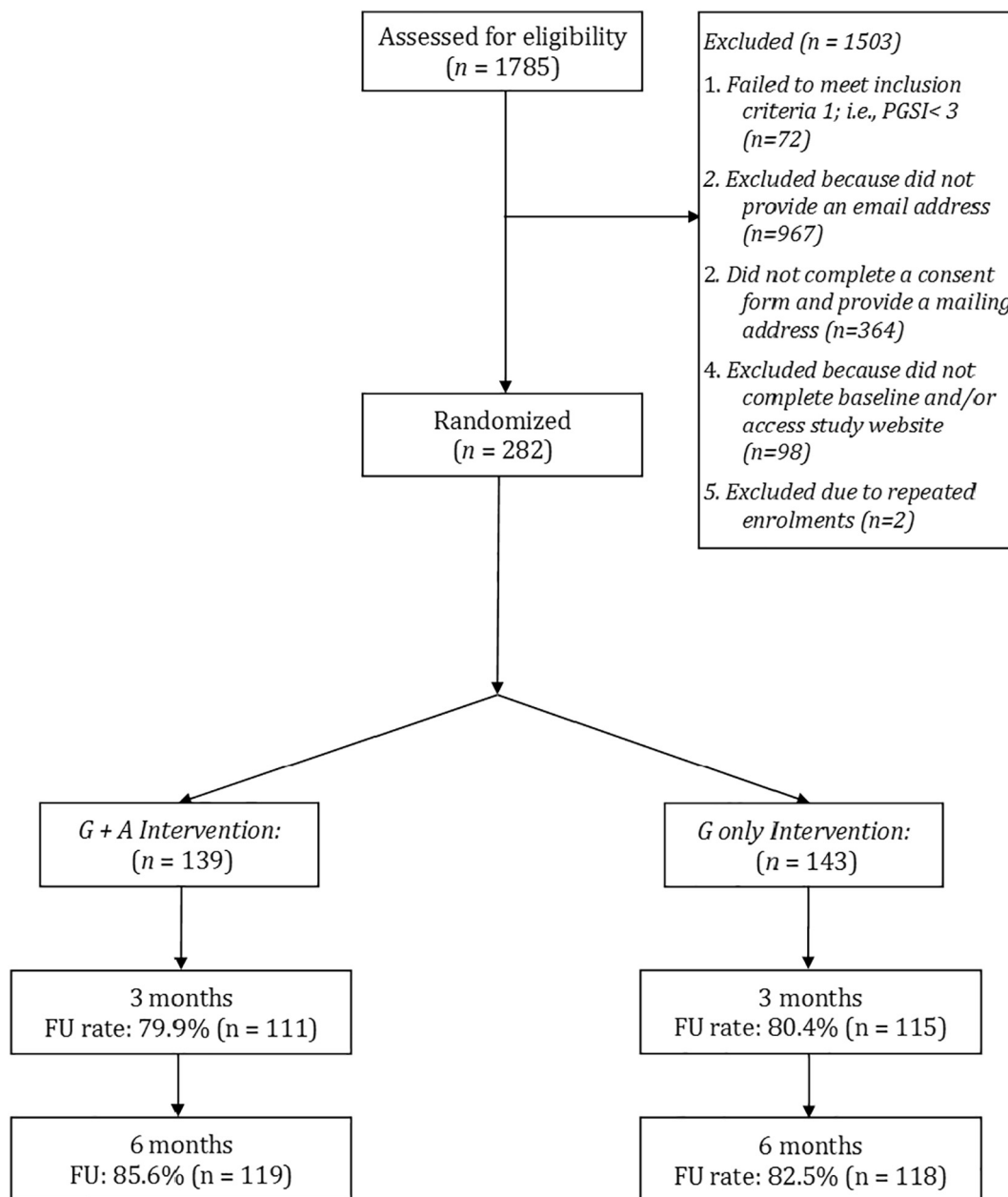


Fig. 1. Consort chart.

with 80.1% at 3-month and 84.0% at 6-month follow-up. A consort chart is provided in Fig. 1.

3.1. Intervention effect on gambling outcomes for participants with and without co-occurring unhealthy alcohol use

To test hypothesis 1, separate mixed effects models were conducted for participants with and without co-occurring unhealthy alcohol use to compare gambling outcomes (number of days gambled in past 30 days; past three months NODS) between the two intervention conditions (G-only vs G + A). For both groups of gamblers, there were significant reductions in both gambling outcomes over time (p < .001). However, in all models, there were no significant differences (p > .05) between intervention conditions. See Tables 2 and 3 for details of these four mixed model analyses. Graphs illustrating the changes in gambling severity over time across both the G-only and the G + A interventions are presented in Fig. 2.

3.2. Relating interventions received to drinking outcomes for participants with and without co-occurring unhealthy alcohol use

To test hypothesis 2, a similar approach was taken with separate mixed models conducted to compare drinking outcome (number of drinks in a typical week) between intervention condition for participants with and without current unhealthy alcohol use. For both groups of gamblers, there were no significant differences (p > .05) observed across time or by intervention received (G-only vs G + A). See Tables 4 and 5 for details of these two mixed model analyses. Graphs illustrating the changes in typical weekly drinking over time across both the G-only and the G + A interventions are presented in Fig. 3.

3.3. Relating changes in drinking between baseline and three-month follow-up to gambling outcomes at six months for participants with co-occurring unhealthy alcohol use

Two separate moderation analyses were conducted (one for each

Table 2
Mixed-effect model results of time, intervention, and time by intervention on gambling severity (NODS) and frequency (past 30 day gambling) for gamblers with co-occurring unhealthy alcohol use (N = 116).

Effect	NODS			# days gambled in past 30		
	Estimate	t	p	Estimate	t	p
Intercept	6.14	15.8	< 0.001	14.7	12.1	< 0.001
Time (ref: baseline)						
3 months	-1.83	-3.97	< 0.001	-3.52	-3.06	0.003
6 months	-2.16	-4.74	< 0.001	-5.10	-4.47	< 0.001
Intervention (reference: G + A)						
G-only	0.41	0.79	0.431	-0.11	-0.07	0.944

Effect	NODS		# days gambled in past 30	
	F	p	F	p
Time × intervention	0.004	0.996	0.620	0.539

Note: NODS; NORC DSM-IV Screen for past 3 month Gambling Problems.

Table 3
Mixed-effect model results of time, intervention, and time by intervention on gambling severity (NODS) and frequency (past 30 day gambling) for gamblers without co-occurring unhealthy alcohol use (N = 166).

Effect	NODS			# days gambled in past 30		
	Estimate	t	p	Estimate	t	p
Intercept	4.94	17.2	< 0.001	10.8	14.7	< 0.001
Time (ref: baseline)						
3 months	-1.29	-4.52	< 0.001	-5.15	-6.29	< 0.001
6 months	-1.70	-6.17	< 0.001	-5.12	-6.43	< 0.001
Intervention (reference: G + A)						
G-only	0.30	0.72	0.474	1.92	1.78	0.077

Effect	NODS		# days gambled in past 30	
	F	p	F	p
Time × intervention	1.36	0.258	0.856	0.426

Note: NODS; NORC DSM-IV screen for past 3 month gambling problems.

gambling outcome variable) using Hayes' Process macro for SPSS to determine the impact of differences in drinking between baseline and 3 months on gambling outcomes at 6 months. Intervention (i.e. G-only and G + A) was set as the predictor, difference in weekly drinking from baseline to 3 months as the moderator variable, and change in gambling severity (NODS) or frequency (number of days gambled in the past 30) as the outcome (see Fig. 2). Both models were not significant (NODS: $F(3,75) = 0.25, p = .860, R^2 = 0.01$; number of days gambled in past 30: $F(3,75) = 2.18, p = .097, R^2 = 0.08$), indicating that reductions in drinking did not moderate the relationship between intervention received and gambling outcomes (see Table 6).

3.4. Use of the interventions

Table 7 provides a summary of the proportion of participants who accessed the interventions in the G-only and G + A conditions. Almost 80% of the sample (78.7%; $n = 222$) accessed at least one of the online gambling modules and 28% ($n = 79$) completed at least 2 of the 4 modules. There was no significant difference ($p > .05$) in the proportion of participants who accessed the online gambling intervention between intervention conditions (G-only vs G + A). For participants

provided the alcohol personalized feedback report, two-thirds accessed the report (66.2%; 92 out of the 139 participants in the G + A condition).

4. Discussion

This trial was the second of two examining the potential benefits of providing additional online help (for mental health concerns in the first study and for unhealthy alcohol consumption in the current study) to an online intervention for problem gambling. In both trials, participants were recruited using an advertisement asking for people who were concerned about their gambling but made no mention of the provision of additional online help beyond that provided for gambling concerns. In both trials, participants reported reductions in gambling over time. In the current trial, there was no observed reduction in alcohol consumption, irrespective of whether the participant was provided access to only the gambling intervention or to both the gambling and alcohol interventions. In the previous trial, there were significant improvements in mental health status but this did not appear to be related to whether the participants actually received the mental health intervention (Cunningham, Hodgins et al., 2019).

While the observed reductions in gambling may be due to provision of the online gambling intervention, this claim cannot be made from the current (or previous) trial because all participants were provided with the online gambling intervention (and testing the efficacy of the gambling intervention was not the purpose of these trials). The intervention itself has shown efficacy in a paper and pencil format (Abbott et al., 2012; Hodgins et al., 2009; Hodgins et al., 2001). However, the online version has not demonstrated efficacy, as of yet, compared to a randomly assigned control group (Cunningham, Godinho, et al., 2019; Hodgins et al., 2019). In the current trial, there appeared to be more use of the gambling modules than our previous study (combining gambling and mental health online interventions). However, extent of use was still fairly limited, with roughly a quarter of participants completing two of the four modules. If it is assumed that participants who complete the intervention will gain the most benefit, then more work is needed to find ways to promote engagement with the intervention. This issue is not unique to the current intervention as lack of engagement with online interventions and, indeed, face-to-face interventions appear to be the norm rather than the exception (Ryan et al., 2018).

The current trial had good follow-up rates and showed a substantial improvement over the previous trial, which employed the same recruitment advertisements (80.1% and 84.0% at 3 and 6 months compared to 38.8% and 34.1% respectively in the previous trial). While it is possible that participants recruited after an extended period of advertising (i.e., after recruitment was completed for the first trial) are more likely to complete a follow-up than those recruited early in an advertising campaign, the more likely reason for this improved retention rate was our revised intake procedure. In our first trial, we only collected participants' email addresses as a means of contact. In the current trial, we collected participants' postal address and telephone numbers in addition to an email address. Further, the postal mail address was checked to establish that it was a real address (and that no occurrences of the same address had been provided). It is probable that this resulted in fewer participants who were not committed to take part in the research (in addition to reducing the number of people who registered for the trial multiple times). Finally, an additional \$10 gift certificate was provided at the completion of the baseline survey to encourage retention at this time point.

The current trial observed no significant ($p > .05$) reductions in alcohol consumption in either condition. This suggests that the addition of a brief alcohol intervention to an online gambling intervention may not be merited as a means to reduce unhealthy alcohol use or to improve gambling outcomes. However, it is important to be clear that this tentative conclusion only applies to the situation where people concerned about their gambling are seeking help for their gambling but

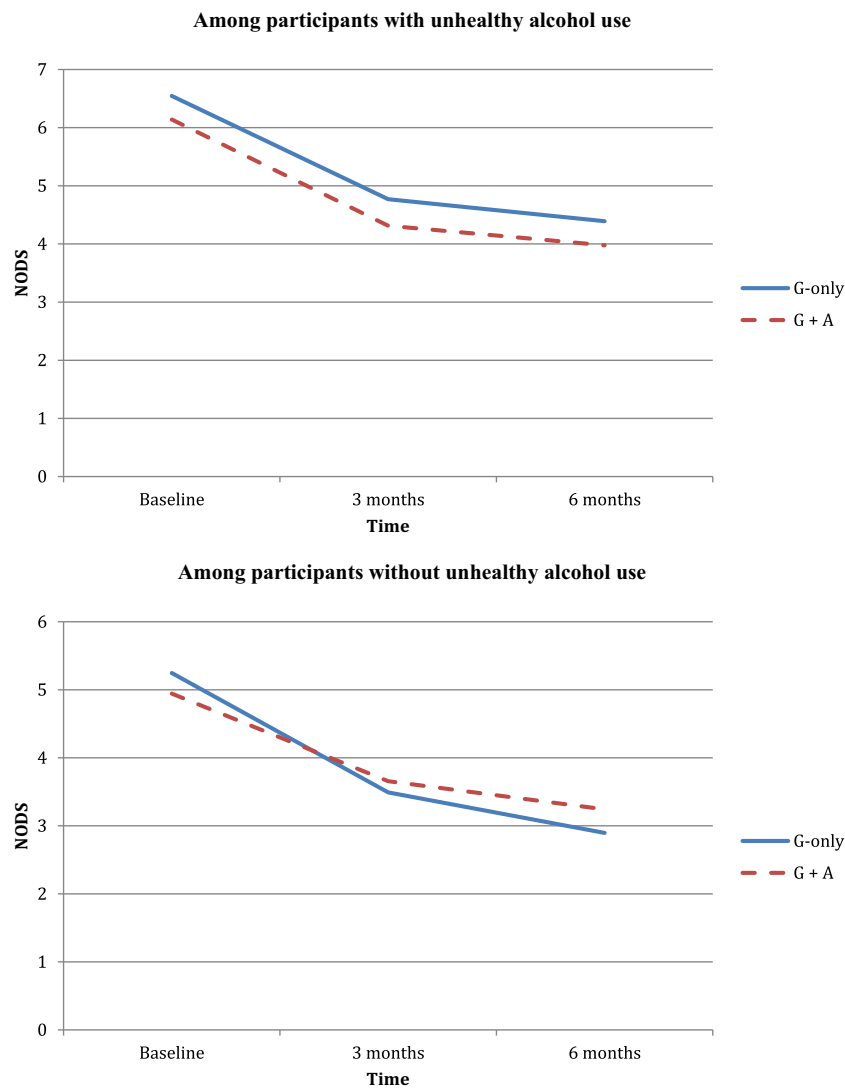


Fig. 2. Gambling severity across time for gamblers in the G-only and G + A intervention.

Table 4

Mixed-effect model results of time, intervention, and time by intervention on frequency of drinking (# drinks in a typical week) those with unhealthy alcohol use (N = 116).

Effect	Estimate	t	p
Intercept	18.7	7.72	< 0.001
Time (reference: baseline)			
3-months	-0.87	-0.37	0.710
6-months	-0.09	-0.04	0.970
Intervention (reference: G + A)			
G-only	2.98	0.93	0.355

Effect	F	p
Time by intervention interaction	1.58	0.208

Table 5

Mixed-effect model results of time, intervention, and time by intervention on frequency of drinking (# drinks in a typical week) those without unhealthy alcohol use (N = 166).

Effect	Estimate	t	p
Intercept	3.54	6.88	< 0.001
Time (reference: baseline)			
3-months	0.26	0.49	0.628
6-months	0.64	1.23	0.218
Intervention (reference: G + A)			
G-only	0.16	0.21	0.836

Effect	F	p
Time by intervention interaction	0.76	0.468

have not sought help for other concerns simultaneously (such as unhealthy drinking). This recruitment approach results in a relevant context within which to examine the benefits of combining gambling and alcohol online interventions because it mimics the way that many people looking for help online for their gambling will most likely approach a website. However, there are other pertinent questions to ask of the benefits of combining gambling and alcohol online interventions.

One such question would be what the best way to provide online help is for participants who are concerned about both their gambling and their unhealthy alcohol use (rather than people who are concerned about their gambling and who drink in an unhealthy fashion but may or may not be concerned about their drinking). In such a situation, the researcher might instead recruit participants using an advertisement asking for people who are concerned about both their gambling and

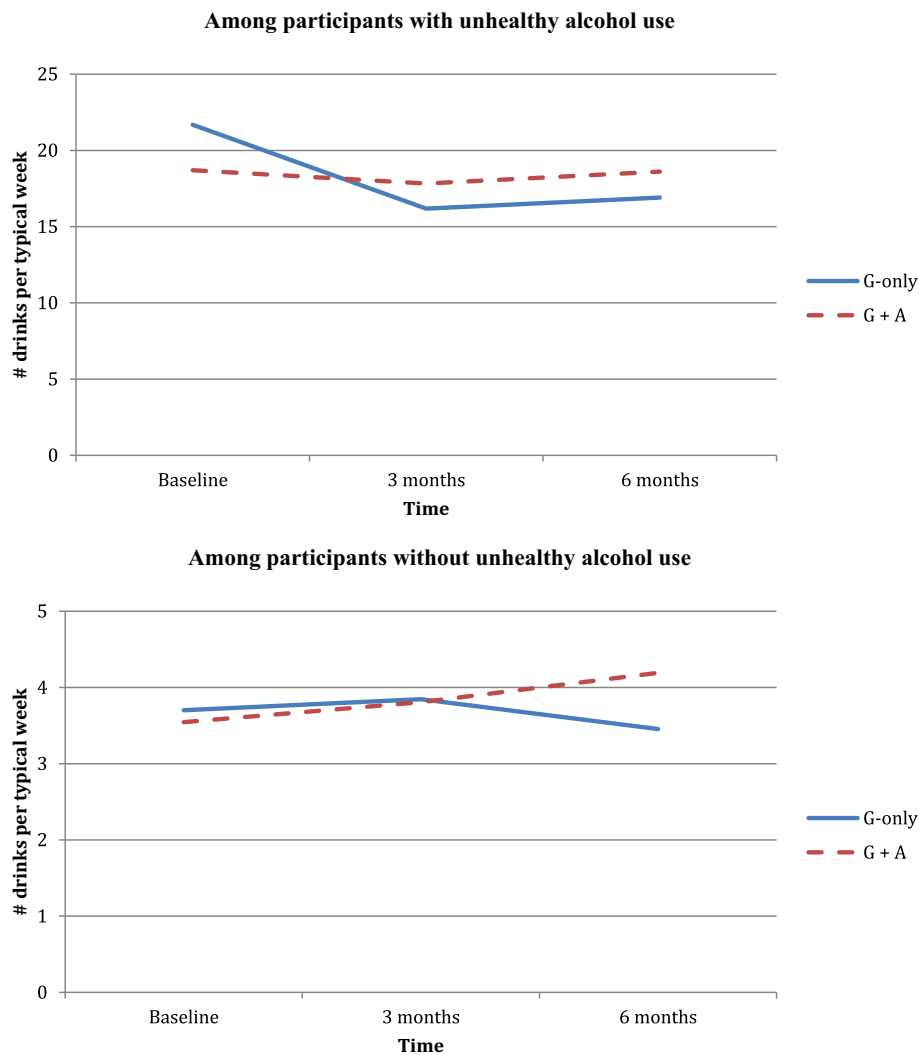


Fig. 3. Drinking frequency across time for the G-only and G + A intervention.

Table 6

Moderation model results of effect of drinking reductions at 3-months on relationship between intervention and change in gambling from baseline to 6 months.

	B	SE	t	p
Outcome variable: NODS				
Constant	-2.11	0.50	4.25	< 0.001
Intervention	0.03	0.74	0.05	0.963
Change in drinking (3M - BL)	-0.01	0.03	-0.42	0.677
Change in drinking x intervention	0.04	0.05	0.86	0.392
Outcome variable: # of days gambled				
Constant	-5.12	1.18	-4.31	< 0.001
Intervention	-0.02	1.76	-0.01	0.989
Change in drinking (3M - BL)	0.16	0.06	2.51	0.014
Change in drinking x intervention	-0.17	0.12	-1.38	0.173

Note: NODS: NORC DSM-IV screen for past 3 month gambling problems
SE: standard error

their drinking. This subgroup of problem gamblers might indeed reduce their alcohol consumption (and show greater improvements in their gambling) when presented with both problem gambling and unhealthy alcohol consumption interventions. However, many participants with unhealthy alcohol use would most likely not respond to an advertisement asking for people who are concerned about both gambling and alcohol use because they may not be concerned about their drinking, or

Table 7.

Proportion of participants using different components of each online intervention.

Component of intervention used	% within intervention (n)
G-only intervention (N = 143)	
Self-help gambling tools	81.8 (117)
G + A intervention (N = 139)	
Self-help gambling tools only	21.6 (30)
CYD only	12.2 (17)
Self-help gambling tools & CYD	54.0 (75)

may decide to address their concerns separately ('I'll deal with my gambling then get to my drinking'), or may assume that the researcher is only interested in people who drink a lot more than they do. Notable in the current trial was that, while almost half of participants met criteria for unhealthy alcohol use were regarded as meriting a brief alcohol intervention, the alcohol consumption of many of these participants was less severe than would be expected in a treatment-seeking sample. However, the personalized feedback intervention provided was largely designed for people with unhealthy, but not severe, levels of alcohol consumption. Thus, there is likely some other reason that no significant reductions in alcohol use were observed among the participants in this trial meeting criteria for unhealthy drinking than some sort of floor effect due to low levels of alcohol consumption at baseline.

There were a number of limits to the current trial, some of which have already been mentioned. The lack of engagement with the online intervention is troubling and points to the need to find ways to make continued use of the intervention more attractive. However, it is important to note that intervention engagement may not be separable from the intervention content, the target behavior, and/or the mechanisms of action within the intervention. Second, while there is research indicating that self-report of amount of gambling is generally reliable, it would be a strength if some other objective measure of gambling could be obtained (and ideally to do this without changing the composition of the participants in the trial). Finally, the brief alcohol personalized feedback intervention employed in the current trial was a stand-alone intervention rather than one that had been integrated into the online gambling intervention. One topic for future research in this area would be the benefits of a more integrated intervention (e.g., one that contained information on how increased levels of intoxication might promote gambling losses – or how gambling losses might promote unhealthy alcohol consumption) on improvements in gambling and reduction in unhealthy alcohol use.

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Declaration of competing interest

The authors declare that they have no conflict of interest.

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