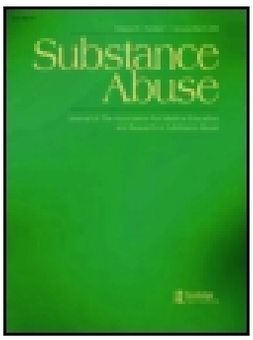

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ORIGINAL RESEARCH

Web-based alcohol intervention for nightclub patrons: Opposite effects according to baseline alcohol use disorder classification

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ABSTRACT

Background: This study aimed to test the effectiveness of a Web-based intervention in preventing alcohol abuse among nightclub patrons. *Methods*: A probabilistic sample of the patrons of 31 nightclubs in São Paulo, Brazil, was invited to participate in an online screening using the Alcohol Use Disorders Identification Test (AUDIT). A total of 1057 patrons met the inclusion criteria to participate in the randomized controlled trial, with data collection at 0, 3, 6, and 12 months. At baseline, participants were classified into 2 AUDIT score groups: a "high-risk" group (AUDIT $\geq$8; 44%) and a "low-risk" group (AUDIT $<$8; 56%). In both groups, the intervention subgroup was exposed once to a personalized normative feedback screen with information on the participant's alcohol consumption and its potential consequences. *Results*: After 12 months, no differences were found between the intervention and the control conditions in either risk group. In the "high-risk" group, there were significant reductions of both the AUDIT score and the prevalence of binge drinking (BD) over time in both the control and the intervention subgroups. In addition, an effect of the intervention was observed at 6 months, i.e., there was an estimated 13% reduction in the AUDIT score in favor of the intervention subgroup (odds ratio [OR] = 0.87; 95% confidence interval [CI]: 0.76, 1.00). In the "low-risk" group, both the control patrons and those receiving the intervention had increased AUDIT scores. *Conclusion*: The results suggest that the time effect of participating in the study may have had a beneficial outcome in reducing harmful drinking among patrons in the "high-risk" group. The intervention is not recommended to the "low-risk" group.

KEYWORDS

Alcohol use disorders; AUDIT; Brazil; nightclub patrons; Web-based intervention

Introduction

Nightclubs are important locations for leisure and socialization for young people worldwide; however, these establishments are characterized by high alcohol abuse rates.[1] Interventions are needed to reduce risky patterns of alcohol use and the associated consequences in this group of individuals.[2]

To identify the frequency, quantity, and consequences of alcohol abuse, the World Health Organization (WHO) has developed the Alcohol Use Disorders Identification Test (AUDIT).[3] There is growing evidence that AUDIT is a rapid and effective screening instrument for identifying risky patterns of alcohol use.[4] In fact, AUDIT has been widely used as a screening test to determine the risky drinking patterns of patients and college students.[5]

Recently, Internet-based interventions have been tested in developed countries, especially among young people and/or students,[6,7] using an approach related to social norms. These interventions have shown success in reducing alcohol-related harm among college students.[8] This type of approach recognizes that individuals, and particularly young people, tend to overestimate the alcohol consumption of their peers, a misperception that leads individuals to drink more than they would otherwise. The social norms approach[9,10] aims to reduce these misperceptions and, consequently, the individual consumption of alcohol through normative feedback. Personalized messages provide personal information, such as the individual's drinking profile and its risk factors, along with comparisons with other profiles and tips for reducing alcohol-related damage.[11,12] The individual's consumption is also compared with the pattern of consumption in the general population.[13] This type of tool has the advantage of utility in large-scale assessments due to its easy accessibility and low cost,[14] in addition to preserving the privacy of participants.[15]

International studies have used Web-based AUDIT as a tool for tracking harmful alcohol consumption in college students,[8] and results have shown a significant reduction in alcohol consumption after the use of Web-based personalized normative feedback.[8,16] Given that the nightclub population is composed of mostly college students,[17] these individuals may also benefit from Web-based personalized feedback. Therefore, interventions among nightclub patrons that are aimed to reduce problems related to harmful alcohol use are required and promising.[18] The present study is innovative in proposing that nightclub patrons' alcohol consumption be screened using AUDIT and that patrons be subjected to Web-based interventions. Thus, the objective of this study was to test a Web-based intervention to reduce AUDIT scores and binge drinking (BD) among nightclub patrons in the city of São Paulo.

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Supplemental data for this article can be accessed on the publisher's Web site.

Methods

Sample

The data used in this study originated from a portal survey study[19] called "Balada com Ciência" conducted in 2013–2014 to diagnose alcohol and drug use and other risk behaviors among nightclub patrons in the megacity of São Paulo, Brazil.[20,21] Sampling details of the cross-sectional study can be found in a study by Sanchez et al.[17]

Data collection and instruments

Subjects were systematically approached while waiting in line at 31 nightclubs that were randomly selected by probability proportional to size. The study included 3 components: face-to-face interviews at the nightclub entrance and exit and a Web-based online questionnaire that was administered the next day. In this last component, the participants were recruited for a Web-based randomized controlled trial (RCT).

Patrons who agreed to participate in the study answered a questionnaire on sociodemographic variables, the practice of pre-drinking, alcohol use patterns, drug use, and other risk behaviors at nightclubs in the past 12 months prior to the first interview. The patrons also had their breath alcohol concentration (BrAC) measured at the time of the interview using a breathalyzer, and each patron received a bracelet with a unique numeric code for identification at the time of exiting the nightclub.

At the nightclub exit, the same participating patrons (identified by their bracelets) were approached once more and invited to answer another questionnaire regarding their use of alcohol and illicit drugs and other risk behaviors that they could have engaged in while inside the nightclub. At the end of the exit interview, each individual's BrAC was measured once more. Additionally, a project folder containing information regarding the post-nightclub questionnaire that would be sent by e-mail the next day was handed to the participants.

On the day after the nightclub interviews, a link to the online post-nightclub questionnaire was sent by e-mail to the interviewees.

The e-mail sent the day after the nightclub interviews specifically contained a link to a new questionnaire, hosted on the Web site www.baladacomciencia.com.br, with items covering (1) patron risk behaviors after exiting the nightclub, (2) demographics (sex, age, weight, height), (3) drinking in the last 12 months (yes/no), and (4) a 10-item AUDIT.

Randomization and intervention

Figure 1 shows the flowchart for patron recruitment and data collection for the "Balada com Ciência" portal survey and the 2-arm, parallel, RCT.

Patrons who answered "*yes*" for the item "*drinking in the last 12 months*" were invited to participate in the RCT of digital intervention with personalized feedback. They were randomly assigned to a control group (screening only) or an intervention group using an algorithm for stratified permuted block randomization, with sex, age group, and AUDIT score considered in the random allocation. Randomization was performed at the individual level for each nightclub.

The intervention, applied only at baseline, consisted of (1) an AUDIT score along with an explanation of the associated health risk and information about how to reduce that risk; (2) the respondent's highest BrAC between that obtained with the breathalyzer at the entrance/exit of the nightclub and the one calculated for the response about the hardest drinking episode in the last 4 weeks as well as information on behavioral and traffic accident–related relative risks[22] plus a reminder of the fines and penalties established in Brazilian traffic law (law 11705/08) and the possibility of the occurrence of risky sexual behavior between alcohol-intoxicated people; (3) estimates of monetary expenditure per month and year; (4) bar graphs comparing episodic and weekly consumption with that of other people of the same age and sex, using data from an alcohol-related household survey conducted in the general population in 2006[23]; and (5) a Web page offering facts about alcohol and tips for reducing the risk of alcohol-related harms. Participants in the control group received no feedback and saw only a thank-you screen after completing the data collection instrument.

Follow-up and outcomes

At 3, 6, and 12 months after the initial assessment, a new e-mail containing a link directing the participants to the study Web site, where they could complete the follow-up questionnaire, was sent. If they did not access the link within 3 days, a new link was sent, in addition to an SMS (mobile phone) message informing the participants about the e-mail. After 3 attempts without a response, the participant was contacted via telephone and informed about the questionnaire link that had been sent via e-mail.

There were 2 planned primary outcomes: (1) the prevalence of BD in the past month and (2) the AUDIT score (range: 0–40). The main instrument used was the AUDIT screening test, in the form of an online, self-administered questionnaire. The internal consistency of AUDIT ranged from 0.70 to 0.61 between baseline and 12 months of follow-up. Sociodemographic data were obtained from the initial data set, i.e., the face-to-face interviews performed at the entrance of nightclubs, as described by Santos et al.[21]

Past-month BD was assessed using the following question: "*In the last 4 weeks, what was the largest number of alcoholic drinks that you consumed on a single occasion*?" This question was open, but for analytical purposes, the answer was categorized as *Yes* when it was 5 or more drinks for men and 4 or more for women. This question was not part of AUDIT but was included to better generate a BD estimate, allowing for gender differences.

The AUDIT score measured the alcohol consumption risk level of the respondents, where a score of 0–7 was classified as "low risk"; 8–14, as "risk"; 15–19, as "harmful use"; and 20–40, as "dependence."[24] The model adjustment variables used were the following sociodemographic characteristics: sex (male; female); age (mean ± standard deviation); and socioeconomic status (SES), obtained from the Brazilian Association of Population Studies (Associação Brasileira de Estudos Populacionais

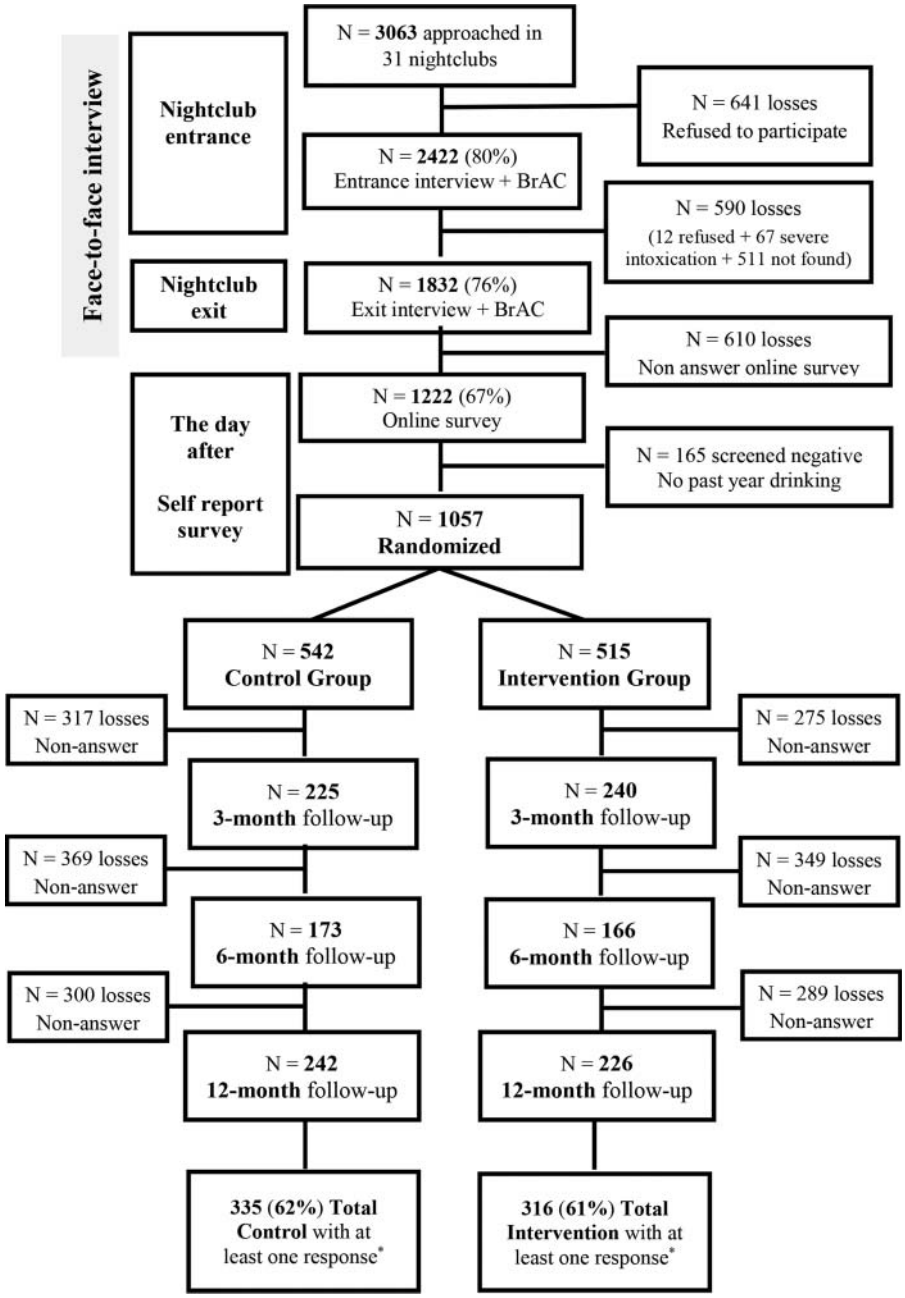

Figure 1. Trial flowchart. *Analyses using random-effects models incorporating participants with at least 1 post-randomization response.

[ABEP])[25] socioeconomic level classification (A = high; B = middle-high; C = middle; D = middle-low; E = low; note that C, D, and E were grouped together due to the small numbers of cases).

Statistical analysis

The analyses were stratified in 2 large risk groups according to AUDIT scores, namely, patrons with a "low risk" (AUDIT score <8) and patrons with a "high risk" (AUDIT score ≥8), to address the possible difference of initial risk profile in the intervention effect. The primary outcomes were analyzed for panel data using Stata 13.1 software (StataCorp, College Station, TX) with an exchangeable correlation matrix. For the evaluation of temporal changes in the proportion of patrons who engaged in BD in the past month, we used a generalized linear mixed model with the xtlogit procedure.[26,27] AUDIT score changes were analyzed with negative binomial regression using the xtnbreg procedure.[28] All models included a random intercept to account for clustering within participants and fixed effects for group, follow-up assessment, and their interaction. The interaction term allowed differences in the intervention effect between follow-up assessments. The results of the intention-to-treat hypothesis (randomization effect on outcome) are presented as odds ratios (ORs) and rate ratios (RRs), with a level of significance of 5%.

We assessed the patterns of missing values and compared the observed and missing values in terms of baseline characteristics (no post-randomization data available) and each follow-up to assess whether unavailability for follow-up was

different according to randomization group and to identify the attrition profile. Although the nondifferential missingness of baseline quantities by randomization group did not rule out nonignorable differential missingness, it did provide some reassurance that the unobserved participants did not drastically differ from the observed ones.

Ethics committee approval

This research was approved by the Research Ethics Committee of the Federal University of São Paulo (Universidade Federal de São Paulo [UNIFESP]; protocol number 21477), conducted between 2013 and 2014 and registered in the Brazilian Clinical Trials Registry of the Ministry of Health (Registros Brasileiros de Ensaios Clínicos [REBEC]; protocol number RBR 35bkzc).

Results

Table 1 presents, for each of the stratified groups ("high risk" and "low risk"), summary measures describing the profiles of and the homogeneity between the 2 study subgroups (control and intervention) at baseline. Most randomly selected nightclub patrons were men (57.5%) from higher social classes (A or B; 85%), and the most frequent age group and marital status were 18–25 years of age (57%) and single (90%), respectively. Regarding education level, more than half of the nightclub patrons had completed high school.

Table 2 presents the profile of losses over time in each AUDIT-stratified group according to study subgroup. For the "high-risk" group, the baseline AUDIT scores were similar between those who responded and those who did not respond to follow-up at 3 months (mean difference: 0.40 points; 95% confidence interval [CI]: −0.35, 1.16), 6 months (mean difference: 0.25 points; 95% CI: −0.55, 1.04), and 12 months (mean difference: −0.10 points; 95% CI: −0.86, 0.65). No statistically significant difference was observed between those who responded and those who did not respond at any of the 3 follow-up times. The "low-risk" group also presented similar baseline AUDIT scores between those who responded and those who did not respond to follow-up at 3 months (mean difference: −0.22 points; 95% CI: −0.58, 0.15), 6 months (mean difference: −0.05 points; 95% CI: −0.44, 0.35), and 12 months (mean difference: 0.08 points; 95% CI: −0.28, 0.45). In this group, men were more likely than women to not respond at both 3 months ($P = .001$) and 6 months ($P = .030$); at 12 months, there was no difference between sexes for those who responded and those who did not respond ($P = .170$). Those who did not respond were older than those who responded at the 3 follow-up times, namely, 3 months (mean difference: 1.07 years; 95% CI: −0.18, 2.32), 6 months (mean difference: 1.12 years; 95% CI: −0.23, 2.46), and 12 months (mean difference: 1.89 years; 95% CI: 0.65, 3.14). However, a significant difference was only observed at the 12-month follow-up ($P = .003$).

Table 3 presents the treatment effects for the outcomes at each of the assessment time points for each AUDIT-stratified group according to treatment subgroup. There were no significant effects of the intervention on either BD in the past month or the AUDIT score in either of the 2 risk groups for AUDIT ($P > .05$), with the exception of the AUDIT score at 6 months for the "high-risk" group (OR = 0.87; 95% CI: 0.76, 1.00; $P = .050$).

Table 1. Sociodemographic characteristics and alcohol use according to AUDIT score and group.

	Total ($N = 1057$)				High risk ($n = 465$)					Low risk ($n = 592$)				
	Intervention ($n = 515$)		Control ($n = 542$)		Intervention ($n = 224$)		Control ($n = 241$)			Intervention ($n = 291$)		Control ($n = 301$)		
Characteristic	*n*	%	*n*	%	*n*	%	*n*	%	*P*	*n*	%	*n*	%	*P*
Sex														
Male	287	55.7	321	59.2	136	60.7	164	68.1	.099	151	51.9	157	52.2	.948
Age (years), mean (SD)	25.8 (6.8)		26.5 (7.4)		24.3 (5.7)		25.0 (6.2)		.237	27.0 (7.3)		27.7 (8.1)		.281
Age group														
18–25 years	300	58.2	304	56.1	149	66.5	155	64.3	.793	151	51.9	149	49.5	.699
26–33 years	145	28.2	153	28.2	59	26.3	65	27.0		86	29.5	88	29.2	
≥34 years	70	13.6	85	15.7	16	7.2	21	8.7		54	18.6	64	21.3	
SES														.546
A	135	26.2	152	28.0	68	30.4	71	29.5	.852	67	23.0	81	26.9	
B	299	58.1	312	57.6	123	54.9	138	57.2		176	60.5	174	57.8	
C/D/E	81	15.7	78	14.4	33	14.7	32	13.3		48	16.5	46	15.3	
Education level														.893
Elementary school	13	2.6	15	2.8	6	2.7	6	2.5	.533	7	2.5	9	3.0	
High school	278	54.8	285	53.1	136	61.5	136.	56.7		142	49.6	149	50.2	
College/Graduate degree	216	42.6	237	44.1	79	35.8	98	40.8		137	47.9	139	46.8	
Marital status														
Single	463	90.2	485	89.6	215	96.0	221	92.1		248	85.8	264	87.7	
AUDIT score, mean (SD)	7.5 (5.3)		7.6 (5.6)		12.4 (4.0)		12.8 (4.2)		.322	3.8 (2.2)		3.5 (2.2)		.109
Drinking summary data[a]														
Drinks alcohol 2 or more times per week	120	23.3	150	27.7	91	40.8	118	49.0	.071	29	10.0	32	10.6	.790
No. of standard drinks per typical drinking occasion, mean (SD)	2.8 (2.3)		2.8 (2.7)		3.8 (2.8)		3.9 (2.4)		.679	2.0 (1.4)		1.9 (1.5)		.402
Alcohol dependence subscale score[b], mean (SD)	1.1 (1.5)		1.0 (1.5)		2.0 (1.7)		2.0 (1.8)		.999	0.3 (0.7)		0.3 (0.6)		.999

Note. SD = standard deviation; AUDIT = Alcohol Use Disorders Identification Test.
[a]AUDIT items 1 and 2.
[b]Sum of scores for AUDIT items 4 through 6.

Table 2. Characteristics of participants unavailable for follow-up analysis according to group and AUDIT score at baseline.

	High Risk					Low Risk				
	Intervention		Control			Intervention		Control		
	N	%	N	%	p	N	%	N	%	p
Missing at 3 mo	122	54.5	145	60.2	0.214	153	52.6	172	57.1	0.264
Men	78	63.9	100	69.0	0.385	95	62.1	95	55.2	0.210
Age, mean (SD), y	24.3 (5.9)		24.9 (6.7)		0.464	26.4 (6.9)		27.3 (7.9)		0.292
SES					0.954					0.110
A	34	27.9	38	26.2		34	22.2	41	23.8	
B	70	57.4	85	58.6		85	55.6	108	62.8	
C/D/E	18	14.7	22	15.2		34	22.2	23	13.4	
AUDIT score at baseline mean (SD)	12.6 (3.8)		12.9 (4.3)		0.581	3.7 (2.3)		3.4 (2.2)		0.313
Missing at 6 mo	145	64.7	164	68.0	0.449	204	70.1	205	68.1	0.599
Men	88	60.7	111	67.7	0.200	115	56.4	110	53.7	0.581
Age, mean (SD), y	24.3 (5.8)		25.0 (6.6)		0.330	26.4 (7.0)		27.5 (7.9)		0.147
SES					0.837					0.297
A	43	29.6	45	27.5		49	24.0	56	27.3	
B	80	55.2	96	58.5		117	57.4	122	59.5	
C/D/E	22	15.2	23	14.0		38	18.6	27	13.2	
AUDIT score at baseline mean (SD)	12.6 (3.9)		12.8 (4.2)		0.596	3.8 (2.2)		3.5 (2.3)		0.300
Missing at 12 mo	120	53.6	137	56.8	0.478	169	58.1	163	54.1	0.336
Men	76	63.3	91	66.4	0.604	93	55.0	88	54.0	0.849
Age, mean (SD), y	24.2 (5.5)		24.8 (6.7)		0.412	26.3 (6.9)		26.8 (7.5)		0.534
SES					0.691					0.889
A	36	30.0	36	26.3		37	21.9	38	23.3	
B	70	58.3	81	59.1		102	60.4	99	60.7	
C/D/E	14	11.7	20	14.6		30	17.7	26	16.0	
AUDIT score at baseline mean (SD)	12.3 (4.1)		12.8 (4.4)		0.328	3.8 (2.2)		3.6 (2.2)		0.341
Missing at 3 and 6 mo	103	46.0	127	52.7	0.148	141	48.4	148	49.2	0.862
Men	66	64.1	89	70.1	0.334	90	63.8	78	52.7	0.055
Age, mean (SD), y	24.4 (5.9)		24.9 (6.9)		0.575	26.4 (6.6)		27.6 (8.2)		0.154
SES					0.934					0.058
A	29	28.2	33	26.0		33	23.4	37	25.0	
B	59	57.3	75	59.1		76	53.9	93	62.8	
C/D/E	15	14.5	19	14.9		32	22.7	18	12.2	
AUDIT score at baseline mean (SD)	12.7 (3.8)		12.9 (4.3)		0.718	3.8 (2.3)		3.5 (2.2)		0.282
Missing at 6 and 12 mo	101	45.1	116	48.1	0.511	151	51.9	136	45.2	0.103
Men	66	65.3	76	65.5	0.979	87	57.6	71	52.2	0.358
Age, mean (SD), y	24.2 (5.6)		24.9 (6.9)		0.463	25.8 (6.5)		27.3 (7.8)		0.097
SES					0.644					0.678
A	30	29.7	30	25.9		31	20.5	31	22.8	
B	60	59.4	69	59.5		91	60.3	84	61.8	
C/D/E	11	10.9	17	14.6		29	19.2	21	15.4	
AUDIT score at baseline mean (SD)	12.2 (3.9)		12.7 (4.4)		0.343	3.9 (2.2)		3.5 (2.3)		0.196
Missing at all time points	80	35.7	96	39.8	0.360	119	40.9	111	36.9	0.316
Men	55	68.7	66	68.7	> 0.999	74	62.2	57	51.3	0.097
Age, mean (SD), y	24.5 (5.5)		24.8 (7.1)		0.760	25.8 (6.2)		27.7 (8.1)		0.055
SES					0.832					0.426
A	22	27.5	23	24.0		25	21.0	25	22.5	
B	48	60.0	59	61.4		69	58.0	70	63.1	
C/D/E	10	12.5	14	14.6		25	21.0	16	14.4	
AUDIT score at baseline mean (SD)	12.2 (3.7)		12.9 (4.6)		0.276	3.8 (2.2)		3.4 (2.2)		0.129

Note. SD = standard deviation; AUDIT = Alcohol Use Disorders Identification Test.

When observing the changes over time according to treatment group, opposite effects were observed according to risk group when the subjects were at baseline (Table 4). For the intervention group in the "high-risk" stratum, a direct comparison between baseline and 12 months showed a 40% decrease in BD in the past month (OR = 0.60; 95% CI: 0.38, 0.95). Regarding the AUDIT score, a decrease was observed at the 3 time points, with the lowest incidence risk ratio (IRR) observed at 12 months (IRR = 0.87; 95% CI: 0.79, 0.95). A similar situation was observed for the control group, in which, at 12 months, there were significant decreases in both BD in the past month (OR = 0.42; 95% CI: 0.26, 0.66) and the AUDIT score (IRR = 0.87; 95% CI: 0.79, 0.95). In the "low-risk" group, the opposite was observed for the AUDIT score, i.e., in both the control and the intervention groups, there were statistically significant increases in the AUDIT score, with the greatest increases being observed at 6 months in both groups (control: IRR = 1.27, 95% CI: 1.11, 1.47; intervention: IRR = 1.37, 95% CI: 1.20, 1.57). However, this stratum showed no effect on BD in the past month for any of the

Table 3. Effects of treatment (intervention vs. control) based on random effects model—crude and adjusted analyses.

Group	Measure	OR_c[a]	95% CI	OR_{adj}[b]	95% CI	*P*
High risk	BD last month					
	Baseline	0.81	0.53–1.23	0.80	0.52–1.21	.282
	3 months	0.83	0.48–1.44	0.83	0.48–1.45	.516
	6 months	0.82	0.44–1.54	0.82	0.44–1.55	.545
	12 months	1.14	0.66–1.97	1.15	0.66–2.00	.621
		IRR_c[c]	95% CI	IRR_{adj}[d]	95% CI	*P*
	AUDIT score					
	Baseline	0.97	0.91–1.03	0.97	0.92–1.04	.430
	3 months	0.95	0.83–1.08	0.95	0.84–1.08	.467
	6 months	0.86	0.75–0.99	0.87	0.76–1.00	.050
	12 months	0.97	0.85–1.11	0.98	0.85–1.11	.726
		OR_c[a]	95% CI	OR_{adj}[b]	95% CI	*P*
Low risk	BD last month					
	Baseline	1.14	0.79–1.65	1.13	0.78–1.64	.508
	3 months	1.11	0.65–1.90	1.11	0.65–1.90	.704
	6 months	1.15	0.61–2.18	1.15	0.60–2.20	.669
	12 months	1.38	0.80–2.41	1.38	0.79–2.42	.256
		IRR_c[c]	95% CI	IRR_{adj}[d]	95% CI	*P*
	AUDIT score					
	Baseline	1.08	0.98–1.20	1.08	0.98–1.19	.125
	3 months	1.13	0.95–1.34	1.15	0.97–1.36	.115
	6 months	1.12	0.91–1.37	1.16	0.95–1.42	.148
	12 months	1.10	0.90–1.34	1.11	0.91–1.34	.302

Note. Control group is the reference for the odds ratio calculation.
[a]Generalized linear mixed models with Stata xtlogit procedure adjusted for group, time, and group × time interaction effects.
[b]Generalized linear mixed models with Stata xtlogit procedure adjusted for group, time, group × time interaction, sex, age group, and SES.
[c]Generalized linear mixed models with Stata xtnbreg procedure adjusted for group, time, and group × time interaction effects.
[d]Generalized linear mixed models with Stata xtnbreg procedure adjusted for group, time, group × time interaction, sex, age group, and SES.

time points or treatment groups. Additionally, Figure 2 shows the effect of time for each stratum according to treatment group. The point estimates for the AUDIT score and BD in the past month in both strata at the 4 time points and in the 2 intervention groups are presented in Table S1 (Supplementary Material).

Finally, the initial losses among the potential 2422 patrons recruited at the entrance of the nightclubs in São

Table 4. Effects of time relative to the baseline based on random effects model—crude and adjusted analyses.

		Time effect—Intervention group						Time effect—Control group					
		Crude			Adjusted			Crude			Adjusted		
Group	Measure	OR_c[a]	95% CI	*P*	OR_{adj}[b]	95% CI	*P*	OR_c[a]	95% CI	*P*	OR_{adj}[b]	95% CI	*P*
High risk	BD last month												
	3 × 0 month	0.66	0.43–1.02	.059	0.65	0.42–1.01	.057	0.64	0.43–0.95	.029	0.62	0.42–0.93	.021
	6 × 0 month	0.71	0.44–1.15	.164	0.71	0.43–1.15	.164	0.70	0.43–1.12	.138	0.68	0.42–1.10	.119
	12 × 0 month	0.60	0.38–0.94	.028	0.60	0.38–0.95	.030	0.43	0.27–0.68	<.001	0.42	0.26–0.66	<.001
	AUDIT score												
	3 × 0 month	0.91	0.84–0.98	.018	0.91	0.85–0.99	.023	0.93	0.85–1.03	.156	0.94	0.85–1.03	.178
	6 × 0 month	0.89	0.81–0.98	.019	0.89	0.81–0.98	.020	1.00	0.91–1.10	.989	1.00	0.92–1.10	.943
	12 × 0 month	0.87	0.79–0.95	.003	0.87	0.79–0.95	.003	0.87	0.79–0.95	.002	0.87	0.79–0.95	.002
		OR_c[a]	95% CI	*P*	OR_{adj}[b]	95% CI	*P*	OR_c[a]	95% CI	*P*	OR_{adj}[b]	95% CI	*P*
Low risk	BD last month												
	3 × 0 month	0.97	0.65–1.46	.888	0.97	0.64–1.47	.895	0.99	0.66–1.50	.979	0.99	0.65–1.50	.974
	6 × 0 month	0.80	0.51–1.28	.357	0.81	0.51–1.30	.385	0.80	0.50–1.26	.340	0.80	0.50–1.27	.340
	12 × 0 month	0.96	0.63–1.47	.851	0.97	0.63–1.49	.884	0.79	0.52–1.21	.283	0.79	0.51–1.22	.293
	AUDIT score												
	3 × 0 month	1.28	1.16–1.42	<.001	1.34	1.21–1.48	<.001	1.23	1.09–1.38	.001	1.26	1.11–1.42	<.001
	6 × 0 month	1.28	1.12–1.47	<.001	1.37	1.20–1.57	<.001	1.25	1.08–1.44	.002	1.27	1.11–1.47	.001
	12 × 0 month	1.14	1.00–1.31	.045	1.20	1.05–1.37	.009	1.13	0.99–1.29	.076	1.17	1.02–1.34	.026

[a]Generalized linear mixed models with Stata xtlogit procedure adjusted for group, time, and group × time interaction effects.
[b]Generalized linear mixed models with Stata xtlogit procedure adjusted for group, time, group × time interaction, sex, age group, and SES.

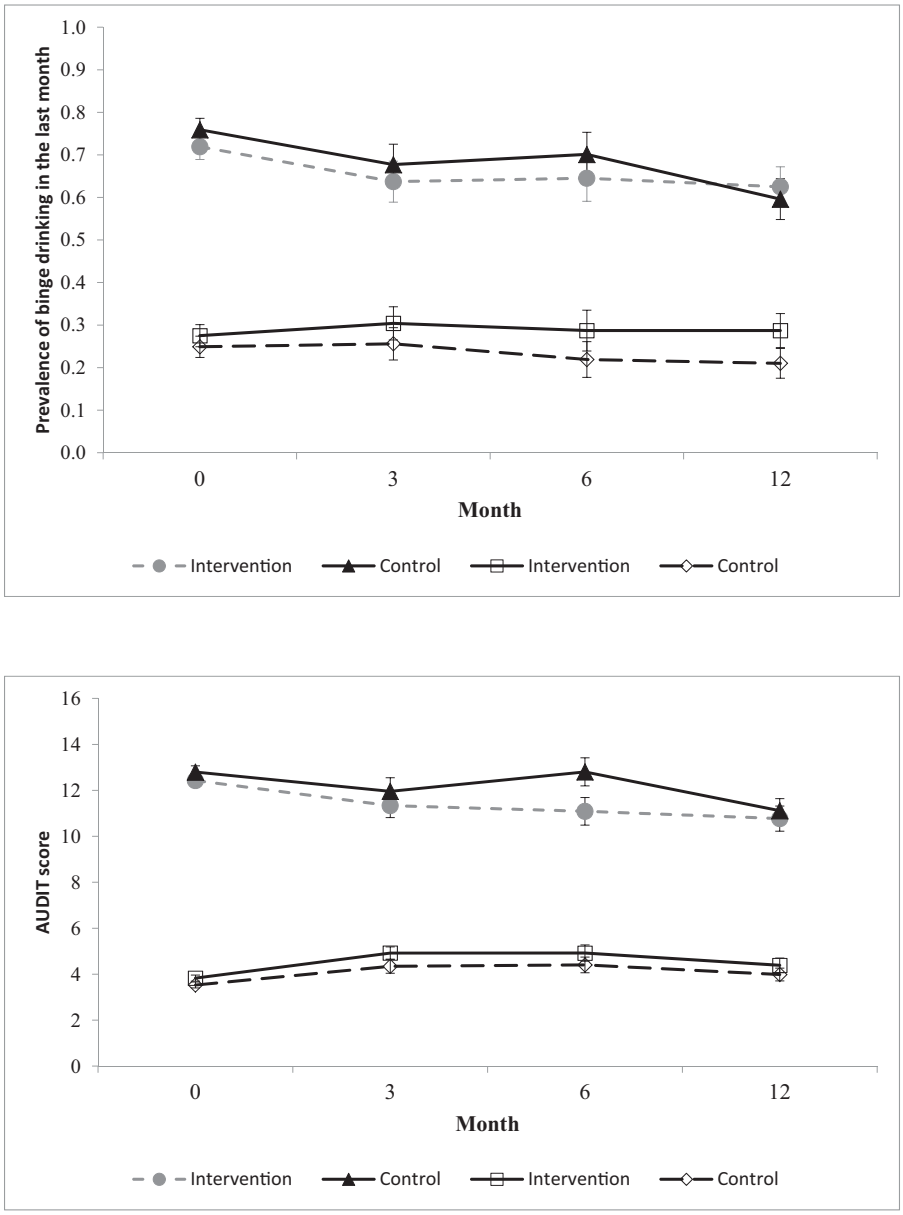

Figure 2. Prevalence of past-month BD and AUDIT score over time according to the baseline AUDIT score and group.

Paulo may be explained by the following: women and more highly educated individuals were more likely to access the Web on the day following the portal survey and to participate in the Web-based RCT. There were no differences with respect to age, education level, SES, or marital status (Table S2).

Discussion

This study is innovative because it used an RCT to evaluate the effectiveness of providing Web-based personalized feedback after Web-based alcohol use screening using AUDIT among nightclub patrons in the southern hemisphere's largest city. In the "high-risk" group, there were significant reductions in both the AUDIT score and the prevalence of BD over time. In addition, there was an effect of the intervention at 6 months, i.e., there was an estimated 13% reduction in the AUDIT score in favor of the intervention group. In the "low-risk" group, both control patrons and those who received the intervention had increased AUDIT scores, and there was no difference in the prevalence of BD compared with that at baseline. The results for the 2 risk groups suggest an effect of the assessment on alcohol use.

Until now, to our knowledge, there have been no other published studies assessing the effectiveness of online interventions among nightclub patrons. However, studies conducted with college students with high levels of at-risk drinking[29] have suggested that this population would be less likely to engage in discussions about their alcohol consumption with health professionals but that a Web-based assessment tool and personalized feedback tend to be well accepted.[30] Given that nightclub patrons are a population of young adults composed of mostly college students, extrapolation to this population is plausible because alcohol abuse is common at nightclubs[31]; thus, interventions for this group are necessary and urgent.[1] Half of the portal survey participants accessed the online

questionnaire on the following day and were willing to participate in the RCT. These data show that the Web-based intervention did not reach a significant proportion of nightclub patrons, with the largest proportion of losses identified among men and less-educated individuals, suggesting the nonuniversality of the intervention.

Another aspect that differentiates our study from other studies is that even the group classified as "low risk" also participated in the intervention and data analyses. The justification for this inclusion was that if the intervention proved to be effective, it would be interesting to make it available to all patrons in the future; therefore, an assessment of its effect on individuals with low-risk drinking patterns was required. Misconceptions in the interpretation of social norms do not occur only among those who engage in risk behaviors, and social normative feedback could be a tool for correcting these misconceptions in the population.[32]

The effectiveness of Web-based interventions aimed at decreasing alcohol consumption and/or preventing alcohol abuse is unclear due to controversial results of the screening and online intervention methodologies, as suggested in a systematic review conducted by Bewick et al.[33] More studies are needed to understand the relationship between different levels of alcohol consumption and intervention effectiveness because whereas Westrup et al.[34] suggested that this type of intervention can be more effective for high-risk participants, a study by Lieberman[35] suggested lower utility among alcohol abusers; the need for more effect assessments through stratification by risk profile is thus clear.

In the "high-risk" group studied here, the patrons benefitted from participation in the study, which is in agreement with the findings of other international studies with college students with an inclusion criterion of an AUDIT score greater than or equal to 8.[8,36] However, the intervention effect observed in the present study was lower than that found in other work with college students, despite use of the same screening criteria and a similar intervention.[37,38] The difference between our study and other studies may be due to differences in the population evaluated; consistent with this, the effect was lower in a study that assessed the general Brazilian population. It is important to note that our finding of changes in the AUDIT score does not imply any change in the risk group; that is, the finding does not mean that the subjects no longer had harmful drinking patterns. Rather, the reduction in the score is evidence of a tendency of improvement in the pattern of alcohol consumption without alteration of the risk profile.

Moreover, even though the reduction in BD practice in the "high-risk" group did not occur as a result of a Web-based intervention, the fact that this reduction may have occurred as part of an assessment of this population, independent of the group, is important. From the point of view of public health, BD is prominent among adolescents and young adults and is generally the source of the harm from drinking in these populations.

A possible iatrogenic effect of the assessment was found in the "low-risk" group, as there were significant increases in the AUDIT score over time in both the control and the intervention groups in this stratum of nightclub patrons. The effect of the assessment occurred through a change in behavioral profiles only because a given individual was included in the study regardless of to which group he or she was allocated and regardless of whether he or she received the intervention. This effect is not new, although it is unusual; it was previously described by McCambridge and Kypri,[39] who emphasized that answering questions about alcohol consumption patterns in screenings seems to change the respondents' consumption patterns and subsequent measurements. This effect leads to bias because completing the questionnaire, which is also completed by the control group, can be considered a component of the intervention and can dilute the effect of the intervention itself.

When analyzing the behavior of the AUDIT scores over time for the "high-risk" and "low-risk" groups, one can see an opposite effect, i.e., a decreasing trend in the former group and an increasing trend in the latter group. This phenomenon may reflect a statistical effect known as "regression to the mean," which presupposes that when subjects are evaluated in extreme moments of behavior, their tendency is to return to the mean, i.e., over time, they will start reporting more realistic instead of extreme consumption levels. According to McCambridge et al.,[40] the phenomenon of regression to the mean affects part of the observed effect of all brief alcohol intervention trials, especially in the control group. Furthermore, the change in alcohol consumption over time can increase as the cutoff point increases. In our case, this cutoff effect did not occur because all drinkers who accessed the Web were included.

This study has limitations, with the main limitation being the high rate of attrition over the 12-month period. The study did not provide incentives to the participants, which may justify the high rate of attrition. Therefore, it is suggested for future longitudinal studies, the possible inclusion of reimbursements or incentives for participation. Another limitation was the inability to compare the results of this study with those of others that assessed online interventions among nightclub patrons due to the unprecedented nature of this work and the difficulty that certain nightclub patrons had in accessing the Internet, thus limiting the scope of the RCT. Moreover, AUDIT is a screening test, and not a diagnostic test; therefore, it was not possible to infer clinical changes over time.

It was concluded that online interventions may be an option for reducing abusive alcohol consumption in the nightclub patron population. Although the adherence to the intervention was average, there was an effect in terms of AUDIT score reduction in the intervention group compared with the control group among "high-risk" subjects. No intervention effects were observed for the "low-risk" group, but there was an iatrogenic effect over time, i.e., the AUDIT scores increased in both the control and the intervention groups.

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Author contributions

Zila M. Sanchez designed the study, wrote the grant protocol, and rewrote the manuscript to create the final version. Adriana Sanudo was responsible for data analysis and writing of the first version of the manuscript. All authors have read and approved the final version of the manuscript and have revised it critically for important intellectual content.

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