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150 (2023) 209061

Contents lists available at ScienceDirect

Journal of Substance Use and Addiction Treatment

journal homepage: www.journals.elsevier.com/journal-of-substance-use-and-addiction-treatment

Culturally adapted motivational interviewing's effects on drinking in response to immigration and acculturation stressors among Latinx adults with heavy drinking problems

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A R T I C L E I N F O

Keywords:
Motivational interviewing
Cultural adaptation
Hispanic
Latinx
Heavy drinking
Immigration/acculturation stress
Adults

A B S T R A C T

Introduction: Culturally adapted motivational interviewing (CAMI) is a form of motivational interviewing that was adapted to address immigration- and acculturation-related stressors among Latinx adults who met criteria for hazardous drinking. This study hypothesized that (1) receiving CAMI was associated with reduced immigration/acculturation stress and related drinking and that (2) these associations differed by participants' acculturation and perceived discrimination levels.
Methods: This study employed a single group pre-post study design using data from a randomized controlled trial. Participants were Latinx adults who received CAMI ($N = 149$). The study assessed immigration/acculturation stress with the Measure of Immigration and Acculturation Stressors (MIAS) and measured related drinking with the Measure of Drinking Related to Immigration and Acculturation Stressors (MDRIAS). The study team conducted linear mixed modeling for repeated measures to examine outcome changes between the baseline and the 6-month and 12-month follow-ups and moderation effects.
Results: Compared to baseline, the study found significant decreases in the total MIAS and MDRIAS scores and subscale scores at 6- and 12-month follow-ups. Moderation analysis results showed that lower acculturation levels and higher levels of perceived discrimination were significantly associated with larger decreases at follow-up in total MIAS and MDRIAS scores and several subscale scores.
Conclusions: Findings provide preliminary support for CAMI's efficacy in reducing immigration and acculturation stress and related drinking among Latinx adults with heavy drinking problems. The study observed more improvements among the less acculturated and more discriminated participants. Larger studies with more rigorous designs are needed.

1. Introduction

1.1. Alcohol-related disparities among Latinx Americans

Alcohol misuse is of growing concern among Latinx/Latino/Hispanic Americans (hereafter Latinxs), the largest ethnic group in the United States (U.S. Census Bureau, 2017). A meta-analysis of data from six nationally representative surveys collected from 2000 to 2016 found that the binge drinking prevalence among Latinxs increased at a significantly faster rate than among non-Latinx White Americans (Grucza et al., 2018). The prevalence of binge drinking among Latinxs increased >1 % per year, compared to the 0.6 % increase per year among non-Latinx Whites. During the same period, a net increase of 0.5 % per year occurred in alcohol use prevalence among Latinxs.

Compared to non-Latinx Whites, Latinxs experience heavier consequences due to drinking. They are more likely to experience recurrent or persistent alcohol dependence (Chartier & Caetano, 2010; Dawson et al., 2005; Grant et al., 2012), have higher rates of alcohol-related cirrhosis (Russo et al., 2004), and present with alcoholic cirrhosis 4 to 10 years younger than White patients (Levy et al., 2015). In addition, the rate of alcohol attributable injury including suicide, homicide, and fatal motor vehicle crashes are high among Latinxs relative to their reported use of

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https://doi.org/10.1016/j.josat.2023.209061
Received 21 September 2022; Received in revised form 13 December 2022; Accepted 1 May 2023
Available online 6 May 2023
2949-8759/

alcohol, perhaps explained by the higher rates of heavy drinking (Keyes et al., 2012). Moreover, despite more severe alcohol consequences compared to non-Latinx Whites, Latinxs are less likely to receive alcohol treatment (Schmidt et al., 2007).

Immigration- and acculturation-related stressors are important contributing factors to alcohol use problems among Latinxs (Delva et al., 2016, 2019). These stressors can manifest in many domains, including acculturation stress and racial/ethnic discrimination stress. *Acculturation* refers to the process of cultural and psychological change that results following sustained contact between cultures (Sam & Berry, 2010). Acculturation stress is the stress that occurs as a result of challenges encountered in the acculturation process (Berry et al., 1987), and it affects individuals of all acculturation levels (Lee et al., 2013). Research has shown acculturation stress to be associated with alcohol and other drug problems among Latinxs (Ehlers et al., 2009; Lee et al., 2013). *Discrimination* is the differential treatment of individuals based on their membership in a minority or lower-status group (Unger et al., 2014). A review of existing literature by Gilbert and Zemore (2016) suggested that experiences of discrimination are positively associated with increased alcohol consumption, drinking problems, and risk of alcohol use disorder (AUD). Studies on Latinxs similarly concluded that experiences of racial/ethnic discrimination are positively associated with substance use (Unger et al., 2014) and alcohol use severity (Cano et al., 2015).

1.2. Culturally adapted motivational interviewing

Motivational Interviewing (MI) is an addiction counseling strategy for AUD. The goal of MI is to promote motivation via eliciting thoughts and feelings about making a change. The few studies that have examined MI's effectiveness for Latinxs with alcohol use problems have indicated good treatment engagement and response in this population. A large randomized controlled trial (RCT) investigated MI's effectiveness for treatment retention and outcome among Spanish-speaking patients in five community substance use treatment programs. Findings suggest that MI was most effective for retaining patients whose primary substance was alcohol (Carroll et al., 2006), and that compared to patients who received treatment as usual, MI patients showed greater treatment retention rates and fewer days of alcohol use at the 28-week follow-up (Carroll et al., 2009). Another study recruited a sample of White, Black/African American (hereafter Black), and Latinx patients who were intoxicated at the time of the injury at a trauma center. That study showed that compared to treatment as usual (e.g., handouts on the risks of heavy drinking), MI had the greatest effects for reducing heavy drinking among Latinx patients only (Field et al., 2010). Additionally, a primary care–based study consisting of 66 % Latinxs studied the effects of receiving a 15-min brief MI versus enhanced usual care (i.e., providing a brochure about alcohol and other drugs) for adolescents ages 12–18 (D'Amico et al., 2018). At one-year follow-up, adolescents who received MI reported fewer negative alcohol consequences compared to adolescents who received enhanced usual care.

In light of the above research documenting a positive effect of MI, Lee et al. (2013) sought to enhance the effectiveness of MI by developing the culturally adapted motivational interview (CAMI) for Latinx who engage in heavy drinking. Details on the cultural adaptation procedures and content are published elsewhere (Lee et al., 2016a, 2016b). CAMI is a form of MI that is adapted to address social stressors and cultural differences among Latinxs, and its efficacy has been tested in two RCTs (Lee et al., 2013; Lee et al., 2019). The first trial found a significant decrease in heavy drinking days and drinking consequences in both the CAMI and standard MI conditions, with larger declines for drinking consequences at 2-month follow-up and continuing reductions at 6-month follow-up among CAMI participants (Lee et al., 2013). The other CAMI RCT was larger and more recent and hypothesized that CAMI would reduce the number of heavy drinking days and frequency of drinking consequences more than standard MI (Lee et al., 2019). Both CAMI and standard MI were found to be efficacious, with no significant difference between the two conditions. However, the study identified acculturation and discrimination as moderators of treatment effects. At the 3-month follow-up, less acculturated participants who received CAMI ($d = 0.22$, 95 % CI [0.02, 0.41]) experienced less frequent adverse consequences of alcohol use compared to participants who received MI ($d = -0.34$, 95 % CI [-0.60, -0.08]). Similarly, participants with higher discrimination levels who received CAMI ($d = -0.17$, 95 % CI [-0.33, -0.01]) experienced less frequent adverse consequences of alcohol use compared to participants who received MI ($d = -0.20$, 95 % CI [-0.39, -0.01]) (Lee et al., 2019).

1.3. The current study

The current study used data from Lee et al. (2019) and assessed the changes in the levels of immigration/acculturation stress and related drinking after receiving CAMI. The changes in these levels have never been examined before. Given the parent trial's findings, we hypothesized that among Latinxs with heavy drinking problems, (1) receiving CAMI would be associated with reduced immigration/acculturation stress and related drinking and that (2) acculturation level and experiences with discrimination would moderate these relationships.

2. Material and methods

2.1. Study design and participants

Data used in the current study came from an RCT that compared standard MI with CAMI for Latinx heavy drinkers, hereafter referred to as the parent trial. The university's Institutional Review Board approved the study and we registered the trial with ClinicalTrials.gov (NCT 01996280). A detailed description of the parent trial can be found elsewhere (Lee et al., 2019). Because a discussion about immigration/acculturation stress and related drinking (i.e., the current study's outcomes of interest) is a major difference between CAMI and the standard version of MI, immigration/acculturation stress and related drinking measures were only given to the CAMI participants in the parent trial to prevent contamination bias. For this reason, the current study restricted participants to the 149 participants who were randomized to the CAMI condition in the parent trial ($N = 149$) and the current study's design became the single-group pre-post study design.

The participant eligibility criteria were: (a) self-identified first- or second-generation Latinx immigrants, (b) 18–65 years of age, (c) reported two or more heavy drinking episodes (4/5 or more drinks per occasion for females/males) in the past month, and (d) not in alcohol treatment. The trial excluded individuals if they had active psychotic symptoms, evidence of cognitive impairment, and active drug use (four or more times in the month) excluding marijuana. The study recruited participants between September 2013 and November 2016 in Boston MA and surrounding areas. Recruitment methods included advertisement on Spanish radio talk shows, free local newspapers, and websites (e.g., Craigslist), flyers on public transportation, and referrals from study participants. Participants received up to $195 in gift cards to compensate their time.

2.2. Intervention

All participants included in the current study received the CAMI intervention, which was delivered in a single face-to-face session in English or Spanish per the participant's preference. The study team designed the session to last 75 min and averaged 71 min in implementation. CAMI was based on the MI process model (Miller & Rollnick, 2013) and structured strategies (Rollnick et al., 1992) and was adapted following the stage model of behavioral therapies research (Onken et al., 2014; Rounsaville et al., 2001) and Lau's framework for cultural adaptations of evidence-based treatments (Lau, 2006). Using community-based participatory research approach and focus group methods, we adapted CAMI by incorporating sociocultural content unique to drinking among Latinxs, such as ethnic-specific drinking norms, Latinx health disparities related to alcohol use, reasons for immigration, marginalization, discrimination, acculturation stress, and lack of access to job opportunities (Lee et al., 2016a). Eleven study therapists (5 female, 6 male) who were bilingual master's level graduate students in social work or psychology received 16 h of training in MI and additional 16-h training in CAMI. The study used MI Treatment Integrity coding system (MITI 3.1.1) (Moyers et al., 2010) and supervision meetings (e.g., reviewing session audiotapes) to ensure and assess intervention fidelity. CAMI's delivery fidelity ratings met the MITI competency thresholds (Lee et al., 2019).

2.3. Measures

2.3.1. Outcome variables

The study measured outcomes with the Measure of Immigration and Acculturation Stressors (MIAS) and the Measure of Drinking Related to Immigration and Acculturation Stressors (MDRIAS), which have been validated for Latinx adults with heavy drinking problems and shown good reliability (MIAS $\alpha = 0.86$; MDRIAS $\alpha = 0.96$) and criterion-related validity (i.e., concurrent, convergent, and predictive) (Rosales et al., n.d.). The study administered MIAS and MDRIAS at baseline, 6 months, and 12 months.

The study assessed immigration/acculturation stress with the MIAS, which includes 15 items and four subscales. The relational stress subscale includes five items about immigration/acculturation-related relationship problems: "It bothers me that family members I am close to do not understand my new values;" "Close family members and I have conflicting expectations about my future;" "It is hard to express to my friends how I really feel;" "I have more barriers to overcome than most people;" and "When I feel defeated, I feel angry." The perceived ethnic discrimination subscale includes four items: "It bothers me when people pressure me to be Americanized;" "Because of my ethnicity, I feel that most people exclude me from their activities;" "People look down upon me if I practice customs of my culture;" and "Some people dislike me because I am Hispanic." The attenuated aspirations subscale has three items: "The longer I live in this country, the more hard-hearted I become;" "In this country I [my family] have not yet what I came searching for;" and "You come to this country full of hopes to get ahead and realize that what you do is fall behind." The effects of immigration subscale includes three items: "I don't feel at home here in the United States;" "People think I'm unsociable when in fact I have trouble communicating in English;" and "I miss my family and friends who live far from me." Items were scored on a five-point Likert scale with three different item response categories (i.e., 1 = not at all stressful to 5 = extremely stressful; 1 = never to 5 = always; and 1 = strongly disagree to 5 = strongly agree).

We measured drinking in response to immigration/acculturation stress with the MDRIAS, which assesses participants' frequency of drinking in response to the scenarios described in MIAS. After each MIAS item, the study asked participants: "How often do you drink when you find yourself in that situation", and scored the answer on a five-point Likert scale ranging from 1 = never to 5 = always.

2.3.2. Moderator variables

We tested acculturation and discrimination levels as moderators (both were collected at baseline).

Acculturation was measured with the Short Acculturation Scale for Hispanics (SASH) (Ellison et al., 2011; Marin et al., 1987; Vella et al., 2011). The SASH is a 12-item measure that assesses self-reported acculturation level in three domains: (a) language preference in different contexts (e.g., "What language[s] do you usually speak at home?"), (b) language preference in different media (e.g., "In what language[s] are the radio programs you usually listen to?"), and (c) ethnicity of social relations (e.g., "Your close friends are…"). For the first two domains, responses ranged from 1 = Only Spanish, 2 = More Spanish than English, 3 = Both equally, 4 = More English than Spanish, to 5 = Only English. For the third domain, responses were: 1 = All Latino/as, 2 = More Latino/as than Americans, 3 = About half and half, 4 = more Americans than Latino/as, and 5 = All Americans. A higher total score indicates a higher acculturation level (range:12–60). The SASH showed good reliability in the parent trial (Cronbach's α=0.92).

Discrimination was measured with the Everyday Discrimination Scale (EDS) (Vella et al., 2011). The EDS is an 8-item self-report scale that measures the frequency of discrimination experiences in the past 12 months (e.g., "You are called names or insulted.") Responses were rated on a Likert scale ranging from 1 = never to 4 = often. A higher total score indicates more frequent discrimination experience (range: 0–40). Reliability in the parent trial was α=0.87.

2.3.3. Demographic variables

The study assessed demographic factors at baseline, and they included gender/sex (woman, man); age; marital status (single/never married, married/living together, separated, divorced); education (elementary school, high school or equivalent, some college, college); and household income ($\leq$ \$15,000, \$15,001–\$30,000, \$30,001–\$60,000, >\$60,000).

2.4. Data analysis

We used R for data analysis (R Core Team, 2022). For the primary analysis, we conducted linear mixed modeling for repeated measures to examine outcome changes between the baseline and the 6-month and 12-month follow-ups (Wallace & Green, 2002). For the moderation analysis, the study included time x moderator interactions in each model to represent moderation effects. Covariates including gender/sex, age, marital status, education, and household income were controlled for in all models. We also tested whether missing data fell under the missing completely at random (MCAR) mechanism using Little's MCAR test with R's BaylorEdPsych package (Little & Rubin, 2002). MCAR results indicated that the missing responses were missing completely at random and should not influence the analysis (p = .121).

3. Results

3.1. Sample characteristics

Table 1 presents the characteristics of the sample at baseline. The participants' average age was 41 years old and <40 % were women. More than half of the participants were single/never married. Approximately a third of the participants had high school or equivalent education and another third had "some college" education. About 40 % of participants had a household income of \$15,000 or lower. Sample sizes at each time point were: baseline $n = 149$, six-month follow-up $n = 119$ ($n = 23$ no response, n = 2 deceased, $n = 5$ withdrew), and 12-month follow-up $n = 109$ ($n = 29$ no response, $n = 4$ deceased, $n = 7$ withdrew).

3.2. Primary analysis outcomes

Table 2 presents the baseline-follow-up changes in MIAS and MDRIAS total scores and subscale scores. Compared to baseline, the study found significant decreases in all MIAS and MDRIAS total score and subscale scores, except for the attenuated aspiration subscale scores at 6-month and 12-month follow-ups and the effects of immigration subscale score at 6 months, whose reductions did not reach statistical significance.

Table 3 presents the moderation analysis results. Lower acculturation levels were significantly associated with greater decreases in the MIAS total score (acculturation x 6-month b = 0.25, SE = 0.08, t = 3.27, p < .010; acculturation x 12-month b = 0.21, SE = 0.08, t = 2.64, p <

Table 1
Baseline participants characteristics ($N = 149$).

	N/Mean	%/SD
Age	41.22	12.05
Women	57	38.3 %
Marital Status		
Single/never married	78	52.3 %
Married/living together	38	25.5 %
Separated	11	7.4 %
Divorced	22	14.8 %
Education		
Elementary school	17	11.4 %
High school or equivalent	54	36.2 %
Some college	52	34.9 %
College	26	17.4 %
Household Income		
$15,000 or lower	60	40.5 %
$15,001–$30,000	29	19.6 %
$30,001–$60,000	37	25.0 %
$60,001 or higher	22	14.9 %
Acculturation Level (theoretical range: 12–60)	36.07	9.79
Discrimination (theoretical range: 0–40)	10.05	8.28
Measure of Immigration and Acculturation Stress		
Total score	32.40	10.44
Relational stress subscale	12.21	4.70
Perceived ethnic discrimination subscale	6.95	3.32
Attenuated aspirations subscale	6.24	3.20
Effects of immigration subscale	6.56	2.48
Measure of Drinking Related to Immigration and Acculturation Stress		
Total score	29.64	14.30
Drinking related to relational stress subscale	11.76	5.46
Drinking related to perceived ethnic discrimination subscale	6.81	4.17
Drinking related to attenuated aspirations subscale	5.32	3.05
Drinking related to effects of immigration subscale	5.75	3.15

.010). MIAS relational stress subscale score (acculturation x 6-month b = 0.14, SE = 0.03, $t = 3.89$, $p < .001$; acculturation x 12-month b = 0.09, SE = 0.04, $t = 2.57$, $p < .050$), and MIAS effects of immigration subscale score (acculturation x 6-month b = 0.05, SE = 0.02, $t = 2.62$, $p < .010$; acculturation x 12-month b = 0.06, SE = 0.02, $t = 3.05$, p < .010).

Similarly, lower acculturation levels were significantly associated with greater decreases in the MDRIAS total score (acculturation x 6-month b = 0.22, SE = 0.09, $t = 2.36$, p < .050), MDRIAS drinking related to perceived ethnic discrimination subscale score (acculturation x 6-month b = 0.06, SE = 0.03, $t = 2.05$, p < .050), and MDRIAS drinking related to effects of immigration subscale score (acculturation x 6-month b = 0.06, SE = 0.02, $t = 2.78$, $p < .010$).

Higher levels of perceived discrimination were significantly associated with greater decreases in MIAS total score (discrimination x 12-month b = −0.28, SE = 0.09, $t = -2.96$, p < .010), MIAS relational stress subscale score (discrimination x 12-month b = −0.11, SE = 0.04, $t = -2.66$, p < .010), and the MIAS perceived ethnic discrimination subscale score (discrimination x 6-month b = −0.07, SE = 0.03, $t = -2.08$, $p < .050$; discrimination x 12-month b = −0.10, SE = 0.03, $t = -3.13$, p < .010).

Similarly, higher levels of perceived discrimination were associated with greater decreases in the MDRIAS total score (discrimination x 6-month b = −0.24, SE = 0.11, $t = -2.17$, $p < .050$; discrimination x 12-month b = −0.38, SE = 0.11, $t = -3.42$, $p < .001$), MDRIAS drinking related to relational stress subscale score (discrimination x 12-month b = −0.16, SE = 0.05, $t = -3.63$, p < .001), MDRIAS drinking related to perceived ethnic discrimination subscale score (discrimination x 6-month b = −0.08, SE = 0.04, $t = -2.30$, p < .050; discrimination x 12-month b = −0.10, SE = 0.04, $t = -2.83$, $p < .010$), and MDRIAS drinking related to effects of immigration subscale score (discrimination x 6-month b = −0.06, SE = 0.03, $t = -2.36$, p < .050; discrimination x 12-month b = −0.09, SE = 0.03, $t = -3.54$, p < .001).

Table 2
Baseline-follow-up outcome changes.

	Mean (*SD*)	Model coefficient	*SE*	*t*	*p*
Total MIAS score					
6-month follow-up	29.20 (9.37)	−2.63	0.75	−3.50	<0.001
12-month follow-up	27.80 (9.43)	−3.85	0.78	−4.96	<0.001
Relational stress subscale					
6-month follow-up	10.88 (4.38)	−1.32	0.35	−3.82	<0.001
12-month follow-up	10.36 (4.24)	−1.90	0.36	−5.33	<0.001
Perceived ethnic discrimination subscale					
6-month follow-up	6.15 (2.73)	−0.79	0.27	−2.98	<0.010
12-month follow-up	5.87 (2.60)	−1.03	0.27	−3.77	<0.001
Attenuated aspirations subscale					
6-month follow-up	5.98 (2.90)	−0.19	0.28	−0.68	0.498
12-month follow-up	5.87 (3.23)	−0.15	0.29	−0.54	0.588
Effects of immigration subscale					
6-month follow-up	6.19 (2.38)	−0.33	0.18	−1.81	0.072
12-month follow-up	5.75 (2.30)	−0.66	0.19	−3.48	<0.001
Total MDRIAS score					
6-month follow-up	25.03 (11.18)	−4.27	0.90	−4.77	<0.001
12-month follow-up	22.51 (9.61)	−6.78	0.92	−7.34	<0.001
Drinking related to relational stress subscale					
6-month follow-up	9.64 (4.57)	−2.06	0.36	−5.69	<0.001
12-month follow-up	8.74 (4.43)	−3.03	0.37	−8.12	<0.001
Drinking perceived related to ethnic discrimination subscale					
6-month follow-up	5.74 (2.93)	−1.00	0.29	−3.42	<0.001
12-month follow-up	5.14 (2.38)	−1.62	0.30	−5.34	<0.001
Drinking related to attenuated aspirations subscale					
6-month follow-up	4.58 (2.45)	−0.63	0.22	−2.85	<0.010
12-month follow-up	4.38 (2.46)	−0.81	0.23	−3.53	<0.001
Drinking related to effects of immigration subscale					
6-month follow-up	5.08 (2.50)	−0.62	0.21	−2.88	<0.010
12-month follow-up	4.26 (1.97)	−1.37	0.22	−6.20	<0.001

Note. MIAS = Measure of Immigration and Acculturation Stress. MDRIAS = Measure of Drinking Related to Immigration and Acculturation Stress. Gender/sex, age, marital status, education, and household income were controlled for in all models.

4. Discussion

CAMI is an adapted version of MI that targets heavy drinking among Latinxs through addressing sociocultural stressors and differences. Building on previous CAMI trial findings, this study investigated CAMI's

Table 3
Moderation analysis results.

	Model coefficient	*SE*	*t*	*p*
Total MIAS score				
Acculturation x 6-month	0.25	0.08	3.27	<0.010
Acculturation x 12-month	0.21	0.08	2.64	<0.010
Discrimination x 6-month	−0.08	0.09	−0.85	0.396
Discrimination x 12-month	−0.28	0.09	−2.96	<0.010
Relational stress subscale				
Acculturation x 6-month	0.14	0.03	3.89	<0.001
Acculturation x 12-month	0.09	0.04	2.57	<0.050
Discrimination x 6-month	−0.003	0.04	−0.08	0.941
Discrimination x 12-month	−0.11	0.04	−2.66	<0.010
Perceived ethnic discrimination subscale				
Acculturation x 6-month	0.038	0.03	1.39	0.166
Acculturation x 12-month	0.053	0.03	1.89	0.060
Discrimination x 6-month	−0.07	0.03	−2.08	<0.050
Discrimination x 12-month	−0.10	0.03	−3.13	<0.010
Attenuated aspirations subscale				
Acculturation x 6-month	0.03	0.03	1.06	0.292
Acculturation x 12-month	0.01	0.03	0.23	0.816
Discrimination x 6-month	0.01	0.03	0.41	0.680
Discrimination x 12-month	−0.03	0.04	−0.87	0.386
Effects of immigration subscale				
Acculturation x 6-month	0.05	0.02	2.62	<0.010
Acculturation x 12-month	0.06	0.02	3.05	<0.010
Discrimination x 6-month	−0.02	0.02	−0.89	0.373
Discrimination x 12-month	−0.04	0.02	−1.89	0.061
Total MDRIAS score				
Acculturation x 6-month	0.22	0.09	2.36	<0.050
Acculturation x 12-month	0.14	0.09	1.47	0.144
Discrimination x 6-month	−0.24	0.11	−2.17	<0.050
Discrimination x 12-month	−0.38	0.11	−3.42	<0.001
Drinking related to relational stress subscale				
Acculturation x 6-month	0.06	0.04	1.53	0.126
Acculturation x 12-month	0.04	0.04	1.00	0.318
Discrimination x 6-month	−0.07	0.04	−1.58	0.116
Discrimination x 12-month	−0.16	0.05	−3.63	<0.001
Drinking related to perceived ethnic discrimination subscale				
Acculturation x 6-month	0.06	0.03	2.05	<0.050
Acculturation x 12-month	0.03	0.03	0.99	0.324
Discrimination x 6-month	−0.08	0.04	−2.30	<0.050
Discrimination x 12-month	−0.10	0.04	−2.83	<0.010
Drinking related to attenuated aspirations subscale				
Acculturation x 6-month	0.04	0.02	1.73	0.086
Acculturation x 12-month	0.04	0.02	1.60	0.112
Discrimination x 6-month	−0.03	0.03	−1.11	0.270
Discrimination x 12-month	−0.03	0.03	−0.93	0.351
Drinking related to effects of immigration subscale				
Acculturation x 6-month	0.06	0.02	2.78	<0.010
Acculturation x 12-month	0.04	0.02	1.59	0.114
Discrimination x 6-month	−0.06	0.03	−2.36	<0.050
Discrimination x 12-month	−0.09	0.03	−3.54	<0.001

Note. MIAS = Measure of Immigration and Acculturation Stress. MDRIAS = Measure of Drinking Related to Immigration and Acculturation Stress. Gender/sex, age, marital status, education, and household income were controlled for in all models.

potential effects on immigration/acculturation stress and alcohol use in response to this type of stress. Our findings were consistent with the parent RCT findings (Lee et al., 2019) and supported our hypotheses that receiving CAMI was associated with reduced immigration/acculturation stress and related drinking, and that acculturation level and experiences with discrimination moderated these relationships.

Specifically, results showed that receiving CAMI was associated with decreases in the MIAS and MDRIAS total scores at both the 6-month and 12-month follow-ups. This finding suggests that CAMI might be able to reduce Latinx heavy drinkers' immigration and acculturation stress and related drinking and that the effect might take place by six months and last up to a year. The study found similar results for the subscales of relational stress, perceived ethnic discrimination, and drinking related to these types of stress. Receiving CAMI was not associated with reductions in attenuated aspirations at 6- or 12-month follow-up. However, drinking related to attenuated aspirations decreased at both follow-ups, suggesting that although CAMI might not be able to ameliorate the stress related to attenuated aspirations, it nevertheless might be able to cut down drinking in response to it through certain mechanisms (e.g., raising awareness of the link between drinking and attenuated aspirations or teaching alternative coping strategies). In addition, results also showed reductions in the effects of immigration subscale among CAMI participants at the 12-month follow-up but not the 6-month follow-up. The effects of such stressors (e.g., not feeling at home in the U.S., missing family and friends) may not have immediately been experienced by participants but may have been something that they noticed over time. In contrast, CAMI's potential impact on drinking related to the effects of immigration might manifest by the six-month mark and continue for another six months.

In addition to CAMI's associations with decreased immigration/acculturation stress and related drinking, this study also found that these associations vary by Latinx heavy drinkers' discrimination and acculturation levels. Specifically, participants with lower acculturation levels and higher perceived discrimination levels showed greater reductions in reported stressors related to immigration and acculturation, as well as to drinking. This finding is also in line with those of the parent trial, which showed that, compared to participants who received standard MI, participants with lower acculturation or higher discrimination levels who received CAMI reported less frequent adverse consequences of alcohol use (Lee et al., 2019). These findings suggest that the more vulnerable subgroups of Latinx heavy drinkers (i.e., those who are less acculturated or perceive more ethnic discrimination) may benefit from CAMI more. Of note, previous studies found that Latinx women and men differ in drinking behaviors, and gender modifies the relationship between acculturation and drinking (Evans et al., 2017; Lee et al., 2019). Therefore, future studies should explore gender by itself and whether it interacts with acculturation/discrimination in moderating CAMI's effects on immigration/acculturation stress and related drinking.

Identifying the intervention components and mechanisms through which CAMI might affect acculturation/immigration stress and related drinking is outside the scope of the current study. However, we suggest that future studies examine the CAMI component that specifically asks about acculturation/immigration stress and related drinking. In this component, participants were prompted by items taken from the MIAS and MDRIAS that they had completed during the baseline assessment. Many of the participants discussed having experienced stress in several of MIAS subdomains (relational stress, perceived ethnic discrimination, attenuated aspirations, and effects of immigration) and using alcohol to cope with the stressors. This discussion, while brief, may contribute to the reductions in immigration/acculturation related stress and drinking that we observed among Latinx adults who received CAMI. Future research should directly compare CAMI with standard MI, which does not include components specifically related to acculturation/immigration stress and related drinking. In addition, to examine CAMI's intervention mechanisms, we also recommend future research allow for mediation analyses for testing whether CAMI impacts drinking behaviors through affecting acculturation/immigration stress. This study was unable to conduct such analyses due to limited statistical power.

The current study is not without limitations. This study employed a quasi-experimental design; experimental studies are needed to see if these findings can be replicated. Additionally, this study relied on two newly developed and validated measures (MIAS and MDRIAS). Future studies on CAMI's effects on immigration/acculturation stress and related drinking should include these or other similar measures to continue building the knowledge base about the effect of CAMI on immigration/acculturation stress and related drinking outcomes.

5. Conclusions

This study's findings provide preliminary support for CAMI's efficacy in reducing immigration and acculturation stress and related drinking among Latinx adults with heavy drinking problems. The study observed more improvements among the relatively more vulnerable subgroups (i.e., less acculturated and more discriminated participants). Although this study was exploratory in nature, its results were consistent with those of the parent RCT's, i.e., it found greater treatment improvements in the same subgroups and thus supports our findings. Larger studies with more rigorous prospective designs should be conducted in the future.

CRediT authorship contribution statement

Audrey Hang Hai: Conceptualization; Formal analysis; Methodology; Validation; Roles/Writing - original draft; Writing - review & editing.

Christina S. Lee: Conceptualization; Data curation; Funding acquisition; Investigation; Methodology; Project administration; Resources; Supervision; Validation; Roles/Writing - original draft; Writing - review & editing.

Carmen Zhou: Writing - original draft; Writing - review & editing.

Jorge Delva: Writing - review & editing.

Declaration of competing interest

This study was supported with funding from National Institute on Alcohol Abuse and Alcoholism Grants R01AA021136. The NIAAA did not have any involvement with determining study design, data collection, analysis, data interpretation, writing of this report, or the decision to submit the article for publication. There are no conflicts of interest to be reported. This study was registered on ClinicalTrials.gov [NCT01996280] prior to study implementation. The terms of the awards assure that the sponsors had no post award scientific input or other influence with respect to the study's design, analysis, interpretation, or preparation of the article.

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