Spring 4-16-2020

Cultural Factors and Alcohol Use in American Indian Adults: Results from a Randomized Controlled Trial of Contingency Management

Jalene L. Herron
University of New Mexico

Jalene Herron
Candidate

Psychology
Department

This thesis is approved, and it is acceptable in quality and form for publication:

Approved by the Thesis Committee:

Kamilla Venner, Chairperson

Davood Tofighi

Michael McDonell

CULTURAL FACTORS AND ALCOHOL USE IN AMERICAN INDIAN ADULTS: RESULTS FROM A RANDOMIZED CONTROLLED TRIAL OF CONTINGENCY MANAGEMENT

by

JALENE L. HERRON

B.A., PSYCHOLOGY, GONZAGA UNIVERSITY, 2015

THESIS

Submitted in Partial Fulfillment of the
Requirements for the Degree of

Master of Science
Psychology

The University of New Mexico
Albuquerque, New Mexico

May 2020

CULTURAL FACTORS AND ALCOHOL USE IN AMERICAN INDIAN ADULTS: RESULTS FROM A RANDOMIZED CONTROLLED TRIAL OF CONTINGENCY MANAGEMENT

by

Jalene L. Herron

B.A., Psychology, Gonzaga University, 2015
M.S., Psychology, University of New Mexico, 2020

ABSTRACT

American Indian and Alaska Native (AI/AN) populations experience health disparities in alcohol use outcomes compared to the general population. This thesis examines cultural factors related to alcohol use in 65 reservation-based American Indian (AI) adults enrolled in a randomized controlled trial of culturally tailored contingency management (CM). Generalized linear mixed modelling (GLMM) was used to analyze the repeated measure, biweekly urine tests of the biomarker, ethyl glucuronide (EtG), across 12 weeks. The relationship between alcohol use (abstinence or heavy drinking) and culturally relevant protective (enculturation, years lived on the reservation) and risk factors (discrimination, historical loss, historical loss symptoms) were examined. There was a negative association between enculturation and probability of submitting a heavy drinking urine sample (OR = 0.973; 95% CI [0.950, 0.996], $p = 0.023$), indicating enculturation may serve as a protective factor against heavy drinking. The remaining cultural factors were not significantly associated with predicting alcohol samples. Participants who received CM were 74.5% less likely to produce an alcohol positive sample (EtG $\geq$ 150) than those in control (OR = 0.255; 95% CI = [0.0934, 0.695], p =

0.008). Cultural factors, like enculturation, may be important constructs to examine with AI adults engaged in alcohol treatment.

Keywords: American Indian adults, alcohol use, contingency management, cultural factors, biomarkers, EtG, cultural adaptation

Table of Contents

Cultural Factors and Alcohol Use in American Indian Adults: Results from a Randomized Controlled Trial of Contingency Management

Understanding how and why American Indian and Alaska Native (AI/AN) people experience higher rates of alcohol use disorders than the general population is a complex issue related to a variety of factors crossing a range of disciplines and contexts. Notably, historical and political factors related to colonization have had a devastating impact on AI/AN communities for generations resulting in intergenerational trauma and significant health disparities for Native people (Brave Heart et al., 2016; Gone & Looking Calf, 2015). While AI/AN people have some of the highest national rates of lifetime alcohol abstinence, AI/AN people also have greater alcohol use related health inequities compared to non-AI/AN people (Cunningham, 2016; Chen et al. 2015). Additionally, alcohol misuse disparities are further intensified by the lack of treatment and services available to Native people and the limited prevalence of evidence-based health interventions designed or evaluated for AI/ANs in particular (Gone & Looking Calf, 2015). While negative factors are often linked to substance use research conducted with Native communities, there is a growing body of research exploring protective factors for and substance use disorders in Indian Country. The current study examines alcohol abstinence outcomes and cultural factors including enculturation, historical loss and trauma, and discrimination in reservation-based AI adults who participated in a randomized controlled trial of a culturally tailored contingency management intervention targeting alcohol use.

Culture as Treatment. Across some tribal communities there is a common concept that traditional Native culture is central to many processes including wellness,

healing, and alcohol or other drugs abstinence (Coyhis & Simonelli, 2008; Gone, 2012; Legha & Novins, 2012). Though broadly defined, culture is viewed as a protective or preventative factor in the development of substance misuse. Further, involvement in culture is also considered itself as a treatment for various addictions across Indigenous communities in Canada, Australia, and the U.S. (Brady, 1995). Gone (2012) noted the importance of Indigenous Traditional Knowledge to conceptualize and evaluate paths to healing, wellness, and substance use abstinence in tribal communities. Cultural processes and traditional approaches are key to understanding and approaching treatment when working with AI/AN alcohol treatment seeking populations. Additionally, efforts to culturally tailor existing evidence-based treatments for substance use in tribal communities are increasing. Legha & Novins (2012) found key principles for incorporating culture into substance treatment included incorporating Native worldviews, emphasizing family and community, and strong relationship building. Other efforts to culturally tailor treatments highlight the significance of including spirituality and including Native Elders and community cultural bearers in processes of adaptation and implementation (Gray et al., 2010; Venner et al., 2008, 2015). Specific cultural activities like drumming and sweat lodges have been integrated into existing substance use treatments specific to the needs of Native individuals seeking care (Dickerson et al., 2014; Gossage et al., 2003; Woodall et al., 2007).

Indigenist Stress Coping Model. The Indigenist Stress Coping Model (Walters et al., 2002) incorporates protective and risk factors specific for AI/AN communities and individuals and recognizes the unique stressors and coping skills applicable within AI/AN cultures. Stressors in the model may include discrimination, historical loss and trauma,

and individual trauma factors. Cultural buffers such as community, cultural identity, spirituality, and enculturation are conceptualized as protective factors and aid in coping. Incorporating strengths and protective factors into conceptual models, research, and treatment options are particularly relevant for work in AI/AN communities given the history of damaging and problematic research with AI/AN populations (James et al., 2018; Pacheco et al., 2013). The Indigenist Stress Coping Model can provide a framework for conceptualizing protective and risk factors for this study sample.

Protective Factors. Many protective factors associated with AI/AN culture are prevalent in the literature including growing up on the reservation and participating in cultural and spiritual activities. AI adults who spend more years living on a reservation have higher rates of social support and report fewer symptoms of mental distress when compared to their AI/AN counterparts who spent more years living off of reservation lands (Huyser et al., 2018). AI/AN adults who engage in Native-specific spiritual practices have lower rates of alcohol use than other AI/AN adults who do not participate in these practices (Stone et al., 2006; Wendt et al., 2017). Evidence from AI/AN adolescents show that strong cultural identity and participation in cultural activities protects against many mental health problems such as depression, suicidal ideation, and substance use problems (Cwik et al., 2015; Tingey et al., 2016). Further, traditional AI spiritual behaviors were negatively related to substance use in an adult AI treatment-seeking sample (Greenfield et al., 2015). In both First Nations Canadian and American Indian college student samples, enculturation and engagement in traditional spiritual practices were protective against substance use (Currie et al., 2011; Greenfield et al., 2018) Further, substance use abstinence is central to participation in cultural activities

such as powwows, sweat lodge, Sun Dances, and other tribally specific spiritual and cultural practices (Hirchak et al., 2018). Cultural activities serve as protective factors against alcohol use and encourage abstinence.

Risk Factors. Considering the broader social, cultural, historical and political contexts where individual behaviors occur is key to conceptualizing mental health problems and substance use disorders in tribal communities. As reported in both quantitative and qualitative AI/AN literature, historical loss and trauma and discrimination can be linked to patterns of problematic substance use (Skewes & Blume, 2019; Whitbeck et al., 2004). Across various marginalized identities, discrimination has demonstrated negative consequences on mental health outcomes, including substance misuse (Pascoe & Smart, 2009). AI/AN youth research is mixed on the relationship between substance use and discrimination. Some evidence links discrimination and increased substance use (Garrett et al., 2017), while other evidence shows discrimination and microaggressions are not associated with substance misuse (Dickerson et al., 2019). However, historical loss and trauma is correlated with alcohol misuse in AI men and women (Whitbeck et al., 2004). Recognizing the context of alcohol related behaviors can provide insight on a population level for factors like historical trauma, as well as an individual level factors with individual exposures of discrimination. Overall, tribal communities are in need of culturally appropriate evidence-based interventions for alcohol. Contextual risk and protective factors should be incorporated into treatment considerations for AI/AN people. These interventions and treatments should be inclusive of cultural considerations, particularly positive and strength-based approaches.

Contingency Management. Contingency management (CM) is an evidence-based treatment utilized to target substance use rooted in the basics of operant conditioning. Operant conditioning is a style of learning where the targeted behavior (i.e., alcohol abstinence) is maintained through behavioral consequences. In CM the behavioral consequences are positive reinforcements (McPherson et al., 2018). Additionally, CM has been tested and shown as an effective intervention for targeting substance use across diverse populations including in Black adults in the United States (Barry et al., 2009), adults in Brazil (Miguel et al., 2016), and adults in rural and urban parts of China (Chen et al., 2013). While CM has shown to be effective for reducing drug use (Benishek et al., 2014), recent interventions use CM to target alcohol use with the biomarker ethyl glucuronide (EtG) (McDonell et al., 2017, 2015). EtG is a metabolite of alcohol created in the liver assessed by urine. At 100 ng/mL EtG can identify up to 80% of any drinking for two days and heavy drinking for five days (McDonell et al., 2015; Lowe et al., 2015). CM has shown to be effective targeting alcohol use among individuals with comorbid alcohol use disorder and serious mental illness (McDonell et al., 2017). As explained by Hirchak and colleagues (2018), this CM intervention utilized focus groups in the partnering tribal communities to assess if CM would be culturally appropriate for use with AI/AN individuals. Additionally, feedback from the focus groups informed the cultural tailoring of this CM intervention. The focus groups found that CM would be culturally congruent with AI/AN communities given that gifting is a traditional and existing cultural value and practice, and the focus on rewarding abstinence rather than punishing alcohol use. Advice on tailoring this intervention included reinforcing cultural engagement by using the local language and incorporating culturally appropriate symbols

and imagery in the delivery of the intervention.

Current Study

The current study is a secondary data analysis that examines alcohol use and cultural factors with reservation-based AI adults who participated in a randomized controlled trial of a culturally tailored contingency management intervention targeting alcohol use and a control group of non-contingent reinforcement for attendance regardless of EtG results. Hypothesis 1: Individuals with higher rates of protective factors (higher rates of enculturation and more years lived on the reservation) will have lower rates of alcohol use. Hypothesis 2: Individuals with higher rates of risk factors (increased scores of discrimination and historical loss and historical loss symptoms) will have higher rates of alcohol use. Hypothesis 3: Enculturation will moderate the relationship between treatment group and alcohol use, where those who have higher enculturation will respond differently to the culturally tailored CM treatment. The culturally tailored CM treatment will be more effective for people with higher rates of enculturation.

Methods

As explained by McDonell and colleagues (2016), in partnership with three tribal communities, researchers at Washington State University implemented a multi-site randomized controlled trial of culturally tailored contingency management targeting alcohol use versus noncontingent rewards. The present secondary data analysis examined cultural and demographic factors associated with alcohol use and treatment condition in a single site of the parent study.

Participants

This sample included participants recruited from a rural reservation in the Northern Great Plains. Participants met eligibility criteria of self-reported AI race, being 18 or older, one heavy drinking episode (4 or more standard drinks in one day for women, 5 for men) in the last 30 days, and a Diagnostic and Statistical Manual, Fourth Edition (American Psychiatric Association, 2000) diagnosis of current alcohol dependence per the Mini International Neuropsychiatric Interview (Sheehan et al., 1998). Exclusion criteria included more illicit drug use days than alcohol use days over the past 30 days, and a history of severe alcohol withdrawals, such as seizures. Notably, possession and consumption of alcohol is illegal on this specific reservation.

Setting. Study procedures were conducted at a tribally operated outpatient substance use treatment facility on a rural reservation in the Northern Great Plains. Assessments and intervention delivery were conducted by two AI research coordinators employed by the Tribe.

Measures

Alcohol Measures. Alcohol abstinence during the study intervention was assessed by the alcohol biomarker ethyl glucuronide (EtG). During bi-weekly study visits throughout the intervention, participants' urine samples were tested for EtG using the Indiko Bench Top Analyzer (Thermo Fisher Scientific, Waltham, MA) with sensitivity measuring from 0 to 2000 ng/mL. Recent alcohol abstinence was defined as an EtG value of less than 150 ng/mL, indicating no alcohol consumption within the past two to three days. Alcohol outcomes were categorized in the following ways: 1) binary EtG value (positive or negative; based on above or below 150 ng/mL), and 2) drinking level (no drinking to moderate drinking, 0-499 ng/mL, and heavy drinking, 500-2000 ng/mL).

Cutoffs for EtG drinking levels were defined by McDonell and colleagues (2015). Examining drinking levels may allow for understanding severity of drinking and efforts around harm reduction.

Demographic Measures. At the baseline assessment, demographic characteristics were gathered via self-report using questions from the Addiction Severity Index, Native American Version (ASI-NAV) (Carise & McLellan, 1999). Measures from the ASI-NAV included in this analysis were sex and years lived on the reservation.

Cultural Measures. Enculturation, the degree to which one engages or identifies with one's culture, was measured by the American Indian Enculturation Scale (Winterowd, Montgomery, Stumblingbear, Harless, & Hicks, 2008). The 17-item scale asked participants to rate their engagement in cultural activities (e.g. speaking their language, attend pow-wows, seek help from Elders) on a Likert scale between one and seven, where one is 'not at all' and seven is 'a great deal.' The scale is summed and has a range of scores between 17 and 119. The scale was adapted with advisement from the study's Community Advisory Board to include responses specific to study sites' cultural activities (McDonell et al., 2016). Enculturation was assessed at baseline and each of the seven monthly assessments throughout the intervention. The enculturation measure was highly reliable at baseline for this sample (17 items; $\alpha = 0.923$).

Historical trauma and loss were measured by the Historical Loss and Historical Loss Associated Symptoms scales at baseline assessment (Whitbeck, Adams, Hoyt, & Chen, 2004). The Historical Loss Scale is 12 items and measured how often (never, yearly or special times, monthly, weekly, daily, or several times a day) individuals thought about historical losses (e.g. "loss of our language," "losing our traditional

spiritual ways"). This measure was highly reliable at baseline for this sample (12 items; $\alpha = 0.932$). The Historical Loss Associated Symptoms Scale is a 12-item measure that assessed how often (always, often, sometimes, seldom, never) individuals felt when thinking about these specific losses (e.g. "shame when you think of these losses," "feel sadness or depression."). This measure was highly reliable at baseline for this sample (12 items; $\alpha = 0.909$). The two scales are scored by first finding the median split of each of the responses for the 24 items and then dichotomized as 0 or 1 for responses above or below the median split. The recoded responses were then summed and the score for each item was between 1 and 12.

At the baseline appointment, discrimination was measured using Whitbeck's Perceived Discrimination Scale (Whitbeck et al., 2004). The 10-item measure asked how often (never, sometimes, or often) participants experienced racial discrimination in certain situations (e.g. "Have other people said something bad or insulting to you because you are Native American?," "Has a store owner, sales clerk, or person working at a place of business treated you in a disrespectful way because you are Native American?"). The score was the mean of the individuals' responses for the 10 items. The item had acceptable reliability in this sample (10 items, $\alpha = 0.796$)

Procedure. Participants who met inclusion criteria completed a two-hour baseline assessment comprised of clinical, cultural, alcohol and drug, and other outcome measures. Individuals then participated in a four-week induction phase prior to randomization to a treatment condition, either CM or a control group. CM interventions commonly use an induction phase intended to familiarize participants with study procedure and increase the likelihood of study retention after randomization (Epstein et

al., 2009; Ling, Hillhouse, Ang, Jenkins, & Fahey, 2013; Preston, Umbricht, & Epstein, 2002). Participants attended bi-weekly study visits and submitted urine samples in exchange for prize draws. Participants receive five prize-draws regardless of EtG results. After the four-week induction phase, participants completed a monthly interview and were assessed for similar measures collected at baseline, including the American Indian Enculturation Scale. Participants who attended at least four of the eight induction visits and provided at least one alcohol-positive urine sample were eligible for randomization and continued on with the treatment phase of the study. Randomization was stratified by baseline EtG test result (positive or negative). Individuals were randomized to receive 12 weeks of either contingency management (CM) or the non-contingent control group. The study timeline is displayed in Figure 1. In this sample, 390 participants were screened and 290 met inclusion criteria. Of those, 186 participants were consented and completed the baseline assessment. After the four-week induction phase, 65 participants met criteria for randomization, with 31 assigned to the CM condition and 34 assigned to the control condition. The consort diagram is displayed in Figure 2.

As explained by McDonell et al. (2016), CM participants received reinforcers (prize draws) when an EtG negative sample was submitted. This procedure is called the variable of magnitude for reinforcement and utilized a prize draw system. Participants drew from a bucket that contained tokens with various values. Fifty percent of tokens read, “good job,” or another positive affirmation, 41.8% read, “small” which was equivalent to a $1 prize, 8% read “large” which was a $20 value, and 0.2% read jumbo which was equivalent to an $80 value prize. Participants in the control drew for prizes in exchange for submitting urine samples regardless of alcohol use, a continuation of the

pre-randomization induction phase. Each month of the treatment phase (months 2, 3, and 4), participants completed a monthly interview and were assessed for similar measures collected at baseline, including the American Indian Enculturation Scale. Participants were considered as a study dropout from their 12-week treatment condition (CM or control) if they missed six consecutive study appointments (three weeks). Informed consent was obtained from participants at baseline. Partnering tribal communities, the Rocky Mountain Tribal Institutional Review Board, and the Washington State University Institutional Review Board provided ethical oversight of the study and approved the study design.

Data Analysis Plan. The focus of these analyses was to identify differences in outcomes of alcohol abstinence across cultural factors in the CM and control groups. Generalized linear mixed model (GLMM) was used to analyze the repeated measure (biweekly urine tests across 12 weeks of treatment) across time. GLMM is a method for analyzing grouped data, like repeated measures data and includes both fixed and random effects. In the first model, the primary outcome was binary EtG value (positive/negative; based on threshold of < 150 ng/mL). In the second model, the primary outcome was binary EtG value adjusted for heavy drinking (light/moderate drinking and heavy drinking; based on threshold of ≥ 500 ng/mL). A binomial logit link function was used for the binary outcomes (i.e., binary EtG). For models 1 and 2, the specified predictors of interest are enculturation, treatment group assignment, sex, years lived on the reservation, discrimination, historical loss, and historical loss symptoms. Hypothesis 1 and 2 were tested using the following cultural factors: enculturation, years lived on the reservation, discrimination, historical loss, and historical loss symptoms variables. Models 1 and 2

test both the first and second hypothesis, where model 1 is predicting any alcohol use (EtG ≥150), and model 2 is predicting heavy drinking (EtG ≥500).

For the third hypothesis, the predictors and the following interaction terms were included: enculturation, treatment condition, and the interaction of enculturation and treatment condition. The interaction of treatment condition and enculturation were tested to examine whether enculturation moderated the effect of treatment on alcohol abstinence. Model 3 tests the third hypothesis predicting any alcohol use (EtG ≥150), while model 4 also tests the third hypothesis predicting heavy drinking (EtG ≥500). To test for multicollinearity, the variance inflation factor (VIF) was examined to meet the threshold for collinearity diagnostics. IBM SPSS Statistics for Windows, version 26 (IBM Corp., Armonk, N.Y., USA) and the GAMLj package (Galluci, 2019) of jamovi (The jamovi project, 2019) was used to conduct these analyses.

Results

Nineteen of the 31 (61.3%) contingency management and 21 of the 34 (61.8%) non-contingent participants completed the 12-week intervention phase (UA visits 9-32), a non-significant difference of completion. Baseline characteristics between participants who completed the interventions and those who dropped out of the intervention were not significantly different as assessed by chi-square and t-tests. Demographic and clinical characteristics of the 65 randomized participants at the time of baseline are displayed in Table 1.

Baseline correlations of outcomes and covariates are presented in Tables 2 and 3. As seen in Table 2, at the time of baseline there is a significant negative association between any alcohol use (EtG >150) and enculturation, $r(63) = -0.295$, $p = 0.017$.

Similarly, enculturation is negatively correlated with heavy drinking (EtG ≥500), $r(63) = -0.319$, $p = 0.010$.

The null model tested for change over time using the outcome of alcohol abstinence based on the threshold of EtG < 150 yielded a significant result (β = - 0.783, OR = 0.457, $p = 0.004$) indicating significant difference in alcohol abstinence outcomes, where participants were 54.3% more likely to submit an alcohol negative sample during the treatment phase (12 weeks). In the null model with the outcome of abstinence from heavy drinking based on the threshold of EtG < 500, the model also yielded a significant result, (β = - 1.60, OR = 0.202, $p < 0.001$), indicating a significant difference, where participants were 79.8% more likely to submit a heavy drinking sample during the treatment phase (12 weeks).

Baseline predictor variables met the assumption of collinearity, indicating that multicollinearity was not a concern (Years lived on reservation, Tolerance = 0.896, VIF = 1.12; Enculturation, Tolerance = 0.561, VIF = 1.78 Discrimination, Tolerance = 0.846, VIF = 1.18 Historical Loss Scale, Tolerance = 0.578, VIF = 1.73; Historical Loss Symptoms, Tolerance = 0.851, VIF = 1.18; Sex, Tolerance = 0.897, VIF = 1.11; Randomization Group, Tolerance = 0.941, VIF = 1.06).

Model 1 Results. In testing hypotheses 1 and 2, the outcome for model 1 was the likelihood of submitting an alcohol positive sample (EtG ≥ 150) meant to capture any alcohol use in the last two to three days. Generalized linear mixed modeling analysis was used to test whether culturally relevant measures (years lived on reservation, enculturation, discrimination, historical loss, and historical loss symptoms) and treatment

condition predicted participants' alcohol sample result. Sex was included as a control variable.

The fixed effect results are shown in Table 4. The results of the analysis indicated the effect of the treatment group (CM versus control) was significant. Those in the CM group were more likely to produce an EtG negative sample. Participants who received CM were 74.5% less likely to produce an EtG positive sample than those in the control group (OR = 0.255; 95% CI = [0.0934, 0.695], $p = 0.008$). The remaining variables in the model were not significantly associated with predicting alcohol positive samples. This included years lived on the reservation (OR = 0.995; 95% CI [0.9488, 1.044], $p = 0.842$), enculturation (OR = 0.977; 95% CI [0.9542, 1.001], $p = 0.061$), discrimination (OR = 2.319; 95% CI [0.5629, 9.557], $p = 0.244$), historical loss scale (OR = 1.077; 95% CI [0.9230, 1.256], $p = 0.347$), historical loss symptoms (OR = 1.075; 95% CI [0.9404, 1.229], $p = 0.289$), and sex (OR = 1.651; 95% CI [0.5543, 4.915], $p = 0.368$).

Model 2 Results. The outcome for model 2 was the likelihood of submitting a urine sample indicative of heavy drinking during the treatment phase (EtG $\geq$ 500). Generalized linear mixed modeling analysis was used to test if culturally relevant measures (years lived on reservation, enculturation, discrimination, historical loss, and historical loss symptoms) and treatment condition predicted participants' alcohol sample results at the threshold of EtG 500. Sex was included as a control variable.

The fixed effect results are shown in Table 5. The results of the analysis indicated the effect of the treatment group (CM versus control) was not significant (OR = 0.376; 95% CI [0.139, 1.019], $p = 0.054$). As hypothesized the effect of enculturation was significant, indicating a negative association between enculturation and probability of

submitting a urine sample representative of heavy drinking (OR = 0.973; 95% CI [0.950, 0.996], $p = 0.023$) accounting for treatment group and the other predictors in the model. Increasing levels of enculturation are associated with decreasing likelihood of submitting a heavy drinking urine sample. The remaining variables in the model were not significantly associated with predicting heavy drinking samples. This included years lived on the reservation (OR = 0.981; 95% CI [0.936, 1.029], $p = 0.436$), discrimination (OR = 3.071; 95% CI [0.715, 13.194], $p = 0.131$), historical loss scale (OR = 1.089; 95% CI [0.931, 1.274], $p = 0.285$), historical loss symptoms (OR = 1.066; 95% CI [0.935, 1.216], $p = 0.337$), and sex (OR = 1.847; 95% CI [0.617, 5.526], $p = 0.273$).

Model 3 Results. Testing for hypothesis 3, generalized linear mixed modeling analysis was used to test if the interaction of enculturation and treatment condition predicted participants' alcohol sample results at the threshold of EtG $\geq$ 150. Sex was included as a control variable.

The fixed effect results are shown in Table 6. The interaction between treatment group (CM or Control) and enculturation was not significant (OR = 1.002; 95% CI [0.9621, 1.045], $p = 0.907$). Contrary to hypothesis 3, the level of enculturation did not relate differentially to higher rates of alcohol abstinent samples for the culturally tailored CM group compared to the control group.

Model 4 Results. Also testing for hypothesis 3, generalized linear mixed modeling analysis was used to test if the interaction of enculturation and treatment condition predicted participants' alcohol sample results at the threshold of EtG 500 where 500 or above is indicative of heavy drinking. Sex was included as a control variable.

The fixed effect results are shown in Table 7. The interaction between treatment group (CM or NC) and enculturation was not significant (OR = 1.008; 95% CI [0.967, 1.051], $p = 0.695$). Increasing levels of enculturation did not have distinctive effects for CM and control when predicting the likelihood of heavy drinking samples, indicating insufficient evidence for the third hypothesis.

Discussion

This secondary data analysis examined culturally specific factors and their predictive ability on alcohol use for individuals participating in a randomized control trial of culturally tailored CM versus a control condition. Analytic results revealed partial support for the first hypothesis related to protective factors and decreased rates of alcohol use. Although enculturation was not significantly related to alcohol abstinence, increasing levels of enculturation was protective against heavy drinking. Results did not support the second hypothesis related to the risk factors of discrimination, historical loss, and historical loss symptoms and increased levels of alcohol use. Neither was support garnered for the third hypothesis, as enculturation did not moderate the relationship between treatment group and alcohol use at either threshold of abstinence or heavy drinking.

The CM treatment was effective in the sample across varying levels of the culturally specific risk (discrimination, historical loss, historical loss symptoms) and protective factors (years lived on the reservation, enculturation). Additionally, enculturation appears to serve as a protective factor against heavy drinking. When evaluating heavy drinking based on EtG levels at or above 500, the interaction between treatment effect and the remaining risk and protective cultural variables (discrimination,

historical loss, historical loss symptoms, years lived on the reservation) did not yield a statistically significant relationship.

In line with other CM literature, this study replicates findings that CM is effective in reducing substance use in underserved and diverse communities including those with co-occurring serious mental illness and SUD (McDonell et al., 2017), Black adults in the United States (Barry et al., 2009), adults in Brazil (Miguel et al., 2016), and adults in rural and urban parts of China (Chen et al., 2013). This specific study demonstrates that culturally tailored CM is an effective treatment for reducing alcohol use in AI adults receiving the intervention in a tribally operated outpatient setting. CM is efficacious for diverse communities and culturally tailored CM has the potential to be adopted in underserved communities to treat alcohol and other substance use disorders.

Research examining culturally specific protective and risk factors associated with substance use in AI people has concentrated on community, college, and adolescent samples. Few studies examine risk and protective factors in alcohol treatment seeking samples specifically. This study's results are partially aligned with existing findings of a negative association between enculturation and heavy alcohol use. Whitbeck and colleagues (2004) utilized community samples and found that enculturation had a protective effect on having an alcohol abuse diagnosis. Other research specifically examined singular cultural constructs and their relation to substance use, such as spirituality (Greenfield et al., 2015) as opposed to enculturation as a broader construct. Additionally, AI/AN college student data shows participation in cultural activities as protective against substance use (Greenfield et al., 2018), further hinting that cultural involvement may be preventative against development of substance use disorders. Other

research (Stone et al., 2006) also found that enculturation, specifically participation in traditional activities and traditional spirituality, was related to alcohol cessation, and may be important to the reduction of alcohol use over time. The present study used a broader measure of enculturation and did not examine specified aspects or behaviors that may be more or less predictive of positive substance use outcomes. Nonetheless, although enculturation was unrelated to abstinence, it was protective against heavy drinking in this treatment seeking sample.

Contrary to hypotheses, this thesis did not show the remaining risk and protective factors were related to alcohol use in this sample. While Huyser (2018) found that more years lived on the reservation was associated with lower rates of mental distress, this association did not translate to lower rates of substance use in the study sample. The protective aspects of more time on the reservation may not translate to substance use in the same way it does to mental distress. Further, Huyser (2018) used community sample data from Southwest and Northern Plains tribes, so the association may be regionally or tribally specific. Further, the association between more years lived on the reservation and less mental distress may be detectable in community samples but not alcohol treatment seeking populations of AI adults, which involves a more restricted range of substance use than a community sample thereby making it harder to detect a relationship with cultural variables like years lived on a reservation.

These findings were also inconsistent with previous literature showing that the Historical Loss Scale and Historical Loss Associated Symptoms Scale are associated with increased substance use (Ehlers et al., 2013; Whitbeck et al., 2004). However, both of these studies utilized community samples and associated the scales as related to a

substance use diagnosis. This finding did not replicate in this treatment seeking sample where all individuals met criteria for a diagnosis of alcohol dependence. Discrimination as assessed by the Perceived Discrimination Scale was also not predictive of alcohol use in this sample, consistent with some literature where AI adolescents' experiences of discrimination were not correlated to substance use (Dickerson et al., 2019). However, other AI adolescent samples show the opposite that discrimination is linked to substance use (Garrett et al., 2017), which is a pattern found in other ethnic minorities and other groups with marginalized identities (Pascoe & Smart Richman, 2009). Further investigation of discrimination and its association to substance use is warranted given the mixed findings in the literature.

The findings of this study may have limited broad applicability on account of relatively small sample size, which is a common issue in small communities. Additionally, the sample is specific to rural, reservation-based AI adults, and generalizability to other AI adults may be limited due to wide tribal diversity and reservation proximity. Study strengths include the examination of culturally specific risk and protective factors in an alcohol treatment seeking sample of AI adults. Measures used in these analyses have been particularly developed for use with AI samples and were reliable in the sample. The study was delivered and tested in a community setting and delivered by AI members of the community, thus increasing ecological validity and indicating that culturally tailored CM is effective for reducing alcohol use and also has the potential to be implemented in tribal communities.

Conclusion

This study adds to the literature on the effectiveness of culturally adapted evidence-based treatments, evaluated specifically for American Indians. Results suggest the importance of enculturation as a protective factor against heavy drinking. Future research should continue to consider and assess AI specific and culturally relevant risk and protective factors related to alcohol treatment outcomes including alcohol abstinence and harm reduction targets.

References

Barry, D., Sullivan, B., & Petry, N. M. (2009). Comparable Efficacy of Contingency Management for Cocaine Dependence Among African American, Hispanic and White Methadone Maintenance Clients. *Psychology of Addictive Behaviors : Journal of the Society of Psychologists in Addictive Behaviors*, *23*(1), 168–174. https://doi.org/10.1037/a0014575

Benishek, L. A., Dugosh, K. L., Kirby, K. C., Matejkowski, J., Clements, N. T., Seymour, B. L., & Festinger, D. S. (2014). Prize-based Contingency Management for the Treatment of Substance Abusers: A Meta-analysis. *Addiction (Abingdon, England)*, *109*(9), 1426–1436. https://doi.org/10.1111/add.12589

Brady, M. (1995). Culture in treatment, culture as treatment. A critical appraisal of developments in addictions programs for indigenous North Americans and Australians. *Social Science & Medicine*, *41*(11), 1487–1498. https://doi.org/10.1016/0277-9536(95)00055-C

Brave Heart, M. Y. H., Lewis-Fernández, R., Beals, J., Hasin, D. S., Sugaya, L., Wang, S., Grant, B. F., & Blanco, C. (2016). Psychiatric Disorders and Mental Health Treatment in American Indians and Alaska Natives: Results of the National Epidemiologic Survey on Alcohol and Related Conditions. *Social Psychiatry and Psychiatric Epidemiology*, *51*(7), 1033–1046. https://doi.org/10.1007/s00127-016-1225-4

Chen, W., Hong, Y., Zou, X., McLaughlin, M. M., Xia, Y., & Ling, L. (2013). Effectiveness of prize-based contingency management in a methadone

maintenance program in China. *Drug and Alcohol Dependence*, *133*(1), 270–274. https://doi.org/10.1016/j.drugalcdep.2013.05.028

Chiung M. Chen, M.A.; Megan E. Slater, Ph.D.; and I-Jen P. Castle, Ph.D., of CSR, and Bridget F. Grant, Ph.D., Ph.D. (n.d.). *U.S. Alcohol Epidemiologic Data Reference Manual, Volume 10*. Retrieved December 11, 2018, from https://pubs.niaaa.nih.gov/publications/NESARC_DRM3/NESARC3DRM.htm

Coyhis, D., & Simonelli, R. (2008). The Native American Healing Experience. *Substance Use & Misuse*, *43*(12–13), 1927–1949. https://doi.org/10.1080/10826080802292584

Currie, C. L., Wild, T. C., Schopflocher, D. P., Laing, L., Veugelers, P. J., Parlee, B., & McKennitt, D. W. (2011). Enculturation and Alcohol Use Problems among Aboriginal University Students. *The Canadian Journal of Psychiatry*, *56*(12), 735–742. https://doi.org/10.1177/070674371105601205

Cwik, M., Barlow, A., Tingey, L., Goklish, N., Larzelere-Hinton, F., Craig, M., & Walkup, J. T. (2015). Exploring risk and protective factors with a community sample of American Indian adolescents who attempted suicide. *Archives of Suicide Research: Official Journal of the International Academy for Suicide Research*, *19*(2), 172–189. https://doi.org/10.1080/13811118.2015.1004472

Dickerson, D. L., Brown, R. A., Klein, D. J., Agniel, D., Johnson, C., & D'Amico, E. J. (2019). Overt Perceived Discrimination and Racial Microaggressions and their Association with Health Risk Behaviors among a Sample of Urban American Indian/Alaska Native Adolescents. *Journal of Racial and Ethnic Health Disparities*. https://doi.org/10.1007/s40615-019-00572-1

Dickerson, D. L., Venner, K. L., Duran, B., Annon, J. J., Hale, B., & Funmaker, G. (2014). Drum-Assisted Recovery Therapy for Native Americans (DARTNA): Results from a Pretest and Focus Groups. *American Indian and Alaska Native Mental Health Research (Online)*, *21*(1), 35–58.

Ehlers, C. L., Gizer, I. R., Gilder, D. A., Ellingson, J. M., & Yehuda, R. (2013). Measuring historical trauma in an American Indian Community Sample: Contributions of substance dependence, affective disorder, conduct disorder and PTSD. *Drug and Alcohol Dependence*, *133*(1). https://doi.org/10.1016/j.drugalcdep.2013.05.011

Garrett, B. A., Livingston, B. J., Livingston, M. D., & Komro, K. A. (2017). The Effects of Perceived Racial/Ethnic Discrimination on Substance Use Among Youths Living in the Cherokee Nation. *Journal of Child & Adolescent Substance Abuse*, *26*(3), 242–249. https://doi.org/10.1080/1067828X.2017.1299656

Gone, J. P. (2012). Indigenous Traditional Knowledge and Substance Abuse Treatment Outcomes: The Problem of Efficacy Evaluation. *The American Journal of Drug and Alcohol Abuse*, *38*(5), 493–497. https://doi.org/10.3109/00952990.2012.694528

Gone, J. P., & Looking Calf, P. E. (2015). The Blackfeet Indian culture camp: Auditioning an alternative indigenous treatment for substance use disorders. *Psychological Services*, *12*(2), 83–91. https://doi.org/10.1037/ser0000013

Gossage, J. P., Barton, L., Foster, L., Etsitty, L., LoneTree, C., Leonard, C., & May, P. A. (2003). Sweat Lodge Ceremonies for Jail-Based Treatment. *Journal of*

Psychoactive Drugs, *35*(1), 33–42. https://doi.org/10.1080/02791072.2003.10399991

Gray, N., Mays, M. Z., Wolf, D., & Jirsak, J. (2010). A Culturally Focused Wellness Intervention for American Indian Women of a Small Southwest Community: Associations with Alcohol Use, Abstinence Self-Efficacy, Symptoms of Depression, and Self-Esteem. *American Journal of Health Promotion*, *25*(2), e1–e10. https://doi.org/10.4278/ajhp.080923-QUAN-209

Greenfield, B. L., Hallgren, K. A., Venner, K. L., Hagler, K. J., Simmons, J. D., Sheche, J. N., Homer, E., & Lupee, D. (2015). Cultural adaptation, psychometric properties, and outcomes of the Native American Spirituality Scale. *Psychological Services*, *12*(2), 123–133. https://doi.org/10.1037/ser0000019

Greenfield, B. L., Venner, K. L., Tonigan, J. S., Honeyestewa, M., Hubbell, H., & Bluehorse, D. (2018). Low rates of alcohol and tobacco use, strong cultural ties for Native American college students in the Southwest. *Addictive Behaviors*, *82*, 122–128. https://doi.org/10.1016/j.addbeh.2018.02.032

Hirchak, K. A., Leickly, E., Herron, J., Shaw, J., Skalisky, J., Dirks, L. G., Avey, J. P., McPherson, S., Nepom, J., Donovan, D., Buchwald, D., McDonell, M. G., & HONOR Study Team. (2018). Focus groups to increase the cultural acceptability of a contingency management intervention for American Indian and Alaska Native Communities. *Journal of Substance Abuse Treatment*, *90*, 57–63. https://doi.org/10.1016/j.jsat.2018.04.014

Huyser, K. R., Angel, R. J., Beals, J., Cox, J. H., Hummer, R. A., Sakamoto, A., & Manson, S. M. (2018). Reservation Lands as a Protective Social Factor: An

Analysis of Psychological Distress among Two American Indian Tribes. *Socius*, *4*, 2378023118807022. https://doi.org/10.1177/2378023118807022

James, R. D., West, K. M., Claw, K. G., EchoHawk, A., Dodge, L., Dominguez, A., Taualii, M., Forquera, R., Thummel, K., & Burke, W. (2018). Responsible Research With Urban American Indians and Alaska Natives. *American Journal of Public Health*, *108*(12), 1613–1616. https://doi.org/10.2105/AJPH.2018.304708

Lowe, J. M., McDonell, M. G., Leickly, E., Angelo, F. A., Vilardaga, R., McPherson, S., Srebnik, D., Roll, J., & Ries, R. K. (2015). Determining Ethyl Glucuronide Cutoffs When Detecting Self-Reported Alcohol Use In Addiction Treatment Patients. *Alcoholism, Clinical and Experimental Research*, *39*(5), 905–910. https://doi.org/10.1111/acer.12699

McDonell, M. G., Leickly, E., McPherson, S., Skalisky, J., Srebnik, D., Angelo, F., Vilardaga, R., Nepom, J. R., Roll, J. M., & Ries, R. K. (2017). A randomized controlled trial of ethyl glucuronide-based contingency management for outpatients with co-occurring alcohol use disorders and serious mental illness. *The American Journal of Psychiatry*, *174*(4), 370–377. https://doi.org/10.1176/appi.ajp.2016.16050627

McDonell, M. G., Skalisky, J., Leickly, E., McPherson, S., Battalio, S., Nepom, J. R., Srebnik, D., Roll, J., & Ries, R. K. (2015). Using Ethyl Glucuronide in Urine to Detect Light and Heavy Drinking in Alcohol Dependent Outpatients. *Drug and Alcohol Dependence*, *157*, 184–187. https://doi.org/10.1016/j.drugalcdep.2015.10.004

McPherson, S. M., Burduli, E., Smith, C. L., Herron, J., Oluwoye, O., Hirchak, K., Orr, M. F., McDonell, M. G., & Roll, J. M. (2018). A review of contingency management for the treatment of substance-use disorders: Adaptation for underserved populations, use of experimental technologies, and personalized optimization strategies. *Substance Abuse and Rehabilitation*, *9*, 43–57. https://doi.org/10.2147/SAR.S138439

Miguel, A. Q. C., Madruga, C. S., Cogo-Moreira, H., Yamauchi, R., Simões, V., da Silva, C. J., McPherson, S., Roll, J. M., & Laranjeira, R. R. (2016). Contingency management is effective in promoting abstinence and retention in treatment among crack cocaine users in Brazil: A randomized controlled trial. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors*, *30*(5), 536–543. https://doi.org/10.1037/adb0000192

Pacheco, C. M., Daley, S. M., Brown, T., Filippi, M., Greiner, K. A., & Daley, C. M. (2013). Moving Forward: Breaking the Cycle of Mistrust Between American Indians and Researchers. *American Journal of Public Health*, *103*(12), 2152–2159. https://doi.org/10.2105/AJPH.2013.301480

Pascoe, E. A., & Smart Richman, L. (2009). Perceived discrimination and health: A meta-analytic review. *Psychological Bulletin*, *135*(4), 531–554. https://doi.org/10.1037/a0016059

Skewes, M. C., & Blume, A. W. (2019). Understanding the link between racial trauma and substance use among American Indians. *American Psychologist*, *74*(1), 88–100. https://doi.org/10.1037/amp0000331

Stone, R. A. T., Whitbeck, L. B., Xiaojin Chen, Johnson, K., & Olson, D. M. (2006). Traditional Practices, Traditional Spirituality, and Alcohol Cessation Among American Indians. *Journal of Studies on Alcohol*, *67*(2), 236–244.

Tingey, L., Cwik, M. F., Rosenstock, S., Goklish, N., Larzelere-Hinton, F., Lee, A., Suttle, R., Alchesay, M., Massey, K., & Barlow, A. (2016). Risk and protective factors for heavy binge alcohol use among American Indian adolescents utilizing emergency health services. *The American Journal of Drug and Alcohol Abuse*, *42*(6), 715–725. https://doi.org/10.1080/00952990.2016.1181762

Venner, K. L., Feldstein, S. W., & Tafoya, N. (2008). Helping Clients Feel Welcome: Principles of Adapting Treatment Cross-Culturally. *Alcoholism Treatment Quarterly*, *25*(4), 11–30. https://doi.org/10.1300/J020v25n04_02

Venner, K. L., Greenfield, B. L., Hagler, K. J., Simmons, J., Lupee, D., Homer, E., Yamutewa, Y., & Smith, J. E. (2015). Pilot outcome results of culturally adapted evidence-based substance use disorder treatment with a Southwest Tribe. *Addictive Behaviors Reports*, *3*, 21–27. https://doi.org/10.1016/j.abrep.2015.11.002

Walters, K. L., Simoni, J. M., & Evans-Campbell, T. (2002). Substance use among American Indians and Alaska natives: Incorporating culture in an “indigenist” stress-coping paradigm. *Public Health Reports (Washington, D.C.: 1974)*, *117 Suppl 1*, S104-117.

Wendt, D. C., Collins, S. E., Nelson, L. A., Serafini, K., Clifasefi, S. L., & Donovan, D. M. (2017). Religious and Spiritual Practices Among Home-less Urban American

Indians and Alaska Natives with Severe Alcohol Problems. *American Indian and Alaska Native Mental Health Research (Online)*, *24*(3), 39–62.

Whitbeck, L. B., Chen, X., Hoyt, D. R., & Adams, G. W. (2004). Discrimination, historical loss and enculturation: Culturally specific risk and resiliency factors for alcohol abuse among American Indians. *Journal of Studies on Alcohol*, *65*(4), 409–418.

Woodall, W. G., Delaney, H. D., Kunitz, S. J., Westerberg, V. S., & Zhao, H. (2007). A Randomized Trial of a DWI Intervention Program for First Offenders: Intervention Outcomes and Interactions With Antisocial Personality Disorder Among a Primarily American-Indian Sample. *Alcoholism: Clinical and Experimental Research*, *31*(6), 974–987. https://doi.org/10.1111/j.1530-0277.2007.00380.x

Tables

Table 1

Baseline Demographic, Cultural, and Clinical Characteristics (N = 65)

Variable	n	%	Mean	SD
Demographic Characteristics				
Age			36.7	8.7
Male	41	63.1		
HS Education or Higher	54	83.1		
Unstably Housed	28	43.1		
Full Time Employed (Last 3 Years)	30	46.2		
Unemployed (Last 30 Days)	47	72.3		
Cultural Characteristics				
American Indian Enculturation Scale			63.9	25.0
Perceived Discrimination Scale			2.0	0.4
Historical Loss Scale			4.4	3.8
Historical Loss Symptoms			4.5	3.9
Years Lived on the Reservation			29.4	10.7
Clinical Characteristics				
Negative Alcohol Sample (EtG $\leq$ 150)	37	56.9		
Heavy Drinking Sample (EtG $\geq$ 500)	19	29.2		

Table 2

Correlation Matrix for Model 1 (EtG 150)

Variable		1	2	3	4	5	6	7
1. EtG ≥ 150	Pearson's r	—						
	p-value	—						
2. Years Lived on Reservation	Pearson's r	-0.202	—					
	p-value	0.107	—					
3. Enculturation	Pearson's r	-0.295	-0.030	—				
	p-value	0.017	0.814	—				
4. Discrimination	Pearson's r	0.023	-0.088	0.216	—			
	p-value	0.856	0.487	0.085	—			
5. Historical Loss Scale	Pearson's r	0.050	0.117	0.501	0.237	—		
	p-value	0.692	0.354	< .001	0.057	—		
6. Historical Loss Symptoms	Pearson's r	0.113	0.018	0.185	0.307	0.261	—	
	p-value	0.370	0.889	0.141	0.013	0.036	—	
7. Sex (Male)	Pearson's r	0.151	0.056	0.313	0.146	0.090	0.083	—
	p-value	0.231	0.660	0.011	0.247	0.474	0.513	—

Table 3

Correlation Matrix for Model 2 (EtG 500)

Variable		1	2	3	4	5	6	7
1. EtG ≥ 500	Pearson's r	—						
	p-value	—						
2. Years Lived on Reservation	Pearson's r	0.203	—					
	p-value	0.104	—					
3. Enculturation	Pearson's r	-0.319	0.030	—				
	p-value	0.010	0.814	—				
4. Discrimination	Pearson's r	0.140	0.088	0.216	—			
	p-value	0.265	0.487	0.085	—			
5. Historical Loss Scale	Pearson's r	0.083	0.117	0.501	0.237	—		
	p-value	0.513	0.354	< .001	0.057	—		
6. Historical Loss Symptoms	Pearson's r	0.069	0.018	0.185	0.307	0.261	—	
	p-value	0.587	0.889	0.141	0.013	0.036	—	
7. Male	Pearson's r	0.071	0.056	0.313	0.146	0.090	0.083	—
	p-value	0.573	0.660	0.011	0.247	0.474	0.513	—

Table 4

Model 1: Fixed Effects Parameter Estimates (EtG ≥ 150)

				95% CI			
Effect	**Estimate**	**SE**	**OR**	**UL**	**LL**	**z**	**p**
(Intercept)	-0.84602	0.2506	0.429	0.2626	0.701	-3.376	< .001
Randomization Group (CM-NC)	-1.36724	0.5119	0.255	0.0934	0.695	-2.671	0.008
Years Lived on Reservation	-0.00486	0.0244	0.995	0.9488	1.044	-0.200	0.842
Enculturation	-0.02289	0.0122	0.977	0.9542	1.001	-1.871	0.061
Discrimination	0.84126	0.7225	2.319	0.5629	9.557	1.164	0.244
Historical Loss Scale	0.07380	0.0785	1.077	0.9230	1.256	0.940	0.347
Historical Loss Symptoms	0.07252	0.0684	1.075	0.9404	1.229	1.061	0.289
Sex (Male)	0.50110	0.5567	1.651	0.5543	4.915	0.900	0.368

Note. Model is predicting the probability of submitting an alcohol positive sample (EtG ≥ 150) over the probability of submitting an alcohol negative sample (EtG <150). UL stands for upper limit of the confidence interval, and LL stands for lower limit. CM stands for contingency management and NC stands for the non-contingent control group.

Table 5

Model 2: Fixed Effects Parameter Estimates (EtG ≥ 500)

				95% CI			
Effect	**Estimate**	**SE**	**OR**	**LL**	**UL**	**z**	**p**
(Intercept)	-1.6213	0.2566	0.198	0.120	0.327	-6.318	< .001
Randomization Group (CM-NC)	-0.9787	0.5087	0.376	0.139	1.019	-1.924	0.054
Years Lived on Reservation	-0.0188	0.0242	0.981	0.936	1.029	-0.778	0.436
Enculturation	-0.0278	0.0122	0.973	0.950	0.996	-2.271	0.023
Discrimination	1.1221	0.7437	3.071	0.715	13.194	1.509	0.131
Historical Loss Scale	0.0855	0.0799	1.089	0.931	1.274	1.070	0.285
Historical Loss Symptoms	0.0643	0.0669	1.066	0.935	1.216	0.961	0.337
Sex (Male)	0.6133	0.5593	1.847	0.617	5.526	1.097	0.273

Note. Model is predicting the probability of submitting a heavy drinking (EtG ≥ 500) sample over the probability of submitting an alcohol negative to moderate drinking level (EtG < 500) sample. UL stands for upper limit of the confidence interval, and LL stands for lower limit. CM stands for contingency management and NC stands for the non-contingent control group.

Table 6

Model 3: Fixed Effects Parameter Estimates (EtG ≥150)

				95% CI			
Effect	**Estimate**	**SE**	**OR**	**LL**	**UL**	**z**	**p**
(Intercept)	-0.84262	0.2587	0.431	0.2593	0.715	-3.258	0.001
Randomization Group (CM-NC)	-1.33803	0.5167	0.262	0.0953	0.722	-2.590	0.010
Enculturation	-0.0577	0.0110	0.984	0.9634	1.006	-1.434	0.152
Sex (Male)	0.53139	0.5611	1.701	0.5665	5.109	0.947	0.344
Randomization ✻ Enculturation	0.00244	0.0210	1.002	0.9621	1.045	0.116	0.907

Note. Model is predicting the probability of submitting an alcohol positive sample (EtG ≥ 150) over the probability of submitting an alcohol negative sample (EtG <150). UL stands for upper limit of the confidence interval, and LL stands for lower limit. CM stands for contingency management and NC stands for the non-contingent control group.

Table 7

Model 4: Fixed Effects Parameter Estimates (EtG ≥ 500)

				95% CI			
Effect	**Estimate**	**SE**	**OR**	**LL**	**UL**	**z**	**p**
(Intercept)	-1.61238	0.2707	0.199	0.117	0.339	-5.956	< .001
Randomization Group (CM-NC)	-0.96694	0.5222	0.380	0.137	1.058	-1.852	0.064
Enculturation	-0.01832	0.0111	0.982	0.961	1.003	-1.654	0.098
Sex (Male)	0.67793	0.5711	1.970	0.643	6.033	1.187	0.235
Randomization ✻ Enculturation	0.00829	0.0211	1.008	0.967	1.051	0.392	0.695

Note. Model is predicting the probability of submitting a heavy drinking (EtG ≥ 500) sample over the probability of submitting an alcohol negative to moderate drinking level (EtG < 500) sample. UL stands for upper limit of the confidence interval, and LL stands for lower limit. CM stands for contingency management and NC stands for the non-contingent control group.

Figures

Figure 1. *Study Timeline*

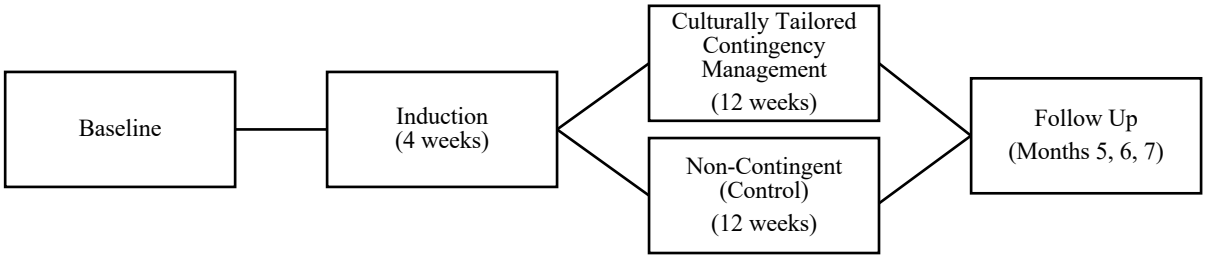

Figure 2. *Consort Diagram*