

A Combined Behavioral Economics and Cognitive Behavioral Therapy Intervention to Reduce Alcohol Use and Intimate Partner Violence Among Couples in Bengaluru, India: Results of a Pilot Study

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Abstract

Hazardous drinking is an important contributing factor to intimate partner violence (IPV) occurrence. However, only a limited number of community-based alcohol reduction interventions have been tested in low- and middle-income countries (LMICs) for their efficacy in reducing IPV. This pilot intervention study tested a 1-month combined behavioral economics and

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cognitive behavioral therapy intervention to reduce hazardous alcohol use and IPV in Bengaluru, India. Sixty couples were randomized to one of three study arms to test the effect of incentives-only and incentives plus counseling interventions compared with a control condition. Alcohol use among male participants was assessed using breathalyzer tests. Violence experienced by female participants was measured using the Indian Family Violence and Control Scale. Couples in the counseling arm participated in four weekly counseling sessions. Male participants in the incentive arms earned a reward for sobriety (breath alcohol concentration [BrAC] <0.01 g/dl). Results showed that while incentives reduced alcohol use, there was a greater proportion of negative BrAC samples among participants in the counseling arm compared with the control group (0.96 vs. 0.76, $p = .03$). Violence also decreased in both intervention arms. The estimated mean violence score for the counseling arm was 10.8 points lower than the control arm at 4-month follow-up visit ($p = .02$). This study contributes important evidence to the field of alcohol reduction and IPV prevention approaches in LMIC settings and adds to the growing evidence that alcohol reduction is a modifiable means of addressing IPV.

Keywords

intimate partner violence, domestic violence, alcohol, contingency management, behavioral economics, cognitive behavioral therapy, behavioral couples therapy

Introduction

Alcohol use and intimate partner violence (IPV) are interconnected issues of significant public health concern. While, historically, debate has ensued about the direction of their relationship, much evidence shows that hazardous alcohol use is an important contributing factor to IPV occurrence and severity in both developed and developing country settings (Brecklin, 2002; Fulu et al., 2013; Javaid, 2015; Jeyaseelan et al., 2004; Rao, 1997; Testa, 2004; Testa et al., 2003). Hazardous drinking among males contributes to violence through several pathways. It impairs problem solving and cognitive abilities thus limiting peaceful conflict resolution; it lowers inhibitions and increases risk taking, as well as serves as a source of conflict in itself (Heise, 2011). In a meta-analytic review by Foran and O'Leary (2008), it was found that alcohol's effect on IPV remained significant even after controlling for other contributing factors, such as hostility, antisocial behavior, and norms of aggression (Kantor & Straus, 2017; Leonard & Senchak, 1993; Reider, 1988). In light of these links,

the World Health Organization's (WHO, 2019) recent report on the prevention of violence against women includes men's alcohol use as a risk factor for IPV and suggests the need for additional evidence generation on alcohol misuse interventions for violence prevention.

As the WHO's (2019) review suggests, limited studies have tested interventions to reduce alcohol misuse for IPV reduction and most research has occurred in high-income settings. Approaches that have been tested for alcohol reduction range from interventions targeting the individual, health care, community, and structural levels. These include brief screening and health care provider interventions, approaches to change social norms around drinking, self-help groups to support users in their abstinence, and policies to limit alcohol availability. Yet many of these interventions—particularly those targeting men with an established alcohol use problem—require mental health professionals and, given low numbers of mental health professionals in low- and middle-income country (LMIC) settings (WHO, 2018), the high cost of biomedical treatments, such as detoxification, and limited subsidization of these services by public health systems (Benegal et al., 2009), concerns about the feasibility and affordability in LMIC settings remain. (Heise, 2011) In addition, stigma associated with mental illness, particularly alcohol use, remains a barrier to treatment seeking (Boysen et al., 2014; Pal et al., 2003; Pescosolido et al., 2010).

Two approaches with limited, but promising evidence that they can be implemented in LMIC settings include contingency management and cognitive behavioral therapy (CBT). Contingency management, the provision of small financial incentives to promote behavior change, has been shown to be effective in low-resource settings for a variety of purposes, including alcohol use reduction (Angelucci, 2008; Schilbach, 2015). In Chennai, India, this method was effective in creating short-term behavior change in daytime drinking among rickshaw drivers (Schilbach, 2015). CBT, a form of psychological treatment aimed at changing harmful drinking patterns, has also been shown to be effective at reducing alcohol use, as well as in reducing IPV in Bengaluru, India (Satyanarayana et al., 2016). Finally, initial evidence suggests that when short-term incentive-based techniques and counseling are combined, the effects may be sustained for longer periods of time. A study in Liberia, which tested a combination of financial incentives and CBT in comparison with financial incentives alone, found that the effects were sustained longer among men receiving the combined approach (Blattman et al., 2016). Behavioral couples therapy (BCT), which uses principles of CBT, is another form of counseling with an evidence base in alcohol and IPV reduction, although primarily in developed countries (Ruff et al., 2010). BCT is usually coupled with an initial detoxification or rehabilitation program that creates

short-term behavior change, much similar to contingency management, prior to beginning counseling (T. J. O'Farrell & Fals-Stewart, 2000).

Building on the existing evidence from high-income countries (HICs) and LMIC settings, the present study attempted to examine the feasibility, safety, and effectiveness of a lay-led intervention combining incentives and CBT, as BCT, for alcohol use and IPV reduction in Bengaluru, India.

Method

The study had two primary aims: (a) to test the feasibility, safety, and acceptability of the research design and intervention approach among couples, and (b) to provide a preliminary assessment of the effects of the intervention on IPV and men's sobriety.

Study Setting

The study was conducted in the lower socioeconomic areas of Jaya Nagar in Bengaluru, India, where the research team has a history of engaging with a local community-based organization, Association for Promoting Social Action (APSA) through their self-help groups (SHGs). The area was also chosen based on relevant characteristics that were thought likely to contribute to the ultimate scalability of the intervention. These characteristics included low socioeconomic status of residents, high levels of current alcohol use and IPV, social norms that demonstrated perceived acceptability of alcohol use and IPV, and inequitable gender norms. Bengaluru is the capital of Karnataka state and is the third most populous city in India, with an estimated population of 10.1 million in 2017. While the previous National Family Health Survey does not provide statistics on IPV specific to Bengaluru, it reports that just over 20% of married women in the state of Karnataka reported ever experiencing IPV (International Institute for Population Sciences & ICF, 2017). Other research has indicated much higher levels of violence. A prospective survey of 744 women in low-income communities in Bengaluru found that 57% of respondents had ever experienced physical violence (Krishnan et al., 2010). Alcohol use is also common. A community-based survey in 2010 reported approximately a quarter of men in Bengaluru drank alcohol with a quarter of those men classified as pathological drinkers (Girish et al., 2010).

Study Design

This study was designed as a randomized control pilot study of *Beautiful Home*, an innovative combined incentive-based and BCT intervention. Full

details of the study design are published elsewhere (Hartmann et al., 2018). In brief, the intervention was developed with input from community partners for the mitigation of hazardous drinking among males and IPV among couples. Intervention materials, including counseling protocols, were written in English then translated into the local language (Kannada) for participants by the implementing team. During training, the case managers and counselors workshoped the Kannada translation of key talking points with our team to ensure agreement on translation and consistency of implementation. To assess the effects of the intervention, the study team recruited a cohort of couples who were randomized into one of three arms (1:1:1 ratio): a control arm, an incentive-only arm, and an incentive plus counseling arm. Over the course of the intervention, breath alcohol concentration (BrAC) levels were collected from men using Soberlink®, a wireless technology that allowed for photo capture to ensure that the appropriate person was taking the test.

Control arm. Men in the control arm were prompted every other day for 4 weeks via cell phone voice messages to breathe into their breathalyzer and received a fee for participation. Men had the option to come into the office once weekly to receive a portion of their participation fee while the rest was placed in a savings account. The money in the savings account was transferred into participants' bank accounts at the end of the study. This approach was designed to account for logistical concerns around the amount of cash that would need to be available and community partners' concerns over how the money would be used.

Incentives arm. Men randomized to the incentives arm received a twice-daily prompt to blow into the breathalyzer for 4 weeks and were offered a monetary incentive for each negative BrAC score in addition to their participation fee. During the orientation session, couples learned how the incentives were tied to breathalyzer scores and were walked through a goal-setting exercise in which they jointly decided on goals they would like to save for, such as education, individual savings, and business savings. Men came into the office to receive a portion of their participation and breathalyzer test rewards weekly. The majority of their earnings were placed in a savings account, which they later allocated to the goals they selected with their female partners during orientation.

Incentives plus BCT arm. Finally, those couples randomized into the incentives and BCT arm participated in all activities described for the incentives arm as well as four weekly BCT sessions on topics such as alcohol use and communication. These sessions began 2 weeks after the incentives portion

had commenced to allow the male partner's alcohol use to stabilize and to mitigate any potential volatility. After each session, couples were asked to complete at-home assignments, including a daily trust contract in which the male partner was asked to state his intent to not drink to his female partner, who would in turn express her support for his effort. The discussion was logged on a daily calendar. Additional details of counseling topics and activities are published elsewhere (Hartmann et al., 2018). Each session lasted for approximately 1 hr. Eight comic strips and graphics were developed by a local artist in collaboration with our team to reinforce lessons and skills taught through the sessions. These visuals included some text, which was originally developed in English and then translated into the local language (Kannada) by our team.

Sessions were conducted by lay counselors who had prior social work experience and who had been trained on BCT facilitation, as part of the preparation for this study. In addition, a senior clinical psychologist (S.T.) trained in the provision of BCT supervised the counselors and supported the interpretation of talking points into Kannada. A total of eight sessions per counselor were observed and assessed for quality and fidelity, using an observation checklist including measures such as the duration of the session, the level of participation during the session, the performance and enthusiasm of the counselor, fidelity to the session plan, and other observations.

Training and Ethical Procedures

Prior to initiating this study, the research team was intensively trained on ethical issues in IPV research using global recommendations (WHO, 2016). The first training consisted of a 5-day research protocol training to familiarize the team with the study aims, protocol, and all research procedures. Interviewer training stressed the importance of building rapport, listening carefully, asking questions with sensitivity, and maintaining confidentiality of participants' responses. The study team received information and training on reporting of social harms and how to assist or refer participants for emotional and social support, should any participant experience distress during an interview. Given the focus on alcohol use and IPV, particular care was taken to develop a close referral network of organizations providing alcohol de-addiction and IPV services to which participants could be referred, along with a detailed case management system. The latter included protocols for regular check-in calls with male and female participants over the course of the first 5 days of the study and an emphasis to participants that they should report any alcohol or violence safety concerns to study staff at any time point during the study. In addition, all members of the research team had

documented research ethics training, which included attention to confidentiality and the protection of research participants. All trained staff, including members of our community partner, were asked to take an oath indicating their commitment to protecting participant confidentiality. The second training was held just prior to the intervention component of the study and consisted of a 5-day training to review the study aims, as well as training in-depth on all intervention procedures, including counseling, case management, and referral protocols.

Outreach and Recruitment

Couples were recruited using a range of community-based approaches, including outreach at women's SHG meetings, at community health camps, and via snowball sampling. The initial plan was to recruit women from SHGs run by our community-based partner prior to any male partner recruitment to avoid coercion of female partners to join the study. However, despite reassurance that study staff would not inform the male partner of the female partner's prior agreement, women insisted that their male partners be contacted first. Research staff used standardized scripts to describe the study and its purpose, paying careful attention to avoid the study's focus on violence in line with global guidelines (WHO, 2016). Interested individuals were asked to participate in an informed consent process and subsequently complete a screening questionnaire to determine eligibility. If the male or female partner was recruited separately from their partner, they were asked for consent to contact their partner for study recruitment and enrollment. Once both members of the couple had consented and were deemed eligible, the couple was enrolled in the study. The study was approved by the St John's Medical College Hospital Institutional Ethics Committee.

Eligibility Criteria and Study Sample

Couple eligibility criteria included the following: (a) female partner aged between 18 and 40 years; (b) married; (c) both partners speak Kannada; (d) female partner reports male partner has a drinking problem; (e) female partner has ever experienced psychological, physical, or sexual violence perpetrated by her male partner, using standard questions from the WHO Multi-country Study on Women's Health and Domestic Violence Against Women; and (f) both partners are willing and able to provide consent. Couples were excluded if (a) the male partner was deemed to be severely alcohol dependent or at risk of severe withdrawal symptoms, as measured by the Severity of Alcohol Dependence Questionnaire (SADQ) and the Clinical

Institute Withdrawal Assessment for Alcohol Scale–Revised (CIWA-AR); (b) the female partner reported six or more occurrences of severe physical or sexual violence in the past 6 months; or (c) one or both members of the couple feared that the intervention may increase violence.

Randomization and Data Collection

Participants were randomized at the couple level, prior to the start of the intervention, by a statistician using a random number generator. The couple came to the study office together for randomization and an orientation session. During the orientation session, the randomization assignment was revealed to the couple using a sealed envelope with their study identification number. In addition, the couple learned more about the study specifics and protocol for using the breathalyzer. Each member of the couple was then asked to separately complete a baseline survey. After completion of the intervention, all participants completed a follow-up survey. This survey was repeated 3 months postintervention (4-month study visit) for a total of three surveys. All data collection tools were translated into the local language (Kannada) and back translated to check accuracy and were interviewer-administered to men and women separately by an interviewer of the same gender as the participant.

Measures

Study surveys included questions designed to understand participant's social and economic status, relationship characteristics, gender norms and attitudes, and alcohol risk behaviors. However, as the primary outcomes of interest were men's alcohol use and women's experience of violence, the following sections describe these measures in greater depth.

Alcohol use measures. Alcohol use by male participants was based on BrAC as captured by the Soberlink® breathalyzer. The breathalyzers were programmed to request a test at a random time within a fixed 1-hr window. For the intervention arms, participants were tested twice per day, and the time windows for testing differed by week; the first test was always requested between 8:00 and 9:00 p.m. For Weeks 1 and 3, the second test was between 10:00 and 11:00 p.m., and for Weeks 2 and 4, the second test was between 7:00 and 8:00 a.m. the next morning. The control arm was randomly tested every other day between 8:00 and 9:00 p.m. The analysis only included results from scheduled breathalyzer tests. The primary outcome was the proportion of negative BrAC tests, defined as BrAC of under 0.01 g/dL.

Secondary outcomes were the proportion of participants sober per day (defined as no positive BrAC tests) and the longest duration of abstinence for the incentive arms (defined as the greatest number of consecutive days with negative BrAC test results). We also collected women's reports of their partner's alcohol use in the past month on a scale ranging from 0 (*never*) to 4 (*every day*) at each survey.

Violence measures. Violence experienced by female participants was measured using an adaptation of the Indian Family Violence and Control Scale (IFVCS), a culturally tailored scale for assessing a range of violent behaviors, which has been tested and validated previously in India (Kalokhe et al., 2016). The IFVCS is a 63-item questionnaire, divided into four domains: control, psychological, physical, and sexual violence. For this study, the sexual violence domain was omitted in consultation with the community partner, given the sensitivity of the items, leaving 51 items. Participants were asked about the occurrence of all items in the past month using a scored scale of 0 = *never*, 1 = *once*, 2 = *a few times*, or 3 = *many times*. A composite score and a score for each subscale were created by summing all items in the scale. The control subscale was based on 14 items (score range = 0–42). Items were reverse scored so that a higher score indicated less personal control. Example scale items include “during the past month, without being bothered by my husband or his family, I could talk freely on the phone or send SMS (text) messages” and “. . . I could wear any type of dress or have any type of style that I wanted.” The psychological subscale included 22 items (score range = 0–66). Example items include “in the past month, my husband or a member of his family excessively criticized me for my work at home” or “. . . intentionally ignored me or did not talk to me.” The physical violence subscale score was the sum of 16 items (score range = 0–48) and included statements such as “in the past month, my husband or a member of his family kicked, punched or beat me” and “. . . threw things in the house when he/she was angry with me.” Scores were created if responses were provided for all items of the scale. These measures were asked at all three survey timepoints.

Analysis

The sample size for this study was selected to assess the feasibility of the design and intervention implementation. Hence, our analysis focused on the direction, consistency, and coherence of observed results, as well as an assessment of the statistical significance of the outcomes. The target sample size was 20 couples per arm. We assumed 10% loss to follow-up and

therefore increased the sample size to 22 couples per arm (66 couples total). A sample size of 20 was estimated to provide 80% power to detect a 7.9-point difference in the composite violence score postintervention, assuming a standard deviation of 12 and two-sided alpha of .05.

Categorical data were summarized with frequencies and percentages; continuous data were summarized with means, medians, and ranges. Fisher's exact tests and *t* tests were used to test for differences in baseline characteristics between arms. A mixed-effect logistic regression model was used to estimate the proportion of negative BrAC tests per arm. A separate mixed-effect model was used to estimate the proportion of participants sober per day per arm. A participant was considered sober if all completed BrAC tests from that day were negative. An interaction term between arm and number of days since randomization was included in the model to capture patterns of sobriety by arm over the 4-week intervention period. A mixed-effect model was used to estimate the proportion of missed scheduled tests per study arm per week. The mean number of consecutive days sober was compared between the two incentive arms using a *t* test. Wilcoxon signed rank tests were used to compare violence scores between baseline and the two follow-up surveys per study arm. A mixed-effect linear regression model estimated the change in composite violence score over time and between arms. All mixed-effect models included a random participant effect to account for the repeated measures structure of the data. The *p* values less than .05 were considered statistically significant. All analyses were performed using Stata 15.0.

Results

A total of 247 individuals (153 females and 94 males) were screened for eligibility between April 2017 and July 2017. Of them, 61% of women and 78% of men were deemed eligible. Of the women found to be eligible, 27 (18%) were excluded because their male partners refused enrollment or were unreachable.

Retention and Intervention Engagement

A total of 67 couples were randomized. However, several technical issues with the breathalyzers delayed the study start and led to a few cases of study attrition. Four of the breathalyzers had back end technical issues that required replacement devices. Unfortunately, shipping replacement breathalyzers from the United States to India was not possible in the study period and these participants were dropped from the study. Attrition was relatively equal

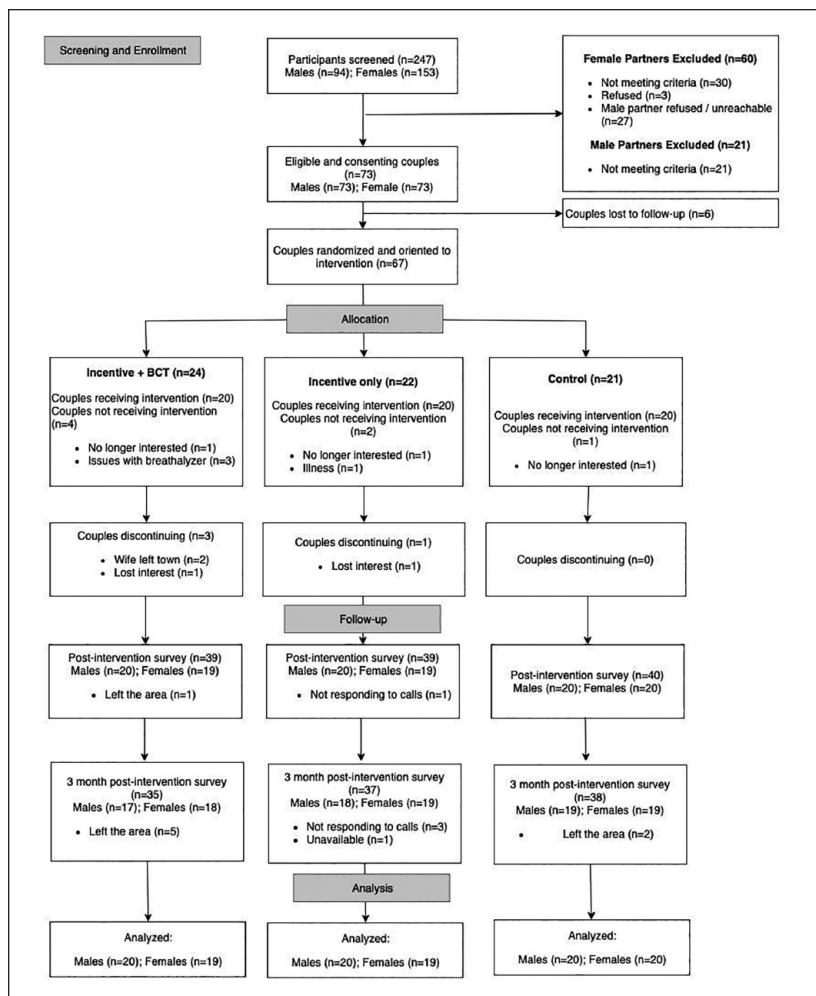


Figure 1. Study consort chart.

Note. BCT = behavioral couples therapy.

across arms. The consort diagram in Figure 1 outlines the flow of screening, enrollment, and retention in the study. Sixty couples (20 per arm) completed orientation and initiated the study. Once enrolled in the study, retention was high, with 95% of couples continuing through the end of the intervention and 90% completing the 4-month follow-up survey.

Couples' engagement in counseling was also high. Seventy percent of couples in the incentives plus BCT arm attended all four sessions (85% attended three sessions), with family illness being the primary barrier to participation. According to counselor observations, the average participant engagement score was 4.1 out of 5.

Participant Characteristics

Background characteristics of the participants and their partnerships are described in Table 1. Most couples had been married for ≥ 10 years (53%) and lived in a nuclear household (70%). Male and female participants did not differ significantly across study arms on the key characteristics evaluated. Median age of females was 29 years (range = 18–42) and median age of males was 35 years (range = 24–56). Between 25% and 35% of women and men per arm were illiterate. Total income for female participants was typically half that of their male partners.

Safety

There were no study-related adverse events, defined as study-related cases of alcohol withdrawal or IPV. This included no incidence of hospitalization or other medical emergencies as a consequence of study participation.

Alcohol Use

At baseline, nearly all male partners (95%) reported drinking alcohol at least 1 day during the week in the past month. Across all three arms, the most common days for the consumption of alcohol were Sunday (60%) or Saturday (17%). Female partners described their partners as drinking alcohol every day (28%) or a few times a week (40%) in the month prior to enrollment.

Despite initial technical issues, compliance with scheduled breathalyzer tests was high across arms. Men in the incentives plus BCT arm, incentives-only arm, and control arm adhered to an estimated 89%, 88%, and 86% of scheduled tests ($p = .46$) respectively. Compliance was consistent over the 4-week intervention period ($p = .79$, data not shown). All alcohol-related outcomes are presented in Table 2.

The incentives plus BCT arm had a greater proportion of negative BrAC samples (0.96, 95% confidence interval [CI] = [0.92, 1.00]) compared with the control arm (0.76, 95% CI = [0.50, 1.00]), $p = .03$. The incentives-only arm had a similar proportion of negative breathalyzer samples as the incentives plus BCT arm (0.93, 95% CI = [0.84, 1.00]) but this proportion was not

Table 1. Participant and Partnership Characteristics by Study Arm.

Characteristic	Control		Incentives		Incentives + BCT		Total	
	N	(%)	N	(%)	N	(%)	N	(%)
Total couples	20	(100)	20	(100)	20	(100)	60	(100)
Female partners								
Median age, years (range)	32	(18–42)	29	(20–40)	28	(19–40)	29	(18–42)
Illiterate	7	(35)	6	(30)	5	(25)	18	(30)
Completed secondary school	12	(60)	14	(70)	14	(70)	40	(67)
Earns income	18	(90)	17	(85)	13	(65)	48	(80)
Median days per week worked previous month (range)	7	(3–7)	7	(6–7)	7	(6–7)	7	(3–7)
Median monthly income, in thousands INR (range)	6.5	(2.0–10.6)	4.0	(0.8–21.0)	6.5	(2.0–20.0)	6.0	(0.8–21.0)
Male partners								
Median age, years (range)	36.5	(27–54)	35	(27–56)	35	(24–44)	35	(24–56)
Illiterate	7	(35)	5	(25)	6	(30)	18	(30)
Completed secondary school	11	(55)	12	(60)	11	(55)	34	(57)
Earns income	20	(100)	19	(95)	19	(95)	58	(97)
Median days per week worked previous month (range)	5.5	(4–7)	5	(1–7)	5	(0.5–7)	5	(0.5–7)
Median monthly income, in thousands INR (range)	10.5	(8.0–35.0)	11.0	(1.5–25.0)	12.0	(4.0–30.0)	11.0	(1.5–35.0)
Median amount spent daily on alcohol when drinking, in INR (range)	200	(60–900)	275	(70–1,000)	215	(60–750)	215	(60–1,000)
Days of the week in the past month drank alcohol								
Saturday	5	(25)	3	(15)	2	(10)	10	(17)
Sunday	11	(55)	12	(60)	13	(65)	36	(60)
Every day	2	(10)	1	(5)	0	(0)	3	(5)
Partnership characteristics								
Median years married (range)	12	(3–27)	11	(1–23)	8	(3–24)	10	(1–27)
Arranged marriage	14	(70)	15	(75)	14	(70)	43	(72)
Lives with extended family	7	(35)	6	(30)	5	(25)	18	(30)

Note. BCT = behavioral couples therapy.

Table 2. Alcohol Outcomes.

Outcome	Control	Incentives	Incentives + BCT
Number of participants	20	20	20
Mean number of completed BrAC samples per participant (SD)	9.8 (2.1)	44.9 (10.6)	44.0 (9.4)
Estimated proportion of scheduled samples missed (95% CI)	0.14 (0.06, 0.23)	0.12 (0.06, 0.18)	0.11 (0.05, 0.16)
Estimated proportion of negative BrAC samples (95% CI)	0.76 (0.50, 1.00)	0.93 (0.84, 1.00)	0.96 ^a (0.91, 1.00)
Mean longest number of consecutive days abstinent (95% CI)	—	9.2 (5.7, 12.7)	10.2 (6.8, 13.6)

Note. BCT = behavioral couples therapy; BrAC = breath alcohol concentration; CI = confidence interval.

^aStatistically different from control arm, $p < .05$.

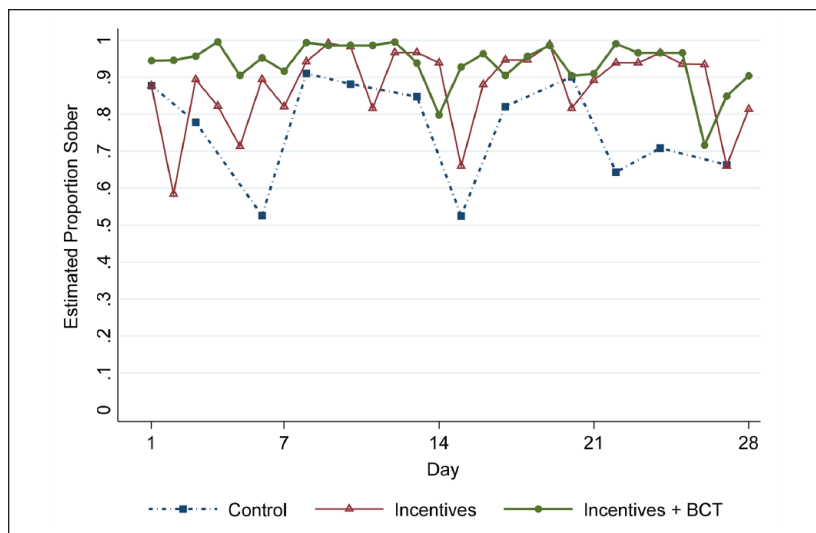


Figure 2. The estimated proportion of participants sober per day of sample collection by study arm.

Note. Sobriety was defined as BrAC <0.01 g/dl in all available samples per day. BrAC = breath alcohol concentration; BCT = behavioral couples therapy.

statistically distinguishable from the corresponding proportion for the control arm ($p = .12$). On average, men in the incentives-only arm were abstinent a maximum of 9.2 consecutive days (95% CI = [5.7, 12.7]), while men in the incentives plus BCT arm were abstinent a maximum of 10.2 (95% CI = [6.8, 13.6]) days ($p = .67$) during the course of the intervention. This measure was not applicable to the control arm as they were not tested every day.

Figure 2 displays the estimated proportion of participants sober per day by study arm during the 4-week intervention period. Graphically, we see that a greater proportion of participants in the incentives plus BCT arm were consistently sober compared with the control arm. We also see a cyclical pattern of alcohol use in the control arm although the pattern did not appear to be related to a certain day of the week.

Consistent with breathalyzer data, at the 1-month follow-up interview ($n = 57$), fewer women described their partner's alcohol use in the past month as every day (14%) or a few times a week (23%) than at baseline. More women in the control arm (45%) and incentives arm (47%) described their partner's alcohol use as a few times a week or more compared with the incentives plus BCT arm (17%), $p = .10$. (Data are not shown in tables.)

Violence

At enrollment, violence scores were similar across study arms. Most of the composite violence score was attributable to the control subscale. However, the majority of women in all study arms also reported some level of physical and psychological violence at baseline.

Women's reports of violence at follow-up indicated that the intervention was associated with a significant reduction in violence, with the incentives plus BCT arm experiencing a larger decrease than the other study arms (Table 3). At the end of the intervention (at the 1-month visit), the incentives plus BCT arm had a significant decrease in overall mean violence score (-9.9 points, 95% CI = $[-15.3, -4.5]$, $p < .001$). The control and incentives-only arms had similar marginal decreases in mean scores (approximate decrease of 4 points each) but these changes were not statistically significant ($p \geq .09$). By the 4-month follow-up visit, the incentives plus BCT arm had a persistently lower mean violence score (-13.3 points, 95% CI = $[-19.0, -7.6]$, $p < .001$). The incentives-only arm also had a significantly lower score at 4 months compared with baseline (-11.7 points, 95% CI = $[-17.5, -5.9]$, $p < .001$). There was no difference in mean violence scores between Months 1 and 4 for the control arm ($p = .90$). Overall, at the 4-month follow-up, the estimated mean violence score for the incentives plus BCT arm was 6.2 points lower than the incentives-only arm (95% CI = $[-15.5, 3.1]$, $p = .19$) and 10.8 points lower than the control arm (95% CI = $[-19.8, -1.8]$, $p = .02$; Figure 3).

Discussion and Conclusion

This study is the first of its kind, which we are aware, to test a combined contingency management and BCT intervention in a low resource setting for the purpose of reducing hazardous drinking and IPV. Results of the study revealed a successful reduction in both outcomes of interest, with statistically significant reductions in alcohol use and IPV among the incentives plus BCT arm. The largest reductions in violence were attributable to reductions in men's control of their female partner, which may have resulted from improved communication skills combined with greater emotional regulation engendered by alcohol reduction. Poor communication and conflict negotiation have been identified previously as a risk factor for IPV, serving as the conceptual basis for interventions focused on teaching healthy relationship skills to couples, as well as for BCT approaches (Feldman & Ridley, 2000; McCollum & Stith, 2008; O'Farrell et al., 2004; Ruff et al., 2010). The incentives-only arm, while not significant, also saw reductions in alcohol use and

Table 3. Violence Scale Score and Subscale Scores by Arm and by Study Visit.

Study visit	Control				Incentives				Incentives + BCT						
	N	M	Median	Range	p value	N	M	Median	Range	p value	N	M	Median	Range	p value
Overall violence score															
Baseline	20	24.6	24	(4–49)		20	27.4	22	(6–67)		20	23.1	24	(7–45)	
Month-1	17	19.9	17	(7–61)	.05	15	24.9	18	(5–75)	.29	19	14.1	10	(2–57)	.001
Month-4	19	20.1	17	(0–73)	.06	15	16.6	11	(0–54)	.007	16	9.5	8	(0–28)	<.001
Control subscale															
Baseline	20	16.3	17	(4–27)		20	16.9	15	(4–31)		20	15.9	16	(7–29)	
Month-1	19	10.1	10	(1–21)	<.001	18	10.2	10	(3–18)	<.001	19	8.8	8	(2–24)	<.001
Month-4	19	9.7	10	(0–21)	<.001	18	6.9	7	(0–19)	<.001	18	5.8	5	(0–21)	<.001
Psychological violence subscale															
Baseline	20	6.0	6	(0–14)		20	7.3	5	(0–28)		20	7.8	8	(0–23)	
Month-1	20	7.6	5	(0–26)	.25	16	8.7	3	(0–36)	.80	19	3.2	2	(0–19)	<.001
Month-4	19	7.5	2	(0–37)	.66	16	5.9	2	(0–28)	.15	16	3.6	2	(0–18)	.007
Physical violence subscale															
Baseline	20	4.2	4	(0–11)		20	5.3	4	(0–18)		20	3.6	3	(0–10)	
Month-1	18	2.6	2	(0–14)	.14	18	4.2	1	(0–29)	.21	19	2.2	0	(0–14)	.04
Month-4	19	2.9	0	(0–19)	.06	18	2.8	0	(0–16)	.07	18	1.8	0	(0–12)	.003

Note. BCT = behavioral couples therapy. p values from Wilcoxon signed-rank tests comparing follow-up visit with baseline, within each study arm.

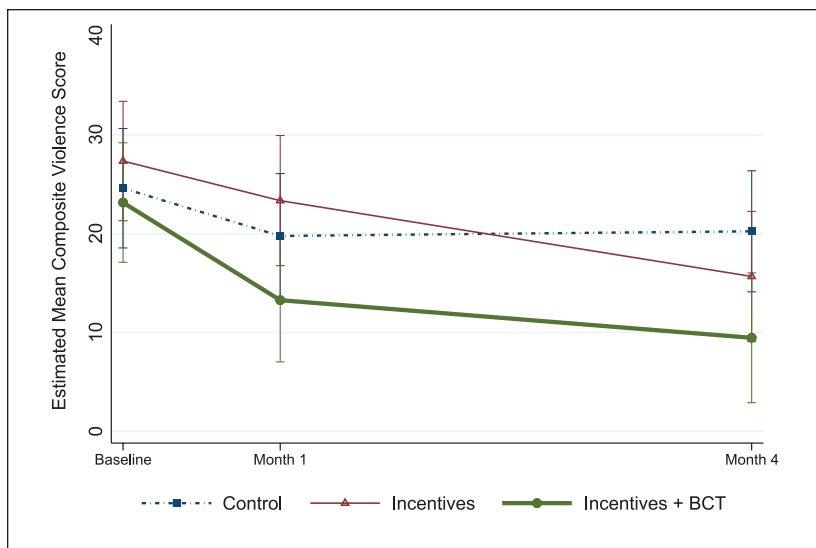


Figure 3. The estimated mean composite violence score by arm and by study visit, with 95% confidence intervals.

Note. Violence score range = 0–153. BCT = behavioral couples therapy.

IPV, suggesting some level of efficacy of incentives alone. Similar pathways may have led to reduced violence in this arm as these couples were also required to communicate about savings plans, as well as to commit to savings goals jointly. Commitment devices, an approach from behavioral economics that encourages people to commit to longer term goals despite a lack of short-term benefit (Ashton et al., 2015), has also been shown to improve women's household decision-making (Ashraf et al., 2010), a key indicator of equity in relationships.

Another key element of this study was the use of lay counselors as case managers and counselors for BCT provision to couples. There is growing interest in addressing mental health issues, such as alcohol abuse, as a means to mitigate IPV in LMIC settings (Tol et al., 2019). Yet feasibility and acceptability remain a concern. LMIC settings are often limited in their resources to address mental health issues, including due to a shortage of trained mental health professionals ("Mental Health Atlas–India," 2011). Where staff do exist, stigma against mental health and IPV limit the uptake of services (Jamison, 2006; McCleary-Sills et al., 2016; Shidhaye & Kermode, 2013). In India, for example, the WHO estimates that there are

less than 0.05 psychologists per 100,000 people (“Mental Health Atlas—India,” 2011). Our effective use of lay counselors therefore fills a gap by demonstrating the feasibility of task shifting these approaches for moderate cases of alcohol misuse and violence—an approach that has been recommended as a means to scale mental health services in resource-constrained settings (Eaton et al., 2011). This approach can be incorporated into a collaborative care model, a cost-effective model proven for mental health in Western settings, where linkages are built between existing mental health professionals and trained community health workers (Katon et al., 2006). This approach has received increasing attention in LMIC settings and is currently being tested for mental health care in India with awareness to its potential role in stigma reduction (Srinivasan et al., 2018). High retention and participant engagement in the intervention suggest acceptability as well and limited stigmatization of participation. This may have been supported by the conceptual focus of “creating a beautiful home,” rather than emphasizing either alcohol or IPV as the primary driver of intervention engagement. Finally, the demonstrated success of minimal, time-bound incentives is a cost-effective alternative to expensive detoxification programs and other less effective approaches. The sustained reduction in alcohol use and IPV 3 months after the intervention concluded demonstrates that incentives do not need to occur in an ongoing manner to be effective. This is in line with contingency management approaches successfully used in other settings (Petry & Martin, 2002; Petry et al., 2000; Prendergast et al., 2006; Schilbach, 2015).

This study is not without limitations. First, the confined geographic area, sociodemographic homogeneity, and small sample size of our study population limit generalizability of the results. Yet despite the small sample size, we still saw statistically significant differences between study arms. There were also several limitations related to our alcohol use data. Our baseline alcohol use data was self-report, limiting our ability to understand the full effect of the incentives’ role in curbing drinking habits. However, we did see an effect during the intervention period, with female partners’ reports of confirmed reductions in their male partner’s drinking adding validity to these findings. Our results may also be subject to missing data bias. Missed breathalyzer tests are most likely not missing at random, however, missing data were comparable across study arms; therefore, had we assumed that missing tests were all positive, we would have seen similar differences across study arms. Although our use of a voice message system to alert participants of scheduled tests and smart breathalyzers to capture alcohol use was novel in the Indian setting, it also came with challenges. Some participants lived in areas without

consistent cellular service and, as a result, did not receive call reminders to take breathalyzer tests. Participants were given calendars with the schedule and time of each test as a reminder, but this was likely less salient than a call reminder. In addition, four of the breathalyzers had back end issues recording test results in the online web portal used to monitor participants. These issues could not be remedied remotely and required replacement devices. Unfortunately, the time necessary to navigate bureaucratic hassles of transporting replacement breathalyzers from the United States to India was an insurmountable barrier in the study's time period and resulted in a few attritions. Finally, the IFVCS measures both violence perpetrated by a husband or a member of his family, limiting its specificity in understanding a reduction in violence from the male partner only. However, given that the majority of couples enrolled in the study did not live with their extended families, and that the intervention content targeted men and couples as opposed to the extended family, we believe that the reduction in violence seen reflects primarily a reduction in IPV.

Regardless of its limitations, this study contributes important evidence to the field of alcohol reduction and IPV prevention approaches in LMIC settings and adds to the evidence base, suggesting that alcohol reduction is a modifiable means of addressing IPV. Given implementation feasibility, acceptability, and safety, as well as a dearth of other high-impact IPV interventions, this study shows value in continuing to explore the mechanisms at play in violence reduction, and testing efficacy in other settings. Further studies should further examine the pathways to change, as well as allow for longer follow-up to assess continued sustainability of these approaches.

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