



A Pilot Randomized Trial of Intervention Components Addressing Drug Use in Couples HIV Testing and Counseling (CHTC) with Male Couples

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Published online: 18 March 2019
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Abstract

Men who have sex with men (MSM) experience high rates of substance use and HIV infection. Main partners are the source of many (35–68%) of these new HIV infections. This study developed and examined the efficacy of two adjunct components to couples HIV testing and counseling (CHTC)—communication training (CT) videos and a substance use module (SUM)—to reduce drug use and sexual HIV transmission risk in MSM couples. Participants included 70 male couples randomized into one of four conditions: CHTC, CHTC + CT videos, CHTC + SUM, and CHTC + CT videos + SUM. Participants completed a survey pre-intervention and 1-, 3-, and 6-months later. Completion of the SUM in the absence of CT videos was associated with significant immediate decreases in drug use and related problems; however, at 3- and 6-month follow ups, the SUM was only associated with reductions in drug use and related problems among men who also viewed the CT videos. There were no between-condition differences in sexual behavior. CHTC may serve as a vehicle for the delivery of brief substance use intervention for MSM couples.

ClinicalTrials.gov NCT # 03125915

Keywords HIV prevention · HIV testing · Gay couples · Men who have sex with men · Drug use

Electronic supplementary material The online version of this article (doi:<https://doi.org/10.1007/s10461-019-02455-2>) contains supplementary material, which is available to authorized users.

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Introduction

Men who have sex with men (MSM) make up 67% of new HIV diagnoses. More than 600,000 MSM are living with HIV in the United States [1] and the highest rates of HIV infection among MSM were observed among those aged 20 to 29 [2]. This age range largely corresponds to the developmental period of emerging adulthood (ages 18 and 29), which is characterized by increasing independence, forming and maintaining relationships with friends and family, evaluating future goals and plans, and developing a sense of identity [3].

Up to two-thirds of HIV infections among MSM occur within the context of primary partnerships [4, 5]. Rates are particularly pronounced for emerging adult MSM. Estimates suggest 79% to 84% of HIV infections are transmitted by primary partners [5].

As these epidemiological data have energized the development of HIV-prevention strategies for couples, couples HIV testing and counseling (CHTC) has received considerable attention. CHTC was initially developed and tested with heterosexual couples in Africa, where it has been used

for over 20 years [6–10]. Men and women who participated in CHTC—previously known as couples voluntary counseling and testing (CVCT)—had 28% fewer instances of condomless intercourse [11]. Effective adaptations of CHTC have been developed for use among MSM in the United States [12]. During CHTC, couples complete an HIV test and receive their results together. In addition, the HIV tester facilitates a future-oriented dialogue between the partners about their HIV prevention practices, sexual agreement, and communication related to HIV risk [13]. CHTC has shown marginally significant reductions in HIV-related sexual risk taking in men who test HIV-negative [13] as well as men who were newly diagnosed as HIV positive [12, 13].

It should be noted that CHTC differs substantially from the kind of counseling that typically occurs within individual HIV testing. In an individual context, HIV counseling focuses on an assessment of sexual risk behaviors and associated psychoeducation related to strategies for HIV risk-reduction, and the questioning is often retrospective in nature (i.e. recently have you experienced risks?) [14]. While it was once a standard of care, data suggest that these individual counseling interventions delivered in conjunction with HIV testing are no more effective at reducing risk than HIV testing alone [15]. In contrast to individual HIV testing and counseling, the counseling component in CHTC is designed to facilitate dyadic processes which result in the development of jointly held goals about HIV risk reduction and enhance and sustain motivation for the accomplishment of these goals, and focuses on how the couple can develop a forward-thinking prevention plan.

The mechanisms by which CHTC might achieve these effects can be described within couple's interdependence theory (CIT) [16]. CIT provides a framework for understanding: (1) how partners influence behavior and, (2) why relationship functioning is associated with health outcomes. In relationships with good dyadic functioning, partners consider how their actions affect their partner and their relationship as a whole [17, 18]. This transformation of motivation increases the likelihood that partners act constructively and engage in behaviors that benefit long-term relationship interests [17, 19]. It also catalyzes the creation of joint goals—termed accommodation [17, 18]. Joint goals are shared by partners and their accomplishment is enhanced by access to individual- and couple-level resources.

The agreements and understandings couples form about sex with partners outside their relationship have been understood as a product of the accommodation process [20, 21]. Gay couples frequently form sexual agreements [22]. The literature most often distinguishes between monogamous or “closed” relationships (which prohibit sex with outside partners) and non-monogamous, or “open” relationships (which permit some sex with outside partners). These sexual agreements serve multiple functions, and among them is the

reduction of HIV transmission risk [22, 23]. Consistent with CIT, sexual agreements are most effective at reducing HIV risk when the relationship is perceived as being intimate, highly satisfactory, and pleasurable [22, 23].

The negotiation of joint goals assumes relationship partners can effectively communicate. The existing CHTC protocol includes a facilitated conversation between partners about their sexual agreement. This includes a discussion of how partners would handle disclosure of agreement violations, and a role-play component in which partners practice telling each other what they want in their agreement and disclosure of a breakage in the agreement. Although these components provide the opportunity for the development of communication guidelines around sexual agreements, CHTC provides limited guidance to providers or opportunities for formal skills training in instances where partners have substantial communication deficits.

This suggests that the effectiveness of CHTC may be enhanced through the incorporation of communication skills training. Such an adjunct component may be particularly relevant for emerging adult young men who have sex with men (YMSM) given that research indicates they score lower on measures of assertive communication, compared to same-aged heterosexual young adults [24]. In the current study, we opted for a video-based delivery format to minimize provider demands. This format is consistent with cognitive-behavioral approaches to skill building and grounded in theories of modeling [25, 26]. Evidence suggests that such video-based modeling components enhance the effects of sexual health interventions [26–28]. Consistent with similar interventions, the communication training (CT) video created for use in *We Test* depicts models of positive (exemplary) and negative (non-exemplary) communication [27, 28].

CHTC may also benefit from the consideration of drug use. Drug use is a well-established correlate of HIV infection risk among MSM, and among YMSM specifically. Thirty-one percent of YMSM report using drugs (e.g., marijuana, cocaine and crack, and amphetamines) during sex. Of those who combined sex and drug use, there was an increased likelihood of having CAS [29].

Despite its relevance to sexual behavior, CHTC does not incorporate a focus on drug use. Several factors point to the potential to integrate a discussion about the rules or understandings couples have related to drug use into the existing CHTC protocol. First, there is evidence that partnered MSM attempt to regulate each other's substance use behaviors in a manner similar to HIV-transmission risk [30, 31]. Second, drug use predicts sexual behavior and co-varies with sexual agreements among partnered MSM [32]. Finally, drug use predicts receptivity to discussing HIV-prevention strategies such as pre-exposure prophylaxis (PrEP) [33], especially among YMSM [34, 35]. CIT would suggest that the formation of

a joint drug use goal might catalyze couple-level resources, which would serve to keep drug use within established limits.

To be compatible with the CHTC format, any substance use intervention delivered would need to be contained within a single session that could be integrated into the steps of CHTC. While not all results of single-session substance use interventions indicate efficacy [36], recent studies suggest that single-session interventions have been successful at reducing substance use among young adults [37–39]. These interventions are based upon the principles of Motivational Interviewing (MI) [40]. MI is a client-centered approach to discussions around a target behavior. The provider's goal is to enhance personal motivation for change by exploring the relationship between a target behavior and the client's broader goals and values within the context of a non-judgmental relationship characterized by empathy, acceptance, and compassion for the client. Single-session MI interventions typically incorporate a brief assessment of substance use followed by feedback. Subsequently, the provider uses the principles of MI to explore the client's perspective on their substance use, examine the potential for change, and plan for change where appropriate. Brief MI interventions (not always limited to one session) have also been utilized to specifically address substance use and HIV-related outcomes among gay and bisexual men [41–44]. Notwithstanding some variability in the significance of effects on substance use and/or HIV related outcomes across assessment time-points and/or outcome measures; these studies generally support the conclusion that MI is a feasible, acceptable and potentially promising intervention approach for this population.

The purpose of the current pilot study was to test the feasibility, acceptability, and preliminary efficacy of two adjunct CHTC components: assertive communication training (CT) videos and a substance use module (SUM) intended to facilitate a discussion around drug use and the formation of joint substance use goals. It was hypothesized that these two experimental components would significantly decrease the occurrence and severity of drug use. It was further hypothesized that these components would significantly reduce the occurrence of CAS with casual partners, a behavior which might increase HIV infection risk for the couple. Two variables relevant to intervention safety were also examined: the emergence of Intimate Partner Violence (IPV) and relationship dissolution post-intervention.

Methods

Participants and Procedures

Data were collected as part of the We Test study, a pilot randomized controlled trial (RCT) assessing the feasibility,

acceptability, and preliminary efficacy of adjunct components of CHTC (NCT# 03125915). Eligible participants were recruited through a variety of online and outreach-based methods in the New York City area between January 2016 and August 2017, follow-up assessments continued through February 2018. Online recruitment efforts included the distribution of study information via listservs as well as websites and smartphone applications targeting GBM. Outreach strategies included study staff attendance at community and social events frequented by GBM in the New York City area.

An index approach to screening was used. One member of the couple (the index partner) completed a telephone screener, which gathered demographic and behavioral information about them and their partner. To be eligible, index participants must have reported being sexually active (engaging in oral or anal sex) with their partner in the past 90 days and also identify as being in the relationship for at least 90 days. Both partners in each couple were at least 18 years of age, indicated a male sex and gender identity, lived in the New York City metropolitan area, and were able to communicate in English. In addition, at least one member of the couple had to be 18–29; have a negative or unknown HIV status; and use drugs in the past 30 days. Finally, couples were excluded at screening if the index partner indicated that they had “physically abused their partner” or “been physically abused by their partner.” Those men who screened eligible were asked to schedule a baseline appointment at a time they could attend with their partner.

The baseline appointment consisted of study consent procedures and a Qualtrics-administered survey assessment. Couples were excluded if either member reported the occurrence of severe physical or sexual intimate partner violence and stated that they did not currently feel safe in their relationship. This was immediately followed by completion of the randomly assigned intervention condition session. Each partner in the couple was compensated \$30 for completion of the baseline survey and \$20 for completion of the intervention session.

Participants were randomized into one of four treatments in a factorial design: CHTC as usual, CHTC plus the SUM, CHTC preceded by CT videos, and CHTC preceded by CT videos and including the SUM. Randomization was stratified by the couples' relationship length (less than 2 years, 2 or more years together), racial composition (both White and non-Hispanic, one or both members identifies as non-White or Hispanic), and age difference (3 years or less, more than 3 years) using Qualtrics and based on data provided by index participants at screening. Randomization was completed by project staff. Intervention providers were told whether to complete the SUM based upon condition assigned. Intervention providers were blinded to video condition.

Follow-up assessments were administered online at 1-, 3-, and 6-months post-intervention to participants independently of their relationship partners at baseline. For each survey, participants received an email reminding them of consent information and containing the survey link. Participants were compensated \$30 for completion of each follow-up assessment. Compensation varied by participant presence: it was either delivered online via Amazon.com gift-card or in-person as cash. All procedures were approved by the Institutional Review Board of Hunter College of the City University of New York and study visits took place at a research center in New York City.

Couples HIV Testing and Counseling (CHTC)

All participants, regardless of condition, completed a CHTC session. Completion of CHTC takes approximately 30–40 min and involves 8-steps: (1) *Introduce CHTC and obtain concurrence* An introduction to the CHTC process and receiving the couple's consent; (2) *Prepare for and conduct HIV test* Explanation of the HIV test and possible results couples could receive, followed by a rapid HIV test; (3) *Explore couple's relationship* General exploration of the couple's relationship to build rapport; (4) *Discuss HIV risk concerns and reasons for seeking CHTC* Discussion of current risks, reasons for testing and HIV prevention strategies (i.e. condom use, PrEP use, etc.); (5) *Discuss couple's agreement* Exploration of the couple's sexual agreement and rules in regards to outside sexual partners; (6) *Provide results* Results are given to the partners together as a couple and can be the same (concordant negative or positive) or different (discordant); (7) *Develop care, treatment, and prevention plan based on result* Discussion of future steps regarding HIV transmission risk prevention strategies (i.e. discussion of introducing condoms or PrEP use); and (8) *Link with follow-up services* Referrals given in light of current HIV test results (i.e. for confirmatory testing and other health services).

CHTC providers were trained by Drs. Starks and Stephenson following the CDC's standard training protocol [45, 46]. This involved a 2-day didactic workshop and subsequent mock delivery of the intervention. Providers required between 4 and 8 mock sessions to achieve fidelity to the protocol. The first author reviewed each mock session and provided feedback. The first author personally reviewed all mock-training session recordings. A session check-list was developed for this study based upon the CDC's checklist for the delivery of CHTC. Providers were trained to deliver the intervention covering the content on the checklist. In turn, the first author utilized this checklist to ensure that required content was present and to monitor for the presence of tangential content. Once fidelity was achieved, providers met weekly with the first author for CHTC supervision, and also

had 1 h of weekly group supervision in which cases were reviewed and discussed.

Assertive Communication Training (CT) Videos

The CT video component was self-delivered. Partners viewed the videos together on an audio-equipped computer in an assessment room. The video duration was approximately 20 min. After viewing, the partners collaboratively completed a video recognition survey as a check of intervention receipt. In the CT videos, four male couples are depicted in separate scenes discussing HIV testing, drug use, sexual agreements, and drug use during sex. Each scene is viewed twice. Initially, the couple makes one or more communication errors. In the second viewing, the couple utilizes more effective communication skills, resulting in a more adaptive resolution. Each scene is introduced by a narrator who orients viewers to the communication errors and skills in each scene.

Substance Use Module (SUM)

The SUM was administered after step 5 of CHTC and prior to the delivery of HIV-test results. The SUM was designed to be completed in 5 to 15 min. First, the HIV-tester asked the couple to fill in a paper calendar of the past 30 days, indicating days on which either member used drugs or alcohol. The HIV-tester then asked a series of debriefing questions designed to elicit the couples' perspective on their use, establish goals and limits for drug use, and make plans to achieve these goals.

Measures

Demographics

Participants reported their age, HIV status, sexual identity (gay or bisexual), race/ethnicity (Black, Latino, White, Other/Mixed; we collapsed several groups, e.g., Native American, Asian, into the "other" category given the small number of participants), income (below \$20,000 and \$20,000 or above), education (less than college or college and above), and relationship length.

HIV-negative participants were asked to report whether they were currently prescribed PrEP for HIV-prevention. No data were gathered related to PrEP adherence among those who reported being on PrEP. HIV-positive participants were asked whether they were prescribed anti-retroviral therapy (ART). Those participants on ART were asked to indicate the number of days on which they missed any of their ART medications using an ordinal response (0 = I took all my medications; 1–9 missed medication days; 10–18 missed medication days; 19–27 missed

medication days; 28–36 missed medication days; 37–45 missed medication days; 46 or more missed medication days). They also indicated whether their most recent viral load was detectable (versus undetectable).

Outcome Variables

Drug use Participants reported their use of a range of illicit drugs in the 30 days prior to assessment. Drugs included: cannabis, prescription drugs, opioids, cocaine/crack, stimulants, psychedelics, and club drugs (ecstasy, ketamine, and gamma aminobutyric acid). Responses were aggregated to create a dichotomous variable indicating the use (or non-use) of any of the drugs assessed.

Problematic drug use was assessed using the 10-item drug abuse screening test (DAST-10). Participants who indicated the use of any of the substances listed above were subsequently asked to indicate the presence or absence of 9 symptoms associated with drug use. Responses were summed to produce a count of problems. Those participants who did not indicate the use of any substances assessed were assigned a value of zero.

CAS with casual partners was assessed using a series of survey items. Participants indicated the number of times they had sex with casual partners alone and in the presence of their main partner. Those who indicated that sex with casual partners had occurred were then asked to indicate the number of times they had insertive and receptive anal sex with a casual partner without a condom. Responses were aggregated into a single variable indicating the occurrence of any CAS with a casual partner.

Safety Indicators

Physical intimate partner violence (IPV) was assessed using the Physical and Sexual IPV subscale of the IPV-GBM Scale [47]. Similar to past studies, responses to the 8 items assessing physical and sexual IPV were dichotomized to indicate whether each had occurred in the previous 12-month period [48, 49]. Subsequently, responses were aggregated into a single variable indicating the occurrence of any of these forms of violence in the previous 12-months.

Relationship dissolution At each follow-up, participants were asked whether they were in a relationship. Participants who indicated “yes” were then asked whether they were still in a relationship with the same person. Responses were utilized to create a dichotomous variable indicating whether participants were still in a relationship with the person with whom they completed the baseline and intervention session.

Analytic Plan

The success of randomization, the presence of differential attrition, and between-group differences on safety indicators (relationship dissolution and IPV) were assessed using repeated-measures analysis of variance (ANOVA) for continuous variables. To account for the nesting of people-within-couples, between-condition differences in categorical variables were assessed by testing differences among Estimated Marginal Means in Generalized Estimating Equation (GEE) models. Where indicated, pairwise comparisons were conducted using a least significance difference (LSD) post hoc test.

Between-condition differences in primary outcomes were tested within a latent growth curve (LGC) framework in Mplus (version 8.0). For each outcome, a latent intercept and linear slope were specified with the first post-intervention follow-up as the initial time-point. Binomial distributions were specified for Drug Use and CAS with casual partners. DAST-10 scores were modeled using a Poisson distribution. Growth factors were specified at both the individual level (to allow for variability between partners within couple) and the couple level (reflecting dyadic assignment to condition). For each outcome, the direct effect of the CT video and SUM were included along with a CT-by-SUM interaction effect at the couple level. In this procedure, a significant effect of treatment on the latent intercept factor indicates the presence of a group difference at that time point. Meanwhile, a significant effect on the latent linear slope factor indicates that the trajectory over time differs between groups.

Missing data were handled within the context of full-information maximum likelihood estimation. Models were run with and without stratification variables (relationship length; age difference; and racial and ethnic composition of the couple reported at screening) as covariates. In all instances, these covariates were either non-significant predictors of growth factors or—where significant—had no impact on the pattern of significance associated with treatment effects. We therefore omitted stratification variables from final models.

Power Analyses

Results were generated by Monte Carlo simulation using Mplus. All estimates were based upon 10,000 sample replications and power was defined as the percentage of randomly generated samples in which the specified parameter was statistically significant. All models specified that individuals were nested within couples. Models focused on detecting between-condition differences at any one follow-up time-point. The main effects of the two interventions were modeled at level 2. Given the pilot nature of this RCT, no a priori hypothesis was made about the size of the interaction effect

anticipated. Therefore, all analyses were conducted under the conservative assumption that the interaction effect is of equivalent size and opposite direction. In this case, there is a significant effect of one treatment only at one level of the other.

Assuming 80% of the sample endorsed drug use at baseline, a sample of 70 couples has power approximately = 0.60 to detect a treatment effect associated with a 10% decrease in the odds of drug use at any follow-up time point. Similarly—assuming an average DAST-10 score of 2.0 at baseline—the study had power ≥ 0.60 to detect a 0.5 SD difference in DAST-10 scores at any follow-up time point. CAS with casual partners was reported by approximately 26% of the sample at baseline. Under the most conservative default assumptions about the size and direction of the interaction term, this study has power approximately = 0.40 to detect a main effect associated with a 15% decrease in the odds of

these variables. Under somewhat less conservative assumptions, assuming a null interaction effect, power to detect a treatment effect of this size was largely unchanged.

Results

Figure 1 contains the study’s CONSORT flow chart from initial phone screening to completion of the last study follow-up. The final sample was comprised of 70 couples (140 individuals); 16 couples (32 individuals; 22.9%) were randomized to complete CHTC as usual, 17 couples (34 individuals; 24.3%) completed CHTC + SUM, 20 couples (40 individuals; 28.6%) completed CHTC + CT; and 17 couples (34 individuals; 24.3%) CHTC + SUM + CT.

Table 1 contains demographic data and baseline reported primary outcomes for the sample. The average

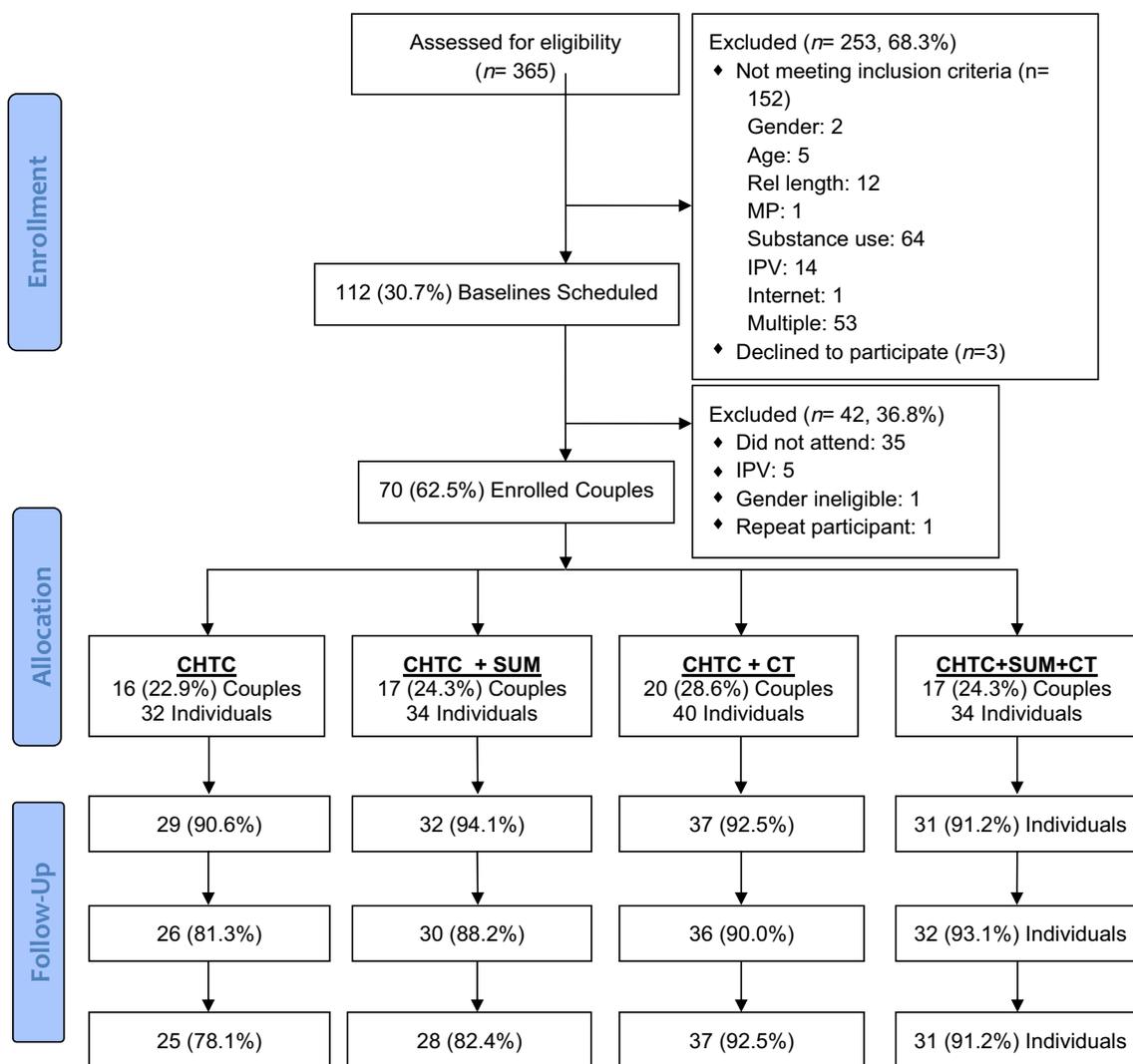


Fig. 1 CONSORT flow

age was 27.0 years ($SD = 5.79$). Most participants (54.3%) identified as a racial or ethnic minority; (62.1%) completed at least a 4-year college degree; and the majority (61.4%) earned more than \$20,000 annually. Couples had been together for an average of 26.5 months ($SD = 24.7$). All couples presented as either sero-concordant HIV-negative (84.3%) or sero-discordant (15.7%). At baseline, 11 participants reported an HIV-positive sero-status. Of these 10 provided information about ART adherence and viral load. All 10 indicated they were at least 90% adherence to ART and 9 of 10 indicated their most recent viral load was undetectable. Following completion of CHTC, 13 participants were identified as HIV-positive; these were distributed across 11 serodiscordant couples and 1 sero-concordant HIV-positive couple.

Tests of between- condition differences suggested that conditions were equivalent with respect to outcome variables reported at baseline and demographic covariates except income. Individuals in the CHTC + SUM and CHTC + SUM + CT conditions were significantly more likely to report earning \$20,000 or more annually than those men assigned to the other two conditions. In subsequent analyses of primary outcomes, follow-up models were run controlling for income at level 1. The inclusion of income did not meaningfully impact the significance of treatment condition.

Review of session recordings revealed that average CHTC delivery time was 32.03 min ($SD = 8.49$) across all conditions. CHTC delivery time did not differ significantly across conditions. Note, average time to complete CHTC

Table 1 Baseline characteristics and analysis of randomization success

	Total	CHTC	CHTC + SUM	CHTC + CT videos	CHTC + SUM + CT videos	Similarity	Test statistic
	<i>n</i> (%)	<i>n</i> (% _{row})	κ	Wald χ^2 (3)			
Race							
Black	23 (16.4)	6 (26.1)	4 (17.4)	9 (39.1)	4 (17.4)	0.74**	1.29
Latino	35 (25.0)	8 (22.9)	13 (37.1)	7 (20.0)	7 (20.0)	0.28*	3.61
White	64 (45.7)	15 (23.4)	13 (20.3)	19 (29.7)	17 (26.6)	0.67**	0.69
Multi-racial/other	18 (12.9)	3 (16.7)	4 (22.2)	5 (27.8)	6 (33.3)	0.44	0.93
Education							
< 4 year degree	53 (37.9)	17 (32.1)	10 (18.9)	17 (32.1)	9 (17.0)		
4 year degree or more	87 (62.1)	15 (17.2)	24 (27.6)	23 (26.4)	25 (28.7)		
Income							
< 20 k per year	54 (38.6)	17 (31.5) ^a	9 (16.7) ^b	20 (37.0) ^a	8 (14.8) ^b	0.34*	8.77*
20 k per year or more	86 (61.4)	15 (17.4)	25 (29.1)	20 (23.3)	26 (30.2)		
Sexual Identity							
Gay	127 (90.7)	31 (24.4)	31 (24.4)	36 (28.3)	29 (22.8)	-0.10	4.17
Bisexual	13 (9.3)	1 (7.7)	3 (23.1)	4 (30.8)	5 (38.5)		
HIV status^c							
Negative	129 (92.1)	29 (22.5)	32 (24.8)	37 (28.7)	31 (24.0)	-0.07	0.4
Positive	11 (7.9)	3 (27.3)	2 (18.2)	3 (27.3)	3 (27.3)		
Prescribed PrEP							
CAS with a CP	39 (27.9)	8 (20.5)	15 (38.5)	9 (23.1)	7 (17.9)	0.40**	3.58
CAS with a CP	29 (26.4)	9 (31.0)	8 (27.6)	8 (27.6)	4 (13.8)		2.73
Drug use							
Drug use	112 (80.0)	25 (22.3)	24 (21.4)	34 (30.4)	29 (25.9)	-0.08	3.21
	M (SD)	M (SE)	M (SE)	M (SE)	M (SE)	ICC	Wald χ^2 (3)
Age	27.01 (5.79)	25.75 (0.89)	26.5 (0.53)	27.83 (1.28)	27.06 (1.31)	0.10	1.96
Relationship length	26.5 (24.69)	22.84 (5.75)	24.28 (6.50)	33.74 (6.11)	23.68 (4.17)	^d	2.26
DAST-10	1.74 (1.52)	2.25 (0.36)	1.47 (0.24)	1.58 (0.21)	1.71 (0.22)	0.09	3.50

CHTC couples HIV testing and counseling, SUM substance use module, CT communication training, CAS condomless anal sex, CP casual partner, DAST drug abuse screening test

NOTE: Where omnibus Wald χ^2 statistics indicated significant between-group differences, those groups with differing super-scripts (indicated by “a” and “b”) differ at $p < .05$ by Least Significant Difference post hoc

* $p < 0.05$; ** $p < 0.01$

^cHIV status at baseline self-report

^dNot applicable; Responses were identical by definition

excludes the time required to complete the SUM in conditions which included it. The SUM required an average of 12.42 min (SD=4.23) to deliver in the conditions which included it. SUM delivery time did not differ significantly between these two conditions.

Attrition Analysis

Study condition was unrelated to the probability of retention at 1-month (Wald $\chi^2(3) = 0.27; p = 0.97$); 3-month (Wald $\chi^2(3) = 1.33; p = 0.72$); and 6-month (Wald $\chi^2(3) = 3.03; p = 0.39$) assessments. There was no evidence of differential attrition. No baseline demographic characteristics were systematically associated with retention across the follow-up period.

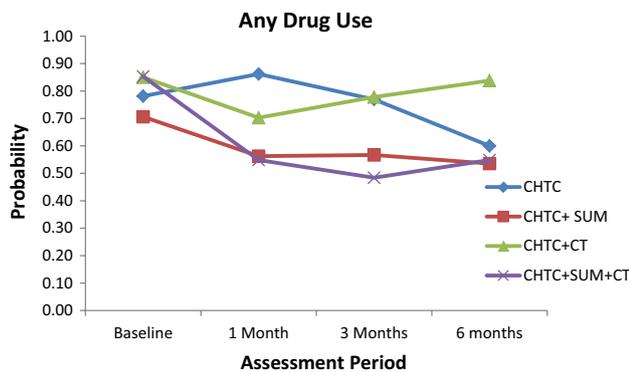


Fig. 2 Observed probability of drug use at baseline and follow-up assessment

Safety Indicators

There were no indications of safety concerns. GEE models predicting physical IPV and relationship dissolution from intervention condition across time (controlling for nesting within couples) indicated that between-condition differences were non-significant. The majority of respondents partnered at follow-up were still with the same partner they completed the intervention with (99.2%; 97.2%; and 96.0% at 1-, 3-, and 6-month follow-up).

Odds of Drug Use

Observed rates of drug use at baseline and each follow-up point are presented in Fig. 2. Results of the LGC model predicting drug use are presented in Table 2. Predictors of the latent intercept factor partially supported the hypothesis that completion of the SUM was associated with a statistically significant decrease in the odds of drug use immediately post intervention. At initial follow-up, the effect of the SUM was significant among those who did not view the CT videos ($B = -3.62; 95\% \text{ CI } -6.78 \text{ to } -0.46; p = 0.03$); however, the effect was non-significant among those who did view the CT videos ($B = -1.67; 95\% \text{ CI } -4.10 \text{ to } 0.76; p = 0.18$). Viewing the CT video was unrelated to the odds of drug use immediately post-intervention regardless of whether the SUM was completed ($B = -0.35; 95\% \text{ CI } -2.50 \text{ to } 1.80; p = 0.75$) or not ($B = -2.30; 95\% \text{ CI } -5.37 \text{ to } 0.77; p = 0.14$).

In contrast, there was a statically significant interaction in the prediction of the latent slope for drug use ($B = -2.65; 95\% \text{ CI } -4.47 \text{ to } -0.83; p = 0.004$). Men who completed CHTC as usual showed a statistically significant decrease in drug use over the follow-up period. The average slope in

Table 2 Results of LGC models predicting primary outcomes

	Odds of drug use <i>B</i> (95% CI)	DAST scores <i>B</i> (95% CI)	Odds of CAS with casual partners <i>B</i> (95% CI)
Intercept			
Threshold/intercept	-4.26** (-7.35, -1.17)	0.59* (0.14, 1.04)	3.99** (1.09, 6.89)
SUM	-3.62* (-6.78, -0.46)	-0.75* (-1.39, -0.11)	0.05 (-2.30, 2.41)
CT video	-2.30 (-5.37, 0.77)	-0.41 (-1.01, 0.20)	0.26 (-2.23, 2.75)
SUM×CT video	1.95 (-1.67, 5.56)	0.25 (-0.61, 1.12)	-1.18 (-4.86, 2.51)
Slope			
Intercept	-1.57* (-3.02, -0.12)	-0.24* (-0.43, -0.04)	-0.65 (-3.51, 2.21)
SUM	1.52* (0.03, 3.02)	0.25 (-0.02, 0.52)	1.83 (-0.62, 4.29)
CT video	2.70** (1.30, 4.11)	0.21 (-0.02, 0.45)	0.35 (-2.02, 2.72)
SUM×CT video	-2.65** (-4.47, -0.83)	-0.40* (-0.78, -0.01)	-1.28 (-4.62, 2.06)

The growth intercept is calculated at the initial (1-month) follow-up in the model presented
 CHTC Couples HIV Testing and Counseling, SUM substance use module, CT communication training, CAS condomless anal sex, DAST drug abuse screening test

* $p < 0.05$, ** $p < 0.01$

this group was -1.57 (95% CI -3.02 to -0.12 ; $p=0.03$). The effect of SUM completion on the slope of drug use was not-significant among men who viewed the CT videos ($B=-1.13$; 95% CI -2.83 to 0.58 ; $p=0.20$); however, among men who did not view the CT video, completion of the SUM was associated with a significantly more positive slope ($B=1.52$; 95% CI 0.03 to 3.02 ; $p=0.046$). Similarly, the effect of CT videos on the slope of drug use was not significant ($B=0.05$; 95% CI -1.07 to 1.18 ; $p=0.93$) among those who completed the SUM. Meanwhile, viewing the CT videos resulted in a significantly more positive slope ($B=2.70$; 95% CI 1.30 to 4.11 ; $p<0.001$) among men who did not complete the SUM. As a result of the statistically significant between-condition interaction in the prediction of drug use slopes, the average slope was not significantly different from zero in the CHTC + CT video ($B=1.14$; 95% CI -0.26 to 2.53 ; $p=0.11$); CHTC + SUM ($B=-0.04$; 95% CI -0.75 to 0.66 ; $p=0.90$); or CHTC + SUM + CT Video ($B=0.01$; 95% CI -0.83 to 0.85 ; $p=0.98$) groups.

Between-condition differences in slopes resulted in variation in between-condition differences in drug use observed at each follow-up time point. These simple main effects were tested by changing the intercept location. At 3-month follow-up, completion of the SUM was associated with a statistically significant decrease in the odds of drug use ($B=-2.79$; 95% CI -5.00 to -0.58 ; $p=0.013$) among those who viewed the CT videos but not among those who did not ($B=-2.09$; 95% CI -4.56 to 0.38 ; $p=0.10$). The effect of the CT videos was not significant at 3-month follow-up regardless of whether the SUM was completed ($B=0.40$; 95% CI -2.35 to 3.16 ; $p=0.78$) or not ($B=-0.30$; 95% CI -2.12 to 1.53 ; $p=0.75$). This trend continued at 6-month follow-up. The effect of SUM was statistically significant among those who also viewed the CT videos ($B=-3.93$; 95% CI -7.06 to -0.81 ; $p=0.014$) but not among those who did not ($B=-0.57$; 95% CI -3.16 to 2.03 ; $p=0.67$). The effect of the CT videos was not significant at 6-month follow-up regardless of whether the SUM was completed ($B=-0.24$; 95% CI -2.39 to 1.91 ; $p=0.83$) or not ($B=3.13$, 95% CI -0.004 to 6.25 ; $p=0.05$).

The analyses above do not provide a straightforward test of the significance of differences between the CHTC as usual and the combined intervention (CHTC + SUM + CT video) groups directly. In order to make these between condition differences more apparent, three post hoc analyses were conducted. Using separate GEE models calculated in SPSS, we tested the significance of between-group differences in the odds of drug use at each time point. These models treated condition as a nominal variable—specified by 3 dummy codes with CHTC as usual treated as the referent group. They were calculated in 1-, 3-, and 6-month data separately. Models specified an exchangeable panel matrix and robust standard errors.

As would be expected based upon growth model results and Fig. 3, the odds of drug use were significantly lower in the CHTC + SUM + CT video condition compared to the CHTC as usual condition at 1 ($B=-1.64$, 95% CI -2.81 , -0.46 ; $\exp B=0.19$; $p=0.006$) and 3 ($B=-1.28$, 95% CI -2.56 , -0.01 ; $\exp B=0.29$; $p=0.049$) month follow-up; however, not at 6-months ($B=-0.20$, 95% CI -1.27 , 0.86 ; $\exp B=0.82$; $p=0.71$) post intervention.

Drug Use Severity

Observed DAST-10 scores at baseline and across follow-up assessment are presented in Fig. 3. Results of the LGC model predicting DAST-10 scores are presented in Table 2. Predictors of the latent intercept factor partially supported the hypothesis that completion of the SUM was associated with a statistically significant decrease in DAST-10 scores immediately post intervention. At initial follow-up, the effect of the SUM was significant among those who did not view the CT videos ($B=-0.75$; 95% CI -1.39 to -0.11 ; $p=0.02$); however, the effect was non-significant among those who did view the CT videos ($B=-0.49$; 95% CI -1.07 to 0.09 ; $p=0.10$). Viewing the CT video was unrelated to DAST-10 scores immediately post-intervention, regardless of whether the SUM was completed ($B=-0.15$; 95% CI -0.77 to 0.47 ; $p=0.63$) or not ($B=-0.41$; 95% CI -1.01 to 0.20 ; $p=0.19$).

In contrast, there was a statically significant interaction in the prediction of the latent slope for DAST-10 scores ($B=-0.40$; 95% CI -0.78 to -0.01 ; $p=0.04$). Men who completed CHTC as usual showed a statistically significant decrease in drug use severity over the follow-up period. The average slope in this group was -0.24 (95% CI -0.43 to -0.04 ; $p=0.02$). The simple main effects of SUM completion on the slope of DAST-10 scores was not-significant regardless of whether the CT videos were viewed ($B=-0.15$; 95% CI -0.41 to 0.11 ; $p=0.27$) or not

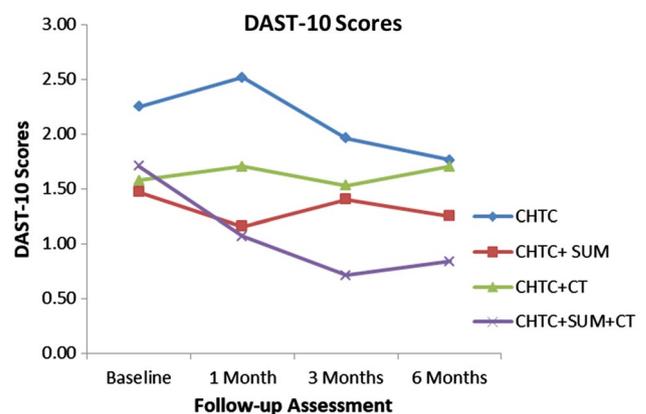


Fig. 3 Observed DAST-10 scores at baseline and follow-up

($B=0.25$; 95% CI -0.02 to 0.52 ; $p=0.07$). Similarly, the simple main effect of CT videos on the slope of DAST-10 scores was not significant regardless of whether SUM was completed ($B=-0.19$; 95% CI -0.48 to 0.11 ; $p=0.22$) or not ($B=0.21$; 95% CI -0.02 to 0.45 ; $p=0.08$). As a result of the statistically significant interaction with respect to the prediction of DAST-10 slopes, the average slope was not significantly different from zero in the CHTC + CT video ($B=-0.02$; 95% CI -0.19 to 0.14 ; $p=0.78$); CHTC + SUM ($B=0.01$; 95% CI -0.19 to 0.22 ; $p=0.90$); or CHTC + SUM + CT Video ($B=-0.17$; 95% CI -0.41 to 0.07 ; $p=0.17$) groups.

Between-condition differences in slopes resulted in variation in between-condition differences in DAST-10 scores observed at each follow-up time point. These simple main effects were tested by changing the intercept location. At 3-month follow-up, completion of the SUM was associated with a statistically significant decrease in DAST-10 scores ($B=-0.64$; 95% CI -1.13 to -0.15 ; $p=0.01$) among those who viewed the CT videos but not among those who did not ($B=-0.49$; 95% CI -1.11 to 0.12 ; $p=0.12$). The effect of the CT videos was not significant at 3-month follow-up regardless of whether the SUM was completed ($B=-0.34$; 95% CI -0.89 to 0.21 ; $p=0.23$) or not ($B=-0.19$; 95% CI -0.76 to 0.38 ; $p=0.51$). This trend continued at 6-month follow-up. The effect of SUM was statistically significant among those who also viewed the CT videos ($B=-0.79$; 95% CI -1.32 to -0.27 ; $p=0.003$) but not among those who did not ($B=-0.25$; 95% CI -0.96 to 0.46 ; $p=0.49$). The effect of the CT videos was not significant at 6-month follow-up regardless of whether the SUM was completed ($B=-0.53$, 95% CI -1.16 to 0.11 ; $p=0.10$) or not ($B=-0.02$; 95% CI -0.60 to 0.64 ; $p=0.96$).

Post hoc GEE analyses to probe differences between the CHTC as usual and CHTC + SUM + CT video combined intervention group were conducted similar to models predicting drug use. A Poisson distribution was specified for DAST-10 scores. As would be expected based upon growth model results and Fig. 3, the mean DAST-10 score in the CHTC + SUM + CT video condition was significantly lower than the CHTC as usual condition at 1 ($B=-0.85$, 95% CI -1.30 , -0.40 ; $\exp B=0.43$; $p<0.001$); 3 ($B=-1.02$, 95% CI -1.59 , -0.45 ; $\exp B=0.36$; $p<0.001$); and 6-months ($B=-0.75$, 95% CI -1.35 , -0.16 ; $\exp B=0.47$; $p=0.010$) post intervention.

Odds of CAS with Casual Partners

Results of the LGC model predicting the odds of CAS with casual partners are provided in Table 2. Analyses suggested that neither the SUM nor the CT video was significantly associated with the growth intercept or growth slope factors. There were no significant between-condition differences at

any time point. Furthermore, slope coefficients were non-significant, suggesting stability across follow-up. Note, results were unchanged in follow-up models controlling for PrEP uptake and HIV-status.

Discussion

These results suggest that CHTC may serve as a promising context for the delivery of brief substance use intervention for emerging adult gay men in relationships. The addition of a brief SUM, which facilitated a discussion about drug use, was associated with significant immediate reductions in drug use as well as drug use associated problems among men who did not view CT videos. CT videos significantly enhanced the effectiveness of this SUM with respect to longer-term reductions in drug use and related problem severity. At 3- and 6-months post intervention, the effects of the SUM were only significant among those men who also viewed the CT videos. Contrary to hypotheses, neither adjunct intervention component was associated with significant reductions in CAS with casual partners.

These results are consistent with CIT, in which the formation of an agreement around the limits and boundaries of substance use can be understood as a joint goal [16]. Drawing upon techniques similar to other brief MI interventions utilized with sexual minority men [41–44, 50], the SUM provided a platform for couples to engage in a facilitated discussion about their substance use. The discussion was tailored to facilitate the formation of a couple-level agreement around future use. CIT would suggest that the formation of such an agreement facilitates partners working collaboratively to achieve the established goal [18].

The present study failed to provide evidence that the CT videos reduced drug use when delivered alone; however, their delivery enhanced the effects of the SUM. This finding is also consistent with CIT, which posits that couples with better dyadic functioning will be better able to carry out joint goals successfully [18]. Previous studies have shown that couples with healthy or positive communication styles are better equipped to handle conflict and achieve their shared goals [51, 52].

There is a clear theoretical rationale for why CT videos alone may have failed to produce significant reductions in drug use or associated problems. Their primary purpose was to facilitate dyadic functioning through the modeling of communication skills in a content-relevant context; however, the experience of watching the videos does not inherently catalyze the formation of an agreement about limits related to drug use or the identification of strategies partners could use to support one another's observance of such limits. Completion of the SUM subsequent to viewing CT videos insured that the couple had an opportunity to engage in such

a discussion. Meanwhile, viewing CT videos potentially enhanced partners' abilities to engage effectively during the SUM and enhanced relationship functioning resources outside of the session.

At this initial stage of intervention development, the failure to show significant intervention effects should be viewed with some caution. Power was approximately 0.60 in the present trial. It is plausible that—in a larger trial with greater power—the SUM might yield some significant reductions in drug use or related problems even when CT videos are not viewed; or, that CT videos may result in some reductions in drug use or related problems independently of the SUM. As such, these results are best viewed as preliminary evidence of the potential efficacy of the We Test intervention components, as well as their capacity to produce clinically meaningful reductions in drug use and related problems. Examination of group means in Figs. 2 and 3 indicates that among men who viewed the CT videos, the SUM was associated with a 38% reduction in the probability of drug use at 3-months post intervention, and a 34% reduction in the probability of drug use 6-months post intervention. Similarly, among men who viewed the CT videos, the SUM was associated with reductions in average DAST-10 scores were 0.50 and 0.52 SD's in magnitude at 3 and 6 months respectively.

Non-significant findings related to drug use and DAST-10 scores were also shaped in part by between-group differences in the trajectories of these outcomes in the current sample. The control condition—which received only CHTC as usual—had a statistically significant negative slope in both drug use and DAST-10 models. In contrast, slopes were non-significant—suggesting relative stability over time—in the 3 groups which received at least some component of the We Test intervention. This trend accounts for the decay of intervention effects associated with the SUM when it is delivered without CT videos. Notably, despite this trend, those participants who received the combined We Test intervention condition (CHTC + SUM + CT video) reported significantly lower odds of drug use at 1- and 3-month follow up and significantly fewer problems associated with drug use relative to the CHTC at all follow-ups. This would suggest some benefits associated with the combined We Test intervention, even if future studies replicated the over-time declines in drug use outcomes associated with CHTC alone.

Non-significant differences in CAS at follow-up should be understood in the context of several factors. First, CHTC has previously demonstrated efficacy in reducing sexual HIV transmission risk among gay couples [53]. It may be challenging to improve further upon this outcome in a single-session intervention. Second, rates of CAS with casual partners in the available sample were relatively low and uptake of PrEP among HIV negative men in the sample was relatively high. It is plausible that the added benefits of adjunct intervention components may emerge

in a sample with a greater degree of HIV-related risk at baseline. Third, it is plausible that reductions in HIV transmission risk post-intervention may be achieved indirectly through reductions in drug use. The available sample size was not sufficient to calculate models involving time-varying mediational pathways between these outcomes.

The intervention components tested here meaningfully expand the available prevention options for gay couples. Beyond CHTC, only two additional dyadic interventions focused on HIV prevention for gay couples have been empirically tested. The *2GETHER* intervention has shown efficacy at reducing sexual HIV-transmission risk and problematic drinking among YMSM in relationships. The intervention consists of four sessions: two group sessions (with multiple couples) and two sessions with individual couples. The latter of these sessions incorporates CHTC [54]. *Connect with Pride* is a seven-session couples-based intervention that showed reductions in sexual HIV-transmission risk and drug use. Intervention sessions last approximately 90-min each. It was also tailored to address factors specific go Black and African American MSM who use methamphetamine [55].

Although these two interventions are promising and generally support the utility of dyadic interventions to target substance use and HIV-prevention, there are several advantages of the We Test intervention components (SUM and CT). First, the intervention components can be delivered by anyone qualified to do rapid HIV testing—and trained in CHTC—without the need of advanced clinical or mental health counseling training. Second, We Test is implemented in a single HIV testing session. This allows for couples who may be unable to attend multiple sessions to receive services. The resulting findings would indicate that the most effective treatment package included receipt of both the SUM and CT videos. Even in this most time-intensive condition, provider demands are modest relative to the size of the intervention effects. Completion of the SUM added approximately 12 min on average to CHTC sessions. The self-administered CT videos were 20 min in duration.

We Test builds upon the existing CHTC intervention which is already established and recognized in many community-based testing agencies. In many respects, this expansion of an existing intervention can be viewed as an asset. Uptake of We Test should be relatively easy to scale where providers are already delivering CHTC. Furthermore, the ability to address drug use through an HIV-testing-service may enhance the appeal of CHTC for some of providers. These advantages notwithstanding, the results of this study are limited to examining the effects of the We Test intervention components only within the context of CHTC. The existing design does not permit any inferences related to the effects of We Test components delivered independently of CHTC.

In addition to the issues discussed above, these findings must be understood in light of several limitations. First, generalizability is limited by the fact that the sample was recruited in a major metropolitan area. Second, the sample had several characteristics consistent with a relatively lower risk for HIV infection. The rate of PrEP uptake among HIV negative men in the sample was substantially higher than the national average (4.0%) while the rate of condomless sex was relatively low [56]. Findings may not generalize to riskier couples. Third, the examination of HIV sexual transmission risk was limited by the nature of data collected. It was not possible to examine day-level associations between PrEP adherence and CAS among men on PrEP. In addition, the study included a relatively small number of HIV positive men, which precluded an examination of whether factors like viral load or HIV medication adherence were associated with CAS. While findings were robust to the inclusion of PrEP uptake and HIV status as covariates, future studies should examine intervention effects on sexual risk in the context of biomedical prevention strategies (including PrEP/PEP and viral suppression) in greater detail. Third, the DAST-10 assesses drug use related problems in the past 12 months. This may have attenuated the study's ability to assess fluctuations in drug related problems over assessments conducted within the 12-month period. Future studies should utilize problem measures with shorter assessment windows in order to maximize sensitivity. Finally the requirements of dyadic participation may bias samples towards couples who have relatively better relationship functioning [57]. Results may not generalize to couples who are unable or unwilling to participate in an intervention together.

Despite these limitations, the findings of this pilot RCT indicate that the incorporation of brief adjunct components to CHTC may result in significant reductions in drug use. Consistent with CIT, couples who participated in both facilitated conversations around substance use and who watched the communication skills training videos saw the greatest reductions in substance use over time. These results suggest that CHTC may constitute a feasible, acceptable, efficacious and scalable platform for drug use intervention with partnered YMSM.

Acknowledgements The authors acknowledge the contributions of the *We Test* Project Team, particularly Mark Pawson, Andrew Cortopassi, Nahuel Smith Bacerra, Ruben Jimenez, Chris Hietikko, and Scott Jones. We also thank Rich Jenkins for his support of the project as well as CHEST staff, recruiters, interns and our participants who volunteered their time.

Funding Collection and analyses of these data were supported by a National Institute on Drug Abuse Grant (R34 DA036419; PI Starks).

Compliance with Ethical Standards

Conflict of interest Tyrel Starks, Trey Dellucci, Sugandha Gupta, Gabriel Robles, Patrick Sullivan, and Rob Stephenson have no conflicts of interest to declare. Jeffrey Parsons' spouse is the owner of Mindful Designs, which received a contract to produce the communication skills training video tested.

Human and Animal Rights All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

References

- Centers for Disease Control and Prevention, HIV in the United States: at a glance. 2017. U.S. Department of Health & Human Services.
- Centers for Disease Control and Prevention, HIV Surveillance Report, 2015, Centers for Disease Control and Prevention, Editor. 2015, Centers for Disease Control and Prevention.
- Arnett JJ. Emerging adulthood: a theory of development from the late teens through the twenties. *Am Psychol*. 2000;55(5):469–80.
- Goodreau SM, Carnegie NB, Vittinghoff E, et al. What drives the US and Peruvian HIV epidemics in men who have sex with men (MSM)? *PLoS ONE*. 2012;7(11):e50522.
- Sullivan PS, Salazar L, Buchbinder S, Sanchez TH. Estimating the proportion of HIV transmissions from main sex partners among men who have sex with men in five US cities. *AIDS*. 2009;23(9):1153–62.
- Painter TM. Voluntary counseling and testing for couples: a high-leverage intervention for HIV/AIDS prevention in sub-Saharan Africa. *Soc Sci Med*. 2001;53:1397–411.
- Allen S, Serufilira A, Bogaerts J, et al. Confidential HIV testing and condom promotion in Africa. Impact on HIV and gonorrhea rates. *JAMA*. 1992;268(23):3338–43.
- Chomba C, Allen S, Kaweka W, et al. Evolution of couples' voluntary counseling and testing for HIV in Lusaka, Zambia. *J Acquir Immune Defic Syndr*. 2008;47(1):108–15.
- Farquhar C, Kiarie JN, Richardson BA, et al. Antenatal couple counseling increases uptake of interventions to prevent HIV-1 transmission. *J Acquir Immune Defic Syndr*. 2004;37(5):1620–6.
- Guthrie BL, de Bruyn G, Farquhar C. HIV 1 discordant couples in sub-Saharan Africa: explanations and implications for high rates of discordancy. *Curr HIV Res*. 2007;5(4):416–29.
- Coates TJ. Efficacy of voluntary HIV-1 counselling and testing in individuals and couples in Kenya, Tanzania, and Trinidad: a randomised trial. *Lancet (British Edition)*. 2000;356(9224):103–12.
- Sullivan PS, White D, Rosenberg ES, et al. Safety and acceptability of couples HIV testing and counseling for US men who have sex with men: a randomized prevention study. *J Int Assoc Provid AIDS Care*. 2014;13(2):135–44.
- Stephenson R, Vwalika B, Greenberg LS, et al. A randomized controlled trial to promote long-term contraceptive use among HIV-serodiscordant and concordant positive couples in Zambia. *J Women's Health*. 2011;20(4):567–74.
- Centers for Disease Control and Prevention. *Revised guidelines for HIV counseling, testing, and referral*. MMWR. Recommendations and reports: morbidity and mortality weekly report. Recommendations and reports 2001. 50 (RR-19): 1.
- Metsch LR, Feaster DJ, Gooden L, et al. Effect of risk-reduction counseling with rapid HIV testing on risk of acquiring sexually

- transmitted infections: the AWARE randomized clinical trial. *JAMA*. 2013;310(16):1701–10.
16. Rusbult CE, Van Lange PA. Interdependence, interaction, and relationships. *Annu Rev Psychol*. 2003;54:351–75.
 17. Rusbult CE, Verette J, Whitney GA, Slovick LF, Lipkus I. Accommodation processes in close relationships: theory and preliminary empirical evidence. *J Pers Soc Psychol*. 1991;60(1):53–78.
 18. Yovetich NA, Rusbult CE. Accommodative behavior in close relationships: exploring transformation of motivation. *J Exp Soc Psychol*. 1994;30(2):138–64.
 19. Kelley HH, Thibaut TW. *Interpersonal relations: a theory of interdependence*. New York: Wiley; 1978.
 20. Goldenberg T, Finneran C, Andes KL, Stephenson RB. “Sometimes people let love conquer them”: how love, intimacy, and trust in relationships between men who have sex with men influence perceptions of sexual risk and sexual decision-making. *Cult Health Sex*. 2015;17(5):607–22.
 21. Starks TJ, Pawson M, Stephenson R, Sullivan P, Parsons JT. Dyadic qualitative analysis of condom use scripts among emerging adult gay male couples. *J Sex Marital Ther*. 2018;44(3):269–80.
 22. Hoff CC, Beougher SC. Sexual agreements among gay male couples. *Arch Sex Behav*. 2010;39(3):774–87.
 23. Hoff CC, Chakravarty D, Beougher SC, Neilands TB, Darbes LA. Relationship characteristics associated with sexual risk behavior among MSM in committed relationships. *AIDS Patient Care STDs*. 2012;26(12):738–45.
 24. Rew LW, Taylor-Seehafer TA, Smith MA, Lorie R. Sexual health risks and protective resources in gay, lesbian, bisexual, and heterosexual homeless youth. *J Spec Pediatr Nurs*. 2005;10(1):11–9.
 25. Decker PJ. Effects of symbolic coding and rehearsal in behavior-modeling training. *J Appl Psychol*. 1980;65(6):627–34.
 26. Albarracín D, Gillette JC, Earl AN, et al. A test of major assumptions about behavior change: a comprehensive look at the effects of passive and active HIV-prevention interventions since the beginning of the epidemic. *Psychol Bull*. 2005;13(6):856–97.
 27. Baldwin TT. Effects of alternative modeling strategies on outcomes of interpersonal-skills training. *J Appl Psychol*. 1992;77(2):147–54.
 28. Taylor PJ, Russ-Eft DF, Chan DWL. A meta-analytic review of behavior modeling training. *J Appl Psychol*. 2005;90(4):692–709.
 29. Centers for Disease Control and Prevention, HIV infection risk, prevention, and testing behaviors among men who have sex with men—National HIV Behavioral Surveillance, 20 U.S. Cities, 2014, 15, Editor. 2016.
 30. Lewis MA, Gladstone E, Schmal S, Darbes LA. Health-related social control and relationship interdependence among gay couples. *Health Educ Res*. 2006;21(4):488–500.
 31. Moos RH. Theory-based processes that promote the remission for substance use disorders. *Clin Psychol Rev*. 2007;27(5):537–51.
 32. Parsons JT, Starks TJ. Drug use and sexual arrangements among gay couples: frequency, interdependence and associations with sexual risk. *Arch Sex Behav*. 2014;43(1):89–98.
 33. John SA, Starks TJ, Rendina HJ, Grov C, Parsons JT. Should I convince my partner to go on pre-exposure prophylaxis (PrEP)? The role of personal and relationship factors on PrEP-related social control among gay and bisexual men. *AIDS Behav*. 2018;22(4):1239–52.
 34. Feinstein BA, Newcomb ME. Event-level associations among drinking motives, alcohol consumption, and condomless anal sex in a sample of young men who have sex with men. *AIDS Behav*. 2017;21(7):1904–13.
 35. Phillips G, Kalmin MM, Turner B, et al. Condom and substance use at last sex: differences between MSMO and MSWO high school youth. *Int J Environ Res Public Health*. 2018;15(5):995.
 36. Saitz R, Palfai TPA, Cheng DM, et al. Screening and brief intervention for drug use in primary care: the ASPIRE randomized clinical trial. *JAMA*. 2014;312(5):502–13.
 37. Samson JE, Tanner-Smith EE. Single-session alcohol interventions for heavy drinking college students: a systematic review and meta-analysis. *J Stud Alcohol Drugs*. 2015;76(4):530–43.
 38. McCambridge J, Strang J. The efficacy of single-session motivational interviewing in reducing drug consumption and perceptions of drug-related risk and harm among young people: results from a multi-site cluster randomized trial. *Addiction*. 2004;99(1):39–52.
 39. Borsari B, Carey KB. Effects of a brief motivational intervention with college student drinkers. *J Consult Clin Psychol*. 2000;68(4):728–33.
 40. Miller WR, Rollnick S. *Motivational interviewing*. 3rd ed. New York: Guilford Press; 2013.
 41. Kahler CW, Pantalone DW, Mastroleo NR, et al. Motivational interviewing with personalized feedback to reduce alcohol use in HIV-infected men who have sex with men: a randomized controlled trial. *J Consult Clin Psychol*. 2018;86(8):645–56.
 42. Wang Z, Lau JTF, Ip M, et al. A randomized controlled trial evaluating efficacy of promoting a home-based HIV self-testing with online counseling on increasing HIV testing among men who have sex with men. *AIDS Behav*. 2018;22(1):190–201.
 43. Parsons JT, Lelutiu-Weinberger C, Botsko M, Golub SA. A randomized controlled trial utilizing motivational interviewing to reduce HIV risk and drug use in young gay and bisexual men. *J Consult Clin Psychol*. 2014;82(1):9–18.
 44. Chen J, Li X, Xiong Y, et al. Reducing the risk of HIV transmission among men who have sex with men: a feasibility study of the motivational interviewing counseling method. *Nurs Health Sci*. 2016;18(3):400–7.
 45. Prevention, C.F.D.C.A. Couples HIV counseling and testing intervention and training curriculum. 2011. <https://www.cdc.gov/globalaids/resources/prevention/chct.html>. Accessed 26 Feb 2019.
 46. Prevention, C.F.D.C.A. Couples HIV testing and counseling (CHTC): in health care facilities, trainer’s manual. 2011. <https://www.cdc.gov/globalaids/resources/prevention/docs/2014docs/chct-trainers-manual.pdf>. Accessed 26 Feb 2019.
 47. Stephenson RB, Finneran C. The IPV-GBM scale: a new scale to measure intimate partner violence among gay and bisexual men. *PLoS ONE*. 2013;8(6):e62592.
 48. Pruitt KL, White D, Mitchell JW, Stephenson R. Sexual agreements and intimate-partner violence among male couples. *Int J Sex Health*. 2015;27(4):429–41.
 49. Stephenson RB, Freeland R, Finneran C. Intimate partner violence and condom negotiation efficacy among gay and bisexual men in Atlanta. *Sex health*. 2016;13(4):366–72.
 50. Mimiaga MJ, Pantalone DW, Biello KB, et al. A randomized controlled efficacy trial of behavioral activation for concurrent stimulant use and sexual risk for HIV acquisition among MSM: project IMPACT study protocol. *BMC Public Health*. 2018;18(1):914.
 51. Avivi YE, Laurenceau JP, Carver CS. Linking relationship quality to perceived mutuality of relationship goals and perceived goal progress. *J Soc Clin Psychol*. 2009;28(2):137–64.
 52. Feeney BC. A secure base: responsive support of goal strivings and exploration in adult intimate relationships. *J Pers Soc Psychol*. 2004;87(5):631–48.
 53. Sullivan PS, White D, Rosenberg ES, et al. Safety and acceptability of couples HIV testing and counseling for US men who have sex with men: a randomized prevention study. *J Int Assoc Provid AIDS Care*. 2014;13(2):135–44.
 54. Newcomb ME, Macapagal KR, Feinstein BA, et al. Integrating HIV prevention and relationship education for young same-sex male couples: a pilot trial of the 2GETHER intervention. *AIDS Behav*. 2017;21(8):2464–78.

55. Wu E, El-Bassel N, McVinney LD, et al. Feasibility and promise of a couple-based HIV/STI preventive intervention for methamphetamine-using, black men who have sex with men. *AIDS Behav.* 2011;15(8):1745–54.
56. Parsons JT, Rendina HJ, Lassiter JM, et al. Uptake of HIV pre-exposure prophylaxis (PrEP) in a national sample of gay and bisexual men in the United States: the motivational PrEP Cascade. *JAIDS J Acquir Immune Defic Syndr.* 2017;74(3):285–92.
57. Starks TJ, Millar BM, Parsons JT. Correlates of individual versus joint participation in online survey research with same-sex male couples. *AIDS Behav.* 2015;19(6):963–9.

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