

Psychometric evaluation of the Condom Barriers and Motivations Scale (CBMS)

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Abstract The Condom Barriers and Motivations Scale (CBMS) was developed to measure four distinct categories of barriers and motives to condom use, including: risk reduction motivations, pleasure reduction barriers, intimacy interference barriers, and partner pressure barriers. The CBMS is a 16-item scale with four items that correspond to each of these subscales. The CBMS was tested in two samples of gay and bisexual men. Results support the reliability and validity of the scale and its structure. Results also indicate that CBMS subscales are distinct from general measures of sexual wellbeing, personality factors, or relationship quality (i.e., discriminant validity) and are associated with self-reported condom use with different partner types (i.e., construct validity). The CBMS can be helpful in better understanding the dynamics of condom use in the context of pre-exposure prophylaxis decision-making, and can shed light on innovative approaches to enhance condom use as part of comprehensive HIV prevention and sexual health goals.

Keywords Condoms · HIV prevention · Measurement · Scale

Introduction

Gay, bisexual, and other men who have sex with men (MSM) remain over represented in global data for the HIV epidemic (Birrell et al., 2013; Phillips et al., 2013), and the incidence of new HIV infections among MSM continues to increase despite stability or decline in other groups (CDC, 2015). Recently, the focus of HIV prevention efforts for MSM has shifted toward pre-exposure prophylaxis (PrEP), due to its potential as a biomedical prevention strategy. However, there are many reasons why it is still important to focus on increasing acceptability and consistent use of condoms in this high priority population. First, despite a significant increase in PrEP awareness in the past two years, uptake remains low (Eaton et al., 2015; Goedel et al., 2016; Mayer & Krakower, in press). Second, while PrEP is extraordinarily effective in preventing HIV, it does not protect against other sexually transmitted diseases (STDs), which are on the rise in MSM populations in general and among PrEP users specifically (Liu et al., 2015; Scott & Klausner, 2016). And third, condoms remain a cheap, flexible, and reliable HIV prevention option that can be easily accessed without a prescription and do not require regular visits to a health care provider. Better understanding both motivations for and barriers to condom use among gay, bisexual, and other MSM remains critical to the promotion of long-term HIV prevention interventions and strategies.

The vast majority of research on motivations for condom use has focused on risk perception—that is, the extent to which individuals perceive themselves to be at risk for HIV and/or other STIs and believe that condom use can

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effectively reduce this risk (Ajzen, 1991; Catania et al., 1990; Fisher & Fisher, 1992; Prochaska et al., 1994). However, evidence suggests that risk perception in and of itself may not be the best predictor of actual condom use (MacKellar et al., 2007; Pollack & Halkitis, 2009). Many MSM are knowledgeable about HIV and other STIs and the importance of condoms despite low rates of use, and evidence illustrates that knowledge of one's own level of risk does not always translate into risk reduction behavior (Hart & Elford, 2010; Mimiaga et al., 2007; Parsons & Bimbi, 2007).

Pleasure has also been consistently cited as a significant—if not the most important—barrier to condom use. Regardless of sexual or gender identity, many individuals report preferring condomless sex because of enhanced arousal and sensation (Crosby et al., 2005; Grady et al., 1993; Higgins et al., 2009). Not surprisingly, accumulating evidence illustrates that individuals who believe that condoms undermine arousal and enjoyment are less likely to use them (Crosby et al., 2008; Hensel et al., 2012; Higgins et al., 2009; Higgins & Wang, 2015; Randolph et al., 2007; Scott-Sheldon & Johnson, 2006).

Researchers have also argued that HIV prevention must attend to the more complex relational or interpersonal factors that affect condom use (Berg, 2009). Condoms have relational significance for gay and bisexual men (Hoff et al., 2016); evidence suggests that condom use within a partnership can signify a lack of trust, emotional connection or intimacy (Blechner, 2002; Harawa et al., 2006; Theodore et al., 2004). Endorsement of these relational barriers to condom use, which have been termed “intimacy interference,” has been associated with increased condomless sex with primary partners (Golub, 2014; Golub et al., 2012; Starks et al., 2014), as well as greater PrEP adoption intentions among HIV-negative gay and bisexual men (Gamarel & Golub, 2015).

Another potential barrier to condom use is concerns about resistance from partners (DuBois et al., 2015; Morgan et al., 2006; Peterson & Muehlenhard, 2007). Perceived partner pressure against condom use includes concerns that a partner might leave, refuse to have sex, yell, threaten, or physically injure the individual who asks them to use a condom (Jones, 2006). Perceived partner pressure barriers to condom use have been demonstrated to decrease condom use even after adjusting for factors such as self-efficacy and condom negotiation skills (Gakumo et al., 2012). Importantly, there is some evidence indicating that perceived partner pressure against condom use is more common in the context of committed relationships than in sexual interactions more generally (Morgan et al., 2006; Peterson & Muehlenhard, 2007).

Several scales have been developed to measure attitudes/barriers to condom use; however, the vast majority

have assessed attitudes related specifically to health outcomes, i.e., attitudes toward condom use *to prevent HIV*, rather than attitudes towards condoms themselves (Brown, 1984; Helweg-Larsen & Colliins, 1994; Madu & Peltzer, 2003; Sacco et al., 1991). The Multi-Factor Attitudes Towards Condom Scale was developed to assess more affective and psychological factors related to condom use without conditioning on a health outcome (Reece et al., 2010); however, this scale has been psychometrically validated only with heterosexual adults and includes subscales which are less relevant to gay men (e.g., reliability of contraception, embarrassment about purchasing condoms) (Hill et al., 2011). One recent study examined safer sex communication, condom “turn-offs,” and condoms’ enhancement of sexual pleasure among young Black MSM (Crosby et al., 2016); however, the scales used in this study did not include factors related to intimacy or perceived partner pressure, and the psychometrics of these measures required their use as dichotomous variables, limiting their utility as predictors. Several papers have been published assessing decisional balance for condom use among both heterosexual college students (Parsons et al., 2000, 2003) and gay men (Bauermeister et al., 2009); however, these studies developed such measures for a particular study, and did not include a psychometric evaluation of validation. To our knowledge, a psychometrically valid condom attitudes scale measuring both motivations and barriers to condom use, including dynamics related to pleasure, risk-reduction, intimacy, and perceived partner pressure among gay and bisexual men has not been published.

The purpose of this study was to test the psychometric properties of the Condom Barriers and Motivations Scale (CBMS). The CBMS was designed to assess four distinct barriers and motives to condom use, including risk reduction motivations, pleasure reduction barriers, intimacy interference barriers, and perceived partner pressure barriers. In this study, we analyze data from two samples of HIV-negative MSM, with a focus on evaluating reliability and validity of the CBMS.

Methods

Design

The study involved two separate samples of participants. Data collected from Study 1 were used to assess the construct validity and reliability of the CBMS. Data collected from Study 2 were used to assess the generalizability, reliability, as well as the convergent and construct validity of the CBMS. Both studies were reviewed and approved by the first author's Institutional Review Board.

Participants and procedures

Study 1

Participants included in Study 1 were drawn from a cross-sectional study examining the impact of PrEP messaging and communication strategies on PrEP adoption intentions. Between January 2012 and June 2014, participants in the study completed a self-report survey at the research center and were presented with educational information about PrEP, including data on efficacy and side effects based on iPrEx study results (Grant et al., 2010). Study 1 participants were recruited in New York City using passive recruitment methods (i.e., flyers), active recruitment methods (i.e., outreach at bars, events, community-based organizations), and participant referral. Eligible participants: (1) were assigned male sex at birth; (2) were at least 18 years old; (3) self-reported an HIV-negative serostatus; and (4) reported at least one act of condomless anal sex with a male partner in the last 30 days. These analyses were restricted to 473 enrolled participants who reported not taking PrEP at the time of their study visit and who self-reported a male gender identity.

Study 2

Participants in Study 2 were part of SPARK, an ongoing PrEP demonstration-implementation project conducted in collaboration with Callen-Lorde Community Health Center in New York City. SPARK participants were recruited through medical provider or counselor referral at the health center. Eligible participants: (1) were patients of the health center; (2) were assigned male sex at birth; (3) were at least 18 years old; (4) tested HIV-negative; and (5) met CDC criteria for PrEP eligibility (CDC, 2014) and/or expressed concern about becoming HIV infected in the next 3 months. Between January 2014 and October 2015, participants who screened eligible for the study completed a self-administered online survey and then were scheduled for an in-person study enrollment visit at the health center at which they decided whether or not they wanted to begin PrEP. All data included in this analysis were collected *prior* to PrEP initiation. These analyses were restricted to the 301 enrolled participants who self-reported a male gender identity and elected to begin PrEP.

Measures

Condom Barrier and Motivation Scale (CBMS)

A pool of items was developed to assess motivations and barriers for condom use. Item development was informed by prior literature on condom use motivations, such as the Decisional Balance for Unsafe Sex Scale and a measure of

situational temptations for condomless sex (Parsons et al., 2000, 2003). We developed additional items to specifically reflect intimacy interference and perceived partner pressure as barriers to condom use. The final item pool consisted of 21 items. Participants in Study 1 and 2 were presented with these items (e.g., “It is too difficult to relax and enjoy myself when using condoms” or “Not using a condom with a partner shows him that I trust him”) and were asked to indicate how often they felt this way on 5-point Likert-type scale (1 = never feel, 2 = feel occasionally, 3 = feel about half of the time, 4 = feel most of the time, 5 = always feel).

Sexual compulsivity

Study 2 participants completed the 10 item sexual compulsivity measure (Kalichman & Rompa, 2001). The sexual compulsivity scale assesses the impact of sexual thoughts on daily functioning and the inability to control sexual thoughts or behaviors. Responses are on a 4-point Likert-type scale (1 = not like me to 4 = very much like me). The sexual compulsivity scale ($\alpha = 0.89$) demonstrated good psychometric properties in this sample.

Behavioral Inhibition/Behavioral Activation System Scales (BIS/BAS)

Study 2 participants completed the BIS/BAS scale (Carver & White, 1994). The BIS/BAS questionnaire uses a 5-point Likert-type response scale (1 = strongly disagree to 5 = strongly agree). The BIS consists of a single score which demonstrated adequate psychometric properties in this sample ($\alpha = 0.79$), while the BAS involves three subscales: “Reward-responsiveness” measures self-reported perceived value of rewards ($\alpha = 0.72$), “Drive” reflects persistence in the pursuit of desired goals ($\alpha = 0.64$), and “Fun-seeking” assesses perceived value of new rewards and spontaneity in pursuing them ($\alpha = 0.78$). Each of the BAS subscales demonstrated adequate psychometric properties in the current sample.

Conscientiousness

Study 2 participants completed a 10 item conscientious subscale from the HEXACO Personality Inventory (Lee & Ashton, 2004). Participants respond to each item on a 5-point Likert scale ranging from strongly disagree to strongly agree. Each item is summed such that greater scores indicate higher levels of conscientiousness. The conscientiousness subscale ($\alpha = 0.83$) demonstrated good psychometric properties in this sample.

HIV worry

Study 2 participants completed one item to assess perceived worry about HIV infection (i.e., “I worry about getting HIV”) with response options: (1) never; (2) rarely, (3) some of the time; (4) most of the time; and (5) all of the time.

Perceived severity of STI infection

Study 2 participants completed an adapted 8 item scale (Champion, 1984), which assessed perceived susceptibility and severity of sexually transmitted infections (example item: “My chances of getting a sexually transmitted disease (STD) is great”). Participants responded on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). The scale ($\alpha = 0.75$) demonstrated good psychometric properties in this sample.

Relationship dynamics

Study 2 participants who reported a primary partner ($n = 93$) were asked to report on their investment in their relationship. We used two of Rusbult et al. s' (1998) validated measures to assess commitment and satisfaction level. Commitment level was measured with a three-item scale (e.g., Do you feel committed to maintaining your relationship with your partner?). Response options ranged from 0 = not at all committed to 8 = completely committed. Satisfaction level was measured with a three-item scale (e.g., Taking into account all of the qualities that are most important to you, how does your relationship compare to other people's?). Responses ranged from 0 = not at all satisfied to 8 = completely satisfied. For each scale, total scores were computed by summing item responses, with higher scores indicating greater commitment and satisfaction level, respectively. Both the commitment level scale ($\alpha = 0.91$) and satisfaction level scale ($\alpha = 0.96$) demonstrated good psychometrics in this sample.

Sexual well-being

Study 2 participants completed three of twelve subscales from the Multidimensional Sexuality Questionnaire (Snell et al., 1993), which assesses different aspects of sexual well-being. Participants completed the four-item *sexual anxiety* subscale (e.g., “I worry about the sexual aspects of my life”; $\alpha = 0.86$), the five-item *sexual esteem* subscale (e.g., “I derive a sense of self-pride from the way I handle my own sexual needs and desires”; $\alpha = 0.89$), and the five-item *sexual satisfaction* subscale (e.g., “I am satisfied with the sexual aspects of my life”; $\alpha = 0.90$). Participants responded to each item on a five point Likert-type scale (0 = not at all characteristic of me to 4 = very characteristic of me). For

each subscale, items were summed to create a total score where higher scores indicate higher levels of each domain.

Sexual risk behavior

Study 2 participants were asked to report their number of sexual partners in the past three months. In addition, participants were asked to report the number of anal and vaginal sex acts with and without a condom with a main or casual male partner in the past three months. We created three variables to assess sexual risk behavior: (1) total number of condomless sex acts; (2) percent of anal sex acts with casual partners that were condomless; and (3) percent of anal sex acts that occurred with primary partners that were condomless.

Results

Study 1 results

Sample characteristics

Participants' demographic information is presented in Table 1. Study 1 participants ranged in age from 18 to

Table 1 Sample characteristics from Study 1 and Study 2

	Study 1 (N = 473)	Study 2 (N = 294)
Age [M (SD)]	32.99 (10.53)	33.91 (8.65)
Sexual identity [<i>n</i> (%)]		
Gay	353 (74.6)	234 (79.6)
Bisexual	94 (19.9)	32 (10.9)
Other	28 (5.5)	28 (9.5)
Race/Ethnicity [<i>n</i> (%)]		
Black	154 (32.6)	35 (11.9)
Hispanic	104 (22.0)	71 (24.1)
White	181 (38.3)	147 (50.0)
Other	34 (7.2)	41 (13.9)
Annual income [<i>n</i> (%)]		
Less than \$20,000	222 (46.9)	75 (25.8)
\$20,000 or greater	251 (53.1)	216 (74.2)
Educational attainment [<i>n</i> (%)]		
High school degree or less	111 (23.5)	23 (7.8)
Some college	147 (31.0)	78 (26.5)
College degree or higher	215 (45.5)	193 (65.7)
Relationship status [<i>n</i> (%)]		
Single	242 (51.2)	201 (68.4)
Partnered	231 (48.8)	93 (31.6)
Partner HIV status [<i>n</i> (%)]		
HIV-positive	22 (9.5)	41 (44.1)
HIV-negative	191 (82.7)	46 (49.5)
Unsure	18 (7.8)	6 (6.4)

66 years ($M = 32.99$, $SD = 10.53$). Approximately 75% of the sample identified as gay ($n = 353$) and 19.9% identified as bisexual ($n = 94$). The sample was diverse in regards to race/ethnicity, with 32.6% ($n = 154$) identifying as Black, 22% ($n = 104$) identifying as Latino, 38.3% identifying as white ($n = 181$), and 7.2% identifying as another race/ethnicity ($n = 34$). Nearly half of the sample earned less than \$20,000 annually ($n = 222$) and 54.5% ($n = 258$) had earned less than a Bachelor's Degree. Approximately half of the sample reported that they had a primary partner ($n = 231$). Of the men in primary partnerships, 9.5% ($n = 22$) were in a relationship with someone they knew was HIV-positive, 82.7% ($n = 191$) were in a relationship with someone they knew was HIV-negative and 7.8% ($n = 18$) were unsure of their partners' HIV status.

Construct validity analyses

We conducted exploratory factor analysis (EFA) using SPSS 21.0 with data from a randomly selected sample of approximately half the participants in Study 1 ($n = 237$). Several guidelines in the literature indicate that this sample size was appropriate for obtaining stable factor solutions (Tabachnick & Fidell, 2001). Following the recommendations of Worthington and Whittaker (2006), we used principal axis factoring. The CBMS approximated multivariate normality as indicated by Kaiser–Meyer–Olkin value of 0.92 and significant Bartlett's test of sphericity: $\chi^2(220, n = 245) = 2051.50$, $p < 0.001$ (Tabachnick & Fidell, 2001). Factor retention was decided by examining eigenvalues, scree plot, and interpretability of factors. Specifically, factors with eigenvalues less than 1 and those with less than three items were not retained (Tabachnick & Fidell, 2001). Examination of the scree plot suggested examination of a four-factor solution. Findings from the oblique (i.e., promax) and orthogonal (i.e., varimax) rotations were examined. Findings from the oblique rotation are reported because emergent factors were expected to be correlated and because the two rotation methods yielded similar solutions.

Next, item retention for the final scale was determined by the magnitude of the factor loadings and cross-loadings. Because we didn't want to take a purely data-driven approach to item retention and scale length optimization, we also considered the conceptual redundancy among items. Specifically, in the EFA, three items with factor loadings less than 0.50 and a relative discrepancy score (i.e., difference between factor loading and cross-loading) of less than 0.15 were removed to ensure the construct specificity and stability of emergent factors (Kahn, 2006). These items included: (1) "Having sex without a condom

makes me feel more connected to my partner;" (2) "I just don't feel close enough to a partner if he uses a condom;" and (3) "Not using a condom makes sex more intimate." Among the 17 items that met loading and cross-loading criteria, 1 item that was conceptually redundant was removed to optimize measure length. We removed "Using condoms makes me feel more responsible" because of its overlap with "Having sex without a condom is irresponsible." As shown in Table 2, modification indices were consistent with these item elimination decisions. As a result of this final process, a final set of 16 items was retained, four for each factor. Factor loadings for retained items on the four emergent factors are reported in Table 2.

We then used MPlus 7.0 to conduct a Confirmatory Factor Analysis (CFA) of the 16 retained items with the data from the 236 Study 1 participants who did not overlap with the EFA sample. These data are presented in Table 3. This sample size exceeded guidelines deriving meaningful and interpretable models and fit indices in CFA (Hau & Marsh, 2004). Chi square model fit criterion can lead to erroneous conclusions with criterion sensitivity to large samples (i.e., greater than 200), and has a tendency to indicate a significant probability level as sample size increases (Schumacker & Lomax, 2010). Therefore, model fit was evaluated by examining the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the standardized root-mean residual (SRMR). RMSEA values lower than 0.06, CFI values above 0.90, and SRMR values close to 0.08 all are indicative of good model fit (Yu & Muthen, 2002).

To evaluate the four-factor structure, items were estimated to load onto their intended factors on the basis of the EFA findings, and the four factors were allowed to correlate. The results of the CFA suggested that this four-factor model provided acceptable fit to the data, $\chi^2(69, N = 246) = 481.34$, $p < 0.001$, CFI = 0.91, RMSEA = 0.06, SRMR = 0.07. As shown in Table 3, items loaded significantly onto their intended factors. Loadings for *Pleasure Reduction Barriers* ranged from 0.55 to 0.85, *Perceived Partner Pressure Barriers* ranged from 0.64 to 0.85, *Risk Reduction Motivations* ranged from 0.56 to 0.79, and *Intimacy Interference Barriers* ranged from 0.62 to 0.70.

Reliability analyses

We assessed internal consistency reliability for the Condom Motivations and Barriers Scale subscales by computing Cronbach's alphas with data from the full Study 1 sample. Cronbach's alpha for the subscale items ranged from 0.74 to 0.83 (see Table 2 for a report of all Cronbach's alphas).

Table 2 Study 1: Principle component analysis of Condom Barriers and Motivations Scale from Study 1 (N = 245)

Item content by factor	1	2	3	4
Factor 1: Pleasure reduction barriers				
Having sex without a condom is more pleasurable (12)		0.87		
It feels better to have sex without a condom (6)		0.89		
It is too difficult to relax and enjoy myself when using condoms (16)		0.59		
Unprotected sex is more spontaneous (1)		0.55		
Factor 2: Perceived partner pressure barriers				
I worry my partner will think I do not trust him if I suggested using a condom (17)	0.83			
I worry that my partner would say no if I suggested using a condom (7)	0.81			
I worry that my partner would leave if I suggested using a condom (3)	0.80			
I worry my partner would think I am having sex without someone else if I suggested using a condom (13)	0.76			
Factor 3: Risk reduction motivations				
Having sex without a condom could cause me to get HIV (10)			0.81	
Having sex without a condom could cause me to get an STD (5)			0.71	
Using condoms reduces my risk for HIV/STDs (19)			0.70	
Having sex without a condom is irresponsible (9)			0.74	
Factor 4: Intimacy interference barriers				
Not using a condom shows a partner how much I care about him (2)				0.79
A guy cumming inside of you is an expression of love (21)				0.79
Not using a condom with a partner shows him that I trust him (14)				0.65
Having sex without a condom shows a partner that I want to see him again (4)				0.50
Eigenvalue	5.66	2.76	1.75	1.05
% of variance	27.43	16.22	10.29	6.20
Range	1–5	1–5	1–5	1–5
Alpha	0.83	0.74	0.75	0.74

Study 2 results

Sample characteristics

Study 2 participants ranged in age from 18 to 63 years ($M = 33.91$, $SD = 8.65$). As shown in Table 1, approximately 80% of the sample identified as gay ($n = 234$) and 10.9% identified as bisexual ($n = 32$) and 9.5% identified as other ($n = 28$). The sample was diverse in regards to race/ethnicity with 12% ($n = 35$) identifying as Black, 24.1% ($n = 71$) identifying as Latino, 50.0% identifying as white ($n = 147$), and 14% identifying as another race/ethnicity ($n = 41$). Over one-third of the sample had earned less than a Bachelor's Degree (34.5%, $n = 101$) and 25.8% earned less than \$20,000 annually ($n = 75$). Moreover, approximately one-third of the sample reported that they had a primary partner ($n = 93$). Of the men in primary partnerships, 41.1% ($n = 41$) were in a relationship with someone they knew was HIV-positive, 49.5% ($n = 46$) were in a relationship with someone they knew was HIV-negative and 6.4% ($n = 6$) were unsure of their partners' HIV status.

Generalizability

We conducted an additional CFA to ensure that the four-factor model was a good fit to data from the Study 2 sample. The results of the CFA suggested that a four-factor model provided acceptable fit to the data, $\chi^2(98, N = 300) = 311.48$, $p < 0.001$, CFI = 0.90, RMSEA = 0.06, SRMR = 0.07. As illustrated in Table 3, items loaded significantly onto their intended factors. Loadings for *Pleasure Reduction Barriers* ranged from 0.62 to 0.90, *Perceived Partner Pressure* ranged from 0.62 to 0.85, *Risk Reduction Motivations* ranged from 0.58 to 0.76, and *Intimacy Interference Barriers* ranged from 0.60 to 0.76.

Reliability analyses

We also assessed internal consistency reliability for the Condom Motivations and Barriers scale and subscale items by computing Cronbach's alphas with data from the Study 2 sample. Cronbach's alpha for the *Pleasure Reduction* subscale was 0.75, *Perceived Partner Pressure* was 0.79,

Table 3 Confirmatory Factor Analyses of Condom Barrier and Motivation Scale from Study 1 (n = 236) and Study 2 (N = 293)

	Study 1	Study 2
Factor 1: Pleasure reduction barriers		
Having sex without a condom is more pleasurable (12)	0.84	0.84
It feels better to have sex without a condom (6)	0.85	0.90
It is too difficult to relax and enjoy myself when using condoms (16)	0.55	0.62
Unprotected sex is more spontaneous (1)	0.64	0.56
Factor 2: Perceived partner pressure barriers		
I worry my partner will think I do not trust him if I suggested using a condom (17)	0.85	0.85
I worry that my partner would say no if I suggested using a condom (7)	0.64	0.62
I worry that my partner would leave if I suggested using a condom (3)	0.67	0.69
I worry my partner would think I am having sex without someone else if I suggested using a condom (13)	0.79	0.76
Factor 3: Risk reduction motivations		
Having sex without a condom could cause me to get HIV (10)	0.79	0.72
Having sex without a condom could cause me to get an STD (5)	0.67	0.69
Using condoms reduces my risk for HIV/STDs (19)	0.67	0.76
Having sex without a condom is irresponsible (9)	0.56	0.58
Factor 4: Intimacy interference barriers		
Not using a condom shows a partner how much I care about him (2)	0.64	0.72
A guy cumming inside of you is an expression of love (21)	0.70	0.71
Not using a condom with a partner shows him that I trust him (14)	0.63	0.76
Having sex without a condom shows a partner that I want to see him again (4)	0.62	0.60

Risk Reduction was 0.70, and *Intimacy Interference* was 0.75.

Construct validity

We computed bivariate correlations to examine convergent and discriminant validity of each of the Condom Barrier and Motivation subscales using Study 2 participants (see Table 4). There were significant but modest positive correlations between *Pleasure Reduction* barriers and both *Perceived Partner Pressure* barriers ($r = 0.22$) and *Intimacy Interference* barriers ($r = 0.29$). There was a moderate positive correlation between *Perceived Partner Pressure* barriers and *Intimacy Interference* barriers ($r = 0.54$). *Risk Reduction* motivations for condom use were uncorrelated with the other three subscales.

To examine construct validity of the Pleasure Reduction subscale, we focused on its association with measures of pleasure seeking, both in general and in the context of sexuality. Pleasure reduction barrier scores were positively correlated with sexual compulsivity ($r = 0.28$, $p < 0.001$), but were not associated with more general appetitive motives as measured by the BAS subscales. To explore construct validity of the Risk Reduction subscale, we examined its association with measures of HIV and STI risk as well as more general measures of risk concern or avoidance. Risk reduction motivation scores were positively associated with both

HIV worry ($r = 0.15$, $p < 0.01$) and perceived STI severity ($r = 0.13$, $p < 0.05$). Risk reduction motivation scores were also positively associated with conscientiousness ($r = 0.13$, $p < 0.05$), but were not associated with more general behavioral avoidance as measured by the BIS subscale. To examine construct validity of the *Perceived Partner Pressure* and *Intimacy Interference* subscales, we assessed their correlations with measures of relationship quality as well as sexual satisfaction, sexual anxiety, and sexual self-esteem. Both subscales were uncorrelated with measures of relationship quality or sexual self-esteem. *Perceived Partner Pressure* scores were positively correlated with sexual anxiety ($r = 0.20$, $p < 0.01$), and *Intimacy Interference* scores were positively correlated with sexual satisfaction ($r = 0.13$, $p < 0.05$).

To assess the predictive validity of the CBMS subscales, we examined their association with sexual behavior variables. Each of the subscales had distinct patterns of association with condomless sex. *Pleasure Reduction* was most strongly positively associated with condomless sex with casual partners ($r = 0.43$, $p < 0.01$), *Risk Reduction* motivations was most strongly negatively associated with condomless sex with primary partners ($r = -0.27$, $p < 0.05$), and both *Perceived Partner Pressure* ($r = 0.25$, $p < 0.01$) and *Intimacy Interference* ($r = 0.13$, $p < 0.05$) were most strongly positively associated with number of condomless sex acts overall.

Table 4 Discriminant and construct validity for Condom Barrier and Motivation Scale from Study 2

	1	2	3	4	5	6	7	8	9	10
1. Pleasure interference	–									
2. Risk reduction	–0.11	–								
3. Partner pressure	0.22**	–0.03	–							
4. Intimacy interference	0.29**	–0.04	0.54**	–						
5. Sexual compulsivity	0.28**	0.02	0.24**	0.19*	–					
6. BIS	–0.14*	0.10	0.05	0.00	–0.05	–				
7. BAS—Reward	–0.11	0.06	0.05	0.12*	–0.09	0.49**	–			
8. BAS—Fun seeking	0.04	0.03	0.02	0.07	0.08	0.15*	0.45**	–		
9. BAS—Drive	0.05	0.04	–0.04	0.08	0.04	–0.08	0.29***		–	
10. HIV worry	0.08	0.15**	0.13*	0.02	0.22**	0.10	0.00	0.01	0.02	–
11. Severity of STIs	0.10	0.13*	0.18**	0.17*	0.29**	0.15**	–0.03	0.01	–0.08	0.42**
12. Conscientiousness	–0.14*	0.13*	–0.13	–0.05	–0.25**	–0.03	0.17**	–0.02	0.33**	–0.05
13. Commitment	–0.01	–0.09	0.10	0.03	–0.05	–0.01	–0.11	–0.15	–0.09	0.10
14. Relational satisfaction	–0.13	–0.02	0.06	–0.05	–0.10	–0.01	–0.06	–0.10	–0.11	0.11
15. Sexual esteem	–0.10	–0.04	–0.06	0.07	–0.02	–0.20**	0.12*	0.16**	0.14*	–0.08
16. Sexual satisfaction	0.04	–0.06	–0.03	0.13*	0.04	–0.25**	0.04	0.16**	0.14*	–0.08
17. Sexual anxiety	0.16**	0.14*	0.20**	0.07	0.31***	0.24**	0.03	0.03	–0.05	0.29**
18. Total CAS acts	0.26**	–0.12*	0.25**	0.13*	0.22**	–0.08	–0.02	0.03	0.05	0.12*
19. Percent CAS with CP	0.43**	–0.21**	0.19**	0.09	0.03	–0.03	0.07	0.18*	0.04	0.09
20. Percent CAS with MP	0.38**	–0.27*	0.11	–0.19	0.02	0.01	0.15	0.21	0.05	0.09
	11	12	13	14	15	16	17	18	19	

1. Pleasure interference										
2. Risk reduction										
3. Partner pressure										
4. Intimacy interference										
5. Sexual compulsivity										
6. BIS										
7. BAS—Reward										
8. BAS—Fun seeking										
9. BAS—Drive										
10. HIV worry										
11. Severity of STIs	–									
12. Conscientiousness	–0.26**	–								
13. Commitment	–0.04	0.03	–							
14. Relational satisfaction	–0.07	0.01	0.81***	–						
15. Sexual esteem	–0.29**	0.16**	0.12	0.28**	–					
16. Sexual satisfaction	–0.23**	0.11	0.15	0.38**	0.81**	–				
17. Sexual anxiety	–0.50**	–0.18**	–0.11	–0.15	–0.45**	–0.39**	–			
18. Total CAS acts	0.10	–0.12*	–0.13	–0.03	0.12*	0.18**	0.08	–		
19. Percent CAS with CP	–0.04	0.02	–0.08	–0.05	0.01	0.03	0.09	0.28**	–	
20. Percent CAS with MP	–0.06	0.10	–0.19	–0.16	–0.00	0.05	0.16	0.38**	0.39**	

CAS condomless anal sex, CP casual partner, PP primary partner

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

Discussion

This paper evaluated the psychometric properties of the CBMS, a new scale designed to measure motivations and barriers to condom use. Participants in a PrEP messaging study (Study 1) and a PrEP demonstration project (Study 2) completed the CBMS. Results support a four-factor subscale structure, with reliable (i.e., internally consistent) subscales that are only modestly correlated. Results also indicate that CBMS subscales are distinct from general measures of sexual wellbeing or relationship quality (i.e., discriminant validity) and are associated with self-reported condom use with different partner types (i.e., construct validity).

CFAs in both study samples supported the hypothesized four-factor structure, and suggest that differences among the four subscales of the CBMS are important in better understanding barriers to condom use among gay and bisexual men. First, concerns that condoms will disrupt pleasure and concerns that condoms will disrupt intimacy appear to be related, but conceptually distinct, barriers to condom use. Believing that condoms make sex less pleasurable and spontaneous was positively associated with both sexual compulsivity and sexual anxiety, and negatively associated with conscientiousness. However, endorsing pleasure reduction barriers was not associated with any of the behavioral approach (BAS) subscales, such as reward responsiveness, fun seeking, or drive. These data suggest that attitudes about the pleasure reducing aspects of condom use may be more related to sexually-specific concerns or anxieties, rather than more general appetitive motives or sensation seeking. In contrast, endorsing intimacy interference barriers was positively associated with both reward responsiveness and sexual satisfaction. These findings highlight the extent to which intimacy may be a powerful reward and driver of sexual satisfaction for gay and bisexual men and suggest the importance of acknowledging and affirming these motives in interventions that focus on attaining sexual health, rather than merely preventing disease.

Second, there were important distinctions between the two “relational” subscales of the CBMS: intimacy interference barriers and perceived partner pressure barriers to condom use. These two scales were moderately correlated, but perceived partner pressure was associated with sexual anxiety, while intimacy interference was associated with sexual satisfaction. Neither subscale was associated with relationship satisfaction or commitment, suggesting that they capture something specific about condom-related attitudes and dynamics, rather than just the quality of a given relationship or partner. Past research indicates that individuals make decisions about condomless sex in the

context of specific partnership types and has demonstrated differences in the associations between intimacy interference barriers and perceived partner pressure barriers in predicting PrEP-related risk compensation intentions based on these patterns (Golub, 2014). Additional research is necessary to better understand both perceptions of partner pressure and intimacy interference as they relate to condom use.

Not surprisingly, risk reduction motivations for condom use were associated with greater HIV worry, perceived STI severity, and conscientiousness. However, risk reduction motivations for condom use were uncorrelated with any of the other three subscales. These findings suggest that motivations for condom use may operate independently from barriers among gay and bisexual men, and suggest that increasing risk reduction motivations will do little to reduce these three important barriers. As such, public health messaging or interventions designed to promote condom use must not focus exclusively on increasing risk perception or fear of infection. Instead, barriers to condom use must be addressed and reduced separately in order to make a significant impact on condom-related attitudes.

It is important to consider several limitations of the CBMS. First, both of the samples analyzed above were drawn from studies of PrEP, either PrEP messaging (Study 1) or a PrEP demonstration project (Study 2). There is reason to believe that condom barriers and motivations may differ in the context of PrEP (Alaei et al., 2016), and even though none of the participants were using PrEP when data were collected, being primed with PrEP may have impacted their responses. Our past research using the subscales of the CBMS with other samples with similar results enhances our confidence in our current findings (Gamarel & Golub, 2015; Golub, 2014; Golub et al., 2012; Starks et al., 2014); however, additional research is needed on the correlates and predictive utility of CBMS for both PrEP users and non-users. Given the large number of gay and bisexual men in New York City and the differences in recruitment strategy and demographics of the two samples, overlap (i.e., non-independence) of the two samples is unlikely, but is a potential limitation as well. Second, these analyses were restricted to HIV-negative gay and bisexual men, and so the generalizability of the scale for use in other populations is limited. However, there is reason to believe in the utility of the scale and its subscales for other groups. There is evidence for the above barriers and motivators for condom use among HIV-positive people, transgender individuals and heterosexual men and women, even as each population may have additional dynamics and environmental contexts to consider (Burlew et al., 2015; Campbell et al., 2016; Gamarel et al., 2016; Operario et al., 2011). Further research is needed to adapt and validate the CBMS

for use with other high priority populations. And third, these analyses were restricted to the psychometrics of scale-development, and did not delve more deeply into the relative predictive power of the four subscales in sexual behavior patterns, their differential role for different partner types, or interactions among subscales that might be particularly relevant in particular settings or contexts. To truly be useful in guiding prevention strategies, the CBMS should be used to distinguish among sexual behavior patterns that might be ripe for intervention.

Despite these limitations, these data suggest that the CBMS is a reliable and valid tool that can be used to assess condom use barriers and motivations among gay and bisexual men. An enhanced understanding of the dynamics of condom use in the context of expanding PrEP and other biomedical HIV prevention programs can make a significant impact on efforts to address the epidemic.

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Compliance with ethical standards

Conflicts of interest As part of an NIH-funded PrEP Demonstration Project (R01AA022067), Sarit Golub receives study drug and partial support for DBS testing from Gilead Sciences. Kristi Gamarel declares that she has no conflict of interest.

Human and animal rights and Informed consent 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. Informed consent was obtained from all individual participants included in the study.

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