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Condom use intentions mediate the relationships between psychosocial constructs and HIV sexual risk behavior in young Black men who have sex with men

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Abstract

HIV prevention interventions that reduce sexual risk behaviors among young Black men who have sex with men (YBMSM), the most severely affected population in the United States, are critical for reducing disparities in HIV infection. However, there are few theory-based sexual risk reduction interventions designed specifically for YBMSM. This study tested the applicability of the Integrated Behavioral Model (IBM), which theorizes that behavioral intentions mediate the relationship between psychosocial constructs and health behavior on condomless anal intercourse (CAI) among YBMSM. To test key constructs of the IBM, analyses were conducted with baseline data from the HealthMpowerment (HMP) randomized controlled trial. Logistic regression was used to examine the relationships between condom use self-efficacy, norms, attitudes, intentions, and environmental constraints, and CAI. Mediation analysis was conducted to determine if condom use intentions mediated the relationship between psychosocial constructs (i.e., condom use self-efficacy, norms, and attitudes) and CAI. Overall 55.7% reported one or more acts of CAI with a male partner in the past 3 months. Those who reported CAI in the 3 months prior to the baseline survey reported lower self-efficacy for condom use, lower condom use norms, more negative attitudes toward condom use, and lower condom use intentions at baseline than those who reported no CAI. In mediation analysis, the relationships between CAI and self-efficacy for condom use (estimated indirect effect=−0.004 (SE=0.002)), condom use norms (−0.002 (SE=0.001)) and attitudes toward condom use (−0.005 (SE=0.002)) were mediated by condom use intentions. This study applied the IBM to sexual risk behavior among a sample of YBMSM. Results indicate that the relationships between condom use self-efficacy, norms, and attitudes, and CAI were mediated by condom use intentions. Future theory-informed interventions should focus on increasing self-efficacy for condom use, condom use norms, attitudes toward condom use, and condom use intentions to reduce CAI among YBMSM.

Disclosure statement

No potential conflict of interest was reported by the authors.

Keywords

Integrated Behavioral Model (IBM); condom use intentions; HIV sexual risk behavior; condomless anal intercourse; young Black men who have sex with men

Introduction

In 2014, new HIV infections among young Black men who have sex with men (YBMSM) represented 44% of new diagnoses among youth in the United States (US) (CDC, 2016). One simulation estimated that nearly 40% of YBMSM may acquire HIV by age 30 (Matthews et al., 2016). In spite of the significant burden of disease, there are few evidence-based interventions designed to address HIV risk behaviors among YBMSM (Johnson et al., 2008; Peterson & Jones, 2009). Although behavioral interventions based on theory are more effective than those that are not (Glanz, Rimer, & Viswanath, 2008), few theory-based interventions have been designed to address HIV risk behaviors among YBMSM. A recent systematic review of HIV behavioral prevention interventions for YMSM (Hergenrather, Emmanuel, Durant, & Rhodes, 2016), which included articles published through Oct 2015, identified 13 evidence-based behavioral HIV prevention interventions for US young men who have sex with men. Theoretical underpinnings were reported five of these studies (Bauermeister et al., 2015; Christensen et al., 2013; Hidalgo et al., 2015; Hightow-Weidman et al., 2012; Mustanski, Garofalo, Monahan, Gratzner, & Andrews, 2013); of which, one included YBMSM only (Hightow-Weidman et al., 2012). More recent theory-based interventions addressing HIV prevention for YBMSM, include reducing sexual risk behaviors, and increasing engagement with prevention and care services (Bouris et al., 2017; Crosby et al., 2018; Koblin et al., 2017; Stein et al., 2015). In order to design and promote the most effective theory-driven HIV risk reduction interventions for YBMSM, it is critically important to assess relationships between theoretical constructs and HIV risk behaviors, including sexual risk behaviors such as condomless anal intercourse (CAI), among YBMSM. Understanding why interventions succeed in changing behavior is hindered when relationships between constructs are not well understood (Glanz & Bishop, 2010).

The Integrated Behavior Model (IBM) combines constructs common to well-established health behavior theories including those from the Health Belief Model, the Theory of Reasoned Action, the Theory of Planned Behavior, and Social Cognitive Theory (Glanz et al., 2008; Kasprzyk, Montaño, & Fishbein, 1998). In the IBM, behavioral self-efficacy, perceived norms, and attitudes predict intentions, which in turn, predict a particular behavior. Self-efficacy refers to an individual's confidence in their ability to execute a behavior despite challenges. Perceived norms are defined as the social pressure regarding whether or not to perform a behavior. Attitudes are determined by individuals' beliefs about behaviors and their outcomes. Finally, the most direct determinant of behavior in the model is intentions, which refer to the perceived likelihood of performing the behavior. Intentions are assumed to capture motivation, which directly influences engagement in the behavior (Kasprzyk et al., 1998). Past HIV prevention efforts based on the IBM have been successful, including recent interventions to increase HIV testing among YMSM (Bauermeister et al., 2015; Solorio et al., 2016).

In prior studies, individual constructs of the IBM have been found to be important in predicting CAI among men who have sex with men (MSM) (Miner, Peterson, Welles, Jacoby, & Rosser, 2009; Newcomb & Mustanski, 2014; Schutz et al., 2011). However, to the best of our knowledge, no published studies to date have specifically tested the relationships between all key IBM constructs and CAI among YBMSM. To address this gap, this cross-sectional study examines relationships between key constructs outlined in the IBM among a sample of YBMSM. Specifically, we will determine if condom use intentions mediate the relationships between condom use self-efficacy, attitudes, and norms, and CAI.

Methods

Study Procedures and Participants

HealthMpowerment (HMP) is a randomized controlled trial (RCT) of an Internet-based, mobile phone-optimized three-month intervention guided by the IBM designed to reduce sexual risk behaviors among YBMSM aged 18 to 30 in North Carolina (NC). Eligibility criteria included: (1) age 18 to 30; (2) born biologically male; (3) self-identify as black; (4) currently reside in North Carolina; (5) currently have access to a mobile device (e.g. smartphone, tablet) that connects to the internet and has texting capabilities; and (6) any of the following in the past six months: (a) CAI with a male partner, (b) any anal sex with more than three male sex partners, (c) exchange of money, gifts, shelter, or drugs for anal sex with a male partner, or (d) anal sex while under the influence of drugs or alcohol (i.e., high or drunk within two hours of sex). Participants were recruited from flyers posted at local venues (including bars, clubs, college campuses), HIV/sexually transmitted infection (STI) clinics, case management organizations, and through online advertisements (e.g., Craigslist, Facebook, Grindr).

The total study period was from November 2013 to October 2016. Participants completed online surveys at baseline, 3, 6 and 12 months. This current cross-sectional study used data collected during the baseline survey.

Measures

Psychosocial IBM constructs included baseline self-efficacy for condom use, condom use norms, and attitudes toward condom use. Condom use intentions were considered as a mediator between the psychosocial constructs and sexual risk behaviors. Environmental constraints were considered to be directly associated with sexual risk behaviors. The outcome variable was dichotomized CAI. The baseline survey assessed the total number of acts of CAI with a male partner in prior 3 months. The study dichotomized this variable to one or more episodes of CAI versus zero episodes of CAI in the last 3 months. The HMP baseline survey included items on demographics including age, education, income, employment status, homelessness, recent arrests (past 3 months), health insurance, and HIV status.

Psychosocial constructs

Condom Use Self-Efficacy.—Condom use self-efficacy was assessed using the 26-item Condom Use Self-Efficacy Scale (CUSES) with responses rated on a 5-point Likert-type

scale from 1=“strongly agree” to 5=“strongly disagree” (Kasen, Vaughan, & Walter, 1992). An example of an item is, “I feel confident in my ability to put a condom on myself or my partner”. Scores were reversed so that higher scores indicate greater condom use self-efficacy. Internal consistency, measured using Cronbach’s α , was 0.95.

Condom Use Norms.—The norms subscale of the Sexual Risks Scale was used to measure condom use norms (DeHart & Birkimer, 1997). The scale includes 7 items with responses based on a 5-point Likert scale from 1= “strongly agree” to 5= “strongly disagree”. An example of an item is, “My friends and I encourage each other before dates to practice safer sex”. Scores were reversed so that higher scores indicate more positive norms toward condom use. The internal consistency of the scale was $\alpha=0.87$.

Attitudes toward Condom Use.—The Attitudes Toward Condom Use subscale of the Sexual Risks Scale was used to measure attitudes toward condom use (DeHart & Birkimer, 1997). The scale includes 13 items with responses based on a 5-point Likert scale from 1= “strongly agree” to 5= “strongly disagree”. An example of an item is, “Safer sex gets boring”. A higher score indicates a more positive attitude toward condom use. The internal consistency of the scale was $\alpha=0.92$.

Mediator

Condom Use Intentions.—Condom use intentions were assessed using the 4 condom use related items (intentions to: discuss condom use with partner, use condoms, use condoms even if a partner refused, and have a condom nearby) out of 8 items measuring safer sex intentions (Hightow-Weidman et al., 2012). Each item used a 4-point Likert scale, 1= “very unlikely” to 4= “very likely”. A higher score indicates stronger intentions toward condom use ($\alpha=0.88$).

Psychosocial constructs and the mediator were transformed to a range of 0–100, with higher numbers reflecting greater condom use self-efficacy, norms, attitudes and intentions.

Environmental Constraints

Environmental constraints were measured using two items that asked if participants knew where to buy condoms and where to obtain free condoms; response options were “yes” and “no”.

Statistical Analysis

All analyses were conducted using SAS 9.4 software (SAS Institute, Cary, North Carolina, USA). Logistic regression was used to test differences in baseline condom use self-efficacy, social norms, attitudes, and intentions between participants who reported any CAI versus no CAI in the 3 months prior to the baseline survey.

The SAS PROCESS computational macro was used for mediation analysis (Hayes, 2013). The macro was used to develop a simple mediation model with the three constructs, self-efficacy for condom use, condom use norms, and attitudes toward condom use; one mediator, safer sex intentions; and a single outcome, CAI. The significance of the indirect

effects was assessed with a 95% confidence interval using bootstrapping procedures, a nonparametric resampling procedure. Figure 1 depicts the simple mediation model and related paths. Mediation refers to the effect of independent variables on the dependent variable through a mediator. The size of the indirect effect is estimated by multiplying the effect of the independent variable on the mediator (a path) and the effect of the mediator on the dependent variable (b path). The direct effect (c' path) is the effect of the independent variable on the dependent variable controlling for the mediator (Preacher & Hayes, 2008). Standard mediation terminology (i.e., indirect effect or direct effect) was used to refer to statistical associations in the mediation analyses though we recognize that our study was cross-sectional and thus we cannot infer causality. Age, level of income, and educational attainment were controlled for in the mediation analysis.

Results

Sample Description

474 participants were enrolled in the study. At baseline, 473/474 (99.8%) participants answered questions about the total number of acts of CAI with a male partner in the past 3 months. As shown in Table 1, the mean age was 24.3 years, 67% identified as gay, and 42% were HIV-positive. Nearly all participants had completed high school (91%), 53% had an income less than \$10,999, 65% were currently employed, and 72% were insured. Mean score for self-efficacy for condom use was 82.47 (SD 15.62), condom use norms was 68.04 (SD 22.41), attitudes toward condom use was 69.86 (SD 22.64), and condom use intentions was 78.57 (SD 26.74). Most participants knew where to buy condoms (98.9%), and knew where to obtain free condoms (91.8%). Overall 55.7% reported one or more acts of CAI with a male partner in last 3 months.

Association between CAI and Psychosocial Constructs

Lower condom use self-efficacy, lower sexual risk norms, negative condom attitudes, and lower safer sex intentions at baseline were all associated with CAI in the 3 months prior to the baseline survey. Compared to those who reported no CAI in the past 3 months, those who reported CAI in the past 3 months had lower self-efficacy for condom use (OR=0.80, 95% CI = 0.71, 0.90), lower sexual risk norms (OR=0.83, 95% CI= 0.76, 0.90), more negative attitudes toward condom use (OR=0.79, 95% CI=0.72, 0.86), and lower safer sex intentions (OR=0.80, 95% CI=0.75, 0.78) at baseline (Table 2). Those who reported CAI in the past 3 months were less likely to know where to buy condoms (OR=0.85, 95% CI=0.14, 5.12) or where to obtain free condoms (OR=0.78, 95% CI=0.43, 1.53) compared to who reported no CAI, but the associations were not statistically significant.

The relationships between Condom Use Self-Efficacy, Norms, and Attitudes, and CAI through Condom Use Intentions

As shown in table 3, participants who reported higher condom use self-efficacy, norms, and attitudes were significantly more likely to report higher condom use intentions (a path). Moreover, those who reported greater condom use intentions were less likely to engage in CAI in the past 3 months (b path). The association between condom use intentions and CAI was the same for the three psychosocial constructs because they were all included and tested

in one model. Participants who had more positive attitudes toward condom use were less likely to report CAI in the last 3 months when intentions were included in the model (c' path). However, there were no statistically significant associations between self-efficacy for condom use or condom use norms and CAI when condom use intentions were included in the model (c' path).

The indirect effect of self-efficacy for condom use on CAI through condom use intentions was significant ($B=-0.004$ ($SE=0.002$), 95% CI, $[-0.009, -0.001]$). Moreover, the indirect effect of condom use norms on CAI through condom use intentions ($B=-0.002$ ($SE=0.001$), 95% CI, $[-0.005, -0.001]$) and the indirect effect of attitudes toward condom use on CAI through condom use intentions ($B=-0.005$ ($SE=0.002$), 95% CI, $[-0.009, -0.001]$) were statistically significant. When testing the indirect effect of each construct, the associations with the two other psychosocial constructs were controlled for in the model. Thus, condom use intentions mediated the relationship between condom use self-efficacy, norms and attitudes and CAI. Figure 2 depicts the results based on the conceptual model.

Discussion

YBMSM who had greater self-efficacy for condom use, positive norms about condom use, and positive attitudes toward condom use had stronger condom use intentions and, in turn, were less likely to engage in CAI. The results of this study indicate high congruence with the IBM and emphasize the importance of associations between sexual risk behaviors, psychosocial constructs, and behavioral intentions among YBMSM.

Previous studies with diverse MSM populations support our findings, and highlight the direct relationships between psychosocial constructs and sexual risk behaviors. For example, condom use self-efficacy was significantly associated with reduced CAI among ethnically diverse MSM in the US (Newcomb & Mustanski, 2014) and HIV-positive MSM in the Netherlands (Schutz et al., 2011). In one study of 252 BMSM in the US, peer norms were found to influence condom use (Jones et al., 2008). In both US and South African MSM, attitudes toward safer sex were associated with less engagement in CAI (Molitor, Facer, & Ruiz, 1999; Tun et al., 2010). Finally, intentions have been found to have a direct effect on CAI among HIV-positive MSM in the Netherlands (Schutz et al., 2011) and in MSM in the US (Miner et al., 2009).

Prior studies notwithstanding, our study is unique in that it targeted YBMSM, a population disproportionately affected by HIV in the US (Balaji et al., 2012), and tested multiple IBM constructs and pathways in one model. Further, our focus on examining intentions as a mediator of the relationship between psychosocial constructs and sexual risk behaviors is of particular importance since intentions are assumed to capture motivation, directly influencing engagement in the behavior, and are considered the most important construct in the IBM (Kasprzyk et al., 1998). However, we identified only one prior study conducted with MSM that examined intentions as a mediator of CAI. In this study, intentions were found to mediate the relationship between condom use norms and CAI among HIV-positive MSM in the US (Miner et al., 2009).

Previous studies have shown the effectiveness of theory-based interventions that address behavioral constructs such as intentions, self-efficacy, norms, and attitudes to reduce CAI among MSM (Coleman, Jemmott, Jemmott, Strumpf, & Ratcliffe, 2009; Mausbach, Semple, Strathdee, Zians, & Patterson, 2007). Given evidence that theory-based interventions targeting MSM improve outcomes (Bartholomew & Mullen, 2011; Glanz & Bishop, 2010), our results suggest that interventions that address IBM constructs and strengthen the pathways proposed in the model may be important for reducing sexual risk behaviors among YBMSM.

More recently, researchers have applied similar theoretical models to interventions delivered online (Bowen, Horvath, & Williams, 2007; Hirshfield et al., 2012; Ko et al., 2013; Mustanski et al., 2013). mHealth interventions capitalize on the interactive nature of online communication, allowing users to interact and collaborate by creating content in virtual communities. These new approaches are considered an important HIV prevention strategy among key populations (Muessig, Nekkanti, Bauermeister, Bull, & Hightow-Weidman, 2015), including YBMSM (Hightow-Weidman et al., 2012).

Several of these mHealth interventions show promising findings for changing sexual risk behavior and psychosocial determinants. For example, social networking features within a comprehensive online sexual risk reduction intervention for YBMSM contributed to improvements in safer sex norms among members of the online community (Hightow-Weidman et al., 2015). Incorporating Popular Opinion Leaders, trained peers who have conversations with participants and serve as behavior change models, into social media interventions has been successful in improving behavioral self-efficacy, social norms, intentions, and behavioral outcomes among MSM (Ko et al., 2013). Delivery of live Motivational Interviewing (MI) sessions via Facebook chat has been effective in increasing safer sex self-efficacy, motivation to change sexual risks (i.e., intentions), and reducing CAI among high risk YMSM (Lelutiu-Weinberger et al., 2015). In contrast to in-person interventions, online interventions can minimize or ameliorate barriers to participation that many YBMSM encounter, such as stigma, discrimination, racism, time constraints, geographic location, and transportation challenges (Hightow-Weidman et al., 2011).

The importance of theory-based online interventions to change sexual risk behaviors among YBMSM indicates the need of further research to develop and evaluate the effectiveness of IBM-based online interventions. Importantly, future studies should determine which IBM constructs or pathways are most impacted by these interventions. Findings from the full HMP RCT will provide the ability to evaluate these constructs over time among a population of YBMSM.

There are several limitations to our study. First, this cross-sectional analysis design does not allow for inference of causality. Moreover, the study was not able to fully assess how past sexual behaviors might have influenced condom use self-efficacy, condom use norms, attitudes toward safer sex, and safer sex intentions constructs, given that only self-reported CAI over the past 3 months was assessed. Thus, it is possible that men with a past history of successful condom use are more likely to report higher future condom use self-efficacy, condom use norms, positive attitudes toward safer sex, and safer sex intentions than the men

who did not have these experiences. Further, men who perceive that they have good reasons for past condomless sex (e.g. serosorting or monogamy with a concordant partner) may intend to continue this behavior and thus report less positive attitudes toward safer sex, and safer sex intentions. Second, our study did not examine the full IBM. The original IBM includes four constructs that are believed to directly affect behavior: knowledge and skills, salience of the behavior, environmental constraints, and habit. The baseline survey examined knowledge of locations to buy condoms and obtain free condoms as environmental constraints. However, 98.9% of participants knew where to buy condoms, and 91.8% of participants knew where to obtain free condoms. Due to the lack of variation, these variables were not included in the final model. This indicates that environmental constraints are either not important constructs for CAI among YBMSM or other environmental constraints which were not tested in this study are associated with CAI. Future studies could include an elicitation phase to discover additional environmental constraints related to condom access, which might include financial circumstances, incarceration, lack of transportation, distance to distribution site, or limited distribution site hours, and other direct effect constraints suggested in the IBM (Gamarel & Golub, 2015; Glanz et al., 2008).

In spite of these limitations, this study was the first to examine relationships between key theoretical constructs of the IBM and sexual risk behaviors among YBMSM. The results of this study support the use of the IBM to inform future interventions focused on reducing CAI among YBMSM. Additional research is needed to determine if improvements in key IBM constructs predict reductions in sexual risk outcomes in IBM-informed interventions for YBMSM. Given the changing context of HIV prevention, future studies should examine the utility of the IBM in describing relationships among psychosocial constructs, behavioral intentions and behaviors such as HIV testing uptake, repeat testing, pre-exposure prophylaxis (PrEP) uptake and PrEP adherence among YBMSM.

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Figure 1.
Simple mediation model.

Figure 2.

Mediation model to examine condom use intentions as a mediator in the relationship between psychosocial constructs and CAI. Dashed line indicates not statistically significant. Notes: The model controlled for age, income and education. Blue line indicates a path, black line indicates b path and red line indicates c' path which includes intentions in the model. * $P < 0.05$, ** $P < 0.01$

Table1.

Socio-demographic characteristics, safer sex related psychosocial constructs and sexual risk behavior of young, black men who have sex with men ($N=473$).

	Mean (SD) / n (%)
Socio-demographic characteristics	
Age	24.33 (SD 3.21) (Range 18–30)
Education	
Some high school or less	43 (9.07%)
High school graduated	316 (66.67%)
College graduated or more than college	115 (24.26%)
Sexual Identity	
Gay	315 (66.60%)
Bisexual	95 (20.08%)
Other	53 (13.32%)
Income	
<\$11,000	248 (53.00%)
\$11,000–\$21,000	87 (18.59%)
\$21,000–\$31,000	68 (14.53%)
\$31,000 or more	65 (13.89%)
Currently employed	306 (64.56%)
Health Insurance	339 (71.52%)
Homeless, last 6 months	104 (21.94%)
Arrested, last 3 months	28 (5.91%)
HIV-positive	199 (41.98%)
Safer sex related psychosocial constructs	
Self-efficacy for condom use	82.47 (SD 15.62) (Range 28.85–100)
Condom use norms	68.04 (SD 22.41) (Range 0–100)
Attitudes towards condom use	69.86 (SD 22.64) (Range 1.92–100)
Condom use intentions	78.57 (SD 26.74) (Range 0–100)
Environmental constraints	
Know where to buy condoms	468 (98.9%)
Know where to obtain free condoms	434 (91.8%)

Mean (SD) / n (%)	
Socio-demographic characteristics	
Sexual risk behavior	
CAI with a male partner in the last three-months	265 (56.03%)

Table 2.

The odds ratios of association between CAI and IBM constructs ($N=473$).

IBM constructs	CAI 3 months prior to the baseline survey		Odds ratio, Yes vs. No CAI (95%CI)
	No (n=208)	Yes (n=265)	
	Mean(SD) / n (%)	Mean(SD) / n (%)	
Self-Efficacy for Condom Use *	85.39 (14.81)	80.13 (15.88)	0.80 (0.71, 0.90)
Condom Use Norms *	73.26 (21.04)	64.08 (22.64)	0.83 (0.76, 0.90)
Attitudes Toward Condom Use *	73.34 (19.91)	65.04 (23.11)	0.79 (0.72, 0.86)
Condom Use Intentions *	85.76 (23.95)	73.11 (27.55)	0.80 (0.75, 0.89)
Know where to buy condoms	206 (99.0%)	262 (98.9%)	0.85 (0.14, 5.12)
Know where to obtain free condoms	193 (92.8%)	241 (90.9%)	0.78 (0.40, 1.53)

* Note: Odds Ratios represent a 10-point increase in the predictor.

Table 3.

The relationships between psychosocial constructs and CAI through condom use intentions. ($N=452$).

Psychosocial Constructs	Mediator	Path			Indirect Effect * <i>b</i> path Effect (boot SE) [Boot LLCI, Boot ULCI]
		a path Effect (SE)	b path Effect (SE)	c' path Effect (SE)	
Self-efficacy for condom use		0.296 (0.091) **	-0.013 (0.004) **	0.0001 (0.009)	-0.004 (0.002) * [-0.009, -0.001]
Condom use norms	Condom use intentions	0.174(0.053) **	-0.013 (0.004) **	-0.0009 (0.005)	-0.002 (0.001) * [-0.005, -0.001]
Attitudes towards condom use		0.351 (0.063) **	-0.013 (0.004) **	-0.015 (0.006) *	-0.005 (0.002) * [-0.009, -0.001]

Notes: The model controlled for age, income and education.

* $P<0.05$,

** $P<0.01$