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Cognitive and Emotional Factors Associated with Sexual Risk-Taking Behaviors among Young Men who Have Sex with Men

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Abstract

Young men who have sex with men (YMSM) between the ages of 13 and 24 account for a disproportionate number of new HIV infections in the United States. Recognizing the unique developmental circumstances that YMSM face and building on the dual process model, it is important to consider the role of cognitive and emotional factors as well as self-efficacy to negotiate safer sex when understanding experiences of sexual risk-taking among YMSM. This paper uses structural equation modeling to examine how the decisional balance to use condoms (a cognitive factor) and limerence (an emotional factor) are both directly and indirectly associated with sexual risk-taking behaviors (the number of insertive and receptive condomless anal intercourse partners), with indirect effects occurring via limited self-efficacy to negotiate safer sex. Data are from a cross-sectional online survey of YMSM (aged 18 to 24) in the United States who did not report being in a romantic relationship. Analysis included a sample of 1,084 single YMSM who had never tested positive for HIV and who had engaged in anal intercourse in the previous two months. Results indicate that the decisional balance to use condoms was both directly and indirectly associated with reduced sexual risk-taking behaviors. Limerence was not directly associated with sexual risk-taking behaviors; however, it was indirectly associated with sexual risk-taking behavior through limited self-efficacy to negotiate safer sex. These findings highlight the importance of considering both cognitive and emotional factors, as well as self-efficacy to use condoms, in the development and implementation of HIV prevention interventions for YMSM.

Keywords

Structural equation modeling; sexual risk-taking; YMSM; cognitive factors; emotions; self-efficacy

Introduction

Young men who have sex with men (YMSM) account for 72% of new HIV infections in people between the ages of 13 and 24 and 30% of new infections among men who have sex with men (MSM) (Centers for Disease Control and Prevention, 2015). To address this, there has been a call for innovative HIV prevention interventions that decrease sexual risk-taking (i.e., engaging in condomless anal intercourse; CAI) among YMSM, a primary risk factor for HIV transmission (Kann, 2016). As adolescents transition into young adulthood, it is normal for them to explore romantic and/or sexual relationships and in doing so, learn to negotiate sexual experiences that might increase their risk for HIV/STI acquisition (Bauermeister, Ventuneac, Pingel, & Parsons, 2012; Schulenberg, Maggs, & Hurrelmann, 1997). Although the exploration of sexual relationships is a common developmental experience, limited social support and comprehensive sex education for same-sex attracted youth has the potential to reduce their self-efficacy to negotiate safer sex (Bauermeister, 2015; Kubicek et al., 2008; Kubicek, Carpineto, McDavitt, Weiss, & Kipke, 2011).

Recognizing the unique developmental circumstances that YMSM experience, it is important to consider both cognitive and emotional factors in the design and implementation of innovative HIV prevention programs (Hergenrather, Emmanuel, Durant, & Rhodes, 2016). Building on previous findings examining sexual risk-taking among YMSM (Bauermeister, 2015; Bauermeister, Hickok, Meadowbrooke, Veinot, & Loveluck, 2014; Bauermeister, Leslie-Santana, Johns, Pingel, & Eisenberg, 2011; Sullivan, Pingel, Stephenson, & Bauermeister, 2017), in order for HIV prevention interventions to provide YMSM with the skills to reduce sexual risk-taking, it is important to understand the motivations behind sexual risk-taking behaviors and their association with both YMSM's self-efficacy and safer sex behaviors.

Adolescence is a developmental period in which romantic and/or sexual relationships are often first explored (Collins, Welsh, & Furman, 2009). These romantic and/or sexual relationships have been found to play a central role in adolescent development, especially because these relationships may influence how one sees themselves and their sexuality, and they may play a role in the development of future romantic and/or sexual relationships (Furman & Wehner, 1997). For YMSM, these romantic and/or sexual relationships occur within a heteronormative context where young men are often expected to perform masculine gender roles and engage in relationships with young cisgender women (Fields et al., 2012). YMSM therefore need to navigate this cultural context (and the minority stressors associated with this context) as they initiate the development of sexual relationships; this may increase experiences of psychological distress and anxiety as these relationships are formed (Fields et al., 2012; Meyer, 2003). At the same time, YMSM often receive limited relevant sexual education obtained through school or through their families, which can result in reduced self-efficacy to engage in safer sex practices, such as condom use (Estes, 2016; Flores, Docherty, Relf, McKinney, & Barroso, 2018; Schaalma, Kok, & Peters, 1993).

Cognitive factors, such as condom decisional balance (defined as the overall motivation to use condoms after considering motivations for not using condoms) and condom self-efficacy with partners, are supported in the behavioral literature as predisposing the likelihood of

engaging in CAI (Bauermeister, Carballo-Diéguez, Ventuneac, & Dolezal, 2009; Wade, Harper, & Bauermeister, 2017). Multiple theories (e.g., Health Belief Model; Theory of Planned Behavior) suggest that cognitive factors such as condom decisional balance operate both directly to influence CAI, as well as indirectly through safer sex self-efficacy (Ajzen, 1991; Fishbein, 1979; Janz & Becker, 1984; Rosenstock, 1974; Weinstein, 1988). Though most research examining cognitive factors has been among adult MSM, a few studies have examined the direct effects of cognitive factors on CAI among YMSM (Bauermeister, 2015; Belcher, Sternberg, Wolitski, Halkitis, & Hoff, 2005; Dudley, Rostosky, Korfhage, & Zimmerman, 2004; Mustanski, DuBois, Prescott, & Ybarra, 2014; Wade et al., 2017). Much of this research has examined the simultaneous effects of cognitive factors in combination with other factors (such as relationship characteristics) on CAI. For example, one study by Mustanski and colleagues (2014) examining YMSM, found that both relationship characteristics (e.g., relationship duration, trust, monogamy) and attitudes about condom use (e.g., intention to use condoms, fear of sexually transmitted infections, pleasure associated with condom use, peer use of condoms) were important in facilitating sexual risk-taking. This highlights that in combination with other influences, cognitive factors may play a role in CAI among YMSM. In addition, some research has found that condom decisional balance and self-efficacy are both associated with CAI (Bauermeister, 2015); however, despite theories suggesting that cognitive factors indirectly affect CAI through self-efficacy (Ajzen, 1991; Fishbein, 1979; Janz & Becker, 1984; Rosenstock, 1974; Weinstein, 1988), it is unknown if self-efficacy mediates the relationship between condom decisional balance and CAI among YMSM. This is problematic because having a better understanding of the role of self-efficacy in sexual risk-taking behaviors is especially important for understanding how to develop interventions aimed at reducing HIV risk among YMSM.

Though many behavior change theories (e.g., Theory of Planned Behavior) have been used to explore the role that cognitive factors play in sexual risk-taking behaviors among MSM (Bauermeister, 2015; Belcher et al., 2005; Dudley et al., 2004; Mustanski et al., 2014), currently-used theories that do not consider a cognitive-affective dual-process model may be insufficient to fully understand the motivation behind YMSM's sexual risk-taking behaviors (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008). Recent theoretical advances have underscored the importance of recognizing dual process models as a useful approach in behavior change. Dual process models highlight the importance of both affective motivations and rational decision-making (Gerrard et al., 2008), whereby these two aspects of sexual risk-taking motivation occur in conjunction with each other to simultaneously affect sexual risk-taking behaviors among YMSM (Gerrard et al., 2008). Therefore, the dual process model is a useful lens because it highlights the importance of both affective motivations and rational decision-making when YMSM engage in sexual risk-taking behavior (Gerrard et al., 2008).

Affective motivations are less explored in the HIV literature, yet there is emerging evidence suggesting that romantic ideation (i.e., "an individual's ability to conceptualize thoughts and feelings about pursuing romantic relationships"; Bauermeister et al., 2012), limerence (i.e., "overzealous ideation," characterized by jealousy, dependence, and intrusive thoughts about a partner; Bauermeister, 2015; Graham, 2010), and other affective components in relationships are associated with an increase in CAI (Bauermeister et al., 2012; Goldenberg,

Finneran, Andes, & Stephenson, 2015; Rosenberger, Herbenick, Novak, & Reece, 2014). Limerence specifically may result in challenges for YMSM when making decisions about condom use. For example, Bauermeister et al. (2012) examined the relationship between CAI and both romantic ideation and romantic obsession (i.e., limerence) and found that romantic ideation was associated with reduced CAI, whereas limerence was associated with increased CAI. Furthermore, limerence may also have an indirect relationship with CAI through safer sex self-efficacy. YMSM experiencing limerence may have reduced confidence in negotiating safer sex; limerence may be linked to one's emotional vulnerability or experiences of non-mutual emotional attachments, which could reduce an individual's perceived and actual power to negotiate safer sex (Goldenberg et al., 2015). In light of these potential pathways, we sought to examine the joint contribution of cognitive and emotional factors related to CAI risk among MSM. To do this, we used structural equation modeling to examine the direct relationships between cognitive and emotional factors and CAI as well as the indirect relationships via limited self-efficacy to negotiate safer sex.

Methods

Sample

Data were collected between July 2012 and January 2013 using a cross-sectional survey examining partner-seeking experiences. This included a national U.S. online sample of 1,638 YMSM. Recruitment occurred through advertisements on two popular social networking sites as well as through participant referrals. All eligible participants self-identified as cis-gender male (assigned male sex at birth and currently have a male gender identity), reported being attracted to other men, were between the ages of 18 and 24, reported being single, and were a U.S. resident (including Puerto Rico).

A total of 3,140 entries were screened during the 7-month recruitment period. Of those entries, 942 were excluded because they were ineligible based on responses to the screener. An additional 366 entries were disqualified because they were identified as duplicate or fraudulent entries (based on best practices for identifying duplicates and false entries; more details on this process are described in Bauermeister, 2015). Of the 1,963 eligible participants with valid entries, 325 of them provided consent for participation, but did not take the survey. This resulted in a total of 1,638 participants completing the survey.

For this analysis, we included a subsample of 1,084 YMSM who have never previously tested positive for HIV (including individuals who had never tested for HIV and individuals who had previously tested for HIV and received a negative test result) and who reported having anal intercourse (as the insertive or receptive partner) in the past two months. Including only sexually-active men allowed for an analysis of specific sexual-risk taking behaviors. All respondents who reported living with HIV were dropped from the sample because experiences of safer sex negotiation are different for this population and there were too few respondents who reported an HIV-positive sero-status ($n=22$) to make any conclusions based on HIV status. Missing data was imputed using maximum likelihood estimation. SPSS, Version 23 (IBM Corp, Armonk, NY) was used to prepare the variables

and EQS, Version 6.3 (Multivariate Software, Encino, CA) was used to conduct structural equation modeling.

Procedures

Bauermeister (2015) provides additional details on the data collection process and procedures. Upon completing an eligibility screener and providing consent, participants completed a 30–45 minute online survey, answering questions about sociodemographic characteristic, Internet use, ideal relationship and partner characteristics, sexual behaviors, and psychological well-being. All study activities were approved by our Institutional Review Board. Participants were compensated with a \$10 VISA e-card for completing the survey.

Measures

Sexual risk behavior was assessed using the Sexual Practices Assessment Schedule (SPAS; Carballo-Dieguez et al., 2002). A latent construct was comprised of two variables describing the number of insertive and receptive CAI partners in the past two months. Since insertive and receptive anal intercourse are separate behaviors with different levels of biological risk for acquiring HIV (Winkelstein et al., 1987), both were included as separate indicators. These variables were transformed using a log10 transformation during our SEM analyses to avoid any potential violations to normality.

Self-efficacy: We used the self-efficacy scale from Fisher and colleagues (1996) to measure self-efficacy to negotiate safer sex. This scale has been found to be reliable and valid in samples of YMSM in recent years (Bauermeister et al., 2015; Lelutiu-Weinberger et al., 2015; Vincent et al., 2017). Across samples, this scale has been found to be reliable and valid. This scale uses the mean of five items to determine a participant's confidence to: discuss safer sex with a partner before having sex, refuse to have unprotected sex, nonverbally show a partner that they only want to practice safer sex, tell a partner through a joke or one-liner that they only want to practice safer sex, and refuse to have sex if the partner refuses to use a condom. For each item, participants selected how confident they were on a 6-point scale, with higher scores indicating reduced self-efficacy (1=Fully Confident; 6=Not Confident at All). This allows for an examination of the relationship between reduced self-efficacy and sexual risk-taking behaviors. Self-efficacy was measured for both receptive and insertive sex with casual partners, respectively. This was appropriate for the model because none of the respondents were currently in a romantic relationship. The self-efficacy scale had a high reliability for both receptive ($\alpha=.83$) and insertive ($\alpha=.90$) sex.

Cognitive Factor.—We used the decisional balance to use condoms to examine how YMSM value sex with condoms relative to sex without condoms (Bauermeister et al., 2012). Participants were asked to answer 7 statements. Each statement referred first to “sex with condoms” (e.g., “Sex with condoms makes me feel very connected with my partner”), being immediately followed by an identical statement asking about “sex without condoms” (e.g., “Sex without condoms makes me feel very connected with my partner”). Participants rated each statement using a 4-point scale ranging from 1 (Strongly Disagree) to 4 (Strongly Agree).

To calculate a decisional balance score, we created a net difference score by subtracting each pair of statements. Statements noting participants' preference for sex without condoms were subtracted from the counterpart statements that indicated a preference for sex with condoms (e.g., The agreement score on the item "sex without condoms is what I like most" was subtracted from the agreement score on the item "sex with condoms is what I like most"). This resulted in seven items ranging from -3 to 3. Participants' total decisional balance to forego condoms was computed by creating a mean score of these items. Greater positive scores reflect greater benefits/gains associated with sex without condoms. Negative scores reflect greater benefits/gains associated with condom use. Scores hovering close to zero indicate neutrality in the costs and gains associated with sex with or without condoms. The Cronbach's α for the decisional-balance scale was 0.89. For use in the model, the items on the scale were parceled into three separate variables (Bandalos, 2002; Bandalos & Finney, 2001), with an even distribution of factor loading across the three variables. Parcel one was comprised of three items, and parcels two and three were comprised of two items.

Emotional factors: Limerence was measured to understand YMSM's experiences with intrusive and intense thoughts about their partners and the intense feelings of dependence, insecurity, and doubt about a relationship that may emerge when thinking about their relationships (Bauermeister et al., 2012; Missildine et al., 2005). Respondents answered 8 items, including having sex to feel loved, confusing sex with love, pursuing partners even though they have said that they are not interested, and obsessing about a specific person even though it may not work out. Each item was measured on a 4-point scale (1=strongly disagree; 4=strongly agree). The Cronbach's α for the limerence scale was 0.84. Again, the items on the scale were parceled into three separate variables to comprise the latent factor of limerence. Items were evenly distributed into each parcel based on their factor loading. Parcels one and two were comprised of three items and parcel three was comprised of two items.

Demographic variables include age, race/ethnicity, and sexual orientation. Age was a continuous variable measured in years. Race/ethnicity was categorized into four groups, including White, Black, Hispanic, and Other. The "Other" group includes individuals who identified as Asian/Pacific Islander, Middle Eastern, Native American, and Other. There were not enough participants in each of these groups to examine these races/ethnicities separately and therefore they were combined into one group, described as Other. Sexual orientation was measured by asking participants how they self-identify. Response options included: gay/homosexual, bisexual, straight/heterosexual, same gender loving, MSM, and other (with an option to specify). Due to a low response rate for some of the categories, sexual orientation was measured as a binary variable, distinguishing between individuals who identified as gay/homosexual and all other identity groups.

Analysis Strategy

Prior to building a structural equation model, we computed descriptive statistics. A measurement model, using the Maximum Likelihood estimation, was then developed to ensure that the goodness of fit demonstrated that variables were appropriately measuring the factors. We used the NFI and CFI to determine measures of goodness of fit and the RMSEA

as an index of misfit. Adequate goodness of fit cutoffs included having both an NFI and CFI greater than 0.90 and a RMSEA less than 0.10 (Kline, 2016). Next, a structural model was built to examine the relationships between the factors. Consideration was given to potential model modifications suggested by the Lagrange Multiplier Test for adding parameters and the Wald Test for dropping parameters, but we opted to avoid making any changes because they were unsubstantiated by the literature and reduced the likelihood of capitalizing on chance (Kline, 1998).

As presented in Figure 1, there were four hypotheses in the model: 1) the decisional balance to use condoms is directly associated with both a lack of self-efficacy and sexual risk-taking (Indicated in the model through the relationship between decisional balance to forego condoms and sexual risk-taking behaviors); 2) the decisional balance to use condoms is indirectly associated with sexual risk-taking behavior through a lack of self-efficacy (Indicated in the model through the relationships between the decisional balance to forego condoms, limited self-efficacy to negotiate safer sex, and sexual risk-taking behaviors); 3) limerence is directly associated with both a lack of self-efficacy and sexual risk-taking (indicated in the model through the relationship between limerence and sexual risk-taking behaviors); and 4) limerence is indirectly associated with sexual risk-taking, with a lack of self-efficacy as an indirect effect (indicated in the model through the relationships between limerence, limited self-efficacy to negotiate safer sex, and sexual risk-taking behaviors). In addition, limerence and the decisional balance to use condoms were correlated in the model because they are both exogenous latent factors. Although not statistically significant, demographic variables (e.g., age, race/ethnicity, sexual orientation) were included in the model as control variables given their inclusion in prior studies. An α level of 0.05 was used to determine the statistical significance of each path.

We estimated the full decomposition of effects in our model using EQS. Similar to path analysis, total effects can be divided into direct effects (i.e., relationship between exogenous and endogenous variable, after controlling for other pathways in the model) and indirect effects (i.e., relationship between an exogenous and endogenous variable through a third variable). Statistical significance of each parameter examining a *direct* and *indirect* association was tested using a z statistic, where a parameter found to be $p < .05$ is found to be different from zero. For ease of interpretation and comparison between paths, all parameters are presented as standardized values.

Given the cross-sectional nature of our data, we explored whether an alternative model could also fit the data just as well or better (MacCallum, Wegener, Uchino, & Fabrigar, 1993). We reversed our proposed theoretical pathways in our Model (e.g., reverse model of Figure 2), as it could be just as plausible that individuals engaging in greater sexual risk behavior would also report greater self-efficacy limitations, decisional balance to forego condoms, and limerence. We also attempted to modify the proposed theoretical order of the latent factors in our model (e.g., could self-efficacy and decisional balance be directly associated with limerence and indirectly associated with sexual behavior via limerence?) yet this model did not converge and subsequently excluded as an alternative model.

Results

Descriptive statistics are described in Table 1. The mean age of the sample was 20.88 ($SD=1.92$). The sample was mostly comprised of White (66.05%, $n=716$) and non-White Hispanic (16.61%, $n=180$) YMSM. The mean score for the decisional balance to use condoms among the sample was -0.04 ($SD=1.12$) on a scale from -3 to 3 . Limerence was also about average, with a mean of 2.97 ($SD=0.90$) on a scale from 1 to 5 . Self-efficacy was approximately the same for negotiating safer sex during receptive (mean= 4.14 , $SD=1.34$) and insertive (mean= 4.30 , $SD=1.49$) anal sex. The average number of CAI partners for receptive anal intercourse was 1.44 ($SD=7.14$) and the average number of CAI partners for insertive anal intercourse was 0.95 ($SD=0.38$). Given skewness, we used the log-10 transformation of these variables in subsequent SEM analyses to avoid normality violations.

A small number of cases ($n=194$; 17.9%) had missing data on our variables of interest. We proceeded to run maximum likelihood estimation using the Expectation/Maximization algorithm to impute the missing cases using EQS 6.1 (Bentler, 2005). Missing data diagnostics found 36 patterns of missing data. In order to test whether these patterns of missing data were missing completely at random (MCAR) at $p<.001$, we examined the LGS test for homogeneity of means, the GLS test of homogeneity of covariance matrices, and the combined GLS test of homogeneity of means and covariance matrices. None of these tests were found to be statistically significant at $p<.001$; therefore, study variables were assumed to be missing at random and followed a multivariate normal distribution (Raghunathan, 2004).

The model demonstrated adequate goodness of fit (Yuan-Bentler $\chi^2(51, n=1,084)=458.58$, $p<.001$; NFI=.92, CFI=0.93, RMSEA=0.09, 95% CI: 0.08, 0.09). As illustrated in Figure 2, most of the hypotheses were supported. Greater decisional balance to forego condoms was associated with limited self-efficacy to negotiate safer sex ($\beta=0.17$) and sexual risk behavior ($\beta=0.48$). Limerence was positively associated with limited self-efficacy to negotiate safer sex ($\beta=0.19$), but not significantly associated with sexual risk-taking behavior. Furthermore, limited self-efficacy to negotiate safer sex was positively associated with sexual risk behaviors ($\beta=0.09$). Limerence and decisional balance were not correlated.

We also tested the indirect contributions of condom use and limerence on sexual risk-taking behaviors through self-efficacy using the decomposition effects (see Table 2). Decisional balance ($\beta=0.016$) and limerence ($\beta=0.017$) were indirectly associated with sexual risk through self-efficacy in our decomposition of effects analyses.

Alternative Model

Our alternate model (the reverse model) had a good fit, [$\chi^2(51, N = 1084) = 459.05$, $p<.001$]. Sexual risk behavior was associated with self-efficacy ($\beta=.17$, $p<.05$) and the decisional balance to forego condoms ($\beta=-.48$, $p<.05$), but not with limerence. Self-efficacy was associated with limerence ($\beta=.20$, $p<.05$) and the decisional balance ($\beta=-.09$, $p<.05$). In the decomposition of effects, sexual risk behavior was indirectly associated with the decisional balance ($\beta=-.02$, $p<.05$) and limerence ($\beta=.03$, $p<.05$) via self-efficacy. While these results are noteworthy, we compared which model fitted the data better using the

Model AIC and Model CAIC coefficients for non-nested model comparisons and each models' fit indices. The original model had a comparable fit (Model AIC=486.77; Model CAIC=181.36; NFI=.92, CFI=.93, RMSEA=.09 (.08, .09) to the alternative model (Model AIC=486.61; Model CAIC=181.20; NFI = .92, CFI = .93, RMSEA = .09 (.08, .09). The negligible difference in fit indices across the two models highlights the importance of referring to our model's theoretical rationale when interpreting these data.

Discussion

Dual process models recognize the role that both affective and cognitive motivations play in decision-making, often occurring simultaneously to affect risk-taking behaviors (Gerrard et al., 2008). In this study, we sought to employ a dual process model to examine how affective (e.g., limerence) and cognitive (decisional balance) factors contributed to YMSM's confidence in their risk reduction decision-making (e.g., self-efficacy) and sexual risk-taking behaviors. Consistent with the dual process model, our findings suggest that both emotional and cognitive factors are important in understanding YMSM's sexual risk-taking behaviors.

Consistent with traditional behavior change theories (e.g., TPB, IMB), our cognitive factor was associated with YMSM's confidence in their ability to negotiate condoms with their partners and their likelihood of engaging in condomless anal intercourse. Specifically, we found that the decisional balance to use condoms contributed to sexual risk-taking through both a direct path to sexual risk behavior and an indirect path to sexual risk-taking through limited self-efficacy to negotiate safer sex. This highlights the importance of focusing on cognitive factors when developing HIV prevention interventions for YMSM. Specifically, our findings suggest that understanding YMSM's weighing of the pros and cons of using condoms when attempting to make an emotional connection with a sexual partner is an important contributor to their sexual decision-making. Given the value placed by YMSM on these anticipated gains and losses when using a condom, future HIV prevention strategies and messages built on cognitive factors (e.g., campaigns promoting positive attitudes about condoms) should support YMSM's recalibration of their decisional balance and ensure that risk reduction measures align with these beliefs accordingly.

In addition to cognitive factors, the dual process model highlights the importance of affective components in decision-making. In this study, we tested whether limerence (a proxy for dysregulated emotions related to relationships/sexual partners) contributed to YMSM's sexual risk-taking behaviors. In our analyses, we did not find support for a direct association between limerence and sexual risk-taking behavior. This finding was surprising, as prior data (e.g., Bauermeister et al., 2012; Missildine et al., 2005) have suggested a direct association between limerence and sexual risk-taking behaviors. The difference between studies may be attributable to the choice of analytic strategy employed. In prior studies (e.g., Bauermeister et al., 2012; Missildine et al., 2005), researchers used multiple linear regression to examine the independent association between limerence and risk behavior in their models, whereas our structural equation modeling approach offered us an opportunity to test all the relationships proposed in our model simultaneously. In so doing, we found evidence to suggest that limerence contributes *indirectly* to sexual risk-taking by contributing to YMSM's limited self-efficacy to negotiate safer sex. This indirect

relationship is consistent with prior research using the dual process model (Gerrard et al., 2008), suggesting that emotional components may facilitate YMSM's enactment of risk reduction strategies through different pathways than those proposed for cognitive factors. Our hypothesized model was both theoretically aligned and statistically supported; however, as a note of caution, we recognize that testing these pathways in a cross-sectional dataset limits our ability to make causal assertions. Future research testing the dual process model prospectively is warranted. Furthermore, it is possible that limerence only had an indirect association with sexual risk-taking behaviors because our measure captures a diverse set of experiences and beliefs related to partner-seeking behaviors beyond sexual behavior. Therefore, a limerence scale focused on risk-taking behaviors may identify a direct relationship between limerence and sexual risk-taking behaviors in the future.

The current findings on self-efficacy also support previous literature that identifies a connection between self-efficacy to negotiate safer sex and condom use (Bauermeister et al., 2014; Eisenberg, Bauermeister, Pingel, Johns, & Santana, 2011; Mansergh et al., 2010; Rosenthal, Moore, & Flynn, 1991). The current findings build on previous literature by identifying that both cognitive and affective factors are associated with limited safer sex self-efficacy. This is consistent with previous literature that identifies that emotional factors as playing a role in YMSM's sexual risk-taking (Goldenberg et al., 2015; Greene, Andrews, Kuper, & Mustanski, 2014; Mustanski et al., 2014). Although most research on the relationship between emotions and sexual risk-taking among MSM has focused on romantic relationships (Davidovich, Wit, & Strobbe, 2006; Greene et al., 2014; Hoff, Chakravarty, Beougher, Neilands, & Darbes, 2012; Mustanski, Newcomb, Du Bois, Garcia, & Grov, 2011), the current study demonstrates that emotions may be associated with sexual risk-taking in casual relationships too. Previous research has found that YMSM's relationships are complex and dynamic (Goldenberg et al., 2015; Sullivan et al., 2017); therefore, having an understanding of how both cognitive and emotional factors are associated with CAI in a variety of types of relationships is useful for improving interventions that address sexual risk-taking among YMSM. This emphasizes the importance that self-efficacy plays in one's negotiation of safer sex and engagement in sexual risk. It would be useful for additional research to further examine the role of self-efficacy to negotiate safer sex, especially when developing HIV prevention interventions for YMSM.

To reduce the incidence of HIV among YMSM, interventions to address sexual risk-taking must recognize that these behaviors occur in the presence of both cognitive and emotional factors. In particular, it is especially important to understand sexual-risk taking as occurring in the context of both negative and positive cognitive and emotional factors. Since comprehensive sex education is often limited for YMSM (Bauermeister, 2015; Kubicek et al., 2011), programs and interventions that provide knowledge and skills to negotiate safer sex may be especially useful for YMSM. Alongside these cognitively focused strategies, future HIV prevention interventions should include affective strategies that promote YMSM's ability to strengthen their emotional regulation, as our findings also underscored how limerence indirectly contributed to sexual risk-taking by influencing YMSM's decisional balance to use condoms and their safer sex self-efficacy. Building on this approach, Bauermeister and colleagues (2017) recently developed an HIV prevention intervention (myDEx) focused on supporting single YMSM's emotional and cognitive needs

as they engage in online partner-seeking behaviors. Similarly, Newcomb and colleagues (2017) developed and pilot tested a hybrid individual and group HIV prevention program for YMSM couples (2GETHER Intervention), which integrated relationship education as a key component of their program. Results from their pilot program found increases in both cognitive factors (e.g., knowledge, motivations) and affective factors (e.g., investment in the relationship). These programs underscore the value of addressing both cognitive and emotional factors related to HIV risk reduction among YMSM. Future research testing the efficacy of these and other programs are warranted.

This study has some limitations. Data are cross-sectional and therefore it is not possible to make causal inferences. In addition, it may be useful to measure additional variables (e.g., access to condoms, power dynamics between sex partners) to better understand what other factors may be associated with sexual risk-taking and self-efficacy to negotiate safer sex. Decisional balance is measured on single continuum, based on an individual's motivations for using condoms vs. not using condoms. While this scale is useful for weighing the motivations of condom use vs. non-condom use, a measure across two separate continuums (one examining the pro's of condom use and one examining the con's of condom use) may highlight the nuances of an individual's attitudes towards condoms. In addition, this study excluded individuals living with HIV and only included individuals with a known negative HIV sero-status (based on a recent test) and individuals who had never been tested for HIV. Experiences with sexual risk-taking among individuals living with HIV are expected to be different from individuals who are not living with HIV or who do not know their status. However, the sample of YMSM who reported living with HIV (n=22) was too small to examine differences by HIV status and therefore these participants were excluded from the study. Future research should address how HIV testing and HIV sero-status play a role in both cognitive and emotional factors related to sexual risk-taking behaviors among YMSM. Finally, data were collected prior to the release of CDC guidelines about pre-exposure prophylaxis (PrEP) in 2014. PrEP-based strategies may circumvent some of the cognitive and emotional challenges experienced by YMSM when seeking to negotiate condoms with partners. Future research examining the relationships between cognitive and emotional factors and PrEP use may also be warranted.

Despite these limitations, this study also has many strengths. Data are based on a geographically diverse sample of YMSM in the United States. This study examines self-efficacy and sexual risk-taking across specific sexual behaviors and includes insertive and receptive anal sex. In addition, because this study utilizes structural equation modeling, it accounts for the relative difference in errors between variables.

Overall, this study provides a useful understanding of how both cognitive and emotional factors play a role in sexual risk-taking behaviors among YMSM. Both emotional and cognitive factors were significantly associated with sexual risk-taking, highlighting the importance of applying a cognitive-affective dual-process model when examining sexual risk-taking behaviors among YMSM. Theoretical frameworks that do not consider how both cognitive and emotional factors play a role in sexual decision-making may have diminish the optimal efficacy of sexual risk reduction interventions for YMSM. HIV prevention interventions and HIV prevention messaging should consider both cognitive and emotional

factors related to sexual risk-taking behaviors. Future research examining the dual-process model for HIV risk reduction is warranted, as it may inform the inclusion of new affective and cognitive strategies to support YMSM in their risk reduction efforts.

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Figure 1.
Hypotheses for structural equation model Notes. Circles represent latent constructs. Each path is shown with a hypothesized direction of association. Double arrow curves are correlations.

Figure 2. Structural equation model (standardized beta coefficients) examining cognitive and emotional correlates of sexual risk among YMSM (N=1,084) Notes. Circles represent latent constructs. Model adjusted for race/ethnicity, sexual orientation, and age. Each path shown represents standardized coefficients. Double arrow curves are correlations. All solid paths are statistically significant at 0.05. Yuan & Bentler $\chi^2(51, n=1,084)= 458.58, p<.001$. NFI=. 92, CFI=0.93, RMSEA=0.09 (0.08, 0.09).

Table 1:

Descriptive Statistics for a sample of 1,084 single YMSM recruited across the U.S.

		% (n)	Mean (SD)	Range
Age			20.88 (1.92)	18 to 24
Race/Ethnicity				
	White	66.05% (716)		
	Black	9.69% (105)		
	Hispanic	16.61% (180)		
	Other	7.66% (83)		
Sexual Orientation				
	Gay	1016 (93.7%)		
	Bisexual or Other	68 (6.3%)		
Decisional Balance to Forego Condoms			-0.04 (1.12)	-3 to 3
Limerence			2.97 (0.90)	1 to 4
Limited self-efficacy for safer sex negotiation				
	During receptive sex		4.14 (1.34)	1 to 6
	During insertive sex		4.30 (1.49)	1 to 6
CAI partners (prior two months)				
	Receptive sex		1.44 (7.14)	0 to 40
	Insertive sex		0.95 (3.77)	0 to 35

Table 2.

Decomposition of Standardized Effects

Outcome	Predictor	Total Effects	Direct Effects	Indirect Effects (via self-efficacy)
Self-Efficacy	Decisional Balance	.168	.137*	
	Limerence	.192	.210*	
Sexual Risk	Decisional Balance	.491	.475*	.016*
	Limerence	.013	-.004	.017*
	Self-Efficacy	.092	.092*	

Notes.
* p .05