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Evaluating the Relationship-Oriented Information, Motivation, and Behavioral Skills model of HIV preventive behaviors in young men who have sex with men

Kathryn Macapagal, PhD^{1,3}, George J Greene, PhD¹, Katie Andrews, MA, M.Ed.^{1,2}, and Brian Mustanski, PhD¹

¹Department of Medical Social Sciences, Northwestern University Feinberg School of Medicine

²Department of Medicine, Division of Hospital Medicine, Northwestern University Feinberg School of Medicine

Abstract

Most HIV infections among young men who have sex with men (YMSM) occur within primary partnerships. Research on YMSM's knowledge, motivation, and behavioral skills regarding relationship-related HIV prevention, and how these correspond to HIV risk and partnership characteristics, is limited. We examined links among the Relationship-Oriented Information-Motivation-Behavioral Skills (RELO-IMB) model, relationship characteristics, and HIV risk in 96 YMSM. Condomless sex with a primary partner was associated with low relationship-related HIV preventive information, motivation, and behavioral skills. Lack of HIV testing and alcohol use before sex were associated with low behavioral skills. In multivariate analyses, behavioral skills were the only consistent predictor of these outcomes. Regarding relationship characteristics, feeling trapped in the relationship or being physically abused by a partner was associated with low motivation and behavioral skills. The RELO-IMB model can be used to understand HIV risk in relationships and points to targets for relationship-specific HIV prevention education for YMSM.

Keywords

Sexual behavior; interpersonal relationships; young men who have sex with men (MSM); sexual partners; HIV

Young men who have sex with men (YMSM) are disproportionately affected by HIV, accounting for over 70% of diagnoses among youth in the United States (CDC, 2012). As many as 80% of HIV infections among YMSM aged 18 to 24 occur in the context of primary sexual partnerships (Sullivan, Salazar, Buchbinder, & Sanchez, 2009), suggesting that relationship factors may underlie elevated HIV risk among this group (Crepaz et al., 2000; Mustanski, Newcomb, & Clerkin, 2011). To date, the few studies that have investigated theoretical models of relationship-related HIV risk have focused on heterosexual adults (Harman & Amico, 2009; Longmore, Johnson, Manning, & Giordano, 2012), and adult

³To whom correspondence should be addressed at Department of Medical Social Sciences, Northwestern University Feinberg School of Medicine, 625 N. Michigan Ave., Suite 2700, Chicago, IL 60611; kathryn.macapagal@northwestern.edu; phone: 312.503.3605; fax: 312.503.4800 .

MSM between ages 30 to 40 (e.g., Mitchell, Harvey, Champeau, & Seal, 2012; Starks, Gamarel, & Johnson, 2014). As such, there is a pressing need to understand mechanisms by which relationship factors increase the risk of condomless anal sex among YMSM, which would shed light on targets for developmentally appropriate, relationship-centered HIV prevention interventions for this population. This study sought to explore the applicability of the Relationship-Oriented Information, Motivation, and Behavioral Skills model (RELO-IMB) (Harman & Amico, 2009; Misovich, Fisher, & Fisher, 1997) to predicting HIV preventive behavior among YMSM. We also sought to explore whether relationship characteristics previously linked with HIV risk behavior among YMSM also may be associated with differences in RELO-IMB factors in this population.

The Relationship-Oriented Information-Motivation-Behavioral Skills Model

The Information-Motivation-Behavioral Skills (IMB) model proposes that general knowledge about HIV prevention, motivation to adopt HIV preventive behaviors, and HIV preventive behavioral skills and self-efficacy underlie an individual's likelihood of engaging in these behaviors (Fisher & Fisher, 1992). While the IMB model has garnered substantial empirical support, including at least one study with YMSM (Fisher, 2012), most studies have focused on applying this model to understanding cognitive and behavioral antecedents of sexual risk among individuals who were not in relationships. A relationship-centered adaptation of the IMB model by Misovich et al. (1997) postulated that when individuals have sex in the context of intimate relationships, a different constellation of HIV prevention related knowledge, motivation, and behavioral skills *specific to HIV prevention with a main partner* (rather than HIV prevention with casual sex partners, or HIV prevention motivation in general) becomes relevant. This model proposes that 1) the Information construct should address implicit personality theories of partner HIV risk (e.g., judging partner risk based on visible or inferred characteristics) and HIV prevention heuristics about sexual risk in relationships (e.g., "Known partners are safe partners"); 2) the Motivation construct should address attitudes towards prevention within relationships, perceived social support for HIV prevention within a relationship, and motivation to use condoms with a main partner; and 3) the Behavioral Skills construct should address skills to negotiate preventive behaviors with a partner and self-efficacy for adopting those behaviors.

Despite this model's clear theoretical relevance to understanding the cognitive factors that may heighten risk of HIV transmission in relationships, it has received little empirical investigation. The only empirical test of this model to date found that the RELO-IMB constructs performed significantly better than the traditional IMB at predicting condomless sex among partnered individuals when examined in both individual- and dyadic-level analyses (Harman & Amico, 2009). As this study was limited to heterosexual couples, research is needed to investigate the applicability of the RELO-IMB model to YMSM, as well as to examine the extent to which the RELO-IMB constructs are predictive of sexual risk behavior within YMSM's primary partnerships.

Relationship characteristics and the RELO-IMB model

HIV risk behavior among MSM and YMSM has been linked with positive aspects of relationships, such as relationship seriousness (Greene, Andrews, Kuper, & Mustanski, 2014; Mustanski et al., 2011), relationship satisfaction (Darbes, Chakravarty, Neilands, Beougher, & Hoff, 2014; Starks et al., 2014) and monogamous relationship agreements (Greene et al., 2014). These relationship features can discourage condom use through beliefs that condoms reflect a lack of trust in one's partner, or the assumption that sex with a primary partner is safe (Kubicek et al., 2008). Moreover, an emerging line of research links elevated HIV risk in YMSM with problematic relationship characteristics, including feeling trapped (Mustanski et al., 2011) and experiencing intimate partner violence (IPV) (Miller, Reed, McNall, & Forney, 2013). These negative relational factors impact YMSM's perceived ability or motivation to adopt or advocate for safer sex behaviors with one's partner. These findings suggest that cognitive factors reflected in the RELO-IMB model may be potential mediators of the association between positive and negative partnership characteristics and HIV risk behaviors. Thus, exploring relationships between partnership characteristics and RELO-IMB factors can shed light on mechanisms through which relationship factors may increase HIV risk in YMSM.

The primary aims of this study were to assess the psychometric properties of the RELO-IMB model among YMSM and to examine cross-sectional and longitudinal relationships between RELO-IMB factors and sexual risk behaviors. A secondary aim was to explore associations between the RELO-IMB factors and relationship characteristics linked with HIV risk among YMSM. This study presents vital first steps toward providing support for a theoretical framework that may explain connections between relationship characteristics and HIV risk among YMSM and identify targets for relationship-focused HIV preventive interventions for this population.

Methods

Participants were YMSM enrolled in Project Q2, a longitudinal cohort study of LGBT youth (Mustanski, Garofalo, & Emerson, 2010). Inclusion criteria for Project Q2 at enrollment included being between ages 16 to 20 years, and identifying as gay, bisexual, or transgender, or having reported same-sex attraction or behavior. Data were collected during the 42-month ($n = 90$) and 48-month follow up ($n = 94$). Because several participants were available at only one of the two time points, sample size varied slightly between waves, with 96 total participants completing at least one wave of data collection. To increase power, all descriptive statistics and cross-sectional analyses include participants' first available data point, except where noted. Analyses focused only on participants who were assigned male at birth. Participants' mean age was 22.6 ($SD = 1.7$ years). Most identified as gay or bisexual (90%) and male (85%). Nearly half of the participants were Black (48%), with the remaining participants identifying as multiracial or from other racial/ethnic backgrounds (21%), White (20%), and Hispanic or Latino (12%). Most reported stable housing (96%) and were at least high school graduates (86%). Of the 87 participants who disclosed their HIV status, 15 (17%) were HIV-positive. Excluding participants who were transgender or HIV-positive did not alter the pattern of results.

Measures

Demographics—Participant demographics, including sexual orientation, gender identity, living situation, and current level of education, were reported at each study visit.

Sexual health and HIV risk behavior—The *HIV-Risk Assessment for Sexual Partnerships* (H-RASP; Mustanski, Starks, & Newcomb, 2014) assesses sexual behaviors and situational and contextual variables of up to three sexual partnerships during the 6 months prior to the interview. The HIV risk outcomes in this study included whether the respondent ever had condomless anal sex with their three most recent partners (0 = never had, 1 = ever had), and whether they ever used drugs or alcohol before having sex with those partners (0 = never used, 1 = ever used). Participants also reported the number of HIV tests received in the past 6 months.

Relationship characteristics—The H-RASP also assesses relationship characteristics on a partner-by-partner basis. Two items assessed physical and sexual abuse, and one item asked whether participants felt trapped in their relationship. Each item was collapsed across participants' partnerships and dichotomized (0 = never experienced, 1 = ever experienced). Relationship seriousness also was assessed for each partner (0 = casual, 1 = serious). A serious partner was defined as "someone you've had vaginal, anal, or oral sex with and someone with whom you've had an ongoing relationship, like a lover, boyfriend or girlfriend, or someone you dated for a while and feel very close to," whereas a casual partner was "someone you have had vaginal, anal, or oral sex with occasionally or even just one time." Only data from participants' current or most recent male partnership was used for analyses, as collapsing this variable across partnerships was not meaningful.

The 7-item *Relationship Assessment Scale* (RAS; Hendrick, 1988) measures respondents' relationship satisfaction, how much respondents love their partner, and perceptions of problems in the relationship and regretting the relationship. Items are scored on a 5-point Likert scale, with anchors varying across items. Higher mean scores indicate greater relationship satisfaction. Cronbach's α in this study was .89.

The *sexual agreement* for participants' most recent relationship was assessed during both time points using an item from Hoff, Beougher, Chakravarty, Darbes, and Neilands (2010): "Which one of the following scenarios best describes the sexual agreement that you and your current or most recent partner have?" Options were: no sex with outside partners, sex with outside partners with restrictions, sex with outside partners with no restrictions, or no agreement.

HIV information, motivation, and behavioral skills—The 27-item *RELO-IMB* scale assessed participants' information, motivation, and behavioral skills related to HIV prevention in the context of primary sexual partnerships. The research team developed a measure to test the RELO-IMB with items derived from the Health and Relationships Survey (Misovich, Fisher, & Fisher, 1998) and the HIV/AIDS Motivation and Behavioral Skills Scale (Kalichman, Picciano, & Roffman, 2008). Items focused on relational aspects of HIV risk including HIV prevention heuristics and assumptions about HIV risk with a partner

(e.g., “When you feel you have gotten to know someone very well, you no longer need to practice safe sex with them”).

The *Information* construct was measured by five items that assessed respondents’ knowledge and beliefs about HIV prevention in a relationship (Misovich et al., 1998). Each item consisted of an incorrect statement (e.g., “If two people have sex only with each other, they really do not have to practice safer sex”) and was scored on a 5-point Likert scale (1 = strongly agree, 5 = strongly disagree). An answer of 5 was considered correct (1) and all other responses were considered incorrect (0). Items were summed with scores representing the total number of correct responses. Cronbach’s α in this study was .70.

The *Motivation* construct was measured by three scales: *Attitudes toward HIV prevention acts* included four items assessing perceptions about safe sex discussions, asking one’s partner to get an HIV test, and always using condoms with one’s partner, among others (Misovich et al., 1998). Participants completed item stems (“Asking my partner(s) to get an HIV test would be...”) using a 5-point Likert scale (1 = very good, 5 = very bad). *Subjective norms regarding HIV prevention acts* included four items assessing perceived social support for HIV preventive behaviors (“Most people who are important to me think I should try to persuade my partner to practice only safer sex.”) (Misovich et al., 1998). Items were scored on a 5-point scale (1 = very true, 5 = very untrue). *Motivation to use condoms* (Kalichman et al., 2008) consists of four items assessing condom use likelihood (“How likely is it that you will not use condoms because your partner won’t trust you if you ask to use condoms?”) scored on a 5-point scale (1 = very unlikely, 5 = very likely). Responses were reverse scored and higher mean scores indicated more positive attitudes or higher levels of motivation. Cronbach’s α for these scales ranged from .66-.77.

The *Behavioral Skills* construct was measured by three scales from Misovich et al. (1998). *Perceived difficulty of HIV prevention behaviors* includes six items that assess participants’ confidence in their ability to engage in preventive behaviors in various contexts (e.g., “How hard would it be for you to make safer sex with latex condoms sexually exciting for your partner?”, “How hard would it be for you to use a condom with your partner while under the influence of alcohol or drugs?”) scored on a 5-point scale (1 = very hard, 5 = very easy). The two remaining scales assessed participants’ actual behaviors. Two items assess whether in the past month participants have had *safer-sex discussions* with a partner or attempted to persuade their partner to practice safer sex (1 = no, 2 = yes, or not applicable). *Condom accessibility* includes two items that assess whether in the past month participants bought condoms, and whether participants kept condoms handy. Although these final two items do not reference a partner, individual-level behaviors are important for enacting safer sex in relationships (Misovich et al., 1998) and were retained. Items are rated on a 4-point scale (1 = often, 4 = never) and reverse-scored to indicate higher frequency of safe sex behaviors. For each scale, higher mean scores indicated greater confidence in or having engaged in preventive behaviors. Cronbach’s α ranged from .59 to .80, with lower reliability in the *Safer-sex discussions* and *Condom accessibility* scales, which had fewer items. As scales with few items tend to produce lower reliability estimates, low alphas were not unexpected (Cortina, 1993).

Procedure

The university's Institutional Review Board approved all study procedures. Participants provided informed consent upon arrival and completed all measures on a computer. Participants first answered demographic items and the RELO-IMB measure, and then those who reported being in a relationship in the 6 months prior to the assessment date completed measures specific to their most recent relationship (i.e., H-RASP, RAS, relationship agreement). Participants in a relationship at the time of the assessment ($n = 48$) responded to items based on that relationship, while those not in a relationship ($n = 44$) reported on their most recent relationship. Nine participants were not in a relationship in the last 6 months and were not administered partner-specific measures. Each assessment lasted 60 minutes and participants were compensated \$30. Six months later, participants completed additional measures for the 48-month follow up.

Data analysis

We conducted psychometric analyses on the RELO-IMB to examine the factor structure and internal consistency at the 42-month assessment, and the stability of the RELO-IMB across the 42- and 48-month assessments. Using correlations and logistic regression, we examined cross-sectional associations between participants' RELO-IMB factor scores and sexual risk behaviors. We also examined longitudinal associations between RELO-IMB data at 42 months and sexual risk behavior at 48 months. Finally, exploratory analyses using one-way ANOVAs investigated whether RELO-IMB scores were linked with relationship agreement type and positive and negative relationship characteristics previously associated with HIV risk behavior.

Results

Table 1 shows relationship characteristics stratified by relationship status. Participants in a relationship at the time of assessment were more likely to be in serious, monogamous, and longer partnerships, and more likely to report having condomless sex with their partners relative to participants who were reporting on their most recent relationship. A minority of participants (19%) were in the same relationship across both waves.

RELO-IMB psychometric properties

Descriptive statistics and psychometric properties for the 42-month assessment are in Table 2. Exploratory factor analysis (EFA) using principal axis factor extraction conducted on the Information scale yielded a one-factor solution, as did the EFA on the Motivation subscales. EFA with varimax rotation on the Behavioral Skills subscales extracted two factors reflecting *Perceived difficulty of HIV prevention behaviors* and *Preparedness for HIV prevention behaviors*. The latter was comprised of the safer-sex discussions and condom accessibility subscales. Factor scores were created for the Motivation and Behavioral Skills constructs by taking the mean of items that loaded onto each factor. Participants had high motivation, low perceived difficulty of HIV prevention behaviors, and moderate levels of information and preparedness for HIV prevention behaviors. The RELO-IMB factors demonstrated good internal consistency, except for the 4-item *Preparedness for HIV prevention behaviors* factor. Scale stability across the two timepoints 6 months apart was

moderate ($r_s = .44-.63$), likely reflecting some stability in beliefs as well as potential changes in beliefs related to different partnerships.

RELO-IMB factors as a predictor of HIV risk: Cross-sectional and longitudinal models

As RELO-IMB factor scores did not significantly differ by relationship status (i.e., participants' current or most recent relationship), the remaining analyses collapse across this variable. Correlations for participants' first available RELO-IMB scores, HIV risk behaviors, and HIV testing are in Table 3. The RELO-IMB factors were significantly correlated with each other, except for information and preparedness for HIV prevention behaviors, and each RELO-IMB factor was significantly correlated in the expected directions with having had condomless sex. HIV testing and drug and alcohol use before sex were linked with behavioral skills.

Logistic regressions adjusted for age, race, and relationship status were conducted to examine whether the RELO-IMB factors together predicted the four outcomes (Table 4). In the multivariate model predicting condomless sex with a primary partner, perceived difficulty of HIV prevention behaviors was the only significant RELO-IMB factor, with lower perceived difficulty decreasing the odds of condomless sex by 69% (OR: .31; 95% CI: 0.11-0.89).

The logistic regression predicting having been tested for HIV in the past six months also was significant. Lower perceived difficulty of HIV prevention behaviors was the only significant RELO-IMB factor and increased the odds of being tested for HIV (OR: 2.46; 95% CI: 1.10-5.51). Race was also a significant predictor of having had an HIV test, with Black participants being more likely to be tested than non-Black participants (OR: 3.21; 95% CI: 1.13-9.16).

The regression on alcohol use before sex with a primary partner in the past six months was significant. Lower perceived difficulty of HIV prevention behaviors decreased the odds of having consumed alcohol before sex by 81% (OR: .19; 95% CI: 0.07-0.54), while greater preparedness for HIV prevention behaviors increased the odds (OR: 3.11; 95% CI: 1.31-7.38). The regression on drug use before sex was not significant.

We then examined longitudinal relationships between RELO-IMB at 42 months and sexual risk at 48 months. RELO-IMB was significant only in the regression on alcohol use before sex, $\chi^2 (7, N = 62) = 14.11, p = .049$. Lower perceived difficulty of HIV prevention behaviors at 42 months predicted an 80% decrease in the odds of drinking alcohol before sex at 48 months (OR: .20; 95% CI: .06-.64; $B = -1.62, SE = .59, p = .006$); greater motivation at 42 months increased the odds (OR: 3.77; 95% CI: 1.07-13.31; $B = 1.33, SE = .64, p = .04$).

Associations between RELO-IMB factors and relationship characteristics

Finally, we explored associations between RELO-IMB scores and relationship characteristics previously linked with HIV risk. Participants reporting on a casual relationship had higher motivation ($M = 4.57, SE = .08$) than those in serious relationships ($M = 4.05, SE = .11; F(1,81) = 14.47, p < .001$). Those who were hit by a partner in the past six months reported greater perceived difficulty of HIV preventive behaviors ($M = 3.94, SE$

= .23) than those who had not ($M = 4.33$, $SE = .08$; $F(1,85) = 3.94$, $p = .049$). Relatedly, participants who reported being forced to have sex by a partner had lower levels of motivation (forced sex: $M = 3.44$, $SE = .54$ vs. no forced sex: $M = 4.29$, $SE = .07$; $F(1,85) = 4.75$, $p = .03$) and greater perceived difficulty of HIV preventive behaviors (forced sex: $M = 3.22$, $SE = .82$ vs. no forced sex: $M = 4.30$, $SE = .07$; $F(1,85) = 6.71$, $p = .01$). Likewise, those who felt trapped in the relationship reported lower levels of motivation (felt trapped: $M = 3.99$, $SE = .23$ vs. did not feel trapped: $M = 4.39$, $SE = .07$; $F(1,77) = 4.58$, $p = .04$) and greater perceived difficulty (felt trapped: $M = 3.98$, $SE = .24$ vs. did not feel trapped: $M = 4.37$, $SE = .08$; $F(1,77) = 3.97$, $p = .05$). Relationship length, satisfaction, and agreement type were not significantly related to the RELO-IMB factors.

Discussion

HIV incidence among YMSM in the United States remains high, with a substantial proportion of infections occurring within established sexual partnerships (Goodreau et al., 2012; Sullivan et al., 2009). Using a theoretical framework to understand how cognitive factors related to relationship involvement may produce increased HIV risk is critical for guiding future research in this area, and may also identify targets for relationship-centered HIV preventive interventions for YMSM. This study was the first to explore the applicability of the RELO-IMB model to YMSM and its associations with relationship dynamics linked with increased HIV risk.

Results extended previous work on the relationship-oriented IMB model (Harman & Amico, 2009; Misovich et al., 1997) and provided support for its use in YMSM. Psychometric analyses indicated that the RELO-IMB measure was reliable and possessed the hypothesized factor structure. Scores reflected high HIV prevention motivation and perceived ease of engaging in preventive behaviors, moderate levels of HIV prevention information, and low-to-moderate preparedness to enact HIV preventive behaviors in this sample. Analyses indicated that scores on the RELO-IMB measure may fluctuate over time, and may depend on whether respondents are in the same relationship across measurements and characteristics of those relationships.

RELO-IMB and HIV risk behavior

RELO-IMB factors were correlated in the expected directions with condomless sex. In regression models, behavioral skills – namely greater perceived difficulty of HIV prevention behaviors – were the only consistent predictor of sexual risk. This is consistent with Misovich et al. (1997), who postulated that behavioral skills mediate the effects of relationship-related HIV prevention information and motivation on HIV risk behavior. Unlike Harman and Amico (2009), low motivation was not a significant predictor of condomless sex in multivariate models. This discrepancy may be attributed to differences in individual vs. dyadic approaches to examining the RELO-IMB model, as motivation may be more likely to influence HIV risk behavior in dyadic analyses through couples' shared social norms, beliefs, and attitudes about safer sex in relationships (Harman & Amico, 2009). Findings suggest that enhancing HIV risk reduction skills in relationships may be valuable in interventions for YMSM. For instance, couples may benefit from practicing discussions

about condom use, pre-exposure prophylaxis (PrEP), or couples HIV testing, which could increase couples' safer sex self-efficacy. Such skills practice may reduce the perceived difficulty of HIV preventive behaviors with a primary partner.

Unexpectedly, greater preparedness for HIV prevention behaviors predicted a greater likelihood of having used alcohol before sex; relatedly, greater motivation predicted alcohol use before sex in longitudinal analyses. These factors assessed whether participants discussed safer sex behaviors with their partner, bought condoms, or kept condoms accessible in the past month, as well as perceived social norms and motivation to use condoms. It is possible that possessing adequate motivation and behavioral skills related to condom use may not always translate into other safe sex behaviors such as avoiding alcohol in sexual situations. Moreover, feeling prepared to use condoms may inadvertently make YMSM feel that they have mitigated the potential risks of infection, especially among late adolescents and emerging adults who may be more prone to a sense of invulnerability regarding HIV and STI risk (Millstein & Halpern-Felsher, 2002). Given elevated rates of condomless sex under the influence among YMSM (Newcomb, Clerkin, & Mustanski, 2011), results point to a need for education to address YMSM's potential overestimations of preparedness to use condoms when drinking alcohol. Finally, there were few other significant relationships between 42-month RELO-IMB scores and 48-month outcomes. This is unsurprising, as most participants were not in the same relationship across study waves, and results suggest that RELO-IMB scores vary according to participants' relationship qualities and contexts rather than being stable individual characteristics.

RELO-IMB and relationship factors

The RELO-IMB factors were associated with relationship qualities tied to elevated HIV risk in couples. Findings suggested that relative to those reporting on casual relationships, YMSM in serious relationships may hold the common misconception that "known partners are safe partners" (Misovich et al., 1997, p. 88) and experience decreased motivation to continue condom use. As younger MSM tend to quickly view relationships as "serious" and stop using condoms shortly after dating (Mustanski et al., 2011), findings suggest a need to educate YMSM and their partners about effective ways to communicate seriousness in their relationship without putting themselves at risk for HIV. In addition, lower motivation and behavioral skills were linked with negative relationship factors, reflecting research showing that low power in one's relationship and experiences of IPV reduce confidence in YMSM's ability to advocate for condom use (e.g., Kubicek, McNeeley, & Collins, 2014). As MSM experience high rates of IPV (Buller, Devries, Howard, & Bacchus, 2014), further testing of this model in YMSM is needed to identify intervention targets aimed at IPV and/or HIV risk reduction.

Finally, relationship satisfaction and relationship agreement type were not significantly related to the RELO-IMB factors, which was surprising given mounting evidence linking these factors with increased HIV risk (Davidovich, De Wit, & Strobbe, 2006; Mitchell & Petroll, 2013). However, unlike other theoretical frameworks applied to research on HIV risk in partnered MSM (e.g., Mitchell et al., 2012), the RELO-IMB model does not explicitly account for relationship processes and contexts. Further research may consider extending

this model to account for relationship characteristics as possible mediators or moderators of the IMB factors.

Limitations, strengths, and future directions

Findings should be considered in context of several limitations. First, due to the sample size, findings should be considered preliminary evidence to stimulate hypotheses in future work on the RELO-IMB, relationship characteristics, and HIV risk in YMSM. Second, the sample consisted mostly of YMSM in their early twenties, most whom were HIV-negative, reported monogamous agreements, and shorter relationships. As such, findings may not generalize to older MSM who may be more likely to have longer relationships and non-monogamous agreements (e.g., Brady, Iantaffi, Galos, & Rosser, 2013), as well as couples in which at least one partner is HIV-positive, which can differentially impact attitudes toward and perceived difficulty of using condoms. Relatedly, since few were in the same relationship across waves, we could not conduct adequately-powered analyses to examine whether RELO-IMB factors change within relationships over time. Third, unlike Harman and Amico (2009), we collected individuals' rather than couples' reports of relationship characteristics, so findings do not account for partner interdependence on each individual's information, motivation, and behavioral skills, nor did we account for structural variables that might impact HIV risk. Future interventions may consider using this model together with others that account for factors beyond the level of the individual. Fourth, participants who were not in a relationship at the time of the assessment were asked to answer items based on their most recent relationship. While ratings may have been affected by recall bias, excluding these participants did not affect the results.

Despite these limitations, our study had several strengths. First, participants were an ethnically and racially diverse sample of YMSM whose relationships varied in length and seriousness. Second, we chose measures that assessed knowledge, motivation, and behavioral skills specifically in the context of participants' current or most recent partnerships, rather than using a more general measure of the IMB factors to test the RELO-IMB model (e.g., Harman & Amico, 2009). Third, we examined how negative relationship factors such as IPV were linked to the RELO-IMB model, which provides a foundation for future studies to evaluate causal mechanisms underlying the relationship between IPV and HIV risk in YMSM.

Our findings suggest several directions for future research. First, further confirmation of this model using path analyses or structural equation modeling in a larger sample of YMSM and older MSM is warranted. Second, as several relationship factors associated with elevated HIV risk in other studies were not significantly correlated with the RELO-IMB, one may consider expanding this model to account for relationship processes that may moderate the RELO-IMB factors among YMSM. Third, studies should measure RELO-IMB among young couples when they begin dating and reassess throughout their relationship to examine changes in the factors as couples become more serious, as relationship agreements change, or as they begin dating new partners. This work could identify whether different partnership characteristics or RELO-IMB factors predict changes in HIV risk over time. Fourth, our sample consisted of several transgender individuals and participants living with HIV but was

not sufficiently powered to examine the RELO-IMB and its correlates in these subgroups. Though the pattern of results did not differ when excluding these participants, additional studies are needed as relationship dynamics and HIV risk behaviors differ among MSM in serodiscordant relationships (Darbes et al., 2014; Poppen, Reisen, Zea, Bianchi, & Echeverry, 2005) and research on this topic in transgender persons is limited (Herbst et al., 2008). Fifth, future versions of relationship-oriented IMB measures may consider assessing HIV risk behaviors other than condomless sex, as well as knowledge and uptake of HIV preventive behaviors beyond condoms (e.g., PrEP).

Finally, skills-based, psychoeducational HIV prevention programs for young male couples should use techniques such as motivational interviewing and communication skills training to increase motivation and behavioral skills specific to prevention with their primary partner. For example, communication skills practice could focus on encouraging partners to assert their sexual health preferences to each other clearly and respectfully, problem-solving barriers to these behaviors and identifying factors that can facilitate adaptive sexual health behavior, and negotiating achievable HIV prevention goals informed by both partners' preferences. In addition, eliciting the couple's motivations for improving their sexual and relationship health, and adjusting norms about safer sex in same-sex relationships via discussions with groups of couples, may also increase an individual couple's likelihood of enacting HIV prevention behaviors.

Taken together, ours was the first study to evaluate the applicability of the RELO-IMB model in YMSM, and results indicate that this model can be used to understand potential cognitive and behavioral mediators of HIV risk among YMSM. Findings point to several avenues for further research on this model in YMSM, and with replication, may shed light on key mechanisms to target in relationship-centered HIV prevention interventions in YMSM.

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Table 1

Characteristics of participants' current or most recent relationships.

	<i>n</i>	Total	Currently in relationship	Not currently in relationship
		<i>M (SD)</i>		
Relationship Assessment Scale	64	3.74 (0.94)	3.82 (0.89)	3.48 (1.06)
		<i>%</i>		
Relationship length ^a	78			
3 months		42.3	27.9	60.0
4-6 months		6.4	4.7	8.6
7-11 months		10.3	14.0	5.7
1 year		41.0	53.5	26.7
Relationship seriousness ^a	82			
Casual		43.9	18.2	73.0
Serious		56.1	81.8	27.0
Relationship agreement ^a	64			
No agreement/Non-monogamous		34.4	27.1	56.3
Monogamous		65.6	72.9	43.8
		<i>% endorsing item</i>		
Had HIV test in last 6 months	92	69.6	66.7	72.7
H-RASP items				
Had condomless sex ^a	84	53.6	66.7	38.5
Drank alcohol before sex	83	63.9	66.7	60.5
Used drugs before sex	83	45.8	50.0	41.0
Hit, slapped, punched, or hurt by partner	85	17.6	20.0	15.0
Forced to have sex by partner	85	3.5	2.2	5.0
Felt trapped in relationship	78	19.2	22.2	15.2

Note. Participants who were not in a relationship at the time of data collection reported on their most recent relationship. All relationship variables based on first available data. *N*s vary due to participants who declined to respond and/or due to survey branching, in which only participants who were in a relationship within 6 months of the assessment date were given the H-RASP, and only participants who completed the RAS were given the relationship agreement measures.

^aDifferences between participants currently in relationship vs. participants reporting on most recent relationship significant at $p < .05$ or less, two-tailed

RELO-IMB descriptive statistics and psychometric properties among young men who have sex with men.

Table 2

RELO-IMB Factors	42 months (n = 90)						42m-48m stability (n = 86)		
	Min	Max	Mean	SD	α	Eigenvalue	Variance explained	Item loadings	r
Information	0.00	5.00	2.84	1.57	0.70	1.60	32%	.52-.64	.44 ^a
Motivation	2.50	5.00	4.46	0.66	0.82	3.52	29%	.37-.67	.47 ^a
Behavioral Skills									
Perceived difficulty	2.17	5.00	4.26	0.75	0.80	2.47	25%	.41-.82	.46 ^a
Preparedness	1.00	4.00	2.35	0.65	0.59	1.43	14%	.46-.65	.63 ^a

^aNote. $p < .001$, two tailed. RELO-IMB scales are keyed such that higher scores indicate more protective information, motivation, or behavioral skills. Separate factor analyses were conducted for each IMB construct.

Table 3

Correlations between RELO-IMB, HIV risk behaviors, and HIV testing among young men who have sex with men.

RELO-IMB Factor	Motivation	Perceived difficulty	Preparedness	Condomless sex	HIV testing	Drinking before sex	Drug use before sex
Information	.38 ^c	.27 ^b	.10	-.34 ^c	-.13	-.02	-.05
Motivation	--	.51 ^c	.26 ^b	-.40 ^c	-.03	.05	.03
Behavioral Skills							
Perceived difficulty	--	--	.32 ^b	-.36 ^c	.20	-.22 ^a	-.12
Preparedness	--	--	--	-.25 ^a	.23 ^a	.23 ^a	.21 ^a

^aNote. *p* .05,

^b*p* .01,

^c*p* .001, two tailed. All outcomes are keyed such that 0 = participant did not report outcome, 1 = participant reported outcome. Sample sizes range from n=85 to n=96 due to participants who responded "Not applicable, I have not had sex in the last month" to items in the Preparedness for HIV Prevention Behaviors factor, participants who declined to respond, or participants who were not currently or recently in a relationship at the time of assessment.

Summary of cross-sectional logistic regression analyses for RELO-IMB factors predicting sexual risk behaviors and HIV testing among young men who have sex with men.

Table 4

Predictors	Condomless sex (<i>n</i> = 84)			HIV testing (<i>n</i> = 92)			Drinking before sex (<i>n</i> = 83)			Drug use before sex (<i>n</i> = 83)		
	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>B</i>	<i>SE</i>	<i>OR</i>	<i>B</i>	<i>SE</i>	<i>OR</i>
Age	-.04	.18	.96	-.15	.17	.86	.09	.17	1.09	-.21	.16	.81
Race	-.83	.56	.44	1.17 ^a	.54	3.21	-.75	.54	.48	-.76	.50	.47
Relationship status	1.03	.57	2.81	-.56	.54	.57	.59	.55	1.80	.43	.51	1.54
Information	-.25	.20	.78	-.25	.19	.78	-.01	.18	0.99	.02	.17	1.02
Motivation	-.93	.56	.39	-.81	.50	.44	.76	.48	2.13	.24	.45	1.27
Behavioral Skills												
Perceived difficulty	-1.18 ^a	.54	.31	.90 ^a	.41	2.46	-1.64 ^b	.52	.19	-.83	.41	.44
Preparedness	-.60	.43	.55	.61	.40	1.83	1.14 ^b	.44	3.11	.98	.43	2.66
Constant	12.38			3.45			-.02			4.62		
χ^2			34.84 ^c			17.88 ^a			19.09 ^b			12.83

Note. All relationship variables based on first available data. *N*s vary due to participants who declined to respond and/or due to survey branching, in which only participants who were in a relationship within 6 months of the assessment date were given the H-RASP. Race and relationship status are coded as follows: 1 = Black, 0 = all other races; 1 = currently in a relationship, 0 = not currently in a relationship.

^a *p* .05,

^b *p* .01,

^c *p* .001, two-tailed.