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Strength of Implementation Intentions to Use Condoms among Men Who Have Sex with Men

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Abstract

Although pre-exposure prophylaxis (PrEP) use is increasing among men who have sex with men (MSM), condoms remain key to HIV prevention. Implementation intentions—which link a behavioral action plan with a situation or cue—may predict condom use. The Strength of Implementation Intentions Scale (SIIS), which assesses condom use implementation intentions, has not been evaluated among MSM. A structural model tested whether the SIIS mediated the relationship between condom use intentions and condomless sex acts among 266 sexually-active MSM (56% White, 26% Black, 15% Latino, $M_{age} = 32.54$). After controlling for PrEP use, HIV-status, and demographics ($\chi^2(107) = 140.06$, CFI = 0.98, TLI = 0.97, RMSEA = 0.03), the SIIS fully mediated the relationship between condom use intentions and condomless sex acts. The SIIS can serve as a fidelity check for interventions, a mediator in theoretical models, and future studies should incorporate implementation intentions into HIV prevention interventions for MSM.

INTRODUCTION

HIV Risk among MSM

In 2015, almost 40,000 people were diagnosed with HIV in the U.S. and among males, men who have sex with men (MSM) accounted for 82% of diagnoses [1]. One in seven MSM who are HIV-positive are unaware of their diagnosis; therefore, they may be unknowingly transmitting HIV to others [2]. While there is interest in biomedical prevention such as pre-exposure prophylaxis (PrEP), condom use remains one of the most important prophylactic methods to reduce the spread of HIV and other sexually transmitted infections (STIs). However, MSM use condoms inconsistently and infrequently, increasing their risk for HIV and other STIs [3]. Understanding the factors that predict condom use may help in designing interventions and health promotion campaigns.

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Informed Consent: This study was reviewed by the Institutional Review Board of the Medical College of Wisconsin. It met the Board's definition of "minimal risk" and a waiver of informed consent was granted.

Intentions and Implementation Intentions

Intentions involve a person instructing them self to perform a desired behavior to reach a goal [4]. For example, people who have higher intentions to use condoms are less likely to have condomless sex [5,6]. However, intentions do not always translate into behavior change [7,8]: a meta-analysis found that a medium-to-large intention effect ($d = 0.66$) led to a small-to-medium behavioral effect ($d = 0.36$) [4]. *Implementation intentions* link an action plan to the performance of a behavior based on a situation or cue: "If situation X occurs, then I will perform behavior Y" [7,9]. For example, "If I'm having sex with a new partner, then I will use a condom." Implementation intentions allow individuals to control their behaviors based on environmental cues [10]. By providing the community and environmental context and situational cues, people have created the *who*, *what*, *when*, and *how* of the behavior they want to perform, increasing the likelihood of performing the actual behavior as compared to developing an intention alone [4,8]. Implementation intentions also explain the limitation of the intention-behavior gap that is common in social cognitive and health behavior theories [11]. As such, this study explored implementations intentions as a mediator between intentions and condom use.

Implementation intentions may be an important predictor of condom use. A meta-analysis found the effect of implementation intention formation on various forms of behavior change to be medium-to-large ($d = 0.65$) [12]. Interventions on implementation intentions have been effective in promoting numerous health behaviors such as healthy eating [13,14], smoking cessation [15], alcohol reduction [16], contraception use [17], and condom carrying behavior [18,19]. However, to our knowledge, implementation intentions and condom use behavior have not been investigated in any MSM population.

Assessment of Implementation Intentions

While implementation intentions have been used as experimental manipulations on a wide variety of behaviors including condom use outside of MSM populations, few studies have *assessed* implementation intentions. Condom use implementation intentions have rarely been assessed, and new scales for implementation intentions have not been tested with MSM. Previous studies developed the Strength of Implementation Intentions Scale (SIIS) for condom use and found it to be psychometrically strong. This scale detected immediate intervention effects and predicted condom use one year later after controlling for baseline condom use among non-injection drug users [20,21]. However, the reliability and predictive utility of the SIIS has not yet been evaluated in a sample of MSM. An implementation intentions scale for condom use that performs well among MSM is desirable, as it could be used as a fidelity check for interventions or as a mediator in theoretical models for HIV prevention.

Overview

MSM are at the greatest risk for HIV and other STIs, and the SIIS is another tool that could be used to increase the understanding of condom use in this population. If the SIIS is shown to have sufficient value in this group, it could be used as a manipulation check or theoretical mediator in future intervention work. The goal of the current study was to test the SIIS in a sample of MSM. We assessed the reliability and factor loadings of the scale. Additionally,

we hypothesized that the SIIS for condom use would predict fewer condomless sex acts among MSM even after controlling for demographic factors, PrEP use, HIV status, and condom use intentions, and that the SIIS for condom use would mediate the relationship between condom use intentions and condomless sex acts.

METHODS

Participants

We initially recruited a sample of 483 participants who were age 18 or older and self-identified as male, a man, or transgender. Participants were excluded if they self-identified as female ($n = 7$), did not report sex with men ($n = 61$), or did not report anal or vaginal sex in the past 3 months ($n = 149$). The analytic sample included 266 MSM who were sexually active within the past three months.

Procedures

Participants were recruited at a community event in a mid-sized Midwestern city in June 2016. Posted signs and research staff invited MSM to participate in a research study. Individuals who were interested were verbally screened to ensure that they were at least 18 years of age, and self-identified as male, a man, or transgender. Eligible individuals were given a survey packet and clipboard where the first page was a description of the study that the participants could keep. No names were requested, and the data were fully anonymous. Since disclosure of sensitive answers was not possible, the study was low risk. Due to the low-risk nature of the study, completion of the survey constituted consent. Research staff were available to answer any questions at any time. Once participants completed their surveys, they were given a resource guide with local services and \$5 for their time and effort. The Medical College of Wisconsin Institutional Review Board approved all procedures.

Measures

Demographic covariates—Participants reported their age, race/ethnicity, income, whether they were single or in an open or monogamous relationship, their current PrEP use, and their HIV status. Race/ethnicity was categorized as White, Black, Latino, and Multiracial/Other. The four race/ethnicity categories were dummy-coded for analyses, with White used as the reference group. Participants were asked what their monthly household income was, and response options were: \$0 – \$1,000; \$1,001 – \$2,000; \$2,001 – \$3,000; \$3,001 – \$4,000; \$4,001 – \$5,000, and \$5,001+. Relationship status was categorized as not in a relationship, in an open relationship (in a relationship and having sex with other people), and in a monogamous relationship. Dummy-codes were created indicating involvement in an open relationship and involvement in a monogamous relationship, with not being in a relationship used as the reference group. Participants were asked if they currently took PrEP and answered either “yes” or “no.” Finally, a dummy variable was created indicating whether participants reported being HIV-positive.

SIIS for condom use—The SIIS for condom use was measured using six items with responses ranging from *strongly disagree* (1) to *strongly agree* (6). The questions were *I*

have made detailed plans:... 1) *about when I will carry a condom*, 2) *about when I will use a condom for vaginal or anal intercourse*, 3) *on where I will keep condoms readily available*, 4) *on what I will say to a partner about using condoms before having sex*, 5) *about what I will do if my partner refuses to use a condom*, and 6) *about when I will put on a condom or offer one to my partner* [21]. The reliability for the SIIS was very good ($\alpha = 0.94$).

Intentions to use condoms—Intentions to use condoms were measured using three items: *I intend on using a condom...* 1) *whenever I have sex with a casual partner*, 2) *if I have sex with someone I just met*, and 3) *if I have sex with a partner whose HIV status I do not know* [22,23]. Responses were *definitely not* (0), *probably not* (1), *probably yes* (2), and *definitely yes* (3). The reliability for the intentions to use condoms measure was good ($\alpha = 0.84$).

Condom use—Participants were asked how many times they had anal or vaginal sex in the past 3 months, which was the total number of sex acts. Then participants were asked of the total number of times they had sex in the past 3 months, how many times they used a condom. The number of acts with condoms was subtracted from the total number of sexual acts to yield a count of condomless sex acts in the past 3 months. Outliers were truncated to three times the interquartile range from the 75th percentile [24] and log transformed.

Data Analysis

Analyses were performed using structural equation modeling (SEM) in Mplus [25]. After fitting a measurement model, we initially fit separate structural models for intentions to use condoms and the SIIS for condom use. These models included paths from intentions/the SIIS to the number of condomless sex acts, and controlled for age, race/ethnicity, income, involvement in an open or monogamous relationship, current PrEP use, and HIV status. We then fit a final structural model testing whether the SIIS mediated associations between intentions to use condoms and condomless sex. This final model, which again included control variables, incorporated paths from intentions to the SIIS and from both intentions and the SIIS to condomless sex. To test mediation, we calculated and tested the significance of the indirect effect of intentions on condomless sex via the SIIS. To increase parsimony, we maintained paths from control variables in all models only if they had associations ($Z > 1$) with intentions, the SIIS, or condomless sex. Multiple imputation (MI), a modern method for dealing with missing data, was used to replace missing covariate values to maintain the maximum sample size [26]. All models were fit using a maximum likelihood estimator with robust standard errors (MLR). Model fit was assessed using traditional fit indices, the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root-mean-square error of approximation (RMSEA). Acceptable fits are indicated by CFI and TLI values over 0.90 and an RMSEA value less than 0.06 [27,28]. Given the use of MI, these fit indices are averages over 100 imputations. We generally report both unstandardized and standardized coefficients. For categorical covariates, we report STDY estimates from Mplus, which can be interpreted as the change in the outcome variable in standard deviation units when the categorical covariate changes from zero to one [25].

RESULTS

Sample Characteristics and Descriptive Information

Sample characteristics and descriptive information are presented in Table 1; a full correlation matrix is included in Table 2. Participants were on average 32.54 years old ($SD = 11.75$, range 18–65), and most participants identified as male (93%), while 7% identified as transgender and <1% identified as other. Over half were White (56%), 26% were Black, 15% were Latino, and 13% identified as multiracial or of other racial/ethnic backgrounds. Most were either not in a committed relationship (46%) or in a committed monogamous relationship (42%); the remainder were in a committed open relationship (13%). A majority of participants (59%) made \$3,000 or less a month. Most participants were not currently taking PrEP (86%). A small number of participants (7%) were HIV-positive. On average, participants engaged in 5.39 ($SD = 6.77$, range 0–21) condomless sex acts in the past 3 months.

Participants had very high intentions to use condoms ($M = 2.56$, $SD = 0.73$, range 0–3) and had strong implementation intentions for condom use ($M = 4.60$, $SD = 1.42$, range 1–6; see Table 1). When responding to each of the SIIS items, the following percentage of participants responded strongly agree to the following items: I have made detailed plans... 1) about when I will carry a condom (38%), 2) about when I will use a condom for vaginal or anal intercourse (49%), 3) on where I will keep condoms readily available (47%), 4) on what I will say to a partner about using condoms before having sex (42%), 5) about what I will do if my partner refuses to use a condom (47%), and 6) about when I will put on a condom or offer one to my partner (46%).

Measurement Model

First, we fit the measurement model, which included the SIIS (with six items as indicators) and condom use intentions (with three items as indicators), as well as the covariance between these constructs. There was a high residual correlation between items 5 and 6 on the SIIS; this correlation was added to the model. As hypothesized, all SIIS factor loadings were positive ($Bs > 0.77$) and significant ($p < 0.0001$). In addition, all three factor loadings for the condom use intention items were positive ($Bs > 0.59$) and significant ($p < 0.0001$). As expected, intentions to use condoms and the SIIS were correlated, $\beta = 0.39$ (0.11), $B = 0.52$ (0.08), $p < 0.001$. Model fit was acceptable, $\chi^2(25) = 55.01$, CFI = 0.97, TLI = 0.95, and RMSEA = 0.07.

Intentions to Use Condoms

A model including intentions to use condoms as a predictor of condomless sex had an acceptable fit, $\chi^2(29) = 38.50$, CFI = 0.97, TLI = 0.96, and RMSEA = 0.04. In terms of covariates, younger MSM reported greater intentions to use condoms, $\beta = -0.08$ (0.04), $B = -0.19$ (0.09), $p < 0.05$. Those in monogamous relationships also reported greater intentions, $\beta = 0.17$ (0.07), $B = 0.34$ (0.13), $p < 0.05$, while those using PrEP reported lower intentions, $\beta = -0.32$ (0.14), $B = -0.63$ (0.23), $p < 0.05$. Older men reported fewer condomless sex acts, $\beta = -0.16$ (0.06), $B = -0.17$ (0.07), $p < 0.05$, and Black MSM reported fewer condomless sex acts than White MSM, $\beta = -0.60$ (0.16), $B = -0.53$ (0.14), $p < 0.001$. MSM in open

relationships and MSM in monogamous relationships both reported more condomless sex acts than those not in relationships, $\beta = 0.61$ (0.20), $B = 0.55$ (0.18), $p < 0.01$ and $\beta = 0.60$ (0.15), $B = 0.54$ (0.14), $p < 0.001$, respectively. Finally, intentions to use condoms were negatively associated with condomless sex acts, $\beta = -0.42$ (0.18), $B = -0.19$ (0.09), $p < 0.05$. The model explained 16% of the variance in condomless sex acts ($p < 0.01$).

SIIS

A model including the SIIS as a predictor of condomless sex fit the data well, $\chi^2(68) = 79.74$, CFI = 0.99, TLI = 0.99, and RMSEA = 0.03. Black MSM reported higher SIIS scores as compared to White MSM, $\beta = 0.49$ (0.21), $B = 0.34$ (0.15), $p < 0.05$. Men who used PrEP and men who were HIV-positive reported lower SIIS scores, $\beta = -0.84$ (0.32), $B = -0.59$ (0.22), $p < 0.01$ and $\beta = -0.70$ (0.33), $B = -0.49$ (0.24), $p < 0.05$, respectively. As hypothesized, stronger implementation intentions to use condoms (i.e., higher SIIS scores) were significantly associated with fewer condomless sex acts, $\beta = -0.22$ (0.05), $B = -0.29$ (0.06), $p < 0.001$. The model explained 21% of the variance in condomless sex acts ($p < 0.001$).

Final Structural Model

The model considering the SIIS as a mediator of the associations between intentions to use condoms and condomless sex acts (see Figure 1) fit the data well, $\chi^2(107) = 140.06$, CFI = 0.98, TLI = 0.97, and RMSEA = 0.03. This model showed that intentions to use condoms were positively associated with the SIIS, $\beta = 1.47$ (0.19), $B = 0.53$ (0.08), $p < 0.001$, and that the SIIS, in turn, were negatively associated with condomless sex, $\beta = -0.22$ (0.07), $B = -0.29$ (0.09), $p = 0.001$. This resulted in a significant indirect effect of intentions on condomless sex via the SIIS, $\beta = -0.33$ (0.12), $B = -0.15$ (0.05), $p < 0.01$. After including the SIIS as a mediator, there was no direct association between intentions and condomless sex, $\beta = -0.01$ (0.23), $B = -0.01$ (0.11), $p = 0.97$, suggesting that the SIIS fully mediated associations between intentions to use condoms and condomless sex. The final model explained 20% of the variance in condomless sex acts ($p < 0.001$).

DISCUSSION

The present study sought to evaluate the factor loadings and reliability of the SIIS among MSM; to determine if the SIIS was associated with condomless sex after controlling for demographic variables, HIV status, and PrEP use; and to assess whether the SIIS mediated the relationship between condom use intentions and condomless sex acts. As hypothesized, all factor loadings for the SIIS were positive and significant, and reliability was high, suggesting good measurement properties for the SIIS among MSM. This supports previous literature that showed good measurement properties among non-injection drug users [21].

Consistent with prior literature, intentions to use condoms were negatively associated with condomless sex [5,6]. Given the increasing popularity of PrEP, our study accounted for participants' use when exploring the associations between condom use intentions, the SIIS, and condomless sex acts. Although those reporting current PrEP use reported slightly lower intentions to use condoms, current PrEP use was not associated with implementation

intentions or condomless sex. Notably, a relatively small portion of participants were taking PrEP. Associations between PrEP use and the SIIS should continue to be explored as uptake of biomedical prevention increases.

The SIIS fully mediated the relationship between condom use intentions and condomless sex acts. This finding supports previous suggestions [20,21] that the SIIS could be used as a fidelity check for interventions promoting condom use among MSM or as a mediator in HIV prevention theoretical models. For example, our finding of full mediation fits well in the framework of the information-motivation-behavioral (IMB) skills model [29]. Intentions are sometimes used as a sub-construct of motivation [30,31], and implementation intentions could be considered as a sub-construct of behavioral skills. Future research on HIV prevention among MSM might consider using the IMB model with implementation intentions as a sub-construct of behavioral skills.

Implementation intentions involve the idea that the link between a specific behavioral goal (i.e., intention) and a triggering cue occur through an automatic process [32,33]. Although people can form implementation intentions without an intervention [21], implementation intention manipulations have shown strong intervention effects across many risk-related behaviors [12], and incorporating implementation intentions into HIV prevention interventions may be extremely beneficial in reducing HIV-risk behaviors. Implementation intention interventions often involve participants writing down very specific details of when and where they will perform specific behaviors in the form of if-then sentences [14,34]. Given evidence in the current study that implementation intentions may fully mediate associations between condom use intentions and condomless sex and thus be more proximal to risk behavior than simple intentions for MSM, HIV prevention interventions should focus on forming implementation intentions for obtaining condoms, carrying condoms, and condom negotiation [18].

Our results have several potential limitations. First, we added a residual correlation between two items of the SIIS. Although adding residual correlations is often appropriate [35,36], these correlations may indicate redundancy among items. The SIIS scale was reliable and associated with condomless sex as hypothesized, but it is possible that future research using this scale may want to consider a shorter version. Second, the intentions scale was used in previous studies [22,23]; however, future studies may want to consider alternative assessments that may be more strongly associated with condomless sex acts. Third, self-report is a potential limitation, although the study was anonymous, which should deter social desirability or self-presentation biases. Fourth, recruiting from one event in a Midwestern city poses a limitation of generalizability. However, our sample was relatively diverse in terms of age, race/ethnicity, and relationship status. Finally, data was cross-sectional; therefore, results cannot be interpreted as causal. It is possible that participants' previous experiences (condomless sex acts) influenced their current perceptions of their intentions and implementation intentions. A prospective or experimental study should be conducted to draw stronger conclusions about causality. Future studies should assess whether the SIIS predicts condomless sex acts longitudinally among MSM as it does for non-injection drug users [21].

CONCLUSIONS

In sum, our findings indicate that the SIIS fully mediates the relationship between condom use intentions and condomless sex acts among MSM. This scale can be used as a fidelity check for interventions utilizing implementation intentions to increase condom use or as a mediator in a theoretical model, such as the IMB, for HIV prevention among MSM. Future studies should consider incorporating implementation intentions into HIV prevention interventions for MSM.

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Figure 1.

Final structural model showing associations between condom use intentions, implementation intentions for condom use, and condomless sex acts, controlling for covariates. The final model fit the data well, $\chi^2(107) = 140.06$, CFI = 0.98, TLI = 0.97, and RMSEA = 0.03, and showed a significant indirect effect of condom use intentions on condomless sex via implementation intentions for condom use, $\beta = -0.33$ (0.12), $B = -0.15$ (0.05), $p < 0.01$, indicating that implementation intentions mediated associations between intentions and behavior. Standardized estimates for pathways are presented. *** $p < 0.001$, ** $p < 0.01$.

Table 1Sample characteristics ($N = 282$)

Variable	% ^a	<i>M</i> (<i>SD</i>)
Age		32.95 (12.31)
Gender		
Male	91.13	
Transgender	7.10	
Other	1.77	
Race/Ethnicity		
White	56.74	
Black	25.18	
Latino	14.89	
Multiracial/Other	12.41	
Monogamy		
Not in a committed relationship	43.62	
In a committed relationship having sex with other people	11.70	
In a committed relationship and monogamous	42.91	
Monthly Income		
\$0 – \$1,000	14.54	
\$1,001 – \$2,000	21.99	
\$2,001 – \$3,000	21.63	
\$3,001 – \$4,000	10.99	
\$4,001 – \$5,000	9.22	
\$5,001+	20.92	
Current PrEP Use		
No	85.46	
Yes	13.12	
Number of sex acts in the past 3 months		10.46 (11.28)
Number of condomless sex acts in the past 3 months		5.40 (6.84)
Intentions to use condoms		2.54 (0.74)
SIIS		4.55 (1.45)

^aPercentages may not add up to 100% due to missing data.

Table 2
Correlation Matrix for All Variables Included in the Final Structural Equation Model

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Condom Int: Item 1	--																	
2. Condom Int: Item 2	0.55	--																
3. Condom Int: Item 3	0.52	0.84	--															
4. SIIS: Item 1	0.35	0.32	0.31	--														
5. SIIS: Item 2	0.50	0.45	0.44	0.75	--													
6. SIIS: Item 3	0.41	0.42	0.38	0.73	0.80	--												
7. SIIS: Item 4	0.41	0.39	0.35	0.65	0.80	0.73	--											
8. SIIS: Item 5	0.33	0.32	0.34	0.61	0.71	0.62	0.73	--										
9. SIIS: Item 6	0.37	0.39	0.35	0.66	0.78	0.72	0.81	0.79	--									
10. Condomless Sex	-0.28	-0.03	-0.02	-0.27	-0.26	-0.24	-0.21	-0.20	-0.21	--								
11. Age	-0.07	-0.21	-0.16	0.03	0.00	0.03	0.08	0.00	0.02	-0.07	--							
12. Black Race	-0.04	-0.07	-0.10	0.13	0.05	0.04	0.04	0.07	0.04	-0.22	-0.21	--						
13. Latino Ethnicity	-0.05	-0.06	-0.04	0.05	-0.02	-0.02	0.01	-0.01	0.01	0.00	-0.02	-0.14	--					
14. Other Race	0.07	0.04	0.07	0.04	-0.01	0.00	0.01	-0.05	-0.01	0.03	-0.12	-0.23	0.26	--				
15. Income	-0.01	-0.09	-0.05	0.03	0.04	0.03	0.06	0.04	0.02	0.02	0.32	-0.11	-0.02	0.05	--			
16. Open Relationship	-0.04	0.02	0.02	0.01	0.02	0.02	0.03	0.05	0.02	0.09	0.07	-0.06	-0.10	-0.02	0.14	--		
17. Monogamous	0.16	0.16	0.17	0.01	0.09	0.04	0.08	0.11	0.08	0.21	-0.06	-0.09	0.09	0.08	0.06	-0.32	--	
18. PrEP Use	-0.17	-0.17	-0.18	-0.07	-0.14	-0.15	-0.12	-0.10	-0.16	-0.03	-0.12	0.26	0.02	-0.03	0.06	0.08	-0.17	--
19. HIV Positive	-0.19	-0.17	-0.12	-0.05	-0.06	-0.12	-0.10	-0.11	-0.06	-0.03	0.16	0.11	0.04	-0.07	0.06	-0.07	-0.06	-0.07

Notes. Condom Int = Condom Intentions, SIIS = Strength of Implementation Intentions Scale for Condom Use, Monogamous = Monogamous Relationship, PrEP = Pre-Exposure Prophylaxis.