A Theory-Based Approach to Understanding Condom Errors and Problems

Reported By Men Attending An STI Clinic

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Short title: Understanding Condom Errors

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Abstract

Objective: To investigate the relationship of three factors (information, motivation, and self-efficacy) to the correct use of condoms among male clients attending a public STI clinic.

Methods: Men (n = 278) attending an STI clinic responded to an anonymous questionnaire aided by a CD-recording of the questions. Participants were English-speaking, 18-35 year old men who had used a condom during penile-vaginal intercourse at least 3 times in the past 3 months. Nine errors and 6 problems were assessed for the last 3 condom use events. The Linear Structural Relations Program was used to conduct several path analyses of the hypothesized IMB model.

Results: Parameter estimates showed that there was a direct positive effect of motivation on self-efficacy (Beta = .17). The effect of information on self-efficacy was in the hypothesized direction, however, it did not achieve significance. Self-efficacy had a direct negative effect on condom use errors/problems (Beta = -.32). Information had a direct negative affect on condom use errors/problems (Beta = -.14); however, the direct effect of motivation on condom use errors and problems was not significant.

Conclusions: Among men attending a public STI clinic, information had a direct effect on condom use errors and problems whereas the effect of motivation was mediated by self-efficacy for the correct of use of condoms. These findings can be used to design brief, clinic-based, safer sex programs for men who have sex with women.

Introduction

The male latex condom is the single best method of reducing the risk of acquiring and transmitting sexually transmitted infections (STIs), including infection with the human immunodeficiency virus (HIV) for people who choose to have sex.[3,4] [References 1 and 2 are missing?) However, for condoms to be effective they must be used correctly as well as consistently.[3] Indeed, evidence suggests that condom failure typically stems from user error rather than product defects.[4-8] Thus, understanding why user errors and problems may occur represents an important starting point toward the goal of promoting improved quality of condom use. Several studies have investigated this question among college students,[5,9-14] and more recently, among STI clinic patients.[6, 15-24] However, to the best of our knowledge, published studies have not examined this research question using a theoretical framework.

Improving the quality of condom use among persons who already use condoms may be a less formidable task than promoting the use of condoms among people who engage inhigh-risk sexual behavior. Indeed, helping people who use condoms to refine the quality of their use may be a task that is amenable to clinic-based interventions. Because condom use is a fully volitional (this sounds strange.- I would cut this out) behavior for males, such programs may initially be designed for men. To serve this goal, it is important to first gain empirical insight into factors that influence whether men use condoms correctly.

Accordingly, the purpose of this study was to investigate the relationship of three factors (information, motivation, and self-efficacy) to the correct use of condoms among male clients attending a public STI clinic. The study population comprised males, 18-35 years old, who reported condom use at least 3 times during vaginal-penile sex in the previous 3 months. The information – motivation – behavioral skills (IMB) model, developed by Fisher and Fisher (2002),[25] was applied to address the research question. [I would suggest that something brief be

added here about the main tenets of the model (and how the model has been used in previous research]. Using this model, we hypothesized that information about the correct use of condoms and men's motivation to use condoms correctly could have an indirect effect on an index of errors and problems (mediated by self-efficacy relevant to skill for correct use) or a direct effect that would not involve self-efficacy. [would the model not be able to lead to more definite hypotheses? i.e. either a direct or an indirect effect??]

Methods

Sample

Data were collected at a large, urban, Midwestern, public STD clinic from October 2004 to September 2005. Men attending the clinic were recruited in the waiting area and screened for eligibility in a private room. Inclusion criteria were: 1) 18-35 years of age, 2) English speaking, and 3) reporting a male condom was used at least 3 times in the past 3 months for sex (penis in vagina) with a female. Five hundred and sixteen men (516) were screened and 351 met inclusion criteria. Of these, 314 (89.5%) agreed to participate and completed a questionnaire. After providing written informed consent, volunteers completed a brief self-administered written questionnaire lasting 15-20 minutes. To minimize problems with literacy, the questions were recorded to a CD that men could choose to play using a portable headset to assist them in completing the questionnaire. Each question constituted a single track; thus, men could easily replay a question just as they would a track of music. Responses were anonymous. Men who completed the questionnaire were paid $10. The Institutional Review Board at Indiana University approved the protocol.

<u>Measures</u>

      A questionnaire refined through use in several studies involving more than 800 men, including STI clinics attendees, was used to comprehensively assess men's condom use errors and problems.[4,5,10,11] Original questionnaire development was informed by widely cited condom use guidelines.[26,27] Nine errors (incorrect use) and 6 problems were assessed (Table 1). Because accuracy of recall was considered vital,[8] the recall period was limited to the last three times condoms were used within the past three months. For each question, men indicated whether the error or problem occurred 0 to 3 times. Sex was defined as "sexual intercourse, or penis in vagina."

      A proxy measure was used to assess men's information level about the correct use of condoms. A single-item asked, "Have you ever been taught how to use condoms correctly?" Men's motivation to use condoms was assessed by two items. The first pertained to their personal motivation (as follows), "I am highly motivated to use condoms correctly." Responses to this item were provided using a scale ranging from "1" (strongly agree) to "5" (strongly disagree). The second pertained to their perceptions of their sex partners' motivation to use condoms correctly "My sex partner(s) is (are) highly motivated to use condoms correctly." [I am wondering if some reviewers might think we should just have looked at the first item, ie. Self-motivation?] Again, response alternatives were provided using the same 5-point scale. Finally, an 8-item index was used to assess men's self-efficacy for the correct use of condoms. These items asked men how "easy or difficult" it would be for them to perform various condom-related tasks. For example, one item was: "How easy or difficult would it be for you to apply condoms correctly?" Responses were provided using a scale ranging from "1" (very easy) to "5" (very difficult). The index produced a satisfactory Cronbach's alpha of .70, suggesting adequate reliability of the measure.

Data Analysis

First, a summative error/problem score was created by simply adding the total number

of times errors and problems were reported [minimum 0; maximum 45 (15 errors/problems X 3

occasions)]. Next, the Linear Structural Relations Program (LISREL 8.72) (Joreskog &

Sorbom, 2004)[28] was used to conduct several path analyses, using the IMB model as the

theoretical framework. A path analysis tests the fit between the hypothesized model and the

observed set of correlations between variables in the model. The data analysis strategy

undertaken was similar to previous tests of the IMB model (e.g., Amico, Toro-Alfonso, &

Fisher, 2006; Fisher, Fisher, Williams, & Malloy, 1994). We first examined a just-identified

model with all paths specified as consistent with the IMB model. The just-identified model

entailed examining both the direct and indirect effects of information and motivation on correct

condom use (with lower scores indicating less errors/problems) and the direct effect of self-

efficacy regarding skills for correct condom use. Significant indirect effects would signify

whether or not [should this read "would indicate that …"?] correct condom use skills mediated

the relation between information and correct condom use and the relation between motivation

and correct condom use. Because the just-identified model is a saturated model with zero

degrees of freedom, the model fit will be perfect; thus, the parameter estimates were the output

of interest when testing this model. [I found the preceding sentence hard to follow, not being

familiar with this type of analysis, and wondered if it could be simplified? I also wonder

whether all of the details in the next paragraph is necessary?]

In a second analysis, we examined a pure mediation model where the pathways between

information and correct condom use and between motivation and correct condom use were

removed. In this model, it was hypothesized the information and motivation would affect

correct condom use only through self-efficacy relative to correct use skills. Model fit indices

examined included the Normal theory weighted least squares chi-square, Adjusted Goodness of Fit Index (AGFI), the Goodness of Fit Index (GFI), the Normed Fit Index (NFI), with values above .90 indicative of good model fit; and the Root Mean Squared Residual (RMSR), with small values (e.g., < .10) indicative of model fit (see Bollen, 1989 for a complete description of fit indices). Finally, to provide a further test of the pure mediation model, the restricted model's fit was compared to two nested models: one that added a direct path from information to correct condom use (without a path from motivation to correct condom use) and another model that added a direct path from motivation to correct condom use (without a path from information to correct condom use). Comparisons in fit were made by calculating the chi-square difference statistic.

Univariate and multivariate tests of normality were conducted for the continuous variables prior to statistical analyses. Violations (i.e., significant skewness and kurtosis levels) indicated the need to normalize the scores before using them in any analyses. PRELIS, an application for manipulating data, transforming data and computing moment matrices (Jöreskog & Sörbom 2004) was used to transform scores so that univariate normality as well as multivariate normality was achieved. PRELIS was also used to generate the correlation matrix comprising polyserial correlations for information, (a dichotomous variable) and Pearson correlations for the other, continuous variables as the input for this analysis.

Results

Characteristics of the Sample

Despite screening attempts, 36 men provided questionnaire responses which indicated that they were ineligible, thereby leaving an analytic sample of 278 men (88.5% of the 314). The mean age was 23.7 years (SD=4.13). About two-thirds (67.6%) identified as Black or

African American, nearly one-quarter (23.7%) as white, and the remainder as other minority

groups.

Findings: Full Model

The full model was assessed using maximum likelihood methods. Figure 1 displays this

model along with the Beta weights representing the strength of relationships between the

constructs. As hypothesized, [there was actually no hypothesis stated about effects of

motivation on self-efficacy; should this be added?] the parameter estimates showed that there

was a direct positive effect of motivation on self-efficacy (Beta = .17). The effect of

information on self-efficacy was in the hypothesized direction; however, it did not achieve

significance. As anticipated, self-efficacy had a direct negative effect on condom use

errors/problems (Beta = -.32) thereby supporting a key portion of the model that hypothesized

that greater self-efficacy for correct use translates into fewer errors and problems regarding the

correct use of condoms. [Again, I did not think that this was a definite hypothesis?]

Restricted Model

The fit indices for the restricted model were: χ^2 (2, N = 278) = 8.53, p < .05, GFI = .98,

AGFI = .92, RMR = .05 and the NFI = .85 suggesting model fit was adequate. The restricted

model was then compared to a model that added a path between motivation and correct condom

use (χ^2 (1, N = 278) = 6.57, p = .01). The difference in chi-square (χ^2 (1, N = 200) = 1.96, p =

.10 was nonsignificant and indicated that the addition of the path from motivation to correct

condom use did not improve model fit. A third, nested model was tested that added a path

between information and correct condom use, χ^2 (1, N = 278) = 2.21, p = .14. The difference in

chi-square between this model and the more parsimonious model (χ^2 (1, N = 278) = 5.32, p <

.05 was significant indicating that the path between information and correct condom use should

be retained as model fit was significantly improved. These analyses indicated that information

had a significant negative effect on condom use (Beta = -.14), such that being taught how to use condoms correctly was related to reporting fewer condom use errors. However, the indirect (non-mediated) effect of information on correct condom use was nonsignificant. Conversely, the direct effect of motivation on correct condom use was nonsignificant while the indirect effect was significant (p < .01) suggesting that self-efficacy partially mediated the relation between motivation and correct condom use. [This last sentence is difficult to follow…. Too many direct and indirects, and significant and nonsignificants!]

Discussion

Findings from the study are novel in that a well-established theoretical framework, the IMB model, was used to investigate relationships of information, motivation, and self-efficacy to an index of 15 errors and problems with the use of condoms among a sample of men at high risk for contracting STIs. Findings from the restricted model supported those suggested by the full model. [I wonder whether this could be reworded to avoid the use of statistical terminology in the Discussion?] Thus, in this sample of men, information had a direct effect on condom use errors/problems while motivation had only a mediated effect through the construct of self-efficacy. The implications of these findings are that clinic-based education and counseling programs for men at risk of STI (including HIV) acquisition and transmission may indeed benefit from teaching men how to use condoms correctly. In contrast to lengthy programs designed to promote the use of condoms, information pertaining only to the correct use of condoms could be imparted to men following the experience of clinical diagnosis and treatment. This form of intervention may be quite feasible in most clinical settings. The CDC demonstration study known as Project RESPECT included information on the correct use of condoms to men (and women) in the context of clinical encounters (Kamb et al. 1998).

However, our findings also support the concept that information must not be the terminal point of the intervention effort. [could this be expanded on? I wasn't quite sure what it was hinting at]

Our resultsalso suggest that prevention efforts may benefit from strategies that motivate men to acquire and apply skills related to the correct use of condoms. In contrast to the provision of information, the task of motivating men to use condoms correctly may be formidable [are there any studies that we could cite here that backs this up??] . Conceptually, motivation may be a product of perceived susceptibility and severity regarding STIs (including HIV) and potentially causing a pregnancy. Motivation may also be a product of the couple, with their joint sense of sexual satisfaction [not sure about "joint sense of sexual satisfaction"..?] being affected to a greater or lesser degree by the use of condoms. Although couples may perceive that condoms detract from many of the physical sensations that enhance sex, they may at the same time feel secure when using condoms are being used correctly and this feeling may, in turn, lead to an overall greater level of sexual satisfaction. In the context of a brief, clinic-based, intervention instilling sufficient motivation to use condoms may not be practical. However, for those who already use condoms it may reasonable to expect that a brief program could instill motivation to use condoms *correctly*.

The findings also suggest that intervention efforts may benefit men by providing them with an enhanced sense of self-efficacy relative to the skills needed to use condoms correctly. In this sample, men perceiving greater skills to use condoms correctly [I think this should be reworded to make it clear that we are talking about self-efficacy here] were significantly less likely to indicate recent errors and problems with the correct use of condoms. It should be noted that self-efficacy is increased through active learning (i.e., information alone is not sufficient) and is best enhanced by repetitive practice of the task. Fortunately, life-like penile

models can easily be obtained by clinics and these can be used to guide men through much of the process involved in the correct application of condoms. Men can then be encouraged to practice the task of condom application using a supply of condoms and the penile model. Active feedback from a member of the clinic staff can then be used to build men's self-efficacy for correct use. The interaction between the patient and staff member could then be used as a platform for discussing how to best acquire proper fitting condoms and how to acquire and add adequate amounts of water-based lubricant to avoid dryness.

Limitations

As is true for any study of sexual behavior, the findings are limited by the validity of the self-reported data. Although we cannot be sure, it is reasonable to expect that the relatively narrow recall period for condom-associated erection loss may have aided men in accurately recalling these events. Utility of the findings is also limited by the use of a convenience sample and the cross-sectional study design. Further, it is important to note that we used only a proxy measure to represent the construct of information. A subsequent study could rectify this problem by the use of a measure that would comprehensively assess men's knowledge about condom use errors and problems. Also important to note is that we only included men who recently had sex with women; future studies may benefit from a similar investigation of men who have sex with men. Finally, it is important to note that this study addressed only the issue of correct condom use. Future, theory-based, studies should be conducted to investigate both correct and consistent condom use as behavioral endpoints.

Conclusions

Among men attending a public STI clinic, information had a direct effect on condom use errors and problems whereas the effect of motivation was mediated by self-efficacy for the correct of use of condoms. Thus, in addition to information, clinic-based intervention programs

that seek to promote the correct use of condoms among men may benefit from efforts designed

to motivate men and to increase their self-efficacy for correct use.

[maybe add something in the Discussion about whether this data are consistent with the IMB

model??]

Acknowledgements

References

1. Holmes KK, Levine R, Weaver M. Effectiveness of condoms in preventing sexually transmitted infections. Bulletin of the World Health Organization 2004;82:454-461.

2. Centers for Disease Control and Prevention. Sexually transmitted diseases treatment guidelines 2002. Morb Mortal Wkly Rep 2002;51:1-60.

3. Crosby RA, DiClemente RJ, Holtgrave DR, Wingood GM. Design, measurement, and analytic considerations for testing hypotheses relative to condom effectiveness against non viral STIs. Sex Transm Infect 2002;78:228-31.

4. Crosby RA, Salazar LF, DiClemente RJ, Yarber WL, Caliendo AM, Staples-Horne M. Accounting for failures may improve precision: Evidence supporting improved validity of self-reported condom use. Sex Transm Dis 2005;32:513-515.

5. Crosby RA, Sanders SA, Yarber WL, Graham CA. Condom use errors and problems: A neglected aspect of studies assessing condom effectiveness. Am J Prev Med 2003;24:367 370.

6. Civic D, Scholes D, Ichikawa L, et al. Ineffective use of condoms among young women in managed care. AIDS Care 2002;14:779-788.

7. Crosby RA, DiClemente RJ, Wingood GM, Lang D, Harrington KF. The value of consistent condom use: A study of STD prevention among African American adolescent females. Am J Public Health 2003;93:901-902.

8. Graham CA, Crosby RA, Sanders SA, Yarber WL. Assessment of condom use in men and women. Ann Rev of Sex Research 2005;16:1-33.

9. Yarber WL, Graham CA, Sanders SA, Crosby RA. Correlates of condom breakage and slippage among university undergraduates. Int J STDs AIDS 2004;15:467-472.

10. Crosby RA, Sanders S, Yarber WL, et al. Condom use errors and problems among college

men. Sex Transm Dis 2002;29:552-557.

11. Crosby RA, Yarber WL, Sanders SA, Graham CA. Condom discomfort and associated problems with their use among university students. Am J College Health 2005;54:143-148.

12. Warner L, Clay-Warner J, Boles J, Williamson J. Assessing condom use practices: Implications for evaluating method and user effectiveness. Sex Transm Dis 1998;6:273-277.

13. Graham CA, Crosby RA, Sanders SA, Yarber WL. Motivation of self, partner, and couple to use male condoms: Associations with condom use errors and problems. Health Education Monograph, Special Issue 2003;20(2):60-64.

14. Sanders SA, Graham CA, Yarber WL, Crosby RA. Condom use errors and problems among young women who apply condoms on males. J Am Med Women's Assoc 2003;58(2):95-98.

15. Spruyt A, Steiner MJ, Joanis C, et al. Identifying condom users at risk for breakage and slippage: Findings from three international sites. Am J Public Health 1998;88:239-244.

16. Richters J, Donovan B, Gerofi J. How often do condoms break or slip off in use? Int J STD AIDS 1993;4:90-94.

17. Mertz KJ, Finelli L, Levine WC, Mognoni RC, Berman SM, Fishbein M, Garnett G, St. Louis ME. Gonorrhea in male adolescents and young adults in Newark, New Jersey: Implications of risk factors and patient preferences for prevention strategies. Sex Transm Dis 2000;27:201-207.

18. Shlay JC, McClung MW, Patnaik JL, Douglas JM. Comparison of sexually transmitted disease prevalence by reported condom use: Errors among consistent condom users seen at an urban sexually transmitted disease clinic. Sex Transm Dis 2004;31:526-532.

19. Grimley DM, Annang L, Houster S, Chen H. Prevalence of condom use errors among STD clinic patients. Am J Health Behav 2005;29(4):324-330.

20. Albert AE, Hatcher RA, Graves W. Condom use and breakage among women in a municipal hospital family planning clinic. Contraception 1991;43:167-176.

21. Lindberg LD, Sonenstein FL, Ku L, Levine G. Young men's experience with condom breakage. Fam Plan Perspect 1997;29:128–131.

22. Steiner M, Piedrahita C, Glover L, Joanis C. Can condom users likely to experience condom failure be identified? Family Planning Perspectives 1993;25:220-223.

23. Trussell J, Warner DL, Hatcher R. Condom performance during vaginal intercourse: Comparison of Trojan-Enz® and Tactylon™ condoms. Contraception 1992;45:11-19.

24. Valappil T, Kelaghan J, Macaluso M, Artz L, Harland A, Fleenor ME, et al. Female condom and male condom failure among women at high risk of sexually transmitted diseases. Sexually Transmitted Diseases 2005;32:35-43.

25.

26. Centers for Disease Control and Prevention. Facts about condoms and their use in preventing HIV infection and other STDs. Atlanta, GA: Department of Health and Human Resources; 1998.

27. Warner DL, Hatcher RA. Male condoms. In: Hatcher RA, Trussell J, Stewart F, et al, eds. Contraceptive Technology. 17th ed. New York, NY: Irvington Publishers Inc; 1999:325-352.
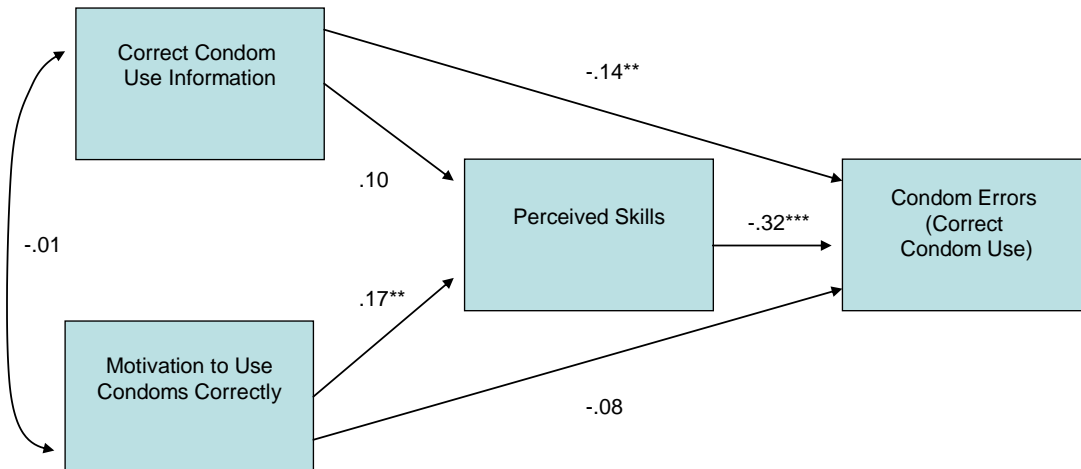
Table 1. Items Comprising an Index of Condom Use Errors and Problems Among 278 Men

Attending an STI Clinic

Type of Error	Frequency[1]
Did not add a water-based lubricant	724
Did not check for visible damage before use	562
Did not squeeze air from receptacle tip	415
Did not leave space for receptacle tip	248
Placed condom on upside down then turned it over	114
Removed condom before sex was done	106
Put condom on after sex had begun	70
Condom contacted sharp object before or during sex	49
Used an oil-based lubricant	34
Type of Problem	
Either partner experienced problem with fit or feel	158
Condom broke during sex	125
Lost erection during sex	119
Lost erection while applying condom	78
Condom slipped off during withdrawal	63
Condom slipped off during sex	55

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1. Of 834 times condoms were used by the 278 men

Figure 1. Beta Coefficients In a Lisrel Model of Condom Use Errors and Problems

p < .05. **p* < .01. ***p* < .001.