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Sexual relationship power and semen exposure among female STI clinic patients in Kingston, Jamaica

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Abstract

Women's power in sexual relationships is thought to be an important predictor of condom use. However, research on correlates of condom use often relies on participant reporting of behavior, which has questionable validity. We evaluated the association between scores from the modified Sexual Relationship Power Scale (SRPS-M) and biological detection of semen exposure in a prospective study of adult women attending a sexually transmitted infection clinic in Kingston, Jamaica with cervicitis or abnormal vaginal discharge in 2010-2011. At enrollment, women were counseled to avoid sex while on treatment and were asked to return in six days for a follow-up visit. At both study visits, women were administered a questionnaire and had vaginal swabs collected to test for prostate-specific antigen (PSA), a biological marker of recent semen exposure. We found no association at enrollment or follow up between SRPS-M scores and semen exposure, as measured with either self-reported data ($p=0.63$ and $p=0.82$, respectively) or PSA positivity. Semen biomarkers could be used to develop and validate new scales on relationship power and self-efficacy related to condom use.

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Compliance with Ethical Standard: Conflict of Interest The authors have no conflicts of interests.

Keywords

condoms; scale; validity; sexually transmitted infections; semen biomarker

Introduction

HIV is the primary cause of death and disability among women of reproductive age worldwide (World Health Organization, 2009). Women account for 50.3% of all cases (WHO, 2009) with more than four-fifths of incident HIV in women resulting from sexual exposure from their husband or primary partner (United Nations Population Fund, 2005). The factors behind the feminization of the HIV epidemic are complex, but a common theme in research on HIV transmission is the degree to which economic and social structures affect women's ability to protect themselves from HIV through condom use or other means. Self-efficacy regarding condom use – defined as one's confidence in the ability to negotiate condom use both generally and situationally – has been widely identified as one of the most robust predictors of condom use among women either directly (Black, Sun, Rohrbach, & Sussman, 2011; Crosby et al., 2013; Do & Fu, 2011; Peipert, et al., 2007; Shih, et al., 2011;) or indirectly by mediating their intentions to use the device (Eggers, Aarø, Bos, Mathews, & de Vries, 2014).

Recognizing that women's self-efficacy to negotiate safer sex could be constrained by gender inequities in their relationships, Pulerwitz et al. developed a 23-item, psychometric instrument, the *Sexual Relationship Power Scale* (SRPS), to measure the construct, sexual relationship power (Pulerwitz, Gortmaker, & De Jong, 2000). Drawing upon the Theory of Gender and Power and Social Exchange Theory, Pulerwitz et al. conceptualized sexual relationship power as an interpersonal dynamic in which one partner engages in behaviors against their partner's wishes and dominates the decision-making, including in the sexual realm (Connell, 1987; Emerson, 1981). This imbalance within individual relationships, which is thought to be a manifestation of wider, structural inequalities between genders, is posited to be a key determinant of safer-sex decision-making and, thus, HIV risk.

A recent systematic review revealed 32 analyses examining the association between SRPS scores (or subscale scores) and measures of condom use (McMahon, Volpe, Klostermann, Trabold, & Xue, 2015). Several studies have shown that the SRPS has good predictive validity of condom use among various populations, including youth and women of different ethnicities and cultures. For example, the SRPS was found to account for 52% of inconsistent or nonuse of condoms in a study of primarily Latina women attending an urban health center in Massachusetts (Pulerwitz, Amaro, De Jong, Gortmaker, & Rudd, 2002).

However, these evaluations of the SRPS – along with many other studies on the correlates of condom use in general – have relied on self-reported measures of behavior, which have questionable validity (Gallo, et al., 2013; Schroder, Carey, & Vanable, 2003; Stuart & Grimes, 2009; Weinhardt, Forsyth, Carey, Jaworski, & Durant, 1998). These studies may have identified correlates of the *reporting* of behavior, rather than the behavior itself (Gallo, et al., 2010). For example, social desirability bias could have resulted in women both over-reporting their relationship power as well as their actual use of condoms and, in this way,

overestimated the scale's ability to predict condom use. We hypothesized that social desirability bias in previous studies might have led to the detection of a spurious association between SRPS and women's reports of condom use. To test this hypothesis, we evaluated whether the association between sexual relationship power and unprotected sex persisted when the latter was measured with an objective marker of recent semen exposure rather than with the more typical measure based on participant reports of behavior. We tested for semen exposure using the detection of prostate-specific antigen (PSA) in vaginal fluid, which is indicative of women's exposure during penile-vaginal intercourse within the previous 48 hours (Lawson, et al., 1998; Macaluso, et al., 1999).

Method

Participants

Data came from a randomized controlled trial conducted in 2010-2011 among women attending a public STI clinic in Kingston, Jamaica (Anderson et al., 2013). Study population consisted of non-pregnant, HIV-negative women at least 18 years of age who were prescribed syndromic treatment for cervicitis or vaginal discharge according to standard clinical care. Participants were randomized to receive at enrollment a counseling message promoting either abstinence or abstinence backed up by the promotion and provision of condoms for the treatment period of 7 days. Participants were asked to complete two visits: enrollment visit and a follow-up visit 6 days afterward. At both visits, a study clinician collected vaginal swabs to test onsite for PSA using a rapid test (ABAcad p30; Abacus Diagnostics, West Hills, CA), following established methods (Hobbs, et al., 2009). The semi-quantitative PSA results were interpreted as negative, low positive, or high positive. PSA can be detected in most specimens (89%-98%) collected immediately after exposure before then clearing from most women (97%-99%) by 48 hours post-exposure (Macaluso, et al., 1999). Vaginal swabs also were collected for onsite testing for cervical infection with *Neisseria gonorrhoeae* or *Chlamydia trachomatis* using Gen-Probe APTIMA Combo2 Assay (Gen-Probe; San Diego, CA) and for *Trichomonas vaginalis* using Gen-Probe APTIMA TV Analyte Specific Reagents.

At both study visits, study staff administered a questionnaire on participant demographics, sexual activity, and reproductive history. The questionnaire at the follow-up visit also included the complete set of 23 questions used for constructing the two subscales that comprise the SRPS (Pulerwitz, Gortmaker, & De Jong, 2000). Only women who gave written consent for screening and for enrollment participated in the study, and only participants who gave written consent for PSA testing at the end of their study participation had this testing performed on their swabs. Ethical review committees at the Jamaican Ministry of Health and the U.S. Centers for Disease Control and Prevention (CDC) approved the research.

Measures

Modified Sexual Relationship Power Scale (SRPS-M)—Participants were asked the 23 SRPS questions about their power with their “main” sex partner, defined as the partner who was most important to them or who was their most regular sex partner. SRPS questions

can be divided to construct two subscales: Relationship Control (e.g., “If I asked my main partner to use a condom, he would get violent”) and Decision-Making Dominance (e.g., “Who usually has more say about whose friends to go out with?”)

Following methods established by Pulerwitz et al. (2000), we constructed a modified (SRPS-M) score by excluding the 4 questions that related to condoms to avoid overestimating the relationship between semen exposure and the scale. The 12 remaining questions for Relationship Control included a four-point scale for responses (i.e., “strongly agree,” “agree,” “disagree,” and “strongly disagree”) while the seven remaining questions for Decision-Making Dominance had a 3-point scale (“your main sex partner,” “both of you equally,” and “you”). Thus, the scores for the subscales had maximum sums of 48 and 21, respectively, with higher scores representing higher levels of sexual relationship power. Following the specified methods, we created a mean score for each subscale for each woman, rescaled each score to a scale of 1-4, and combined them (using equal weighting) into a single score. We then used the distribution of total scores to categorize participants into tertiles for having “low,” (≤ 2.393) “medium” (>2.394 - 2.669) or “high” (≥ 2.670) power. Internal consistency of the scale in our sample at baseline and follow up was good (Cronbach's alpha = 0.72 and 0.73, respectively).

Semen exposure—Semen exposure was measured two ways: 1) PSA detection, dichotomized as low or high positive vs. negative and 2) self-reported exposure defined as recently having ≥ 1 unprotected act. This self-reported measure consisted of a derived variable (yes vs. no) for any report of sex without condom use in response to questions about each vaginal sex act and condom use with “main” and “other” sex partners that occurred “today,” “yesterday,” or “the day before.” Otherwise, participants (who reported no sex or only protected acts) for these questions were coded as having no recent exposure.

Potential confounders—Potential confounders for the adjusted analyses were selected based on the Theory of Gender and Power as applied to women's HIV risk (Wingood & DiClemente, 2000). These variables consisted of the following: age (categorized into tertiles based on the age distribution), education (0-11 vs. ≥ 12 years), ≥ 4 alcoholic drinks during past week (yes vs. no), relationship status (single; having a “visiting” partner [defined as a non-cohabiting, conjugal partner] (Dreher & Hudgins, 2010); vs. married or cohabiting), chlamydia, gonorrhea or trichomoniasis diagnosis at enrollment (yes vs. no), and number of male partners during three months before enrollment (0-1 vs. ≥ 2).

Statistical analysis

Our objective was to evaluate the association between sexual relationship power (measured with SRPS-M score) and recent semen exposure. We used multivariable logistic regression to evaluate the association between SRPS-M scores and semen exposure, as measured with PSA test results and self reports, in separate models. We constructed both crude and adjusted models, the latter of which were adjusted for randomization arm and only the potential confounders listed above. We also calculated chi-squared tests to explore differences in semen exposure (biomarker and self reports) by the variables of interest.

Given the possible heterogeneity in motivation for avoiding unprotected sex before each of the two study visits, we conducted analyses separately for enrollment and follow-up visits. At enrollment, all women had cervicitis or abnormal vaginal discharge (per the eligibility criteria) and, thus, these symptoms could have prompted some women (or couples) to avoid sex or to use a condom before the study visit. All participants were prescribed treatment and counseled at the enrollment visit to abstain from sex (with half of the study population also counseled to use a condom if abstinence was not possible) while on treatment during the interval between visits to avoid infecting their partners. This counseling could have motivated women to avoid unprotected sex during the interval preceding the follow-up visit. We used SAS, version 9.1 (SAS Institute, Cary, NC) for all analyses.

Results

Of 300 women randomized to the trial, seven did not return for the follow-up visit, and 26 had missing values for the questions from the follow-up visit that were used to calculate SRPS-M score. An additional six women at enrollment and five at follow-up, were missing PSA results. Thus, the analyses at enrollment and follow up were based on visits from 87%-89% of the enrolled women. Participants had a median age of 28 years (range, 18-55), and one-quarter were single while the remainder either had a visiting partner (38.1%) or were married or cohabiting (36.9%).

SRPS-M scores were not related to testing positive for PSA or self-reporting semen exposure at either the enrollment ($p = 0.40$ and $p = 0.63$, respectively; Table 1) or follow-up visit ($p = 0.87$ and $p = 0.82$, respectively; Table 2). Only two of the factors assessed were associated with semen exposure at enrollment. Higher proportions of women who reported consuming 4 alcoholic drinks in the past week had PSA detection or self-reported unprotected sex than those reporting less alcohol consumption (20.5% vs. 6.9%, $p < 0.01$, and 26.7% vs. 13.1%, $p = 0.02$, respectively). Also, higher proportions of women who were married or cohabiting had PSA detected (15.8%) and reported unprotected sex (23.5%) than women who had a visiting partner (6.9% and 10.8%, respectively) and single women (3.1% and 10.5%, respectively) ($p = 0.01$ and $p = 0.02$, respectively). At the follow-up visit, no correlates of semen exposure measured with the biomarker were found and the sole correlate of self-reported unprotected sex was alcohol use. Higher proportions of women who reported consuming 4 alcoholic drinks in the past week reported unprotected sex (26.7%) than those reporting less alcohol consumption (4.4%; $p < 0.01$).

Adjusted analyses also did not reveal any association between SRPS-M and either measure of semen exposure at either visit (Table 3). At enrollment, PSA detection was not higher in women classified as having medium (adjusted odds ratio [aOR], 2.1; 95% confidence interval [CI], 0.6-6.9) or high SRPS-M scores (aOR, 1.6; 95% CI, 0.5-5.2) compared to those with low SRPS-M scores. Also, at follow up, no difference in PSA positivity was found in women with medium (aOR, 1.0; 95% CI, 0.4-2.8) or high SRPS-M scores (aOR, 1.2; 95% CI, 0.5-3.3). Similarly, at enrollment, no differences were found in self-reported unprotected sex among those classified as having medium (aOR, 1.5; 95% CI, 0.6-3.5) or high SRPS-M scores (aOR, 1.1; 95% CI, 0.4-2.7) compared to those with low scores. Also, at follow up, self-reported exposure was similar for those having medium (aOR, 0.7; 95%

CI, 0.2-2.6) or high SRPS-M scores (aOR, 0.8; 95% CI, 0.2-2.8) compared to those with low scores.

Discussion

We found no relationship between women's sexual relationship power, measured with the SRPS-M scale, and exposure to semen, measured with either a biomarker or self report. We had hypothesized that social desirability bias might have caused prior studies to overestimate the association between sexual relationship power and self-reported condom use. However, we found no relationship between SRPS-M and semen exposure, regardless of whether the outcome was measured with women's reports of unprotected sex or the objective semen biomarker.

Low levels of relationship power measured with SRPS have been associated with self-reported failure to use condoms among a diversity of populations, including women with a history of substance use in prison (Knudsen, et al., 2008) or in treatment in the U.S. (Amaro, et al., 2007); pregnant women in Haiti (Kershaw, et al., 2006) and South Africa (Dunkle, et al., 2004); and sexually-experienced, young women in South Africa (Pettifor, Measham, Rees, & Padian, 2004). However, these studies either did not use – or clearly specify the use of – the SRPS version modified to exclude condom-related questions. The inclusion of questions on condom use could artificially inflate the strength of the relationship between the scale scores and the condom use outcome. Of the seven studies that reported on the relationship between the SRPS-M (or its modified subscales) and condom use, only two found a statistically significant association (Pulerwitz, et al., 2002). The remainder either did not find the modified scale or modified subscales to be predictive of condom use (Koblin, et al., 2010; Magee, Small, Frederic, Joseph, & Kershaw, 2006; Tietelman, Ratcliffe, Morales-Aleman, & Sullivan, 2008; Weeks, et al., 2010) or found an inconsistent relationship (Campbell, et al., 2009). To test the robustness of our study findings, we repeated our analyses using each of the two modified subscales as the independent variable and found no difference in the interpretations of our results (data not shown).

The effect of sexual relationship power on condom use also is likely to vary according to participant characteristics and the wider cultural and gender norms of the target population. The SRPS, which was designed and validated among a specific population in the U.S., might be inadequate for measuring the construct in all populations. For example, rather than employing direct communication or demands, some women might exert influence over their partner through indirect strategies that are less challenging to traditional gender roles (e.g., avoiding sex by referring to their menstrual cycle or the need to attend to children or by pretending to enjoy condom use with their partner). In this way, women could be empowered in their relationship with their sexual partner in important ways that the SRPS fails to capture.

We had expected the women in the present study to be highly motivated to avoid semen exposure in the intervals before the enrollment visit (because of their symptoms prompting them to attend the STI clinic study site) and the follow-up visit (because they were counseled to avoid unprotected sex while on treatment). We hypothesized that this high

motivation would magnify the role of relationship sexual power regarding condom use, by clearly identifying the women who were unable even under these conditions to influence their sexual behavior with their partner. It is possible, though, that women's relationship power was less relevant to decisions about condom use than usual in these situations, and that other factors, such as the couple's perceptions about the degree of her infectiousness or severity of her infection, had more bearing on whether they engaged in unprotected sex.

Also, some women could have strong agency within their relationships and yet not desire to use condoms. A large body of research has explored the difficulties surrounding condom use, including the challenge of negotiating its use in established relationships. Women may choose not to use condoms, or not to request their use, as an expression of intimacy, trust and fidelity (Marston & King, 2006). Furthermore, while the negative physical attributes of condoms are usually described as barriers to male acceptance of the device, women could be even more resistant to condom use from the decrease in sensation than males (Higgins & Hirsch, 2008). The transtheoretical model of behavioral change stipulates that before women can realize consistent condom use (Prochaska, et al., 1994), they must have sufficient sexual relationship power to have the self-efficacy to use the device and also must perceive the advantages of condoms as outweighing their disadvantages. Women attending the study STI clinic in Kingston might not have met the latter condition, which is a prerequisite for their transitioning to readiness to use condoms.

A main limitation of the study is the inability to generalize the findings to other populations or social or clinical contexts. For instance, even within this study population, it is unknown whether SRPS-M scores would have been predictive of semen exposure had the women not had cervicitis or abnormal vaginal discharge and not been on treatment for these symptoms. Furthermore, we only measured recent semen exposure, which differed from past studies on the scale and condom use, which generally measured self-reports of sex without condom use over longer periods of 1-12 months (McMahon, et al. 2015). Finally, study power might have been inadequate for detecting a true association.

Strengths of the study included the use of the complete set of scale questions for calculating the SRPS-M score (as well as both subscales) and the low rate of study attrition. Furthermore, the use of an objective biomarker for measuring semen exposure was a methodologic advancement over past studies on SRPS, which have measured only participant reports of unprotected sex.

Interventions that attempt to persuade individuals to reduce their risk factors without simultaneously targeting societal-level changes may be overstating the role of individual-control over behaviors and, consequently, may be unlikely to succeed in halting the HIV epidemic (Buvé, Bishikwabo-Nsarhaza, & Mutangadura, 2002). While women have greater biological susceptibility to HIV than males (WHO, 2009), economic and social inequality is arguably one the most important causes of HIV acquisition among women (UN Millennium Project; 2010). Although we found no association between SRPS-M and semen exposure in our study of women receiving syndromic care at an STI clinic in Kingston, an earlier study found SRPS to be predictive of incident HIV infection among women in South Africa (Jewkes, Dunkle, Nduna, & Shai, 2010). This suggests that sexual relationship power is

influential for women's HIV risk, but that what constitutes sexual relationship power may be different across populations or may require different measurement methods in different social contexts. Collecting biological markers in tandem with self-reports of behavior, self-efficacy and control is likely to allow for the development and tailoring of measures of power and self-efficacy to be more contextually-specific and valid.

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Demographic and behavioral factors by semen exposure, measured with prostate-specific antigen and self report, at enrollment**Table 1**

Prostate-specific antigen (N = 261)			Self-reported unprotected sex (N = 267)				
Positive		Negative		Yes		No	
No. (%)	No. (%)	No. (%)	p value	No. (%)	No. (%)	No. (%)	p value
SRPS-M							
Low	5 (5.8)	81 (94.2)	.40	11 (12.4)	78 (87.6)		.63
Medium	9 (10.2)	79 (89.8)		15 (17.1)	73 (83.0)		
High	10 (11.5)	87 (88.8)		15 (16.7)	75 (83.3)		
Study arm							
Abstinence only	10 (7.5)	124 (92.5)	.32	19 (14.0)	117 (86.0)		.52
Abstinence + condoms	14 (11.0)	113 (89.0)		22 (16.8)	109 (83.2)		
Age in years							
18-25	12 (11.8)	90 (88.2)	.50	21 (20.2)	83 (79.8)		.20
26-32	6 (7.1)	79 (92.9)		11 (12.8)	75 (87.2)		
> 32	6 (8.0)	69 (92.0)		9 (11.5)	69 (88.5)		
Years of school attendance							
0-11	22 (9.7)	205 (90.3)	.47	37 (15.9)	196 (84.1)		.53
12	2 (5.9)	32 (94.1)		4 (11.8)	30 (88.2)		
Alcoholic drinks in past week							
4	9 (20.5)	35 (79.6)	<.01	12 (26.7)	33 (73.3)		.02
0-3	15 (6.9)	203 (93.1)		29 (13.0)	194 (87.0)		
Relationship status							
Single	2 (3.1)	62 (96.9)	.01	7 (10.5)	60 (89.6)		.02
Visiting partner,	7 (6.9)	95 (93.1)		11 (10.8)	91 (89.2)		
Married or cohabiting	15 (15.8)	80 (84.2)		23 (23.5)	75 (76.5)		
Chlamydia, gonorrhea or trichomoniasis at enrollment							
Yes	12 (11.5)	92 (88.5)	.29	13 (12.2)	94 (87.9)		.23
No	12 (7.6)	146 (92.4)		28 (17.5)	133 (82.5)		
Male partners during 3 months before enrollment							

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Prostate-specific antigen (N = 261)		Self-reported unprotected sex (N = 267)			
		Negative		Yes	
		No. (%)	No. (%)	No. (%)	No. (%)
0,1		17 (9.3)	166 (90.7)	28 (15.1)	158 (84.9)
2		7 (8.9)	72 (91.1)	13 (15.9)	69 (84.2)

SRPS-M Modified Sexual Relationship Power Scale

Demographic and behavioral factors by semen exposure, measured with prostate-specific antigen and self report, at follow-up**Table 2**

	Prostate-specific antigen (N = 262)			Self-reported unprotected sex (N = 267)		
	Positive		p value	Yes		p value
	No. (%)	Negative No. (%)		No. (%)	No. (%)	
SRPS-M						
Low	9 (10.5)	77 (89.5)	.87	6 (6.7)	83 (93.3)	.82
Medium	9 (10.2)	79 (89.8)		4 (4.6)	84 (95.5)	
High	11 (12.5)	77 (87.5)		5 (16.7)	85 (94.4)	
Study arm						
Abstinence only	12 (9.0)	122 (91.0)	.26	6 (4.4)	130 (95.6)	.38
Abstinence + condoms	17 (13.3)	111 (86.7)		9 (6.9)	122 (93.1)	
Age in years						
18-25	12 (11.7)	91 (88.4)	.97	7 (6.7)	97 (9.3)	.58
26-32	9 (10.6)	76 (89.4)		3 (3.5)	83 (96.5)	
> 32	8 (10.8)	66 (89.2)		5 (6.5)	72 (93.5)	
Years of school attendance						
0-11	25 (11.0)	202 (89.0)	.90	13 (5.6)	219 (94.4)	.95
12	4 (11.8)	30 (88.2)		2 (5.9)	32 (94.1)	
Alcoholic drinks in past week						
4	2 (14.3)	12 (85.7)	.69	4 (26.7)	11 (73.3)	<.01
0-3	27 (10.9)	221 (89.1)		11 (4.4)	241 (95.6)	
Relationship status						
Single	5 (7.7)	60 (92.3)	.59	4 (6.0)	63 (94.0)	.61
Visiting partner	12 (11.8)	90 (88.2)		4 (3.9)	98 (96.1)	
Married or cohabiting	12 (12.6)	83 (87.4)		7 (7.1)	91 (92.9)	
Chlamydia, gonorrhea or trichomoniasis at enrollment						
Yes	15 (14.4)	89 (85.6)	.16	8 (7.5)	99 (92.5)	.28
No	14 (8.9)	144 (91.1)		7 (4.4)	153 (95.6)	
Male partners during 3 months before enrollment						

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	Prostate-specific antigen (N = 262)			Self-reported unprotected sex (N = 267)		
	Positive		Negative	Yes		No
	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)	No. (%)
0,1	18 (9.8)	165 (90.2)	.33	10 (5.4)	175 (94.6)	.82
2	11 (13.9)	68 (86.1)		5 (6.1)	77 (93.9)	

SRPS-M Modified Sexual Relationship Power Scale

Table 3

Modified Sexual Relationship Power Scale and semen exposure, measured with prostate-specific antigen and self report, at enrollment and follow-up

Study visit	Prostate-specific antigen			Self-reported unprotected sex		
	OR	(95% CI)	aOR*	(95% CI)	OR	(95% CI) aOR*
Enrollment						
SRPS-M						
Low	1.0		1.0		1.0	
Medium	1.8	(0.6, 5.7)	2.1	(0.6, 6.9)	1.5	(0.6, 3.4) 1.5
High	2.1	(0.7, 6.4)	1.6	(0.5, 5.2)	1.4	(0.6, 3.3) 1.1
Follow-up						
SRPS-M						
Low	1.0		1.0		1.0	
Medium	1.0	(0.4, 2.6)	1.0	(0.4, 2.8)	0.7	(0.2, 2.4) 0.7
High	1.2	(0.5, 3.1)	0.2	(0.5, 3.3)	0.8	(0.2, 2.8) 0.8

OR odds ratio, SRPS-M/Modified Sexual Relationship Power Scale

* Adjusted for randomization arm, age, years of school attendance, alcoholic drinks in past week, relationship status, chlamydia, gonorrhea or trichomoniasis at enrollment, and male partners during 3 months before enrollment.