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A Measurement Model of Women's Behavioral Risk Taking

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Abstract

The current study was designed to gain a better understanding of the nature of the relationship between substance use and sexual risk taking within a community sample of women (N = 1,004). Using confirmatory factor analysis, the authors examined the factor structure of sexual risk behaviors and substance use to determine whether they are best conceptualized as domains underlying a single, higher order, risk-taking propensity. A 2 higher order factor model (sexual risk behavior and substance use) provided the best fit to the data, suggesting that these 2 general risk domains are correlated but independent factors. Sensation seeking had large general direct effects on the 2 risk domains and large indirect effects on the 4 first-order factors and the individual indicators. Negative affect had smaller, yet still significant, effects. Impulsivity and anxiety were unrelated to sexual health risk domains.

Keywords

sexual risk taking; alcohol drinking patterns; drug usage; sensation seeking; negative affect

Numerous studies have shown that high levels of substance use and risky sexual behaviors—such as drinking in conjunction with sex, and sex with a casual and/or a risky partner—are associated with each other (Cooper, 2002; Guo et al, 2002). In addition, both health-risk domains are associated with negative sexual outcomes, including sexually transmitted infections (STIs; Corbin & Fromme, 2002) and sexual assault (Kilpatrick, Acierno, Resnick, Saunders, & Best, 1997). Although the empirical relationship is well documented, the nature of the association is less well understood. The purpose of the current article is to identify the factor structure of measures of risky sexual behavior and substance use in women and to examine personality characteristics associated with these behaviors.

Early studies, including male and female adolescents and adults, have revealed that the variance among measures of risky behaviors can be adequately explained by a single first-order factor, labeled "unconventionality" (e.g., Donovan & Jessor, 1985). Most of these early studies used exploratory factor analysis with a single indicator for each type of behavior. As researchers began to use confirmatory factor analysis with multiple indicators of each type of risky

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behavior, their findings became more complex. For example, McGee and Newcomb (1992) used multiple sexual risk indicators but single indicators for both alcohol and drug use. They identified both a first-order factor for sexual risk and a first-order factor for substance use, as well as a higher order factor accounting for the variance among them. Cooper, Wood, Orcutt, and Albino (2003) replicated these procedures with similar results. The varying number of first-order factors identified in these studies is likely due to the number of indicators used to represent each domain. In contrast, a study that used multiple indicators of all risk-taking domains identified distinct first-order factors for sexual risk, drinking behavior, and illicit drug use, but no higher order factor was tested (Fromme, Katz, & Rivet, 1997).

In the current study, using multiple indicators of risk domains, we first wanted to determine whether sexual risk and substance use would be best represented by two first-order domains (Cooper et al., 2003; McGee & Newcomb, 1992) or as three first-order domains, with alcohol and drug use being distinct (Fromme et al., 1997). After the first-order domains were identified, we then wanted to confirm that a single higher order factor (health risk taking) would account for the variance among them (Cooper et al., 2003; McGee & Newcomb, 1992). In addition, because many researchers have used drinking and/or drug use concurrent with sexual intercourse as a risk marker for STI (see, e.g., Cooper, 2002), we included measures of alcohol and drug use with sex to determine whether they are best used as indicators of sexual risk taking, substance use, or both.

Because personality characteristics are likely to influence women's risk-taking behavior (Cooper et al., 2003), we examined personality correlates of sexual risk and substance use. In the current study, we focused on impulsivity and sensation seeking because both variables have been associated with risk-taking behavior, sexual promiscuity, and alcohol and drug use (Baker & Yardley, 2002; Cooper et al., 2003; Hoyle, Fejfar, & Miller, 2000; Parent & Newman, 1999). In addition, baseline measures of sensation seeking have prospectively predicted sexual risk behaviors and use of alcohol in sexual situations (Kalichman & Cain, 2004).

Substance use may stem from attempts to ameliorate negative affect, such as depression, anxiety, or posttraumatic stress disorder (Folkman, Chesney, Pollack, & Phillips, 1992; Holahan, Moos, Holahan, Cronkite, & Randall, 2004; Stewart, Conrod, Amoluk, Pihl, & Dongier, 2001). Furthermore, it has been suggested that women's risky sexual behavior may be viewed as a means of coping with trauma via experiential avoidance (Polusny & Follette, 1995). Consequently, we included measures of depression, trauma, and anxiety as correlates of risky behaviors.

We focused exclusively on women in our analyses for several reasons. First, women's risk-taking behavior has been understudied relative to men's, particularly with respect to sexual risk taking (see Crepaz & Marks, 2001). Furthermore, relationships among substance use, risky sexual behavior, and personality may differ for women compared with men. For example, fewer women than men have substance use disorders, but those who do are more likely to have comorbid mood disorders (e.g., Zilberman, Tavares, Blume, & el-Guebaly, 2003). Finally, gender-specific examination of risk taking seems warranted given lack of equivalence for various measures of risky sexual behavior (Amaro, 1995). Moreover, sex risk among women may be more closely related to affiliation with risky partners than to a substance-abusing lifestyle (Amaro, Raj, & Reed, 2002). To address this issue, we include measures of the women's own sexual risk behavior as well as measures of affiliation with risky partners.

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Method

Participants and Procedure

The sample consisted of 1,014 women completing the first wave of a three-wave prospective study related to alcohol and sexual behavior. From May 2000 through April 2002, random-digit dialing was used to identify women 18–30 years of age living in the Buffalo, New York, metropolitan area. Of eligible women, 61% agreed to participate and closely matched the local population in terms of ethnicity (75% European American, 17% African American, 3.5% Hispanic, and 4.5% Asian, Native American, and other), income (median household incomes from $30,000 to $40,000), and education (95% were high school graduates). The average age was 23.76 years (*SD* = 3.71), and most were unmarried (76% never married, 3% divorced or legally separated). Ten women who self-identified as lesbian or bisexual and had only female intimate partners in the past year were dropped from analyses.

Eligible women were recruited to participate in an initial questionnaire/interview session at the Research Institute on Addictions, University at Buffalo, State University of New York involving assessment of personality, substance use, and sexual experiences. On their arrival at the Research Institute on Addictions, study procedures were explained and informed consent was obtained. We collected questionnaire data using computer-assisted self-interview to facilitate report of sensitive information (Gribble, Miller, Rogers, & Turner, 1999). Women were paid $50 for participation.

Measures

Sexual risk taking—Risky sexual behavior indicators (α = .65) included age at first sexual encounter, number of lifetime sexual partners, and how soon she typically has sex with a new partner after meeting him. The number of partners item provided seven response options: “0,” “1,” “2,” “3,” “4,” “5–9,” and “10 or more,” with the two highest options receded to 7 and 10 partners, respectively. How soon she has sex with a new partner was scored on a 6-point scale ranging from 1 (*first day that I meet him*) to 6 (*a year or more after meeting him*). Women indicated how frequently they use alcohol prior to or during intercourse (1 = *once in a while*, 5 = *all the time*) and how intoxicated they are in these situations (1 = *not at all intoxicated*, 7 = *very intoxicated*), combined into an alcohol intoxication-frequency index during intercourse (α = .84). A drug intoxication-frequency index during intercourse was formed from parallel drug use items (α = .79).

Women reported on specific aspects of sexual relationships with up to three past-year partners, including perception of STI risk of each partner. Partner’s sexual risk included his number of lifetime partners and infidelity, and partner’s HIV-specific risk included sex with men, had/gave an STI, injected drugs, has HIV/AIDS. A woman’s score in these two arenas was calculated by summing the risk across the number of partners she had in the past year (α = .84 and α = .80, respectively).

Substance use—On the basis of the number of drinks consumed during a typical drinking occasion and a maximum drinking occasion, as well as frequency of binge drinking (1 = *never*, 6 = 5 *or more days per week;* all assessed with the Daily Drinking Questionnaire; Collins, Parks, & Marlatt, 1985), a composite of heavy drinking was formed (α = .89). The Drinking Context Questionnaire assessed frequency of drinking (1 = *not in past year*, 8 = 5 *or more times per week*) in different social settings (i.e., bars, parties, or dates; see Single & Wortley, 1993; α = .73). The drug use index (α = .77) was composed of the number of different illicit drugs used and frequency of use (0 = *not in past year*, 6 = *every day or nearly*) assessed with the Substance Use Questionnaire (from the National Household Survey; Substance Abuse and

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Mental Health Administration, 1997). The Drug Abuse Screening Test (α = .84; Skinner, 1982) assessed severity of use, with higher scores indicating a more severe problem.

Impulsivity, sensation seeking, and anxiety—The Zuckerman–Kuhlman Personality Questionnaire (Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993) assessed three personality constructs. Impulsivity consisted of eight yes/no items such as, "I tend to change interests frequently" (α = .75). Sensation seeking consisted of 11 yes/no items (e.g., "I prefer friends who are excitingly unpredictable"; α = .81). Anxiety (e.g., "I feel edgy and tense") consisted of 19 items (α = .87). Because the items on each scale were all highly intercorrelated, each scale was parceled into three sets of items to form latent variables for model testing (Bandalos, 2002).

Negative affect—The depression measure was a count of 10 depressive symptoms based on *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM–IV;* American Psychiatric Association, 1994) diagnostic criteria (α = .62). The trauma measure was a count of 21 symptoms based on *DSM–IV* criteria (α = .92).

Data Analysis

We used confirmatory factor analysis with maximum likelihood estimation (using AMOS; Arbuckle, 2003) to compare three alternate factor structures of health risk behavior. In the first model, the five sexual risk items were indicators of risky sexual behavior, and the four substance use items were indicators of substance use, with the items addressing alcohol and drug use concurrent with intercourse allowed to load on both factors. In the second model, alcohol and drug use concurrent with intercourse were allowed to load only on risky sexual behavior. In the third model, they were allowed to load on substance use only. After the best model was identified, the second-order risk-taking factor was added. Models were viewed as empirically adequate if they resulted in fit indices (normed fit index, Tucker-Lewis Index, comparative fit index) of .95 or greater, a root-mean-square error of approximation (RMSEA) less than .06, and medium (.13–.25) or large (> .25) effect sizes as measured by R^2 (Byrne, 2001; Hu & Bentler, 1999). The chi-square difference test was used to compare alternate models (Byrne, 2001). (Bootstrapping was used to estimate small amounts of missing data; Byrne, 2001.)

The values of the RMSEA, the expected cross-validation index (ECVI), and the Akaike information criterion (AIC) were used as indicators of the final model's likelihood of replicating in additional samples of the same size drawn from the same population (Byrne, 2001; Hu & Bentler, 1999). An RMSEA value less than .05, with an upper value of the 90% confidence interval less than .06 and *p* value for closeness of fit greater than .50, indicates that the model is likely a good fit in the population (Byrne, 2001). In addition, the model with the lowest ECVI and AIC values is the one most likely to be a good fit in similar samples. Finally, the four personality constructs were added to the best fitting model and then-effects freely estimated. We were interested in the general effects of the personality constructs (i.e., then-effects on the higher order risk factor) as well as effects specific to individual risk domains.

Results

Identifying the Most Appropriate Factor Structure

Descriptive data and loadings for each of the indicators are shown in Table 1. Fit statistics for the tested models are presented in Table 2. The two-factor model with cross-loadings was not supported, and the fit significantly declined when the measures of substance use concurrent with sex were allowed to load on risky sexual behavior (Model 2), $\chi^2(2) = 733.28$, $p < .001$.

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The model in which these two measures loaded only on substance use also represented a poorer fit, $\chi^2(2) = 57.29$, $p < .001$.

Further examination of the loadings and the correlation matrix (available on request from Carol VanZile-Tamsen) revealed that the substance use in conjunction with sex variables are most closely related to the relevant substance use variables (alcohol and drug use), which appear to be separate constructs, and that indicators of partner risk are distinct from the woman's own sexual behavior. To account for these observations, we proposed four latent factors: women's sexually risky behavior, affiliation with risky partner, drinking behavior, and drug use. This model has a significantly improved fit, $\chi^2(3) = 816.71$, $p < .001$. When a single second-order factor is added, fit declines significantly, $\chi^2(2) = 51.96$, $p < .001$.

Because the two sexual domains were more strongly related to each other than to the two substance use domains ($r = .58$, $p < .001$), and the two substance use domains were more strongly related to each other than to the sexual domains ($r = .51$, $p < .001$), a model with two second-order factors—sexual risk behavior and substance use—was proposed. This model resulted in an adequate fit to the data and was not significantly different in fit from the first-order model, $\chi^2(3) = 5.06$, $p < .25$, suggesting that there are two highly correlated ($r = .65$, $p < .001$) higher order domains of health risk behavior measured here. The sexual risk behavior factor accounted for 49% of the variance in risky sexual behavior and 66% of the variance in affiliation with risky partners. The substance use factor accounted for 63% of the variance in drinking behavior and 40% of the variance in drug use, which are all large effect sizes. In addition, the RMSEA, ECVI, and AIC values of this model suggest that it should replicate well in other independent samples of women (Byrne, 2001). Although the RMSEA value is a little higher than the .06 value usually called for and the p for closeness of fit was .00, the ECVI and AIC are considerably lower for this model as compared with others that were tested (see Table 2).

Examining the Impact of Personality Constructs on Health Risk Behavior

When the personality constructs were added to the model (see Figure 1), only sensation seeking and negative affect had significant effects, with both being related to the two higher order factors. These personality factors accounted for only a small proportion of variation in sexual risk behavior ($R^2 = .14$) but nearly half of the variation in substance use ($R^2 = .48$). In addition, sensation seeking had large indirect effects on risky sexual behavior (.22), affiliation with risky partners (.26), drinking behavior (.44), and illicit drug use (.37). The indirect effects of negative affect on these domains were much smaller in magnitude: .07, .06, .12, and .10, respectively. Indirect effects of these two personality constructs on individual indicators are shown in Table 1.

Discussion

Results suggest that a two higher order factor model of risk-taking behaviors—sexual risk behavior and substance use—represents the best fit to the data in a sample of community women. In addition, indices used to assess the extent to which a model will be replicated in other, independent samples suggest that the model is generalizable. In contrast to the single general factor found in previous studies (e.g., Cooper et al., 2003; Donovan & Jessor, 1985; McGee & Newcomb, 1992), two second-order risk factors sufficiently accounted for covariation among our four risk domains. The complexity of our model is likely due to the fact that we used multiple indicators for each of the domains that we assessed. Had we chosen only one indicator to represent each of the four domains, we may have found a single general factor. Including multiple measures in a domain showed that these measures are more strongly related to others in their domain than to measures from other domains (e.g., drinking items are more strongly related to other drinking items than to illicit drug use or risky sex items). Findings

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revealed that measures of sex in conjunction with alcohol use and drug use are more related to their respective substance use domains than to other measures of sexual risk taking. Although studies have used substance use in conjunction with sex as a measure of sexual risk taking in college samples (e.g., Cooper, 2002), among community samples of women, in which many women do not use substances, these measures may be a better reflection of substance use than of sexual risk.

Sensation seeking was strongly related to the two health risk domains, supporting the hypothesis that a propensity to take risks is associated with risky behavior (e.g., Baker & Yardley, 2002; Hoyle et al., 2000; Parent & Newman, 1999). Although Cooper et al. (2003) found no relationship between negative affect and risk domains in their sample of men and women, we found small effects for negative affect. This suggests that its effects are specific to women and may be masked when men are included in the sample (e.g., Holahan et al., 2004). Both personality factors were more strongly related to substance use than to sexual risk behavior, suggesting that other correlates need to be identified that will better help researchers understand sexual health risk.

Some limitations must be taken into account when attempting to generalize these results. First, the data are cross-sectional, and no conclusions can be drawn regarding causality. Although directional arrows are used in Figure 1 to represent the relationships from the personality factors to risk-taking behaviors, in actuality, these arrows represent partial correlations in the language of structural equation modeling. The relationships may in fact be reciprocal, with risk-taking behavior leading to greater sensation-seeking tendencies and/or increased negative affect. Second, as is common in studies of behavioral risk taking, we relied on self-report. Although we attempted to ensure the accuracy of the data (e.g., the use of computer-assisted self-interview to emphasize confidentiality of the data), the extent of bias is unknown. Finally, no conclusions should be made with regards to the model's usefulness outside of community samples (e.g., clinical samples).

What we can conclude from our analyses is that among a community sample of young women, sexual health risk behavior and substance use are highly related, yet they do not compose a single complex of behavior. This finding is likely due to the fact that an important part of women's sexual risk involves affiliation with sexually risky partners and may be less under her control than her own drinking and/or drug use (Amaro et al., 2002). Consequently, the two general domains appear to have different correlates, with a risk-taking personality (sensation seeking) being more strongly related to substance use than to sexual risk. Although the effects of negative affect are much smaller, the pattern is the same, suggesting that we can explain a great deal more about drinking behavior and drug use than we can about sexual risk behavior. Future research should attempt to identify those personality constructs that are more strongly related to sexual risk-taking behavior. In addition, the prospective nature of these relationships should be explored to determine whether personality factors predict risky behavior over time.

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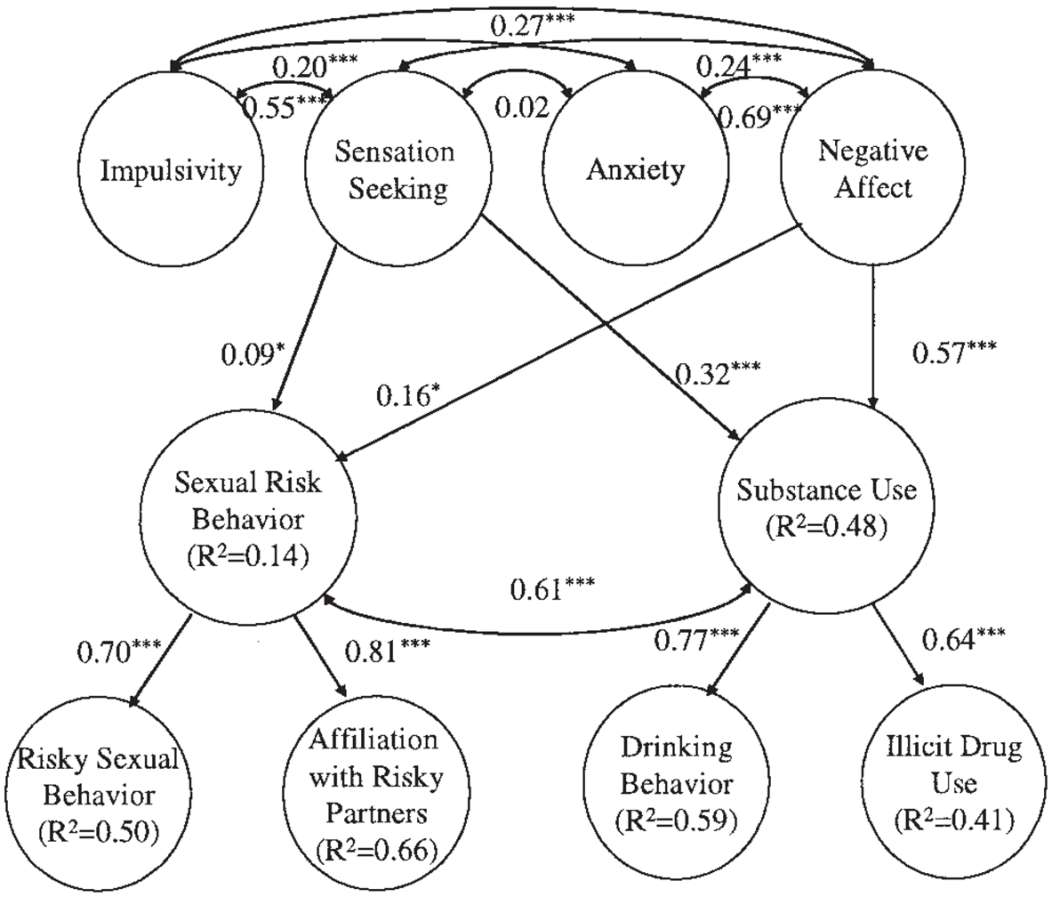

Figure 1.
Health risk-taking behavior and personality. *$p < .05$. ***$p < .00$.

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Table 1
Descriptive Statistics for Indicators of Latent Variables

Indicator of latent factors	Factor loading	Indirect effect of sensation seeking	Indirect effect of negative affect
Risky sexual behavior			
No. of lifetime partners[a]	.89	.20	.05
How soon sex with new partner	.62*	.14	.03
Years of intercourse before age 20 years	.47*	.11	.04
Affiliation with risky partner			
Partner's sexual risk behaviors[a]	.99	.25	.07
Partner's HIV risk behaviors	.75*	.19	.05
Drinking behavior			
Past year heavy drinking[a]	.81	.36	.10
Past year drinking in social settings	.77*	.34	.09
Past year drinking in sexual situations	.64*	.28	.08
Drug use			
Illicit drug use[a]	.95	.35	.10
Drug problems[b]	.89*	.33	.09
Past year illicit drug use in sexual situations[b]	.79*	.29	.08
Impulsivity[c]			
Parcel 1[a]	.83		
Parcel 2	.62*		
Parcel 3	.70*		
Sensation seeking			
Parcel 1[a]	.82		
Parcel 2	.81*		
Parcel 3	.67*		
Anxiety			
Parcel 1[a]	.88		
Parcel 2	.81*		
Parcel 3	.83*		
Negative affect			
No. of symptoms — depression[a]	.77		
No. of symptoms — trauma	.66*		

[a] Factor loading fixed to one to set scale of latent factor; significance not tested.

[b] Indicates variables that were skewed and normalized using a log plus ten transformation for structural equation modeling.

[c] Confirmatory factor analysis was performed separately to establish that these four factors were indeed the best structure of the personality variables, $\chi^2 = 104.21$, $df = 38$, normed fit index = .98, Tucker–Lewis index = .98, comparative fit index = .99, root-mean-square error of approximation = .042 (.032–.051).

* $p < .001$.

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Table 2

Comparisons of Alternate Risk-Taking Models

Model	χ^2	*df*	NFI	TLI	CFI	RMSEA (90% CI)	χ^2 difference	*df*	ECVI	AIC
Two factors with cross-loadings	1,070.38	41	.80	.68	.80	.16 (.15–.17)			1.13	1,142.38
Two factors without cross-loadings	1,803.66	43	.66	.48	.66	.20 (.19–.21)	733.28*	2	1.87	1,871.66
Two factors without cross-loadings	1,127.67	43	.79	.68	.79	.16 (.15–.17)	57.29*	2	1.19	1,195.67
Four factors	253.67	38	.96	.93	.96	.07 (.06–.08)	816.71*	3	0.31	313.67
Second order model — one factor	305.63	40	.94	.92	.95	.08 (.07–.09)	51.96*	2	0.38	379.63
Second order model — two factors	248.61	41[a]	.95	.94	.96	.07 (.06–.08)	5.06	3	0.32	320.61
Model with personality factors[b]	601.74	201	.94	.95	.96	.05 (.04–.05)			0.75	749.75

Note. NFI = normed fit index; TLI = Tucker-Lewis index; CFI = comparative fit index; RMSEA = root-mean-square error of approximation; CI = confidence interval; ECVI = expected cross-validation index; AIC = Akaike information criterion.

[a] In order for the model to be identified, paths from sexual health risk to risky sexual behavior and affiliation with risky partner were constrained to be equal, and paths from substance use to drinking behavior and drug use were constrained to be equal.

[b] For this model to be identified, the correlations among the four personality variables and between the two higher order risk domains were fixed at the values identified in previous analyses. In addition, the paths to the two higher order risk domains were constrained to be equal for each personality construct.

* $p < .001$.