

Sensation Seeking as an Explanation for the Association Between Substance Use and HIV-Related Risky Sexual Behavior

Seth C. Kalichman, Ph.D.,^{1,2} Timothy Heckman, Ph.D.,¹ and Jeffrey A. Kelly, Ph.D.¹

Past research has shown that recreational drug use correlates with sexual behaviors that confer high risk for human immunodeficiency virus (HIV) infection. The present study tested the hypothesis that sensation seeking, a disposition characterized by the tendency to pursue novel, exciting, and optimal levels of arousal, accounts for a majority of the variance in associations between substance use and high-risk sexual behavior. Ninety-nine homosexually active men completed measures of sensation seeking, self-reported sexual behavior, and substance use. Path analysis and hierarchical regression analyses demonstrated that sensation seeking accounts for the observed relationship between substance use and high-risk sexual behavior. We conclude that personality characteristics, often ignored in high-risk sexual episodes, predict risk behavior over and above substance use, and may be useful in tailoring HIV prevention interventions.

KEY WORDS: HIV-risk behavior; AIDS; substance use and sex; sensation seeking.

INTRODUCTION

Although many gay men have substantially changed their sexual behavior to reduce their risk for contracting human immunodeficiency virus (HIV) infection, some homosexually active men continue to engage in

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¹Center for AIDS Intervention Research, Medical College of Wisconsin, Milwaukee, Wisconsin.

²To whom correspondence should be addressed at the Department of Psychology, Georgia State University, University Plaza, Atlanta, Georgia 30303.

high-risk sexual activities. For example, Kelly *et al.*, (1992) found that over one third of gay and bisexual men in small cities reported recent occurrences of anal intercourse without condoms. Studies in HIV-AIDS epidemic centers also find a sizable minority of homosexually active men engaging in unsafe sex (Ekstrand and Coates, 1990). Sexual risk-taking is determined by multiple and complex interactions among relationship, situational, and dispositional factors (Aspinwall *et al.*, 1991). Understanding the determinants of sexual risk behavior is essential to implementation of effective HIV-AIDS prevention (Kelly *et al.*, 1993).

Among predictors of high-risk behavior, substance use shows consistent relationships to sexual risk-taking. Leigh and Stall (1993) found that use of alcohol and other psychoactive substances correlates with high-risk sexual practices across several populations. Among gay and bisexual men, substance use predicts engaging in unprotected anal intercourse (e.g., Davidson *et al.*, 1992; McCusker *et al.*, 1990; Stall *et al.*, 1986; Valdiserri *et al.*, 1988), as well as lapses to unsafe sexual behaviors after initiating behavioral changes (e.g., Kelly, Kalichman, *et al.*, 1991; Kelly, St. Lawrence, and Brasfield, 1991; Stall *et al.*, 1990). A 6-year longitudinal analysis of substance use and sexual risk behavior among 384 gay and bisexual men in Chicago found a reliable relationship between recreational substance use and HIV risk-related sexual practices (Ostrow *et al.*, 1993). Unfortunately, research has only determined that substance use and high-risk sex are correlated. Directional interpretations have rarely, therefore, been possible and potential third variables have not been examined. Although it has been suggested that associations between substance use and sexual risk behavior are spurious (Leigh, 1990), few variables have explained these correlations.

One potential corollary of both substance use and high-risk sexual behavior is sensation seeking, a personality disposition characterized by the tendency to pursue novel, exciting, and optimal levels of stimulation and arousal (Zuckerman, 1971, 1994; Zuckerman *et al.*, 1978, 1964). Sensation seeking is associated with sexual activity relevant to HIV transmission. For example, Fisher and Misovich (1990) found that sensation seeking significantly correlated with number of sexual partners for both gay men and heterosexuals, and that sensation seeking correlated with the number of unfamiliar sexual partners reported by college students. Likewise, Newcomb and McGee (1991) identified significant relationships among heterosexual experiences and sensation seeking, particularly with respect to disinhibition and boredom susceptibility. Other studies have also shown that sensation seeking predicts sexual risk behavior (Seal and Agostinelli, 1994) and greater numbers of sexual partners, even when protected by condoms (Temple *et al.*, 1993).

Among HIV-positive gay and bisexual men, Gold *et al.* (1994) found that sexual adventure and excitement seeking distinguished unsafe from safer sexual encounters. Sensation seeking also significantly differentiates gay and bisexual men who engage in unprotected anal intercourse from men who do not (Kalichman *et al.*, 1994).

Although sensation seeking may be related to engaging in high-risk sexual practices, it may also mediate the association between substance use and risky sex. In a study that identified high rates of HIV risk behavior and HIV infection among individuals in an alcohol abuse treatment program, Avins *et al.* (1994) concluded that "alcohol abuse may be a marker for individuals who tend to have risk-taking personalities rather than a direct cause of high-risk behavior" (p. 518). Thus, sensation seeking potentially constitutes a third variable in the relationship between substance use and sexual risk behavior (Leigh and Stall, 1993).

In the present study, we investigated sensation seeking as a predictor of unprotected anal intercourse among gay and bisexual men and its putative role as a third variable in the relationship between substance use and sexual behavior. We hypothesized that sensation seeking would significantly predict frequencies of unprotected anal intercourse in a sample of gay and bisexual men followed over a 3-month period. Using regression and path analyses, we investigated the directional relationships between high-risk sexual behavior, substance use, and sensation seeking. Finally, we tested whether sensation seeking accounts for the association between substance use and sexual risk behavior using hierarchical regression analysis. We hypothesized that sensation seeking serves as an origin for multiple risk-taking behaviors, including both substance use and sexual risk behaviors.

METHOD

Participants

Ninety-nine self-identified homosexually active men were recruited by advertisements in newspapers and community announcements placed at businesses, bars, and health clinics with primarily gay-bisexual clientele. Measures were completed at an initial session and again 3 months later. At both assessment sessions, measures were completed individually in small groups, and with assistance from research staff when needed. Participants were paid \$20 for completing each assessment.

Table I. Substance Use, Sexual Behavior, and Sensation-Seeking Scores Collected Twice Over Three Months^a

Sample characteristic	Time 1		Time 2	
	\bar{x}	SD	\bar{x}	SD
Alcohol use before sex	2.9	7.0	3.5	10.4
Marijuana use before sex	0.9	3.6	1.9	9.6
Cocaine use before sex	0.4	2.3	0.2	0.9
Nitrite use before sex	0.8	2.9	0.7	2.1
Total drug use before sex	2.1	5.2	2.8	9.9
Insertive unprotected anal intercourse	1.3	5.3	0.9	3.7
Receptive unprotected anal intercourse	1.4	3.6	1.0	3.6
Total unprotected anal intercourse	2.7	7.1	1.9	6.9
Total unprotected anal intercourse partners	0.6	1.1	0.6	1.1
Sexual sensation-seeking scale scores	2.3	0.6	2.3	0.5
Nonsexual experience-seeking scale scores	2.0	0.6	2.0	0.6

^aSexual and substance use behaviors were reported for the previous 3 months.

The mean age of participants was 35.9 years ($SD = 8.9$); 69% of the sample was white, 21% African American, and 10% of other ethnic backgrounds. The mean years of completed education was 13.9 ($SD = 1.9$; range 10–17). Thirty-nine percent of participants reported full-time employment and 69% reported annual incomes below \$20,000. Eighty-one percent of the men reported current sexual involvement with at least one male partner, and 46% reported two or more male sexual partners in the previous 3 months. In addition, 91% of men reported having been tested for HIV antibodies and 37% reported that they were HIV seropositive. Table I presents rates of substance use and sexual behavior, and means for the measures of sensation seeking, collected at two assessment times.

Measures

Sensation Seeking

Two scales developed by Kalichman *et al.* (1994) were used to assess sensation seeking. Based on Zuckerman *et al.*'s (1964) Sensation-Seeking Scales, Kalichman *et al.* developed two independent measures of sensation seeking; one assessed sensation seeking specifically related to sexual interests and activities (sexual sensation seeking), the other assessed nonsexual experience seeking. Neither scale includes items that reflect substance use. The

11-item sexual sensation-seeking scale was developed by revising several of Zuckerman *et al.*'s items to reflect sexually relevant themes. For example, the item "I like wild 'uninhibited' parties" was revised to read "I like wild 'uninhibited' sexual encounters"; "I enjoy watching many of the sexy scenes in movies" was revised to "I enjoy watching 'X-rated' videos"; and "I like to try new foods that I have never tasted before" was revised to "I am interested in trying out new sexual experiences."

The nonsexual experience-seeking scale consists of 11-items derived from Zuckerman *et al.*'s (1964) Experience-Seeking Scale. Kalichman *et al.* (1994) retained 5 items from Zuckerman *et al.*'s (1964) original scale, e.g., "I would enjoy the sensations of skiing very fast down a high mountain slope," and "I would like parachute jumping"; revised 3 items to reflect contemporary western culture, e.g., "I could conceive of myself seeking pleasures around the world with the 'jet set'," was revised to "I can see myself seeking pleasures around the world with 'exciting' people"; and developed 3 original items for the scale, "I would like to try 'bungee jumping'," "I have been known by my friends to be a 'risk taker'," and "While driving, I will sometimes try to run yellow lights for the thrill of it."

Items on both scales were placed on a 4-point response format ranging from 1 (*not at all like me*) to 4 (*very much like me*). Scores for each scale were computed by calculating the mean endorsement (total score/number of items). Kalichman *et al.* (1994) demonstrated acceptable levels of internal consistency and 2-week test-retest reliability for the sexual sensation-seeking scale ($\alpha = .75$, test-retest $r = .78$), and nonsexual experience-seeking scale ($\alpha = .79$, test-retest $r = .89$). In the present study, the two scales were internally consistent (sexual sensation seeking, $\alpha = .82$; nonsexual experience seeking, $\alpha = .83$). Interscale correlations computed for two assessments and 3-month test-retest correlations are presented in Table II. As shown, the scales were found to have acceptable test-retest reliabilities.

Substance Use

Use of alcohol, marijuana, cocaine, and nitrite inhalants (poppers) in relation to sexual encounters over the past 3 months was assessed. Participants were asked to report the number of times in the past 3 months they drank alcohol, and used marijuana, cocaine, or poppers before engaging in sexual activity. This measurement format was selected for several reasons. First, assessing the use of substances in relation to sexual behavior links the two activities and therefore provides a more exact assessment of the substance use-sexual behavior relationship than does an assessment of global substance use over a given time period (Leigh, 1990; Leigh and Stall,

Table II. Intercorrelations Among Measures of Substance Use, Sexual Behavior, and Sensation Seeking Collected at Two Assessment Times^a

Variable	Unprotected anal intercourse	No. of intercourse partners	Alcohol use	Drug use	Nonsexual experience seeking	Sexual sensation seeking
Sexual sensation seeking	.22 ^b	.24 ^b	.29 ^c	.32 ^c	.60 ^c	.67^c
Nonsexual experience seeking	.17	.19 ^b	.29 ^c	.16	.76^c	.59 ^c
Drug use	.39 ^c	.29 ^c	.58 ^c	.55^c	.19 ^b	.27 ^c
Alcohol use	.34 ^c	.29 ^c	.56^b	.46 ^c	.22 ^b	.15
No. of partners	.87 ^c	.66^c	.32 ^c	.21 ^b	.23 ^b	.37 ^c
Unprotected anal intercourse	.70^c	.87 ^c	.32 ^c	.33 ^c	.24 ^b	.33 ^c

^a Intercorrelations among measures collected at Time 1 are presented in the upper panel (above correlations in bold); intercorrelations among measures collected at Time 2 are presented in the lower panel (below correlations in bold); test-retest correlations for the measures are presented in bold type.

^b $p < 0.05$, two-tailed test.

^c $p < 0.01$, two-tailed test.

1993). Second, we did not tie substance use before sex to the occurrence of only unprotected anal intercourse because the study investigated substance use in relation to this specific sexual practice. Thus, to have limited substance use only to sexual occasions that involved unprotected anal intercourse would have been circular. Our measure allowed participants to report use of substances before sexual activity whether or not unprotected anal intercourse occurred. Finally, the retrospective time frame was matched to the time frame used to assess sexual behavior. Frequencies of marijuana, cocaine, and popper use were summed in a single index of non-alcohol substance use prior to sex (see Table II).

Sexual Behavior

Participants completed self-report measures of sexual behaviors in the past 3 months using a standardized retrospective instrument in which they reported the number of times that they had insertive and receptive anal intercourse with another man and without the use of condoms. Participants also reported their number of different male unprotected anal intercourse partners over that same period. Unprotected anal intercourse was our focus because this sexual practice overwhelmingly accounts for the greatest risk for HIV infection among gay men (Kingsley *et al.*, 1987). Participants reported the number of times that they had engaged in a given sexual practice in the previous 3 months by writing the number in a blank. This open-ended response format was used to increase accuracy of self-reported behavior (Catania *et al.*, 1990). Frequencies of insertive and receptive unprotected anal intercourse were summed to provide a single index of unprotected anal intercourse (see Table II). Measures of sexual behavior similar to those used in the present study have acceptable reliability (Kauth *et al.*, 1991).

RESULTS

To examine the relationships among substance use, sensation seeking, and high-risk sexual behavior, we performed correlational analyses using data collected over a 3-month period.³ Analyses were conducted to identify associations of frequencies of unprotected anal intercourse with four predictor variables: alcohol use, drug use, sexual sensation seeking, and

³Because distributions of sexual behavior, alcohol use, and drug use were skewed, these data were transformed for all correlational analyses using the formula $\text{Log}_{10}(X+1)$, as recommended by Winer (1971) and Kirk (1968). Observed values are presented in Table I.

nonsexual experience seeking. In each case, the measures presented moderate to high time stability (.56 to .76) over 3 months and the synchronous relationships between measures at each time point were reliable. As shown in Table II, sensation seeking correlated with substance use before sex and sexual risk behaviors at both Times 1 and 2. Consistent with previous research (Leigh and Stall, 1993), substance use before sex also correlated with sexual risk at both assessment times. We also tested the associations of the predictor variables with sexual risk over time. Drug use before sex ($r = .26, p < 0.01$), sexual sensation seeking ($r = .27, p < 0.01$), and nonsexual experience seeking ($r = .28, p < 0.01$) significantly correlated with frequency of unprotected anal intercourse 3 months later. To further examine these relationships in a single model, we conducted a path analysis.

Path Analysis: Sensation Seeking and Substance Use as Predictors of Risky Sex

Path analysis was performed on frequency of unprotected anal intercourse, and included alcohol use, drug use, and sexual sensation seeking as predictors (Asher, 1983).⁴ The model specified that sexual sensation seeking would significantly predict alcohol use, drug use, and unprotected anal intercourse, with alcohol use and drug use not serving as significant independent predictors of unprotected anal intercourse. Figure 1 presents the model, bivariate correlation coefficients, and standardized path coefficients. We also decomposed bivariate relationships into direct effects, indirect effects, and noncausal associations. Results showed that sexual sensation seeking significantly predicted alcohol and drug use, and unprotected anal intercourse. Use of alcohol or drugs, however, did not directly affect frequency of unprotected anal intercourse. The direct effect of sexual sensation seeking accounted for 80% of its total association with unprotected anal intercourse, with only 8% of sensation seeking's relationship to risky sex being mediated through alcohol use, and only 12% through drug use. Path coefficients for the direct effects of alcohol and drug use on risky sex were not statistically significant. Thus, we conclude that much of the observed association between substance use and unprotected anal intercourse is spurious, and is accounted for by sexual sensation seeking, and possibly other related personality dispositions not included in the model.

⁴The sexual sensation-seeking scale was used in the path analysis because it is more conceptually related to substance use prior to sexual activity and unprotected intercourse. However, we reconducted the path analysis using the nonsexual experience-seeking scale and found similar pathways. For the sake of simplicity, only one model is presented.

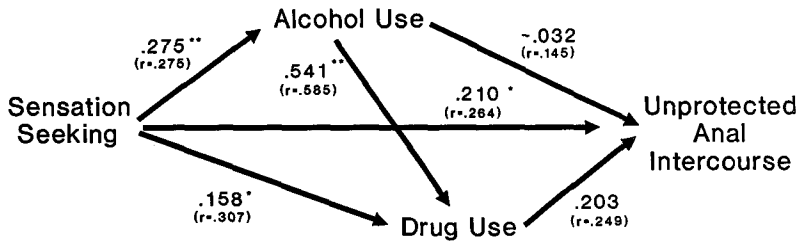


Fig. 1. Path analysis of a three predictor recursive model of sensation seeking, alcohol use, and drug use in relation to frequency of unprotected anal intercourse. Numbers in parentheses are zero-order correlation coefficients between variables and numbers outside parentheses represent standardized regression coefficients: betas, $*p < 0.05$, $**p < 0.01$.

To describe the degree to which sensation seeking accounts for the substance use and sexual behavior relationship, we conducted a hierarchical regression analysis predicting frequency of unprotected anal intercourse at Time 2 from measures of substance use and sensation seeking assessed at Time 1. Entry order was specified such that the dispositional characteristics were entered into the equation before substance use to test whether sensation seeking accounts for the substance use and sexual risk behavior relationship. When entered first in the hierarchical regression, sexual and nonsexual sensation seeking significantly predicted unprotected anal intercourse, $R = .30$, $F(2, 96) = 4.85$, $p < 0.01$; accounting for 9% of the variance. Adding alcohol and drug use into the equation resulted in a 4% change in variance accounted for, a nonsignificant contribution, $F = 1.99$, $p > 0.1$. The total equation, however, remained significant, $R = .36$, $F(4, 94) = 3.47$, $p < 0.01$, accounting for 13% of the variance. Partial correlations between sensation seeking and sexual risk behavior controlling for substance use are presented in Table III, and partial correlations between substance use and sexual risk behaviors controlling for sensation seeking are presented in Table IV. The partial correlations are consistent with the conclusion that sexual and nonsexual sensation seeking account for the relationship between substance use and sexual risk-taking.

Tests for Artifacts

Relationship factors may influence risk behavior and unprotected anal intercourse with an exclusive sexual partner confers a different and probably lower level of HIV risk than sex with nonexclusive partners. We

Table III. Partial Correlations for Sensation-Seeking Scales with High-Risk Sexual Behaviors Controlling for Alcohol and Drug Use

	Frequency of unprotected anal intercourse		No. of unprotected anal intercourse partners	
	Alcohol use	Drug use	Alcohol use	Drug use
Sexual sensation seeking ^a	.24 ^c	.20 ^c	.23 ^c	.23 ^c
Nonsexual experience seeking ^b	.25 ^d	.25 ^d	.26 ^d	.28 ^d

^a Correlated .27^d with frequency of anal intercourse, .28^d with number of partners.

^b Correlated .28^d with frequency of anal intercourse, .31^d with number of partners.

^c $p < 0.05$, two-tailed test.

^d $p < 0.01$, two-tailed test.

Table IV. Partial Correlations for Alcohol and Drug Use with High-Risk Sexual Behaviors Controlling for Sexual and Nonsexual Sensation Seeking

	Frequency of unprotected anal intercourse		No. of unprotected anal intercourse partners	
	Sexual sensation seeking	Nonsexual experience seeking	Sexual sensation seeking	Nonsexual experience seeking
Alcohol use ^a	.08	.07	.12	.11
Drug use ^b	.18	.22 ^c	.09	.13

^a Correlated .15 with frequency of anal intercourse, .19^c with number of partners.

^b Correlated .26^d with frequency of anal intercourse, .17 with number of partners.

^c $p < 0.05$, two-tailed test.

^d $p < 0.01$, two-tailed test.

therefore reconducted the analyses including only those 71 men who reported not having an exclusive sexual partner and found no differences in the results. We also reconducted all analyses using number of unprotected anal intercourse partners in the past 3 months as the outcome variable (see Tables III and IV). Results were similar to those found for frequency of unprotected anal intercourse, suggesting that the findings are robust across two different indices of high-risk behavior.

DISCUSSION

The present study demonstrates associations between sensation seeking, substance use, and unprotected anal intercourse in this sample of gay and bisexual men. We found evidence that sensation seeking accounts for a significant proportion of well-established relationships between substance use and HIV risk behavior. Although sensation seeking has been hypothesized as a third variable linking substance use to risky sex (Leigh and Stall, 1993), few studies have investigated sensation seeking or other personality dispositions in relation to substance use and HIV-risk behavior. These findings are, however, consistent with previous research demonstrating associations between substance use and risky sex, as well as theoretical and empirical ties between sensation seeking and sexual behavior (Simpson and Gangestad, 1991; Temple *et al.*, 1993; Zuckerman, 1983, 1994; Zuckerman *et al.*, 1972). In addition, these results replicate previous studies that show nonalcohol drug use is more closely related to risky sex than is alcohol consumption (Leigh, 1990; Ostrow *et al.*, 1990). These findings were observed in two cross-sectional assessments, as well as over a 3-month period.

Substance use has long been considered a component of sensation seeking (Zuckerman *et al.*, 1980), primarily because of disinhibiting actions and the risks involved in intoxication. Like substance use, unprotected sexual intercourse in populations with high HIV-seroprevalence rates is a risk-taking behavior. Thus, as Leigh and Stall (1993) suggested, the relationship between substance use and risky sex may be explained by "an underlying tendency toward sensation seeking, risk-taking, or impulsivity [that] leads people to use substances and to have riskier sex" (p. 1036). Given the complexity of both substance use and sexual relationships, as well as the amount of variance not explained by the variables included in our model, it is unlikely that one personality disposition acts as a sole mediating variable. It is probable that multiple and interactive dispositional, interpersonal, and situational factors cause substance use, sexual risk, and many other risk-taking behaviors. When personality dispositions are accounted for, however, results show that substance use offered little explanation for sexual risk behavior.

Limitations of the present study should be noted. The study used a relatively small sample from a convenience sample of gay men. Generalizability of these results must therefore be cautioned. Although our data met the conditions of reliability and stability to allow for directional inferences, having only two points of assessment limits the conclusions that can be drawn from the study findings. In addition, studies with larger samples should test more complete models, which may include additional constructs, stability paths, mediating variables, and interaction terms. Thus, the initial findings reported here should be considered preliminary and require replication in future research.

Sensation seekers take risks to achieve heightened sensory stimulation and arousal. The novelty of new sexual partners may be particularly difficult for high sensation seekers to relinquish (Kalichman *et al.*, 1994). Thus, people high in sensation seeking may constitute a subpopulation of particular relevance to the development of effective HIV prevention interventions (Fisher and Misovich, 1990). Given that substance use seems to be a corollary rather than a cause of high-risk sexual behavior, prevention programs that specifically target substance use to reduce high-risk sexual practices may be misguided; reduction in one risk activity is unlikely to affect other risk behaviors. Instead, HIV prevention efforts are more likely to be effective if they emphasize increased erotic novelty and stimulation gained from sexual activities. In addition, cognitive approaches that counter perceptions that condoms reduce sensation may serve to increase willingness to use condoms as a means of preventing HIV infection. However, it should be emphasized that HIV risk behavior cannot be attributed to any single factor, dispositional or otherwise. Too little is currently known about human sexuality and sexual relationships to allow for an understanding of

how individual differences affect these important dimensions of human behavior. Basic research in these areas is therefore needed before goals of eliminating new HIV infections can be achieved.

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