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Stress mediates the relationship between past drug addiction and current risky sexual behavior among low income women

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Abstract

This study examined the role of stress as a mediator of the relationship between prior drug addiction and current high risk sexual behavior. Eight hundred twenty women aged 18 to 30 years, who received care at community-based family planning clinics were interviewed using the Composite International Diagnostic Interview and the Sexual Risk Behavior Assessment Schedule. They also completed the brief version of the Self-Control Scale as a measure of problem-solving strategies, and measures of recent stressful events, daily hassles, and ongoing chronic stress. Regardless of addiction history, stress exposure during the previous 12 months was associated with risky sexual behavior during the previous 12 months. Structural equation modeling revealed that 12-month stress levels mediated the relationship between past drug addiction and 12-month high risk sexual behaviors, as well as the negative relationship between problem-solving strategies and high risk sexual behaviors. Problem-solving strategies did not moderate the relationship between drug addiction and high risk sexual behaviors. These findings suggest that stress management training may help reduce risky behavior among young, low-income women

Keywords

stress; coping resources; drug use; addiction; risky sexual behavior; women

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Introduction

It has been well documented that both exposure to stress and drug addiction are associated with risky sexual behavior (Kalichman, Simbayi, Jooste, Cherry, & Cain, 2005; Needle et al., 2008; Corneil et al., 2006; Kidder, Wolitski, Pals, & Campsmith, 2008). High stress levels increase the likelihood of participating in risky sexual behaviors and contracting sexually transmitted infections (STI), including human immunodeficiency virus (HIV). (e.g., Kalichman et al., 2005; Needle et al., 2008). Drug use or addiction is associated with high risk sexual behaviors, such as unprotected sex with a casual partner (Corneil et al., 2006; Kidder, Wolitski, Pals, & Campsmith, 2008), having sex with multiple partners (Kidder et al., 2008; Salazar et al., 2007), and trading sex for money, drugs, or shelter (Bobashev, Zule, Osilla, Kline & Wechsberg, 2009; Corneil et al., 2006). However, potential mechanisms linking stress, drug addiction, and risky sexual behaviors are not well-documented. In this study, structural equation modeling was used to examine the role of stress in the relationship between drug addiction and risky sexual behavior among a sample of sexually active young adults.

Stress exposure models focus on the direct effect of stress on health behaviors including risky sexual behavior (Kalichman, Simbayi, Jooste, Cherry, & Cain, 2005; Kalichman et al., 2006; Needle et al., 2008). For example, Kalichman et al. (2006) documented that drug use can at first provide an escape from stress and may help manage stress. Over time, however, the anatomical and physiological changes caused by repeated drug use increase drug craving (Volkow et al., 1996). Factors such as social support or adaptive coping strategies may mitigate the negative effects of stress on health (Lazarus & Folkman 1984). Using coping resources as an example, individuals with low self-control may experience high levels of self-imposed stress (Thompson and Brownfield, 2009) and may also engage in more impulsive responses to stress, including unplanned or unprotected sex (Grasmick, Tittle, Bursik, & Arneklev, 1993).

Hammen (2006) proposed a stress generation model of depression in which depression compromises a person's ability to function effectively, thereby generating stressful encounters. This framework may be applied to the relationship between stress and substance use, in which repeated drug use often leads to behaviors that generate stress, such as financial and legal problems, which in turn prompt further risky behavior. Thus, the current study examined whether stress mediates the relationship between past drug addiction and current risky sexual behaviors. Specifically, we hypothesized that previous drug addiction increases exposure to stress, which in turn increases the probability of the high risk sexual behavior

Similarly, repeated drug use may compromise self-control as a coping resource, which in turn may generate stress, and in the absence of more effective self-regulation strategies, result in risky sexual behaviors in response to stress. Thus, the study's secondary aim was to examine whether self-control as a coping resource mediates or moderates the relationship between stress and risky sexual behaviors. In testing self-control as a moderator, we hypothesized that stress would be more strongly related to risky sexual activities among

women with lower levels of self-control than among those with higher levels of self-control. In testing self-control as a mediator, we hypothesized that the relationship between stress and risky sexual behaviors would work through coping resources.

To achieve these aims, we studied low income women who were seeking reproductive health care from university-operated state-funded family planning clinics. Low income women are at increased risk of both stress and drug use (Bassuk, Buckner, Perloff, & Bassuk, 1998; Dube, et al., 2003; Scarinci, Ames, & Brantley 1998), as well as exposure to violence related to illegal drug markets and other dangerous and violent situations (Bassuk, Buckner, Perloff, & Bassuk, 1998; Dube, et al., 2003; Scarinci, Ames, & Brantley 1998). Thus, this sample offered a unique opportunity to examine the structural relationships among drug addiction, coping resources, stress, and risky sexual behavior. We first evaluated whether previous drug addiction increased exposure to the current stress, which in turn increased the probability of the current high risk sexual behavior among this high risk sample of sexually active, low income women. Further, we evaluated the mediation or moderation effect of coping resources on the relationship between stress and risky sexual behaviors.

Method

Study Design and Sampling

Eight hundred eighty women who attended one of six University of Texas Medical Branch (UTMB) community-based family planning clinics in Southeast Texas between December 1, 2006 and Nov 30, 2010 provided data for this study. Inclusion criteria included: 1) women between 18–30 years of age, 2) not pregnant at the time of study, and 3) either Euro-American, African American, or Hispanic. Other racial/ethnic groups were excluded because of their smaller numbers.

This study oversampled substance users by: 1) screening for use of illicit substances such as marijuana, heroin, hallucinogens, narcotics, etc. in the past 12 months, and 2) conducting drug urine tests for 5 of the most widely used drugs, including marijuana, heroin, hallucinogens, narcotics and methamphetamine. After screening 3116 women, 866 who reported drug use in the past year or had a positive urine test were invited to participate, and 611 (70.6%) agreed and were consented. Among the remaining 2240 women who did not use drugs, 483 randomly selected women were invited to participate and 275 (56.9%) agreed and were consented. Overall, 886 (65.7%) women participated in the study. For the current analysis, we excluded 57 women with a missing DSM-IV diagnosis for illicit drug use and an additional 10 incident cases in which women were diagnosed within the previous 12 month before baseline.

The remaining 820 women were used for the current analysis including 33.7% European Americans, 45.7% African Americans and 20.5% Hispanics. More than two thirds of the sample reported having an annual household income of <\$6000 and more than half (57.9%) were not currently married or cohabiting. The mean age was 23.6 years ($SD \pm 3.5$). In addition, race/ethnicity, marital status and drug addiction diagnosis was positively associated with at least one of 3 stress measures ($p < .05$).

Procedure

With approval from UTMB's Institutional Review Board, the study was explained to potential participants who met all inclusion and exclusion criteria by a bilingual (English or Spanish) trained research assistant and initial informed oral assent was obtained to screen for substance-use. Participants were asked whether they had used any illicit substances such as marijuana, heroin, hallucinogens, narcotics etc. more than 5 times in the last 12 months. Participants were then screened for substance use with a urine drug test. If a woman screened positive for substance use in the last 12 months either by urine testing or self-report, she was invited to participate in the main study. All participants were reimbursed US \$30 for their time and travel.

Measures

To test the primary hypothesis, we measured previous drug addiction (diagnosed at least 12 months prior to participation), and both stress and high risk sexual behavior within the 12 months prior to study participation.

Drug use diagnosis—The World Health Organization-Composite International Diagnostic Interview (WHO CIDI, version 3.0) was used to determine if women met the criteria established in the *Diagnostic & Statistical Manual, Fourth Edition (DSM-IV)* (Kessler & Ustun, 2004) for the diagnoses of addiction to illicit drugs, such as marijuana, cocaine, hallucinogens, and narcotics. A validated Spanish language version of the CIDI was used for Spanish speaking women (Shrout, et al., 2008). Women who met the diagnostic criteria for drug addiction 12 months prior to the baseline interview were included in the current analysis. Ten women who had been diagnosed within the previous 12 months were excluded from the study.

Risky sexual behavior in the past 12 months—We adapted the Sexual Risk Behavior Assessment Schedule (SERBAS; Meyer-Bahlburg Ehrhardt, Exner, & Gruen, 1991) to obtain detailed information regarding risky sexual behaviors. Participants were asked: 1) 'In the last 12 months, with how many different people have you had sexual intercourse?'; 2) 'In the last 12 months, how often did you use a condom when you had sexual intercourse?'; and 3) 'In the last 12 months, how often did you drink alcoholic beverages or use drugs just before having sex?' The response choices to the latter two questions were 'never,' 'less than half of the time,' 'half the time' and 'always.'

To ease clinical interpretation, we dichotomized these responses into high risk sexual behavior versus low risk, using methods adapted from previous research (Rahman & Berenson, 2013). A summary index for this study was created by the following criteria: low risk included those who a) had 0–2 sexual partners in the last 12 months; b) reported use of condoms consistently (100% times) in the last 12 months; and c) had used alcohol <50% of the time before sex in the last 12 months.

Self control/problem solving—We measured self control and problem solving as examples of coping resources using the 13-item version of the Self-Control Scale (SCS; Rosenbaum, 1980). The SCS measures an individual's general repertoire of behavioral self-

control capacities (e.g., “I am good at resisting temptation”), or problem solving strategies (e.g., “I refused to do things that are bad for me.” Item responses range from 1 to 5 with [1] not at all, [3] sometimes and [5] very much. The total score can range from 13 to 65 (Cronbach alpha = .80). Higher scores indicate greater coping resources.

Stress experienced in the last 12 months—To assess stress and its various facets comprehensively, we included 3 measures of current stressful experience in the last 12 months: recent stressful events, daily hassles, and ongoing chronic stress. For the final SEM model, the score for each indicator was first divided by its observed maximum score in order to convert to a scale of 0 to 10. A composite score (called as Stress Composite) was then computed as the mean of the three indicators.

Recent life events were assessed using the Recent Stressful Events scale (Turner, Wheaton, & Lloyd, 1995; McDonough & Walters, 2001), a 33-item checklist that measures recent stressful events in the last 12 months. Respondents were asked to indicate whether each event on a scale of 0 (never), 1 (sometimes), 2 (often), such as being arrested or laid-off, was experienced personally, by a partner/ boyfriend, or by parents in the last 12 months. A summary index was created by summing all items, ranged from 0 to 66. *Daily hassles* during the previous 12 months were assessed with a 17-item questionnaire on a scale of 0 (never) to 10 (strongly agree), asking about daily hassles such as running out of pocket money, being interrupted when relaxing, and doing household chores (Scarinci, Ames & Brantley, 1999). This measure has demonstrated predictive validity among low-income women. A summery index was created by summing all items, ranging 0 to 120. Higher scores indicate experiencing more daily hassles. Finally, *chronic stress* was measured with a 33-item checklist of stressors such as long-term debt, ongoing conflict with partner/boyfriend, or chronic illness in the last 12 months on a scale of 0 (never), 1 (sometimes), 2 (often) (Turner, Wheaton, & Lloyd, 1995; Turner & Avison, 2003). A summation index of all items ranged from 0 to 66. Chronic stressors have shown good predictive value for mental distress and drug-use (McDonough, Walters & Strohschein, 2002; Turner & Avison, 2003).

Statistical Analyses

Initial bivariate analyses were conducted to examine the relationship between various stress measures and socio-demographic characteristics. We conducted a student's *t-test* to compare the mean differences on stress scores by socio-demographic characteristics and sexual risk behaviors. To compare group differences for race/ethnicity (including Euro Americans, African Americans and Hispanics) and marital status (including married, cohabitating, and unmarried), one-way analysis of variance (ANOVA) was used with Bonferroni correction. Pair-wise Pearson correlation (*r*) was used to evaluate the association between continuous variables. Two-tailed tests were used and statistical significance was evaluated with a *p*-value of <0.05. These analyses were performed using SAS version 9.2.

Mediation analyses were conducted using the Structural Equation Modeling (SEM) software program Mplus (Muthén & Muthén, 2013). Specifically, a robust Weighted Least Squares Means and Variance (WLSMV) adjusted estimator (Muthén & Muthén, 2013) was employed to test the mediational models. The model included the entire sample and

examined the relationships of drug addiction and coping resources with a latent measure of stressors, and the number of reported risky sexual behaviors. Demographic variables (age, household income, education, ethnicity, employment, and marital status) were included in each of the models when they were initially marginally predictive of risky sexual behavior ($p < .20$), and error terms between drug addiction and coping resources were correlated. For ethnicity, two effects coded variables were included; one to assess African American status (+1 = African American, -1 = Not African American), and one to assess Hispanic status (+1 = Hispanic, -1 = Not Hispanic).

The fit of the model was evaluated through the examination of several fit indices: 1) chi-square, 2) the comparative fit index (CFI; values greater than 0.90 indicate good fit), and 3) the root-mean-square residual (RMSEA; values < 0.10 indicate reasonable fit; Browne & Cudeck, 1993; Kline 2005). We also tested the indirect effects of coping resources and drug addiction diagnosed at least a year prior to participation on risky sexual behavior during the past year through the stress experiences in the last 12 months. To do this, we conducted bias corrected two-tailed tests of significance for indirect path effects, and calculated 90% confidence intervals for each path coefficient, using a bootstrapped sample of 5,000 (Fritz & MacKinnon, 2007; MacKinnon, Fairchild, & Fritz, 2007).

Results

Women with drug addiction who had more than 3 sex partners in the past 12 months reported more recent stressful events and higher levels of daily hassles in the past 12 months compared to those who had fewer partners. Women without drug addiction who had more than 3 sexual partners in the past 12 months reported more recent life events than those with fewer than 3 sexual partners in the past 12 months. Both groups of women who used alcohol before sex in the last 12 months reported more recent events and higher levels of ongoing, chronic stress than their counterparts.

Women with greater coping resources reported lower levels of current stress including recent stressful events ($r = -.25$, $p < .001$), daily hassles ($r = -.28$, $p < .001$), and chronic stressors ($r = -.19$, $p < .001$). Women with greater coping resources were less likely to engage in risky sexual behaviors, except for inconsistent condom use (all $p < .05$). The indicators of recent life events, daily hassles, and chronic stress were moderately correlated with each other (Table 1).

The mediational model examined the indirect effects of drug addiction (and coping resources) on high-risk sexual behavior, through stress (Figure 1). The model fit statistics indicated good model fit, $\chi^2(13) = 11.76$; $p\text{-value} > .05$ (CFI = 1.00, RMSEA = .001, 95% CI [.001; .034]. The path from the past 12-month stress to the past 12-month risky sex was significant ($\beta = .246$, $p < .001$; see Figure 1). As hypothesized, mediational analysis of the bias-corrected indirect effect of drug addiction 12 months ago on the past 12-month risky sex via the past 12-month stress was significant (indirect standardized $\beta = .069$, 95% bootstrap Confidence Interval CI = [.020; .118], $p < .001$). The bias-corrected indirect effect of coping resources was also significant (indirect standardized $\beta = -.069$, CI [-.112; -.026], $p < .001$). Both the direct effects to risky sexual behavior from drug addiction 12 months ago

and from coping resources was not significant ($\beta = .107$, $p = .215$, and $\beta = -.013$, $p = .809$, respectively). This indicated total mediation of both these effects through stress.

To examine whether self-control as a coping resource mediates or moderates the relationship between stress and risky sexual behavior, we first tested the mediational model in which the effects of drug addiction and stress flow to sexual risk behavior both directly and indirectly, through coping resources. The chi-squared statistic for model fit and CFI (Comparative Fit Index, Bentler, 1990) indicated less support for this alternative model, $\chi^2(16) = 25.25$, $p = .065$, CFI = .970. Second, we tested the possibility of a moderator model, in which coping resources moderates the relationship between stress and risky sexual behavior. The fit of the model worsened dramatically, with no support for an interaction effect. Further, we sought other possible associations among variables. We tested an additional mediational model in which stress mediated the causal relationship from risky sexual behavior and drug addiction to reduced coping resources. The chi-squared statistic for model fit ($\chi^2(17) = 30.25$, $p = .025$) and the CFI, (= .957), favored the original model. Notably, all models with a three-indicator stress latent variable indicated worse fit than their composite score counterparts. Thus, based on absolute fit, RMSEAs and CFIs, the original mediational model (in Figure 1) had the best fit. Syntax and output for the models are posted at <http://trippcenter.uchc.edu/modeling/>.

Discussion

To our knowledge, this is the first study to examine the relationship between high risk sexual behaviors and drug addiction, coping resources and stress among low-income women. Stress levels were higher in our sample than the general population and those found in a prior study (Nurullah, 2010). This is likely due to its distinct attributes, such as poverty and high rate of drug addiction as women with these characteristics report greater stress than the general population (Lott & Bullock, 2001; O'Higgins, 1998). These findings underscore the importance of examining vulnerable populations.

This study demonstrated that among low income, reproductive age women, multiple stressors are associated both with choosing a high-risk sexual partner and with having multiple partners. Since stress may impair judgment and lead to inaccurate risk perception or an overwhelming need for support, women reporting greater stress exposure may have difficulty selecting an appropriate partner, or being without a partner. This may result in the selection of risky partners (Shrier et al., 2009). Alternatively, they may engage in risky sexual behaviors as a result of feeling hopeless or worthless (Ramrakha, Dickson, Moffit & Paul, 2000). This is consistent with previous studies that have demonstrated an association between engagement in risky sexual behaviors and internalizing behaviors such as depression, poor self-esteem, or psychological distress (Mazzaferro et al., 2006; Seth, Raiji & DiClemente, 2009).

The model (in Figure 1) supports our hypothesis regarding the past 12-month stress as a proximal factor in the past 12-month risky health behaviors and drug addiction 12 months prior to study participation and coping resources as more distal and primarily indirect contributors. In short, we observed that stress plays a mediating role in the relationship

between drug addiction and risky sexual behaviors. This is consistent with evidence that stress is the proximal pathway leading to adverse health outcomes (Adler & Matthews, 1994). Hence, this study adds to the literature by highlighting the mediating role of stress in the association between drug addiction and high-risk sexual behavior and the likelihood that drug addiction may generate subsequent stress (Hammen 2006).

Our findings support the idea that stress may play a mediating role in the relationship between coping resources and high risk sexual behaviors. Traditionally, high levels of coping resources have been found to reduce risky behavior either directly or indirectly (Grasmick et al., 1993) and our study corroborates that finding. However, we did not find coping resources to be a direct predictor of risky sexual behaviors when stress was included in the model. Rather, stress acted as a mediator between coping resources and risky sexual behaviors. One possible explanation is that individuals experience higher stress due to lack of coping resources and may in turn experience high levels of anxiety, anger, and impulsivity, and then experience higher levels of stress, thus resulting in poor decision-making (Hancock & Desmond, 2001) and hence engaging in more risky sexual behaviors. Since our sample included a large number of women with *DSM-IV* drug addiction, it is possible that stress functioned differently than it does in the general population.

This study has several limitations. First, we analyzed cross-sectional data to compare several alternative causal order models. A more stringent test would entail longitudinal measurement to aid in discerning causal processes (e.g., Cullum, Armeli, & Tennen, 2010; Barta, Tennen & Kiene 2010); such data however need to closely match the temporal timeline of causal processes (Gollob & Reichardt, 1987), and can raise additional questions about possible multiple mediation links between both levels and changes in several outcomes (MacKinnon, 2008, p. 216, Selig & Preacher, 2009). For example, one alternative model is that a history of risky sex generates stress, which in turn makes these women vulnerable to drug abuse. Cross-sectional analyses cannot distinguish between such alternate temporal ordering of effects, but can lend more support to one alternative causal model that best fits the data. However, we have attempted to differentiate reported timeframes of predictors and outcomes. For example, drug use/dependence was diagnosed at least 12 months prior to study participation, whereas stress and risky sexual behavior was measured for the last 12 months. Finally, as we oversampled drug addicted individuals, findings from this study cannot be generalized to all low income women.

Despite these limitations, this study sheds light on the association between stressors and risky sexual behavior in a high risk sample. Our findings suggest that stress may be a mediating factor in the relationship between drug addiction and high risk sexual behaviors, as well as in the relationship between coping resources and high risk sexual behavior. Health care providers who provide care to low income drug addicted women should be aware of this relationship. Since stress can lead to other adverse outcomes, it is important to identify and reduce stress early by referring women experiencing high levels of stress to appropriate treatment. Although it is not possible to provide a stress-free environment (Latkin et al., 2005), a reduction in drug use or improvement of coping resources may result in less stress and lower the likelihood of risky sexual behaviors among these underprivileged women.

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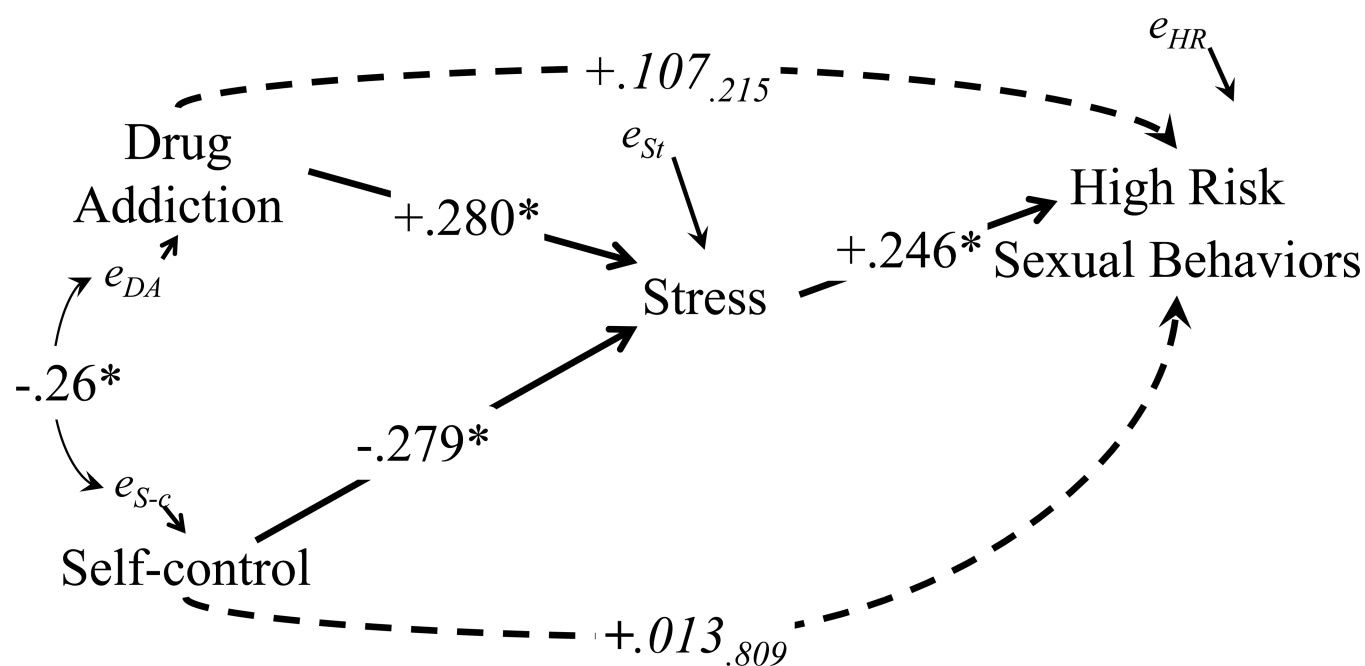


Figure 1.
Mediation effects of stress on the relationships from self-control and drug addiction to high risk sexual behaviors

Table 1

Correlations between main variables

	1	2	3	4
1. Drug addiction				
2. Self-control	0.04 [†]			
3. Stress composite ⁺⁺	0.16	-0.13		
4. Risk behavior	0.08	0.08	0.22	
Means	0.69	41.96	2.69	0.74
Standard deviations	0.81	12.37	1.56	0.44

All correlations statistically significant at $p < 0.001$, except[†];

⁺⁺: The score for each of the three stress indicator was first divided by its observed maximum score in order to convert to a scale of 0 to 10. Stress Composite was then calculated as the mean of the three indicators. The higher scores of Stress Composite indicate higher levels of overall stress in the past 12 months.