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## Sensation Seeking and Risk-taking Propensity as Mediators in the Relationship between Childhood Abuse and HIV-related Risk Behavior

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### Abstract

**Objectives**—Although a wealth of literature suggests that childhood physical, emotional, and sexual abuse are related to later-life HIV-related risk behaviors, few studies have explored disinhibition (e.g., impulsivity, risk-taking propensity, and sensation-seeking) as a risk factor in this relationship.

**Method**—This cross-sectional study examined impulsivity, risk-taking propensity, and sensation seeking as mediators in the relationship between abuse history and engagement in HIV-related risk behaviors among a sample of 96 inner-city African American adolescents.

**Results**—Findings indicated that abuse history was positively related to self-reported engagement in HIV-related risk behaviors ( $B = 0.027$ ,  $SE 0.008$ ,  $\beta = .32$ ,  $sr^2 = .105$ ,  $p = .001$ ), as well as risk-taking propensity ( $B = 0.35$ ,  $SE 0.11$ ,  $\beta = .30$ ,  $sr^2 = .090$ ,  $p = .003$ ) and sensation seeking ( $B = 0.17$ ,  $SE 0.05$ ,  $\beta = .35$ ,  $sr^2 = .124$ ,  $p = .0004$ ). Abuse history was not related to impulsivity. Further, while sensation-seeking and risk-taking propensity (to a lesser extent) mediated this relationship, impulsivity did not.

**Conclusions**—These findings provide an initial step in the examination of the mechanisms underlying the relationship between childhood abuse and engagement in HIV-related risk behaviors.

Childhood abuse across emotional, physical, and sexual domains can be devastating to the victims, their families, and society at large. Negative consequences include, but are not limited to, interpersonal relationship problems, post-traumatic stress disorder, severe depression,

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deliberate self-injury, and suicide (see Fergusson et al, 1996 for a review). Beyond these psychopathology-related consequences, childhood abuse has been consistently found to predict the increased likelihood of behaviors that increase risk for HIV both directly (e.g., risky sexual behavior) and indirectly (e.g., alcohol and drug use).

Research linking child abuse with later risk behaviors has focused largely on childhood *sexual* abuse, with studies indicating that sexually abused individuals are at an increased risk of later engagement in risky sexual behavior (such as multiple short-term sexual encounters; exchange of sex for money, drugs, or shelter; and unprotected sex), as well as substance use (e.g., Paolucci, Genuis, & Violato, 2001). However, sexual abuse rarely takes place as an isolated event and instead typically occurs within a broader social context of multiple adversities, including other forms of abuse such as emotional and physical (e.g., Dubo et al., 1997). Moreover, preliminary evidence indicates that physical and emotional abuse uniquely contribute to HIV-related risk behaviors (e.g., Medrano, Hatch, Zule, & Desmond, 2003). Taken together, this literature indicates the importance of simultaneously considering the role of multiple types of abuse in subsequent engagement in HIV-related risk behavior.

Despite these consistent findings, only a handful of studies have examined the mechanisms underlying the association between various forms of childhood abuse and HIV-related risk behavior. This limitation is noteworthy and unfortunate, as understanding the mechanisms of risk processes is likely to facilitate the development of prevention efforts and innovative treatments for those who have been victimized. Cross-sectional studies suggest that childhood trauma is most likely to occur in poverty-stricken, predominantly minority communities where illicit drugs are highly available (e.g., Garbarino & Kostelny, 1992). In turn, behaviors such as heavy drug use, exchange of sex for drugs or money, and frequent sexual contact within a population at an elevated risk for seropositivity (i.e., IV drug users) are widespread within these communities (Substance Abuse and Mental Health Services Administration, 2003). Although these environmental variables may account somewhat for the association of childhood trauma and HIV-related risk behavior, many individuals within at-risk communities do not engage in HIV-related risk behavior, suggesting that other variables are involved. Thus, research in this area would benefit from an expanded perspective, including a focus on individual difference variables that may moderate the likelihood of engagement in HIV-related risk behaviors.

A potential unifying mechanism in the relationship between childhood trauma and HIV-related risk behaviors is disinhibition, with variables such as impulsivity, sensation-seeking, and risk-taking propensity often falling under this larger construct (Lejuez, Aklin, Bornovalova, & Moolchan, 2005). Indeed, disinhibition has been linked independently to both childhood victimization (Brodsky et al., 2001) and HIV-related risk behaviors (Donohew et al, 2000). Moreover, multiple disorders in the DSM-IV that are linked to childhood victimization include impulsivity and risk-taking within the diagnostic criteria (e.g., antisocial and borderline personality disorders). Two recent studies provide compelling evidence for the role of disinhibition in the trauma-to-risk relationship. Smith, Davis, & Fricker-Elhai (2004) found that victims of childhood physical and sexual abuse demonstrate impairment in the ability to appraise risky situations accurately. Individuals with a history of childhood sexual abuse reported higher expected involvement in illicit drug use and risky sexual practices, and both higher perceived benefits (e.g., experiencing pleasure) and lower perceived risks (e.g., failing school) of these behaviors. Additionally, the effect of childhood sexual abuse on elevated illicit drug use and risky sexual practices was mediated by higher perceived benefits and lower perceived risks. Further, Bailey and McCloskey (2005) indicated that impulsivity mediated the relationship between childhood sexual abuse and substance use over an 8-year longitudinal study, above and beyond demographics, parenting styles, and psychopathology. These two studies provide compelling preliminary evidence that disinhibition may play a role in the relationship between childhood traumatic experiences and HIV-related risk behavior.

Directional models may explain how disinhibition plays a role in the trauma-to-risk relationship. Beyond those that implicate social and environmental factors, research suggests that the link between childhood abuse and HIV-risk behaviors may be accounted for by genetic factors in the form of disinhibition and its biological correlates (i.e., dysregulation of the dopaminergic and serotonergic systems; e.g., Benjamin et al, 1996). Another model posits that exposure to traumatic stress in childhood can affect both brain structure and chemistry (leading to deficits in the same neural systems; Galvin, Stilwell, Shekhar, Kopta, Goldfarb, & McKasson, 1997), in turn resulting in neurochemistry profiles that are independently associated with indices of disinhibition (Galvin et al., 1997; Limosin et al, 2003) and substance misuse (Limosin et al, 2003). Theoretical accounts have implicated these biological processes in sexual risk behaviors as well (e.g., Zuckerman & Kuhlman, 2000).

Although future work should address these directional models specifically, a useful first step may be to utilize a cross-sectional design to clarify the role of disinhibition in the relationship between childhood trauma and HIV-related risk behavior. As such, the goal of the present study was to explore the potentially underlying role of disinhibition in the target relationship. In doing so, it was hypothesized that childhood abuse history would be associated with greater levels of: a) disinhibition (in the form of sensation-seeking, impulsivity, and risk-taking propensity), and b) HIV-related risk behavior, including risky sexual behavior and substance use. In addition, it was predicted that disinhibition would mediate the relationship between childhood abuse and HIV-related risk behavior. Based on the findings that inner-city minority individuals are at high risk for traumatic experiences (Schwab-Stone et al, 1995) and for engagement in HIV risk behaviors (Stanton et al, 1994), we chose to explore these relationships in a sample of predominantly minority adolescents living in an urban/inner-city area. Although the cross-sectional nature of the current study precludes definitive statements about causal directions, it effectively sets the stage for a more comprehensive understanding of the processes linking abuse, disinhibition, and HIV risk-taking behavior.

## Method

### Participants

Participants were 96 9<sup>th</sup>-12<sup>th</sup> grade adolescents recruited as a convenience sample via community after-school programs throughout inner-city neighborhoods in the District of Columbia Metropolitan Area. Recruitment lasted 12 months and was open to all participants in these programs in the target grades; no other exclusion criteria were used. The mean age was 14.9 (range = 13-18). Of 96 participants, 52% were male and 100% were African American. All participants were native English speakers.

### Measures

**Self-Reported HIV-related Risk Behavior**—To measure HIV-related risk behaviors we examined unprotected sexual intercourse and substance use. Participants were asked about lifetime engagement in a) sexual intercourse without a condom, b) alcohol use, and c) use of illicit drugs. Because the percentages of individuals reporting no instances of unprotected intercourse, alcohol use, and illicit drug use were 68%, 42%, and 80%, respectively, we scored each item dichotomously (0 = no instance, 1 = at least one instance) and created a composite score of HIV-related risk behaviors (ranging from 0 - 3). The alpha of .66 was acceptable, especially given its basis on three items.

**Childhood Trauma Questionnaire (Bernstein et al., 2003) Childhood Trauma Questionnaire-Short Form**—The Childhood Trauma Questionnaire-Short Form (CTQ; Bernstein et al., 2003) assesses childhood maltreatment experiences (i.e., “while you were growing up”) using a 5-point scale ranging from 1 (*never true*) to 5 (*very often true*). The CTQ

contains three subscales for abuse across emotional, physical, and sexual domains ( $\alpha$ 's = .89, .86, .95 respectively). Scores on these subscales are stable over time and show convergent and discriminant validity with other trauma measures (Bernstein et al., 2003). The CTQ has good sensitivity and satisfactory specificity when self-reports are compared with trauma ratings from child welfare records and reports of family members and clinicians (Bernstein et al., 1997). In the current study, the inter-relationship among these subscales was high, with the lowest correlation (.63) between emotional and sexual abuse, and the highest correlation (.75) between physical and emotional abuse; therefore, a composite abuse score was computed ( $\alpha = .87$ ). It is of note that re-conducting the subsequent analyses presented below using each abuse subscale separately provided equivalent results as that presented using the composite abuse score.

**Self-Report Measures of Impulsivity and Sensation Seeking**—To measure trait levels of impulsive behavior, the *Eysenck Impulsivity subscale* of the Eysenck Impulsiveness Scale (Eysenck, Pearson, Easting, & Allsopp, 1985) was administered. This subscale includes 19 forced-choice (yes or no) items, with higher scores indicating greater levels of impulsivity. Eysenck et al. (1985) have found good internal consistency for the subscale ( $\alpha = .84$ ). Previous work with similar samples indicates acceptable internal consistency ( $\alpha > .70$ ), and score predicts real world risk behaviors (e.g., Aklin et al. 2005). In the current sample, internal consistency was acceptable ( $\alpha = .75$ ). To examine the seeking of varied, novel, complex and intense situations and experiences, and willingness to take physical, social, and financial risks for the sake of such experiences, we administered the *Sensation Seeking Scale* (Zuckerman, Eysenck, & Eysenck, 1978). This 40-item instrument (scores range from 0 to 40, with higher scores indicating higher levels of sensation seeking) has well-established psychometric properties with good internal consistency ( $\alpha > .80$ ; Zuckerman et al., 1978). Additionally, it has been shown to correlate with real-world risky behaviors in adolescents (Aklin et al., 2005; Zuckerman et al., 1978) and has shown good internal consistency in our laboratory within similar samples as that used here ( $\alpha > .70$ ; Aklin et al., 2005). The internal consistency in the current sample was acceptable ( $\alpha = .78$ ).

**Behavioral Measure of Risk-Taking Propensity: The Balloon Analogue Risk Task – Youth Version (BART-Y; Lejuez et al., 2005)**—The youth version of the Balloon Analogue Risk Task (BART-Y) involves inflating a computer generated balloon. Each pump is worth one point, but if a balloon is pumped past its explosion point, then all points accrued for that balloon are lost. The probability that any particular balloon would explode is 1/128 for the first pump, 1/127 for the second, and so on until the 128<sup>th</sup> pump at which point the probability is 1/1. According to this algorithm, explosion values formed a normal distribution around 64 pumps (see Lejuez et al., 2002 for further details).

During the task, participants had the opportunity to stop pumping the balloon at any time prior to an explosion and allocate the accrued points to a permanent prize meter. After a balloon exploded or points were allocated to the permanent prize meter, a new balloon appeared. Upon completion of 30 balloon trials, the position of the prize meter determined the final prize, with markings indicating small, medium, large, and bonus prize. Participants were offered a gift certificate to a local restaurant for the small prize (value = \$5), one movie ticket for the middle prize (value = \$10), two movie tickets for the large prize (value = \$20), and the gift certificate and two movie tickets for the bonus prize (value = \$25). Standardized instructions were given to each participant prior to beginning the task. These instructions included the total number of balloons and the fact that points in the prize meter would be exchangeable for prizes immediately following the task with the prize marking on the task corresponding to the quality of the prize earned. Moreover, participants were informed that: “It is your choice to determine how much to pump up the balloon, but be aware that at some point the balloon will explode” and that “the explosion point varies across each of the thirty balloons, ranging from the first

pump to enough pumps to make the balloon fill the entire computer screen.” To ensure comprehension across participants, these instructions were followed by a summary of the instructions. Further, the experimenter was told to solicit questions regarding comprehension of the task.

Participants were given no other information about the probability underlying the explosion point for each balloon. In line with all published BART studies to date, the average number of pumps on balloons that did not explode is the preferred index of riskiness on BART-Y. This adjusted value is preferred to other variables such as the number of explosions because it is not constrained by the explosion points across balloons.

## Procedure

Participants and their guardians were informed that “the current study is focused on examining how one's personality and experiences are related to their behavior, which we will examine using a variety of life questions and a computer game.” After explaining the protocol, the guardian completed the adolescent permission form and the adolescent completed the assent form. To ensure anonymity of responses, all measures utilized only a participant number that could not be linked to participant names. Given the potential for order effects, the questionnaires and tasks were administered in a randomly selected order for each participant. After the completion of the questionnaires and tasks, participants were paid according to their performance on the BART-Y and given a referral sheet listing counseling services; this sheet was given to all participants regardless of study responses.

## Data Analysis

We first calculated zero-order correlations to test the hypothesis that childhood abuse would be associated with greater levels of disinhibition and HIV-related risk behavior. We also examined correlations between the three measures of disinhibition and HIV-related risk behavior. Impulsivity, sensation seeking, and risk-taking propensity indexed by BART-Y were considered as potential mediators. Each was included in the mediation analysis only if it was significantly correlated with abuse and with HIV-related risk behavior. Because the three indices of disinhibition (our hypothesized mediators) were only modestly correlated, each was tested separately.

Mediation was tested using a series of regression analyses. Support for a mediational effect is dependent upon four criteria: (1) a significant direct effect of an independent variable (childhood abuse) on a dependent variable (HIV-related risk behavior); (2) significant effects of an independent variable on putative mediators (impulsivity, sensation seeking, and/or risk-taking propensity indexed by BART-Y); (3) significant effects of putative mediators on the dependent variable; (4) significant indirect (i.e., mediated) effects of the independent variable on the dependent variable when it is analyzed in conjunction with the mediators. To test the first criterion of mediation, we estimated the direct effect of abuse on HIV-related risk behaviors (denoted at  $c$ ) in a linear regression without covariates. We then estimated the main effect of abuse on each of the three hypothesized mediators (denoted at  $a_1$ ,  $a_2$ , and  $a_3$ ) in separate linear regression analyses to test criterion 2. To test criterion 3, we ran a multiple regression analysis predicting HIV-related risk behaviors with abuse and the mediators as predictors. This model estimates the effects of the mediators (denoted as  $b_1$ ,  $b_2$ , and  $b_3$ ), as well as the direct effect of abuse on the dependent variable that is not accounted for by the mediators (denoted as  $c'$ ). The reduction in the direct effect of abuse (i.e.,  $(c - c')/c$ ) when analyzed simultaneously with the mediators represents the proportion of the effect of childhood abuse accounted for by the mediators. To test the significance of the individual mediated effects (criterion 4), we used the product of coefficients procedures outlined by MacKinnon et al. (2002). The indirect effect of abuse through each mediator is calculated by multiplying the

mediator's regression coefficient,  $b$ , times the regression coefficient,  $a$ , for the effect of abuse on that mediator. These products are divided by standard error estimates calculated with the formula provided by MacKinnon et al. (2002) and tested for significance using MacKinnon's  $z'$  distribution. For these analyses, we used an alpha level of .05, for which a  $z'$  value of .97 or higher is considered significant.

## Results

As shown in Table 1, childhood abuse was significantly correlated with sensation seeking and BART-Y, but was not significantly correlated with impulsivity. Childhood abuse also was significantly correlated with HIV-related risk behavior. Both sensation seeking and BART-Y were significantly correlated with HIV-related risk behavior, but impulsivity was not. Given these results, impulsivity was dropped from further consideration as a mediator.

Standardized regression coefficients from regression analyses testing mediation are depicted in Figure 1. When analyzed without the mediators, the effect of childhood abuse on HIV-related risk behaviors was significant and positive,  $B = 0.027$ ,  $SE = 0.008$ ,  $\beta = .32$ ,  $sr^2 = .105$ ,  $p = .001$ . Separate regression analyses demonstrated that childhood abuse significantly predicted higher scores on sensation seeking ( $B = 0.17$ ,  $SE = 0.05$ ,  $\beta = .35$ ,  $sr^2 = .124$ ,  $p = .0004$ ) and BART-Y ( $B = 0.35$ ,  $SE = 0.11$ ,  $\beta = .30$ ,  $sr^2 = .090$ ,  $p = .003$ ). In the final model with childhood abuse, sensation seeking, and BART-Y as predictors, the effect of childhood abuse was reduced by 59.2% and was no longer significant,  $B = 0.011$ ,  $SE = 0.08$ ,  $\beta = .13$ ,  $sr^2 = .015$ ,  $p = .17$ . In this model, sensation seeking was associated with significantly greater HIV-related risk behavior,  $B = 0.068$ ,  $SE = 0.017$ ,  $\beta = .38$ ,  $sr^2 = .127$ ,  $p = .0001$ . The indirect effect of childhood abuse through the SSS was significant,  $a_1b_1 = 0.011$ ,  $z' = 2.71$ ,  $p < .001$ , accounting for 40.7% of the total effect of childhood abuse. BART-Y also was associated with greater HIV-related risk behavior,  $B = 0.013$ ,  $SE = 0.007$ ,  $\beta = .18$ ,  $sr^2 = .030$ ,  $p = .055$ , though the effect was considerably smaller and the significance of the effect was just above the traditional  $p$ -value of .05. The indirect effect of BART-Y ( $a_2b_2 = 0.005$ ,  $z' = 1.62$ )  $p < .01$  also was considerably smaller than that of sensation seeking, but was still significant and accounted for 18.5% of the total effect of childhood abuse on HIV-related risk behavior.

## Discussion

Among a sample of 96 African-American adolescents living in an urban/inner-city area, results indicated that HIV-related risk behavior was related to a composite of physical, sexual, and emotional childhood abuse, as well as two aspects of disinhibition (sensation seeking and risk-taking propensity). Further, both sensation seeking and risk-taking propensity served a mediating role in the relationship between abuse history and HIV-related risk behavior, with sensation seeking being considerably more influential. Impulsivity, which was used as a third aspect of disinhibition, was not related to either the abuse composite or HIV-risk behavior.

Results are consistent with those of previous research indicating the role of disinhibition variables in the link between childhood abuse and HIV risk behavior (e.g., Smith et al., 2004), and it extends these findings to our at-risk sample of low income minority youth using well defined multimodal measures of disinhibition. It is notable that impulsivity as a specific aspect of disinhibition did not serve a mediational role here, which is in contrast to the findings of Bailey and McCloskey (2005). Although several explanations for this difference are possible, measurement issues should be considered. The current study utilized a measure that was highly specific to impulsivity, whereas Bailey and McCloskey measured impulsivity more indirectly using the Aggression and Attention Problem subscales of the CBC-Youth Self Report form (Achenbach, 1991) and the Anger, Risk-seeking, and Impulsivity scale (Grasmick, Tittle, Bursik, & Arneklev, 1993). Although these measures assess aspects of impulsivity, they also

assess disinhibition more broadly including aspects of sensation seeking and risk-taking propensity which were the variables that did serve as mediators in the current study. As such, it is important for future studies to continue to examine impulsivity while addressing the various dimensions of the construct to understand better the specific nature of its relationship with abuse and HIV-risk behaviors.

The finding that risk-taking propensity and sensation-seeking mediated the relationship between childhood trauma and HIV-related risk behaviors suggests the need for larger-scale future studies. In exploring how this pattern of results may have come about, the directional models which we briefly described in the introduction are worthy of consideration. The first concerns the heritable nature of the biological correlates of sensation seeking (Benjamin et al, 1996), and, although less work on the topic is available, risk-taking propensity. Specifically, an emerging body of literature suggests that sensation-seeking and risk-taking may stem from dysregulation of the dopaminergic system (Benjamin et al, 1996). Disruptions in the dopamine system have been independently linked with drug misuse and other health-compromising/risky behavior (Limosin et al, 2003). Further, disorders linked with dopamine dysfunction, including substance use disorders, personality disorders, and bipolar disorder, often are evident in families of abuse victims (e.g., Chaffin, Kelleher, & Hollenberg, 1996). Although these findings could also be due to environmental factors, it is plausible that biological substrates with emergent psychological properties (i.e., temperament, personality dispositions) may account, in part, for abusive behavior and/or chaotic, disruptive environment on the part of the relevant family member, and the development of sensation-seeking/risky behavior such as risky sexual behavior and drug use on the part of the child.

A second plausible directional model suggests a pathway in which traumatic experiences in childhood lead to neurochemical dysregulation, which in turn leads to deficits in behavioral regulation and inhibition. Supporting this model, Galvin et al. (1991) reported that psychiatrically hospitalized children who had experienced significant neglect and/or abuse are considerably more likely to have reduced levels of plasma dopamine beta hydroxylase (D $\beta$ H), when compared to children without a history of traumatic stress. In turn, Galvin et al. (1997) have reported an association between low serum D $\beta$ H and symptoms of behavioral undercontrol/disinhibition, as well as with a history of early maltreatment. Relatedly, a wealth of literature indicates the role of mesolimbic dopamine release during drug-seeking behavior (e.g., Hyman, 2005). As such, behavioral undercontrol, biological irregularities, and intense negative affect (that is often associated with a history of abuse) may work in concert to lead victims to perceive positive consequences of the risky behaviors (Leigh, 1990).

There are four key limitations to be considered. First, the sample included only low income African American adolescents. This is clearly an underserved group for whom direct research attention is crucial given compounded risk for trauma associated with environmental factors (e.g., poor housing and poverty, prevalence of substance use and community violence; see Horowitz, Weine, & Jekel, 1995 and Schwab-Stone et al, 1995). However, it is unclear to what extent findings from the current study generalize more broadly or are limited to this specific group of adolescents. The second limitation was the use on composite measures to index abuse as well as HIV-related risk behavior. Although the use of composite scores was supported by inter-relationships among the measures in both cases, the limited sample size precluded more sophisticated statistical analyses to tease apart unique relationships across these variables. The third limitation was the measure of abuse used, as the retrospective self-report nature of the CTQ provides no way to substantiate the actual occurrence of childhood abuse, and introduces the possibility of retrospective bias. Moreover, the format and brevity of the CTQ provide a more general assessment limiting specificity regarding the context, nature, timing, and frequency of the abuse (see Dubo et al, 1997; Johnson et al., 2001). Fourth, although all participants came from a similar setting, the current study did not include other potentially

relevant demographic variables such as parental income and education, as well as stability of the home environment (e.g., Dong et al, 2005).

Despite limitations, the present study provides preliminary empirical evidence for the medicating role of the disinhibition variables, specifically sensation seeking and risk-taking propensity, in the relationship between childhood trauma and HIV-related risk behavior. In this way, the current study extends the literature using well-defined multimodal measures of disinhibition, and highlights the importance of increased attention to these individual difference variables among low income minority adolescents who are at elevated risk for developing HIV. At a clinical level, this work also suggests the potential value of efforts to target disinhibition processes and their tie to a history of abuse in HIV prevention efforts.

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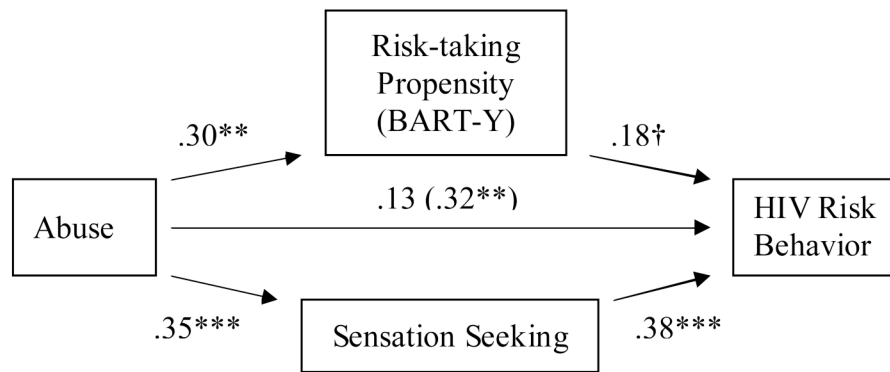
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**Figure 1.** Model depicting the mediated and direct effects of childhood abuse on HIV-related risk behaviors. Standardized regression coefficients are presented. The effect of abuse on HIV-related risk behaviors when the mediators are not included in the model is shown in parentheses. †  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ .

Table 1

Intercorrelations among key variables.

	Gender	Age	CTQ	BART-Y	SSS	EIS	HIV RB
Gender	---						
Age	.09	---	.04	-.12	.16	.09	-.08
CTQ	---	---	.12	.11	-.02	-.24*	.10
BART-Y			---	.30**	.35**	.06	.32**
SSS				---	.20*	.07	.30**
EIS					---	.39**	.47**
HIV RB						---	.12
							---

\*  $p < .05$ .\*\*  $p < .01$ .

Gender coded as 0 for girls and 1 for boys; CTQ = Childhood Trauma Questionnaire; BART-Y = Risk-taking propensity on the Balloon Analogue Risk Task-Youth Version; SSS = Sensation Seeking Scale; EIS = Eysenck Impulsivity Scale; HIV RB = HIV Risk Behavior.