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Impulsivity and its Relationship to Risky Sexual Behaviors and Drug Abuse

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Abstract

We examined a mediational model of the inter-relationship of drug use, sexual risk and impulsivity in a sample of young adults ($N = 89$), of which almost half displayed highly disruptive behaviors as children. We chose a mediational model given the emerging evidence that impulsivity is an underlying risk factor for many youth health risk problems, including sexual risk behaviors. The findings supported a partial mediational model in that the three target variables were significantly related to each other, yet the association of drug use and sexual risk was significantly reduced (although not to zero) when controlled by impulsivity. The findings support the view that the association of drug use and sexual risk behaviors is partially mediated by impulsivity, as well as the broader theory that youth with deficits in self-regulatory behavioral systems confer a greater likelihood of engaging in risky behaviors. Study implications and limitations are discussed.

Keywords

adolescent sexual risk; impulsivity; drug abuse

Impulsivity and its Relationship to Risky Sexual Behaviors

The risk for contracting the human immunodeficiency virus (HIV) infection and other sexually transmitted diseases (STDs) is a major public health concern among adolescents and young adults. The Centers for Disease Control and Prevention (Grunbaum et al., 2000) reported that 25% of the 15 million new STD cases in the U.S. each year are adolescents, making adolescence the fastest growing age group contracting HIV/STDs. In the United States, by the end of 2000, there were 1,688 cases of HIV reported in youth ages 13–24, with 959 of those cases reported in boys and 729 cases reported in girls.

Primary factors that increase the risk for risky sexual behaviors include early sexual involvement and unsafe sex (i.e. multiple partners, unprotected intercourse, and sex with high risk partners). Early initiation of sexual activity is usually defined as sexual experiences that occur before the age of 15, which, sequentially, increases the risk of contracting HIV or STDs because those who are younger tend to have more sexual partners and are less likely to use contraception (Moore et al., 1995). In a summary of three nationwide surveys, researchers found that sexual intercourse before the age of 15 was reported by 17% of females and 22% of males (Manlove & Terry, 2000), and less than two-thirds of sexually active U.S. high school

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youth in 2003 reported using a condom during most recent sex (Grunbaum et al., 2004). Furthermore, a study by Santelli, Brener, Lowry, Bhatt and Zabin (1998) found that, among American youth who were currently sexually active, 35% of males and 15% of females reported two or more sexual partners in the previous three months alone.

Unfortunately, many adolescents will not practice safe sex until after they contract an STD or become pregnant (Kershaw & Niccolai, 2003). To compound matters, HIV's long latency period suggests that the virus is often contracted during adolescence, but symptoms do not appear until approximately eight to ten years later (Sieving et al., 1997). Thus, it is likely that many people who were diagnosed in their twenties became infected during adolescence (Miller, Turner, & Moses, 1990).

Impulsivity (sometimes referred to as *behavioral undercontrol* or *disinhibition*) may have its origins in infant temperament and, if severe, manifest in childhood as disruptive behaviors, including the presence of attention deficit hyperactivity and conduct disorders (Tarter, Alterman, & Edwards, 1985; Kruger et al., 2002). It has also been linked to unsafe sexual behavior (Kruger et al., 2002). For example, Donohew and colleagues (2000) examined the relationship between impulsivity and risky sex among nearly 3000 high school students and found that female students scoring high on impulsivity reported "unwanted sex under pressure" and "unwanted sex when drunk" significantly more often than those low on impulsivity. Impulsivity was also significantly related to sexual risk variables of "5 or more lifetime sexual partners," "used alcohol before sex," "used marijuana before sex" and "never refused unsafe sex" among both genders. Other researchers have reported parallel relationships between impulsivity and risky sexual behaviors (Lejuez, Bornavolova, Daughter, & Curtin, 2005; Kahn, Kaplowitz, Goodman, & Emans, 2002).

Another factor that may be related to unsafe sex practices is the role of alcohol and other drug (AOD) use. Use of AODs has been associated with risky sexual behavior in young people (Poulin & Graham, 2001; Brook et al., 2004), and adolescents who abuse AODs are at a particularly high risk for contracting the HIV/AIDS infection as a result of having unplanned and unprotected sex (Capaldi, Stoolmiller, Clark, & Owen, 2002; Tapert, Arons, Sedlar, & Brown, 2001; St. Lawrence, Crosby, Brasfield, & O'Bannon, 2002).

We are not aware of any studies that have specifically addressed sexual risk behaviors among adolescents and young adults by examining the relations of impulsivity, drug involvement and sexual risk behaviors. Specifically, we test a mediational model to explore this interrelationship given our hypothesis that the association of AOD use and sexual risk behavior is influenced by the effects of impulsivity (presumed as an underlying trait). Clarification of this relationship can be beneficial to clinicians, researchers, and parents of youth in terms of prevention, recognition, and treatment of sexual risk behaviors.

Method

Participants

Eighty-nine English-speaking young adults participated in this study, ranging in age from 18 to 20 years (mean age = 18.7 years). Subjects were identified as a result of participating in two concurrent studies: a longitudinal study on ADHD and related disruptive disorders (the Minnesota Competence Enhancement Project (MNCEP) study; August et al., 1995; August et al., 2006), and a multi-site POSIT HIV/STD validation and norming study (Adolescent HIV/STD Risk-of-Exposure Screen Development; Young & Rahdert, 2000). MNCEP participants were identified from the broader, longitudinal study (the Minnesota Competence Enhancement Project), which started in 1991 when participants ranged in age from 7–11 years old. The MNCEP project identified samples of *disruptive* and *control* children from 22 suburban

elementary schools using a multiple-gate screening procedure (see August et al., 1995). Briefly, this procedure involved parent and teacher reports of disruptive behaviors, based on the Conners' Hyperactivity Index (HI-P, HI-T; Goyette, Conners, & Ulrich, 1978). Students who scored 1.75 sd above the mean on both the parent and teacher portions of the Conners screen were assigned to the disruptive group, whereas those who scored below 1.0 sd above the mean were assigned to the non-disruptive, or control group. The two groups did not differ significantly in regards to demographic variables (gender, school, age). At the baseline measurement (T1), all participants had an IQ score of ≥ 80 (Kaufman Brief Intelligence Test; K-BIT; Kaufman and Kaufman, 1990), did not have a pervasive developmental disorder, came from predominantly middle socioeconomic status families (Hollingshead, 1975), and were predominantly Caucasian. The sample's fourth assessment (T4) took place in 2000, when participants were either high school seniors, or one-year post-high school. Participants at the T4 assessment were additionally invited to be part of a multi-site study on a new sexual risk scale of the Problem Oriented Screening Instrument for Teenagers (POSIT). The multi-site POSIT study was conducted across the United States with the primary purpose of measuring the reliability and validity of a new HIV/STD risk scale among American, English-speaking youth (ages 12–19 years). Thus, the sample used for the current study includes participants who consented to both the MNCEP study and the POSIT- University of Minnesota study ($N = 89$; Disruptives $n = 49$; Controls $n = 40$). A summary of sample characteristics is provided in Table 1.

Measures

Sexual risk behaviors—The study used a relatively new scale measuring risk for HIV and STD's based on sexual behavior (Rahdert, Young, & Langenbucher, 2005; Young & Rahdert, 2000). The scale consists of 11 “yes/no” items that measure a range of sexual risk behaviors, including “ever had sexual intercourse”, “ever had sexual intercourse without using a condom”, “difficulty using condoms consistently”, “ever thought you/your partner might be pregnant”, “had sex with 2 or more people in past 3 months”, “ever had anal intercourse”, “ever been tested for HIV”, and “ever had a sexually transmitted disease”. Scores that fall in the range of 8–11 are considered *high risk of exposure* to HIV/STDs, whereas scores ranging from 0–2 are considered a *low risk of exposure* (Rahdert et al., 2005). The scale's estimate of internal consistency (coefficient alpha) is .78 (Rahdert et al., 2005). This newly developed HIV/STD risk scale constitutes the eleventh 11th problem area scale on the Problem Oriented Screening Instrument for Teenagers (POSIT; Rahdert, 1991). Development of this scale involved both rational and empirical procedures (Rahdert & Czechowicz, 1997). First, experts in the fields of adolescent development, HIV infection, and STDs submitted items that, based on their clinical experience, might predict risk of exposure to STDs among adolescent boys and girls. Members of this workgroup sorted the proposed items into 20 behavioral categories, rank-ordered the categories by level of risk, and then redistributed the original items into the 12 “most predictive” behavioral categories. Finally, the workgroup reduced the number of items in each behavioral category until the entire HIV/STD risk scale consisted of 30 nominated items. Using item response theory (IRT; Lord, 1980), the scale was reduced to 11 items by eliminating items that showed weak association with the HIV/STD criterion measures. Subsequently, the scale was evaluated as part of a multi-site study in which the scale and several validity measures were administered to 1418 adolescents from community and clinical settings (see Rahdert et al., 2005). Given the HIV/STD risk scale's link to the POSIT, we will refer to it heretofore as the POSIT HIV/STD scale.

Impulsivity—Impulsivity was measured by the higher order factor of Constraint (CON) on the Multidimensional Personality Questionnaire (MPQ; Tellegan & Waller, 1994). In its entirety, the MPQ consists of 11 primary scales, ten of which help define one of the three higher order dimensions: Constraint, Positive Emotionality, and Negative Emotionality. For purposes

of this study, only the Constraint dimension was used to measure impulsivity. This dimension encompasses traits related to impulsivity and behavioral moderation, including control, harm avoidance (otherwise known as sensation-seeking), and traditionalism (level of nonconformity or rebellion). Generally, high scores reflect characteristics of caution, sensibility, and high moral standards, but for ease of interpretation in this study, items were reverse-scored so that high scores indicate high levels of impulsivity, recklessness, and risk-taking. Extensive normative data have been collected on clinical and community samples (Harkness, Tellegan, & Waller, 1995; Ben-Porath, Almagor, Hoffman-Chemi, & Tellegan, 1995; DiLalla, Gottesman, Carey, & Vogler, 1993).

Drug abuse—This variable was defined as the number of recent (prior 5 years) DSM-IV substance use disorder (SUD; American Psychological Association, 1994) symptoms reported by the respondent. Clients were assessed for SUD symptoms for a maximum of three substances; thus this variable could range from 0 – 33. SUD symptoms were measured with the Adolescent Diagnostic Interview's (ADI) Substance Use Disorder module (Winters & Henly, 1993). This highly structured interview covers all abuse and dependence criteria for substances used five or more times during the prior 12 months. If the client reported use of five more times for more than three substances, the interviewee assessed SUD symptoms for the three drugs that the client reported to have used the most frequently within in the prior 12 months. There are extensive test-retest reliability and validity psychometric data on the ADI (Winters & Henly, 1993; Winters, Stinchfield, Fulkerson, & Henly, 1993).

Procedures

Participants were adolescents who had already consented to be assessed for their wave 4 MNCEP evaluation and who also consented to the additional POSIT study assessment. The MPQ (impulsivity) and ADI (drug abuse) measures were conducted as self-administered and interview measures, respectively. The POSIT HIV/STD scale was administered via an audio-computer-assisted self-interview (audio-CASI). In this procedure, the interviewer led the participant through a brief series of trial questions on a laptop computer in which the participant learned the structure of the computer program. The participant then donned a headset, and questionnaire items were shown one at a time on the computer screen while simultaneously being heard through the headset. The interviewer was present while the participant completed the computer-administered questionnaire in case of technical problems or questions, but could not see the individual items or responses. In addition to the MPQ, ADI, and POSIT HIV/STD, participants were also administered a battery of instruments at that time, including measures of drug use behaviors, psychopathology, and psychosocial adjustment. All of the participants were assessed by a trained research assessment technician, and completion of the battery lasted approximately 2 hours. Participants were paid a remuneration of \$75 for their participation.

Statistical Analyses

ANOVA was used to compare groups (disruptives vs. non-disruptives) on the target variables (drug abuse, impulsivity and sexual risk), partial correlations (controlling for age and gender) were computed between the target variables, and the hypothesized mediational effect of impulsivity on the relationship between drug use and HIV risk was tested using methods developed by Baron and Kenny (1986).

Results

Sample Bias

To test for sample bias effects, we compared data separately within the disruptive and control groups those who consented at the MNCEP T4 assessment to participate in the additional POSIT study (which represents the present study sample) versus those who participated in only

the MNCEP study at T4 ($n = 133$, disruptives; $n = 68$ controls). Separate one-way ANOVAs (POSIT-MNCEP participants vs. MNCEP-only participants) were computed within each subject group on all of health and psychosocial variables collected at T4 and on the following demographic variables (age at T4, gender, ethnicity, SES, IQ at T1, and % being raised by a single parent at T1). Within the controls, tobacco use was the only variable with group differences. The POSIT-MNCEP sample reported a higher rate of regular (weekly or more) tobacco use compared to the MNCEP-only group (64% versus 40%, $\chi^2 = 4.34$, $p < .05$). Within the disruptive group, we found only one between-group difference: the POSIT-MNCEP sample had a significantly higher rate of high-school graduates compared to the MNCEP-only sample (98% versus 81%, $\chi^2 = 8.69$, $p < .01$). Thus, in general, the MNCEP disruptive and control subjects who participated in the extra POSIT study assessment were quite comparable to the youth who received only the MNCEP assessment.

Mediational analysis

Table 2 shows means and standard deviations for the study target variables (drug abuse, impulsivity and HIV risk) as a function of group. Significant group differences were found on drug abuse, $F(1, 88) = 5.6$, $p < .05$, and impulsivity, $F(1, 88) = 6.1$, $p < .05$. There was no group difference on the HIV risk score ($p > .05$).

The partial correlations (i.e., after controlling for age and gender) among the variables are reported in Table 3. All correlations were statistically significant, $p < .001$ (range of r 's = .39 – .43).

According to Baron and Kenny (1986), a variable may function as a mediator to the extent that it accounts for the relation between the predictor and the outcome variable. Mediation is tested using the following four steps: (a) there is a significant correlation between the predictor variable and the mediating variable (Path a); (b) there is a significant correlation between the mediator and the dependent variable (Path b); (c) there is a significant correlation between the predictor variable and the dependent variable (Path c); (d) when Paths a and b are controlled, the magnitude of the relation between the predictor variable and the dependent variable (Path c) is significantly reduced or is no longer significant.

Tests of the effect of drug abuse on impulsivity (Path a) revealed that drug abuse was a significant predictor of impulsivity, $B = 0.42$, $\beta = 0.39$, $F(1, 83) = 15.08$, $p < .001$. Impulsivity was also found to be a significant predictor of sexual risk (Path b), $B = 0.11$, $\beta = 0.40$, $F(1, 84) = 13.60$, $p < .001$. Test of the unmediated model, which evaluated the effect of drug abuse on sexual risk (Path c) showed that drug abuse significantly predicted level of sexual risk, $B = 0.18$, $\beta = 0.43$, $F(1, 84) = 18.34$, $p < .001$. When the mediated model was tested, in which impulsivity was controlled, the effect of drug abuse on level of sexual risk, although significant, was reduced, $B = 0.13$, $\beta = 0.32$, $F(1, 82) = 18.26$, $p < .001$ (see Table 4). Sobel's (1982) test of mediation showed that this reduction was statistically significant, $Z = 2.22$, $p < .05$.

Discussion

This study was the first to examine the relationship of drug use, sexual risk and impulsivity. We chose a mediational model to explore these three variables given the emerging evidence that impulsivity is an underlying risk factor for many youth health risk problems, including sexual risk behaviors. The findings supported a partial mediational model. All three variables were significantly related to each other, yet the association of drug use and sexual risk was significantly reduced (although not to zero) when controlled for by impulsivity. In this light, sexual risk is influenced by drug use, but we also demonstrated an independent contribution of impulsivity.

The data are consistent with the notion that youth with impulse control problems suffer from deficits in self-regulatory behavioral systems that modulate cognitive functioning, which is essential in evaluating the immediate benefits from perceived pleasurable activities (Barkley, 1997). Consequently, when faced with risk-taking opportunities, such as sexual activity and drug use, which promise some type of immediate reinforcement (emotional or behavioral), individuals with dysregulated systems are more likely to relent to the urge to engage in the risky behavior. Behaviorally, this deficit in self-regulation can contribute to problems and disorders that likely stem from poor self-regulation, such as drug abuse and risky sexual behaviors (Martin, Earlywine, Blackson et al., 1994; Wills et al., 2001). There is also growing evidence that deficits in the pre-frontal cortex may contribute to this type of dysfunction in the brain's regulatory system that manifests as deficits in impulse control (Barkley, 1997).

Also, our findings are consistent with the growing literature on the increased likelihood of risky behaviors among youth diagnosed with disruptive behavioral problem, such as ADHD and/or conduct disorder. Whereas some exceptions in the literature exist (see Mannuzza, Klein, Bessler, Malloy, & LaPadula, 1998), teenagers with a childhood diagnosis of ADHD and/or conduct disorder, have demonstrated an elevated risk for drug involvement (August et al., 2006; Capaldi, Crosby, & Stoolmiller, 1996; Molina, Smith, & Pelham, 1999; Wilens, Biederman, & Mick, 1998) when compared to youth without these disorders. In the only study that has examined the risk of ADHD and risky sexual behavior, young adults with a childhood history of ADHD reported greater risky sexual behaviors compared to a matched sample of young adults without a history of ADHD (Flory, Molina, Pelham, Gnagy & Smith, 2006). Also, youth with these childhood diagnoses have shown tendencies toward impulsivity (Clark & Winters, 2002). Whereas our relatively small sample of disruptive youth does not permit an analysis by diagnosis, our disruptive youth had a high percentage with a childhood diagnosis of ADHD (55%) and the disruptives scored higher on all three target variables (drug involvement, impulsivity and sexual risk) compared to the non-disruptive controls.

Our study's focus on drug use and impulsivity should not minimize the importance of other factors that contribute to sexual risk behaviors. These include family factors (e.g., low level of perceived parental monitoring, poor communication) (Donenberg, Wilson, Emerson, & Bryant, 2002; Miller, Levin, Whitaker, & Xu, 1998) and peer variables (Dishion & McMahon, 1998; Winters, Remafedi & Chan, 1996). Additional studies are needed in order to better determine the relative strength of these contributing factors on sexual risk and the extent to which etiological factors vary as a function of gender, age, race and other youth characteristics.

The study findings reinforce the importance of prevention programs for sexual risk behaviors. Adolescence is a developmental period that gives rise to seeking experiences associated with high intensity feelings and arousal, and with less than optimal decision making when faced with requirements to control impulses and delay gratification (Dahl, 2004). The adolescent propensity towards impulsiveness may be developmentally normative. In this light, educating young people about the serious health risks associated with sexual behavior is indicated. Promising results have been found with sex education programs that include a significant involvement by the parents (e.g., Klein et al., 2005). Moreover, applying targeted prevention programs that focus on youth with deficits in impulse control (e.g., Conduct Disorder, ADHD), is a rational approach given that these types of programs are starting to demonstrate effectiveness and can be cost-efficient (August et al., 2007).

There are several study limitations. First, the study has a small sample size, which weakens the generalizability of the study findings. We did not have sufficient numbers of youth with a childhood history of ADHD and/or conduct disorders in order to generalize our results to the youth with these diagnoses. As already noted, several variables that may have exerted indirect effects on sexual risk behaviors were not included in the study. These include family factors

and parenting practices. Another limitation is that the measures of the target variables relied on self-report. Shared method variance may have contributed to the inter-relationship among the target variables.

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Table 1
Demographic characteristics of the study sample ($N = 89$)

Variable	n	%	mean
Control Group ¹	40	44.9	
Disruptive Group ²	49	55.1	
Boys	58	65.2	
Girls	31	34.8	
White	85	95.5	
Non-White	4	4.5	
High school graduate or equivalent	84	94.4	
Mean age at study intake			7.9
Mean age at young adult assessment			18.7

¹ Group based on absence of elevated scores on the teacher and parent Conners' Hyperactivity Index (Goyette, Conners, & Ulrich, 1978).

² Group based on elevated scores on the teacher and parent Conners' Hyperactivity Index.(Goyette et al., 1978). Based on the Revised Parent Version of the Diagnostic Interview for Children and Adolescents (DICA-R; Reich, Shayla, & Taibelson, 1992), the diagnostic breakdown of the Disruptive group is as follows: ADHD only, $n = 10$; ADHD with CD or ODD, $n = 17$; and only CD/ODD, $n = 2$.

Table 2
Summary Statistics and Group Differences (ANOVA) of the Study Variables

Variable	Disruptive (n=40)		Control (n=49)		F	p level
	Mean	sd	Mean	sd		
Drug Abuse (SUD symptom count; range 0–40) ^f	4.7	6.1	2.2	4.3	5.6	<.05
Impulsivity (MPQ; range 0–23)	12.2	5.3	9.2	6.2	6.1	<.05
HIV Risk Scale (POSIT; range 0–11)	3.8	2.0	3.5	2.6	0.3	.61

^f SUD symptom count refers to an aggregate count of symptoms for no more than 3 psychoactive substances.

Table 3Intercorrelations of the Study Variables Controlling for Age and Gender ($N = 89$)

	Drug Abuse	Impulsivity	HIV Risk
Drug Abuse	-		
Self-regulation/ Impulsivity (MPQ)	.39***	-	
HIV Risk	.43***	.40***	-

p<.001

Table 4
Results of the Logistic Regression Analysis in Predicting Sexual Risk

Step and Measure	R ²	Δ R ²	F for Δ R ²	Final Beta	t
Dependent Variable: Sexual Risk					
Step 1: Covariate	.00	.00	.03		
Gender				-.05	-.55
Age				.03	.28
Step 2: Impulsivity	.25	.07	7.14**	.28	2.67**
Step 3: Drug Abuse	.18	.18	18.26***	.32	3.03**