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Associations Between a Dopamine D4 Receptor Gene, Alcohol Use, and Sexual Behaviors among Female Adolescent African Americans

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Abstract

Adolescent African-American females are disproportionately impacted by HIV, thus there is a clear need to understand factors associated with increased HIV-risk behaviors among this vulnerable population. We sought to explore the association between a dopamine D4 receptor gene (DRD4), a genetic marker associated with natural variations in rewarding behaviors, and self-reported alcohol-use and sexual risk-behaviors, while controlling for other known correlates of risk-taking such as impulsivity, sensation seeking, and peer norms among a group of high-risk African American female adolescents to evaluate whether this biological factor enhances our understanding of patterns of risk in this vulnerable group.

Keywords

adolescents; African-American; risk-taking

African-American young women experience elevated rates of sexually transmitted diseases (STDs; Datta et al., 2007). Recent national estimates indicate that African American female adolescents between the ages of 15 and 19 experience the highest rates of chlamydia and gonorrhea (CDC, 2009), and are also disproportionately affected by HIV (Rangel, Gavin, Reed, Fowler, & Lee, 2006), accounting for 73% of adolescent HIV infections, with a diagnosis rate nearly 23 times the rate for Caucasian adolescents (CDC, 2012). Among African-American adolescent women, the majority of incident STD/HIV infections are

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acquired via heterosexual transmission (CDC, 2010, 2012). Given the high prevalence of STDs and HIV among African-American female adolescents, there is a clear need to understand factors associated with increased HIV-risk behaviors among this population.

One factor associated with sexual risk-taking and STDs/HIV across many populations, including African-American women, is alcohol use (Donovan & McEwan, 1995; Griffin, Umstattd, & Usdan, 2010; Shuper, Joharchi, Irving, & Rehm, 2009). Alcohol use can interfere with cognitive processing of information and decrease perceptions of risk, which in turn can influence sexual decision-making and increase the likelihood of risky sexual behaviors (Fromme, D'Amico, & Katz, 1999; Norris, Masters, & Zawacki, 2004). Historically, African-American women have lower prevalence rates of alcohol use disorders or dependence compared to Caucasian women (O'Leary, Broadwell, Yao, & Hasin, 2006). However, epidemiological findings suggest that the consequences of alcohol abuse are more severe among African-American women (Caetano, 1984).

In a review by Sales and colleagues (2012) of the association between alcohol use and sexual risk behaviors among African-Americans, eight of the nine studies conducted among African-American adolescents found significant positive associations between alcohol use and sexual risk behaviors (Sales, Brown, Vissman, & DiClemente, 2012). In the four studies conducted with exclusively female samples (which were predominately or exclusively African-American), all reported significant associations between alcohol use and sexual behavior, as well as associations with STDs (O'Donnell et al., 2008; Sales et al., under review; Seth et al., 2011; Woodrume, Zimet, Orr, & Fortenberry, 2006).

The emergence of the alcohol-risky sex connection is consistent with alcohol myopia theory, which specifies that alcohol exerts its largest effect on social behaviors in contexts where there are both strong instigatory and inhibitory cues to engage in a desired behavior (Steele & Josephs, 1990). When strong instigatory and inhibitory cues are present, alcohol myopia theory specifies that alcohol use limits a drinker's capacity to attend to distal inhibitory cues (e.g., potential STDs, unintended pregnancy) in the face of more powerful situational cues to engage in a desired behavior (e.g., sex without a condom or sex with a new partner). In support of alcohol myopia theory, experimental laboratory studies indicate greater intentions to engage in sexual risk behaviors (Abbey, Saenz, & Buck, 2005; MacDonald, Zanna, & Fong, 1996) and less ability to delay rewards when drinking relative to sober control participants (Ortner, MacDonald, & Olmstead, 2003). Thus, alcohol may lead to unsafe sex by narrowing attentional focus to the most salient aspects of the sexual situation (e.g., pleasurable sex without a condom) while reducing a person's capacity to focus on distal consequences of engaging in a desired behavior (MacDonald, MacDonald, Zanna, & Fong, 2000).

In addition to alcohol's demonstrated effects on decision-making and risk-taking among youth, biologically-based processes also impact decision-making and risk-taking. Dopamine, a neurotransmitter in the brain, is involved in brain systems implicated in attention, motivation, and reward seeking (Robbins & Everitt, 1999). These dopaminergic systems undergo extensive changes in adolescence, and these changes are thought to be involved in the heightened risk-taking that occurs during this time period (Steinberg, 2008). Despite a

general increase in risk-taking among adolescents, the level and type of risk-taking varies between individuals. Thus, it is essential for us to understand the biological influences on risk-taking in addition to the more traditionally studied socio-environmental influences on risk-taking (e.g., peers norms), and how biological and socio-environmental factors may interact in order to effectively design programs to reduce adolescent risk-taking and the negative consequences of sexual risk behaviors.

Due to dopamine's involvement in brain systems involved with attention, motivation and reward seeking, studying differences in genes that regulate dopamine's availability and detection in the brain may shed light on individual differences in reward-related behaviors. Variations in the genes that regulate dopamine's availability and detection have been studied in association with a number of behaviors and traits including, but not limited to, attention-deficit hyperactivity disorder (Nikolaidis & Gray, 2010), gambling (de Castro et al., 1997; Comings et al., 2001), sexual promiscuity (Garcia et al., 2010), alcohol use (Creswell et al., 2012; Park et al., 2011; Larsen et al., 2010), and novelty seeking (Forbes et al., 2009; Luciano et al., 2004). One of the most prominently studied genetic variations is a Variable Number of Tandem Repeats (VNTR) in the dopamine D4 receptor (DRD4). DRD4 was first discovered by Van Tol et al. (1991) who noted that a portion of the DRD4 genetic code contained a variable number of repeats, commonly 2, 4 or 7+ repeats (Van Tol et al., 1992). Activation of this dopamine receptor results in an inhibitory signal, and the DRD4.7 variant produces a weaker inhibitory signal compared to the other variants (Asghari et al., 1995; Wang et al., 2004). This difference may result in slightly altered dopamine signaling and brain responses to experiences that activate dopamine systems, such as reward-related experiences (e.g., pleasurable sexual situations, alcohol use with peers). A recent neuroimaging study showed that individuals with the DRD4.7 allele had a heightened brain response to a reward-related activity (a guessing game with varied positive and negative feedback; Forbes et al., 2009). Therefore, it is suggested that the weakened inhibitory effect of the DRD4.7 allele may allow for heightened reactivity (due to less inhibition) to stimuli that activate this dopamine system (Forbes et al., 2009). However, additional studies and confirmation are needed.

Two landmark studies investigated DRD4's association with behavioral traits. Both individually reported an association between DRD4.7 and novelty seeking behaviors (Ebstein et al., 1996; Benjamin et al., 1996). However subsequent studies have produced largely mixed results and point to the complicated nature of human behavior, and particularly to the variation in reward, attention, and motivation by an individual's age and situational context (Creswell et al., 2012; Luciano et al., 2004). For example, while an explicit association between DRD4.7 and alcohol use has been mixed and largely negative (Tyndale, 2003), a number of studies have reported an association between DRD4.7 and youth's alcohol use in social contexts. Young adults with the DRD4.7 allele were more likely to drink heavily if they were in the presence of someone drinking heavily (Larsen et al., 2010) and were more likely to report higher feelings of social bonding when drinking in a group setting, compared to those with other DRD4 alleles (Creswell et al., 2012). Furthermore, Park et al. (2011) found that college/Greek involvement heighten the risk for alcohol dependence only among young adults with the DRD4.7 allele. These findings point

to the potential importance of evaluating context and past experiences on reward-related behaviors and their association with DRD4.

Theory of differential susceptibility has been applied to DRD4, where individuals with the DRD4.7 allele are thought to be more susceptible to their social environments, both positive and negative (Belsky, 2007). This theory is particularly intriguing given that it may fit with both the positive and negative association findings for a variety of behaviors, due to their dependence on the individual's age, context, and past experiences (Belsky, 2007). During a study of delayed discounting among adults (preference for smaller, immediate rewards versus larger, delayed rewards), childhood socioeconomic status (SES) was more influential on the reward-delay preference for those with the DRD4.7 allele. Specifically, those reared in low SES conditions with the DRD4.7 allele had the greatest preference for a smaller, immediate monetary reward. Adults with the DRD4.7 allele but who were raised in higher SES conditions did not demonstrate a comparable preference for the smaller, immediate reward (Sweitzer et al., 2013). Another study reported that children with the DRD4.7 allele were more responsive to maternal behavior, where those with "insensitive mothers" were most likely to exhibit externalizing behaviors and those with "sensitive mothers" were least likely, compared to children with other DRD4 alleles (Bakermans-Kranenburg & van IJzendoorn, 2007). Furthermore, those with DRD4.7 were subsequently more responsive to a parenting intervention (Bakermans-Kranenburg, van IJzendoorn, Pijlman, Mesman, & Juffer, 2008), a finding that has been extended into adolescence where adolescents with the DRD4.7 allele were similarly found to be more responsive to a risk-reduction family intervention (Beach & Brody, 2010).

While the proposed link between DRD4 and behavior among youth has yet to be fully elucidated, evidence suggests DRD4s importance in understanding natural variations in behaviors that involve dopamine systems. Because of the known changes that occur in the dopamine systems during adolescence and their proposed link to increased levels of risk behaviors (specifically alcohol use and sexual behavior), our study sought to explore the relationship between DRD4 and self-reported lifetime alcohol-use and sexual risk-behaviors (lifetime number of vaginal partners), while controlling for other known correlates of risk-taking such as impulsivity, sensation-seeking, and peer norms (Sales & Irwin, 2009) among a group of high-risk African-American female adolescents to evaluate whether this biological factor provides a more comprehensive understanding of patterns of risk in this vulnerable group.

Method

Participants

From July 2005 to June 2007, African-American adolescent females were recruited from clinics in Atlanta, GA, to participate in an STD/HIV prevention trial. Adolescents were approached in clinic waiting areas by a female African-American recruiter who assessed study eligibility. Eligibility criteria included: age 14–20 years, at least one episode of vaginal sex without a condom in the past 6 months, not married, and not pregnant. Written informed consent was obtained from all adolescents with parental consent waived for those younger than 18 years because of the confidential nature of services they were seeking at the clinic.

Of those eligible, 94% ($N = 701$) enrolled in the study. Participants were compensated \$75 for baseline assessments. Participants were followed-up with post-intervention assessments every 6 months for 3 years.

DNA sample collection was a supplemental study to the main trial's data collection, thus not every participant enrolled in the main trial was invited to provide a sample. Those who were not invited to participate in this supplemental study were participants who 1) had already completed the trial ($n = 65$), or 2) did not return for the 24-month follow-up assessment ($n = 273$) when the DNA sample collection occurred. No differences were observed on baseline variables for participants retained in the trial compared to those unavailable for follow-up. In total, 363 participants were invited to provide a sample as part of the supplemental study; 31 declined. This study and its analyses report on data from 319 participants who participated in the main trial, and who, in addition to the baseline assessment, consented and provided a valid saliva sample for DNA analysis (13 samples were not of sufficient quality to yield results). The Emory University Institutional Review Board approved all study protocols.

Materials and Procedures

Audio computer-assisted self-interview—Prior to randomization and participation in the HIV prevention program, all participants completed a 60-minute survey via audio computer-assisted self-interviewing (ACASI) technology. Questions included demographics, impulsivity, sexual sensation seeking, peer norms supportive of sexual risk behaviors, alcohol use and sexual behaviors. All measures included in the study have been employed successfully in prior studies conducted among African-American adolescent females.

Genotyping—DNA was obtained using Oragene™ DNA kits (Genetek; Calgary, Alberta, Canada). Participants rinsed their mouths with tap water and then deposited 4 ml of saliva in the Oragene vial. The vial was sealed, inverted, and shipped via courier to a central laboratory in Iowa City, where samples were prepared according to the manufacturer's specifications. Genotype at DRD4 was determined for each sample as previously described (Beach, Brody, Lei, & Philibert, 2010). DRD4 genotypes were grouped as 7R– (both alleles less than 7-repeats) (0) or 7R+ (at least one allele 7-repeats or longer) (1); the 7R+ genotype was present in 46.5% of the sample. Based on prior findings, we hypothesize that those in the 7R+ group should report a greater odds of having ever tried alcohol and to have more sexual partners in their lifetime.

ACASI Measures

Demographic Item: Participants reported age in years and their current living arrangement.

Correlates of adolescent risk-taking

Impulsivity: Impulsivity was assessed using a 15-item impulsivity scale (Zimmerman & Donohew, 1996). Higher scores indicating higher levels of impulsivity. Cronbach's alpha was .76.

Sexual sensation-seeking: Sexual sensation-seeking was assessed by a 9-item scale (DiClemente et al., 2010). Higher scores indicating higher levels of sexual sensation seeking. Cronbach's alpha was .72.

Perceived peer norms supportive of sexual risk: Five items assessed perceived peer norms supporting risky sexual behavior (Stanton, Black, Feigelman, & Ricardo, 1995). Higher scores indicated greater perceived peer norms supporting risky sexual behaviors. Cronbach's alpha was .76.

Adolescent risk-taking: Alcohol use and sexual behaviors: Lifetime alcohol use was assessed by one item, "In your lifetime, have you ever tried alcohol?" (no/yes). Number of lifetime vaginal sex partners was assessed by asking, "In your entire life, how many guys have you had vaginal sex with?"

Because the main trial was not focused on alcohol use, our assessment of alcohol use is very restrictive. The only lifetime measure of risky sexual behavior assessed was lifetime number of vaginal sex partners, hence our rationale for utilizing this as the sexual behavior of interest. For descriptive purposes, participants also reported the frequency of condom use for vaginal sexual encounters during the past six months. Additionally, participants were tested for three STDs (Chlamydia, gonorrhea, and trichomoniasis) and the rate of baseline incident STDs is presented for descriptive purposes.

Data Analysis Plan

Analyses were limited to the baseline assessment and the results of the genotyping. Descriptive statistics summarized all study variables. Analyses examined bivariate associations (assessed by Pearson correlations) between potential correlates and adolescent risk-taking (i.e., alcohol use and number of lifetime sex partners) in order to identify variables to control for in our ANCOVA analysis. Bivariate analyses (t-tests and chi-square tests) were conducted to examine the association between DRD4 status, alcohol use and number of lifetime sex partners (i.e., the variables of focus in this study). To explore the extent to which the association between alcohol use and number of lifetime sex partners vary depending upon DRD4 status, an ANCOVA was conducted, with lifetime number of vaginal sex partners entered as the dependent variable, and DRD4 status (7R- and 7R+) and history of alcohol use [no history of alcohol use (0), and history of alcohol use (1)] as the primary independent variables. Age, peer norms supportive of sexual risk, impulsivity and sexual sensation seeking were all entered as control factors in this model. Post-hoc comparison tests were performed to interpret the significant interaction between alcohol use and DRD4 status on number of vaginal sex partners.

Results

Sample Description

Descriptive statistics for all measures are presented in Table 1. The majority was still in high-school or had only completed some high-school at enrollment (53.9%). Many reported living with their mother only (42.9%). Condoms were used, on average, 48% of the time

during vaginal sex in the 6 months prior to baseline assessment and 27% ($n = 86$) tested positive for an STDs. Among those testing positive, 46 were in the DRD4 7- group and 40 were in the DRD4 7+ group.

Bivariate associations among study variables

Pearson correlations among the entire sample (not conducted separately by DRD4 group status) are presented in Table 2. Sexual sensation-seeking was significantly positively correlated with having a lifetime history of alcohol use. Sexual sensation-seeking and peer norms supportive of sexual risk-taking were positively associated with number of lifetime vaginal sex partners. None of these factors were significantly related to DRD4 status.

Participants with a history of alcohol use reported more lifetime vaginal sex partners than those who had never used alcohol, $t(317) = -2.62, p = .009$; 10.12 versus 6.44 partners, respectively. In regards to the association between DRD4 and alcohol use, participants with at least one DRD4.7 repeat allele (7R+) were more likely (87.8%) to report a history of alcohol use compared to the 7R- group (78.9%); Chi-Square = 4.46, $p = .035$. However, participants in the 7R+ group did not significantly differ in the number of lifetime vaginal sex partners compared to the 7R- group; $t(317) = .71, p = .48$; 8.70 versus 9.93 partners, respectively.

ANCOVA to explore relationship between alcohol use and DRD4 status on sexual behavior

An ANCOVA, with lifetime number of vaginal sex partners as the outcome variable, and DRD4 status group (7R- versus 7R+) and history of alcohol use (no history of use versus history of alcohol use) as the primary independent variables was conducted, controlling for age, sexual sensation-seeking, impulsivity and peer norms supportive of sexual risk-taking (See Table 3). There were no main effects of either alcohol use or DRD4 status on number of sexual partners. However, an interaction between history of alcohol use and DRD4 was observed and indicated that for non-alcohol users, those in the 7R+ group had more lifetime sexual partners than those without ($M = 11.81$ vs. 4.85, respectively, with means adjusted for covariates entered in the model), but among alcohol users those with 7R+ reported fewer sexual partners than those without ($M = 8.51$ vs. 11.05, respectively, with means adjusted for covariates entered in the model), $F(1, 311) = 3.97, p = .047$. Post-hoc comparisons conducted separately for each DRD4 group found that among the 7R- group those who had never tried alcohol had significantly fewer partners than those who had tried alcohol, $F(1, 169) = 5.37, p = .02$. Among the 7R+ group, those who had never tried alcohol did not differ significantly in the number of partners than those who had tried alcohol, $F(1, 146) = 0.59, p = .45$.

Discussion

Similar to prior findings, we observed a positive association between adolescent's who endorse ever having tried alcohol and number of vaginal sexual partners among an adolescent African-American female sample (Sales et al., 2012 for review). Additionally, we observed that impulsivity, sexual sensation-seeking, and peer norms supportive of sexual risk-taking were also significantly associated with having more lifetime vaginal sex partners. Unique to this study we observed that a biological marker, DRD4 status, was associated with

being more likely to have a lifetime history of alcohol use among an adolescent African-American female sample. When controlling for known correlates of sexual risk-taking, the association between alcohol use (as measured by endorsing having ever tried alcohol) and sexual risk-taking (as measured by number of sex partners) varied depending upon an individual's DRD4 status, thus suggesting that biological differences, such as DRD4 status, may be important to consider when developing programs to reduce the risk-taking behaviors of adolescents. Future studies may consider utilizing broader theoretical perspectives such as the biopsychosocial model (Sales & Irwin, 2009), which emphasizes the importance of biological, psychosocial, and environmental factors and their intersection as they relate to behavior, to inform the development of future risk-reduction programs for adolescents.

In regards to the literature on DRD4 and reward sensitivity among youth, our findings replicate the positive association observed between DRD4.7 and alcohol use among young people (Larsen et al., 2010; Creswell et al., 2012) and extends this literature to a high-risk adolescent African-American sample. We believe our findings, similar to those of Larsen et al. (2010) and Creswell et al. (2012), point to the potential importance of evaluating socio-environmental factors including context and past experiences on reward-related behaviors and their association with DRD4. We found that the association between a history/context of alcohol use was differentially associated with lifetime number of sexual partners depending on DRD4 status. Thus, one's reward-sensitivity may influence their engagement in risk-taking behaviors directly, but importantly, it may also interact with their prior experiences (whether they are protective experiences or prior risk-taking experiences) to influence other risk-taking behaviors. Together, these findings point to the important interplay between biological influences of the dopamine system combined with socio-environmental influences of context and past experiences or previous risk-behavior on subsequent risk-taking behavior.

Another compelling, and related approach for interpreting our findings comes from the theory of differential susceptibility, where individuals with the DRD4.7 allele are thought to be more susceptible to their environments, both positive and negative (Belsky, 2007). For instance, based on prior studies reporting the strong influence of peers on whether teens will or will not engage in various risk-taking behaviors (see Sales & Irwin, 2009 for a review), it is plausible that adolescents who have never used alcohol affiliate with peers who do not use alcohol. However, because this sample was selected to participate in the parent study because of their high-risk sexual behaviors (and not their alcohol use), it is reasonable to expect they may affiliate with peers who also engage in high-risk sexual practices. In turn, those possessing the DRD4.7 allele may be more sensitive to the sexual risk-taking and high-risk norms supported by their peers, thereby influencing the number of sexual partners they have. This possibility should be interpreted with caution as we did not examine the relationship between DRD4, peer norms, and sexual behavior in this sample. However, we did find that those reporting perceived peer norms supportive of sexual risk-taking had significantly higher numbers of lifetime sexual partners. Thus, this association remains an empirical question for future studies.

Although we did not assess peer norms or peer behavior related to alcohol use in this sample, following the argument described above, adolescents with a history of alcohol use

may have been exposed to alcohol in the context of their peers' use. Those possessing the DRD4.7 allele may have been more sensitive to peer influences to use alcohol, and thus more likely to try alcohol. According to Jessor and Jessor's (1977) Problem Behavior Theory, risk-taking behaviors tend to co-occur among adolescents. Thus, alcohol using teens are likely exposed to alcohol using peers as well as peers who engage in sexual risk-taking. Although we found no overall significant difference in number of sex partners between those with and without the DRD4.7 allele, we did observe that overall, adolescents who endorsed ever having tried alcohol had more sex partners than non-alcohol using adolescents. Furthermore, among the non-alcohol using group, the DRD4 allele was significantly related to sexual risk. Specifically, the least risky group (lowest number of sex partners) were those who did not use alcohol and who did not have the DRD4.7 allele. However, those who similarly did not use alcohol but who did have the DRD4.7 allele reported significantly higher numbers of sexual partners and, interestingly, a relatively similar number of sexual partners as the alcohol-using group. Future research should more thoroughly explore the intersection of genes predisposing environmental-sensitivity and the role of peers, parents, and other salient social environmental factors on risk-taking behaviors, as well as resilient behaviors of adolescents. Findings that those with DRD4.7 were more responsive to a parenting intervention (Bakermans-Kranenburg et al., 2008), and a risk-reduction family intervention (Beach & Brody, 2010), suggests that understanding bio-socio-environmental interactions could be useful in identifying promising approaches for reducing risk-taking among youth.

Regardless of an individual's DRD4 status, we believe our findings indicate that additional research is needed to gain a greater understanding of the nuanced role of reward-sensitivity and the intersection of both risk behaviors in this population. More importantly for HIV prevention efforts, HIV prevention programs for adolescent African American females may consider providing in-depth discussion on the intersection between alcohol use and sexual behaviors, especially as alcohol use was associated with increased number of sex partners among this sample.

Our findings have practical implications for social workers as well. In order to ascertain a more complete profile of an individual adolescent's risk, social workers or others who interface with adolescents during the provision of social services may benefit from not only assessing the alcohol and sexual risk-taking practices of the individual teen, but also from assessing the larger peer norms supporting both alcohol and sexual risk-taking in their social networks. Given the complexity of the association between alcohol use and sexual risk-taking observed in this study, linking adolescent African-American girls regardless of their substance use behaviors to sexual health services may be an important protective action social services can engage in to help prevent unintended pregnancy, STDs or HIV among this population.

Our study has limitations. Due to the primary purpose of the parent study, we only had a very crude assessment of alcohol use, as well as no assessment of peer norms surrounding alcohol use in this sample. Additionally, we had a relatively small sample to explore genetic markers as they related to behavioral outcomes, and our variability was further restricted by having a small group of adolescents who had no lifetime history of alcohol. This restricted

the types of analyses we could explore and the questions we could examine in this sample. Future studies with more power and variability should explore the possible mediating role of parental and peer influences. Future research should utilize more sensitive measures that capture recent alcohol use patterns and the circumstances surrounding recent drinking (in the presence of peers or partners who are drinking) which map onto time-matched sexual behaviors in order to more adequately examine if DRD4 status (serving as a possible marker for sensitivity to one's environment) differentially relates to engaging in risk-taking behaviors. Finally, we utilized a sample recruited from sexual health clinics, which may limit generalizability of our findings to other samples who have never attended sexual health clinics or have not recently had unprotected vaginal sex.

Despite the availability of efficacious HIV prevention programs tailored for young African-American females, rates of STDs and HIV remain high. It is important that we continually explore new avenues of research, such as behavioral genetics, that may inform the adaptation of existing HIV prevention interventions tailored for adolescent African-American females or the development of new HIV prevention programs that are well suited to meet the needs of this group.

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Table 1

Descriptive statistics of the full study sample ($N=319$), and the DRD4 7- ($n = 171$) and DRD4 7+ ($n = 148$) groups separately.

	Full sample		DRD4 7-		DRD4 7+	
	Mean	SD	Mean	SD	Mean	SD
Descriptive variables						
School enrolled *	172	53.9	90	52.6	82	55.4
Live with mother *	137	42.9	82	48.0	55	37.2
Proportion of condom-protected sex, 6 months	.48	.36	.48	.36	.47	.36
STD positive *	86	27.0	46	26.9	40	27.0
Sociodemographic						
Age	18.04	1.39	18.10	1.36	17.98	1.43
Potential Correlates						
Impulsivity	38.65	7.06	39.34	6.69	37.85	7.40
Peer norms supportive of sexual risk	17.62	4.22	17.64	4.26	17.59	4.19
Sexual sensation seeking	19.61	4.16	19.84	4.18	19.36	4.14
Risk behaviors						
Lifetime alcohol use (no/yes) ^a	265	83.1	135	78.9	130	87.8
Lifetime number of vaginal sex partners	9.36	15.39	9.93	17.49	8.70	12.58

Note.

* These descriptive variables are binary (coded no/yes) so values presented in the means columns are frequency of participants endorsing yes for that variable and values presented in the standard deviation columns are percent of the sample endorsing yes for that variable.

^a Because this is a binary variable the values presented in the mean columns are frequency of participants reporting a history of alcohol use and values presented in the standard deviation columns are percent of sample reporting a history of alcohol use.

Table 2

Pearson correlations between known correlates of risk-taking and reported risk-taking behaviors among the full sample ($N = 319$).

Correlates of risk	Risk Behaviors	
	Number of sex partners	Lifetime alcohol use
Impulsivity	.08	.01
Sexual sensation seeking	.12 *	.19 **
Peer norms supportive of sexual risk	.15 **	.07

Note.

* $p < .05$,

** $p < .01$

Table 3

ANCOVA with number of lifetime sex partners as the outcome variable ($N = 319$).

	<i>F</i> , (<i>df</i>)	<i>P</i> value
Control variables		
Age	.91 (1, 311)	.342
Impulsivity	1.07 (1, 311)	.303
Peer norms supportive of sexual risk	4.94 (1, 311)	.028
Sexual sensation seeking	1.09 (1, 311)	.298
Main effects		
Lifetime alcohol use (no/yes)	.36 (1, 311)	.548
DRD4 status (7-/7+)	.86 (1, 311)	.353
Interaction		
Lifetime alcohol use x DRD4 status	3.97 (1, 311)	.047

Note. All means presented in the text are adjusted for the covariates in the model.