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Risky Sex, Drugs, Sensation Seeking, and Callous Unemotional Traits in Justice-Involved Male Adolescents

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The current study examined whether callous-unemotional (CU) traits predicted risky sexual behavior (i.e., unprotected sex, casual sex) and whether substance use and sensation seeking mediated this relationship over 24 months in justice-involved young men. Participants ($N = 1,216$) were an ethnically and racially diverse sample (46.3% White Latino, 38% Black, 15.7% White non-Latino) of first-time offending male adolescents (ages 13–17 years) from 3 U.S. cities. Participants completed 5 self-reported interviews at 6-month intervals over 2 years. Bootstrapped mediation analyses were conducted to test direct effects of CU traits on risky sexual behaviors, as well as indirect effects through substance use and sensation seeking. CU traits at baseline were positively associated with risky sexual behavior 18–24 months later. CU traits were also associated with the hypothesized mediators, sensation seeking and substance use, measured 6–12 months after baseline. CU traits exerted direct effects on later unprotected sex and casual sex, as well as indirect effects through substance use but not sensation seeking. These effects were largely unchanged when accounting for the youth's level of self-reported delinquency. These findings demonstrate that CU traits predict later risky sexual outcomes, and this is at least partly explained by substance use. Further, the findings highlight the importance of CU traits for several outcomes that are of significant public health concern among justice-involved adolescents, namely, risky sexual behavior and substance use.

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There is a growing body of research suggesting that callous-unemotional (CU) traits (i.e., a lack of remorse and empathy, deficits in concern over performance in important activities,

restricted or shallow affect) designates a distinct and important subgroup of children and adolescents with behavior problems (Blair, Leibenluft, & Pine, 2014; Frick, Ray, Thornton, & Kahn, 2014b). Specifically, antisocial youth who show elevated levels of these traits often show a severe, persistent, and violent pattern of conduct problems. For example, among justice-involved adolescents, CU traits predict more frequent and more varied delinquent acts (Ray, Thornton, Frick, Steinberg, & Cauffman, 2016) and more severe aggression that results in greater harm to victims (Kruh, Frick, & Clements, 2005; Lawing, Frick, & Cruise, 2010).

In addition to these differences in important antisocial outcomes, the presence of CU traits also characterizes a subgroup of antisocial youth who differ from their peers on a number of theoretically important variables that could be important for causal theory. For example, antisocial youth with CU traits are more likely to be fearless and sensation seeking (Barker, Oliver, Viding, Salekin, & Maughan, 2011; Fanti, Panayiotou, Lazarou, Michael, & Georgiou, 2016; Frick, Lilienfeld, Ellis, Loney, & Silverthorn, 1999), more likely to show reduced emotional reactivity to other's distress (Lozier, Cardinale, VanMeter, & Marsh, 2014; Marsh et al., 2008; Viding et al., 2012; White et al., 2012), and less sensitive to the effects of punishment (Blair, Colledge, & Mitchell, 2001; Centifanti & Modecki, 2013; Frick et al., 2003) than other antisocial youth. These characteristics have been hypothesized to play an important role in the deficits in prosocial emotions that define this group and may lead to more severe and aggressive pattern of behavior problems (Blair, 2013; Frick, Ray, Thornton, & Kahn, 2014a). Thus, the study of CU traits has proven to be important for understanding the development and manifestation of antisocial behavior in children and adolescents, which has led the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2013) to include CU traits among the criteria that define serious conduct problems in youth.

To date, much of the research on CU traits has focused on their association with a severe pattern of antisocial behavior and their significance in causal theories of antisocial and aggressive behavior (Frick et al., 2014a). However, there is emerging evidence that these traits may be important for explaining other problems in adjustment as well. Specifically, CU traits have been shown to be a risk factor for early and problematic substance use. For example, Fanti (2013) found that Greek-Cypriot youth with high levels of both conduct problems and CU traits were at greatest risk for initiating substance use between Grades 7 and 9 compared to youth with conduct problems and low levels of CU traits, as well as compared to youth with low or average levels of conduct problems. Similarly, adolescents' self-reports of CU traits in sixth grade were associated with increased likelihood of substance use, impairment associated with this use, and recurrent use in the ninth grade (Wymbs et al., 2012). Among youth involved with the juvenile justice system for the first

time, youth with CU traits were found to engage in more frequent substance use and to use harder substances (Ray et al., 2016). Moreover, boys classified as serious offenders with high levels of CU traits showed higher rates of multiple substance use over a 6-year follow-up period compared to other adolescent serious offenders (Baskin-Sommers, Waller, Fish, & Hyde, 2015).

These findings highlight the potential of using CU traits to identify risk for important problems in adjustment beyond antisocial outcomes in justice-involved adolescents. Another important outcome that may be related to CU traits is risky sexual behavior. Justice-involved adolescents are more likely to report risky sexual behaviors than community adolescents (Belenko, Dembo, Rollie, Childs, & Salvatore, 2009; Castrucci & Martin, 2002; Elkington et al., 2008; Romero et al., 2007; Teplin, Mericle, McClelland, & Abram, 2003). Risky sexual behavior is an important public health risk factor, given that prior research has demonstrated that male adolescents who endorsed having sex with someone not known well and who engaged in other high-risk sexual behaviors (e.g., concurrent partners, risky sexual partners) were more likely to contract a sexually transmitted infection (Dariotis et al., 2008). Despite the public health importance of risky sexual behavior in juvenile justice-involved adolescents, only a few studies have examined a possible association between risky sexual behavior and CU traits.

Rucević (2010) found that CU traits were positively associated ($r = .13$ and $.12$, for boys and girls, respectively) with a composite measure of risky sexual behavior (e.g., unprotected sex, one-night stands, pregnancy, sexually transmitted infection) in a large sample ($n = 226$ boys, $n = 480$ girls) of Croatian adolescents (ages 12–19 years). Similarly, McCauley and colleagues (2016) reported that CU traits were associated with self-reports of unprotected sex in a sample of community adolescents (ages 10–14 years). Further, adolescents with conduct problems and elevated CU traits were more likely to report early initiation of sex (i.e., before 13 years of age) over a 6-year study period compared to other adolescents with or without conduct problems (Wymbs et al., 2013). However, within the same sample, high levels of conduct problems, but not CU traits, predicted pregnancy by 12th grade. Research from the Fast Track Project of adolescents in four school systems across the United States ($n = 683$) indicated that CU traits and conduct problems interacted to predict a composite score of risky sexual behavior, such that conduct problems positively predict risky sexual behavior among youth with high levels of CU traits but not among youth with low levels of CU traits (Anderson, Zheng, & McMahon, 2016). Thus, there is some evidence that CU traits are associated with risky sexual behavior in adolescence. However, these studies also suggest that the potential role of conduct problems needs to be considered when studying this association. Further, none of the studies to date have examined this association in justice-involved adolescents who, as noted, appear to show high rates of both CU traits and risky sexual behaviors.

Existing research has also not explored possible reasons for why CU traits may be associated with risky sexual behavior. For example, CU traits are highly correlated with measures of impulsivity and sensation seeking in both adult (Hare & Neumann, 2008) and child (Essau, Sasagawa, & Frick, 2006; Frick, Bodin, & Barry, 2000) samples. Further, sensation seeking is associated with risky sexual behavior in samples of adolescents (Byck, Swann, Schalet, Bolland, & Mustanski, 2015; Charnigo et al., 2013; Ritchwood, Penn, DiClemente, Rose, & Sales, 2014; Spitalnick et al., 2007; Voisin, Tan, & DiClemente, 2013). For example, sensation seeking was negatively associated with condom use among juvenile justice-involved youth (Robbins & Bryan, 2004). Thus, it is possible that the high level of sensation seeking in youth with elevated CU traits may be the mechanism through which CU traits lead to risky sexual behavior.

Another possible explanation for the link between CU traits and risky sexual behavior involves substance use. As noted, CU traits have been related to more severe patterns of substance use in both community (Fanti, 2013) and justice-involved (Baskin-Sommers et al., 2015; Ray et al., 2016) adolescents. Further, substance use in early adolescence has been found to predict early sexual activity in high-risk youth, as well as to mediate the association between aggressive disruptive behavior in kindergarten and early sexual activity (Schofield, Bierman, Heinrichs, & Nix, 2008). Moreover, male juvenile offenders were 6 times more likely to report having vaginal or anal sex if they had recently used alcohol (Tolou-Shams et al., 2012). Several reasons have been suggested to explain the association between substance use and risky sexual behavior (see Leigh & Stall, 1993, for review). Specifically, substance use may reduce the likelihood that adolescents will discuss sexual risks and condom use with their partners (Kingree & Betz, 2003; Kingree, Braithwaite, & Woodring, 2000; Wu, Witkiewitz, McMahon, & Dodge, 2010) or substance use may decrease inhibition, leading to higher rates of multiple types of risk behaviors, including risky sexual behaviors (Donovan & Jessor, 1985; Donovan, Jessor, & Costa, 1988).

Based on this previous research, we tested the hypothesis that CU traits would predict risky sexual behavior in a sample of justice-involved adolescents. In addition, we tested the novel prediction that the effects of CU traits on risky sexual behavior would be mediated by substance use and sensation seeking. These two potential mediators reflect behavioral and temperamental possibilities for helping to explain an association between CU traits and risky sexual behaviors. These hypotheses were tested using a longitudinal design in which CU traits were assessed at a time point prior to the assessment of sensation seeking and substance use, which in turn were assessed prior to the risky sexual behavior outcomes. Utilizing such a longitudinal design with temporal ordering provides the strongest test of mediational hypotheses (Cole & Maxwell, 2003; Maxwell & Cole, 2007; Preacher & Kelley, 2011). It is important to note, we tested whether any direct or indirect effects of CU traits on risky sexual behavior was independent of antisocial behavior (i.e.,

self-reported offending). Further, we indexed risky sexual behavior with behaviors (unprotected sex, casual sex) that have previously been associated with negative outcomes for adolescents, such as acquiring a sexually transmitted infection or pregnancy (Belenko et al., 2009; Dariotis et al., 2008). Moreover, using a sample of justice-involved adolescents not only enhances the variability of the key constructs of interest but also makes the results potentially important for understanding why this group may display high rates of risky sexual behaviors, which could in turn guide interventions implemented to reduce this public health risk.

METHODS

Participants

Participants were 1,216 male adolescents drawn from the juvenile justice systems of Jefferson Parish, LA ($n = 151$); Orange County, CA ($n = 532$); and Philadelphia, PA ($n = 533$), to participate in the Crossroads Study. To be eligible for the Crossroads Study, juveniles had to be first-time male offenders according to court records at each site, be English speakers between the ages of 13 and 17 at the time of arrest, and have an eligible offense. Eligible charges were midrange offenses, such as theft of goods, simple battery, and vandalism. Across all three sites, 72.32% of individuals eligible to participate enrolled in the study. Participants' mean age at baseline was 15.28 years ($SD = 1.29$), and the sample was primarily White Latino ($n = 563$, 46.3%) and Black ($n = 462$, 38.0%), followed by White non-Latino ($n = 191$, 15.7%). Participants' average intelligence was lower than that of the general population (Full Scale IQ = 88.54, $SD = 11.65$, as assessed by the Wechsler Abbreviated Scale of Intelligence [Wechsler, 1999] using the vocabulary and matrix reasoning subtests).

Participants were reassessed every 6 months and data from baseline and the 6-month ($n = 1,161$; 95% retention), 12-month ($n = 1,141$; 94% retention), 18-month ($n = 1,141$; 93% retention), and 24-month ($n = 1,154$; 95% retention) follow-ups were utilized to test the study hypotheses. Participants that were not included in analyses due to attrition (i.e., having less than three completed interviews; $n = 37$) did not differ significantly in age or IQ, processing decision, study site, race/ethnicity, or the baseline variables such as CU traits and self-reported offending. This effective sample size ($n = 1,179$) was still primarily White Latino ($n = 549$; 46.6%) and Black ($n = 448$; 38.0%), followed by White non-Latino ($n = 182$; 15.4%).

Measures

Key predictor

Callous-unemotional traits. CU traits were assessed at baseline using the 24-item Inventory of Callous-Unemotional Traits (ICU; Kimonis et al., 2008). CU traits as measured by

the ICU have been associated with restricted emotional responses to others' distress on self-report (e.g., measures of affective empathy; Jones, Happé, Gilbert, Burnett, & Viding, 2010) and biological (e.g., less amygdala activation to fearful faces; Lozier et al., 2014; Viding et al., 2012; White et al., 2012) measures. The use of the total score on the ICU has been supported in factor analyses conducted with both detained (Kimonis et al., 2008) and community (Essau et al., 2006) samples of adolescents. That is, although factor analyses suggest that the items consistently form three subfactors (Callousness, Unemotional, and Uncaring; e.g., Kimonis et al., 2008), adequate model fit is only obtained by specifying an overarching CU dimension including all items. Further, the construct validity of three subfactors has been called into question by item–response analyses, suggesting that they may reflect method factors attributable to the direction of item wording (Ray et al., 2016). Finally, the total score on the ICU correlates positively with antisocial behavior and negatively with prosocial behavior in samples of both community and detained adolescents (Eremsoy, Karanci, & Berument, 2011; Essau et al., 2006; Kimonis et al., 2008; Roose, Bijttebier, Decoene, Claes, & Frick, 2010). Within the current sample, the internal consistency for the ICU at baseline was adequate (Cronbach's $\alpha = .76$) and the mean and standard deviation exhibited in Table 1 are similar to those demonstrated in other juvenile justice-involved samples of adolescents (e.g., Kimonis, Frick, Fazekas, & Loney, 2006).

Mediators and covariate

Sensation seeking. Sensation seeking was measured at 6- and 12-month assessments using the six-item short

version of the Sensation Seeking Scale (Steinberg, Albert, Cauffman, Banich, & Graham, 2008), which was derived from the full scale (Zuckerman, Eysenck, & Eysenck, 1978) to focus on items exclusively indexing thrill and novelty seeking. Participants indicate whether each of the six items are true or false for them (e.g., "I like doing things just for the thrill of it"). Higher scores indicate higher levels of sensation seeking. The Sensation Seeking Scale has been associated with a laboratory task of risk taking in adolescents (Chein, Albert, O'Brien, Uckert, & Steinberg, 2011; Steinberg et al., 2008). Within the current sample, the internal consistency for sensation seeking was adequate at 6-month (Cronbach's $\alpha = .74$) and at 12-month (Cronbach's $\alpha = .76$) assessments. Further, sensation seeking means at 6- and 12-month assessments were positively associated ($r = .57, p < .001$) and, as a result, the mean scores across the two time points were used in analyses.

Substance use. Substance use was assessed at 6- and 12-month assessments using the Substance Use/Abuse Inventory (Chassin, Rogosch, & Barrera, 1991). The Substance Use subscale comprises 13 items (i.e., alcohol, marijuana, sedatives, stimulants, cocaine, opiates, ecstasy, hallucinogens, inhalants, amyl nitrate, own prescription medication, other's prescription medication, other drugs), which assess the number of times the participant had used a category of substances in the past 6 months (e.g., "How many times have you used marijuana or hashish to get high?" "How often have you had alcohol to drink?"). Each item was then dichotomized (0 = no, 1 = yes) to reflect the number of substances endorsed during the previous 6 months. This assessment of substance use has previously been associated with substance or alcohol

TABLE 1
Zero-Order Correlations Among Main Study Variables

	2	3	4	5	6	7	8	9	10	11	M/%	SD	Range
1. Age	.06	-.09**	.08**	.03	.19***	-.01	.09**	.29***	.22***	.15***	15.28	1.29	13–18
2. IQ	—	-.14***	.26***	-.06	.08**	-.07*	.07*	.15***	.03	.08**	88.44	11.67	55–128
3. Black ^c		—	-.33***	-.73***	-.09**	-.08**	-.22***	-.28***	-.13***	-.06	38.0%	—	—
4. White Non-Latino ^c			—	-.40***	.06	-.05	.11***	.22***	.06*	.01	15.4%	—	—
5. White Latino ^c				—	.05	.11***	.14***	.11***	.08*	.05	46.6%	—	—
6. Self-Reported Offending ^a					—	.36***	.32***	.50***	.23***	.23***	1.68	.80	0–4.36
7. CU Traits						—	.26***	.29***	.17***	.14***	26.29	8.11	0–55
8. Sensation Seeking							—	.38***	.17***	.11***	.63	.27	0–1
9. Substance Use ^b								—	.35***	.24***	.25	.25	0–1.10
10. Unprotected Sex ^c									—	.55***	36.1%	—	—
11. Casual Sex ^c										—	19.6%	—	—

Note: Black, White non-Latino, White Latino are coded 1 for endorsing the race/ethnicity and 0 for all other individuals. Age, IQ, CU traits, and Self-Reported Offending assessed at baseline; Sensation Seeking and Substance Use mean score across 6- to 12-month follow-up assessments; Unprotected Sex and Casual Sex are dichotomous (1 = endorsed) variables across 18–24 months. CU = callous-unemotional traits.

^aSquare root transformed.

^bLogarithm transformed.

^cA dichotomous variable; correlations associated with these variables are dichotomous/dichotomous or dichotomous/continuous depending upon the variable correlated.

* $p < .05$. ** $p < .01$. *** $p < .001$.

disorders, as well as self-reported offending and number of arrests within a serious juvenile offending sample (Mulvey, Shubert, & Chassin, 2010). Within the current sample, the internal consistency for substance use was adequate at both 6-month (Cronbach's $\alpha = .76$) and 12-month (Cronbach's $\alpha = .74$) assessments. Further, substance use means at 6- and 12-month assessments were positively associated ($r = .69, p < .001$). Thus, the mean score across the two time points was used. However, the initial mean from the two time points calculated for substance use was extremely skewed (2.38) and kurtotic (7.98), which would violate the assumptions of normality for the proposed mediational analyses. Thus, the mean score was log transformed (i.e., $\log[\text{substance use mean} + 1]$), and the resulting log-transformed substance use variable exhibited a more normal distribution (skew = .69, kurtosis = $-.30$).

Self-reported offending. The Self-Report of Offending Scale (SRO; Huizinga, Esbensen, & Weiher, 1991) was utilized to assess offending behavior at baseline. The SRO comprises dichotomous items (0 = no, 1 = yes) asking participants if they have ever engaged in 24 types of crime (e.g., vandalism, theft, carrying a gun). A total score was calculated to create an overall measure of variety of offending, in which higher scores reflect more types of offending. The SRO has previously been associated with official reports of offending in juvenile samples (Thornberry & Krohn, 2000). Similar to the substance use variable, the SRO total score violated the assumptions of normality for the proposed mediation analyses based on skew (i.e., 1.83) and kurtosis (i.e., 7.98). Therefore, a square root transformation was conducted on the SRO total score, which corrected for both skew (i.e., .44) and kurtosis (i.e., .58). Further, the SRO demonstrated good internal reliability in the current sample (Cronbach's $\alpha = .82$).

Sexual risk outcomes

Unprotected sex. Whether participants engaged in unprotected sex was assessed at 18- and 24-month assessments by asking participants about their condom usage for different types of sex in the past 6 months. Participants indicated their general patterns of condom usage for both vaginal and anal sex (e.g., "Thinking about the past 6 months, how often do you use condoms when you have vaginal sex?") and responded on a 4-point scale from 0 (*always*) to 3 (*never*). Responses were dichotomously coded such that participants who did not engage in sex or always used condoms (for either vaginal or anal sex) across both time points were coded as 0 (no unprotected sex; $n = 723, 64\%$) and participants who endorsed engaging in any (vaginal or anal sex) unprotected sex were coded as 1 (yes unprotected sex; $n = 408, 36\%$).

Casual sex. Another measure of risky sex was assessed at 18- and 24-month assessments, such that participants endorsed whether they had sex (i.e., vaginal or anal)

with a partner that was "not known well" (i.e., casual sex) in the previous 6 months. Prior research has demonstrated that male adolescents who endorsed having sex with someone not known well and engaged in other high-risk sexual behaviors (e.g., concurrent partners, risky sexual partners) were more likely to have had a sexually transmitted infection (Dariosis et al., 2008). In the current study, participants endorsed whether they had experienced sex with a partner whom they did not know very well (e.g., "Have you had vaginal sex with someone you didn't know very well in the past 6 months?"). Responses were dichotomously coded, such that if a participant endorsed any sex (vaginal or anal) with a not-known-well partner at 18- or 24-month assessments were coded 1 (yes casual sex; $n = 217, 20\%$), and those who did not endorse any sex with a not-known-well partner were coded 0 (no casual sex; $n = 892; 80\%$).

Procedures

Institutional Review Board approval was obtained at each participating university before data collection began. Following determination that the youth met inclusionary criteria based on official records, researchers contacted and provided a description of the study to eligible youth and his parent or legal guardian. The parent or legal guardian provided consent either over the phone, which was recorded, or at the time of the baseline interview. During the consent process, researchers informed the parent that the youth would receive an incentive for participation that would increase by \$15 for each follow-up interview (i.e., \$50 at baseline, \$65 at 6-month follow-up, \$80 at 12-month follow-up, \$95 at 18-month follow-up, and \$110 at 24-month follow-up) and that participation in the study would in no way influence the youth's treatment by the juvenile court. Participants provided assent at the baseline interview. If a participant reached the age of 18 during the study, consent from the participant was obtained before continuing with participation. The parent and youth were informed that the research project had obtained a Privacy Certificate from the Department of Justice, which allowed the research information to be protected from being subpoenaed for use in legal proceedings.

Participants' baseline interview was conducted within 8 weeks of the initial processing decision from the respective juvenile justice systems, and follow-up interviews were conducted every 6 months for a total of five time points (baseline, 6-month, 12-month, 18-month, and 24-month assessments). Interviews were conducted at a location convenient for the youth, often his home, a nearby restaurant, or library in the community, or at the universities conducting the research. Interviewers attempted to provide as much privacy to the participant as possible by utilizing response cards for standardized measures, which allowed the participant to say a number as opposed to a full verbal response. The interview was administered from a laptop with an

interviewing program that included all items and measures for convenience and standardized administration. If the participant was incarcerated in a facility that did not allow researchers to utilize the interviewing laptop, a paper version of the interview was administered ($n = 234$; 3.97% of all interviews). If a participant had moved a significant distance from the study locations and an in-person interview was not possible, phone interviews were conducted ($n = 238$; 4.04% of all interviews). To avoid comprehension problems related to low reading ability, interviewers read all interview questions aloud to the participant.

Data Analyses

Zero-order correlations were first used to test the association among the main study variables and between the main study variables and demographic variables (i.e., age, IQ, and race/ethnicity). To test the mediation hypothesis, the Process procedure (Hayes, 2013) was utilized in IBM SPSS Statistics 22.0 (IBM, 2013). The Process procedure produces beta estimates of the total, direct, and indirect effects of an independent variable (i.e., CU traits) on an outcome (i.e., sexual risk outcomes) through bootstrapping (10,000 iterations). The Process procedure excludes participants if complete data are not available, which is reflected in the different number of participants in each analysis (i.e., unprotected sex $n = 1,127$; casual sex $n = 1,106$). These differences represent participants that did not respond sufficiently for scores on main study variables in addition to the 37 participants not included due to attrition.

Given that both the sexual risk outcomes were dichotomous, the Process procedure provides a logistic regression summary, which includes p values for the direct effect of the independent variable on the outcome. However, indirect effects are not provided with p values but with bootstrapped bias-corrected 95% confidence intervals. Effect size measures for indirect effects are not provided when outcomes are dichotomous, but a contrast between indirect effects ($\text{Effect}_{\text{Mediator1}} - \text{Effect}_{\text{Mediator2}}$) and the resultant bias-corrected 95% confidence intervals are provided. CU traits at baseline were entered as the independent variable and the dichotomous risky sex indicators from 18- to 24-month assessments were entered as the outcome variables in logistic regression analyses. Sensation seeking and substance use means from 6- to 12-month assessments were entered as potential mediators for all models. Further, age, IQ, dummy coded race variables (White Latino as the comparison group) were entered as covariates for all models.

For each of the two sexual risk outcomes, the mediational tests were conducted in a hierarchical order. In the first model, direct and indirect effects were calculated and tested for significance controlling only for demographic covariates. In the second model, baseline levels of self-reported offending were added to determine if any direct or indirect effects of CU traits on the sexual risk outcomes could be accounted for by the youths' general antisocial tendencies. In the third model, mediational tests were conducting adding baseline levels of the

mediators (substance use, sensation seeking) and the risky sex outcomes. This last step provides the most conservative tests of mediation, especially given that the risky sex outcomes were dichotomous variables. That is, this last step tests the ability of CU traits to predict new instances of sexual risk behavior in those who did not show any risk behavior prior to study entry (i.e., at baseline). Thus, this approach to data analyses allowed for clear tests of CU traits' overall association on later risky sexual behavior, as well as its effects on new onset risky sexual behavior specifically. Following these main analyses, follow-up analyses were conducted to examine whether the results changed when (a) only alcohol and marijuana use were used as indicators for substance use (together and individually) and (b) when all youth who had been detained at any point during the 24 months ($n = 151$) were removed from analyses.

RESULTS

Zero-Order Correlations

The descriptive statistics and the zero-order correlations among the main study variables are presented in Table 1. Age was positively associated with sensation seeking, substance use, and both sexual risk outcomes. Intelligence was negatively associated with CU traits but positively associated with sensation seeking and substance use, as well as engaging in casual sex (i.e., sex with a not-known-well partner). Being Black was negatively associated with sensation seeking and substance use, as well as unprotected sex. Further, self-reported delinquency was associated with CU traits, the hypothesized mediators, and the sexual risk outcomes. The zero-order correlations also indicated that, consistent with the mediational predictions, CU traits were associated with both sexual risk outcomes. Further, CU traits were significantly correlated with both hypothesized mediators, and both mediators were associated with the risky sex outcomes, as would be predicted by the mediational hypotheses.

Primary Tests of Mediation

Table 2 provides the results of the bootstrapped total, direct, and indirect effects with their corresponding bootstrapped bias-corrected confidence intervals for the three logistic regressions testing mediation for engaging in unprotected sex. In the first model for unprotected sex ($n = 1,127$), the demographic variables were included as covariates and the overall binary logistic regression model was significant (Nagelkerke $R^2 = .1971$, $p < .0001$). This model resulted in a significant direct effect from CU traits, as well as a significant total indirect effect through the two mediators. Further, when the indirect effects were separated between the two mediators, the indirect effect through substance use was significant, but the indirect effects through sensation

TABLE 2
Bootstrapped Binary Logistic Regression Analyses for Mediation

	Nagelkerke R^2	Direct Effect	p	Indirect Effect	95% Bias-Corrected CI	
					Lower	Upper
Controlling for Age, IQ, Race/Ethnicity						
CU → SU/SS → Unprotected Sex	.1971	.0251	.0053	.0242*	.0169*	.0323*
CU → SU → Unprotected Sex				.0216 ^a	.0149	.0289
CU → SS → Unprotected Sex				.0027 ^a	-.0019	.0079
Controlling for Baseline Self-Reported Offending						
CU → SU/SS → Unprotected Sex	.1984	.0227	.0149	.0124*	.0073*	.0187*
CU → SU → Unprotected Sex				.0108 ^b	.0066	.0164
CU → SS → Unprotected Sex				.0015 ^b	-.0016	.0052
Controlling for Baseline Self-Reported Offending, Baseline levels of Mediators and Outcome						
CU → SU/SS → Unprotected Sex	.2350	.0228	.0166	.0096*	.0053*	.0153*
CU → SU → Unprotected Sex				.0087	.0049	.0140
CU → SS → Unprotected Sex				.0009 ^c	-.0011	.0036

Note: Unprotected Sex is dichotomously coded from 18–24 months. Age, IQ, dummy coded race/ethnicity variables (White Latino as comparison group) were entered as covariates on all models. The second model also entered baseline Self-Reported Offending as a covariate. The third model also added baseline Substance Use, baseline Sensation Seeking, and the baseline outcome as covariates. CU = Callous-Unemotional traits assessed at baseline; SU = Substance Use logarithm transformed mean 6–12 months; SS = Sensation Seeking mean 6–12 months; CI = confidence interval.

^aIndirect effects were significantly different (β contrast = .0189), bootstrapped 95% CI [.0095, .0286].

^bIndirect effects were significantly different (β contrast = .0093), bootstrapped 95% CI [.0037, .0160].

^cIndirect effects were significantly different (β contrast = .0078), bootstrapped 95% CI [.0032, .0136].

*Total indirect effects and CIs.

seeking were not. It is important to note, all of these direct or indirect effects remained significant when controlling for self-reported offending (Nagelkerke R^2 = .1984, p < .0001) and controlling for baseline levels of the mediators and outcome (Nagelkerke R^2 = .2350, p < .0001).

Table 3 provides the results of the bootstrapped total, direct, and indirect effects with their corresponding bootstrapped bias-corrected confidence intervals for the three logistic regressions testing mediation for engaging in casual sex. In the first model for casual sex (n = 1,106), the demographic variables were

TABLE 3
Bootstrapped Binary Logistic Regression Analyses for Mediation

	Nagelkerke R^2	Direct Effect	p	Indirect Effect	95% Bias-Corrected CI	
					Lower	Upper
Controlling for Age, IQ, Race/Ethnicity						
CU → SU/SS → Casual Sex	.1179	.0297	.0049	.0176*	.0098*	.0263*
CU → SU → Casual Sex				.0158 ^a	.0086	.0237
CU → SS → Casual Sex				.0019 ^a	-.0038	.0083
Controlling for Baseline Self-Reported Offending						
CU → SU/SS → Casual Sex	.1287	.0217	.0475	.0072*	.0018*	.0134*
CU → SU → Casual Sex				.0065	.0025	.0119
CU → SS → Casual Sex				.0006	-.0033	.0050
Controlling for Baseline Self-Reported Offending, Baseline Levels of Mediators and Outcome						
CU → SU/SS → Casual Sex	.1530	.0200	.0711	.0067*	.0024*	.0126*
CU → SU → Casual Sex				.0066 ^b	.0027	.0125
CU → SS → Casual Sex				.0001 ^b	-.0025	.0027

Note: Casual Sex is dichotomously coded from 18–24 months. Age, IQ, dummy coded race/ethnicity variables (White Latino as comparison group) were entered as covariates on all models. The second model also entered baseline Self-Reported Offending as a covariate. The third model also added baseline Substance Use, baseline Sensation Seeking, and the baseline outcome as covariates. CU = Callous-Unemotional traits assessed at baseline; SU = Substance Use logarithm transformed mean 6–12 months; SS = Sensation Seeking mean 6–12 months; CI = confidence interval.

^aIndirect effects were significantly different (β contrast = .0139), bootstrapped 95% CI [.0033, .0250].

^bIndirect effects were significantly different (β contrast = .0066), bootstrapped 95% CI [.0015, .0133].

*Total indirect effects and CIs.

included as covariates and the overall binary logistic regression model was significant (Nagelkerke $R^2 = .1179$, $p < .0001$). This model resulted in a significant direct effect from CU traits, as well as a significant total indirect effect through the two mediators. Further, when the indirect effects were separated between the two mediators, the indirect effect through substance use was significant but the indirect effect through sensation seeking was not. This pattern of significant direct and indirect effects did not change controlling for baseline self-reported offending (Nagelkerke $R^2 = .1287$, $p < .0001$). However, when controlling for baseline levels of the mediators and outcome (Nagelkerke $R^2 = .1530$, $p < .0001$), the indirect effect through sensation seeking remained significant but the direct effect from CU traits to casual sex dropped below significance ($p = .07$).

Follow-Up Analyses

Given the significant indirect effects of CU traits on the risky sex outcomes through substance use, follow-up analyses were conducted to determine if the effects may be specific to certain substances. Thus, the mediational tests were repeated limiting the mediator to use of both alcohol and marijuana and then to use of only alcohol and only marijuana (full results of all follow-up analyses are available upon request). For predicting unprotected sex, the combined alcohol and marijuana indicator, as well as the alcohol-only model, exhibited the same findings as the primary analyses (i.e., significant direct effects of CU traits and significant indirect effects through substance use only). When mediation was tested with marijuana use only, the direct effect from CU traits to unprotected sex and the indirect effects through substance use again remained significant. However, the indirect effects through sensation seeking became significant. For casual sex, no differences emerged across the analyses with the different measures of substance use. Specifically, CU traits exhibited a significant direct effect on casual sex, as well as a significant indirect effect that was through substance use but not sensation seeking.

The primary analyses were also repeated using only participants who had never been detained during the study. The analyses for both unprotected sex ($n = 986$) and casual sex ($n = 968$) demonstrated the same pattern of findings as the primary analyses. Specifically, CU traits exerted a significant direct effect on the risky sexual outcome, as well as a significant indirect effect through substance use but not sensation seeking.

DISCUSSION

The current study examined whether CU traits predicted adolescents' risky sexual behaviors over a 24-month period and whether any such association was mediated by sensation seeking or substance use. Our findings suggest that CU traits did predict both unprotected sex and casual sex and that this was independent of the youth's overall level of antisocial

behavior. These findings are consistent with past research in community samples that also demonstrated a link between CU traits and various forms of risky sexual behavior (Anderson et al., 2016; McCauley et al., 2016; Rucević, 2010; Wymbs et al., 2013). Taken together, this research clearly links CU traits to a number of clinically important outcomes in justice-involved adolescents, in addition to being related to more severe and violent antisocial behavior (Frick et al., 2014a). Risky sexual behaviors are an important public health concern, given their link to sexually transmitted diseases both in adolescents in general (Centers for Disease Control and Prevention, 2016) and specifically in justice-involved adolescents (Belenko et al., 2009; Dembo, Belenko, Childs, & Wareham, 2009; Elkington et al., 2008).

The finding that CU traits were associated with risky sexual behavior even after controlling for the adolescent's baseline levels of self-reported delinquency also supports the possibility that CU traits may be associated with clinically important outcomes, even when they are displayed without significant antisocial behavior (Rutter, 2012). This conclusion needs to be tempered in the present study because all participants had been arrested for at least one offense. However, Moran, Ford, Butler, and Goodman (2008) reported results from a large ($n = 5,770$) community sample of children and adolescents (ages 5–16 years) indicating that CU traits predicted behavioral and emotional problems 12 and 24 months later, even in the absence of significant levels of conduct problems. Further, Burke, Waldman, and Lahey (2010) reported that CU traits measured in childhood were a predictor of antisocial personality disorder in adulthood in the absence of significant conduct problems.

Moreover, our results also suggest that the link between CU traits and risky sexual behaviors is at least partially explained by the high rate of substance use in adolescents with elevated levels of CU traits. That is, we found that CU traits were significantly associated with substance use in our sample of justice-involved adolescents, which again is consistent with past research in community (Fanti, 2013; Wymbs et al., 2012) and justice-involved (Baskin-Sommers et al., 2015; Ray et al., 2016) adolescents. However, our analyses went beyond prior research by showing that CU traits had indirect effects on risky sexual behavior through the adolescent's substance use. The importance of substance use for understanding risky sexual behavior is consistent with a study reporting that, over a 3-year span, more than 75% of male participants in a sample of justice-involved youth reported having unprotected sex while drunk or high (Romero et al., 2007). Further, our supplementary analyses indicated that when considering alcohol and/or marijuana separately, CU traits largely continued to predict risky sexual behavior regardless of the type of substance used.

Further, it is important to note that, in contrast to the potential importance of substance use for explaining the association between risky sexual behavior and CU traits, there was little evidence to support the potential mediating

role of sensation seeking. That is, the only time that any significant indirect effects of CU traits on the risky sex outcomes emerged for sensation seeking was in the supplemental analyses when substance use was restricted to marijuana use only. Thus, although sensation seeking may be associated with risky sexual behavior in both community samples of adolescents (Byck et al., 2015; Charnigo et al., 2013; Ritchwood et al., 2014; Spitalnick et al., 2007; Voisin et al., 2013) and justice-involved youth (Robbins & Bryan, 2004), this personality dimension does not appear to be important for explaining the link between CU traits and risky sexual behavior.

Our results need to be interpreted in the context of several study limitations. First, although CU traits were associated with substance use and risky sexual behaviors, the effect sizes were very modest across all mediation models. For example, the zero-order correlation between CU traits and unprotected sex and casual sex were $r = .17$ and $r = .14$, respectively. Thus, it is clear that CU traits account for only a modest amount of the variance in risky sexual behavior. As such, it is clear other factors continue to play a role in explaining risky sexual behavior for youth with CU traits and should be investigated further. The second limitation is the reliance on self-report for the assessment of the main study variables. This self-report methodology may have inflated associations among variables due to shared method variance, indicating that these relationships need to be explored using other methodologies. However, given the covert nature of substance use and risky sexual behaviors for youth, particularly those involved in the juvenile justice system, report of these behaviors by others (e.g., parents) may be less valid than self-report. Third, the sample consisted of boys who were first-time offenders involved in the juvenile justice system. Prior work has demonstrated differences in associations between substance use and risky sexual behavior in male and female individuals (Dembo, Belenko, Childs, Greenbaum, & Wareham, 2010; Dembo et al., 2009; Rucević, 2010). For example, more male than female participants have reported engaging in multiple risky sexual behaviors (e.g., multiple sex partners, sex when drunk or high; Romero et al., 2007), but arrested female individuals who engage in highly risky behaviors have higher rates of contracting a sexually transmitted infection (7%) than arrested male individuals who engage in high-risk sexual behaviors (0.8%; Dembo et al., 2009). Therefore, these associations should be specifically examined within samples of girls, particularly those in the juvenile justice system. Fourth, we did not examine the role of anxiety and/or trauma, which recent research has suggested may moderate the association between CU traits and certain outcomes (Kimonis, Fanti, Isoma, & Donoghue, 2013; Kimonis, Skeem, Cauffman, & Dmitrieva, 2011; Wall Myers et al., *in press*). This too should be the focus of future research.

Taking these limitations into consideration, our findings suggest that CU traits appear to predict risky sexual behaviors in justice-involved adolescents. Further, these effects on unprotected and casual sex appear to be mediated at least in part through substance use. Although youth with CU traits have previously been considered to be resistant to treatments, recent work suggests that justice-involved adolescents with CU traits do respond to intensive multicomponent treatments that are tailored to their unique emotional, cognitive, and motivational styles (Butler, Baruch, Hickey, & Fonagy, 2011; Caldwell, Skeem, Salekin, & Van Rybroek, 2006; White, Frick, Lawing, & Bauer, 2013). However, these treatment studies have largely focused on the effectiveness of the intervention for reducing the adolescent's level of antisocial behavior and risk for reoffending. Our findings suggest that greater development and testing of effective treatments for youth with CU traits in the juvenile justice system should include other outcomes that are important for public health, particularly substance use and risky sexual behaviors.

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CONFLICTS OF INTEREST

The authors declare no conflicts of interest

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