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Clinical and Social/Environmental Characteristics in a Community Sample of Children With and Without Family Histories of Substance Use Disorder in the San Antonio Area: A Descriptive Study

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Abstract

This is a descriptive study of the recruitment and clinical/environmental characteristics of a child cohort (ages 10–12) established to test transmission of impulsivity in children with (FH⁺; n = 305) and without (FH⁻; n = 81) family history of substance use disorder. Among this cohort FH⁺ children had more emotional and behavioral symptoms, worse family relationships, and more deviant peers compared to FH⁻ children. This cohort of children was established prior to the initiation of regular substance use and significant clinical problems, which will allow the opportunity to examine reciprocal relations between development of impulse control and substance use development.

Keywords

Family history; children; substance use; longitudinal; impulsivity

Children with a family history of substance use disorders (FH⁺) are at increased risk for developing substance use disorders (SUDs) themselves relative to children with no such histories (FH⁻) (e.g., Clark, Cornelius, Kirisci, & Tarter, 2005; Ridenour, Lanza, Donny, & Clark, 2006). For example, and FH⁺ children are 4–9 times more likely to develop SUDs than FH⁻ children (Merikangas et al., 1998). Furthermore, research has shown an additive relationship between number of parents with a substance use history and risk for the development of substance use problems in offspring (Luthar, Merikangas, & Rounsaville, 1993). This increased risk is thought to be partly due to the transmission of behavioral impulsivity (Vanyukov et al., 2009).

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However, studies examining relations between SUDs and impulsivity often include those already engaged in substance use (e.g., Coffey, Gudleski, Saladin, & Brady, 2003; Dougherty et al., 2013; Kirby & Petry, 2004). Thus, it remains unknown whether poor impulse control increases risk for initiation and escalation of substance use, whether youth substance use alters trajectories of impulsivity development, or whether a bidirectional interaction fuels the escalation of each. Additionally, research has yet to fully examine familial risk on change in behavioral impulsivity across pre- to mid-adolescence. To our knowledge only one prospective longitudinal study has examined impulse control development in FH⁺ and FH⁻ youths.

Specifically, Tarter and colleagues (2003) conducted a longitudinal study of boys with ($n = 47$) and without ($n = 65$) a family history for SUD. At study entry, the researchers derived a latent construct of neurobehavioral disinhibition that included a measure of impulsive behaviors. This construct discriminated between FH⁺ and FH⁻ boys at baseline (ages 10–12) and at age 16, and predicted SUDs at age 19. These results suggest that the latent construct of neurobehavioral disinhibition is an important indicator of SUD risk and that the severity of this disinhibitory trait likely covaries with the probability of developing a SUD.

Although informative, there are two important limitations of this study. First, this study measured impulsivity within the context of a single self- and parent-report measure of neurobehavioral disinhibition. Impulsivity is a complex construct with several distinct components best measured with multiple measures (Dougherty et al., 2009). Second, this study did not examine substance use development in the context of complex disinhibition-environment (e.g., parenting, peer, stress) interactions, which they stated would synergistically contribute to SUD risk (Tarter et al., 2003). A more complete understanding of adolescent impulse control development in FH⁺ and FH⁻ children and their relation to initiation and progression of substance use disorders requires a more comprehensive prospective study using a wider array of impulse control measures along with a comprehensive assessment of social context.

To address these limitations, we designed a prospective longitudinal study to determine how preadolescent impulse control contributes to the initiation and progression of substance use. In the first 2 years and 10 months, we recruited a cohort of 386 FH⁺ and FH⁻ boys and girls, 10 to 12 years old, who had not yet initiated regular substance use. Children and their parents completed a longitudinal assessment battery upon study entry and are currently being assessed every 6 months. This battery includes self-reports, parent-reports, and laboratory behavioral measures that will be used to monitor developmental changes in substance use involvement, environmental stressors, maturation, and impulse control.

Our study design allows us to determine: (1) to what extent FH⁺ children differ in impulse control compared to FH⁻ children prior to regular substance use; and to what extent these differences predict regular substance use; (2) to what extent impulse control development differs among adolescents engaged in substance use and adolescents not engaged in substance use; and how this development is related to the progression of substance use involvement; and (3) to what extent are relations between impulse control and substance use involvement reciprocal; and (a) how does this differ as a function of family history of

substance use; and (b) as a function of environmental stressors, poor familial relationships, and deviant peer affiliation.

Similar to other researchers who have established large cohorts to clarify processes that contribute to the development and maintenance of mental health conditions (e.g., Forster, Chen, Perry, Oswald, & Willmorth, 2011), the purpose of the current report is to provide in detail study recruitment, assessment methods, and baseline information for a cohort of FH⁺ and FH⁻ children prior to the onset of serious problem behaviors in order to guide other similar efforts and to serve as a point of reference for future publications. This article describes clinical and social/environmental characteristics and examines how FH⁺ and FH⁻ children differ across these characteristics. This descriptive article is particularly needed as most family history article provide descriptive information relevant to particular article topics. The current study provides full cohort details and descriptive statistics for all risk factors for substance use involvement examined among the larger cohort.

Method

Procedures

Three hundred and eighty six (37 sibling pairs and 2 sibling trios) boys (FH⁺ $n=152$; FH⁻ $n=35$) and girls (FH⁺ $n=153$; FH⁻ $n=46$) with a mean age of 10.97 ($SD=.84$) and their parents were recruited from the community through radio, newspaper, and television advertisements. Respondents were invited to complete a comprehensive screening assessment. Inclusion criteria included children ages 10 to 12, good physical health, and for the FH⁺ group, a biological father with a history of a SUD. Boys and girls were excluded if they: (1) met diagnostic criteria for a SUD or reported a history of regular substance use ($n=2$) (i.e., substance use at least once per month for 6 consecutive months; Clark et al., 2005); (2) met diagnostic criteria for a psychiatric disorder ($n=27$), except Oppositional Defiant Disorder (ODD), Conduct Disorder (CD), and Attention-Deficit Hyperactivity Disorder (ADHD), Dysthymia, and Anxiety Disorders among those in the FH⁺ group because these disorders are highly co-morbid with development of substance use; (3) tested positive for alcohol or drugs following a breath alcohol and urine drug test ($n=0$); (4) returned a positive pregnancy test ($n=0$); (5) had an IQ < 70 ($n=8$); or (6) had physical or developmental disabilities that would interfere with the ability to complete study procedures ($n=9$).

Families meeting study eligibility returned to the clinic within the month to complete a baseline assessment of a longitudinal battery that included questionnaires, interview, and laboratory behavioral impulsivity measures. The participating parent (Mother = 85.9%; Father = 13.3%; Other relative = 0.8%) completed assessments and interviews on the same visit separately from the child. Recruitment was completed in the first 34 months of this 5-year study, which will result in 4 – 10 follow-up assessments. Families are currently being re-assessed at 6-month intervals to monitor changes in impulse control, substance use involvement, psychiatric status, familial relationships, stress, and physical maturation. Total time required to complete the baseline assessment was approximately 6 hours; follow-up assessments require approximately 4 hours. The child and participating parent were each

compensated \$120.00 at baseline and \$120.00 (child) and \$75.00 (parent) at each follow-up. Families were provided lunch during their visits, including 2 breaks to prevent fatigue.

Group Selection

Families were classified into one of two groups based on the presence (FH⁺) or absence (FH⁻) of a biological father with a history of SUD using the Family History Assessment Module (described below). Following selection criteria of previous studies (e.g., Giancola, Mezzich, Clark, & Tarter, 1999), children who had a father with a history of substance use disorder were classified to the FH⁺ group. The presence or absence of a substance use disorder among other family members (mothers and grandparents) in this group was free to vary. This will allow us to test effects of family density of substance use disorder on child and adolescent outcomes. History of substance use was defined as current or lifetime histories of any DSM-IV class of SUDs, other than caffeine related disorders and nicotine dependence (American Psychiatric Association, 1994). The FH⁻ group had no first-degree or second-degree relatives with a past or present SUD. Families were recruited and classified based on having a father diagnosis of substance use disorder because of strong research showing the transmission of substance use from the biological father (for a review see Goodwin, 1985). In addition, this selection criteria will aid interpretation of outcomes from this cohort to previous family history studies (e.g., Giancola & Parker, 2001).

We recruited FH⁺ to FH⁻ groups in a ratio of approximately 3:1. The FH⁺ group was oversampled to increase the likelihood of having enough children with early onset substance use involvement, an outcome tested in the main aims of the parent project. The FH⁺ groups were matched to the FH⁻ group on sex and age (by year).

Measures

Demographic characteristics—Parents reported their child's birth date, sex, race, and ethnicity. Parent marital status, education, and employment were self-reported on the *Four Factor Index of Social Status* (FFIS; Hollingshead, 1975), which was also used to calculate family socioeconomic status based on education and occupation. The FFIS provides a reliable measure of SES (Cirino et al., 2002). Scores for this scale range from 8 (unskilled laborer) to 66 (major business professional).

Developmental characteristics

Wechsler Abbreviated Scale of Intelligence (WASI; Psychological Corporation, 1999): The WASI was administered to all children to obtain an estimate of their Full Scale IQ using the four subtests (vocabulary, block design, similarities, and matrix reasoning). The WASI is a brief and reliable (Axelrod, 2002) screener of verbal, non-verbal, and general cognitive ability.

Petersen Pubertal Development Scale (PPDS; Petersen, Crockett, Richards, & Boxer, 1988): The PPDS is a self-report questionnaire that provides a continuous measure of pubertal status and contains items that ask about growth spurt, body hair, and changes in skin. Questionnaires given to boys also asked about changes in voice and growth of facial hair; and girls were asked about breast development and the onset of menarche. Response

choices include: not yet started (1 point); barely started (2 points); definitely started (3 points); and seems completed (4 points), with the exception of a yes/no response choice for whether girls began menstruation (*Yes* = 4 points, *No* = 1 point). Point values were averaged to give a continuous measure of pubertal development. This scale is highly correlated with physical examinations pubertal development (Petersen et al., 1988).

Diagnostic formulation—The presence of a SUD or other mental health disorder was determined to be present if the parent or child met full DSM-IV diagnostic criteria. Interviews were completed by a trained research staff; and all diagnoses were made by consensus review with the study's board certified child and adolescent psychiatrist.

Family History Assessment Module (FHAM; Janca, Bucholz, & Janca, 1992): The participating parent was interviewed using the FHAM to assess for current and lifetime histories of psychiatric and SUDs in first- and second-degree relatives. The FHAM provides a detailed chronology of substance use quantity and frequency. This measure is widely used to assess family history of substance use (e.g., Clark et al., 2005).

Schedule for Affective Disorders and Schizophrenia for School-Age Children Present and Lifetime (K-SADS-PL; Kaufman et al., 1997): Children and one parent were interviewed separately using the K-SADS-PL to obtain age of onset for past and current DSM-IV psychiatric diagnoses meeting full diagnostic criteria. All Axis-I diagnostic categories were assessed. Information was recorded using both the child and the parent's report. The KSADS-PL is a semi-structured interview with established reliability and validity (Ambrosini, 2000; Kaufman et al., 1997).

Modified Substance Use Disorders Module (Martin et al., 1995): Children were assessed for regular substance use involvement (including age of onset for those who reported ever having used) and present and past SUD using the modified module of the Structured Clinical Interview for DSM-IV Disorders (First, Spitzer, Gibbon, & Williams, 2001). The Substance Use Disorders module of the K-SADS-PL was substituted because this module includes probes that assess developmentally appropriate alcohol- and other drug-related problems, which are relevant to DSM-IV SUD symptoms. This module was administered to the child without the parent present. Data regarding alcohol, cannabis, stimulant, sedative, opioid, PCP, hallucinogen, and inhalant use were collected.

Frequency of substance use

Drug History Questionnaire (DHQ; Dougherty et al., 2013): Children were interviewed using the DHQ, a drug assessment measure modified from the procedures of Sobell, Kwan and Sobell (1995). Our modified DHQ provides patterns of use for the following drug classes: alcohol, cannabis, hallucinogens, depressants, inhalants, narcotics, stimulants, tranquilizers, caffeine, nicotine, and other drugs; along with age of onset and age of last used.

Behavioral characteristics

Sensation Seeking Scale for Children (SSS-C; Russo et al., 1993): The SSS-C is a self-report measure that assesses the tendency to prefer new and arousing experiences. The SSS-C contains 40 items presented in an opposition-stated forced-choice format, yielding a total score and three subscales: Thrill Seeking and Adventure, Drug and Alcohol Attitudes, and Social Disinhibition. Higher scores indicate higher levels of sensation seeking.

Internal consistency was acceptable for three of the four subscales (Total $\alpha = .83$; Thrill Seeking $\alpha = .80$; Drug and Alcohol Attitudes $\alpha = .62$; and Social Disinhibition $\alpha = .71$). Reliability and validity for this measure has been established (Russo et al., 1993).

Inventory of Callous-Unemotional Traits (ICU; Essau, Sasagawa, & Frick, 2006): The ICU was given to both children and parents to assess child characteristics often associated with the construct of psychopathy. The ICU includes 24-items rated on a 4-point scale, with higher sums indicating more psychopathic traits. Internal consistency was acceptable (self-report $\alpha = .75$; parent report $\alpha = .85$). Previous research supports the validity of the self-reported versions of the ICU in community and high-risk samples (e.g., Essau et al., 2006).

Lifetime History of Aggression (LHA; Coccaro, Berman, & Kavoussi, 1997): The LHA is a semi-structured interview that was administered to children to assess lifetime aggressive behaviors. Endorsed behaviors (e.g., overt display of aggression, self-injurious behavior and experience of social consequences as a result of aggressive behavior) are given a frequency count that ranges from 1 (one event) up to 5 (too many events to count). Total scores were calculated by summing the frequency for all items; higher scores indicate more aggression. This measure is established as a reliable and valid measure of life history of aggression (Coccaro et al., 1997).

Child Behavior Checklist (CBCL) and Youth Self-Report (YSR) (Achenbach & Rescorla, 2001): Parents and children completed the CBCL and YSR respectively to assess problem behaviors over the prior 6 months. The CBCL and YSR consist of 113 behavior problem items, assessing symptoms of Internalizing Problems (e.g., depression and anxiety), Externalizing Problems (e.g., aggression), and Total Behavior Problems. These scales also provide a measure of Attention Problems, Social Problems, and Thought Problems. Raw scores on all scales were converted to *T*-scores. The CBCL and the YSR are two of the most well-validated measures of child and adolescent behavior functioning (Achenbach & Rescorla, 2001).

Environmental characteristics

Family Assessment Measure (FAM-III; Skinner, Steinhauer, & Santa-Barbara, 1983): The FAM-III was given to parents and children to obtain quantitative indices of the family environment in the prior 6 months. The FAM-III is a 134-item self-report measure that yields scores characterizing overall family functioning (General Scale), individual functioning (Self-Report Scale) with the family, and dyadic relationships (Dyadic Relationship Scale; i.e., child rating parent, parent rating child). For purposes of this report, the General Scale is reported. Total scores were normalized (*T*-scores) and then child and

parent reports were averaged to provide a single score. The FAM-III is a validated measure for the assessment of environmental factors in prospective studies of sons and daughters of substance abusing fathers (Blackson et al., 1999).

Peer Delinquency Scale (PDS; Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998): The PDS was given to children to assess the extent to which their peers engaged in aggressive and delinquent acts (e.g., used or sold alcohol or other drugs, skipped school without an excuse, or did other violent or illegal activities) in the prior 6 months. The PDS includes 15-items on a 5-point scale ranging from 0 = *None of them* to 4 = *All of them*. Items where a respondent reported “don’t know” were replaced with the scale’s mean. Subsequently, items were summed, with higher scores representing more involvement with deviant peers. Internal consistency was adequate, $\alpha = .75$. Good concurrent and predictive validity has also been reported (Keenan, Loeber, Zhang, Stouthamerloeber, & Vankammen, 1995).

Statistical Analyses

FH groups were compared using *t*-tests for continuous measures and chi-square analyses for discrete measures. Small variations in sample sizes occur due to missing data. For families with more than one child in the study, parent demographic data (i.e., marital status, education, and employment), clinical characteristics, and ratings of the family environment at the time the first child was enrolled was included in the group numbers and percentages. The effects of clustering were examined by comparing results from SAS PROC REG (with unadjusted standard errors) to those from SAS PROC MIXED (with adjusted standard errors using the “sandwich” variance estimator). Results showed that effects were somewhat smaller when accounting for clustering within families (e.g., effect of family history on CBCL Aggression was 4.80 vs. 4.76) and the standard errors somewhat larger (e.g., .82 vs. .85). Although inference based on models accounting for clustering are more appropriate (Fitzmaurice, Laird, & Ware, 2004), clustering did not have a substantial impact on our results, particularly because Bonferroni corrections were applied to all analyses.

Results

Demographic and Developmental Characteristics

FH groups differed on some, but not all, demographic characteristics. FH⁺ and FH⁻ children were similar in age, pubertal development, race, and ethnicity (Table 1). FH⁺ children did have significantly lower (though still in the average range, 90–110) IQ estimates than those in the FH⁻ group. FH⁺ and FH⁻ parents differed on age and ethnicity, with FH⁺ parents more likely to be Hispanic and younger (Table 2). FH⁺ parents had significantly lower socioeconomic status; they endorsed lower employment status and had lower education attainment (Table 2). While partial college was the most common educational category for both groups, FH⁺ parents were more likely to have less than high school education than FH⁻ parents (Table 2).

Parent Diagnostic Profile

FH⁺ parents experienced a wide range of substance use and other psychiatric disorders (Table 3). On average, FH⁺ fathers had two substance use diagnoses and 36.7% had both a substance use and psychiatric diagnosis. Seventy-nine (28.7%) FH⁺ families had both a father and a mother with a substance use disorder. Forty-eight percent ($n = 131$) of FH⁺ mothers had either a substance use or psychiatric diagnosis, and 13.8% had both a substance use and psychiatric diagnosis. Alcohol dependence was the most prevalent diagnosis for both fathers and mothers, followed by cocaine and cannabis dependence. Of the psychiatric diagnoses for fathers, the most common were antisocial personality disorder followed by major depression; whereas for mothers the most common was major depressive disorder, followed by bipolar disorder. Due to our exclusion criteria, no FH⁻ fathers or mothers had a current or past SUD diagnosis; additionally only a handful of FH⁻ mothers presented with current (major depression: $n = 4$) or past (substance induced psychotic disorder: $n = 1$) psychiatric diagnoses.

Child Diagnostic Profile

FH⁺ boys and girls did not differ in the total number of lifetime or current diagnoses (Table 4). FH⁺ boys were modestly more likely to have a current Attention Deficit/Hyperactivity Disorder diagnosis than FH⁺ girls ($r_{\text{phi}} = .21$).

Emotional and Behavioral Characteristics

FH⁺ parents reported significantly more symptoms on all CBCL subscales compared to FH⁻ parents (Table 5), and group differences remained when FH⁺ children with a ODD, CD, or ADHD diagnosis were removed from analyses ($p < .05$ for all subscales). FH⁺ children self-reported more total problems than FH⁻ children, but there were no group differences among the subscales on the YSR that survived Bonferonni correction (Table 5).

Personality Characteristics

There was no significant difference between FH⁺ and FH⁻ children on total sensation seeking scores (Table 6). FH⁺ children scored higher on Drug and Alcohol Attitudes (a subscale of the sensation seeking scale); however, given low internal consistency for this subscale this difference should be interpreted with caution (Table 6). FH⁺ children had higher total callous-unemotional trait scores compared to FH⁻ children. However, when FH⁺ children with a ODD, CD, or ADHD diagnosis were removed from analyses, group differences were no longer significant, $t(284) = 1.56$, $p = .12$. FH⁺ parents reported significantly more episodes of aggression among their children on the Lifetime History of Aggressive Behavior measure (Table 6). This group difference remains significant when accounting for FH⁺ children who have an ODD, CD, or ADHD diagnosis.

Substance Use

A small number of children reported having tried substances prior to study entry. Alcohol use was most common (FH⁺ $n = 10$, FH⁻ $n = 2$), followed by tobacco (FH⁺ $n = 5$, FH⁻ $n = 1$), and marijuana (FH⁺ $n = 2$, FH⁻ $n = 0$). No other drug use was reported.

Environmental Factors

FH⁺ families reported poorer family environments including more problems with task communication, role performance, communication, affective expression, involvement, control, values and norms, and overall ratings of the family environment; and FH⁺ children reported more deviant peer affiliations (Table 7).

Discussion

The purpose of the current report was to describe study recruitment, assessment methods, and clinical and social/environmental characteristics for a cohort FH⁺ and FH⁻ children that was established to examine developmental trajectories of impulse control and substance use involvement. Our longitudinal study is unique because we measure several core components of impulsivity in preadolescence (prior to the onset of regular substance use and significant clinical problems) and are repeating the assessments every 6 months throughout a 5 year study, providing 4 to 10 follow-up assessments for this cohort. This design will allow for a better understanding of bidirectional relations between impulsivity and substance use. That is, how multiple facets of impulsivity impact initiation of substance use, how substance use impacts the development of impulse control, and how development of impulse control in turn impacts progression to regular substance use. This study is also unique because we are collecting concurrent data about the environment (familial environment, peer, and stress). These measures will help better understand the interactions between impulse control development and environmental context. The discussion that follows presents information about the results of our cohort's characteristics at baseline, highlighting additional strengths.

Parental Diagnostic Prevalence

This report provides a description of substance use and co-occurring psychopathology in parents with a history of substance use. Results showed high rates of alcohol use disorder among FH⁺ fathers, and comorbidity of other substances of abuse was high. The majority of studies examining child outcomes of parents with a history of substance use limit the description of parental substance use to alcohol (see Johnson & Leff, 1999 for a review). Sparse research includes details of parental illicit substance use when characterizing family history (Blackson, Tarter, Loeber, Ammerman, & Windle, 1996). When this information is provided, illicit drug classes are typically aggregated and reported as "drug" abuse or dependence (e.g., Elkins, McGue, Malone, & Iacono, 2004; Giancola, et al., 1999). A comprehensive and explicit description of all parental substance use is important since research suggests transmission liability may differ based on family history for licit versus illicit substance use (Barnard & McKeganey, 2004).

Consistent with previous research, the most common psychiatric diagnoses were antisocial personality disorder (ASPD) and depression among FH⁺ fathers (e.g., Giancola et al., 1999) and depression among FH⁺ mothers (e.g., Tarter et al., 2003). Prevalence rates for father ASPD are *similar* to studies reporting high rates of a family history for alcohol and drug use disorders (Clark et al., 1997) and *higher* than studies of exclusively alcohol use disorder (Chassin, Rogosch, & Barrera, 1991), with one exception (Fals-Stewart, Kelley, Fincham, Golden, & Logsdon, 2004). Prevalence rates for father depression showed the largest

difference when compared to other studies, with our sample having a lower prevalence rate (e.g., Giancola et al., 1999). Similarly, prevalence rates for mother depression were inconsistent with the existing family history literature, with rates in the current study much lower than some (Giancola et al., 1999) and much higher than others (Clark et al., 1997). The inclusion of a majority Hispanic population and or the use of a representative community sample in the current study could account for these differences. This conclusion is supported with research by Chassin et al. (1991) which sampled a similarly large representative sample of FH⁺ individuals in which a quarter of the sample identified as Hispanic; prevalence rates of depression are the most similar to the current study.

Offspring Diagnostic Prevalence and Behavioral Characteristics

FH⁺ boys more commonly had externalizing spectrum disorders: ADHD, CD, and ODD than FH⁺ girls. ADHD and anxiety were most prevalent among FH⁺ girls. ADHD was the only statistically significant difference between sexes, with higher prevalence among boys. Given our method of recruitment, it is not wise to interpret or compare these prevalence rates to the current literature, but to serve as information for a relatively healthy population of children prior to regular substance use.

FH⁺ children had more parent reported externalizing and internalizing problems compared to FH⁻ children, though they did not reach clinically significant levels (*T*-Score = 60). These results are consistent with other studies comparing externalizing and internalizing symptoms between FH⁺ and FH⁻ offspring in several populations and across a range of sampling strategies (e.g., El-Sheikh & Buckhalt, 2003; Puttler, Zucker, Fitzgerald, & Bingham, 1998; Wilens, Biederman, Kiely, Bredin, & Spencer, 1995). Interestingly, FH⁻ parents and their children largely agreed on ratings of the child's internalizing and externalizing symptoms. On the other hand, FH⁺ children self-report across ratings of internalizing and externalizing symptoms differed from parent-reported ratings, with children rating many of the symptom areas lower than that of parents, especially for externalizing symptoms.

In addition to externalizing and internalizing symptoms, callous-unemotional traits and sensation seeking are hypothesized to confer risk for substance use (Ohannessian & Hesselbrock, 2008; Wymbs et al., 2012). Both child and parent-report of callous-unemotional traits were elevated in FH⁺ children. Although callous-unemotional traits predict adult diagnosis of antisocial personality disorder and substance use, research has not tested this factor when comparing FH⁺ and FH⁻ children. Uniquely, this study found greater callous-unemotional traits prior to the development of significant behavior problems among FH⁺ children, however, this elevation was driven by children with an ODD, CD, or ADHD diagnosis. Among these FH⁺ children, results indicate affective and dispositional traits are present that place them at risk for later antisocial behaviors including substance use. Tests of callous-unemotional traits may provide unique predictive information about progression to substance use disorders that are distinct from general externalizing symptoms.

Sensation seeking was not significantly different overall across groups. These results are inconsistent with previous research, which has reported FH⁺ offspring exhibit greater total sensation seeking (e.g., Handley et al., 2011). However, studies examining sensation seeking both in the familial risk literature and in the larger literature typically use a measure

developed for adult populations (Pedersen, Molina, Belendiuk, & Donovan, 2012; Steinberg et al., 2008) and thus are not directly comparable to our findings. Another possibility for a lack of consistency is that we assessed sensation seeking prior to rather than after the onset of substance use. Research suggest reciprocal relations between sensation seeking and substance use, with past substance use associated with increased sensation seeking and subsequently continued substance use (e.g., MacPherson, Magidson, Reynolds, Kahler, & Lejuez, 2010). Future papers will allow us to examine this relationship using a measure of sensation seeking for which initial levels were collected prior to substance use and significant clinical problems.

Environmental Correlates

FH⁺ children showed elevated levels (though not clinically significant levels) of poor family relationships and more deviant peers than FH⁻ children. These results were not driven by the presences of ODD, CD, and ADHD in FH⁺ children and are consistent with previous reports (Moss, Lynch, Hardie, & Baron, 2002). These results suggest that problematic family environments may not reach clinical thresholds prior to the onset of significant behavior problems and or substance use. In terms of deviant peer affiliation, results of this study are consistent with previous research of a similar design (Blackson & Tarter, 1994). Our results are unique in that we show an elevation in deviant peer affiliation prior to the onset of significant problem behavior and regular substance use.

Limitations of the Current Study

A number of limitations should be noted. First, while our decision to recruit FH⁺ children based on having a biological father with a substance use disorder is consistent with the literature (e.g., Giancola et al., 1999), the exclusion of mothers with substance use disorders in the absence of fathers' diagnostic history limits generalizability to those family systems. While there is evidence suggesting transmission of psychopathology from mothers with substance use disorder, these relationships have been less reliable than those involving the father (e.g., Bucholz, Heath, & Madden, 2000; Chassin, Curran, Hussong, & Colder, 1996; Pollock, Schneider, Gabrielli, & Goodwin, 1987). Second, while we collect age of onset for past and current child psychiatric disorders, we do not have information for age of onset for sub-threshold, problem behaviors. Such information could add to our ability to examine the progression of symptoms across FH groups and to examine the impact of the progression of symptoms on the growth trajectory of impulsive symptoms, as well as the development of substance use involvement. Finally, while there are methodologically sound reasons for excluding FH⁻ children with a psychiatric diagnosis, this limits comparisons between the groups at baseline and the impact of child diagnoses on the development of substance use involvement in the larger study.

Strengths and Directions for Future Study

We were successful in establishing a cohort of FH⁺ and FH⁻ children prior to the initiation of regular substance use. This cohort will help understand how developmental trajectories of impulse control and substance use are related and how environmental contexts moderate these relations. More specifically, future papers will use the longitudinal data from this cohort to address the study goals and hypotheses, including to what extent are relations

between impulse control development and substance use involvement reciprocal and (a) how does this differ as a function of family history of substance use; and (b) as a function of environmental stressors, poor familial relationships, and deviant peer affiliation. Outcomes of our work may be interpreted within the context of current models (e.g., Vanyukov et al., 2009) on the etiology of adolescent substance use involvement, and will be important for the advancement of prevention programs.

Notably, our cohort is well-suited to examine sex and ethnic differences among study hypotheses and models of risk. A major limitation of many family history studies is that samples are primarily FH⁺ offspring that are non-Hispanic white and male (Clark et al., 1997; Feske et al., 2008; Gillespie, Lubke, Gardner, Neale, & Kendler, 2012) which does not allow examination of sex and ethnic effects on risk transmission. Of select studies that do include both sexes, initial recruitment was designed to include boys only (e.g., Clark et al., 2005), which have their own limitations due to cohort effects. In addition, studies focused on familial liability factors often had less than 4% Hispanic sampling (Fals-Stewart et al., 2004; e.g., Tarter, Kirisci, Ridenour, & Vanyukov, 2008), except Chassin et al., (1993) at 18.8 – 28.2% across FH⁺ and FH⁻ parents. It remains unknown whether sex or ethnicity increases one's vulnerability for the transmission of behavioral impulsivity or how behavioral impulsivity and substance use are related over time. Our total combined sample is 51.6% female and 78.5% Hispanic which will allow us to consider sex and ethnicity in future papers.

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Table 1

Youth Demographic and Developmental Characteristics

	FH⁺ (<i>n</i> = 305)	FH⁻ (<i>n</i> = 81)		
	<i>M</i> (SD) or %	<i>M</i> (SD) or	<i>t</i>(df), <i>X</i>²(df), or Fisher Exact	<i>p</i>
<u>Demographics</u>				
Age	10.96 (0.85)	11.05 (0.82)	0.84 (384)	.40
Male Gender	49.8%	43.2%	1.12 (1)	.29
Race			2.38	.30
White	85.6%	91.4%		
African American	12.1%	6.2%		
Other ^a	2.3%	2.4%		
Ethnicity			4.01 (1)	.05
Hispanic	80.7%	70.4%		
Non-Hispanic	19.3%	29.6%		
<u>Developmental</u>				
Full Scale IQ	94.88 (11.18)	102.32 (12.18)	5.23 (384)	< .001
Verbal IQ	94.57 (12.19)	100.57 (13.34)	3.86 (384)	< .001
Performance IQ	96.32 (11.00)	103.64 (12.43)	5.18 (384)	< .001
Pubertal Development	2.08 (0.66)	2.10 (0.68)	0.21 (383)	.84

Note. FH⁺ = Families with a history of a substance use disorder; FH⁻ = Families without a history of substance use disorder;

^aRepresents American Indian or Alaska Native (*n* = 3), Native Hawaiian or Pacific Islander (*n* = 2), Unknown (*n* = 1), and More than one race (*n* = 3).

Table 2

Participating Parent Demographics

	FH⁺ (<i>n</i> = 275)	FH⁻ (<i>n</i> = 70)		
	<i>M</i> (SD) or %	<i>M</i> (SD) or %	<i>t</i>(df), <i>X</i>²(df), or Fisher Exact	<i>p</i>
Age	36.3 (6.61)	39.9 (5.90)	4.24 (346)	<.001
Relationship to youth			0.48	.85
Mother	85.2%	88.6%		
Father	13.7%	11.4%		
Other ^a	1.1%	0.0%		
Race			3.83	.11
White	87.0%	95.7%		
African American	10.8%	4.3%		
Other ^b	2.2%	0.0%		
Ethnicity			5.53 (1)	.019
Hispanic	75.5%	61.4%		
Non-Hispanic	24.5%	38.6%		
Socioeconomic Status	32.58 (11.52)	43.51(10.18)	7.18 (343)	<.001
Marital Status			20.16	<.001
Married/Live-in Partner	53.5%	82.9%		
Divorced	38.9%	15.7%		
Single	6.2%	1.4%		
Widow	1.4%	0.0%		
Education			46.07	<.001
< 7 th Grade	1.1%	0.0%		
Middle School	4.0%	0.0%		
Partial High School	7.6%	1.4%		
High School Degree	26.2%	4.3%		
Partial College	44.4%	42.9%		
College Degree	11.3%	35.7%		
Graduate/Professional	5.4%	15.7%		

Note. FH⁺ = Families with a history of a substance use disorder; FH⁻ = Families without a history of substance use disorder;

^aRepresents one participating grandmother, one aunt, and one step mother;

^bRepresents American Indian or Alaska Native (*n* = 3), Native Hawaiian or Pacific Islander (*n* = 2), Unknown (*n* = 1), and More than one race (*n* = 3).

Table 3**Prevalence of Psychiatric Disorders Among FH⁺ Parents**

	FH⁺ Father (n = 275)			FH⁺ Mothers (n = 275)		
	N	% Abuse	% Dep.	N	% Abuse	% Dep.
% Alcohol Use Disorder Only			17.8			9.5
% Other Mental Health Diagnoses Only			----			18.9
% Substance Use <i>and</i> Other Psychiatric Diagnoses			36.7			13.8
# of SUDs (<i>Mdn</i> ; Range)			2; 8			0; 7
<u>Diagnosis</u>	N	% Abuse	% Dep.	N	% Abuse	% Dep.
<u>Substance Use Disorder (Lifetime)</u>						
Alcohol	208	7.7	92.3	49	18.4	81.6
Amphetamine	44	36.4	63.6	9	11.1	88.9
Cannabis	154	42.9	57.1	26	30.8	69.2
Cocaine	159	25.8	74.2	33	21.2	78.8
Hallucinogen	16	81.3	18.8	3	66.7	33.3
Inhalant	4	25.0	75.0	2	50.0	50.0
Opioid	61	27.9	72.1	13	23.1	76.9
Poly Substance	3	0.0	100.0	0	0.0	0.0
Sedative/Hypnotic Anxiolytic	38	47.4	52.6	4	50.0	50.0
Unknown Substance	5	100.0	0.0	0	0.0	0.0
<u>Psychiatric Diagnosis (Lifetime)</u>	N		%	N		%
Adjustment Disorder	1		0.4	1		0.4
Antisocial Personality Disorder	78		28.4	8		2.9
Bipolar Disorder I or II	7		2.5	11		4.0
Conduct Disorder	2		0.7	3		1.1
Delusional Disorder	0		0.0	1		0.4
Dysthymia Disorder	1		0.4	2		0.7
Major Depressive Disorder	31		11.3	71		25.8
Schizoaffective Disorder	1		0.4	0		0.0

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	FH ⁺ Father (<i>n</i> = 275)	FH ⁺ Mothers (<i>n</i> = 275)
Substance Induced Mood or Psychotic Disorder	6	0.0

Note: FH⁺ = Families with a history of substance use disorder; FH⁻ = Families without a history of a substance use disorder; SUDs = Substance Use Disorders.

Table 4Prevalence of Psychiatric Disorders in FH⁺ Offspring

	FH⁺ Boys (n = 152)	FH⁺ Girls (n = 153)		
	Median; Range	Median; Range	t (303)	p
<u># of Diagnoses</u>				
Lifetime	1.0; 7	1.0; 6	-1.67	.10
Current	1.0; 5	1.0; 5	-1.52	.13
<u>Current Diagnoses</u>				
	%	%	χ² (1) or Fisher Exact	p
Attention-Deficit/Hyperactivity Disorder	39.5	19.6	14.47	<.001
Disruptive Behavior Disorder	13.2	7.2	2.98	.085
Oppositional Defiant Disorder	12.5	6.5	3.15	.08
Conduct Disorder	0.7	0.7	*	1.00
Dysthymia	0.0	0.7	*	1.00
Any Anxiety	13.2	24.2	6.10	.01
Generalized Anxiety Disorder	4.6	5.9	0.25	.62
Separation Anxiety Disorder	3.3	6.5	1.72	.19
Specific / Simple Phobia	5.3	3.3	0.74	.39
Social Phobia	1.3	4.6	*	.17
Post-traumatic Stress Disorder	2.0	8.5	*	.02
Panic + Agoraphobia	0.0	0.7	*	1.00
Elimination Disorder	7.9	5.2	0.88	.35
Enuresis	7.2	5.2	0.53	.47
Encopresis	0.7	0.0	*	.50
Adjustment Disorder	0.7	0.7	*	1.00
Any Tic Disorder	3.9	0.7	*	.07

Note. FH⁺ = Families with a history of a substance use disorder; FH⁻ = Families without a history of a substance use disorder;

* Statistic is missing intentionally. Cell sizes < 5 so a Fisher Exact Test was performed; Bonferonni correction $p < .003$

Table 5Behavioral and Emotional Characteristics in Offspring by FH⁺ Group

Behavioral and Emotional Characteristics	FH ⁺ (n = 305)		FH ⁻ (n = 81)		t	p	Eta-sq
	M (SD)		M (SD)				
Child Behavior Checklist							
Externalizing Symptoms	51.94 (10.32)		42.74 (7.00)		9.41	<.001	0.19
Aggressive Behavior	55.61 (7.31)		50.81 (1.86)		10.27	<.001	0.22
Rule Breaking Behavior	55.16 (6.23)		51.38 (2.60)		8.24	<.001	0.15
Internalizing Symptoms	52.93 (10.66)		44.26 (8.97)		6.72	<.001	0.11
Anxious/Depressed	55.44 (7.04)		51.98 (4.18)		5.64	<.001	0.08
Withdrawn/Depressed	55.45 (7.13)		51.85 (3.37)		6.50	<.001	0.10
Somatic Complaints	56.43 (7.08)		52.80 (4.68)		5.49	<.001	0.07
Attention Problems	56.60 (7.22)		52.19 (3.52)		7.76	<.001	0.14
Social Problems	55.86 (6.71)		51.65 (3.71)		7.46	<.001	0.13
Thought Problems	55.43 (6.60)		51.26 (3.17)		7.51	<.001	0.13
Total Problems	53.09 (10.68)		41.27 (9.30)		9.09	<.001	0.18
Youth Self-Report							
Externalizing Symptoms	45.04 (10.45)		42.46 (8.66)		2.28	.05	0.01
Aggressive Behavior	53.05 (6.03)		51.73 (3.98)		2.36	.02	0.01
Rule Breaking Behavior	52.05 (3.83)		51.20 (2.44)		2.45	.02	0.02
Internalizing Symptoms	49.33 (10.20)		45.83 (10.57)		2.73	.007	0.02
Anxious/Depressed	53.13 (5.51)		52.35 (5.46)		1.15	.25	0.00
Withdrawn/Depressed	53.86 (5.43)		52.72 (4.88)		1.72	.09	0.01
Somatic Complaints	55.71 (7.31)		53.86 (6.24)		2.09	.04	0.01
Attention Problems	55.60 (7.81)		53.52 (7.16)		2.29	.02	0.01
Social Problems	54.67 (6.34)		53.21 (5.79)		1.97	.05	0.01
Thought Problems	53.97 (6.03)		52.72 (5.62)		1.69	.09	0.01
Total Problems	47.97 (10.79)		44.01 (10.18)		2.97	.003	0.02

Note. FH⁺ = Families with a history of substance use disorder; FH⁻ = Families without a history of a substance use disorder; Eta squared effect sizes: .01 = small, .06 = moderate, .14 = large (Cohen, 1988); Bonferroni correction $p < .001$.

Table 6Personality Characteristics in Offspring by FH⁺ Group

Personality Traits	FH ⁺ (<i>n</i> = 305)	FH ⁻ (<i>n</i> = 81)	<i>t</i>	<i>p</i>
	<i>M</i> (SD)	<i>M</i> (SD)		
Sensation Seeking _y	10.78 (4.78)	10.41 (4.60)	0.62	.53
Thrill and Adventure Seeking	7.65 (3.06)	7.54 (3.37)	0.27	.79
Drug and Alcohol Attitudes	0.53 (1.03)	0.30 (0.66)	2.49	.01
Social Disinhibition	2.60 (2.00)	2.57 (1.75)	0.12	.91
Callous-Unemotional Traits _y	20.72 (8.15)	17.81 (5.74)	3.02	<.001
Callous-Unemotional Traits _p	19.60 (9.07)	15.21 (7.03)	4.68	<.001
Lifetime History of Aggression _p	6.01 (6.38)	2.38 (3.25)	7.06	<.001

Note. FH⁺ = Families with a history of substance use disorder; FH⁻ = Families without a history of a substance use disorder; y = youth report; p = parent report. Bonferonni correction for the SSSC *p* < .01.

Table 7

Environmental Characteristics of Offspring by FH⁺ Group

	FH ⁺		FH ⁻		<i>t</i>	<i>p</i>	Eta-sq
	<i>M</i> (SD)		<i>M</i> (SD)				
<u>Family Environment</u>							
Global Scale							
Task Accomplishment	51.02 (8.32)		46.40 (6.38)		4.33	<.001	0.05
Role Performance	54.97 (8.98)		49.59 (7.71)		4.61	<.001	0.06
Communication	53.43 (8.53)		47.36 (6.50)		5.56	<.001	0.08
Affective Expression	50.66 (8.08)		45.53 (7.97)		4.75	<.001	0.06
Involvement	50.89 (7.28)		44.65 (6.02)		6.63	<.001	0.11
Control	52.12 (7.59)		47.29 (7.06)		4.83	<.001	0.06
Values and Norms	50.80 (7.40)		46.51 (6.88)		4.38	<.001	0.05
Overall Rating	51.98 (6.55)		46.76 (5.50)		6.14	<.001	0.10
Deviant Peer Affiliation	2.38 (3.65)		0.75 (1.55)		5.93	<.001	0.09

Note. FH⁺ = Families with a history of substance use disorder; FH⁻ = Families without a history of a substance use disorder; Sample sizes are: family environment measure FH⁺ = 275 and FH⁻ = 70; deviant peer affiliation FH⁺ = 305 and FH⁻ = 81. Eta squared effect sizes: .01 = small, .06 = moderate, .14 = large (Cohen, 1988). Bonferroni correction $p < .001$ for the family environment measure.