RISK-TAKING BEHAVIORS AND RELATED CONSTRUCTS IN 12-YEAR-OLD ADOLESCENTS WHO WERE PRENATALLY EXPOSED TO COCAINE

by

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The current study investigated risk taking and related constructs (i.e., self-regulation, developmental assets) in a cohort of youth who were prenatally exposed to cocaine (CE). Participants were 283 12-year-olds (CE=138; NCE=145) enrolled in a longitudinal study investigating the developmental outcomes of prenatal cocaine/poly drug exposure. At 12 years old, data pertaining to risk taking and related constructs was gathered. Regression models were carried out statistically controlling for potential confounding variables (e.g., other prenatal and postnatal drug exposure, home environment) to ensure isolated effects could be attributed to CE. The primary outcomes included: 1) self-reported risk behavior; 2) risk-taking propensity on a behavioral task; 3) self-regulation; and 4) behavioral assets. Controlling for potential confounders, a significant effect of CE was found for self-regulation ($\beta = .210; p = .030$), which upon further examination revealed a CE x gender interaction effect ($\beta = -.216; p = .036$). That is, being CE and female significantly predicted worse self-regulation. The findings replicate and extend previous findings with this cohort further demonstrating heightened vulnerability for females who were CE. Continued study of risk taking, self-regulation, and developmental assets in youth who were CE is needed to elucidate the developmental trajectories of risk and resilience.
Introduction

Health risk behaviors contribute to morbidity and mortality among youth and young adults (Eaton, Kann, Kinchen, Ross, Hawkins, Harris, et al., 2006). The primary risk behaviors that contribute to morbidity and mortality in individuals aged 10-24 years are classified into six categories of preventable behaviors. These six categories of health risk are: 1) behaviors that contribute to unintentional injuries and violence; 2) tobacco use; 3) alcohol and other drug use; 4) sexual behaviors that contribute to unintended pregnancy and STDs, including HIV infection; 5) unhealthy dietary behaviors; and 6) physical inactivity (Eaton et al., 2006). Despite the fact that health-risk behaviors may result in death, sickness and/or injury, a significant number of youth continue to engage in such behaviors nonetheless (Kann, 2001). Adolescence is a particularly vulnerable time period for the onset of risk-taking behaviors (Galvan, Hare, Voss, Glover, & Casey, 2007). Important research in this area aims to identify subgroups of adolescents that may be at heightened risk for engaging in hazardous health behaviors.

Not only are adolescents at high risk for engaging in hazardous health behaviors, but also children prenatally exposed to cocaine and other substances are of particular interest with regards to the study of health risk behavior. Children prenatally exposed to cocaine (CE) experience a variety of vulnerabilities that put them at increased risk for displaying risky behavior. For example, CE children are at increased odds of exhibiting behavioral problems given an increased probability of neurological insult during fetal development and environmental instability related to parental substance abuse (Lester & Padbury, 2009; Mayes, 1999, 2002). Externalizing behavioral problems in early childhood have been linked to CE (Bailey, Sood, Sokol, Ager, Janisse, Hannigan, et al.,
2005; Bendersky, Bennett, & Lewis, 2006; Linares, Singer, Kirchner, Short, Min, Hussey, et al., 2006), with these behavior problems persisting at later ages (Aguirre McLaughlin, Minnes, Singer, Short, Linares Scott, Satayatham et al., under review; Schofield, Bierman, Heinrichs & Nix, 2008; Vierhaus & Lohaus, 2007). Moreover, recent research has documented increased risk taking in preadolescents (M age=10.5 years; range 10.3 years-11.5 years) that were prenatally cocaine exposed (Bennett, Bendersky & Lewis, 2007), suggesting that early adolescence may be the critical developmental period for the onset of risky behavior. Aside from the research performed by Bennett et al. (2007), little else is known regarding risk behavior outcomes in early adolescents who were CE. This study aims to develop and enhance the research in this area by exploring group differences in risk behavior and related constructs in 12-year-old young adolescents who were CE and non-cocaine exposed (NCE).

Risk-taking behavior

Risk-taking behaviors are associated with short- and long-term negative outcomes. Negative outcomes associated with risk-taking behaviors include greater incidence of mental and physical health problems. In a study by Dowdell (2002) designed to examine smoking in early adolescence (ages 11-13), early drinking behaviors placed subjects at increased risk for smoking, with the combination of tobacco and alcohol use increasing the likelihood of police involvement as compared to adolescents who did not drink alcohol or smoke. Also, adolescents using tobacco self-reported lower ratings of health and more days absent from school (Dowdell, 2002). Another study has documented that engaging in one risk behavior increased the odds that adolescents engaged in other risk behaviors, even after controlling for demographic factors (Fisher,
Kramer, Hoven, King, Bird, Davies, et al., 2000). Not only do these risk-taking behaviors increase the probability of additional risky behaviors, they are also linked to undesirable mental health outcomes, including increased overall psychopathology, limited psychological resources, low self-worth, and depressive symptomatology (Crockett, Moilanen, Raffaelli, & Randall, 2006; Flisher, et al., 2000).

While a consensus exists regarding the increased frequency of risk-taking behavior in the adolescent period, methodological inconsistencies pose a problem for researchers and clinicians invested in this area of inquiry. First, risk-taking behavior has been assessed in a variety of ways, including self-report of behavior and behavioral tasks aimed at tapping risk-taking propensity. While the benefits of using self-report to measure the frequency of engagement in specific risk-taking behaviors are apparent, there are also notable drawbacks. Some researchers have suggested that adolescents’ self-reports of substance use and violent behavior have weak correlations with teacher- and parent-reports of the same behavior (Achenbach, McConaughy, & Howell, 1987). Discrepancy between informants may be in part due to a lack of teacher or caregiver knowledge regarding risk behavior exhibited by their child or student. Inter-item disagreement found in adolescent self-report of risk behaviors has also been obtained (Barnes & Welte, 1986). An example of inter-item disagreement includes when an item response indicates the individual has been drunk before but this same individual also indicates never having had a sip of alcohol. One potential explanation for inconsistent and possibly inaccurate self-report data may be that self-report methods place excessive cognitive demands on adolescents. Recalling with accuracy one’s behavior is a difficult task because it relies on several cognitive processes including, but not limited to,
comprehension and retrieval of information (Brener, Billy, & Grady, 2003). Additionally, social desirability or demand characteristics may also hinder honest reporting of illegal and/or stigmatized behavior (Brener et al., 2003).

Methods aimed at obtaining data regarding risk-taking behavior may be refined and supplemented with behavioral measures of risk taking. Behavioral measures have the advantage of tapping disinhibition or risk-taking propensity, a construct theorized to underlie risky behavior (Bornovalova, Gwadz, Khaler, Aklin, & Lejuez, 2008) while circumventing the challenges inherent in self-report methods. One such behavioral measure is the Balloon Analogue Risk Task (BART; Lejuez, Read, Kahler, Richards, Ramsey, Stuart, et al., 2002), which requires subjects to engage in risk-taking behavior while completing a task involving inflating a computer-generated balloon. In this task, the subject is presented with an empty balloon, which may be inflated incrementally for points. At any time, the subject has the opportunity to stop pumping the balloon and collect the points accumulated to that point in a temporary bank or to continue pumping. However, if the balloon pops, all the points accrued in the temporary bank on that specific balloon are lost and another balloon appears. In sum, the task involves weighing two consequences: the risk of losing all points allocated when the balloon explodes versus the benefits of increasing the quality of the prize at the end of the task by assuming increased risk (loss of all points earned) with each additional pump. The behavioral index of risk-taking as measured by the BART has the potential to enhance reporting of risk taking by avoiding problems associated with self-report of risk.

The BART has been shown to correlate significantly with self-reported risk behavior, as well as related constructs (e.g., sensation-seeking & impulsivity; (Lejuez,
Aklin, Bornovalova, & Moolchan, 2005; Lejuez, Aklin, Daughters, Zvolensky, Kahler, & Gwadz, 2007). Regression analyses revealed that the BART accounts for some of the variance in self-reported risk behavior above and beyond demographics, sensation-seeking, and impulsivity (ranging from approximately 7% to 16%; Aklin, Lejuez, Zvolensky, Kahler, & Gwadz, 2005; Lejuez, et al., 2005). The BART’s incremental validity is evidenced in the variance accounted for above and beyond demographics and related constructs and supports the notion that a behavioral measure taps a distinct aspect of risk taking in youth. Performance on the BART has also been shown to distinguish between adolescents who had ever smoked versus nonsmokers (Aklin et al., 2005; Lejuez, et al., 2005) and adolescents in treatment for conduct and substance use disorder versus adolescents with no substance/conduct problems (Crowley, Raymond, Mikulich-Gilbertson, Thompson, & Lejuez, 2006). Taken together, the BART may enhance measurement of risk-taking behavior in two ways: 1) it may circumvent typical problems associated with the self-report method; and 2) it may tap a unique “disinhibition” component of risk-taking behavior. Accurate measurement of risk-taking behavior is crucial as risk-taking outcomes are associated with harmful physical, mental, and behavioral health outcomes.

Self-Regulation

Self-regulation is a broad term used to describe “any self-directed action that serves to alter the likelihood of a future consequence” (Barkley, 2000). Self-regulation has been theorized to be a necessary component underlying adaptation to the environment (Rueda, Posner, & Rothbart, 2005) and appears to mediate between early experience, genetic vulnerabilities, and later functioning (Fonagy & Target, 2002). While researchers
and theorists have postulated several different models for self-regulation, key components have consistently been emphasized. The central assumption is that self-regulation involves the regulation of three components: attention, behavior, and emotion.

Longitudinal investigations underscore the stable nature of individual differences in self-regulation (Brody & Ge, 2001; Miller & Byrnes, 1997; Raffaelli, Crockett, & Shen, 2005). Persistent self-regulation difficulties pose problems in adolescence, as cognitive, emotional, and social demands require adolescents to strike a balance between self-expression and socially appropriate behavior (Posner & Rothbart, 2000). Self-regulation problems in early adolescence have been associated with increased sexual risk taking, depression, substance use (Brody & Ge, 2001; Crockett, et al., 2006) and increased tobacco use (Gardner, Dishion, & Posner, 2006) in later adolescence.

The relationship between self-regulation and adjustment has been examined in cross-sectional studies (Buckner, Mezzacappa, & Beardslee, 2003; Eisenberg, Sadovsky, Spinrad, Fabes, Losoya, Valiente, et al., 2005; Raffaelli & Crockett, 2003). Using a behavioral checklist to measure adjustment, relationships between internalizing and externalizing behavior problems and regulation and emotionality in children were explored at 4-7 years and at a second time point 2 years later (Eisenberg, Cumberland, Spinrad, Fabes, Shepard, Reiser, et al., 2001; Eisenberg, et al., 2005). Parent-rated self-regulation predicted unique variance in externalizing behavior problems concurrently at Time 1 and Time 2 and also from Time 1 to Time 2 (Eisenberg, et al., 2001; Eisenberg, et al., 2005). While self-regulation deficits found at Time 1 were associated concurrently with internalizing behavior problems at Time 1, this relationship did not hold at Time 2 nor did it demonstrate a predictive relationship from Time 1 to Time 2 (Eisenberg, et al.,
2001; Eisenberg, et al., 2005). Although the relationship between self-regulation and internalizing problems appears somewhat unclear; there does appear to be stability between self-regulation and externalizing behaviors, with the latter important in long-term adjustment (Eisenberg, et al., 2005).

The relationship between self-regulation and adjustment was further supported by research with resilient children (Buckner, et al., 2003). After controlling for demographic variables and negative life events; greater self-regulation, self-esteem and increased parental monitoring were all associated with increased resiliency (Buckner et al., 2003). One possible explanation for the association found between self-regulation and resiliency can be found in the work of Lengua and Long (2002). Their research was designed to examine the relationship between self-regulation in predicting coping and adjustment to stress in children 8-12 years old. Superior self-regulation predicted greater use of active coping and fewer adjustment problems (Lengua & Long, 2002). Thus, the authors reasoned that individuals with better self-regulation skills may be able to mitigate the ill-effects of stress by using adaptive coping strategies (Lengua & Long, 2002). Taken together, these investigations emphasize the importance of self-regulation in studies of behavioral outcomes.

The specific effect that self-regulation skills have on risk behavior has also been examined. Wills, Sandy, and Yaeger (2002) found that self-regulation had a moderating effect on substance use in two independent samples of adolescents. Specifically, adolescents characterized as having lower self-control reported increased substance use behaviors (Wills et al., 2002). Conversely, good self-control was found to protect against increased substance use (Wills et al., 2002). Raffaelli and Crockett (2003) examined the
role of self-regulation and risk-proneness in a longitudinal study of sexual risk taking. At 12-13 years of age, youth were assessed on self-regulation and risk-proneness. Four years later, subjects answered questions related to their sexual initiation and sexual behavior. Self-regulation was measured using a modified version of the Behavior Problems Index, which briefly taps twelve behaviors related to deficits in regulation of attention, emotion, and behavior. Risk-proneness was measured using self-report of attraction and tendency to engage in risky behavior. Self-regulation, but not self-reported risk-proneness, measured at 12-13 years accounted for significant variance in self-reported sexual risk-taking behavior 4 years later (Raffaelli & Crockett, 2003).

Interestingly, self-regulation was related to some sexual behaviors but not others, with lower self-regulation related to less frequent condom use and greater number of sexual partners, but not to early initiation of sexual intercourse (Raffaelli & Crockett, 2003). The authors concluded that a unique relationship exists between self-regulation and risk behavior, but not risk initiation (Raffaelli & Crockett, 2003). Other researchers have examined the link between impulsivity, which is theorized to be subsumed under poor self-regulation and sexual risk behavior. These studies have supported the finding that impulsivity is related to engagement in risky sexual behavior (Pack, Crosby, & St. Lawrence, 2001; Robbins & Bryan, 2004). Research examining the relationship between self-regulation and health risk behaviors in adolescence is in its infancy. Yet preliminary findings suggest, importantly, that self-regulation deficits contribute to increased risk behavior outcomes. Given this finding, it seems imperative to identify individuals at increased risk for self-regulation problems (e.g., children prenatally exposed to
substances). Identifying vulnerable groups of children is a necessary first step in the development of well-targeted and highly needed clinical interventions.

**Protective Factors**

Over time, many youth exposed to individual and/or environmental factors that heighten vulnerability (e.g., CE & self-regulation problems) are likely to exhibit risk-taking behavior. Some of these children, however, will demonstrate adaptation in the face of hardship. Not only is it important to identify factors that predispose children to risk but also it is important to identify the protective factors that buffer youth against negative outcomes. A framework designed to identify behavioral assets has the potential to paint a richer and more nuanced picture of development in youth, particularly for those at high risk (Short, Fairchild, Findling Manos, 2007). Indeed, several researchers have highlighted the importance of research examining protective factors (Glantz & Sloboda, 1999; Leffert, Benson, Scales, Sharma, Drake & Blyth, 1998; Newcomb & Gelix-Ortiz, 1992; Scales, Benson, Leffert, & Blyth, 2000; Short et al., 2007). Protective factors are positive characteristics, predispositions and influences in adolescents’ lives that can buffer them from negative influences (Mackler, 1998). Adolescents with greater protective factors (e.g. supportive relationships with adults & peers) experience fewer behavioral problems including fewer risk behaviors such as substance use, suicidal behavior, and sexual activity (Henrich, Brookmeyer, Shrier, & Shahar, 2006; Jessor, Van Den Bos, Vanderryn, Costa, & et al., 1995).

A recent survey measuring risk behaviors, attitudes, and assets has helped to expand the conceptualization of behavioral assets and protective factors (Leffert, et al., 1998; Scales, et al., 2000). According to Leffert et al. (1998), behavioral assets can be
categorized into 40 subcategories that may foster adaptive development. These assets are comprised of internal (e.g., educational, community, values, social competency and positive identity) and external assets (e.g., support, empowerment, boundaries and expectations, and time). Data gathered from this survey has revealed the cumulative effect that a repertoire of assets has on increasing socially adaptive behaviors and decreasing risk-taking behaviors (Leffert et al, 1998; Scales et al, 2000). In a study controlling for important demographic factors (e.g., maternal education, race/ethnicity, and grade level), adolescents who possessed a greater number of behavioral assets were more likely to engage in health-promoting behaviors and avoid risky behaviors (Murphey, Lamonda, Carney, & Duncan, 2004).

Many protective factors have been studied and have been shown to buffer against negative risk behavior outcomes. Specifically, assets pertaining to various parent and peer factors have been highlighted. Parental factors are quite numerous and range from parent opinions on substance use, to monitoring, and to more general connectedness to a caregiver. In one study, parental disapproval of smoking and having an intact nuclear family was consistently associated with decreased odds of regular smoking (Ellickson, Tucker & Klein, 2008). For youth in foster care, parental monitoring and connectedness to a caregiver moderated sexual activity and increased use of protection methods during sexual activity (James, Montgomery, Leslie, Zhang, 2009). Lohman & Billings (2008) examined sexual behavior in a sample of low-income males and revealed that increased parental monitoring and higher academic achievement were associated with later sexual debut and less risky sexual behaviors. In another study, frequency of family dinners, perhaps a proxy for greater parental monitoring or a strong family relationship, was
significantly and positively associated with decreased health risk behaviors including substance use, sexual behaviors, antisocial behaviors and violence (Fulkerson, et al., 2006).

Factors outside the immediate family have also been shown to protect against risk behaviors. Perkins & Jones (2004) explored resiliency in adolescents who have been physically abused. While most abused adolescents did not engage in high-risk behaviors (e.g. sexual activity, marijuana, & tobacco use), abused youth did engage in these activities with greater frequency than their non-abused counterparts (Perkins & Jones, 2004). Protective factors were found to buffer against these risk behavior outcomes in abused adolescents, with peer influence, positive school climate, and religiosity decreasing the likelihood of alcohol use, tobacco use, other drug use, antisocial behavior, and sexual activity (Perkins & Jones, 2004). Conversely, having a close relationship with an adult outside the family was found to significantly increase the odds of engaging in sexual activity, suicidal behaviors, use of alcohol, tobacco, and other drugs (Perkins & Jones, 2004). The authors posited that abused adolescents experiencing behavioral problems might be more likely to seek support from adults outside their family in response to poor family relations (Perkins & Jones, 2004). Other research further documents the protective role of certain peer variables. Youth reporting that they had positive peer role models were more likely to experience better behavioral outcomes (French, Leffert, Story, Neumark-Sztainer, Hannan & Benson, 2001). The role of positive peer relationships was also present at younger ages as it was positively predictive of normal range scores on measures of externalizing behavior (Schultz, Tharp-Taylor, Haviland & Jaycox, 2009). Despite conflicting findings with regards to a close
relationship with an adult outside the family, on the whole, several resiliency factors contribute to decreased risk behaviors in abused youth.

An eco-transactional model has been employed to look at the potential long-term protective effects of parental and peer relationships. Henrich et al. (2006) gathered data from adolescents regarding their parent and peer relationships and sexual risk behavior. The interaction between positive parent and peer relationships resulted in a significant decrease in the odds of engaging in sexual risk behavior over time (Henrich et al., 2006). That is, close relationships with a parent were associated with a decreased probability of later sexual risk behavior only when adolescents reported stable relationship with peers (Henrich et al, 2006). The authors contended that, supportive relationships with peers were protective in that they augmented the benefits of a close relationship with parents. Overall, there is a growing body of literature substantiating the value of supportive familial and peer relationships in adolescent adjustment (Crosnoe & Elder, 2004; Scholte, van Lieshout, & van Aken, 2001).

Though defined and studied in different ways, it is apparent that behavioral assets contribute to positive outcomes in youth, contributing to decreased risk-taking outcomes. No previous research has explored the presence of protective factors in the lives of youth prenatally exposed to cocaine; however, the presence and importance of protective factors have been documented in other at-risk populations (e.g., children with ADHD; Short et al., 2007). By extending the study of protective factors to youth with CE, we have the potential to shed light on how to offset their vulnerabilities and decrease risk-taking behavior in this population.

*Prenatal Cocaine Exposure*
Children with CE appear to be at higher risk for problems in the aforementioned areas resulting from a variety of factors including: 1) the direct effects of prenatal drug exposure; 2) negative environmental conditions; and 3) other negative developmental outcomes (i.e. cognition, attention and behavior) associated with CE. Early and school age outcomes in these areas will be highlighted below.

Researchers have hypothesized that prenatal cocaine exposure affects the developing fetus in several ways. First, cocaine is theorized to alter typical fetal development through its effects on the monoamine system that appears to be important in the proper functioning of the arousal regulatory processes (Mayes, 1999, 2002). Arousal regulation involves cortical processes of activation that react to internal and external stimulation. In response to stimulation, arousal regulatory processes influence attention and self-regulation, which have been shown to be essential for learning and information processing (Mayes, 1999, 2002). Given the role of the arousal system in attention and executive functioning, and in stress reactivity and coping, researchers have theorized that the effects of cocaine on the monaminergically regulated arousal systems may contribute to elevated mental health problems (Glatt, Bolanos, Trksad & Jackson, 2000; Mayes, 2002). Also, vaso-constrictive effects are believed to lead to hypoxia, which can affect head circumference, birth weight and overall growth of the fetus (Lester & Padbury, 2009). Recently, a third pathway by which cocaine negatively affects fetal development has been proposed (Lester & Padbury, 2009). Lester and Padbury (2009) theorized that cocaine acts as a stressor that alters fetal programming or the expression/transcription of genes during early development. Via this early stressor, behavioral dysregulation occurs
and contributes to negative child behavior outcomes and later psychopathology (Lester & Padbury, 2009).

While research tying together insult to monoamine systems and later outcomes in humans is primarily theoretical, links have been documented empirically between neurotransmitters associated with monoamine regulatory systems and negative behavioral outcomes. The principal monoamine neurotransmitters in the brain are dopamine, norepinephrine, and serotonin. Abnormal monoamine neurotransmitters systems have been implicated in the development of depression, delinquent and aggressive behavior (Berman & Coccaro, 1998; Caspi, McClay, Moffitt, Mill, Martin, Craig, et al., 2002; Stahl, 2000). Caspi et al. (2002) discovered a moderating effect of monoamine genotype on adjustment of adult males who had been maltreated as children. Maltreated males with a monoamine genotype conferring low levels of monoamines were more likely to engage in antisocial behavior compared to maltreated males with a genotype that conferred high levels of monoamines (Caspi et al., 2002). Similarly, research examining serotonin has linked increased levels of serotonin with decreased aggression in male children (Beitchman, Baldassarra, Mik, De Luca, King, Bender et al., 2006; Halperin, Kalmer, Schulz, Marks, Sharma, Newcorn, 2006). The research is nascent with regards to the study of monoamine systems in children; nonetheless, these investigations further our understanding of the theoretical connection between insults to monoamine systems during fetal development and increased vulnerability to negative outcomes.

In addition to hypothesized direct teratologic effects of cocaine, mothers of CE children have been found to experience heightened depression and psychological distress (Minnes, Singer, Kirchner, Satayathum, Short, Min, et al., 2008), which has been related
to increased externalizing and internalizing problems in their children (Accornero, Morrow, Bandstra, Johnson, & Anthony, 2002; Bennett, Bendersky, & Lewis, 2002; Warner, et al., 2006). Warner et al. (2006) examined the presence of behavior problems in children with CE and NCE at 3 years and found that only maternal depression significantly predicted problems. Though mothers of children with CE and NCE at 3 years did not differ in maternal depression in this study, children in both groups revealed higher rates of behavioral problems than are typically found in the general population (Warner et al., 2006). Similarly, greater parental stress at 4 months was associated with increased externalizing behavior problems (Bagner et al., 2009). This relationship was also present regardless of CE status at 3 years old (Bagner et al., 2009). Mothers who used cocaine during pregnancy are particularly susceptible to greater psychopathological distress (Minnes et al., 2008). In studies examining youth with CE, caregiver psychopathology has been shown to predict negative behavioral outcomes (Accornero, et al., 2002; Bennett, Bendersky, & Lewis, 2002) such as internalizing and externalizing symptoms and more symptoms of separation anxiety as self-reported by 9-year-old children (Aguirre McLaughlin, et al., under review).

Investigations of cognitive development highlight difficulties associated with CE beginning in infancy. Singer and colleagues (2005) employed an infant measure of intelligence and found that infants with CE demonstrated poorer visual recognition memory at 12 months of age than infants without CE, with exposed infants obtaining lower mean scores and a higher percentage of scores in the risk range. When specifically examining the dose response effects of cocaine exposure on executive functioning, heavier CE was related to significant differences in executive functioning when
compared to the lighter CE and NCE counterparts in infancy (Noland, Singer, Mehta, & Super, 2003). Cognitive impairments persisted in this group at 2 years, with children with heavier CE exhibiting greater cognitive deficits compared to counterparts who were NCE (Singer, Arendt, Minnes, Farkas, Salvator, Kirchner, et al., 2002). CE was associated with double the likelihood of developmental delay in the first 2 years compared to children who were NCE (Singer et al., 2002). At 4 years of age, CE was not associated with differences in overall IQ but instead related to increased risk for specific cognitive impairments (Singer, et al., 2004). Despite no differences in average IQ, the children who were CE were less likely to earn IQ scores above the normative mean (Singer, et al., 2004), with the difference in cognitive performance not explained by other possible confounding variables (Singer, et al., 2004). At school age, cognitive deficits associated with CE persisted, with 9 year olds experiencing lower perceptual reasoning skills compared to NCE counterparts (Singer, Nelson, Short, Min, Lewis, Russ, et al., 2008). Despite an absence of research on later cognitive outcomes, evidence exists supporting early and persistent effects of CE on cognition through preadolescence and underscores the heightened vulnerability experienced by children who were CE.

In addition to cognitive deficits, studies examining CE in early and middle childhood document attentional and behavioral problems when compared to children who were NCE. Early outcomes reveal that heavily-exposed infants had more attentional problems than NCE infants (Singer, Arendt, Fagan, Minnes, Salvator, Bolek, et al., 1999; Singer, Arendt, Minnes, Farkas, & Salvator, 2000). Consistent findings were found in a sample of children from 1 to 5 years, children with CE exhibited slower reaction times on an attention task than children with NCE, as well as greater behavioral regulation
difficulties (Heffelfinger, Craft, White, & Shyken, 2002). These early attention and behavioral problems appear to continue into early childhood. At 4.5 years, youth with CE demonstrated greater reactivity and lower self-regulation as measured on a problem-solving task (Dennis, Bendersky, Ramsay, & Lewis, 2006). At 5 years, CE, gender, and environmental risk all predicted significant variance in a composite aggression score comprised of child observation, teacher- and parent- report on aggressive behavior (Bendersky et al., 2006). Males with CE demonstrated a particularly heightened likelihood of aggression (Bendersky, et al., 2006).

At school age, Linares et al. (2006) assessed behavioral problems using both child self-report and caregiver report. Findings revealed that youth who were CE were more likely to rate themselves in the probable clinical range on oppositional defiant and attention deficit/hyperactivity problems than children who were NCE even after controlling for confounding variables (Linares, et al., 2006). Bailey et al (2005) also documented increased likelihood of teacher-reported behavioral problems in children with CE and specifically found interactive effects of CE and alcohol exposure (AE) on behavioral outcomes. At 7 years, males with AE who were also CE had increased rates of delinquency (Bailey, et al., 2005). Also, among females who were non-alcohol exposed, females who were CE revealed greater odds of externalizing behavior, aggression, and were five times more likely to experience externalizing symptoms than females who were NCE (Bailey et al., 2005). These findings held after controlling for confounding variables. Recent research has examined persistence of behavioral problems in middle childhood. Using child self-report and caregiver report, 9-year-olds who were CE were found to be at increased risk for delinquency behavior problems, controlling for
significant confounders (Aguirre McLaughlin, et al., under review). This finding was particularly true for females who were CE as they demonstrated a 7-fold increase in odds of delinquent behavior as reported by their caregivers. Furthermore, caregivers of youth who were CE reported their children as experiencing greater thought problems, inattention, aggression, externalizing, and overall problems (Aguirre McLaughlin et al., under review). Since most research has focused on effects of CE on attention and behavioral difficulties from early to middle childhood, little is known about whether these problems will persist as children enter adolescence. Moreover, interesting findings with regards to the interaction of CE and gender highlight the importance of further studying a potential moderating effect of gender on behavioral outcomes.

Cognitive, attentional, and behavioral problems have been examined as they relate to risk behavior outcomes. McGloin and Pratt (2003) examined cognitive functioning and noted that it mediated between childhood adversity and early onset of delinquent behavior. That is, childhood adversity was associated with early onset of delinquency when cognitive functioning was low (McGloin & Pratt, 2003). Similarly, when studying cognitive functioning and negative affect in substance abusing adolescents, both have been found to be associated with greater drug use frequency and problems (Shoal & Giancola, 2001). Researchers have also uncovered links between cognitive distortions and engagement in risk behavior (Kirisci, Tarter, Vanyukov, Reynolds, & Habeych, 2004; Sharps, Price-Sharps, Day, Villegas, & Nunes, 2005). Thus, cognitive functioning is an important factor that affects outcomes and warrants consideration when examining behavioral outcomes.
As discussed above, self-regulatory problems, which subsume attentional and behavioral problems, appear to be stable and contribute to increased risk taking in youth. Specifically, attentional and conduct problems have been shown to be highly related to negative behavioral outcomes especially substance abuse (Biederman, Wilens, Mick, & Faraone, 1997; Wilens, Biederman, Mick, Faraone, & Spencer, 1997). Given that attentional and behavioral problems and caregiver/environmental characteristics are strongly associated with CE (e.g., parental substance abuse, possible heritability factors, poverty), youth who were CE were identified as an important subgroup for study of risk-taking behavior outcomes.

The Current Study Aims and Hypotheses

Cognitive, attentional, and behavioral problems have been documented in samples of CE children, with these problems assumed to be related to risk-taking behavior. Given these associations, it seemed imperative to examine more carefully risk-taking behaviors using a multimethod approach in our high-risk sample of youth who were CE and NCE. As a first step in this research, the current study investigated effects of CE on risk-taking behavior. Additionally, this study examined CE effects on factors (i.e., self-regulation, behavioral assets) related to risk taking. Contextual-level variables (e.g., other prenatal and postnatal drug exposure, home environment) were controlled for in these analyses to ensure effects could be attributed to CE. The four areas that were assessed included: 1) self-reported risk behavior; 2) behavioral risk taking propensity; 3) self-regulation; and 4) behavioral assets. It was hypothesized that youth with CE would demonstrate greater risk taking as measured behaviorally and via self-report than youth with NCE. It was also hypothesized that youth who were CE would demonstrate greater
deficits in self-regulation and fewer behavioral assets compared to youth who were NCE. Additionally, previous research suggests that possible mediating and moderating variables may influence cocaine effects. That is, research has demonstrated the moderating effect of gender on cocaine effects (Aguirre McLaughlin, et al., under review; Bailey et al., 2005; Bendersky et al., 2006; Bennett et al., 2007). Also, as specific IQ deficits have been found in children who were CE (Singer, et al., 2004; Singer et al., 2008) and IQ linked to risk taking (McGloin & Pratt, 2003; Shoal & Giancola, 2001), it is necessary to explore the possible indirect effect of IQ on outcome. Thus IQ and gender will be explored as possible mediators and moderators, respectively, of CE effects in this study.

Method

Participants

Participants were 283 12-year-old children enrolled in a longitudinal study investigating the developmental outcomes of prenatal cocaine/poly drug exposure. Mothers and infants were recruited from a large, urban county hospital. Shortly before or after infant birth a nurse recruiter identified and approached 647 mothers and their infants as eligible for inclusion in the study. Forty-nine cocaine using and 106 non-cocaine using women refused to participate and 54 (20 cocaine using, 34 non-cocaine using) were excluded for various reasons (no meconium, Down syndrome, maternal psychiatric history, primary heroin use, HIV positive status, maternal low IQ, fetal alcohol syndrome, maternal age <19 years, infant medical illness, maternal chronic illness, and other). Twenty-three women did not present for the enrollment visit.

Therefore at birth, 415 women and their infants were enrolled in the study (218 CE,
Urine samples were obtained immediately before or after labor and delivery and analyzed for the presence of cocaine metabolites, cannabinoids, opiates, PCP, and amphetamines. Urine toxicology screens for drugs were performed by the hospital on all women who received no prenatal care, appeared to be intoxicated or taking drugs, who had a history of involvement with the Department of Human Services in previous pregnancies, or who self-admitted or appeared to be at high risk for drug use after interview by a social worker or medical resident. Infants also had meconium drug analyses performed for cocaine and its metabolites (i.e. benzoylecgonine, meta-hydroxybenzoylecgonine, cocaethylene), cannabinoids, opiates, PCP, amphetamines, and benzodiazepines. Meconium specimens were collected from the newborns' diapers in the hospital by a nurse trained in the research protocol. When available, samples were accumulated over multiple diapers from the same infant. After collection, specimens were stirred for 5 minutes to insure homogeneity and stored in a refrigerated container. Cocaine-status was determined if the mother or infant were positive on any of the following: maternal/infant urine sample, infant meconium, or maternal self-report of cocaine use. A negative report on all measures was required to be placed in the control group. Drug use was quantified using urine samples obtained before or after labor and delivery and/or meconium collected from infants’ diapers (for a full description of urine/meconium collection and analysis see Singer, et al., 2000). Before the first data collection, 11 participants died (8 CE and 3 NCE [$X^2 = 1.9; p = .17$]). At the end of the most recent wave of data collection, one more participant has died and of the 403 surviving participants, 365 participated in data collection, which represents approximately 91% retention rate. Data collection for the current study ended
approximately 4 months before data collection was completed for the larger study. Thus, the sample size for the current study is 283 (138=CE, 145=NCE). Compared to all surviving participants, the participants in this study did not differ in their cocaine status ($X^2= .15; p=.70$).

**Measures**

*Youth Risk Behavior Surveillance System (YRBSS).* A shortened version of the YRBSS (Centers for Disease Control and Prevention [CDC], 2001, see Appendix A) was used as the self-report measure of the engagement in actual risk behaviors in daily life. This 10-item inventory measured both substance use and non-substance use health risk behaviors. On this measure, subjects answered yes or no to engagement in the following behaviors in the last year: 1) drank alcohol (even one drink); 2) smoked a cigarette (even a puff); 3) used an illegal drug; 4) been in a physical fight; 5) gambled for real money; 6) ridden a bicycle or motorcycle without a helmet (even once); 7) ridden in a car without wearing a seatbelt (even once); 8) stolen anything from a store; 9) carried a weapon such as a gun, knife, or club outside of your home 10) had sexual intercourse. If the participant responded “yes” to an item, then they rated the frequency of engaging in that particular behavior in the past 12 months: 1 to 2 times, 3 to 6 times, 7 to 11 times, monthly, weekly or daily. If the subject responded “no” to an item, the score on that item was a 0. If the subject responded “yes” to an item, the score for that item was determined based on the frequency rating such that indicating that the subject had engaged 1 to 2 times earned a score of 1, 3 to 6 times earned a score of 2, 7 to 11 times earned a score of 3, monthly earned a score of 4, weekly earned a score of 5, and daily earned a score of 6 for that item. A total risk score was calculated by adding the frequency rating of each
item. In theory, the total score could range from 0 indicating no risk behaviors to 60 indicating engaging in each of the 10 risk behaviors daily. The sum of the YRBSS frequency score was used in the analyses.

*Balloon Analogue Risk Task, Adolescent Version (BART).* The BART is a behavioral measure of risk taking involving a self-administered computer task (Lejuez, et al., 2002). In the task, a computer-generated balloon is pumped and visually increases in size on the screen (see Appendix B for a computer screen image). Each pump is worth one point, but if a balloon is pumped past its explosion point then all points accrued for that balloon are lost. Individuals completing the task, have the opportunity, before the balloon explodes, to stop pumping and collect the accumulated points in a prize meter, which is visually displayed on the screen. After a balloon exploded or points are collected, a new balloon is displayed on the screen for a total of 30 balloons. At the end of the task, the position of the prize meter determines the final prize with markings on the meter indicating a small, medium, large, or bonus prize. In this study, if the prize meter indicated a small prize, then the participant was offered a prize worth less than $0.25 (e.g. a small piece of hard candy). If the prize meter indicated a medium prize then a piece of candy of slightly greater value was provided (e.g. a lollipop), a larger piece of candy (e.g. a “jumbo” lollipop) was supplied for a large prize, and a small candy bar for the bonus prize.

Standardized instructions were provided to each participant prior to beginning the task (see Appendix C). The participants were informed that there were going to be 30 balloons and that points in the prize meter would indicate the quality of the prize to be provided upon completion of the task. Also, participants were advised that: “if a balloon
pops, then you lose the points built up on that balloon” and that “the bigger you make the balloon before you press ‘save points’, the more you will fill the prize meter.” Participants were provided no further information about the probability underlying the explosion point for each balloon.

Based on all published BART studies to date, the average number of pumps on balloons that did not explode is the preferred index of risk-taking on the BART (Lejuez et al., 2007). This value is adjusted, that is, it is calculated using the average number of pumps on balloons that did not explode (versus the average number of pumps on all balloons). It is preferable to the unadjusted value, which would be necessarily constrained on balloons that exploded, thereby limiting between-participant variability in the unadjusted averages (Lejuez et al., 2002). Therefore risk-taking propensity was examined in this study using the adjusted number of pumps variable.

**Behavior Rating Inventory of Executive Function (BRIEF).** The BRIEF is a caregiver-report measure of executive functioning in youth 5-18 years old (Gioia, Isquith, Guy, & Kenworthy, 2000; see Appendix D). The BRIEF has high test-retest reliability r=.82 and has established convergent validity with measures of inattention, impulsivity, and learning skills (Gioia, Isquith, Kenworthy, & Barton, 2002). The BRIEF has also demonstrated divergent validity for measures of emotional and behavioral functioning including the Child Behavior Checklist and Conners’ Rating Scales (Achenbach, 1994; Conners, 1994). Normative data was based on child ratings from males and females from diverse SES and ethnic groups. Raw scores are converted to t-scores with a mean of 50 and a standard deviation of 10. Higher scores indicate a greater level of dysfunction and t-scores at or above 65 are considered clinically significant and represent scores above
the 90th percentile (Gioia, et al., 2000). The GEC is useful as a summary measure and can be used as an accurate reflection of overall executive dysfunction (Gioia, et al., 2000). Thus, the GEC will be used to examine group differences in overall executive functioning, the GEC.

**Developmental Assets Profile (DAP).** The DAP employs a self- and caregiver-report assessment of eight developmental asset categories for youth ages 11-18 (Scales & Leffert, 2004; see Appendix E). Based on a developmental asset framework, it provides a way to document, quantify, and portray the types of assets available in the participants’ lives.

The DAP categorizes assets in two ways. External assets are the positive experiences youth have available to them from the world around them. These 20 assets are about supporting and empowering youth, about setting boundaries and expectations, and about positive and constructive use of young people’s time. Additionally, the DAP assesses the presence of 20 internal assets, characteristics and behaviors that reflect positive internal growth and development. Internal assets include positive values and identities, social competencies, and commitment to learning. Two or more items are required to cover different facets of some of the 40 assets, resulting in a total of 58 items in the current version of the DAP (DAP user manual, 2005). Scores from the caregiver-rated DAP pertaining to internal, external, and total assets were obtained at this assessment. Many participants appeared to have some difficulty in their comprehension of the items from the self-report version of the DAP as noted by examiners administering the measure. Thus, as recommended in the DAP user manual (DAP user manual, 2005) data was gathered from the caregivers completing the DAP with regards to their child’s
behavioral assets. The caregiver-rated DAP total score was the variable of primary interest in this study as I was primarily interested in the participants’ overall level of assets.

Procedures

Participants were seen at birth, 6.5 months, 1 year, 2 years, 4 years, 6 years, 9 years, 10 years, and 11 years of age. This study collected data at the 10th wave of data collection when the participants were 12-years-old. Upon arriving at the clinic, the child and their caregiver met with a staff member and reviewed the participants’ confidentiality rights as well as information regarding the research (e.g., duration of testing session, types of tasks that they would engage in at the visit). The Institutional Review Boards of the participating hospitals approved the study. Informed consent and assent was obtained from the caregiver and their child, respectively. The child and their caregiver were provided lunch during their visit and compensated $50 each for their participation in the study.

At each assessment visit, the child’s primary caregiver completed an assessment battery that included an interview regarding current drug usage and a variety of questionnaires related to demographics, psychological coping and functioning, and their child’s cognitive, language, and behavioral functioning. While the caregiver was being interviewed, the child was simultaneously taking part in an assessment battery that involved cognitive, behavioral, and emotional functioning using self-report questionnaires, behavioral tasks, and examiner-administered tests. An examiner blind to cocaine status administered these measures. The child’s assessment battery typically lasted about 4 hours.
Statistical Analyses

All data analyses were conducted using the Statistical Package for the Social Sciences for Windows (SPSS, version 17.0). The statistical plan for data analysis was conducted in the following two stages.

Stage One: Examination of Data Distribution and Descriptive Statistics

Distribution of data. Prior to performing analyses, the distributions of the descriptive (e.g., demographics, pre- and postnatal) and primary outcome (i.e., self-reported risk taking on the YRBSS, behavioral risk taking on the BART, self-regulation on the BRIEF, and developmental assets on the DAP) variables were inspected to assess normality, identify outliers and other abnormalities in the data set. As recommended by Tabachnick & Fidell (2007) variables that were skewed (e.g., maternal prenatal and current caregiver drug use variables, maternal psychological distress) were normalized using a loge (x+1) transformation before conducting regression analyses. Self-reported risk-taking behavior on the YRBSS was also slightly skewed. A square root transformation was used for data because it was mildly skewed. By calculating the square root of the variable, individual outliers that are causing skewness are brought closer into the mean creating a normalized variable (Tabachnick & Fidell, 2007). This type of transformation is typically enough to correct mild skewness; however, if a square root transformation does not correct skewness caused by outliers then other transformations (e.g., log) are recommended (Tabachnick & Fidell, 2007). A square root transformation is preferable in that the transformed scores tend to be easier to interpret (i.e., to interpret a transformed score of 2 one would simply square the score to determine that the original score was 4; Tabachnick & Fidell, 2007). After the square root
transformation of the YRBSS was conducted, the variable no longer appeared to be skewed.

**Descriptive data.** T-tests for continuous data and Pearson $\chi^2$ for categorical data were carried out to examine differences based on cocaine status (CE vs NCE) on: 1) child/maternal demographic and prenatal drug exposure variables at birth; and 2) child/caregiver demographic and current caregiver drug use variables at 12 years of age. The continuous variables that were examined were: the participant’s WISC-IV score; Home Observation for Measurement of the Environment (HOME) score at 12 years of age; maternal years of education; maternal psychological distress at birth and for current caregiver; prenatal exposure to cigarettes, alcohol, and marijuana as well as current caregiver cigarette, alcohol, and marijuana use; maternal IQ and PPVT (a measure of receptive vocabulary). The categorical variables that were examined were: current caregiver marital status; sex, race, and SES of child.

**Bivariate analysis of cocaine effects.** T-tests were carried out to examine the effects, without control for potential confounders, of prenatal cocaine exposure on the outcomes of primary interest in this study (i.e., self-reported risk taking on the YRBSS, behavioral risk taking on the BART, self-regulation on the BRIEF, and developmental assets on the DAP).

**Stage Two: Hypothesis Testing: Examination of cocaine effects**

**Identification of potential confounders.** It was hypothesized that, after control for potential confounders, youth who were CE would exhibit more risk-taking behavior as measured via self-report and behaviorally, as well as worse self-regulation and fewer developmental assets compared to youth who were NCE. One of the principal tasks in
behavioral teratology research, such as that carried out in the current study, is the identification of possible confounders. Controlling for potential confounders is a necessary first step in this type of research as it allows for more accurate interpretation of the relationship between prenatal cocaine exposure and the outcome variable (Jacobson & Jacobson, 1996; Lester, 1999). A potential confounding variable is identified when it meets two criteria: 1) it is significantly different based on, in this study, cocaine status; and 2) it is significantly related to the outcome of interest. It should be noted that although gender did not differ based on cocaine status, it was nonetheless examined as a potential covariate as it a substantial base of literature supports gender differences in risk-taking behavior and self-regulation.

Thus, information gathered from the first stage of this data analytic plan was used to identify the potential confounding variables to include in the regression models. That is, descriptive variables that were different based on cocaine status (CE vs NCE) were identified first. As this was an initial step in the statistical analyses with the purpose of identifying potential confounders, a p-value was set purposefully higher at p < .20, and thus somewhat more inclusive, than the p-value set for our primary regression analyses presented later in this section.

Examination of cocaine effects. After identification of potential confounders and before conducting the analyses, the assumptions of multiple regression were checked (e.g., adequate sample size; absence of multicollinearity and singularity; absence of outliers; normality, linearity, homoscedasticity, independence of residuals) by examining the distributions of and the correlations between the independent and dependent variables. The assumptions of multiple regression were met thus the regression models
were developed and conducted for each outcome variable (i.e., risk-taking on the YRBSS, risk-taking propensity on the BART, self-regulation on the BRIEF, & developmental assets on the DAP).

The primary objective of this study was to examine the effects of prenatal cocaine exposure on self-reported risk-taking behavior, risk-taking propensity, self-regulation, and behavioral assets controlling for potential confounders. The variables of interest were: 1) the square root transformation of the total YRBSS score; 2) the adjusted number of pumps from the BART (i.e., number of pumps for balloons that did not explode; risk-taking propensity); 3) the caregiver-rated GEC score from the BRIEF (self-regulation); and 4) the total number of behavioral assets from the caregiver-rated DAP. These variables of primary interest were entered as the dependent variable in each of the four models.

Once the potential confounders were identified for each outcome measure, cocaine was entered into the model first, for each particular dependent variable (i.e., YRBSS, BART, DAP & BRIEF). Order of entry of the potential confounders was as follows: gender, home environment (i.e., the HOME score); demographic and prenatal factors; and significant caregiving and other drug exposure variables. If upon entry these covariates were significant in the model at p < .10, then they were retained in the model. Also, as previous behavioral teratology researchers have advised for handling potential confounders (e.g., Tong & Lu, 2001), if the parameter estimate of cocaine changed by 10% or greater, even if that particular variable was not significant at p < .10 when it was included in the model, then that covariate remained in the final model as a potential confounder.
To summarize this second stage of the data analytic plan, the potential confounders were identified as those descriptive variables that were different by cocaine status ($p < .20$) and significantly related to outcome ($p < .20$). The potential confounders were entered into the regression model following cocaine status. The potential confounders were retained in the model if they were significant at $p < .10$ or if the cocaine estimate changed by 10%. For self-reported and behavioral risk taking as well as self-regulation, gender was also evaluated in the models based on prior research documenting gender effects in these areas. After the final model for each outcome variable (i.e., self-reported risk taking on the YRBSS, risk-taking propensity on the BART, self-regulation on the BRIEF, developmental assets on the DAP) was determined, the potential mediating and moderating effects of IQ and gender, respectively, were examined as described below.

**Analysis of Mediator and Moderators.** The importance of theoretically driven exploration of mediators and moderators has been emphasized (Frazier, Tix, & Barron, 2004). If cocaine was a significant predictor of outcome, then IQ as a mediating variable was evaluated. A variable is considered a mediator if it partially or completely accounts for the relationship between cocaine exposure and the primary outcome. Analysis of the possible mediating effect of IQ will entail entry of IQ into the final multiple regression model last (following cocaine and the significant covariates). IQ will be determined to be a mediating variable if it is partially or completely responsible for the effect of prenatal cocaine exposure on the outcome. Also, the potential moderating effect of gender will be examined. To examine the moderating effect of gender, as recommended by Tabachnick & Fidell (2007), gender will be entered into the model following cocaine exposure. The
potential confounders and the interaction term (prenatal cocaine exposure by gender) will be entered into the model last. Gender will be considered a moderating variable if the interaction term (prenatal cocaine exposure by gender) demonstrates a significant effect. If there is a significant moderating effect of gender, analysis of covariance will be carried out to more clearly examine the interaction as well as to present the adjusted means (i.e., adjusted for the significant covariates) for ease of interpretation of the interaction effect.

**Results**

**Distribution of data.** Prior to analysis, the descriptive (predictor) and outcome (dependent) variables were examined to assess normality, identify outliers, and other abnormalities in the data set. As suggested by Tabachnick and Fidell (2007) skewed data (e.g., maternal prenatal and current caregiver drug use variables, & maternal psychological distress) were normalized using a loge (x+1) transformation before conducting regression analyses. The YRBSS score was also transformed but due to mild skewness and ease of interpretation, following recommendations set forth by Tabachnick and Fidell (2007), a square root transformation was utilized for this variable.

**Descriptive data.** Characteristics of the current sample (N=283) by cocaine status are found in Table 1. At birth, children who were CE were shorter in length \((p<.001)\), weighed less \((p<.001)\), and had smaller head circumference \((p<.001)\), compared to children who were NCE. Also, mothers of the participants who were CE were older \((p<.001)\), had less education \((p<.001)\) and more psychological distress \((p<.001)\) compared to caregivers of NCE participants. Although mothers of NCE youth also demonstrated cigarette, alcohol, and tobacco use, mothers of CE youth demonstrated significantly more cigarette \((p<.001)\), alcohol \((p<.001)\), and marijuana use \((p<.001)\)
compared to mothers of NCE participants (see Table 2). At 12 years of age, Table 3 reveals that caregivers of youth who were CE were less educated ($p<.01$) and currently smoked more cigarettes per day ($p=.02$) compared to caregivers of youth who were NCE.

**Bivariate analysis of cocaine effects.** T-tests were performed to explore differences in our sample attributable to cocaine with no regard for potential covariates (see Table 4). No group differences were obtained for self-reported risk-taking behavior composite score, risk-taking propensity, and total developmental assets score. There was an effect of cocaine on the caregiver-rated self-regulation score from the BRIEF, $t(272) = -2.54, p = .012$. Youth who were CE were rated as demonstrating poorer self-regulation compared to youth who were NCE.

**Identification of potential confounders.** In an effort to identify potential confounders, t-tests were performed to examine group differences (CE vs NCE) on the descriptive data. The variables that were significantly different ($p < .20$) based on cocaine status (CE vs. NCE) were: HOME score at 12 years of age; maternal years of education; maternal psychological distress; prenatal exposure to cigarettes, alcohol, and marijuana; current caregiver cigarette use; maternal PPVT score; and current caregiver marital status. Of the variables that differed significantly between the CE and NCE groups, several were also significantly correlated ($p < .20$) to the primary outcome scores. Gender was related to self-reported risk-taking behavior on the YRBSS while PPVT, prenatal exposure to cigarettes and marijuana, and current caregiver cigarette use were all related to risk-taking propensity as measured by the BART. For self-regulation as measured by the BRIEF, significant covariates were HOME score, maternal psychological distress at birth, and prenatal exposure to cigarettes, alcohol, and marijuana. On the DAP measure
of behavioral assets, HOME score was determined to be a significant covariate. Gender was also entered into the risk-taking (self-reported and risk-taking propensity) and self-regulation models and evaluated as outlined above (i.e., remained in the model if significant at p < .10) to determine whether it was a significant covariate.

**Examination of cocaine effects.** Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, and homoscedasticity. For the transformed self-reported risk taking score, risk-taking propensity on the BART, self-regulation on the BRIEF, and for developmental assets on the DAP, inspection of the Normal Probability Plot revealed a reasonably straight diagonal line from bottom left to top right suggesting that there are no major deviations from normality. Also for these 4 outcome variables, inspection of the Mahalanobis and Cook’s distances did not reveal critical outliers. Lastly, assumptions of multicollinearity were assessed by examining Tolerance and Variance Inflation Factor values. There were no Tolerance values less than .10 and no VIF values greater than 10 indicating that the variability of one independent variable was not explained by other independent variables in the model (Tabachnick & Fidell, 2007). Thus, normality was assumed for the square root transformation of the YRBSS, BART, BRIEF, and DAP variables.

Regression analyses examining cocaine effects for each primary outcome variable were performed controlling for potential confounders (Tables 5, 6, 7, & 8). Cocaine exposure was entered into the models first followed by the significant covariates. For ease of reading and interpretation, the text presents the standardized β coefficients only, while the tables present both the B and β coefficients, which represent unstandardized and standardized coefficients, respectively. As the β coefficient is standardized,
comparisons may be made across measures in terms of the relative contribution of the predictor. There was a significant effect of CE on self-regulation ($\beta=.212, p=.029$) indicating that CE status would likely increase self-regulation scores by .212 standard deviation units. That is, CE contributed to worse self-regulation compared to NCE. Conversely, there were no significant effects of CE on self-reported risk-taking behavior ($\beta=.014, p=.816$), risk-taking propensity ($\beta=-.110, p=.198$), or developmental assets ($\beta=.021, p=.726$). As the multiple regressions resulted in no significant effects for self-reported risk taking on the YRBSS, further exploratory analyses with logistic regression utilizing a dichotomized self-reported risk-taking score (representing high and low risk-taking with a median split) would allow for a confirmatory examination of cocaine effects. The results obtained from the logistic regressions were corroborated those obtained in the multiple regressions; no CE effects on self-reported risk taking on the YRBSS.

Effects of other prenatal exposure, gender, and environmental variables on risk taking and related constructs. Prenatal exposure to alcohol, cigarettes and marijuana was not a significant predictor of self-reported risk taking, risk-taking propensity, self-regulation, or developmental assets.

The final model examining risk taking on the YRBSS was not significant ($R^2 = .018, F(2, 269) = 2.520, p = .082$). However, gender was related significantly to self-reported risk taking ($\beta = .135, p = .026$) such that being male likely results in a .135 increase in standard deviation units on the YRBSS. A main effect was found for gender on self-regulation indicating that being male is significantly predictive of worse executive
functioning compared to females; however, this finding must be interpreted in the context of the cocaine x gender interaction effect, which will be presented below.

Environmental factors were not found to significantly predict risk taking on the YRBSS or self-regulation on the BRIEF in this sample. There was a trend for current caregiver number of cigarettes smoked daily to predict risk-taking propensity on the BART ($\beta = 0.158, p = 0.052$). HOME scores at 12 years predicted behavioral assets ($\beta = 0.181, p = 0.003$) such that an increase of one unit on the HOME measure would likely result in a 0.181 standard deviation unit increase in the DAP score. That is, children with better home environments were rated as having more developmental assets compared to those with a worse home environment.

**Mediators and Moderators.** As there was no significant effect of CE on any of the primary outcome measures once significant covariates were entered into the model, IQ was not examined as a mediator. Gender was examined as a moderator for self-reported risk-taking and risk-taking propensity, as well as for self-regulation. The interaction term, cocaine by gender, was entered into the regression models last following cocaine status, gender, and potential confounders. The interaction term was not significant for risk taking either via self-report or on the behavioral task. There was; however, a moderating effect of gender on self-regulation ($\beta = -0.209; p = 0.043$) such that being CE and female predicted worse self-regulation compared to males who were CE and youth who were NCE. The moderating effect of gender was not explored as it pertained to developmental assets only and was not part of my a priori, theoretically derived hypotheses.
Discussion

Cognitive, attentional, and behavioral problems have been documented in samples of youth who were CE, with these problems theorized to underlie increased engagement in substance use and health risk behaviors. Given the heightened vulnerability of these children, the current study utilized a multitrait, multimethod approach to examine risk-taking by exploring self-reported risk-taking, risk-taking propensity, self-regulation, and developmental assets in a high-risk sample of youth who were CE and NCE. This study is the first to explore developmental assets as well as the first to explore risk taking using a behavioral measure in addition to self-report in youth who were CE. These two constructs (i.e., risk-taking propensity, developmental assets) have the potential to greatly inform our understanding of the development of risk-taking behaviors. The purpose of this study was to expand research with youth who were CE by inclusion of these important constructs (risk taking, self-regulation, developmental assets) as well as extend previous research that documents self-regulation problems in youth who were CE when compared to their similarly at-risk but NCE counterparts.

Main findings

The hypothesized cocaine effects on risk-taking were not found when risk taking was measured via self-report or using a behavioral task of risk-taking propensity. Similarly, there was no effect of CE on developmental assets. There was a significant effect of CE on self-regulation, which upon closer examination, revealed a moderating effect of gender for self-regulation. Specifically, being female and CE were predictive of poorer self-regulation compared to males who were CE and youth who were NCE.

Effect of CE on self-regulation
The effect of CE on self-regulation found in the current study supports prior research that has found effects of prenatal CE on self-regulatory behavior problems. That is, several previous studies have demonstrated deficits related to prenatal CE in constructs that are theorized to be subsumed under self-regulation including behavioral regulation (Dennis et al., 2006), attention (Linares et al., 2006; Singer et al., 1999; Singer et al., 2000), aggressive, and oppositional behavior (Bendersky et al., 2006; Linares et al., 2006; Minnes et al., 2010). Notably, the significant findings of increased vulnerability for females who were CE are consistent with previous research in this same cohort that have also demonstrated greater delinquency (Aguirre McLaughlin et al., under review), greater inhibitory attention problems (Minnes, Singer, Short, Min; 2010) and more language problems (Lewis, Minnes, Short, Weishampel, Satayathum, Min, et al., in press) for CE females. This finding raises some interesting questions regarding the underlying mechanisms that may be operating to increase risk for females who were CE. It may be that female fetuses are somehow more vulnerable to the prenatal insult that occurs with CE. However, other researchers have suggested the opposite (i.e., male fetuses are more vulnerable to prenatal insult; Kraemer, 2000). It has also been suggested in other research with this cohort that caregivers of females who were CE are more willing to report on these types of problems in their children (Minnes et al., 2010).

While it is evident here that females who were CE displayed worse executive functioning, other research has documented a moderating effect of male gender on outcomes of youth who were CE. Specifically, males who were CE have demonstrated more aggressive/disruptive behavior (Bendersky et al., 2006; Dennis et al., 2006), specific cognitive deficits (Bennett, Bendersky, & Lewis, 2008; Singer et al., 2004), and
less frustration tolerance (Dennis et al., 2006) compared to youth who were NCE and females who were CE. Given some differing findings across studies, the manner in which gender influences outcome for youth who are CE is not yet entirely understood and deserves further attention.

Risk-taking outcomes

Given the limited knowledge of risk-taking behaviors in youth who were CE, the current study focused on exploration of risk-taking and related domains of interest in 12-year-old youth who were CE or NCE. The current study found no effect of CE for risk taking via self-report or behavioral measure. This was unexpected given that prior studies have demonstrated effects of CE on related outcomes such as impulsivity, poor emotional regulation, ODD, ADHD, and inattention in children with CE from infancy through school age (Bendersky & Lewis, 1998; Bennett, et al., 2006; Linares et al., 2006; Noland, Singer, Short, Minnes, Arendt & Kirchner, 2005; Singer et al., 1999; Singer et al., 2000). Moreover, the current study documented that CE and being female was predictive of worse self-regulation. Given that it is precisely these types of inhibitory control behavior problems (i.e., problems with impulsivity, poor emotional regulation, ODD, and ADHD) that set the stage for later risk-taking behavior (Campbell, Shaw & Gilliom, 2000; Nigg & Breslau, 2007), it was somewhat surprising that there were no effects of CE for risk-taking in our sample. Moreover, this null finding is in contrast to a recent study that has investigated risk-taking behavior in youth with CE, which documented an effect of CE in preadolescence (mean age 10.5 years old) on risk-taking behavior (Bennett, et al., 2007).
A few comparisons between the current study and the only other published study (Bennett, et al., 2007) on risk taking in youth who were CE may be helpful to highlight potential explanations for the lack of an effect of CE in this study. The current study and Bennett and colleagues’ study (2007) both utilized a modified form of the YRBSS self-report form to measure risk-taking behaviors. The behaviors tapped in both studies included substance use behaviors (e.g., have you had a drink of alcohol) as well as safety/delinquency behaviors (e.g., have you ridden in a car without a seatbelt; have you started a fight). However, the modified YRBSS differed in these two studies in two ways that may have had a bearing on the differing findings: 1) mode of presentation and 2) number of items.

In the current study, we utilized a pencil and paper format for the YRBSS whereas the Bennett et al study utilized a computer to present the YRBSS items. Computer-assisted measurement of risk-taking behaviors is recommended with youth populations (Dillon, Charles, Robbins, & Szapocznik, 2005; Lessler, Caspar, Penne, & Barker, 2000). It is believed that computerized measures of risk taking decrease reliance on reading comprehension skills and possibly circumvents socially desirable responding by providing a more discrete manner for the participant to provide their answers. In terms of number of items, the Bennett et al. (2007) adaptation included approximately 5 more items tapping safety behavior, substance use and aggressive behavior, which may have enhanced their variability in responses thereby increasing the likelihood of detecting a significant effect. Both studies found that there was low variability on this self-report measure and both studies utilized a transformation for the skewed data obtained from this measure. As both these studies demonstrate, young adolescents engage in lower rates of
risk behaviors than older adolescents; however, even epidemiological studies suggest
greater rates of risk behaviors in youth at 12 years of age than was demonstrated in the
current sample.

While most research performed examining risk-taking behaviors in youth focuses
on adolescents who are older than the adolescents in this sample (i.e., approximately 15
years; Aklin et al., 2005; Bornovalova et al., 2008, Crowley et al., 2006; Lejuez et al.,
2003, Lejuez et al., 2007; Lejuez et al., 2005; Wills, et al., 2002) a few epidemiological
studies provide data on risk taking in 12-year-olds. In general, prevalence rates of any
experience with alcohol for children 12 years and younger range from approximately
25% to approximately 30% in national epidemiological studies (for a review see
Donovan, 2007). In contrast, the rate of any alcohol experience was 2.5% in the current
study. Also, in epidemiological studies, initiation of sexual intercourse before 13 years of
age was reported in 7.1% of youth (CDC, 2003), with African American youth reporting
earlier rates of initiation compared to other ethnic groups (Santelli, Lowry, Brener, &
Robin, 2000). Conversely, in our sample consisting of predominantly African American
12-year-olds, the rate of ever having sexual intercourse was 2.1%. Given the rates found
in epidemiological studies, it would be expected that a greater proportion of the children
from this sample, have engaged in some substance use or other type of risk behaviors.
Either youth from this sample are indeed engaging in risk behaviors at a lower rate than
epidemiological studies would suggest or other measurement issues in our study hindered
accurately capturing participants’ involvement in these behaviors (i.e., participants
minimized their risk-taking behaviors).
Frequency of risk-taking behavior involvement may have been lower in this sample for several reasons. First, it is possible that participants’ involvement in this study might have conferred some protection against early risk behavior initiation. The children and their caregivers involved in this study have been coming to the clinic since birth. That is, after the first year, visits were conducted bi-yearly until age 6 then yearly until age 12 with multiple contacts over the phone and through letters in between visits for scheduling and verification of information purposes. The social worker in charge of scheduling visits has been with the project for several years, as have several of the testers. The participants and their caregivers demonstrate familiarity with the staff (e.g., asking if they will see one of the testers, recognizing the social workers voice when she calls). Furthermore, if problematic behavior is observed or reported by caregiver or child, the examiner notifies the licensed psychologist on staff at the clinic. The psychologist assesses the nature of the current difficulties and, if needed, provides a referral for services to the family (e.g., mental health counseling). By virtue of their involvement in the study, these families may be receiving services that families of similar background and circumstance do not receive thereby preventing or offsetting risk behaviors. Thus, the incidence of risk-taking behavior engagement may be truly less than typically documented in epidemiological studies. Nonetheless, other data gathered from this sample, including the effect of CE for females found for self-regulation in this study, indicate that these children are indeed at greater risk for the inhibitory control problems (attention, behavioral, & cognitive difficulties) that may underlie risk-taking.

Also, characteristics of our sample may help explain lower risk-taking behavior. The current sample consists predominantly of African American youth. Previous
research suggests that African American youth initiate substance use risk behaviors later and to a lesser degree than their Caucasian counterparts (Epstein, Botvin, & Diaz, 1998; Kelder, Prokhorov, Barroso, Murray, Orpinas, & McCormick, 2003; McGrady, Ahluwalia, & Pederson, 1998). Although some research suggests later and lesser substance use in adolescence, African American individuals are disproportionately likely to experience the ill effects of substance use in adulthood (Gil, Wagner, & Tubman, 2004; USDHHS, 1998). It is unclear why initiation of substance use may be later in African Americans. However further research understanding the trajectory of risk behavior initiation in vulnerable populations, such as those with lower cognitive functioning and among inner-city, African American youth, is clearly vital as initiation often dictates later course of substance use. This information also has the potential to shed light on best practices for prevention efforts.

While youth in our study may truly be engaging in risk behaviors at a lower rate than documented epidemiologically, another possibility is that participants may be underreporting their engagement in risk behaviors. The participants may have felt reluctant to discuss or report their engagement in illegal and/or stigmatized behaviors and then hand over the survey to the examiner. Moreover, as mentioned above, given the high retention rate in this study and familiarity with staff, some adolescents involved in this study have developed a relationship with the examiners as they have returned to the clinic for several years and these youth may have been particularly apprehensive about reporting these types of behaviors. Thus, social desirability may have influenced reliable reporting of risk behaviors and resulted in inaccurate underreporting of engagement in risk behaviors.
Indeed, current best practice recommendations for accurate measurement of risk behaviors involves multi-method measurement that includes biological markers and computer-assisted measures utilizing headphones with a voice presenting items aloud for self-report of risk (Dillon, Turner, Robbins, Szapocznik, 2005; Lessler et al., 2000). Computer-assisted measures have the advantages of not requiring respondents to rely on their reading skills while also possibly circumventing problems of responding in a socially desirable manner. As mentioned above, the only other study to examine risk-taking behaviors in youth who have been CE (Bennett, et al., 2007) utilized headphones with a voice presenting orally the items from the self-report measure of risk-taking while the text was presented simultaneously on a computer screen. Moreover, epidemiological studies tend to gather data anonymously, further supporting the notion that familiarity with an examiner, as is the case in this study, may affect gathering accurate data on risk-taking behaviors. As this study continues to collect data on risk behaviors, the protocol may be improved upon by inclusion of a computer-assisted measure of self-report as well as biological markers (e.g., urine sample, hair sample) in addition to measures of risk-taking propensity to provide optimal multi-trait, multi-method assessment of risk behaviors.

Risk-taking propensity

Behavioral measures have the potential to tap a unique aspect of risk taking (i.e., the propensity to engage in risk behaviors or trait disinhibition), while also avoiding the problems associated with self-report of stigmatized and/or illegal risk behavior. In this study, risk-taking propensity was not different by cocaine group. It was also not significantly correlated with self-reported risk behavior. The BART has been fairly
recently validated in youth (Lejuez et al., 2007). Studies documenting its use support its
construct validity by indicating strong associations with risk taking (Lejuez et al., 2007)
in predominantly low-income, African-American adolescents. Thus, one would expect
that the validity of the measure would hold in the current sample. However, there may
have been a few issues that may have hindered the BART’s generalizability in this
sample.

Most previous studies validating the youth version of the BART do not provide
much information about the use of this measure in individuals with lower cognitive
ability. One study provided information about the sample’s IQ. Those with IQ less than
or equal to 80 were excluded from the study and the overall sample was characterized as
having approximately average cognitive ability and (Crowley et al., 2006). In the current
study, there were 104 participants with an IQ less than 80. Moreover, IQ was
significantly correlated with BART score ($r= .226; p=.002$). Thus, use of the BART with
youth experiencing lower cognitive ability at 12-years-old may be compromised by their
lower cognitive abilities. Although it is unclear whether or not this tool is appropriate to
use in individuals with lower cognitive ability, research performed with an undergraduate
population documented no relationship between BART score and IQ (Lejuez, Aklin,
Jones, Richards, Strong, Kahler et al., 2003). Continued use of this measure in
adolescents of lower cognitive ability will help determine whether the construct validity
of this tool is generalizable in intellectually diverse samples such as the current sample.
Moreover, use in younger adolescents and children will help ascertain its generalizability
to youth at different ages.
Notably our sample was low in risk-taking propensity with the overall average BART score equal to 25.8 pumps. This overall average score on the BART is similar to that obtained by non-clinical adolescents in a previous study (M=24.0; Crowley et al., 2006). Although no predetermined non-clinical range has been set for the BART, our sample appears to demonstrate a non-clinical level of risk-taking. Importantly, as our sample ages, it will be critical to continue to assess risk-taking propensity. Youth in this study were 12-years-old while the average age of adolescents in previous BART studies was approximately 15-years-old (Aklin et al., 2005; Bornovalova et al., 2008, Crowley et al., 2006; Lejuez et al., 2003, Lejuez et al., 2007; Lejuez et al., 2005). Perhaps, when our sample reaches mid-adolescence, risk-taking propensity will more closely resemble clinical populations. Conversely, perhaps our sample will continue to demonstrate lower risk-taking propensity, in line with their lower self-reported risk behavior. Continued research with the BART would be worthwhile as it has shown construct validity (Aklin et al., 2005; Bornovalova et al., 2008, Crowley et al., 2006; Lejuez et al., 2003, Lejuez et al., 2007; Lejuez et al., 2005) with various samples of adolescents. Furthermore, although not clearly evident in this study, the BART has demonstrated utility as a highly promising supplement to multi-trait/ multi-method approaches to risk behavior assessment in youth.

**Developmental Assets**

It is important to consider that, in many studies, youth who were CE demonstrate resiliency across various domains of behavioral and socio-emotional health (Dennis et al., 2006; Linares et al., 2006). Moreover, effect sizes for cocaine effects are often small (Bendersky et al., 2006; Bennett et al., 2007; Dennis et al., 2006; Linares et al., 2006) further supporting resilience in many children with CE. Given that many CE youth
demonstrate resiliency in the face of significant adversity, the significance of understanding and exploring the factors that contribute to adaptation is extremely important. This study was the first to examine assets in a sample of CE youth. Based on a foundation of literature documenting prenatal and postnatal disadvantages associated with CE (Bagner et al., 2009; Bennett, Bendersky, & Lewis, 2002; Minnes et al., 2008), one would expect that youth who were CE would demonstrate fewer assets. However, in this study, there was no effect of CE on developmental assets. That is, youth who were CE demonstrated a similar level of developmental assets compared to those who were NCE. According to conventions outlined in the DAP manual; the mean DAP asset score for youth who were CE (M= 44.10) and for those who were NCE (M=44.04) fell in the interpretive range considered “Good”. That is, children from this sample, who experience multiple disadvantages, appear to demonstrate resiliency in the face of adversity. In addition to a “Good” level of assets, that youth who were CE demonstrated no significant differences in risk-taking behavior further suggests that youth in this sample demonstrate resiliency. Although the expected effect was not found, there were somewhat interesting findings with regard to this measure of developmental assets. Specifically, findings here support the DAP’s concurrent validity. Indeed a measure of home environment positively predicted the number of assets experienced by the participant. This finding indicates that for children in this at-risk sample, a better home environment predicted the presence of more assets. Further exploration of the correlations between assets and the other constructs of interest in this study revealed that, for the entire sample, assets were significantly related to risk-taking, risk-taking propensity, and self-regulation. That is, greater assets were linked to engagement in
fewer self-reported risk taking behaviors, less risk-taking propensity, and better self-regulation skills. Again, supporting previous large-scale validation studies, the DAP demonstrated concurrent validity in our sample indicating the generalizability of this tool in the current sample.

In sum, this study explored the effect of prenatal CE on self-reported risk taking, risk-taking propensity, self-regulation, and developmental assets controlling for significant covariates. There was a significant effect of CE on self-regulation that, upon further exploration, revealed that gender moderated the effect of CE such that being CE and female was predictive of worse self-regulation compared to youth who were NCE and males who were CE. Despite the lack of significant CE effects on the risk-taking outcomes and in developmental assets, the findings from this study inform our understanding of the development of CE youth and high-risk youth, however, there are several potential limitations worth noting.

*Limitations of the current study*

Importantly there was somewhat low variability with regards to self-reported risk-taking. There are different possible reasons for the current study’s lower reported rates, compared to epidemiological studies, including problems with socially desirable responding. One potential way to accurately identify risk behavior and circumvent problems associated with socially desirable responding would have been to include biologic measures aimed at tapping substance use behavior. Moreover, using an adaptation of the YRBSS with a computer adaptation could potentially decrease problems associated with reading comprehension and social desirability. As mentioned above, including additional items on the YRBSS has the potential to increase variability in turn
increasing the ability to detect a significant effect. Importantly, the phenomenon of risk taking is such that typical initiation occurs in early adolescence and increases through later adolescence. Thus, even with these methodological enhancements, some low variability is expected and may make detection of a small effect difficult. There is no published data, to my knowledge, of the use of the BART in youth who were CE thus possibly limiting the validity of this tool in our sample. Although this measure did not demonstrate significant CE effects, it is, in theory, an important supplement to gathering data on risk-taking behavior. The caregiver-rated measure of assets was used instead of the self-report measure as youth demonstrated some difficulty with their comprehension of a few of the items. Although this is the recommended method for gathering data on assets when youth demonstrate comprehension difficulties, it may have hindered assessment of assets. Gathering this data from self-report may enhance our measurement of assets and more accurately identify which specific assets are related to improved outcomes. Despite these limitations several strengths deserve attention.

Strengths of the current study

The current study replicated and extended previous findings of inhibitory control problems into early adolescence and, in particular, for females in this cohort who were CE. Also, to the author’s knowledge, only one published study exists specifically examining risk-taking in youth who were CE and this study is the first to examine developmental assets in youth who were CE and polydrug exposed. As these children demonstrate potential vulnerabilities in areas that are theorized to underlie increased risk-taking behavior, it is imperative to continue research in this area. Indeed, a better grasp of the links between prenatal exposure and behavioral problems (e.g., self-regulatory and
delinquency problems) has the potential to contribute to the creation of empirically driven, developmental pathway models of female risk taking, which is important for informing early intervention and prevention planning.

Another strength of the current study is that it lends further support to the notion that youth who were CE are not performing poorly across the board. That is, youth who were CE have demonstrated in other studies and demonstrate in this study, resilience in several areas. This is the first study to specifically examine behavioral assets in youth who were CE. More than tapping just the absence of risk, the DAP measure of assets assesses the nuances of resiliency with items such as “I have good neighbors who care about me”, “I have a family that knows where I am and what I am doing”, “I am involved in a religious group or activity” and “I am sensitive to the needs and feelings of others”. As this study used a low SES, primarily African American polydrug exposed sample, this suggests that the DAP may be appropriate for use with this group. Most importantly, the DAP may have the potential to refine our understanding of resiliency and risk clarifying the complex relationships that exist between important variables (e.g., gender, self-regulation, prenatal drug exposure) and engagement in risk-taking behavior. Continued use of this tool will likely further our understanding of protective mechanisms in this population.

Finally, the age at which the current study gathered data was a strength in that it has the potential to provide a baseline measure of risk and resilience. Normal developmental trends highlight increased risk-taking behavior as youth progress through adolescence and high school. Conversely, developmental trends show that assets typically dip in mid-adolescence. Thus, the baseline data gathered here has the potential to inform
our understanding of normal developmental trends in assets and their relation to risk-taking behavior. Development of well-targeted prevention efforts and empirically based treatment rests on theoretically-developed and empirically-tested models of development, this study adds to the literature advancing our understanding of risk-taking behavior and related constructs in vulnerable youth.

Implications for Future Research

Given that youth who were CE demonstrated continued self-regulation difficulties that may eventually predict greater risk taking, in particular for females, it is important for future research to continue to follow this cohort. As this study has the potential to provide a baseline level of risk behaviors for youth, it will be interesting to explore whether or not the low prevalence of risk behaviors continues or if it increases with age. Also, it will be interesting to see if differences based on cocaine exposure (NCE vs CE) in developmental assets and risk behaviors manifest and if/how they interplay. As females who were CE demonstrated worse self-regulation, continued examination of the potential moderating effects of gender would likely prove useful for better understanding developmental outcomes. Following theoretical bases but shifting the methodology used here, perhaps other moderating effects may be explored such as investigating whether youth identified as high vs low self-regulators or youth identified as experiencing high or low environmental risk may experience worse risk behavior outcomes. That is, modifying the methodology used in this study may increase power to detect an effect.

Another potentially valuable area for future research entails gathering information about how involvement in the study may confer resilience in some children. Specifically, data pertaining to referrals (e.g., mental health counseling, case management services)
made by the examiners conducting the assessments in this study may highlight increased utilization of services and subsequent improved outcomes for a subset of the sample. It may be that youth receiving referrals fare worse by virtue of the very fact that they are receiving services or it may be that their risk behavior outcomes are better as the services they have received have been effective.
Table 1. Maternal and Infant Characteristics at Birth

<table>
<thead>
<tr>
<th></th>
<th>Cocaine (n=138)</th>
<th>Noncocaine (n=145)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>N (%)</td>
</tr>
<tr>
<td>Infant characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender (male)</td>
<td>---</td>
<td>---</td>
<td>45</td>
</tr>
<tr>
<td>Race (nonwhite)</td>
<td>---</td>
<td>---</td>
<td>82</td>
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<tr>
<td>Gestational age (weeks)</td>
<td>37.93</td>
<td>2.83</td>
<td>---</td>
</tr>
<tr>
<td>Birth weight (grams)*+</td>
<td>2764</td>
<td>624</td>
<td>---</td>
</tr>
<tr>
<td>Birth length (cm)*+</td>
<td>47.57</td>
<td>3.89</td>
<td>---</td>
</tr>
<tr>
<td>Head circumference (cm)*+</td>
<td>32.37</td>
<td>2.06</td>
<td>---</td>
</tr>
<tr>
<td>WISC-IV (at 11 years)</td>
<td>83.74</td>
<td>11.99</td>
<td>---</td>
</tr>
<tr>
<td>Maternal Characteristics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (years)*</td>
<td>29.52</td>
<td>5.05</td>
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<tr>
<td>Global severity index (log units)*</td>
<td>.53</td>
<td>.36</td>
<td>---</td>
</tr>
<tr>
<td>Years of education*</td>
<td>11.38</td>
<td>1.66</td>
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</tr>
<tr>
<td>Low Socioeconomic status</td>
<td>---</td>
<td>---</td>
<td>99</td>
</tr>
<tr>
<td>Received prenatal care</td>
<td>---</td>
<td>---</td>
<td>83</td>
</tr>
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</table>

*p<.001
+controlled for gestational age
Table 2. Maternal Self-Report of Drug Use During Pregnancy (Reported at Child’s Birth)

<table>
<thead>
<tr>
<th>Self-reported maternal drug use during pregnancy</th>
<th>Cocaine (n=132)</th>
<th>Noncocaine (n=151)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Cigarettes per day</td>
<td>2.13</td>
<td>1.08</td>
<td>.81</td>
</tr>
<tr>
<td>Alcohol drinks per week</td>
<td>1.67</td>
<td>1.27</td>
<td>.37</td>
</tr>
<tr>
<td>Marijuana joints per week</td>
<td>.35</td>
<td>.65</td>
<td>.11</td>
</tr>
<tr>
<td>Cocaine rocks per week</td>
<td>2.32</td>
<td>1.37</td>
<td>---</td>
</tr>
</tbody>
</table>

*p<.001
<table>
<thead>
<tr>
<th></th>
<th>Cocaine (n=140)</th>
<th>Noncocaine (n=137)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>SD</td>
</tr>
<tr>
<td>Years of education</td>
<td>11.88</td>
<td>2.29</td>
<td>12.79</td>
</tr>
<tr>
<td>PPVT-R score</td>
<td>79.05</td>
<td>15.31</td>
<td>79.76</td>
</tr>
<tr>
<td>Log of GSI</td>
<td>-1.11</td>
<td>.80</td>
<td>-1.11</td>
</tr>
<tr>
<td>Home score</td>
<td>47.86</td>
<td>6.69</td>
<td>49.13</td>
</tr>
<tr>
<td>Cigarettes per day</td>
<td>1.20</td>
<td>1.25</td>
<td>.86</td>
</tr>
<tr>
<td>Alcohol drinks per week</td>
<td>.40</td>
<td>.70</td>
<td>.33</td>
</tr>
<tr>
<td>Marijuana joints per week</td>
<td>.09</td>
<td>.57</td>
<td>.04</td>
</tr>
</tbody>
</table>
Table 4. Means and Standard Deviations for Primary Outcome Measures

<table>
<thead>
<tr>
<th></th>
<th>Cocaine (n=138)</th>
<th>Noncocaine (n=136)</th>
<th>t</th>
<th>df</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>YRBSS</strong>*</td>
<td>4.71</td>
<td>4.57</td>
<td>-0.15</td>
<td>270</td>
</tr>
<tr>
<td>BART</td>
<td>25.28</td>
<td>26.50</td>
<td>0.75</td>
<td>194</td>
</tr>
<tr>
<td>BRIEF**</td>
<td>55.93</td>
<td>52.41</td>
<td>-2.54</td>
<td>272</td>
</tr>
<tr>
<td>DAP</td>
<td>44.10</td>
<td>44.04</td>
<td>-0.06</td>
<td>272</td>
</tr>
</tbody>
</table>

*Unadjusted mean

**p=.012
Table 5. Correlations between IQ, gender, and the primary outcome measures for the entire sample (N=283)

<table>
<thead>
<tr>
<th></th>
<th>YRBSS</th>
<th>BART</th>
<th>BRIEF</th>
<th>DAP</th>
</tr>
</thead>
<tbody>
<tr>
<td>WISC-IV</td>
<td>.09</td>
<td>.23**</td>
<td>-.17**</td>
<td>.06</td>
</tr>
<tr>
<td>Gender (F=0)</td>
<td>.11</td>
<td>.07</td>
<td>.07</td>
<td>-.08</td>
</tr>
<tr>
<td>YRBSS</td>
<td>1</td>
<td>.09</td>
<td>.11</td>
<td>-.23**</td>
</tr>
<tr>
<td>BART</td>
<td>.09</td>
<td>1</td>
<td>-.02</td>
<td>-.21**</td>
</tr>
<tr>
<td>BRIEF</td>
<td>.11</td>
<td>-.02</td>
<td>1</td>
<td>-.18**</td>
</tr>
<tr>
<td>DAP</td>
<td>-.23**</td>
<td>-.21**</td>
<td>-.18**</td>
<td>1</td>
</tr>
</tbody>
</table>

*p<.05  
**p<.01
Table 6. Cocaine effects on self-reported risk taking (N=272)

<table>
<thead>
<tr>
<th></th>
<th>Estimate (B)</th>
<th>Standard Error</th>
<th>Beta</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>YRBSS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cocaine</td>
<td>.030</td>
<td>.128</td>
<td>.014</td>
<td>.234</td>
<td>.816</td>
</tr>
<tr>
<td>Gender</td>
<td>.287</td>
<td>.128</td>
<td>.135</td>
<td>2.24</td>
<td>.026</td>
</tr>
</tbody>
</table>

\(^a R^2 = .018, F(2, 269) = 2.520, p = .082 \)
Table 7. Cocaine effects on risk-taking propensity (N=196)$^a$

<table>
<thead>
<tr>
<th></th>
<th>Estimate (B)</th>
<th>Standard Error</th>
<th>Beta</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BART</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cocaine</td>
<td>-2.500</td>
<td>1.935</td>
<td>-.110</td>
<td>-1.292</td>
<td>.198</td>
</tr>
<tr>
<td>PPVT</td>
<td>.099</td>
<td>.056</td>
<td>.129</td>
<td>1.747</td>
<td>.082</td>
</tr>
<tr>
<td>Log of average</td>
<td></td>
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</tr>
<tr>
<td>cigarettes smoked</td>
<td>.634</td>
<td>.814</td>
<td>.072</td>
<td>.779</td>
<td>.437</td>
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<tr>
<td>daily</td>
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<tr>
<td>Log of average</td>
<td>1.894</td>
<td>1.452</td>
<td>.097</td>
<td>1.304</td>
<td>.194</td>
</tr>
<tr>
<td>marijuana joints</td>
<td></td>
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</tr>
<tr>
<td>smoked weekly</td>
<td></td>
<td></td>
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<tr>
<td>Log of average</td>
<td>1.470</td>
<td>.752</td>
<td>.158</td>
<td>1.955</td>
<td>.052</td>
</tr>
<tr>
<td>cigarettes smoked</td>
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<tr>
<td>daily by current</td>
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<td>caregiver</td>
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</tbody>
</table>

$^aR^2 = .080$, $F(5, 183) = 3.186$, $p < .009$
### Table 8. Cocaine effects on self-regulation (N=274)<sup>a</sup>

<table>
<thead>
<tr>
<th></th>
<th>Estimate (B)</th>
<th>Standard Error</th>
<th>Beta</th>
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<th>p</th>
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</thead>
<tbody>
<tr>
<td><strong>BRIEF</strong></td>
<td></td>
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<tr>
<td>Cocaine</td>
<td>4.866</td>
<td>2.235</td>
<td>.210</td>
<td>2.177</td>
<td>.030</td>
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<tr>
<td>Gender</td>
<td>4.551</td>
<td>2.024</td>
<td>.196</td>
<td>2.249</td>
<td>.025</td>
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<tr>
<td>Home score at 12 years</td>
<td>-.173</td>
<td>.110</td>
<td>-.096</td>
<td>-1.565</td>
<td>.119</td>
</tr>
<tr>
<td>Log of BSI</td>
<td>3.858</td>
<td>2.148</td>
<td>.116</td>
<td>1.795</td>
<td>.074</td>
</tr>
<tr>
<td>Log of average cigarettes smoked daily</td>
<td>.648</td>
<td>.654</td>
<td>.072</td>
<td>.990</td>
<td>.323</td>
</tr>
<tr>
<td>Log of average alcohol units consumed weekly</td>
<td>-.419</td>
<td>.726</td>
<td>-.043</td>
<td>-.577</td>
<td>.565</td>
</tr>
<tr>
<td>Log of average marijuana joints smoked weekly</td>
<td>1.244</td>
<td>1.256</td>
<td>.063</td>
<td>.991</td>
<td>.323</td>
</tr>
<tr>
<td>CE X Gender</td>
<td>-5.950</td>
<td>2.824</td>
<td>-.216</td>
<td>-2.107</td>
<td>.036</td>
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</tbody>
</table>

<sup>a</sup><em>R² = .079, F(8, 251) = 2.680, p = .008</em>
Table 9. Cocaine effects on developmental assets (N=274)

<table>
<thead>
<tr>
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<th>Beta</th>
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<th>p</th>
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<tr>
<td>DAP</td>
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<tr>
<td>Cocaine</td>
<td>.379</td>
<td>1.079</td>
<td>.021</td>
<td>.351</td>
<td>.726</td>
</tr>
<tr>
<td>Home score at 12 years</td>
<td>.250</td>
<td>.084</td>
<td>.181</td>
<td>2.982</td>
<td>.003</td>
</tr>
</tbody>
</table>

\(^aR^2 = .032, F(2, 265) = 4.448, p = .013\)
Appendix A: Youth Risk Behavior Surveillance System (YRBSS)

Please read the following questions and answer YES or NO to each item by filling in the bubble for the appropriate answer.

1a. In the last 12 months have you drunk alcohol (even one drink)?  
   ○ No  ○ Yes

1b. If YES, how often in the last 12 months?  
   ○ 1 to 2 times  ○ 3 to 5 times  ○ 6 to 11 times  ○ Monthly  ○ Weekly  ○ Daily

2a. In the last 12 months have you smoked a cigarette (even a puff)?  
   ○ No  ○ Yes

2b. If YES, how often in the last 12 months?  
   ○ 1 to 2 times  ○ 3 to 5 times  ○ 6 to 11 times  ○ Monthly  ○ Weekly  ○ Daily

3a. In the last 12 months have you used any illegal drug?  
   ○ No  ○ Yes

3b. If YES, how often in the last 12 months?  
   ○ 1 to 2 times  ○ 3 to 5 times  ○ 6 to 11 times  ○ Monthly  ○ Weekly  ○ Daily

4a. In the last 12 months have you been in a physical fight?  
   ○ No  ○ Yes

4b. If YES, how often in the last 12 months?  
   ○ 1 to 2 times  ○ 3 to 5 times  ○ 6 to 11 times  ○ Monthly  ○ Weekly  ○ Daily

5a. In the last 12 months have you gambled for real money?  
   ○ No  ○ Yes

5b. If YES, how often in the last 12 months?  
   ○ 1 to 2 times  ○ 3 to 5 times  ○ 6 to 11 times  ○ Monthly  ○ Weekly  ○ Daily
Please read the following questions and answer YES or NO to each item by filling in the bubble for the appropriate answer.

6a. In the last 12 months have you ridden a bicycle or motorcycle without a helmet (even once)?
   ○ No  ○ Yes

6b. If YES, how often in the last 12 months?
   ○ 1 to 2 times  ○ 3 to 5 times  ○ 6 to 11 times  ○ Monthly  ○ Weekly  ○ Daily

7a. In the last 12 months have you ridden in a car without wearing a seatbelt (even once)?
   ○ No  ○ Yes

7b. If YES, how often in the last 12 months?
   ○ 1 to 2 times  ○ 3 to 5 times  ○ 6 to 11 times  ○ Monthly  ○ Weekly  ○ Daily

8a. In the last 12 months have you stolen anything from a store?
   ○ No  ○ Yes

8b. If YES, how often in the last 12 months?
   ○ 1 to 2 times  ○ 3 to 5 times  ○ 6 to 11 times  ○ Monthly  ○ Weekly  ○ Daily

9a. In the last 12 months have you carried a weapon such as a gun, knife, or club outside of your home?
   ○ No  ○ Yes

9b. If YES, how often in the last 12 months?
   ○ 1 to 2 times  ○ 3 to 5 times  ○ 6 to 11 times  ○ Monthly  ○ Weekly  ○ Daily

10a. In the last 12 months have you had sexual intercourse (even once)?
    ○ No  ○ Yes

10b. If YES, how often in the last 12 months?
     ○ 1 to 2 times  ○ 3 to 5 times  ○ 6 to 11 times  ○ Monthly  ○ Weekly  ○ Daily
Appendix B: Balloon Analogue Risk Task (BART) Computer Screen Image

Click the PUMP to make the balloon bigger
OR
Click Get $$$ to stop and fill up prize meter

BONUS!!!
BIG PRIZE
MIDDLE PRIZE
SMALL PRIZE
Get $$$
Pump
Appendix C: Balloon Analogue Risk Task (BART) Standardized Verbal Instructions

“Now you are going to see 30 balloons, one after another on the screen. For each balloon you will use the mouse to click on the box that will pump up the balloon. The bigger you pump the balloon the more points will build up. But if a balloon pops, then you lose the points built up on that balloon. If you stop pumping a balloon before it pops and you click on the box labeled “save points”, your points will be saved into the prize meter on the left. The bigger you make the balloon before you press “save points”, the more you will fill the prize meter. At the end of the game, the size of your prize will equal the amount of points you have saved into your prize meter, which will determine if you get a small, medium, large, or bonus prize. Good Luck!”
Appendix D: Behavior Rating Inventory of Executive Functioning (BRIEF)

Instructions

On the following pages is a list of statements that describe children. We would like to know if your child has had problems with these behaviors over the past 6 months. Please answer all the items the best that you can. Please DO NOT SKIP ANY ITEMS. Think about your child as you read each statement and fill in the bubble for your response:

- **N** if the behavior is **Never** a problem
- **S** if the behavior is **Sometimes** a problem
- **O** if the behavior is **Often** a problem

For example, if your child never has trouble completing homework on time, you would fill in the bubble for **N** for this item:

Has trouble completing homework on time  

If you make a mistake or want to change your answer, DO NOT ERASE. Draw an “X” through the answer you want to change, and then fill in the bubble for the correct answer:

Has trouble completing homework on time  

nida_brief_2008_1108A  
Page 1 of 6  
Last Modified: 11/08/2008
### Behavior Rating Inventory of Executive Function: Parent Form (BRIEF)

**DO NOT WRITE IN HERE**

<table>
<thead>
<tr>
<th>STUDY ID</th>
<th>MEMBER</th>
<th>TEST #</th>
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<tbody>
<tr>
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</table>

<table>
<thead>
<tr>
<th>N = Never</th>
<th>S = Sometimes</th>
<th>O = Often</th>
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</table>

1. Overreacts to small problems.  
2. When given three things to do, remembers only the first or last.  
4. Leaves playroom a mess.  
5. Resists or has trouble accepting a different way to solve a problem with schoolwork, friends, chores, etc.  
7. Has explosive, angry outbursts.  
8. Tries the same approach to a problem over and over even when it does not work.  
10. Needs to be told to begin a task even when willing.  
11. Does not bring home homework, assignment sheets, materials, etc.  
12. Acts upset by a change in plans.  
13. Is disturbed by change of teacher or class.  
14. Does not check work for mistakes.  
15. Has good ideas but cannot get them on paper.  
16. Has trouble coming up with ideas for what to do in play or free time.  
17. Has trouble concentrating on chores, schoolwork, etc.  
18. Does not connect doing tonight’s homework with grades.  
19. Is easily distracted by noises, activity, sights, etc.  
20. Becomes tearful easily.
<table>
<thead>
<tr>
<th>STUDY ID</th>
<th>MEMBER</th>
<th>TEST #</th>
<th>N = Never</th>
<th>S = Sometimes</th>
<th>O = Often</th>
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</thead>
<tbody>
<tr>
<td>21.</td>
<td></td>
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<tr>
<td>Makes careless errors.</td>
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<td>22.</td>
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<tr>
<td>Forgets to hand in homework, even when completed.</td>
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<td>23.</td>
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<tr>
<td>Resists change of routine, foods, places, etc.</td>
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<td>24.</td>
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<tr>
<td>Has trouble with chores or tasks that have more than one step.</td>
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<td>25.</td>
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<tr>
<td>Has outbursts for little reason.</td>
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<td>26.</td>
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<tr>
<td>Mood changes frequently.</td>
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<td>27.</td>
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<tr>
<td>Needs help from an adult to stay on task.</td>
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<tr>
<td>28.</td>
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<tr>
<td>Gets caught up in details and misses the big picture.</td>
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<tr>
<td>29.</td>
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<tr>
<td>Keeps room messy.</td>
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<td>30.</td>
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<tr>
<td>Has trouble getting used to new situations (classes, groups, friends).</td>
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<td>31.</td>
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<tr>
<td>Has poor handwriting.</td>
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<td>32.</td>
<td></td>
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<tr>
<td>Forgets what he/she was doing.</td>
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<td>33.</td>
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<tr>
<td>When sent to get something, forgets what he/she is supposed to get.</td>
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<tr>
<td>34.</td>
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<tr>
<td>Is unaware of how his/her behavior affects or bothers others.</td>
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<tr>
<td>35.</td>
<td></td>
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<tr>
<td>Has good ideas but does not get job done (lacks follow-through).</td>
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<td>36.</td>
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<tr>
<td>Becomes overwhelmed by large assignments.</td>
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<td>37.</td>
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<tr>
<td>Has trouble finishing tasks (chores, homework).</td>
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<td>38.</td>
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<tr>
<td>Acts wilder or sillier than others in groups (birthday parties, recess).</td>
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<td>39.</td>
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<tr>
<td>Thinks too much about the same topic.</td>
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<td>40.</td>
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<tr>
<td>Underestimates time needed to finish tasks.</td>
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<td></td>
<td>TEST #</td>
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<table>
<thead>
<tr>
<th></th>
<th>N = Never</th>
<th>S = Sometimes</th>
<th>O = Often</th>
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</thead>
<tbody>
<tr>
<td>41</td>
<td>Interrupts others.</td>
<td></td>
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</tr>
<tr>
<td>42</td>
<td>Does not notice when his/her behavior causes negative reactions.</td>
<td></td>
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<tr>
<td>43</td>
<td>Gets out of seat at the wrong times.</td>
<td></td>
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<tr>
<td>44</td>
<td>Gets out of control more than friends.</td>
<td></td>
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<tr>
<td>45</td>
<td>Reacts more strongly to situations than other children.</td>
<td></td>
<td></td>
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<tr>
<td>46</td>
<td>Starts assignments or chores at the last minute.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>Has trouble getting started on homework or chores.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Has trouble organizing activities with friends.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>49</td>
<td>Blurs things out.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>Mood is easily influenced by the situation.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>51</td>
<td>Does not plan ahead for school assignments.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>52</td>
<td>Has poor understanding of own strengths and weaknesses.</td>
<td></td>
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<tr>
<td>53</td>
<td>Written work is poorly organized.</td>
<td></td>
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<tr>
<td>54</td>
<td>Acts too wild or &quot;out of control&quot;.</td>
<td></td>
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<tr>
<td>55</td>
<td>Has trouble putting the brakes on his/her actions.</td>
<td></td>
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<tr>
<td>56</td>
<td>Gets in trouble if not supervised by an adult.</td>
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<td></td>
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<tr>
<td>57</td>
<td>Has trouble remembering things, even for a few minutes.</td>
<td></td>
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</tr>
<tr>
<td>58</td>
<td>Has trouble carrying out the actions needed to reach goals (saving money for special item, studying to get a good grade).</td>
<td></td>
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</tr>
<tr>
<td>59</td>
<td>Becomes too silly.</td>
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<tr>
<td>60</td>
<td>Work is sloppy.</td>
<td></td>
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</tbody>
</table>
**Project NIDA Behavior Rating Inventory of Executive Function: Parent Form (BRIEF)**

<table>
<thead>
<tr>
<th>STUDY ID</th>
<th>MEMBER</th>
<th>TEST #</th>
<th>N = Never</th>
<th>S = Sometimes</th>
<th>O = Often</th>
</tr>
</thead>
</table>

61. Does not take initiative.  
62. Angry or tearful outbursts are intense but end suddenly.  
63. Does not realize that certain actions bother others.  
64. Small events trigger big reactions.  
65. Talks at the wrong time.  
66. Complains there is nothing to do.  
67. Cannot find things in room or school desk.  
68. Leaves a trail of belongings wherever he/she goes.  
69. Leaves messes that others have to clean up.  
70. Becomes upset too easily.  
71. Lies around the house a lot ("couch potato").  
72. Has a messy closet.  
73. Has trouble waiting for turn.  
74. Loses lunch box, lunch money, permission slips, homework, etc.  
75. Cannot find clothes, glasses, shoes, toys, books, pencils, etc.  
76. Tests poorly even when knows correct answers.  
77. Does not finish long-term projects.  
78. Has to be closely supervised.  
79. Does not think before doing.  
80. Has trouble moving from one activity to another.
<table>
<thead>
<tr>
<th>STUDY ID</th>
<th>MEMBER</th>
<th>TEST #</th>
</tr>
</thead>
<tbody>
<tr>
<td>N = Never</td>
<td>S = Sometimes</td>
<td>O = Often</td>
</tr>
<tr>
<td>81. Is fidgety.</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>82. Is impulsive.</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>83. Cannot stay on the same topic when talking.</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>84. Gets stuck on one topic or activity.</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>85. Says the same things over and over.</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>86. Has trouble getting through morning routine in getting ready for school.</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Appendix E: Developmental Assets Profile (DAP)

**Project**  
NIDA

**Developmental Assets Profile**  
Modified Caregiver Form (DAP)

<table>
<thead>
<tr>
<th>STUDY ID</th>
<th>MEMBER</th>
<th>TEST DATE</th>
<th>TEST #</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DO NOT WRITE IN HERE**  

**FEMALE:** 1:Bio. 2:Adpt. 3:Stp. 4:Fstr. 5:Grnd. 6:Other Rel. 7:Other 0:Child  
**MALE:** 11:Bio. 12:Adpt. 13:Stp. 14:Fstr. 15:Grnd. 16:Other Rel. 17:Other 0:Child

**Rater ID:**

**INSTRUCTIONS:** Below is a list of positive things that your child might have in **him/herself, his/her family, friends, neighborhood, school, and community**. For each item that describes your child **now or within the past 3 months**, fill in the bubble if the item is true:

- **Not At All or Rarely**  
- **Somewhat or Sometimes**  
- **Very or Often**  
- **Extremely or Almost Always**

If you do not want to answer an item, leave it blank. But please try to answer all items as best as you can.

**MY CHILD ...**

<table>
<thead>
<tr>
<th></th>
<th>Not At All or Rarely</th>
<th>Somewhat or Sometimes</th>
<th>Very or Often</th>
<th>Extremely or Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Stands up for what he/she believes in.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>2.</td>
<td>Feels in control of his/her life and future.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>3.</td>
<td>Feels good about him/herself.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>4.</td>
<td>Avoids things that are dangerous or unhealthy.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>5.</td>
<td>Enjoys reading or being read to.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>6.</td>
<td>Builds friendships with other people.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>7.</td>
<td>Cares about school.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>8.</td>
<td>Does his/her homework.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>9.</td>
<td>Stays away from tobacco, alcohol, and other drugs.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>11.</td>
<td>Expresses his/her feelings in proper ways.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>12.</td>
<td>Feels good about his/her future.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>13.</td>
<td>Seeks advice from his/her parents.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>14.</td>
<td>Deals with frustration in positive ways.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>15.</td>
<td>Overcomes challenges in positive ways.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>16.</td>
<td>Thinks it is important to help other people.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>17.</td>
<td>Feels safe and secure at home.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>18.</td>
<td>Plans ahead and makes good choices.</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>MY CHILD ...</td>
<td>Not At All or Rarely</td>
<td>Somewhat or Sometimes</td>
<td>Very or Often</td>
<td>Extremely or Almost Always</td>
</tr>
<tr>
<td>--------------</td>
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<tr>
<td>20. Resolves conflicts without anyone getting hurt.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>21. Feels valued and appreciated by others.</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>22. Takes responsibility for what he/she does.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. Tells the truth even when it is not easy.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24. Accepts people who are different than him/herself.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. Feels safe at school.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>My CHILD IS...</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>27. Developing a sense of purpose in his/her life.</td>
<td></td>
</tr>
<tr>
<td>28. Encouraged to try things that might be good for him/her.</td>
<td></td>
</tr>
<tr>
<td>29. Included in family tasks and decisions.</td>
<td></td>
</tr>
<tr>
<td>30. Helping to make his/her community a better place.</td>
<td></td>
</tr>
<tr>
<td>31. Involved in a religious group or activity.</td>
<td></td>
</tr>
<tr>
<td>32. Developing good health habits.</td>
<td></td>
</tr>
<tr>
<td>33. Encouraged to help others.</td>
<td></td>
</tr>
<tr>
<td>34. Involved in a sport, club, or other group.</td>
<td></td>
</tr>
<tr>
<td>35. Trying to help solve social problems.</td>
<td></td>
</tr>
<tr>
<td>36. Given useful roles and responsibilities.</td>
<td></td>
</tr>
<tr>
<td>37. Developing respect for other people.</td>
<td></td>
</tr>
<tr>
<td>38. Eager to do well in school and other activities.</td>
<td></td>
</tr>
<tr>
<td>39. Sensitive to the needs and feelings of others.</td>
<td></td>
</tr>
<tr>
<td>40. Involved in creative things such as music, theater, or art.</td>
<td></td>
</tr>
<tr>
<td>41. Serving others in his/her community.</td>
<td></td>
</tr>
<tr>
<td>42. Spending quality time at home with his/her parent(s).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>MY CHILD HAS ...</td>
</tr>
<tr>
<td>----</td>
<td>--------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>43</td>
<td>Friends who set good examples for him/her.</td>
</tr>
<tr>
<td>44</td>
<td>A school that gives students clear rules.</td>
</tr>
<tr>
<td>45</td>
<td>Adults who are good role models for him/her.</td>
</tr>
<tr>
<td>46</td>
<td>A safe neighborhood.</td>
</tr>
<tr>
<td>47</td>
<td>Parent(s) who try to help him/her succeed.</td>
</tr>
<tr>
<td>48</td>
<td>Good neighbors who care about him/her.</td>
</tr>
<tr>
<td>49</td>
<td>A school that cares about kids and encourages them.</td>
</tr>
<tr>
<td>50</td>
<td>Teachers who urge him/her to develop and achieve.</td>
</tr>
<tr>
<td>51</td>
<td>Support from adults other than his/her parents.</td>
</tr>
<tr>
<td>52</td>
<td>A family that provides him/her with clear rules.</td>
</tr>
<tr>
<td>53</td>
<td>Parent(s) who urge him/her to do well in school.</td>
</tr>
<tr>
<td>54</td>
<td>A family that gives him/her love and support.</td>
</tr>
<tr>
<td>55</td>
<td>Neighbors who help watch out for him/her.</td>
</tr>
<tr>
<td>56</td>
<td>Parent(s) who are good at talking with him/her about things.</td>
</tr>
<tr>
<td>57</td>
<td>A school that enforces rules fairly.</td>
</tr>
<tr>
<td>58</td>
<td>A family that knows where he/she is and what he/she is doing.</td>
</tr>
</tbody>
</table>
References


*Special Issue: Pathways and obstacles in drug use measurement, 30*(1), 9-34.


the International Society for Research in Child and Adolescent Psychopathology, 36 (8), 1175-1188.


