Risk-Taking Propensity as Mediator in the Relationship between Childhood Trauma and Alcohol Use During Early Adolescence

By

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Thesis

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VITA

Jonathan Ross Gilbert was born in Boston, Massachusetts, the son of Stephen Jay Gilbert and Susan Jayne Gilbert. After completing his degree at Belmont High School, Belmont, Massachusetts, in 1988, he entered Pomona College, Claremont, CA, receiving the degree of Bachelor of Arts in June 1992. He attended Harvard Business School, Boston, MA, in August 1997, receiving a Master's of Business Administration in June 1999. During the following years, he was employed as a turnaround manager and performance improvement specialist for companies near or in bankruptcy. In September 2011, he entered the Graduate School at Brown University in Providence, RI, to explore the synergistic application of corporate renewal methodologies to urban education reform.

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PREFACE AND ACKNOWLEDGEMENTS

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1.0 ABSTRACT

Background: Although an abundance of research demonstrates that disinhibition may act as a mechanism in the childhood trauma-to-risk behavior relationship, little attention has been paid to types of trauma other than physical and sexual abuse. Because evidence suggests that emotional abuse may be one of the most destructive and pervasive forms of maltreatment, further research is needed to determine whether similar mechanisms are present in the emotional abuse-to-risk behaviors relationship, particularly among early adolescents where such patterns of problematic behaviors are only starting to emerge.

Purpose: The present study aims to expand upon the literature by investigating the roles of risk-taking propensity and sensation seeking as indicators of disinhibtion in the relationship between childhood emotional abuse and alcohol-related risk behaviors in adolescence.

Methods: A total of 246 5th-8th grade adolescents between the ages of 9 to 13 completed the Brief Sensation Seeking Scale (SSS), the childhood emotional abuse (CEA) subscale of the Childhood Trauma Questionnaire (28-item version) and a variety of behavioral and psychological measures associated with alcohol-related risk taking behavior. The participants also engaged in a computerized decision-making task, the Balloon Analogue Risk Task for Youth (BART-Y), designed to assess risk-taking propensity. Mediation analysis was employed to uncover hypothesized causal pathways between childhood trauma and alcohol-related risk behavior.

Results: Findings indicated that self-reported emotional abuse during childhood was positively related to self-reported engagement in alcohol-related risk behaviors ($\beta = .30$) and sensation seeking ($\beta = .26$) in early adolescence. Childhood emotional abuse was not significantly related to risk-taking propensity in early adolescence as assessed by the BART-Y. Further, while sensation seeking mediated the relationship between childhood trauma history and alcohol-related risk behaviors in early adolescence, risk-taking propensity did not.

Conclusions: Risk-taking propensity may not be a useful mechanism for understanding the relationship between all domains of childhood trauma and subsequent maladaptive behavior in adolescence. However, there is a point of convergence on the role of sensation seeking as an integral pathway in the childhood trauma-to-risk behavior relationship. There is a need for larger-scale future studies that incorporate multiple domains of childhood trauma and utilize multiple laboratory measures of risk-taking propensity in a prospective format.

2.0 BACKGROUND/LITERATURE REVIEW

2.1 *Risk Taking Behavior Disproportionately Impacts Adolescents*

It is widely agreed among experts in the study of adolescent health and development that the greatest threats to the well-being of young people in industrialized societies come from preventable and often self-inflicted causes, including automobile and other accidents (which together account for nearly half of all fatalities among American youth), violence, drug and alcohol use, and sexual risk-taking [1,2].

Adolescence, described as a phase of life beginning in biology and ending in society [3], is a period of major change in brain development and behavior when most of a person's biological, cognitive, psychological, and social characteristics are changing from what is typically considered child-like to what is considered adult-like [4]. Although adolescents gain important skills and maturity, many also engage in considerable risk taking, putting them at risk for lifelong health problems, injury, or death [5]. In fact, adolescents are disproportionately represented in virtually every category of risk taking behavior [6]. Developmental research has shown that adolescents are more likely than children or adults to binge drink, to smoke, to drive recklessly, to drive while intoxicated, to use varied illicit substances, to have unprotected sex, and to engage in both minor and more serious antisocial behavior [6-11]. Most troublesome are risks taken in conjunction with other risks such as drinking and operating a motor vehicle or sexual activity without contraception; indeed, there is strong evidence that risk taking behaviors co-occur, taking place in a variety of domains [12]. However, not all adolescents are risk-takers, and identifying individual differences in risk-taking is important for targeting those at greatest risk [13].

While considerable progress has been made in the prevention and treatment of disease and chronic illness among adolescents, similar gains have not been made with respect to reducing the morbidity and mortality that result from risky and reckless behavior [14]. Although rates of certain types of adolescent risk-taking, such as driving under the influence of alcohol or having unprotected sex, have dropped, the prevalence of risky behavior among adolescents remains high and continues to place them at risk for the leading causes of morbidity and mortality [15].

2.2 *The Human and Economic Toll of Adolescent Risk Taking Behavior*

Although many adolescents do not engage in risk taking, the rates of injuries, fatalities and the economic cost of risk taking involving adolescents remain unacceptably high [16,17]. The Centers for Disease Control (CDC) has identified three behaviors contributing to the leading causes for death and illness in adolescents: injury and violence, alcohol and drug use, and risky sexual behaviors [18].

Injury and violence is the leading cause of death in adolescent's age 10 - 24 years of age. Adolescent deaths are most often a result of motor vehicle crashes (30%), homicides (15%), and suicide (12%). Alcohol and drug use is a factor in approximately 41% of deaths related to motor vehicle crashes. More youth in the U.S. use alcohol than tobacco or other drugs. Almost half of the 19 million new sexually transmitted infections diagnosed each year in the U.S. are among adolescents 15 - 24 years old. Thirty-nine percent (39%) of sexually active high school students report not using a condom during their last sexual intercourse. Teen drivers have the highest crash rate per mile driven of any age group [19]. Male teens have an especially high rate of fatal crashes and an even higher rate of nonfatal injury crashes [19]. In 2011, approximately 45% of high school students had tried cigarette smoking, 71% had at least one drink of alcohol, 22% of students had five or more drinks of alcohol in a row, 40% had used marijuana one or more times, 11% breathed inhalants to get high, 21% had taken prescription drugs (e.g., Oxycontin, Percocet, Vicodin, codeine, Adderall, Ritalin, or Xanax) one or more times, 47% had sexual intercourse, 40% of sexually active students did not use a condom or other birth control, 16% had contemplated suicide, 17% had carried a weapon, 24% rode in a vehicle driven by someone who had been drinking alcohol, 33% had been in a physical fight one or more times, and 33% had texted or e-mailed while driving a car or other vehicle [20].

The consequences of risk taking by adolescents put all of society at risk through lessened potential for our collective future [21]. Adolescent risk taking behavior extracts a high cost in health care, educational failure, mental health services, drug and alcohol treatment, and juvenile crime. [22]. Because many forms of risk behavior initiated in adolescence elevate the risk for the behavior in adulthood (e.g., drug use), and because some forms of risk-taking by adolescents put individuals of other ages at risk (e.g., reckless driving, criminal behavior), public health experts agree that reducing the rate risk-taking by young people would make a substantial improvement in the overall well-being of the population [7]. In fact, the present value of preventing

a single high-risk youth from drug abuse and other forms of delinquency is estimated to be as high as $1.7 to $2.3 million [23].

Excessive risk taking may be treatable and substantial human and financial resources are devoted each year to developing programs that target specific risk behaviors [24]. However, vast expenditures of public dollars are invested in large programmatic interventions that are either statistically ineffective (e.g., D.A.R.E. [25], abstinence education [26], and driver training [27]) or unproven [28,29]. A more promising path appears to be in the identification of unique characteristics that make some youth vulnerable to risk taking behavior and subsequent intervention through individualized, skill-based prevention programs [30].

2.3 Risk Taking Behavior Defined Along a Continuum Ranging from Adaptive to Maladaptive

Risk-taking behavior is defined as the tendency to engage in behaviors with unpredictable rewards and punishments that can result in physical or psychological harm [31]. The incidence and prevalence of risk taking in adolescence indicates that risky behavior is a common, if not developmentally appropriate, aspect of the adolescent experience. Although some risk taking behaviors are socially sanctioned, such as extreme sports, a challenge lies in distinguishing between those behaviors which are health-enhancing (or adaptive) and health-compromising (or maladaptive).

Despite potential hazards, adolescent risk taking may confer benefits. Whether attempting mastery or testing limits, taking risks appears to be a way of gaining self-understanding toward the main developmental tasks of adolescence, forming an identity and developing autonomy [32]. Adolescent risk-takers have been found to be more self-confident, to feel more accepted, and to be better liked than their more-cautious peers [33]. Healthy risks can also turn unhealthy risks in a more positive direction or prevent them from ever occurring [34].

Yet the taking of certain risks can also have grave consequences. As the frequency and intensity of risk taking increases, risk taking no longer serves a positive developmental purpose and becomes problematic. For example, sexual experimentation during adolescence is normative and arguably, adaptive [35]. While not inherently dangerous, some sexual behaviors (namely, "high-risk sexual behaviors") increase an adolescent's risk of unplanned pregnancy, contraction of sexually transmitted diseases, and sexual violence. Moreover, early involvement in risk taking has been found to result in maladaptive behavioral outcomes in adolescence [36].

2.4 The Balloon Analogue Risk Task (BART) is a Valid and Reliable Measure of Risk Taking Behavior

A major limitation of prior behavioral studies of risk taking is the reliance on participant self-reports that are subject to a number of biases [37]. Several objective assessments of risk-taking behavior in the laboratory [38] were developed to address these shortcomings and help explain individual variance in a range of risk taking behaviors above and beyond correlative personality constructs [39]. Two of the most frequently used assessments appear to be the Iowa Gambling Task (IGT) and the Balloon Analogue Risk Task (BART). Although the IGT's sensitivity for detecting decision-making impairment is well established, recent studies have highlighted the complexity of this task and the challenges this poses for understanding what functions (or dysfunctions) it measures [38]. In contrast to the IGT, where players cannot express their risk propensity until they have learned the risks, the BART is designed so that players are able to express their risk propensity from the beginning of the task and has been reliably extended for use in adolescent populations (Balloon Analogue Risk Task for Youth; BART-Y) [40].

The BART [39] is a decision-making game that involves inflating a simulated balloon on a computer screen. Participants accumulate points (that can be converted in to prizes) each time they pump up the balloon, but each pump also carries the risk that the balloon will pop. Pressing a separate "collect" icon at any time saves the points earned and leads to presentation of the next balloon. All points are lost if the balloon pops prior to pressing the "collect" icon. Each balloon is randomly programmed to pop somewhere between 1 and 128 pumps, with an average breakpoint of 64 pumps. Risk taking is defined as the average number of pumps on un-popped balloons with higher scores indicating greater risk taking [39]. Participants are provided with the point value of each pump and the total number of balloons but are not given any information related to the breakpoints of individual balloons.

Performance on the BART is correlated with a wide range of addictive, health and safety risk behaviors [40-42]. Data also indicate that risk-taking propensity on the BART is related to self-reported engagement in real world risk taking behaviors [43]. Higher BART scores are significantly correlated with an increase in both the quantity and frequency of risk behavior, however, BART scores are employed as a continuous variable so there is not a specific cut-off at which adolescents are classified as "risk-takers." For example, Lejuez et al. [39] assessed the psychometric properties of the BART and its connection to self-reported risk taking behavior in the environment with a community sample of young adults aged 18 to 25 years.

The findings indicate that the BART exhibits sound psychometric properties and substantiates the correlation between risk taking propensity on the BART and specific real world risk taking behaviors such as alcohol use and abuse, drug use and abuse, unprotected sex, and smoking. The similar results were gleaned from studies on both community and clinical samples of adults. Multiple studies found a significant association between BART scores and certain forms of substance use [44-46] and at least one study also identified a correlation between BART scores and risky sexual behavior [42].

2.5 BART-Y is a Valid and Reliable Measure of Risk Taking Propensity in Older Adolescents and Emerging Adults

Subsequent to these studies, a youth version of the BART (BART-Y) [40] was created for the developmental period of middle adolescence (ages 14 to 17). The reliability and validity of the BART-Y was evaluated in a seminal study of ninety-eight, 9th- through 12th-grade African American adolescents from low-income areas within Washington, D.C. BART-Y was found to uniquely explain and to be significantly related to a risk behavior composite (scored as a single factor comprised of smoking, illegal drugs, gambling, stealing, sex without a condom, and weapons in addition to high or low risk for the variables of fighting, helmet use, and seatbelt use) after controlling for demographic variables, impulsivity, and sensation seeking [40].

Additional studies utilizing the BART-Y found correlations between risk taking propensity and substance use, gambling, delinquency behaviors, and risky sexual behavior [40-41, 47]. Crowley et al. [48] specifically compared a clinical population of substance abusing adolescents with behavioral problems to highly matched community controls and found higher BART scores in the patient population while controlling for differences between the two groups [48].

2.6 Childhood Adversity Linked to Maladaptive Health Risk Taking Behavior and Outcomes Throughout the Lifespan

Histories of childhood maltreatment (e.g., physical abuse, sexual abuse, emotional abuse, and neglect) and other adverse childhood experiences have been incontrovertibly linked in a significant and graded relationship with poorer mental health outcomes [49-51] and other impairments in later life such as heart disease, depression, and substance abuse [52,53]. In fact, there is a 4- to 12- fold increase in the risk for depression, alcoholism, drug abuse and suicide attempts for adults exposed to multiple categories of childhood trauma compared to those not reporting any adversity [54]. A preponderance of evidence from both treated and untreated

population substantiates that early childhood traumatic experiences are associated with an enhanced risk of adolescent and adult alcohol and substance use disorders [55].

In adolescence, childhood maltreatment predicts substance use disorder outcomes over and above those accounted for by childhood conduct disorder and problematic parental substance use, two potent predictors of adolescent substance use disorders [56,57]. Childhood maltreatment is also associated with significant functional impairment and life lost in both adolescence and adulthood [58-64]. A study of 136,549 students in the 6th, 9th, and 12 grades who responded to the 2007 Minnesota Student Survey indicated that 1 in 4 youth (28.9%) reported at least 1 adverse childhood experience [58]. Each type of adverse childhood experience was significantly associated with adolescent interpersonal violence perpetration (delinquency, bullying, physical fighting, dating violence, weapon-carrying on school property) and self-directed violence (self-mutilation behavior, suicidal ideation, and suicide attempt). For each additional type of adverse event reported by youth, the risk of violence perpetration increased 35% to 144% [58]. Studies also show that youth in foster care engage in more risk-taking behaviors than other youth [59]. Gang-involved youth have also often experienced trauma. A high number of delinquent and gang-involved youth have experienced abuse, neglect, maltreatment, as well as exposure to domestic and community violence [60]. A convergence of studies has found that exposure to sexual, physical abuse or domestic violence during childhood increased the risk of teenage pregnancies [61-64].

In emerging adulthood, childhood physical abuse and childhood neglect are associated with nicotine dependence, illicit drug use, and drug-related problems in both males and females [65,66]. A recent study of women (n=7,576; 18 to 27 years of age) demonstrated that experiencing different kinds of maltreatment during childhood led to subsequent sexual risk behaviors, delinquency, and suicidality in young adulthood [67].

In middle adulthood, abused and neglected individuals were approximately 1.5 times more likely than controls to report using any illicit drug (in particular, marijuana) during the past year, use of a greater number of illicit drugs, and more substance-use-related problems [68].

In adulthood, the more types of childhood maltreatment individuals were exposed to the more likely they were to have problems with substance use and risky sexual behaviors [69]. Odds of substance dependence were highest among adults who reported multiple (two or more) victimization experiences compared to those who reported no lifetime victimization in a cross-sectional survey of the general U.S. population aged 20+ years [70]. These associations have also been validated outside of the U.S. within the general population of many

other countries. In Brazil, it was reported that adverse early life events increases an individual's susceptibility to substance misuse in a retrospective study of the general adult population aged 20 to 60 years [71]. A similar finding from a large-scale cross-sectional study of the general adult population aged 18 to 65 years old in Mexico indicated that childhood family dysfunction and multiple forms of abuse are strong predictors of the onset of substance use throughout the life course [70]. A robust association between reports of harsh punishment in childhood and alcohol dependence in adulthood adjusting for a range of possible confounding factors was also found in a retrospective study of adults aged 18 to 70 years in China [72]. Both childhood sexual abuse and childhood physical abuse have also been associated with risky sexual behavior [73]. HIV infected adults with childhood physical or sexual abuse histories reported more HIV-risk behavior than other HIV infected adults (e.g., greater number of partners, less condom use) [74] and women who experience intimate partner violence report engaging in more risky sexual behaviors [75].

An accumulation of research has also found substance-specific associations with various types of childhood adversity. Child maltreatment is a consistent risk factor for early onset of drinking in adolescence and adult alcohol use disorders, and accumulating evidence suggests that specific polymorphisms may interact with child maltreatment to increase risk for alcohol consumption and disorder [76]. More experiences of childhood abuse were associated with increased drinking to cope with depression, which was associated with a greater number of alcohol-related consequences in a cross-sectional study of male and female college student drinkers [77]. All types of or combinations of types of childhood maltreatment are robust risk factors for preteen alcohol-use initiation and adolescent binge drinking controlling for age, gender, race, parental alcoholism and monitoring [78,79]. All measures of childhood adversity were also associated with an increased risk of incident drug use in adults who had not previously used drugs and cumulative categories of adverse childhood experiences were strongly associated with drug use in both male and female adults in general [80,81]. Childhood victimization history has recently been strongly linked with other illicit drug dependence such as amphetamines and benzodiazepine (aka "benzo") [82,83].

Nearly 80% of children (ages 2-17) and 60% of adults (ages 18+) in the U.S. report exposure to at least one adverse childhood experience and both groups report multiple victimization rates of over 25% [84,85]. Black and Hispanic populations are particularly vulnerable due to higher rates of reported physical abuse and domestic violence in childhood [86]. The economic burden of health-, crime-, and productivity-related outcomes associated with childhood victimization is in excess of $600 billion annually [87]. In 1995,

Kaiser Permanente's Department of Preventive Medicine and the Centers for Disease Control and Prevention (CDC) began to collaborate on what is known as the Adverse Childhood Experiences (ACE) Study. The ACE Study is the first large-scale study to demonstrate that trauma and household dysfunction in childhood significantly increase the risk for physical and mental disease in adulthood. Although knowledge of the link between childhood adversity and health has motivated collaboration across disciplines such as medicine, public health, psychology, and social work, there continues to be an incomplete understanding of the inputs (the range of adverse experiences in childhood), the processes (how these may affect people) and the outcomes (across the stages in lifespan development) [88]. These processes include the lack of an objective evaluation of risk-taking propensity in adolescence and within the contextual backdrop of one or more adverse childhood experiences.

2.7 Emotional Abuse as a Proxy for All Forms of Childhood Trauma

Emotional abuse is probably the least understood of all forms of childhood trauma but can be the cruelest and most destructive over time. Emotional abuse or maltreatment is described as the repeated exposure to hostile and inconsistent caregiving that is damaging to a child's development and self-worth [89]. Core elements of emotional abuse include being criticized, screamed at, humiliated, threatened with abandonment or injury, controlled, ignored or scapegoated [90]. Emotional abuse is also unique in that it is inherent in all forms of maltreatment, making it the most commonly occurring form of child abuse [91]. Equally troubling is the degree to which emotional abuse goes unnoticed. Vissing et al. [92] observed that in their sample of 3,346 parents, the rate of emotional abuse inflicted upon children was about 51 times greater than the estimated rate from the survey conducted for the National Center of Child Abuse and Neglect. Additionally, perpetrators of this form of abuse are almost exclusively primary caregivers, and children are thus exposed to emotional abuse frequently and for prolonged periods of time. Such pervasive exposure may worsen the severity of damage as the patterns of interaction gain permanence [93]. Although overshadowed by the greater attention to physical and sexual abuse, emotional abuse may be equally, if not more damaging to the child [94]. Compared to physical abuse, childhood emotional abuse is a more powerful predictor of childhood aggression, interpersonal problems, depression, and low self-esteem [92, 95]. Childhood emotional abuse is associated with a wide variety of negative consequences such as scholastic underachievement [96], behavioral problems including vandalism,

stealing, drinking, using drugs, getting arrested [92], and disordered eating [97]. Despite the pervasiveness of emotional abuse and resultant negative ramifications, little is known of mechanisms linking this form of abuse to early engagement in adolescent problem behaviors. In fact, to-date, few studies have investigated the relationship between emotional abuse and initial engagement in risk behaviors during early adolescence, a developmental period in which there is a rapid increase in the emergence of problematic behaviors with significant negative consequences [98].

2.8 The Role of Risk-Taking Propensity in the Relationship Between Childhood Adversity and Maladaptive Risk Behavior

Prior studies have clearly documented that disinhibition is linked independently to both childhood victimization [99] and risky behaviors (i.e. substance use, smoking initiation, gambling, risky sexual behavior) [39,100-103]. Evidence has also increasingly indicated that dispositional variables (i.e., personality and temperamental characteristics), such as differences across the disinhibition spectrum, may play a crucial part in engagement in risk behaviors among adolescents [47, 100-101, 41]. Disinhibition has been found to be composed of several constructs, such as impulsivity, sensation seeking, and risk-taking propensity [39,102].

A limited body of research has examined constructs of disinhibition as the critical pathway in the relationship between various types of childhood adversity and maladaptive risk behaviors. Smith et al. [104] relied on self-reports to investigate the role of perceived risks and benefits in predicting engagement in a range of risk-taking behaviors by a cross-section of college women (n=340) with and without histories of interpersonal victimization across developmental periods including, but not limited to, childhood. Findings indicated that the relationship between victim status and expected involvement in risky behaviors was mediated by cognitions about risks and benefits of those risky behaviors [104]. Trauma victims reported greater perceived benefits and lower perceived risks and, therefore, greater expected involvement in risky sexual behavior, sexual drug use, and heavy drinking than non-victims [104].

Bailey & McCloskey [105] subsequently employed a longitudinal design to investigate the role of depressive self-concept and behavioral under-control (impulsivity) as pathways to substance abuse in later life among sexually abused girls (n=150) aged 6 to 12 years at the start of the study. Childhood sexual abuse was measured as a dichotomous variable to capture the number and severity of incidents. Substance abuse was measured in adolescence by questions pertaining to patterns of drug use (diversity and frequency of a

comprehensive range of illicit drugs) and problem drinking (since occasional or experimental alcohol use in adolescence is normative). Results indicated that behavioral under-control mediated the effects of child sexual abuse on adolescent substance abuse among the girls in the study but depressive self-concept did not [105]. Child sexual abuse severity was positively related (.34) to behavioral under-control, which was in turn significantly associated (.41) with adolescent substance use [105].

One study-to-date specifically explored the three primary constructs (e.g., impulsivity, sensation seeking, and risk-taking propensity) of disinhibition as unifying mechanisms between childhood adversity and risk-taking behavior in adolescence. Bornovalova et al. [106] examined impulsivity, risk-taking propensity (indexed by BART-Y), and sensation seeking as individual mediators in the relationship between child abuse history and engagement in HIV-related risk behaviors among inner-city African-American adolescents (n=96) in Washington, D.C. Childhood abuse was extended beyond sexual abuse to include physical and emotional abuse as well. Participants self-reported a composite score measure of HIV-related risk behaviors consisting of lifetime engagement in sexual intercourse without a condom, alcohol use, and illicit drug use. Correlation analyses indicated that impulsivity was not associated with childhood abuse or HIV-related risk behavior so the construct was removed from further consideration as a potential pathway [106]. Mediation analyses findings demonstrated that HIV-related risk behavior was related to both childhood abuse (e.g., physical, sexual, and emotional) and two specific aspects of disinhibition (sensation seeking and risk-taking propensity) [106]. Further, both sensation seeking and risk-taking propensity served a mediating role in the relationship between childhood abuse history and HIV-related risk behavior (see Figure 1) [106].

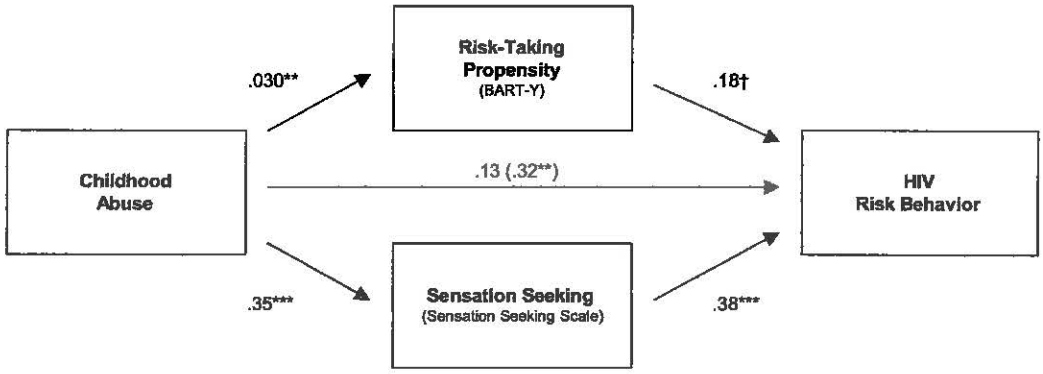


Figure 1.

Model depicting the mediated and direct effects of childhood trauma on HIV-related risk behaviors (Bornovalova et al., 2008). Standardized regression coefficients are presented. The effect of abuse on HIV-related risk behaviors when the mediators are not included in the model is shown in parentheses.

† p < .10; * p < .05; ** p < .01.

Several issues point to a need to replicate and extend aspects of these studies. First, the size, gender, socioeconomic status, and racial and ethnic diversity of the study participants have impeded the generalizability of results to the broader population. The cited research studies in this field have emphasized either non-minority or specific minority (e.g., African-American, Hispanic) participants at the expense of a significantly diverse population. Gender and geographic location have also been limiting factors. Bornovalova et al. [106] was the first study to include adolescent males and the only study to focus on African-Americans in urban environments. Additional research should draw from a larger sample of low income and minority adolescents. Second, well-defined multimodal measurements of childhood adversity are critical to clarify the breadth and depth of the impact of both direct victimization exposure and non-victimization adversities in childhood on subsequent adolescent development. Past research limited measurement to sexual, physical and emotional abuse. Bornovalova et al. acknowledge that abuse rarely takes place as an isolated event and instead typically occurs within a broader social context of multiple adversities [106]. A better calibration might be to extend childhood adversity to include a broader array of victimization exposure (e.g., acute and traumatic stressors) and non-victimization adversities (e.g., chronic family adversity and other non-victimization events). For example, victimization might be comprised of events such as physical abuse, child neglect (physical, educational, emotional), psychological abuse (emotional abuse and neglect), and sexual abuse. Non-victimization adversities might include other forms of stress such as poverty, parental alcohol or drug problems, parental imprisonment, marital discord, episodes of homelessness, parental mental illness, etc. Furthermore, any measurement of childhood adversity must consider not only the type of adversity, but also the frequency, severity, and timing of that adversity both in isolation and in aggregate over the course of development. Third, the specific role of risk-taking propensity as indexed by the BART-Y in the pathway between childhood adversity and both alcohol and other substance use remains unexamined. Bornovalova et al. [106] included "alcohol use" and "use of illicit" drugs as discrete variables within a composite score for HIV-related risk behaviors but it is difficult to tease apart these elements to draw specific conclusions related to the pathway. Furthermore, both alcohol use and the use of illicit drugs require a multimodal evaluation to ensure that self-reports capture the full range of level of engagement and type of substance. Fourth, the utilization of objective laboratory measures of risk-taking would enhance the reliability of findings with respect to the pathway between childhood adversity and risk-taking behavior in adolescence. Two of the three cited mediation studies have examined constructs of disinhibition that can only be measured through self-reports

(e.g., risk appraisal, behavioral under-control or impulsivity). Bornovalova et al [106] was the first study to employ a multimodal measurement of disinhibition that included a laboratory measure. Specifically, the authors indexed risk-taking propensity on the BART-Y in a controlled environment. A convergence of findings in this area would be useful to further legitimize the significance of risk-taking propensity in the mediation pathway and facilitate future studies in this area. Fourth, clarification is needed with respect to the relative strength of risk-taking propensity compared to sensation seeking in the mediation pathway between childhood adversity and adolescent risk-taking behavior. Bornovalova et al. [106] indicated that the indirect effect of BART-Y was considerably smaller than that of sensation seeking. This finding presents an interesting juxtaposition of other research suggesting that the BART has been shown to predict risk behaviors in adolescents over and above self-report assessments of impulsivity and sensation-seeking [41,43].

Last, other confounding variables or important contributing factors, such as peer variables, parental monitoring, and patterns of substance use among family members, need to be considered along the pathway between childhood adversity and maladaptive risk-taking in adolescence. Neither of these important influencers has been integrated into analogous studies.

3.0 STATEMENT OF PURPOSE

The economic and social costs of both adolescent risk-taking behavior and childhood trauma are staggering. Developmental research has shown that the propensity for risk-taking is higher during adolescence compared with both childhood and adulthood, which makes adolescence a period of heightened vulnerability to detrimental outcomes such as substance abuse, accidents, violence, and victimization. Despite the documented prevalence of risk-taking behavior in adolescence, the laboratory evidence of risk taking remains scarce, and the individual variation poorly understood. Childhood trauma, particularly maltreatment, has also been frequently identified in epidemiological studies of risk factors for significant functional impairment and life lost in adolescence and adulthood. However, experimental research on childhood victimization and other adverse childhood experiences has focused almost exclusively on specific traumas in isolation and their cumulative correlation to risk outcomes as opposed to risk behaviors. A number of other limitations undermine past research efforts including, but not limited to, a reliance on participant self-reports, a lack of prospective research, inadequate population size, inconsistent operationalization of constructs, and the dearth of randomized controlled study designs.

Recent work attempting to understand the "why" of the child abuse-to-risk behavior relationship has identified the construct of disinhibition as the potential explanatory mechanism. Historically, disinhibition has been considered an "umbrella" term encompassing impulsivity, sensation seeking, and risk-taking [103]. Aspects of this overarching construct have independently been linked to both childhood victimization [99] and engagement in risky behaviors [107-108]. Although an abundance of research demonstrates that disinhibition may act as a mechanism in the trauma-to-risk relationship, little attention has been paid to types of trauma other than physical and sexual abuse. Because evidence suggests that emotional abuse may be one of the most destructive and pervasive forms of maltreatment, further research is needed to determine whether similar mechanisms are present in the emotional abuse-to-risk behaviors relationship, particularly among early adolescents where such patterns of problematic behaviors are only starting to emerge. A better understanding of these potential mechanisms can yield important implications for targeted prevention and treatment efforts throughout the developmental lifespan.

With the above discussion in mind, the present study aims to expand upon the literature by investigating the roles of risk-taking propensity and sensation seeking in the relationship between emotional

abuse and risk behaviors. The first goal is to focus exclusively on the construct of risk-taking propensity as indexed by the BART-Y to provide an observable measure of disinhibition. The second goal is to examine a broader range of adolescents (e.g., age, gender, geographic location, socioeconomic status, and ethnic and racial diversity) within a larger sample population of participants exposed to childhood trauma. The third goal is to examine data related to the initial engagement in risk behaviors. The final goal of the present study is to tease apart and isolate alcohol-related risk behaviors in order to draw specific conclusions about the mediation pathway between childhood trauma and alcohol use and misuse.

A single research question was posed in an attempt to achieve these goals: "What role does risk-taking propensity, as indexed by the BART-Y, play in the pathway between childhood trauma and alcohol-related risk behaviors in adolescence?" In doing so, it was hypothesized that: a) childhood trauma history will be associated with greater levels of disinhibition (in the form of both risk-taking propensity as indexed by the BART-Y and self-reported sensation seeking), b) childhood trauma history will predict initial engagement in alcohol-related risk behaviors in early adolescence, and c) that both risk-taking propensity and sensation seeking will mediate the influence of emotional abuse on risk-taking behaviors (see Figure 2).

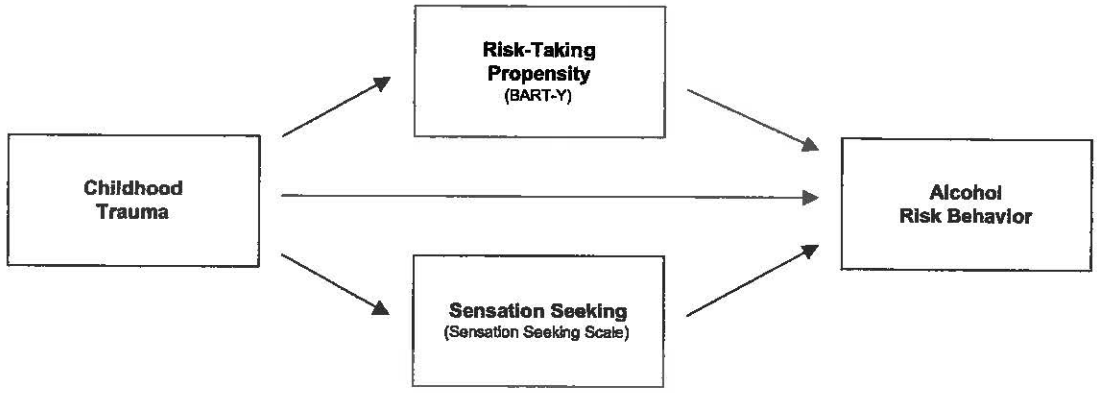


Figure 2. Pathway model of adolescent risk-taking behavior proposed by the author.

These anticipated results are consistent with the findings of Bornovalova [106] that disinhibition mediated the relationship between childhood abuse and HIV-related risk behavior in a population of inner-city African American adolescents.

Although the cross-sectional nature of the current study precludes definitive statements about causal directions, it effectively sets the stage for a more comprehensive understanding of the processes linking trauma, disinhibition, and alcohol and illicit drug use behaviors. This understanding will, hopefully, highlight: (a) the importance of increased attention to individual difference variables in risk-taking propensity among low income majority and minority adolescents who are at elevated risk for developing substance use disorders; and (b) the potential value of efforts to target risk-taking propensity processes and their tie to a history of trauma in alcohol and other substance abuse prevention efforts.

4.0 METHODS

Data were obtained through a prior National Institute of Drug Abuse (NIDA) funded longitudinal study, entitled "Behavioral Technologies for Predicting HIV Risk" (Carl W. Lejuez, Ph.D., #R01 DA18647), that tested the behavioral, environmental, and genetic mechanisms of risk for HIV-related risk behaviors in youth.

4.1 Participants

This study employed data from a sample of early adolescents (n = 277), ages 9 to 12 at initial enrollment, participating in a larger prospective study of behavioral, environmental, and genetic mechanisms of risk for HIV-related risk behaviors in youth. Follow-up assessments were conducted at yearly intervals for 3 consecutive years and are currently ongoing. Participants were a convenience sample of youth, and their parents, recruited in the greater metropolitan Washington D.C. area via media outreach and mailings with area schools, libraries, and Boys and Girls Clubs. Monetary inducements were utilized to facilitate participation. Recruitment lasted approximately 2 years and was open to all youth in the fifth and sixth grades who were proficient in English; no other exclusion criteria were used. Participants included in the present analyses completed both the baseline and at least 1 of the 2 subsequent annual follow-up assessments (Waves 1, 2, and 3, respectively; ±2 months from the annual scheduled appointment at each assessment). Participants were excluded from the present analyses for missing both Waves 2 and 3 of data (n = 20). Follow-up rates were 89.1 and 86.9% for Waves 2 and 3, respectively. Participants lost to attrition included those who could not be located or did not respond to phone or letter inquiries. Excluded participants did not differ significantly on gender, age, ethnicity, sensation seeking, or risk-taking propensity (all p's > 0.10). The resultant sample of 257 youth included participants who at study enrollment were on average 11.0 years of age (SD = 0.8), 43.0% women, 49.0% non-Hispanic White, 35.1% African-American, 3.3% Latino, 1.2% Asian-American, and 11.0% mixed or other ethnicity.

4.2 Measures

Demographics. The parent/guardian completed a basic demographics form for personal information, as well as information about the child. The form included, but was not limited to, characteristics such as age, gender, race, education level of mother and father, and annual family income.

Childhood Emotional Abuse (CEA). CEA was measured with the Childhood Trauma Questionnaire (28-item version), which is a screening measure for maltreatment histories in both clinical and non-referred groups [109]. The emotional abuse subscale is composed of five items that refer to verbal assaults on a child's sense of worth or well-being, or any humiliating and demeaning behavior directed towards a child by an older person throughout early childhood and pre-adolescence [109]. Three additional items assess tendencies to minimize or deny abuse. Respondents rate the truth of each item on a scale of 1 to 5, from "Never true" to "Very often true" when they were "growing up as a child…" Thus, scores range from 5 to 25 for each abuse type. Internal consistency in this sample was $\alpha = .83$. An example item from the CEA scale is 'People in my family said hurtful or insulting things to me'. Scores on this subscale are stable over time and show convergent and discriminant validity with other trauma measures [109]. The CTQ has good sensitivity and satisfactory specificity when self-reports are compared with trauma ratings from child welfare records and reports of family members and clinicians [109].

Self-Reported Sensation Seeking. The Brief Sensation Seeking Scale (BSSS) [110] was used to assess sensation seeking. The BSSS is an 8-item self-report measure designed specifically for use with youth populations. Example items include, "I would love to have new and exciting experiences, even if they are illegal." Participants are asked to rate each item according to the extent to which it accurately describes their experience using a 5-point Likert scale (1 = strongly disagree; 5 = strongly agree). The BSSS has been found to be associated with well-established measures of other aspects of disinhibition and is predictive of risky behaviors [110-111]. Items were summed to create a total score. Internal consistency within this sample of youth was adequate at Wave 1 ($\alpha = 0.69$), Wave 2 ($a = 0.77$), and Wave 3 ($a = 0.75$).

Risk-Taking Propensity: Balloon Analogue Risk Task–Youth Version (BART-Y) [40]. In the BART-Y, the youth inflates a computer-generated balloon. Each pump is worth one point, but if the balloon is pumped past its explosion point, then all points accrued for that balloon are lost. The probability that any particular balloon will explode is 1/128 for the first pump, 1/127 for the second pump, and so on until the 128th pump at which point the probability is 1/1. According to this algorithm, explosion values form a normal distribution around 64 pumps [39]. The task can be analyzed separately for the first, middle, and last 10 blocks of balloons. To allow a meaningful and unbiased comparison across these blocks, the average breakpoint was set in each case also to mirror the overall average breakpoint of 64. These blocks have been used in previous work to examine changes in risk-taking propensity as a function of continued exposure to the task. As in all prior BART studies, the key measure was the adjusted average that equals the average number of pumps on balloons that did not explode [39-40]. Given its role as a primary variable in the current study, the adjusted average is referred to herein as risk-taking propensity. During the task, participants had the opportunity to stop pumping the balloon at any time prior to an explosion and allocate the accrued points to a permanent prize meter. After a balloon exploded or points were allocated to the permanent prize meter, a new balloon appeared. After completion of 30 balloon trials, the position of the prize meter determined the final prize (small, medium, large, bonus). Standardized instructions were given to each participant prior to beginning the task. Further, participants were informed that "It is your choice to determine how much to pump up the balloon, but be aware that at some point the balloon will explode" and that "the explosion point varies across each of the 30 balloons, ranging from the first pump to enough pumps to make the balloon fill the entire computer screen." Participants were given no further information about the probability underlying the explosion point for each balloon. Participants completed the BART-Y at each wave of assessment.

Alcohol Use. A modified version of the Youth Risk Behavior Surveillance System [15] was used to assess past year engagement in alcohol use at each assessment wave. Response options were "zero," "once," "a few times," "1 to 3 times per month," "1 to 3 times per week," and "almost everyday or more." Frequencies of each response option above "zero" were low, with endorsement of no other response option rising above 20%. Specifically, reports of "zero" use were 73.2, 64.9, and 53.8% at Waves 1, 2, and 3, respectively. Therefore, because of the item distributions and the variable interval between response options, a dichotomous scale was

constructed to identify whether the child had engaged in alcohol use a few times or more (1) or zero times (0) in the past year.

4.3 Procedure(s)

Interested families who met inclusion criteria were invited to come to the University of Maryland campus accessible by public transportation. Participants and their guardians were informed that "the current study is focused on examining how one's personality and experiences are related to their behavior, which we will examine using a variety of life questions and a computer game." After explaining the protocol, the guardian completed the adolescent permission form and the adolescent completed the assent form. The youth and caregiver were then accompanied to separate rooms to complete the assessments. Standardized-specific instructions were given separately to the caregiver and youth.

Trained undergraduate, post-baccalaureate, and graduate research assistants read aloud specific, standardized instructions for each questionnaire to youth participants. Questionnaires were given to the youth one at a time at which point the experimenter moved out of sight of the participant responses; the participant indicated when they were done with a questionnaire and then the next one was explained using standardized instructions. Although experimenters were available at all times for questions, they did not have the ability to view participant responses. Youth were encouraged to ask any questions if the content of the questions were unclear. If the youth or parent indicated reading difficulties, questionnaires were read aloud. Caregivers were given the entire battery of questionnaires without individual verbal instructions for each questionnaire but were offered assistance with questions (e.g., encouraged to ask questions about any of the content, research assistants checked in periodically to see if any questions had arisen). To ensure anonymity of responses, all measures utilized only a participant number that could not be linked to participant names. Given the potential for order effects, the questionnaires were administered in a randomly selected order for each participant. Administrating the computer tasks to the caregiver and youth involved presenting a screenshot of the game accompanied by standardized verbal instructions from the research assistant.

These procedures were repeated at all interview points. After the completion of the questionnaires and tasks, participants were paid according to their performance on the BART-Y and given a referral sheet listing counseling services; this sheet was given to all participants regardless of study responses.

4.4 Data Analysis

Mediation is a hypothesized causal chain in which one variable affects a second variable that, in turn, affects a third variable. The intervening variable, M, is the mediator. It "mediates" the relationship between a predictor, X, and an outcome, Y. Graphically, mediation can be depicted (see Figure 3) as follows:

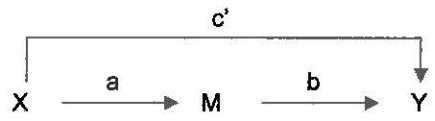


Figure 3. Mediation depicted as a hypothesized causal chain.

Paths (a) and (b) are called direct effects. The mediational effect, in which X leads to Y through M, is called the indirect effect. Path (c') can also be called a direct effect.

In the present study, mediation was tested utilizing a four-step approach (see Figure 4) [112] in which several regression analyses are conducted and significance of coefficients is examined at each step (see Table 1). The purpose of Steps 1-3 is to establish that zero-order relationships among the variables exist. If one or more of these relationships are nonsignificant, researchers usually conclude that mediation is not possible or likely. Assuming that there are significant relationships from Steps 1 through 3, one proceeds to Step 4.

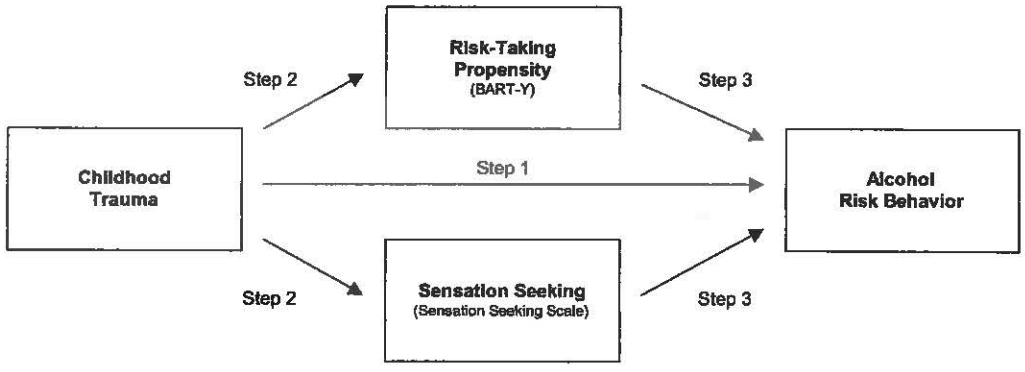
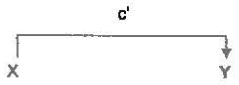
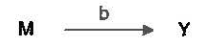
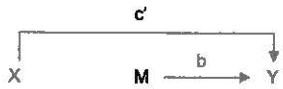


Figure 4. Model depicting the four-step approach to mediation analyses proposed by Baron and Kenny (1986).

Table 1

Series of regression analyses to be performed in support of partial or full mediation.

	Analysis	Visual Depiction
Step 1	Conducted a simple regression analysis with X predicting Y to test for a significant direct effect of an independent variable (childhood trauma) on a dependent variable (alcohol-related risk behavior).	
Step 2	Conducted a simple regression analysis on path (a) with X predicting M to test for significant effects of an independent variable (childhood trauma) on putative mediators (sensation seeking and/or risk-taking propensity as indexed by BART-Y).	
Step 3	Conducted a simple regression analysis for path (b) alone with M predicting Y to test for significant effects of putative mediators (sensation seeking and/or risk-taking propensity as indexed by BART-Y) on the dependent variable (alcohol-related risk behavior).	
Step 4	Conducted a multiple regression analysis with X and M predicting Y to test for significant indirect (i.e., "mediated") effects of the independent variable (childhood trauma) on the dependent variable (alcohol-related risk behavior) when it is analyzed in conjunction with the mediators (sensation seeking and/or risk-taking propensity as indexed by BART-Y).	

In the Step 4 model, some form of mediation is supported if the effect of M (path b) remains significant after controlling for X. If X is no longer significant when M is controlled, the finding supports full mediation. If X is still significant (i.e., both X and M significantly predict Y), but a reduction in the association between x and y exists once m is included in the regression, the finding supports partial mediation.

Risk-taking propensity as indexed by BART-Y and sensation seeking were both considered as potential mediators and were only included in the mediation analysis if significantly correlated with childhood trauma and alcohol-related risk behaviors. The 'product of coefficients' procedures outlined by MacKinnon et al. [113] were utilized to test the significance of the individual mediated effects (*Step 4*). The indirect effect of childhood trauma through each mediator is calculated by multiplying the mediator's regression coefficient, **b**, times the regression coefficient, a, for the effect of abuse on that mediator. These products are divided by standard error estimates calculated with the formula provided by MacKinnon et al. [113] and analyzed for significance using the Sobel test [113].

5.0 RESULTS

As shown in Table 2, CEA was significantly correlated with sensation seeking, but was not significantly correlated with BART-Y. CEA was also significantly correlated with alcohol-related risk behavior. Both sensation seeking and BART-Y were significantly correlated with alcohol-related risk behavior. The statistically insignificant association between CEA and BART-Y persisted when controlling for both gender and race (see Table 3). Given these results, BART-Y was dropped from further consideration as a mediator.

Table 2

Intercorrelations among key variables.

	Gender	Age	CTQ	BART-Y	SSS	Alcohol RB
Gender	-----	0.07	0.00	0.01	0.10	0.28**
Age		-----	0.00	0.10	0.21**	0.22**
CTQ			-----	0.07	0.26**	0.30**
BART-Y				-----	0.13	0.15*
SSS					-----	0.47**
Alcohol RB						-----

* $p < .05$.

** $p < .01$.

Gender coded as 0 for girls and 1 for boys; CTQ = Childhood Trauma Questionnaire; BART-Y = Risk-taking propensity on the Balloon Analgoue Risk Task-Youth Version; SSS = Sensation Seeking Scle; Alcohol RB = Alcohol Risk Behavior

Table 3

Cross tabulation analyses comparing self-reported emotional abuse in childhood to demographic-characteristics of participants.

Characteristic(s)	Not Emotionally Abused in Childhood 66 (26.8%)		Emotionally Abused in Childhood 180 (73.2%)	
	n	%	n	%
Gender				
Female	31	*47.0%*	77	*42.8%*
Male	35	*53.0%*	103	*57.2%*
Age				
9	1	*1.5%*	5	*2.8%*
10	18	*27.3%*	44	*24.4%*
11	28	*42.4%*	75	*41.7%*
12	19	*28.8%*	55	*30.6%*
13	0	*0.0%*	1	*0.6%*
Grade				
< 5th	6	*10.2%*	14	*8.5%*
5th	17	*28.8%*	41	*24.8%*
6th	23	*39.0%*	77	*46.7%*
7th	13	*22.0%*	32	*19.4%*
8th	0	*0.0%*	1	*0.6%*
Ethnicity				
White/Caucasian	31	*47.0%*	89	*49.7%*
Black/African American	27	*41.0%*	59	*33.0%*
Hispanic/Latino	3	*4.5%*	5	*2.8%*
Native American	0	*0.0%*	1	*0.6%*
Asian	0	*0.0%*	3	*1.7%*
Other	5	*7.6%*	22	*12.3%*
Biological Father Lives w/ Family				
No	22	*33.3%*	58	*32.4%*
Yes	44	*66.7%*	121	*67.6%*
Annual Household Income				
< $10,000	2	*3.3%*	2	*1.2%*
< $25,000	5	*8.2%*	11	*6.4%*
< $50,000	10	*16.4%*	31	*18.0%*
< $75,000	9	*14.8%*	26	*15.1%*
< $100,000	15	*24.6%*	30	*17.4%*
< $250,000	20	*32.8%*	72	*41.9%*

Standardized regression coefficients from regression analyses testing mediation are depicted in Figure 5. When analyzed without the mediators, the effect of childhood trauma on alcohol-related risk behaviors was significant and positive, $B = .355$, $SE = .078$, $\beta = .301$, $sr^2 = .086$, $p = .001$. Separate regression analyses demonstrated that childhood trauma significantly predicted higher scores on sensation seeking ($B = .426$ $SE = .103$, $\beta = .255$, $sr^2 = .060$, $p = .0001$). In the final model with childhood trauma and sensation seeking as predictors (see Figure 5), the effect of childhood trauma on alcohol risk behavior was reduced by 33% and was no longer significant, $B = .237$, $SE = .073$, $\beta = .201$, $sr^2 = .256$, $p = .001$. In this model, sensation seeking was associated with significantly greater alcohol-related risk behavior, $B = .317$, $SE = .046$, $\beta = .43$, $sr^2 = .256$, $p = .0001$. The indirect effect of childhood trauma through the SSS was small, $\alpha_i\beta_i = .045$, $z' = .361$, $SE = .124$, $p = .718$.

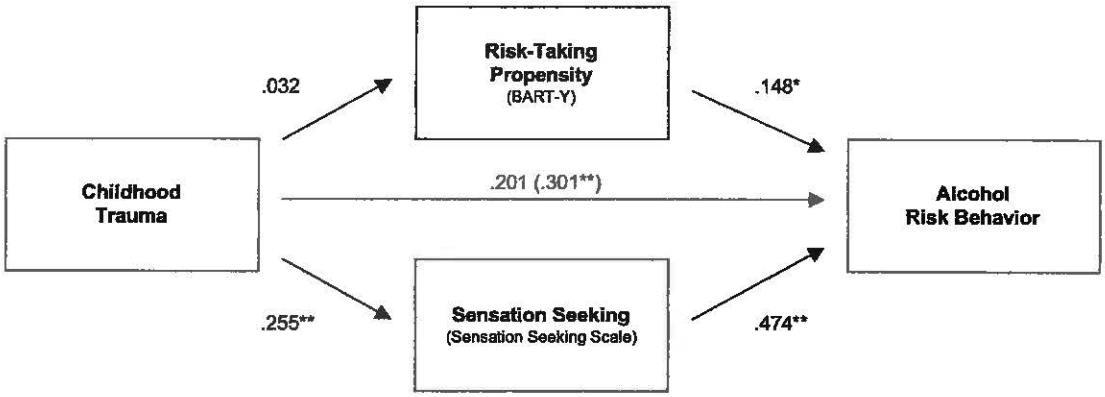


Figure 5.

Model depicting the mediated and direct effects of childhood trauma on alcohol-related risk behaviors in adolescence. Standardized regression coefficients are presented. The effect of childhood trauma on alcohol-related risk behaviors when the mediator is not included in the model is shown in parentheses.

* p < .05; ** p < .01.

6.0 DISCUSSION

There are innumerable factors that might explain excessive risk-taking behavior in adolescence. The current study empirically investigated the association between one specific form of childhood trauma – childhood emotional abuse – and one general category of adolescent risk taking behaviors – alcohol use and misuse – as a means to early identification and intervention in developmental trajectories.

These results provide further evidence that a significant positive relationship exists between childhood emotional abuse and alcohol-related risk behavior in a diverse sample of early adolescents. As hypothesized, this relationship was mediated by sensation seeking. In contrast, our hypothesis about the mediating role of risk-taking propensity, as reported by Bornovalova et al. [106], was not supported. This finding is also inconsistent with generalized research suggesting that childhood trauma has a significant direct effect on risk-taking propensity as indexed by BART-Y [106] and that the BART has been shown to generally predict risk behaviors in adolescents over and above self-report assessments of impulsivity and sensation seeking [41,43].

A few notable points of departure between this study and other research that might explain the resultant findings. The first significant difference is the size and average age of the sample. Bornovalova et al. utilized a sample of 96 9th-12th grade adolescents with an average age of 14.9 years [106] in contrast to the current sample of 246 5th-8th grade adolescents with an average age of 11.0 years. The developmental period of early adolescence may simply be too soon to observe the potential manifestation of childhood trauma through laboratory measures of risk-taking propensity. Each stage in development carries risks for alcohol use and its consequences. Studies show that alcohol use typically begins in early adolescence (ages 12–14) [114] and that between ages 12 and 21, rates of alcohol use and binge drinking increase sharply before leveling off in the twenties [115]. The second significant difference is in the utilization of the CTQ to measure childhood trauma. Bornovalova et al. employed all three subscales (emotional abuse, physical abuse, and sexual abuse) to compute a composite abuse score [106]. The current study, based on a growing body of literature, employed the emotional abuse subscale as a proxy for all other forms of abuse. Data was not collected across all three subscales so retrospective analyses could not be conducted. The prior study, in contrast, conducted subsequent analyses using each abuse subscale separately and that each subscale separately provided equivalent results [106].

However, these inconsistencies are a poignant reminder of the need for larger-scale future studies that incorporate multiple domains of childhood trauma and utilize multiple laboratory measures of risk-taking propensity in a prospective format. The value of disinhibition as a general construct belies the complexity of mechanisms that serve as its operational foundation. Prior research may be too bold in its reliance upon existing measures of trauma and disinhibition to uncover plausible pathways between experiences in childhood and subsequent maladaptive behavior throughout the lifespan. The fact that self-reported childhood emotional abuse, as measured by the CEA, did not predict risk-taking propensity in adolescence, as assessed by the BART-Y, is an important discovery because evidence suggests that emotional abuse may be one of the most destructive and pervasive forms of maltreatment. A convergence of findings is essential to developing a useful pathway model for understanding and addressing a wide spectrum of risky behavior before, during, and after adolescence.

The present research has several limitations. First, the four-step statistical approach employed to test for mediation tends to miss some true mediation effects (Type II errors) [116]. Second, the lack of baseline BART-Y scores in childhood for this sample prevents an examination of the specific course of change of that measure in response to childhood emotional abuse between childhood and adolescence. Third, the assessment utilized to measure alcohol use did not account for the frequency or intensity of self-reported drinking behavior and also failed to capture information related to the quantity of alcohol consumed per drink. Research indicates that adolescents who drink excessively are more likely to experience an alcohol use disorder (AUD). Fourth, the BART-Y fails to account for or predict the manifestation of risk-taking propensity across different environmental contexts and in different emotional states. Data indicating the antecedent state of participants was also not collected prior to the start of the laboratory test. Fifth, the current study did not attempt to capture the variety of societal influences (e.g., mass media, community norms, and adult role models) that also influence adolescent risk-taking behaviors. Last, participants were not asked to report a comprehensive set of adverse childhood experiences beyond emotional abuse.

7.0 CONCLUSION/RECOMMENDATION(S)

Keeping in mind the aforementioned limitations, results of the present study have several implications for investigating the mechanisms underlying the relationship between childhood trauma and risk-taking behavior in adolescence. Specifically, this work provides further evidence of the mediating role of sensation seeking but was unable to replicate the mediating role of risk-taking propensity found in prior studies. Since research on childhood adversity suggests that the type, timing, and frequency of experience might have significant effects on risk-taking propensity in adolescence, there is a need for larger scale prospective studies that incorporate multiple domains of childhood adversity and utilize multiple laboratory measures or risk-taking propensity in conjunction with other types of disinhibition. Furthermore, risk-taking behavior in adolescence often occurs within the context of both individual and environmental characteristics. An analysis that identifies unique trajectories over time and tests relations between them should be conducted with a cohort starting in childhood and followed through adolescence to determine how an early risk trajectory changes in response to childhood adversity. Future studies would also benefit from the inclusion of additional personality measures that may assist in teasing apart and understanding individual variation within various thresholds of sensation seeking, risk taking propensity scores on the BART-Y, and other types of disinhibition.

Another critically important recommendation is to revise the approach to mediation analysis to ensure that the significance of the indirect pathway – that X (childhood trauma) affects Y (alcohol-related risk behavior) through the compound pathway of "a" (risk-taking propensity) and "b" (sensation seeking) – is really tested. An alternative, and potentially preferable approach, to traditional mediation analysis is to calculate the indirect effect and test it for significance. The regression coefficient for the indirect effect represents the change in Y for every unit change in X that is mediated by M. There are two ways to estimate the indirect coefficient. Judd & Kenny suggest computing the difference between two regression coefficients [117]. An equivalent approach calculates the indirect effect by multiplying two regression coefficients [118].

Finally, although the short- and long-term outcomes associated with negative childhood experiences have gained increasing attention in recent years from both researchers and mass media, there are no standardized definitions and data collection methodologies for established and validated outcome measures in the associated research. Traditional definitions were limited to a composite of childhood maltreatment sub-types that included physical abuse, sexual abuse, physical neglect, and emotional neglect. However,

inconsistencies are evident between studies due to inherent differences in the temporal sequence, severity, and frequency of maltreatment being measured. These disparities are further exacerbated by the recent recognition and inclusion of a more diverse set of negative childhood events in empirical studies. Two attempts at establishing expanded operational definitions for research purposes are currently underway. The first is the result of a large-scale 'Adverse Childhood Experiences (ACE) Study' by the Centers for Disease Control and Prevention and Kaiser Permanente's Health Appraisal Clinic in San Diego, CA. An ACE is defined as "growing up experiencing any of the following conditions in the household prior to age 18: recurrent physical abuse; recurrent emotional abuse; contact sexual abuse; an alcohol and/or drug abuser in the household; an incarcerated household member; someone who is chronically depressed, mentally ill, institutionalized, or suicidal; mother is treated violently; one or no parents; and emotional or physical neglect" [54]. The second emanates from research on childhood victimization and poly-victimization as reported by children in the 'Victimization of Children and Youth Survey' [119]. The concept of "childhood victimization" brings together criminal acts as defined by law, child abuse in all its forms, child-to-child violence, and indirect victimization where children witness or are affected by the crime victimization of a family member or friend [85, 119-121].

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