



W&M ScholarWorks

Dissertations, Theses, and Masters Projects

Theses, Dissertations, & Master Projects

Spring 2017

Adverse Childhood Experiences and Health Risk Behaviors among College Students

Morgan Thompson

College of William and Mary - Arts & Sciences, mjt2692@gmail.com

Follow this and additional works at: <https://scholarworks.wm.edu/etd>

 Part of the [Psychology Commons](#)

Recommended Citation

Thompson, Morgan, "Adverse Childhood Experiences and Health Risk Behaviors among College Students" (2017). *Dissertations, Theses, and Masters Projects*. Paper 1499450058.

<http://doi.org/10.21220/S2195C>

This Thesis is brought to you for free and open access by the Theses, Dissertations, & Master Projects at W&M ScholarWorks. It has been accepted for inclusion in Dissertations, Theses, and Masters Projects by an authorized administrator of W&M ScholarWorks. For more information, please contact scholarworks@wm.edu.

Adverse Childhood Experiences and Health Risk Behaviors
among College Students

Morgan J. Thompson

Lynchburg, VA

Bachelor of Arts, Randolph College, 2013

A Thesis presented to the Graduate Faculty
of The College of William & Mary in Candidacy for the Degree of
Master of Arts

Department of Psychology

College of William & Mary
May, 2017


APPROVAL PAGE

This Thesis is submitted in partial fulfillment of
the requirements for the degree of

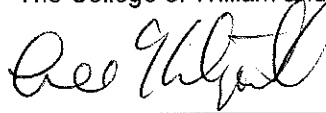
Master of Arts


Morgan Jane Thompson

Approved by the Committee, March 2017


Committee Chair

Associate Professor and Director of Graduate Studies Danielle Dallaire, Psychology
The College of William and Mary



Associate Professor Lee Kirkpatrick, Psychology
The College of William and Mary



Assistant Professor Elizabeth Raposa, Psychology
The College of William and Mary

COMPLIANCE PAGE

Research approved by

Protection of Human Subjects Committee

Protocol number(s): PHSC-2016-07-20-11282-dhdall

Date(s) of approval: 08/01/2016

ABSTRACT

Adverse childhood experiences (ACEs) are associated with social, emotional, and cognitive impairments resulting from disrupted neurodevelopment. These impairments manifest as health risk behaviors (HRBs) including tobacco, alcohol, marijuana, illicit drug use, and sexual risk behaviors. The current study assessed the relation between ACEs and HRBs by examining the cognitive abilities of 144 college students ($M = 18.92$ years; 56.3% female; 63.9% White; $M = .078$ ACEs). Participants completed an interview (parental incarceration, Criminogenic Cognitions Scale), surveys (Youth Risk Behavior Survey, ACE Questionnaire), delay discounting task, the Tower of Hanoi, and the Peabody Picture Vocabulary Test. Results revealed a graded relation between ACE scores and illicit drug use risk behaviors, ACE scores and sexual risk behaviors, and household criminality and sexual risk behaviors. Students who reported more ACEs had an increased likelihood of reporting illicit drug use and sexual risk behaviors. Although no significant mediation effects of cognitive impairment were observed, a path analysis model revealed that a subscale of the Criminogenic Cognitions Scale (Negative Attitudes toward Authority) was a marginal partial mediator between ACE scores and sexual risk behaviors. These findings demonstrate the cognitive impairments may not serve as the best explanation for the relation between ACEs and HRBs among college students. However, these findings do indicate that a universal approach to preventing and reducing HRBs among at-risk college students may be inappropriate. Rather, it may be best to target specific HRBs.

TABLE OF CONTENTS

Acknowledgements	vi
Introduction	1
Contemporary developmental systems models for human development	4
Adverse childhood experiences	6
Adverse childhood experiences: Abuse	8
Adverse childhood experiences: Household challenges	11
Adverse childhood experiences: Neglect	13
ACEs among college students	14
Executive functioning	17
Involvement in health risk behaviors	19
Cognitive processes	21
Current study	23
Hypotheses	24
Hypothesis 1	24
Hypothesis 2	24
Hypothesis 3	25
Method	25
Participants	25

Measures	26
Barratt Simplified Measure of Social Status	26
Criminogenic Cognitions Scale	27
Youth Risk Behavior Survey	29
Adverse Childhood Experiences Questionnaire	34
Delay Discounting Task	37
Tower of Hanoi	38
Peabody Picture Vocabulary Test Fourth Edition	39
Procedures	40
Results	41
Plan of analysis	41
Preliminary analyses	42
Age	42
Gender	43
Race	43
Social status	43
Verbal IQ	44
Hypothesis 1	44
Gender and follow-up, exploratory analyses	45
Hypothesis 2a	46

Abuse	46
Neglect	46
Household challenges	47
Gender and follow-up, exploratory analyses	47
Hypothesis 2b	48
Hypothesis 3a	49
Gender and follow-up, exploratory analyses	50
Hypothesis 3b	52
Discussion	53
The relation between adverse childhood experiences and health risk behaviors	54
Future directions	59
Strengths and limitations	61
Implications	63
Conclusions	65
References	66
Figures	82
Figure 1: ACE Pyramid from Felitti and colleagues (1998)	82
Figure 2: Criminogenic Cognitions Scale measurement model	83
Figure 3: Health risk behavior measurement model	84

Figure 4: Graded relation between ACE scores and sexual risk behaviors	85
Figure 5: Graded relation between ACE scores and illicit drug risk behaviors	86
Figure 6: Path modeling examining the relation between ACE scores and sexual risk behaviors as mediated by Negative Attitudes toward Authority	87

Tables

Table 1: Participant characteristics	88
Table 2: Descriptive data	89
Table 3: Correlations between observed variables and control variables	90
Table 4: Differences between observed variables based on gender	91
Table 5: Differences between observed variables based on Race	92
Table 6: Unstandardized, standardized, and significance levels for HRB measurement model and CCS measurement model	93
Table 7: Unstandardized coefficients, standardized coefficients, and significance levels for total ACE scores predicting HRBs	94
Table 8: Unstandardized coefficients, standardized coefficients, and significance levels for total ACE scores predicting HRBs by gender	95
Table 9: Unstandardized coefficients, standardized coefficients, and significance levels for individual ACE scores and parental incarceration predicting HRBs	96

Table 10: Unstandardized coefficients, standardized coefficients, and significance levels for the ACE abuse category predicting HRBs by Gender	97
Table 11: Unstandardized coefficients, standardized coefficients, and significance levels for the household challenges category of the ACE questionnaire predicting sexual risk behaviors	98
Table 12: Independent samples T-test for specific HRBs based on parental incarceration	99
Table 13: Correlations between observed variables and control variables for males	100
Table 14: Correlations between observed variables and control variables for females	101
Table 15: Unstandardized, Standardized, and significance levels for path analysis including total ACE scores, Negative Attitudes toward Authority (CCS), and Sexual Risk Behavior	102
Appendices	103
Appendix A: Demographic and parental incarceration	103
Appendix B: Criminogenic Cognitions Scale	104
Appendix C: Barratt Simplified Measure of Social Status	105
Appendix D: Youth Risk Behavior Survey	106
Appendix E: Adverse Childhood Experiences Questionnaire	113
Appendix F: Delay Discounting Task	115
Appendix G: Tower of Hanoi	116

ACKNOWLEDGEMENTS

I am especially grateful for my advisor, Danielle Dallaire, who shared her knowledge and support with me throughout this endeavor. With her guidance, I have developed new interests, which have flourished over these two years and to which I intend to pursue throughout my career.

I would like to express my gratitude to my committee members, Drs. Lee Kirkpatrick and Liz Raposa, whose willingness to provide feedback and insight throughout the project made the process smoother and more successful.

Lastly, I would like to thank all of the students who worked on this project, without whom, this study would not have been possible. It was a pleasure to work with you all and I am grateful for all of your support.

Adverse Childhood Experiences and Health Risk Behaviors among College Students

The present study assessed whether cognitive impairments account for the relation between adverse childhood experiences (ACEs) and health risk behaviors (HRBs) among college students. Previous research has demonstrated an association between ACEs and an increased likelihood of engaging in tobacco, alcohol, illicit drug use, and sexual risk behaviors (e.g., multiple partners, not using protection). These behaviors often serve as coping mechanisms for the social, emotional, and cognitive impairments arising from ACEs. Although early life experiences may increase the likelihood of HRBs, normal developmental patterns may have a similar effect. The delayed maturation of the prefrontal cortex leaves adolescents and young adults in a state of diminished inhibitory control, which results in increased reward seeking behaviors (e.g., alcohol use, risky sexual behaviors). These behaviors may be perpetuated by a set of beliefs, referred to as criminogenic cognitions that distort and rationalize delinquent behavior. Therefore, this study examined whether impairment to executive functioning (i.e., degree of impulsivity, and planning) and cognitive processes (i.e., criminogenic cognitions) mediated the relation between ACEs and HRBs among college students.

HRBs including alcohol, tobacco, illicit drug use, and sexual risk behaviors are widespread among college students. Data from the National Longitudinal Study of Adolescent to Adult Health (Add Health Study) compared binge drinking patterns among full-time enrolled college students and non-enrolled college

students and revealed that college students were at a higher risk for weekly binge drinking (19% versus 14%; Reckdenwald, Ford, & Murray, 2016). Binge drinking estimates in college students range from 23.1% to 42.0% (Schorling, Gutgesell, Klas, Smith, & Keller, 1994; Wechsler, Davenport, Dowdall, Moeykens, & Castillo, 1994). In a sample of 164 college students, students reported binge drinking on an average of 4.52 days out of the past 30 days (Bylund, Imes Ma, & Baxter, 2008). In this same sample, students also reported smoking at least one cigarette on an average of 5.51 days in the past 30 days. Data from Wave III of the Add Health Study revealed that 29.5% of participants reported using cigarettes in the past 30 days (Kaufman, Land, Parascandola, Augustson, & Backinger, 2015).

Illicit drug use is also common among college students. Data from 3,374 undergraduates revealed that marijuana is the most frequently used illicit drug with 26.0% of students using it in the past year, whereas 3.5% reported using cocaine and 4.4% reported using LSD (Schorling et al., 1994). A second study across 11 universities with 8,141 participants found that lifetime marijuana usage ranged from 42.5% to 63.6% ($M = 53.3\%$) and prevalence of marijuana use in the past month ranged from 15.5% to 38.7% ($M = 26.2\%$) (Pearson, Liese, & Dvorak, 2017). In addition to alcohol, tobacco, and illicit drug use patterns among college students, sexual risk behaviors are also prevalent. Bylund and colleagues (2008) reported that college students engaged in sexual intercourse on an average of 4.86 days in the past month, and only 46% used a condom; however, 95% reported using contraception.

HRBs among college students are a growing public health concern due to both the immediate and long-term negative consequences. Data from the College Alcohol Study revealed that 47% of binge drinkers experienced five or more alcohol-related problems since the start of the school year (Wechsler et al., 1994). These problems included doing something they regret, missing class, forgetting where they are or what they did, engaging in unplanned sexual activity, falling behind in course work, getting hurt or injured, and getting into trouble with campus or local police. Similarly, marijuana users reported an average of eight marijuana-related problems in the past 30 days, including driving while high, saying or doing something embarrassing, feeling in a fog or tired until the next morning, having unprotected sex, engaging in disruptive behavior, and injuring someone else (Pearson et al., 2017). A range of medical consequences have also been associated with substance use, including cardiac arrhythmias, stroke, heart attack, kidney damage, lung cancer, and memory, cognitive, and motor impairment (Khalsa, Treisman, McCance-Katz, & Tedaldi, 2008). Similarly, sexual risk behaviors can also have negative consequences for young adults. Early sexual initiation has been associated with having two or more partners in the past year and being diagnosed with a sexually transmitted infection in the past year (Kugler, Vasilenko, Butera, & Coffman, 2015).

Reducing negative outcomes among college students requires a better understanding of factors associated with involvement in HRBs. The current review of the literature will present factors contributing to college students' engagement in HRBs, including ACEs, executive functioning, and cognitive

processes. Although prior research has already assessed whether these factors increase individuals' likelihood for engaging in HRBs, it is still yet to be determined whether cognitive impairments account for the relation between ACEs and HRBs. The present study assessed the strength of each of the ten ACE items identified by Dube and colleagues (2003) in predicting college students' involvement in HRBs, and examined whether executive functioning and cognitive processes mediated the relation between ACEs and HRBs in college students.

Contemporary Developmental Systems Models for Human Development

One approach to better understand the relation between ACEs and HRBs includes a developmental and individual-social context approach. These theories incorporate both characteristics of the individual and their interactions with their social and cultural environments (Lerner & Castellino, 2002). Developmental change occurs across multiple levels of a system, including biological and psychological characteristics of the individual, social contexts (e.g., families, peer groups), and sociocultural contexts (e.g., educational and public policy institutions). Therefore, these theoretical models require an inter-level approach, which are based on the idea that outcomes at one level are shaped by interactions at another level. For example, the degree of social support an individual receives from family or friends after an anxiety-invoking event influences whether that individual will develop a psychological issue such as depression.

Bronfenbrenner's ecological model provides one such inter-level approach

by focusing on the interactions between the individual and their immediate social and cultural environment (Bronfenbrenner, 1994). This model centers around two propositions: first, human development occurs via a reciprocal interaction between an individual and proximal processes (i.e., persons, objects, symbols) in the environment; second, proximal processes vary as a function of both the characteristics of the developing individual and the characteristics of the environment (Bronfenbrenner, 1994). Bronfenbrenner (1994) discusses a longitudinal study conducted by Drillien (1963) to exemplify this model. In Drillien's study, a healthy mother-child interaction was the strongest predictor of reduced behavioral disturbance in children; however, the strength of this predictor varied as a function of children's birth weight. These findings corroborate Bronfenbrenner's ecological model and demonstrate how characteristics of the individual (e.g., birth weight) and interactions with the immediate environment (e.g., mother-child interaction) influence development.

Based on an individual-social context approach, this study sought to disentangle the relation between ACEs and HRBs. ACEs are negative events occurring within the first 18 years of an individual's life that result in disrupted neurodevelopment leading to social, emotional, and cognitive impairments. This study specifically examined cognitive impairments (i.e., individual characteristics) and whether these impairments accounted for the relation between ACEs (i.e., interactions with the immediate environment) and HRBs (i.e., developmental outcomes).

Adverse Childhood Experiences

ACEs include abuse (physical, emotional, or sexual), household challenges (mother treated violently, household substance abuse, mental illness in household, parental separation or divorce, and criminal household member), and neglect (physical or emotional; Dube et al., 2003; Felitti et al., 1998). As represented in the ACE pyramid (see Figure 1), ACEs result in disrupted neurodevelopment leading to social, emotional, and cognitive impairments (Felitti et al., 1998). These impairments cause various psychological issues such as anxiety, depression, and difficulty forming social ties. Individuals adopt HRBs such as drug use, tobacco use, and risky sexual behaviors to help cope with the stress induced by the adverse experience. These harmful coping mechanisms have been proposed as the underlying link between ACEs and later disease. For example, smoking may provide immediate relief to individuals battling depression; however, when smoking becomes a chronic behavior, it eventually leads to more serious complications such as emphysema, cardiovascular disease, and malignancy (Felitti et al., 1998).

The negative outcomes associated with ACEs are concerning given the prevalence of ACEs within the general population. Over half of respondents (52.1%) from the original ACE study reported experiencing at least one ACE (Felitti et al., 1998); however, a follow-up study revealed that over 65% of the sample had experienced at least one ACE (Dube et al., 2003; Dube et al., 2006). Additionally, the prevalence of ACEs differs by gender with females reporting a greater a number of ACEs than males (Campbell, Walker, & Egede, 2016).

Although fewer individuals report higher ACE scores (e.g., four or more; Dube et al., 2003; Felitti et al., 1998), experiencing one ACE substantially increases individuals' likelihood of experiencing another. For example, an individual who has one ACE is 78% to 98% more likely to have a second ACE and 58% to 90% more likely to have a third ACE (Dube et al., 2003). Unfortunately, the relation between ACEs and negative outcomes is graded: the likelihood of experiencing negative health outcomes or engaging in HRBs increases as the number of ACEs increase (Dube et al., 2003; Felitti et al., 1998).

Due to this co-occurrence, individuals exposed to at least one ACE are more likely to be exposed to another ACE; therefore, they are at a higher risk for negative health outcomes and HRBs. For example, Felitti and colleagues (1998) revealed that individuals experiencing four or more ACEs had a 4- to 12-fold increased risk for alcoholism, drug abuse, depression and suicide; a 2- to 4-fold increased likelihood to smoke, rate their health as poor, have 50 or more sexual partners and have sexually transmitted diseases; and a 1.4- to 1.6-fold increased risk for physical inactivity and severe obesity. In a sample of 8,613 men and women recruited from the Kaiser Health Plan, those receiving an ACE score of 5 or higher were 7- to 10-fold more likely to report illicit drug use problems, addiction to illicit drugs, and parenteral drug use than those reporting zero ACEs (Dube et al., 2003). Each ACE was associated with a 2- to 4-fold increase in early drug initiation (younger than 14-years-old). In a similar sample of men and women recruited from the Kaiser Health Plan ($N = 8,417$), individuals receiving an ACE score of four or more were three times more likely to report ever using

alcohol in comparison to those reporting zero ACEs (Dube et al., 2006). Although each individual ACE was associated with an increased likelihood of early alcohol use initiation (younger than 14-years-old) except for physical neglect, individual ACEs varied in the strength of their effect on alcohol use initiation. For example, incarceration of a household member was associated with a 3-fold increased risk of early alcohol use initiation, but having a battered mother was associated with a 2-fold increased risk of early alcohol use initiation. This finding is consistent with Campbell and colleagues (2016) who demonstrate that individual ACEs differ in their associations with negative health outcomes and HRBs.

Adverse childhood experiences: Abuse. Dube and colleagues (2003) revealed that physical abuse was the second most commonly reported ACE with 26.4% of the sample reporting exposure to physical abuse. In comparison, Felitti and colleagues (1989) observed a 10.8% rate of physical abuse within their sample. Physical abuse has been associated with an increased odds of being diagnosed with depression (adjusted odds ratio, AOR = 1.36), having a disability as a result of poor health (AOR = 1.48), and having to use special equipment due to a disability (AOR = 1.37; Campbell et al., 2016). Data from 2,051 respondents from the Wisconsin Longitudinal Study (WLS) corroborate the findings of Campbell and colleagues (2016). Participants who reported parental physical abuse during childhood were more likely to report symptoms of depression, anxiety, and anger in addition to reporting more medical diagnoses and physical health symptoms (Springer, Sheridan, Kuo, & Carnes, 2007). Mullen, Martin, Anderson, Romans, and Herbison (1996) also demonstrated greater mental

health problems among respondents reporting physical abuse. Participants were more likely to be identified as having symptoms consistent with that of a clinical diagnosis for psychopathology based on the Present State Exam (Cooper, Sartorius, & Wing, 1974), to have attempted suicide, and to have had an eating disorder and/or depressive illness. A systematic review and meta-analysis including 124 studies further support these findings (Norman et al., 2012). Individuals physically abused during childhood had a higher risk of developing depressive and anxiety disorders, suicidal behavior, having childhood behavioral and conduct disorders, engaging in problem drinking (i.e., alcohol abuse/dependence, binge drinking), smoking, having sexually transmitted infections, engaging in risky sexual behavior, and obesity. A moderate effect on limbic irritability (i.e., paroxysmal somatic disturbances such as brief hallucinatory events) and depression have also been demonstrated in physically abused individuals (Teicher, Samson, Polcari, & McGreenery, 2006).

Previous research has observed similar rates of sexual abuse within the general population with two studies reporting rates of 21.0% and 22.0% (Dube et al., 2003 and Felitti et al., 1989, respectively). Exposure to sexual abuse has been associated with increased odds of being diagnosed with depression (AOR = 1.80) and diabetes (AOR = 1.45), having a disability as a result of poor health (AOR = 1.34), obesity (AOR = 1.59), smoking (AOR = 1.26), and risky HIV behavior (AOR = 2.03; Campbell et al., 2016). Results from the National Comorbidity Survey support these findings and revealed associations between childhood sexual abuse and onset of 14 mood, anxiety, and substance use

disorders even after controlling for exposure to other childhood adversities (Molnar, Buka, & Kessler, 2001). Molnar and colleagues (2001) further demonstrate that the odds of having depression and substance use problems increase in individuals reporting childhood sexual abuse but no other childhood adversities. Mullen and colleagues (1996) similarly reported an association between childhood sexual abuse and poorer mental health. For example, individuals exposed to sexual abuse were more likely to be identified as having symptoms consistent with that of a clinical diagnosis for psychopathology based on the Present State Examination (Cooper, Sartorius, & Wing, 1974), to have a history of eating disorders and depression, to have attempted suicide, to have spent time in a psychiatric hospital, to drink at hazardous levels, to report sexual problems, and to marry and have their first pregnancy prior to age 19. Furthermore, in a study of 1,942 individuals from the Virginia Twin Registry, twins reporting childhood sexual abuse were more likely to be diagnosed with alcohol dependence, drug dependence, panic disorder, general anxiety disorder, and major depression in comparison to their non-abused twin (Kendler et al., 2000). Lastly, childhood sexual abuse has also been demonstrated to have a moderate effect on limbic irritability, anxiety, anger-hostility, and a large effect on depression (Teicher et al., 2006).

Rates of emotional or psychological abuse have also been consistent with studies reporting rates of 10.2% and 11.1% (Dube et al., 2003 and Felitti et al., 1989, respectively). Campbell and colleagues (2016) revealed that verbal abuse is associated with increased odds of being diagnosed with depression (AOR =

1.64) and diabetes (AOR = 1.22), having a disability as a result of poor health (AOR = 1.35), smoking (AOR = 1.22), and binge drinking (AOR = 1.29). In contrast, Johnson and colleagues (2001) reported that childhood verbal abuse was not associated with an increased risk for anxiety, depressive, or substance use disorders during late adolescence and early adulthood; however, verbal abuse was associated with various disruptive disorders and personality disorders, including borderline, narcissistic, paranoid, schizoid, and schizotypal. Furthermore, childhood verbal abuse has demonstrated moderate effects on limbic irritability, dissociation, depression, and anger-hostility (Teicher et al., 2006).

Adverse childhood experiences: Household challenges. Prevalence rates of household challenges have been consistent across previous studies. Substance abuse has been revealed as the most prevalent of all ACEs (28.2% and 25.6%; Dube et al., 2003; Felitti et al., 1989, respectively). Mental illness was the next most prevalent household challenge (20.3% and 18.8%; Dube et al., 2003 and Felitti et al., 1989, respectively), followed by mother treated violently (13.0% and 12.5%; Dube et al., 2003 and Felitti et al., 1989, respectively), then incarceration of a household member (6.0% and 3.4%; Dube et al., 2003 and Felitti et al., 1989, respectively). Dube and colleagues (2003) also reported a 24.1% rate of parental separation or divorce.

Despite household challenges having some of the most frequently reported ACEs, the differential effects have not been widely studied. Campbell and colleagues (2016) reported that household mental illness was associated

with increased odds of being diagnosed with depression (AOR = 2.78), having a disability due to poor health (AOR = 1.64), and obesity (AOR = 0.87). Substance abuse has also been associated with increased odds of being diagnosed with depression (AOR = 1.23), having a disability due to poor health (AOR = 1.22), and smoking (AOR = 1.38). Parental separation or divorce was associated with increased odds of being diagnosed with depression (AOR = 0.80), smoking (AOR = 1.52, respectively), and coronary heart disease (AOR = 0.72). Witnessing violence among adults in the household was associated with a 0.76 increase in the likelihood of being diagnosed with diabetes. Lastly, incarceration of a household member was also associated with an increase in the likelihood of being diagnosed with depression (AOR = 1.32), myocardial infarction (AOR = 1.85), and risky HIV behavior (AOR = 2.21).

Despite the overall paucity of literature focusing on differential effects of household challenges, parental incarceration has become a burgeoning conversation. Data from the Add Health study revealed that parental incarceration is associated with drug use and risky sexual behaviors. Individuals who reported experiencing parental incarceration during childhood had greater odds of using marijuana during adolescence (grades 7 – 12; OR = 1.87), emerging adulthood (18 – 26 years old; OR = 1.31), and adulthood (24 – 32 years old; OR = 1.52) (Khan, McGorray, Scheidell, Vaddiparti, & Brotman, 2015). Kopak and Smith-Ruiz (2015) similarly assessed drug use among a sample of African American offspring (mean age = 28) who had neither parent incarcerated, both parents incarcerated, mother only incarcerated, and father only

incarcerated. Offspring affected by maternal incarceration were the most likely to engage in lifetime marijuana use, lifetime cocaine use, and lifetime use of other drugs (i.e., methamphetamine, LSD, mushrooms, heroin, ecstasy, PCP, inhalants). Furthermore, age of marijuana use onset was latest for individuals who were not affected by parental incarceration. Roettger, Swisher, Kuhl, and Chavez (2011) also revealed a higher initial frequency of marijuana use among offspring of fathers who had been incarcerated, and these elevated use levels continued into young adulthood. These results demonstrate an altered age trajectory for marijuana use among individuals affected by paternal incarceration with use peaking at age 24 rather than the typical marijuana use peak ages of 20 and 21, for females and males respectively. In regard to risky sexual behaviors, individuals who reported experiencing parental incarceration during childhood had greater odds of having multiple sex partners during adolescence (OR = 1.40), and adulthood (OR = 1.20) (Khan et al., 2015). There was also an increased risk of contracting a sexually transmitted infection during emerging adulthood (OR = 1.42) and adulthood (OR = 1.76) among individuals who had been affected by parental incarceration.

Adverse childhood experiences: Neglect. Dube and colleagues reported a 14.8% rate of emotional neglect and a 9.9% rate of physical neglect. Neglect has also been associated with specific mental and physical health outcomes. In Norman and colleagues' (2012) systematic review and meta-analysis, neglected individuals were at a higher risk of developing depression, having an anxiety disorder, suicidal behavior, having childhood behavioral and

conduct disorders, engaging in problem drinking, having sexually transmitted infections, and engaging in risky sexual behavior. Despite these findings, the literature focusing on the effects of childhood exposure to neglect is limited. Furthermore, the neglect ACE categories were not included in Campbell and colleagues' (2016) study.

Adverse childhood experiences among college students. As noted by Karatekin and Ahluwalia (2016), there is a dearth of research focusing on the prevalence of ACEs among college students and the impact that ACEs have on college students' well-being. Three studies have assessed the prevalence of ACEs among college students. These studies report that 21% to 37% of students reported one ACE, 14% to 34% reported two ACEs, 9% to 19% reported three ACEs, and 11% to 13% reported four or more ACEs (Boynton Health Service, 2015; McGavock & Spratt, 2014; Smyth, Hockemeyer, Heron, Wonderlich, & Pennebaker, 2008). Karatekin and Ahluwalia (2016) also assessed the prevalence of ACEs among college students; however, the authors edited the Juvenile Victimization Questionnaire (JVC; Finkelhor, Shattuck, Turner, & Hamby, 2013) to include the original ACE questionnaire (Felitti et al., 1998) and edited the wording to be appropriate for adults. The revised 33-item instrument was administered to 321 college students who reported an average of 4.7 ACEs (out of 33; Karatekin & Ahluwalia, 2016). Karatekin and Ahluwalia (2016) further demonstrated the impact that ACEs have on college students' well-being and revealed that higher ACE scores were associated with higher stress and lower social support scores. Additionally, higher ACE scores were also associated with

worse mental health scores even after controlling for stress and social support, as similarly demonstrated in non-college samples (Campbell et al., 2016; Felitti et al., 1998). In a sample of 216 college students, early adversity was associated with higher reports of cigarette smoking and risky sexual behaviors, but not drug use, at the beginning of students' first semester (Filipkowski, Heron, & Smyth, 2016); However, when assessing changes over the course of the first semester, prior adversity was associated with greater increases in drug use.

More broadly, previous research has also focused on the effect that childhood maltreatment and victimization has on college students' psychological health. In a sample of 2,637 college students, emotional abuse was the strongest maltreatment type predictor for anxiety, depression, and emotion regulation (Berzenski & Yates, 2011); however, a combination of maltreatment types (i.e., physical and emotional abuse) was the strongest predictor of dating violence, substance use, and risky sexual behaviors. Wright, Crawford, and Castillo (2009) similarly demonstrated in a sample of 301 college students that childhood emotional abuse and emotional neglect were associated with anxiety and depression, even after controlling for gender, income, parental alcoholism, and other childhood abuse experiences. In a sample of 321 college females who reported an average of 7.8 victimizations (out of 34), poly-victimization (i.e., experiencing more than one victimization) accounted for a significant proportion of psychological distress variance (ranging from .02 to .07) beyond what could be accounted for by any single variable included in either the Symptom Checklist 90-Revised (SCL-90-R; Derogatis, 1994) or the Inventory of Altered Self-

Capacities (IASC; Briere, 1998) (Richmond, Elliott, Pierce, Aspelmeier, & Alexander, 2009). In a similar sample of 321 college females with an average of 8.7 victimizations (out of 34), Elliott, Alexander, Pierce, and Richmond (2009) observed that poly-victimization accounted for 2% to 22% of the variance for college adjustment, beyond what could be accounted for by the College Adjustment Scale (CAS; Anton & Reed, 1991) and the Student Adaptation to College Questionnaire (SACQ; Baker & Siryk, 1999). Childhood abuse has also been demonstrated to influence dating violence outcomes among college students. In a sample of 2,541 college students, childhood abuse was associated with a 43% increase in the likelihood for perpetrating physical violence and a 35% increase in the likelihood of perpetrating psychological abuse (Gover, Kaukinen, & Fox, 2008). Furthermore, students who reported childhood abuse had a 51% increase in the likelihood of being a victim of physical violence and a 31% increase in the likelihood of being a victim of psychological abuse.

Previous research has demonstrated both the prevalence of ACEs as well as the HRBs and health consequences resulting from ACEs (Felitti et al., 1998); however, few studies have differentiated between the strength of each individual ACE as a predictor for negative outcomes. Additionally, there is a paucity of literature focusing on negative outcomes among college samples that are associated with ACEs (Karatekin & Ahluwalia, 2016). Consequently, this study sought to expand the current knowledge related to the differential strength of each individual ACE as a predictor for HRBs. This study also provides additional literature for negative outcomes during college that are associated with ACEs.

Furthermore, Dube and colleagues (2004; 2006) revealed that household criminality was the second strongest predictor of early drug use initiation and the strongest predictor of early alcohol use initiation. Therefore, this study will attempt to determine if the strength of household criminality varies based on which member of the household was incarcerated, specifically maternal incarceration versus paternal incarceration, or both maternal and paternal incarceration. Lastly, this study sought to determine whether cognitive processes mediate the relation between ACEs and HRBs among college students.

Executive Functioning

According to Bronfenbrenner's ecological model, developmental outcomes do not solely result from an individual's immediate environment or their own personal characteristics, but rather the interaction between their individual characteristics and their immediate environment. One such individual characteristic that has demonstrated associations with HRBs is executive functioning, which is driven by natural developmental patterns within the brain. The human brain does not reach full maturity until around 25 years of age with the last region to develop being the prefrontal cortex, the center of impulse control, planning, and decision-making (i.e., cognitive control system; Burke, 2011; Steinberg, 2009). In contrast to the prefrontal cortex, the socioemotional system of the brain undergoes a surge in dopaminergic activity during puberty resulting in increased sensation seeking behaviors. The imbalance between the development of the cognitive control system and socioemotional system is referred to as a dual-systems model, which results in a heightened vulnerability

to engaging in HRBs due to an inability to control impulsive drives (Casey, Jones, & Somerville, 2011; Doremus-Fitzwater, Varlinskaya, & Spear, 2010; Harden & Tucker-Drob, 2011; Paus, 2005; Romer, Duckworth, Sznitman, & Park, 2011; Steinberg, 2009; Steinberg, 2010; Steinberg et al., 2008).

In support of the dual systems model, impulsivity and sensation seeking have demonstrated only a modest correlation ($r = .21$) and are further driven by differing psychological factors (i.e., cognition, motivation, affect) requiring independent assessments (Harden & Tucker-Drob, 2011; Steinberg, 2010). Steinberg (2010) corroborated the dual systems model by demonstrating that impulsivity and sensation seeking are indexed by separate behavioral tasks. For example, self-reported impulsivity predicts planning and executive functioning, as measured by the average time to first move when completing the Tower of London. In comparison, self-reported sensation seeking predicts reward-seeking behaviors, as measured by selecting cards from the advantageous decks when completing the Iowa Gambling Task. Although impulsivity and sensation seeking develop independently, the functional connection between the cognitive control system and socioemotional system reveals a need to understand how the interaction between longitudinal changes in impulsivity and sensation seeking influence involvement in HRBs (Harden & Tucker-Drob, 2011).

A curvilinear developmental pattern has been observed for sensation seeking behaviors. These behaviors increase between early and middle adolescence and decrease between late adolescence and adulthood (Harden & Tucker-Drob, 2011; Romer et al., 2011; Steinberg, 2010). In contrast, impulsivity

demonstrates a gradual decline throughout adolescence and into early adulthood. Thus impulse control improves as adolescents become older. Findings reveal a maturation of impulse control capabilities around the mid-20s, when declines in impulsivity begin to level off (Harden & Tucker-Drob, 2011).

The gradual decrease in impulsivity has been observed across several studies with participants ranging in age from early adolescence to middle adulthood, including 7 to 29 years old, 14 to 22 years old, and 10 to 30 years old, (respectively, Galvan, Hare, Voss, Glover, & Casey, 2007; Leshem & Glicksohn, 2007; Steinberg, 2010). For example, in a sample of individuals between 10 and 30 years old, older participants waited longer before making their first move when completing the Tower of London, thus indicating greater planning capabilities (Steinberg, 2010). Consequently, as adolescents and young adults transition into adulthood, their executive functioning will mature, resulting in a decrease in the likelihood of engaging in HRBs (Harden & Tucker-Drob, 2011). Additionally, gender differences have been demonstrated in degree of impulsivity with males exhibiting greater impulsivity than females (Stanford, Greve, Boudreaux, Mathias, & Brumbelow, 1996).

Involvement in health risk behaviors. Both impulsivity and sensation seeking have been associated with involvement in HRBs. For example, a longitudinal study including 357 adolescents between 10 and 17 years of age revealed that impulsivity predicts substance use: impulsivity scores at Wave 2 were positively related to substance use at Wave 3 (two years later; Farley & Kim-Spoon, 2015). High impulsivity scores among high school and college

students have also been associated with a higher likelihood of engaging in risky behaviors, including fighting, drug use, drunk driving, and not wearing a seatbelt (Stanford et al., 1996). Furthermore, in a study assessing differences in HRBs between young adults (17 to 20 years of age) and adults (31 to 61 years of age) based on responses to the Stoplight task (a risky decision-making task), revealed that riskier decision-making was only associated with a higher frequency of substance use among the young adult sample (Kim-Spoon et al., 2016). These studies suggest that associations between HRBs and impaired cognitive control capabilities exist primarily among adolescents and young adults. Consequently, involvement in HRBs may be associated with an inability to control impulses due to an inchoate prefrontal cortex.

Similar patterns of substance use have been observed during early adolescence in regard to sensation seeking levels. Previous alcohol use and total alcohol use was assessed in a sample of 257 adolescents between 9- and 12-years-old across three time points (MacPherson, Magidson, Reynolds, Kahler, & Lejuez, 2010). Alcohol use within the past year was significantly correlated at each time point with alcohol use increasing with each consecutive assessment (27.6%, 35.1%, and 44.5% of adolescents used alcohol in the previous year at time points one, two, and three, respectively). Moreover, as sensation seeking increased at each time point, the likelihood of using alcohol also increased. MacPherson and colleagues (2010) revealed that a one standard deviation increase in sensation seeking was associated with a 1.54 odds increase in alcohol use. Consequently, individuals susceptible to emotion and reward are

more likely to engage in HRBs.

Despite the association between impulsivity, reward seeking, and HRBs, previous research has demonstrated that inhibitory control may play a moderating role between reward sensitivity and substance use. In a sample of 157 early adolescents (13 to 14 years of age), Kim-Spoon and colleagues (2016) revealed that higher levels of reward-seeking were related to earlier substance use onset; however, this was apparent only among adolescents with low inhibitory control and not adolescents with high inhibitory control. These findings suggest that with high enough inhibitory control, reward-seeking behaviors can be regulated and substance use onset can be delayed.

Cognitive Processes

Cognitive processes, a second individual characteristic associated with delinquent activity, drive and perpetuate HRBs. Although HRBs are not typically viewed as delinquent activity, these behaviors do fall under the umbrella of delinquency. For example, illicit drug use and underage consumption of alcohol are both illegal. Therefore, cognitive processes believed to encourage delinquent behaviors are the same that influence involvement in HRBs.

Cognitive processes, in terms of criminogenic cognitions, are thought to be learned techniques, including motives, rationalizations (or neutralizations), and attitudes that promote and justify delinquent behaviors (Sykes & Matza, 1957). Previously, moral reasoning has been the primary focus for the justification of delinquent behavior; however, underlying moral cognitive processes such as distortion and rationalization techniques are believed to better

explain the initiation and maintenance of delinquent behavior (Tangney, Mashek, & Stuewig, 2007; Tangney et al., 2012). These cognitive processes are referred to as criminogenic beliefs (or immoral cognitions), which are a distinct set of beliefs that rationalize and perpetuate delinquent activity (Tangney et al., 2007).

Cognitive distortions are the externalization of blame for current legal issues (Tangney et al., 2007; Tangney et al., 2012). Common cognitive distortions include beliefs such as an overzealous cop, betrayal from an associate, lack of adequate employment opportunities, and the existence of “victimless” crimes (e.g., burglary; Tangney et al., 2007). Rationalizations, on the other hand, are explanations defending a crime with claims that the crime lacked criminal intent (Sykes & Matza, 1957). These explanations are referred to as neutralization techniques because the offender is able to protect their self-image by presenting their crime as acceptable within society. There are five types of neutralization techniques: 1) the denial of responsibility (e.g., the crime was an accident or due to factors beyond the offender’s control such as unloving parents); 2) the denial of injury (e.g., the offender does not believe the crime has caused harm such as auto theft, which can be seen as borrowing); 3) the denial of the victim (e.g., the offender transforms the victim into someone deserving of the crime and sees the victim as receiving punishment such as stealing from a crooked store owner); 4) the condemnation of the condemners (e.g., the offender shifts the focus from their crime to the motives and behavior of those disapproving of the crime such as claiming that police are corrupt); and 5) the appeal to higher authorities (e.g., the offender commits a crime out of loyalty to

the smaller social group they belong to such as a gang). These cognitive processes strengthen the relation between one's moral standards and their behavior by justifying delinquent behavior and minimizing negative effects, which consequently increases the likelihood of future delinquent activity (Tangney et al., 2012). Importantly, criminogenic cognitions are believed to be dynamic and malleable to interventions; thus, other life experiences such as ACEs may also have the potential to shape these beliefs.

Current Study

This study sought to differentiate the strength of each individual ACE as a predictor for HRBs among college students, and to assess whether executive functioning and cognitive processes serve to mediate the relation between ACEs and HRBs. This study expands on the current available literature that differentiates HRBs associated with each individual ACE among a college sample. This study attempts to determine how ACEs influence college students' involvement in HRBs by assessing whether executive functioning and cognitive processes partially mediate the relation. Previous research suggests that executive functioning acts as a mediator between environmental influences and HRBs. For instance, impulsivity was observed to mediate the relation between quality of parent-adolescent relationship and risky sexual behavior such that lower levels of relationship quality were associated with higher impulsivity and consequently a greater involvement in risky sexual behaviors (Kahn, Holmes, Farley, & Kim-Spoon, 2015). Consequently, the current study attempts to demonstrate a similar relation such that executive functioning partially mediates

the relation between ACEs and involvement in HRBs, and additionally, whether similar mediation patterns can be observed for cognitive processes.

Hypotheses

Hypothesis 1: ACE scores and involvement in HRBs will illustrate a graded relation in which higher ACE scores will be associated with more HRBs. This hypothesis serves to confirm previous studies, which have demonstrated that the more ACEs an individual is exposed to, the more likely they are to experience negative health outcomes and HRBs.

Hypothesis 2: a) Individual ACEs will differ in their strength as predictors for involvement in overall HRBs; b) Parental incarceration will differ in its strength as a predictor for involvement in HRBs based on whether participants experienced maternal incarceration, paternal incarceration, or the incarceration of either their mother or father. To date only one study has assessed the strength of each individual ACE as a predictor for various HRBs, health conditions, and disability (Campbell et al., 2016). This study revealed that household substance abuse, parental separation or divorce, household criminality, verbal abuse, and sexual abuse were the strongest predictors of HRBs. However, this study did not include the two neglect-related ACE items. Similarly, when assessing alcohol use initiation, Dube and colleagues (2006) demonstrated that household criminality was the strongest predictor, but there was no follow up to determine whether the strength of this predictor varied based on which member of the household was incarcerated. Consequently, this study attempts to add to the existing literature differentiating between each

individual ACE as a predictor of HRBs among college students and further delineate if household criminality varies based on which member of the family was incarcerated.

Hypothesis 3: a) Executive functioning and cognitive processes will mediate the relation between ACE scores and overall HRBs; b) Executive functioning and cognitive processes will mediate the relation between parental incarceration and overall HRBs. Both executive functioning and cognitive processes have been demonstrated to play key roles in young adults' involvement in HRBs. Consequently, this study proposes that impairments in executive functioning and cognitive processes can explain the relation between ACE scores and HRBs in young adults. Additionally, previous research has demonstrated that inhibitory control serves as a mediator between adolescent's environment (specifically, parent-adolescent relationship quality) and adolescent involvement in HRBs. Therefore, this study proposed that a similar relation can be demonstrated between ACEs and HRBs, in which executive functioning and cognitive processes serve as mediators.

Method

Participants

Participants included 144 undergraduate college students between 18 and 22 years of age. All participants were recruited from the Psychology Department participant research pool from the local college community. College students received partial course credit for their participation. College students on average were 18.92-years-old. Approximately 63.9% were white, and 56.3% were female.

The mean social status was 54.40 (on a scale from 8 to 66 with higher scores indicating higher social status; Barratt, 2006). Thirteen (9.0%) reported that either their mother ($N = 3$, 2.1%) or father ($N = 10$, 6.9%) had been incarcerated at some point during their life. The average number of ACEs reported was 0.78 (range: 0-6). Additional participant characteristics are provided in Table 1.

Measures

Participants self-reported their demographic data, including age, gender, race, social status, and parental incarceration history.

Barratt Simplified Measure of Social Status (BSMSS; Barratt, 2006).

The BSMSS is a questionnaire providing a measure of social status that is scored based on the Hollingshead Four Factor Index of Social Status (Hollingshead, 1975). The total social status score is calculated based on parental, spouse, and participant education and occupation. Participants select from seven education choices (ranging from 1 = *less than 7th grade* to 7 = *graduate degree*) and from nine occupation categories (ranging from 1 = *day laborer* to 9 = *higher level executive/professional*). When calculating social status scores for full-time students, the student is removed from the equation and scores are calculated based on their responses for their parents. The total education score is calculated by multiplying each parent's education scale value by a weight of 3 and then averaging the weighted scores of both parents' education. However, if the participant grew up in a single parent household, only the weighted score of the parent they grew up with is included. Total education scores range from 3 to 21. The total occupation score is calculated by multiplying

each parent's occupation scale value by a weight of 5 and then averaging the weighted scores of both parents' occupation unless the participant grew up in a single parent household, in which case only the score of the parent they grew up with is used. Total occupation scores range from 5 to 45. A total social status score is calculated by adding the total education score to the total occupation score. Total social status scores range from 8 to 66 with higher scores indicating higher social status.

Scoring based on the Hollingshead Four Factor Index of Social Status has demonstrated substantial inter-rater reliability ($\kappa = .68$) and moderate inter-measure concordance with the Nakeo and Treas (1992), and the Blishen, Carroll, and Moore (1987) measures of socioeconomic status ($\kappa = .59$ and $\kappa = .54$, respectively; Cirino et al., 2002). Further, Cirino and colleagues (2002) provide preliminary support for the validity of the Hollingshead Four Factor Index of Social Status using the well-known relation between socioeconomic status, intelligence, and academic achievement. Significant correlations have been demonstrated between the Hollingshead Four Factor Index of Social Status and the Kaufman Brief Intelligence Test (K-BIT) composite intelligence quotient score ($r = .43$), the Woodcock Reading Mastery Test – Revised (WRMT-R) total reading score ($r = .27$), the Wide Range Achievement Test-3 (WRAT-3) Spelling subtest ($r = .17$), and the WRAT-3 Arithmetic subtest ($r = .17$). The Hollingshead Four Factor Index of Social Status has been previously used in college samples (Mospens, 2008; Senices, 2006).

Criminogenic Cognitions Scale (CCS; Tangney et al., 2012). The CCS

consists of 25-items assessing individuals' propensity to engage in future criminal behavior based on their current thinking. Respondents rated their level of agreement with each statement on a 4-point Likert scale (1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Agree*, 4 = *Strongly Agree*). Three items also have the option of "Not Applicable;" these items are only applicable to participants who have engaged in criminal behavior (e.g., "Even though I got caught, it was still worth the risk."). The CCS includes a composite score that averages all 25-items, and has five domains each consisting of five questions, including *Short Term Orientation* (e.g., "The future is unpredictable and there is no point planning for it."), *Notions of Entitlement* (e.g., "When I want something, I expect people to deliver."), *Failure to Accept Responsibility* (e.g., "Sometimes I cannot control myself."), *Negative Attitudes toward Authority* (e.g., "Most police officers/guards abuse their power."), and *Insensitivity to impact of Crime* (e.g., "When you commit a crime the only one affected is the victim.").

A confirmatory factor analysis was conducted to determine whether a latent construct could be used for the CCS in the structural equation models (see Figure 2). The CCS measurement model revealed a good model fit between the five CCS subscales (Short Term Orientation, Notions of Entitlement, Failure to Accept Responsibility, Negative Attitudes Toward Authority, and Insensitivity to Impact of Crime), $\chi^2(5) = 2.401$, $p = .791$; Tucker–Lewis index (TLI) = 2.460, comparative fit index (CFI) = 1.000, root mean square error of approximation (RMSEA) = .000; RMSEA 90% CI [.000, .075]. Standardized and unstandardized parameter estimates appear in Table 6. However, due to power, the structural

equation models including the CCS did not use the latent variable construct, but rather the total CCS score.

Tangney and colleagues (2012) demonstrated good reliability of the CCS Total Score with a high internal consistency ($\alpha = .81$). The internal consistencies of each domain were also reasonable (*Short Term Orientation* $\alpha = .51$; *Notions of Entitlement* $\alpha = .61$; *Failure to Accept Responsibility* $\alpha = .56$; *Negative Attitudes toward Authority* $\alpha = .75$; *Insensitivity to Impact of Crime* $\alpha = .62$). The CCS has also demonstrated predictive validity with each score being significantly correlated with predictors of recidivism, including previous criminal behavior ($r = .17$), current custody level ($r = .15$), antisocial personality disorder symptoms ($r = .29$), and psychopathy ($r = .34$; please note that Pearson r values are provided for the total CCS score). CCS scores also demonstrated concurrent validity with self-reported aggression ($r = .42$), violence potential ($r = .48$), externalization of blame ($r = .53$) and clinician-rated violence risk ($r = .35$; please note that Pearson r values are provided for the total CCS score). Although the CCS has not previously been used in college samples, the CCS has been used in a wide ranging sample of justice involved adults between 18 and 69 years of age with a mean of age of 32 (Tangney et al., 2012). The CCS demonstrated moderate internal consistency in the present study: total CCS score ($\alpha = .589$), Short Term Orientation ($\alpha = .459$), Notions of Entitlement ($\alpha = .553$), Failure to Accept Responsibility ($\alpha = .527$), Negative Attitudes toward Authority ($\alpha = .573$), and Insensitivity to Impact of Crime ($\alpha = .528$).

Youth Risky Behavior Survey (YRBS; Kolbe, Kann, & Collins, 1993).

Thirty-six items from three of the six YRBS categories that identify risk behaviors contributing to the leading causes of death, disability, and social problems among adolescents and young adults were included. Included items focused on tobacco, alcohol, marijuana, illicit drug use, and sexual risk behaviors.

Tobacco use. Seven items focused on participants' tobacco risk, including cigarettes, smokeless tobacco, and cigars. Items asked participants whether they ever tried smoking cigarettes, the age at which participants first tried smoking cigarettes, on how many days they smoked cigarettes in the past 30 days, how many cigarettes they typically smoked in a day during the past 30 days, and how many days they used smokeless tobacco or smoked cigars in the past 30 days. An example item includes, "During the past 30 days, on how many days did you smoke cigarettes?". Responses were dichotomized so that for each item participants were either at risk or not at risk. If participants were at risk, they received a "1." If participants were not at risk, they received a "0." Scores were then tallied to calculate a total tobacco risk behavior score. Scores ranged between 0 and 7 with higher scores indicating greater risk. The tobacco risk items demonstrated moderate internal consistency ($\alpha = .462$) in the present study.

Alcohol use. Five items focused on participants' alcohol risk. Items asked participants on how many days they have had at least one drink of alcohol in their life, how old they were when they had their first drink of alcohol, how many days they had at least one drink of alcohol in the past 30 days, how many days they had five or more drinks of alcohol in a row during the past 30 days, and the

largest number of drinks they had in a row during the past 30 days. An example item includes, "During the past 30 days, what is the largest number of alcoholic drinks you had in a row, that is, within a couple of hours?". Responses were dichotomized so that for each item participants were either at risk or not at risk. If participants were at risk, they received a "1." If participants were not at risk, they received a "0." Scores were then tallied to calculate a total alcohol risk behavior score. Scores ranged between 0 and 5 with higher scores indicating greater risk. The alcohol risk items demonstrated strong internal consistency ($\alpha = .862$) in the present study.

Marijuana use. Three items focused on participants' marijuana risk. Items asked participants how many times they had used marijuana during their lifetime, how old they were when they first had marijuana, and how many times they used marijuana in the past 30 days. An example item includes, "During the past 30 days, how many times did you use marijuana?". Responses were dichotomized so that for each item participants were either at risk or not at risk. If participants were at risk, they received a "1." If participants were not at risk, they received a "0." Scores were then tallied to calculate a total marijuana risk behavior score. Scores ranged between 0 and 3 with higher scores indicating greater risk. The marijuana risk items demonstrated moderate internal consistency ($\alpha = .662$) in the present study.

Illicit drug use. Ten items focused on participants' patterns of illicit drug use risk behaviors, including cocaine, inhalant, heroin, methamphetamine, ecstasy, synthetic marijuana, steroid pill or shot, and prescription drug use. Items

asked participants how many times in their life had they used each illicit drug, how many times they used a needle to inject any illicit drug into their body, and whether they had ever been offered, sold, or given an illicit drug on school property during the past year. An example item includes, "During your life, how many times have you used any form of cocaine, including powder, crack, or freebase?". Responses were dichotomized so that for each item participants were either at risk or not at risk. If participants were at risk, they received a "1." If participants were not at risk, they received a "0." Scores were then tallied to calculate a total illicit drug use risk behavior score. Scores ranged between 0 and 10 with higher scores indicating greater risk. The illicit drug use risk items demonstrated weak internal consistency ($\alpha = .042$) in the present study.

Risky sexual behaviors. Seven items focused on participants sexual risk behaviors that contribute to unintended pregnancy and sexually transmitted diseases. Items asked participants whether they had ever engaged in sexual intercourse, how old they were the first time they engaged in sexual intercourse, the number of lifetime partners they have had, the number of partners they had in the past three months, if they used alcohol or drugs the last time they had sexual intercourse, if they used a condom the last time they had sexual intercourse, and what method they used to prevent pregnancy the last time they had sexual intercourse. An example item includes, "During the past 3 months, with how many people did you have sexual intercourse?". Responses were dichotomized so that for each item participants were either at risk or not at risk. If participants were at risk, they received a "1." If participants were not at risk, they received a

“0.” Scores were then tallied to calculate a total risky sexual behavior risk score. Scores ranged between 0 and 7 with higher scores indicating greater risk. The sexual risk items demonstrated strong internal consistency ($\alpha = .832$) in the present study.

The YRBS has demonstrated substantial test-retest reliability in individuals in grades 7 through 12 (Brener, Collins, Kann, Warren, & Williams, 1995). For the 53 self-report items, kappa statistics ranged from 14.5% to 91.1% with 71.7% of the items having substantial reliability ($\kappa = 61-100\%$). Substantial test-retest reliability has also been demonstrated in a sample of 9th to 12th graders (Brener et al., 2002). Kappa statistics ranged from 23.6% to 90.5% with 47.2% of items having moderate or substantial reliability ($\kappa = > 41\%$). Brenner and colleagues (1995) further revealed that consistency scores were worse among individuals in 7th grade suggesting that the YRBS is more reliable among individuals beyond 7th grade. The YRBS has previously been used in college samples (Douglas et al., 1997; Patrick, Covin, Fulop, Calfas, & Lovato, 1997). The YRBS demonstrated strong internal consistency ($\alpha = .855$) in the present study.

An overall HRB variable was created by summing tobacco, alcohol, marijuana, illicit drug use, and sexual risk behaviors. A confirmatory factor analysis was conducted to determine whether a latent construct could be used for overall HRBs in the structural equation models (see Figure 3). The HRB measurement model revealed a good model fit between the five HRBs (tobacco, alcohol, marijuana, illicit drug use, and sexual risk behaviors), $\chi^2(5) = 8.131$, $p = .149$; TLI = .928, CFI = .976, RMSEA = .066; RMSEA 90% CI [.000, .145].

Standardized and unstandardized parameter estimates appear in Table 6.

Adverse Childhood Experiences (ACE) Questionnaire (Felitti et al., 1998). The ACE questionnaire consists of 10-items measuring the occurrence of an adverse event during an individual's first 18 years of life. The ACE questionnaire has three categories, including abuse (emotional abuse, physical abuse, sexual abuse), neglect (physical neglect, emotional neglect), and household challenges (mother treated violently, household substance abuse, mental illness in household, parental separation or divorce, and criminal household member). Responses were dichotomous (0 = No, 1 = Yes) with scores ranging from 0-10 and higher scores reflecting a greater number of ACEs.

Physical abuse. The physical abuse item consisted of the following two questions, "Did a parent or other adult in the household often or very often push, grab, slap, or throw something at you? Or, ever hit you so hard that you had marks or were injured?". Participants responded in the affirmative (1) if they answered "yes" to one or both of these questions.

Emotional abuse. The emotional abuse item consisted of the following two questions, "Did a parent or other adult in the household often or very often swear at you, insult you, put you down, or humiliate you? Or, act in a way that made you afraid that you might be physically hurt?". Participants responded in the affirmative (1) if they answered "yes" to one or both of these questions.

Sexual abuse. The sexual abuse item consisted of the following two questions, "Did an adult or person at least 5 years older than you ever touch or fondle you or have you touch their body in a sexual way? Or, attempt or actually

have oral, anal, or vaginal intercourse with you?”. Participants responded in the affirmative (1) if they answered “yes” to one or both of these questions.

Physical neglect. The physical neglect item consisted of the following two questions, “Did you often or very often feel that you didn’t have enough to eat, had to wear dirty clothes, and had no one to protect you? Or, your parents were too drunk or high to take care of you or take you to the doctor if you needed it?”. Participants responded in the affirmative (1) if they answered “yes” to one or both of these questions.

Emotional neglect. The emotional neglect item consisted of the following two questions, “Did you often or very often feel that no one in your family loved you or thought you were important or special? Or, your family didn’t look out for each other, feel close to each other, or support each other?”. Participants responded in the affirmative (1) if they answered “yes” to one or both of these questions.

Mother treated violently. Mother treated violently consisted of the following three questions, “Was your mother or stepmother often or very often pushed, grabbed, slapped, or had something thrown at her? Or, sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something hard? Or, ever repeatedly hit over at least a few minutes or threatened with a gun or knife?”. Participants responded in the affirmative (1) if they answered “yes” to at least one of these three questions.

Household substance abuse. Household substance abuse consisted of the following question, “Did you live with anyone who was a problem drinker or

alcoholic, or who used street drugs?”. Participants responded in the affirmative (1) if they answered “yes.”

Household mental illness. Household mental illness consisted of the following question, “Was a household member depressed or mentally ill, or did a household member attempt suicide?”. Participants responded in the affirmative (1) if they answered “yes.”

Parental separation or divorce. Parental separation or divorce consisted of the following question, “Were your parents ever separated or divorced?”. Participants responded in the affirmative (1) if they answered “yes.”

Household criminality. Household criminality consisted of the following question, “Did a household member go to prison?”. Participants responded in the affirmative (1) if they answered “yes.”

The ACE questionnaire has demonstrated good reliability with reports demonstrating strong internal consistency ($\alpha = .88$; Murphy et al., 2014). Additionally, reports have demonstrated good test-retest reliability with kappa coefficients for each ACE item ranging from .41 to .86 (Dube, Williamson, Thompson, Felitti, & Anda, 2004). Murphy and colleagues (2014) have also demonstrated evidence suggesting concurrent validity of the ACE questionnaire with the Adult Attachment Interview (AAI) such that as ACE scores increase the prevalence of respondents classified as unresolved or discordant on the AAI also increases. The ACE questionnaire has been previously administered among college samples (Boynton Health Service, 2015; McGavock & Spratt, 2014; Smyth, Hockemeyer, Heron, Wonderlich, & Pennebaker, 2008). The ACE

questionnaire demonstrated moderate internal consistency ($\alpha = .626$) in the present study.

Delay Discounting Task (DDT; Kirby, Petry, & Bickel, 1999). The DDT is a 27-item money-choice task that measures impulsivity. Participants are asked to choose between a smaller reward (ranging between \$11 and \$80) available immediately, or a larger reward (ranging between \$25 and \$85) available after a pre-determined amount of time (ranging from one week to six months; e.g., “Would you rather \$55 today, or \$75 after 61 days?”). Estimates of participants’ discounting-rate parameters (k) were calculated based on Kirby and colleagues (1999) study by using participants’ pattern of choices on the DDT and the indifference point between two reward choices. Higher discounting rates are reflective of a higher gratification toward delayed rewards.

Hypothetical monetary rewards have been demonstrated to serve as a valid alternative to real rewards (Johnson & Bickel, 2002; Lagorio & Madden, 2005). Significant correlations have been demonstrated between the DDT and self-report measures of impulsivity, including the impulsiveness subscale of the I-5 questionnaire ($r = .27$) and the Barratt Impulsiveness Scales, Version 10 (BIS-10; $r = .25$), thus demonstrating construct validity (Kirby et al., 1999). Additionally, the DDT has demonstrated high test-retest reliability with a strong correlation ($r = .89$) between participants’ area under the curve during session 1 and session 2 (Weafer, Baggott, & de Wit, 2013). The DDT has previously been used in college samples (Kirby, Winston, & Santiesteban, 2005; Rachlin, Raineri, & Cross, 1991).

Tower of Hanoi (TOH; Simon, 1975). The TOH is a building block task that assesses planning skills. The TOH has three pegs with a number of disks varying in size stacked on the pegs. All disks must be moved from a “start position” to the “goal position;” however, only one disk can be moved at a time and it can never be placed on a smaller disk. Scoring was based on the scoring system adopted by Friedman and colleagues (2014). Participants completed 7-, 11-, and 15-move puzzles with four disks. They had a total of six trials to complete the puzzles in the optimal number of moves. To move on to the next puzzle, participants must have completed the puzzle in the optimal number of moves twice. If they do not complete the puzzle in the optimal number of moves, the TOH task ended. Participants completing the puzzle on trials one and two received six points, on trials two and three received five points, on trials three and four received four points, on trials four and five received three points, and trials five and six received two points. Participants who completed nonconsecutive trials correctly received a score that averaged the two trials together. For example, if trial two and five were completed successfully, the participant received four points. Participants who do not complete the puzzle twice in the optimal number of moves received zero points. A total score was calculated by summing participants’ scores from each trial. The TOH can be administered in 15 min and has been used with college students (Welsh, Satterlee-Cartmell, & Stine, 1999).

The TOH has received satisfactory reliability scores (Ahonniska, Ahonen, Aro, Tolvanen, & Lyytinen, 2000). The TOH has demonstrated high internal

consistency as assessed by three analyses, including split-half reliability ($r = .87$), Chronbach alpha (.90), and item-total correlations with four disk problems having the strongest correlations (Pearson r ranging from .679 to .808; Humes, Welsh, Retzlaff, & Cookson, 1997). Additionally, the TOH has demonstrated moderate convergent validity with the Tower of London ($r = .37$; Humes et al., 1997).

Peabody Picture Vocabulary Test, Fourth Edition (PPVT-4; Dunn & Dunn, 2007). The PPVT-4 is an intelligence test that asks participants to match a vocabulary word (e.g., dromedary, calyx, trajectory) to one of four pictures. Participants were scored based on correctness for each item. Each error was tallied to calculate the total number of errors, which was subtracted from the ceiling item to obtain the raw score. Using the manual provided by the PPVT-4 the raw score was then translated into a standardized score. Each research team member watched the PPVT training video and then practiced administering and scoring the PPVT-4 on the principal investigator. Once the principal investigator approved each research team members' training, the research team began administering the PPVT-4 on study participants.

The PPVT-4 has demonstrated a high correlation with the Expressive Vocabulary Test, Second Edition (r ranging from .80 to .84), moderate to high correlations with the Clinical Evaluation of Language Fundamentals, Fourth Edition (r ranging from .67 to .75), and moderate to high correlations with the Group Reading Assessment and Diagnostic Evaluation (r ranging from .47 to .79; Dunn & Dunn, 2007). These moderate to high correlations with other measures of vocabulary suggest that the PPVT-4 has demonstrated content validity. The

PPVT-4 has also demonstrated good reliability with split-half reliabilities ranging from good to excellent (r ranging from .89 to .97), alternate form reliabilities ranging from good to excellent (r ranging from .87 to .93), and excellent test-retest reliability (r ranging from .92 to .96; Dunn & Dunn, 2007). The PPVT-4 was standardized in a sample of individuals ranging from 2.5 years old to 90 years old and older making the PPVT-4 suitable for use in a college sample (Dunn & Dunn, 2007).

Procedures

All participants provided written informed consent prior to participation and had the opportunity to ask questions about their participation. Trained members of the research team conducted the interviews within the research laboratory. Before research team members began administering the interview and tasks to research participants, they practiced on fellow research team members and received final approval from the principal investigator. Participants first completed the interview with a member of the research team, which consisted of the demographic questions and CCS. Following the interview, participants completed the BSMSS, YRBS, and ACE questionnaire on their own to promote anonymity and confidentiality. Lastly, a member of the research team administered the two executive functioning tasks (DDT and TOH, respectively) and the vocabulary assessment (PPVT-4) to the participants. In total, participation lasted approximately 45 minutes. All study materials and procedures were approved by the college's Institutional Review Board.

Results

Plan of Analysis

A series of correlations, independent samples t-tests, and chi-square analyses were conducted to determine whether there were any effects of age, gender, social status, race, and verbal IQ on parental incarceration, ACE scores, and HRBs (tobacco, alcohol, marijuana, illicit drug use, and sexual risk behaviors). These analyses were used to determine whether age, gender, social status, race, and verbal IQ should be treated as control variables during hypothesis testing.

To test hypothesis 1 and 2, a series of linear regressions were conducted to determine the strength of total ACE scores and ACE categories as predictors for overall HRBs controlling for age, gender, social status, race, and verbal IQ. In the regression model age, gender, social status, race, and verbal IQ were entered first, and then the total ACE score or ACE category being assessed was entered in the second block. Separate linear regression analyses were conducted for each ACE category. These steps were repeated with the parental incarceration variable to determine the strength of parental incarceration as a predictor for overall HRBs when controlling for age, gender, social status, race, and verbal IQ.

Structural equation modeling was then used to test whether executive functioning (*k* and total TOH scores) and cognitive processes (total CCS scores) partially mediated the relation between ACE scores and overall HRBs as well as between parental incarceration and overall HRBs. Partial mediation was tested

through a series of models estimating 1) whether the mediators (k , total TOH scores, and total CCS scores) can be regressed onto the independent variables (ACE scores and parental incarceration), 2) whether the dependent variable (HRBs) can be regressed onto the independent variable, and 3) whether the dependent variable can be regressed onto both the independent variable and the mediators (Baron & Kenny, 1986). To establish partial mediation, the independent variables must have demonstrated an effect on the mediator in the first equation and the dependent variable in the second equation, and the mediator must have demonstrated an effect on the dependent variable in the third equation. Lastly, the independent variable's effect on the dependent variable must be greater in the second equation than in the third equation.

Preliminary Analyses

Age. Preliminary analyses were conducted to examine potential main effects of age (see Table 3). Using a series of correlations, significant associations emerged between age and overall HRBs, ($r(139) = .312, p = .000$), tobacco risk behaviors, ($r(142) = .189, p = .024$), alcohol risk behaviors, ($r(140) = .232, p = .006$), and sexual risk behaviors, ($r(144) = .389, p = .000$). These associations revealed that as age increased so did overall HRBs, tobacco risk behaviors, alcohol risk behaviors, and sexual risk behaviors. Additionally, a marginally significant association emerged between age and marijuana risk behaviors, ($r(143) = .143, p = .089$). These associations demonstrated that as age increased so did marijuana risk behaviors. No other significant associations were found.

Gender. Preliminary analyses were conducted to examine potential main effects of gender (see Table 4). Independent samples t-tests demonstrated significant differences based on gender for tobacco risk behaviors, ($t(141) = 2.75$, $p = .007$, $d = 0.46$), illicit drug use risk behaviors, ($t(142) = 2.22$, $p = .028$, $d = 0.36$), k , ($t(137) = 2.54$, $p = .012$, $d = 0.42$), and total TOH scores, ($t(142) = 2.22$, $p = .028$, $d = 0.38$). Males engaged in more tobacco and illicit drug use risk behaviors. Males also received a higher k and higher scores on the TOH. Additionally, marginally significant differences emerged for the abuse subcategory of the ACE questionnaire, ($t(140) = -1.82$, $p = .070$, $d = -0.32$), with females reporting a higher number of ACEs in the abuse category. No other significant differences were found.

Race. Preliminary analyses were conducted to examine potential main effects of race (see Table 5). Using independent samples t-tests analyses, marginally significant differences emerged in total ACE scores, ($t(9.69) = -1.81$, $p = .102$, $d = -0.53$) and total TOH scores, ($t(10.25) = 1.77$, $p = .106$, $d = 0.59$). These analyses revealed that African Americans reported a greater number of ACEs and were more likely to receive lower scores on the TOH. No other significant differences were found. A chi-square analysis revealed that a greater proportion of African Americans reported parental incarceration (3/10) in comparison to their counterparts (10/134), $\chi^2(144) = 5.76$, $p = .016$, $\Phi = 0.20$.

Social status. Preliminary analyses were conducted to examine potential main effects of social status (see Table 3). Using a series of correlations, a significant association emerged between social status and overall HRBs, ($r(139)$

= .204, $p = .016$), illicit drug use risk behaviors, ($r(144) = .232, p = .005$), and the Insensitivity to Impact of Crime subscale of the CCS, ($r(144) = .226, p = .006$). These associations revealed that as social status increased so did overall HRBs, illicit drug use risk behaviors, and insensitivity to impact of crime. Additionally, marginally significant associations were revealed between social status and alcohol risk behaviors, ($r(140) = .143, p = .092$), and sexual risk behaviors, ($r(144) = .140, p = .093$). These associations demonstrated that as social status increased so did risk for alcohol use and involvement in risky sexual behaviors. No other significant correlations were found.

Verbal IQ. Preliminary analyses were conducted to examine potential main effects of IQ (see Table 3). Using a series of correlations, marginally significant associations emerged between IQ and tobacco risk behaviors, ($r(142) = -.149, p = .077$), and the Notions of Entitlement Subscale of the CCS, ($r(144) = -.139, p = .096$). These associations revealed that as IQ decreased, tobacco risk behaviors and scores on the Notions of Entitlement subscale of the CCS increased.

Hypothesis 1: ACE scores and involvement in HRBs will illustrate a graded relation in which higher ACE scores will be associated with more HRBs

A linear regression was conducted to predict overall HRBs based on ACE scores when controlling for age, gender, race, social status, and verbal IQ (see Table 7). Although a significant regression equation was found between ACE scores and overall HRBs, ($F(6, 131) = 5.04, p = .000, R^2 = .187$), ACE scores did

not predict overall HRBs over and above what could be accounted for by age, gender, race, social status, and verbal IQ, ($\beta = .372$, $p = .120$, $\Delta r^2 = .015$, $p = .120$).

Gender and follow-up, exploratory analyses. Based on significant differences in tobacco risk behaviors, ($t(140) = 2.75$, $p = .000$, $d = .46$), and illicit drug use risk behaviors, ($t(142) = 2.22$, $p = .012$, $d = .36$; see Table 4), between males and females, follow-up linear regression analyses examined whether ACE scores varied in strength as predictors for tobacco and illicit drug use risk behaviors based on gender (see Table 8). A marginally significant regression equation was found between ACE scores and tobacco risk behaviors among females, ($F(5, 73) = 2.26$, $p = .057$, $R^2 = .134$). ACE scores predicted females' tobacco risk behaviors over and above what could be accounted for by age, race, social status, and verbal IQ, ($\beta = .092$, $p = .032$, $\Delta r^2 = .029$, $p = .032$). No other significant predictions emerged.

Based on a significant correlation between the ACE scores and sexual risk behaviors, ($r(141) = .193$, $p = .022$; see Table 3), and a marginally significant correlation between ACE scores and illicit drug use risk behaviors, ($r(141) = .156$, $p = .065$), follow-up linear regression analyses examined whether ACE scores predicted specific HRBs (see Table 7). A significant regression equation was found between ACE scores and sexual risk behaviors, ($F(6, 134) = 7.91$, $p = .000$, $R^2 = .262$). ACE scores predicted sexual risk behaviors over and above what could be accounted for by age, gender, race, social status, and verbal IQ, ($\beta = .246$, $p = .003$, $\Delta r^2 = .052$, $p = .003$; see Figure 4). A significant regression

equation was also found between ACE scores and illicit drug use risk behaviors, ($F(6, 134) = 3.61, p = .002, R^2 = .139$). ACE scores predicted illicit drug use risk behaviors over and above what could be accounted for by age, gender, race, social status, and verbal IQ, ($\beta = .114, p = .015, \Delta r^2 = .039, p = .015$; see Figure 5).

Hypothesis 2: a) Individual ACEs will differ in their strength as predictors for involvement in overall HRBs

Abuse. A series of linear regressions were conducted to predict overall HRBs based on each individual ACE when controlling for age, gender, race, social status, and verbal IQ (see Table 9). When examining the abuse subcategory of the total ACE score, a significant regression equation was found between abuse and overall HRBs, ($F(6, 132) = 5.59, p = .000, R^2 = .204$). Abuse predicted overall HRBs over and above what could be accounted for by age, gender, race, social status, and verbal IQ, ($\beta = 1.253, p = .024, \Delta r^2 = .032, p = .024$). A significant regression equation was found between emotional abuse and overall HRBs, ($F(6, 132) = 5.72, p = .000, R^2 = .206$). Emotional abuse predicted overall HRBs over and above what could be accounted for by age, gender, race, social status, and verbal IQ, ($\beta = 1.984, p = .026, \Delta r^2 = .031, p = .026$). Physical and sexual abuse did not predict overall HRBs over and above age, gender, race, social status, and verbal IQ.

Neglect. No participants reported experiencing physical neglect; consequently analyses focusing on the neglect subcategory focused on emotional neglect (see Table 9). A significant regression equation was found

between emotional neglect and overall HRBs, ($F(6, 132) = 11.82, p = .000, R^2 = .177$). However, emotional abuse did not predict overall HRBs over and above what could be accounted for by age, gender, race, social status, and verbal IQ, ($\beta = -.650, p = .623, \Delta r^2 = .002, p = .623$).

Household challenges. When examining the household challenges subcategory of the total ACE score, a significant regression equation was found between household challenges and HRBs, ($F(6, 132) = 4.86, p = .000, R^2 = .181$). However, household challenges did not predict overall HRBs over and above what could be accounted for by age, gender, race, social status, and verbal IQ, ($\beta = .300, p = .364, \Delta r^2 = .005, p = .364$; see Table 9). A significant regression equation was found between household criminality and overall HRBs, ($F(6, 132) = 5.35, p = .000, R^2 = .195$). Household criminality marginally predicted overall HRBs over and above what could be accounted for by age, gender, race, social status, and verbal IQ, ($\beta = 2.036, p = .074, \Delta r^2 = .020, p = .074$). Parental separation or divorce, mother treated violently, household substance abuse, and household mental illness did not predict overall HRBs over and above what could be accounted for by age, gender, race, social status, and verbal IQ.

Gender and follow-up, exploratory analyses. Based on a marginal significant difference in the abuse subcategory of the total ACE score, ($t(141) = -1.82, p = .070, d = -.32$; see Table 4), between males and females, follow-up linear regression analyses examined whether the abuse subcategory varied in strength as a predictor for overall HRBs based on gender (see Table 10). A

significant regression equation was found between the abuse subcategory and overall HRBs among females, ($F(5, 72) = 4.33, p = .002, R^2 = .231$). The abuse subcategory marginally predicted females' overall HRBs over and above what could be accounted for age, race, social status, and verbal IQ, ($\beta = 1.024, p = .078, \Delta r^2 = .034, p = .078$). No other significant predictions emerged.

Based on a significant correlation between the household challenges subcategory and sexual risk behaviors, ($r(142) = .241, p = .004$; see Table 3), follow-up linear regression analyses examined whether items related to household challenges predicted sexual risk behaviors (see Table 11). A significant regression equation was found between the household challenges subcategory and sexual risk behaviors, ($F(6, 135) = 1.33, p = .000, R^2 = .263$). Household challenges significantly predicted sexual risk behaviors over and above what could be accounted for by age, gender, race, social status, and verbal IQ, ($\beta = .338, p = .002, \Delta r^2 = .052, p = .002$). A significant regression equation was also found between household criminality and sexual risk behaviors, ($F(6, 135) = 9.13, p = .000, R^2 = .289$). Household criminality significantly predicted sexual risk behaviors over and above what could be accounted for by age, gender, race, social status, and verbal IQ, ($\beta = 1.453, p = .000, \Delta r^2 = .078, p = .000$).

Hypothesis 2: b) Parental incarceration will differ in its strength as a predictor for involvement in HRBs based on whether participants experienced maternal incarceration, paternal incarceration, or the incarceration of either their mother or father

To determine the effects of parental incarceration, specifically, rather than household criminality more broadly (e.g., aunt, cousin), a linear regression was conducted to predict overall HRBs based on experiencing parental incarceration when controlling for age, gender, race, social status, and verbal IQ. However, due to low power, differential effects of maternal incarceration, paternal incarceration, and incarceration of either parent could not be tested. Consequently, the following analysis focused on the strength of parental incarceration (either mother or father was incarcerated) as a predictor of overall HRBs. A significant regression equation was found between parental incarceration and overall HRBs, ($F(6, 132) = 4.87, p = .000, R^2 = .181$). However, parental incarceration did not predict overall HRBs over and above what could be accounted for by age, gender, race, social status, and verbal IQ, ($\beta = .964, p = .355, \Delta r^2 = .005, p = .355$; see Table 9). No significant differences emerged from a series of preliminary independent samples T-tests for tobacco, alcohol, marijuana, illicit drug use, and sexual risk behaviors (see Table 12). Consequently, no follow-up linear regressions were conducted.

Hypothesis 3: a) Executive functioning and cognitive processes will mediate the relation between ACE scores and overall HRBs

Prior to conducting structural equation models to assess partial mediation effects, correlational analyses examined whether partial mediation was possible (see Table 3).

Model 1 included the relation between ACE scores and HRBs as mediated by k . Correlational analyses revealed that 1) ACE scores were not associated

with k , ($r(136) = -.067, p = .435$), 2) ACE scores were not associated with HRBs, ($r(138) = .073, p = .393$), and 3) k was not associated with HRBs, ($r(134) = -.095, p = .276$). Consequently, it was not possible to examine whether k partially mediated the relation between ACE scores and HRBs.

Model 2 included the relation between ACE scores and HRBs as mediated by total TOH scores. Correlational analyses revealed that although 1) ACE scores were associated with total TOH scores, ($r(141) = -.215, p = .010$), 2) ACE scores were not associated with HRBs, ($r(138) = .073, p = .393$), and 3) total TOH scores were not associated with HRBs, ($r(139) = .070, p = .412$). Consequently, it was not possible to examine whether total TOH scores partially mediated the relation between ACE scores and HRBs.

Model 3 included the relation between ACE scores and HRBs as mediated by total CCS scores. Correlational analyses revealed that although 1) ACE scores were not associated with total CCS scores, ($r(139) = .046, p = .592$), and 2) ACE scores were not associated with HRBs, ($r(138) = .073, p = .393$), 3) total CCS scores were associated with HRBs, ($r(137) = .377, p = .000$). However, it was not possible to examine whether total CCS scores partially mediated the relation between ACE scores and HRBs.

Gender and follow-up, exploratory analyses. Based on significant and marginal significant differences that emerged during preliminary independent samples t-test analyses between males and females for the abuse subcategory of the total ACE score, tobacco risk behaviors, illicit drug use risk behaviors, k , and total TOH scores (see Table 4), follow-up correlational analyses examined

whether there may be partial mediation effects (see Table 13 and 14). No significant correlations emerged between the predictor variable (abuse subcategory), the mediator variables (k and total TOH scores), and the outcome variables (tobacco and illicit drug use risk behaviors) for either males or females. Consequently, no path analysis models were conducted based on gender.

Based on preliminary correlational analyses assessing the relation between ACE scores, subscales of the CCS, and sexual risk behaviors, a path analysis model examined partial mediation effects (see Figure 6 and Table 3). Age, gender, race, social status, and verbal IQ were controlled by specifying these variables as exogenous predictors of the mediator variable and the outcome variable. Analyses were conducted using Amos version 24 (Amos Development Corp., Wexford, PA).

The path analysis model included the relation between total ACE scores and sexual risk behaviors as mediated by the Negative Attitudes toward Authority subscale of the CCS. Correlational analyses revealed 1) that ACE scores were marginally associated with Negative Attitudes toward Authority, ($r(141) = .146, p = .083$), 2) ACE scores were associated with sexual risk behaviors, ($r(141) = .193, p = .022$), and 3) Negative Attitudes toward Authority was associated with sexual risk behaviors, ($r(144) = .167, p = .045$). The model was fully saturated ($df = 0$), indicating perfect model fit. Standardized and unstandardized parameter estimates appear in Table 15. A nearly marginal significant effect emerged from the path analysis model in which Negative Attitudes toward Authority partially mediated the relation between ACE scores and sexual risk behaviors, ($\beta = .471,$

$p = .115$).

Based on this indication in AMOS, a confirmatory analysis was conducted utilizing the PROCESS macro to generate a bias-corrected 95% bootstrap confidence interval for the indirect effect using 10,000 bootstrap samples (Hayes, 2013). When controlling for age, gender, race, social status, and verbal IQ there was a significant total effect of ACE scores on sexual risk behaviors, ($\beta = .247$, $p = .003$, CI = .088 to .405), and a significant direct effect of ACE scores on sexual risk behaviors additionally controlling for Negative Attitudes toward Authority, ($\beta = .226$, $p = .006$, CI = .067 to .385); however, there was no significant indirect effect of ACE scores on sexual risk behaviors through Negative Attitudes toward Authority, ($\beta = .021$, CI = -.004 to .096).

Hypothesis 3: b) Executive functioning and cognitive processes will mediate the relation between parental incarceration and overall HRBs

Prior to conducting structural equation models to assess partial mediation effects, correlational and independent samples T-test analyses examined whether partial mediation was possible (see Table 3 and Table 12).

Model 4 included the relation between parental incarceration and HRBs as mediated by k . Correlational and independent samples T-test analyses revealed that 1) k did not differ based on parental incarceration, ($t(15.16) = -.798$, $p = .437$, $d = .22$), 2) HRBs did not differ based on parental incarceration, ($t(13.57) = .051$, $p = .960$, $d = -.02$), and 3) k was not associated with HRBs, ($r(134) = -.095$, $p = .276$). Consequently, it was not possible to examine whether k partially mediated the relation between parental incarceration and HRBs.

Model 5 included the relation between parental incarceration and HRBs as mediated by total TOH scores. Correlational and independent samples T-test analyses revealed that although 1) total TOH scores differed based on parental incarceration, ($t(14.95) = 2.338, p = .034, d = -.66$), 2) HRBs did not differ based on parental incarceration, ($t(13.57) = .051, p = .960, d = -.02$), and 3) total TOH scores were not associated with HRBs, ($r(139) = .070, p = .412$). Consequently, it was not possible to examine whether total TOH scores partially mediated the relation between parental incarceration and HRBs.

Model 6 included the relation between parental incarceration and HRBs as mediated by total CCS scores. Correlational and independent samples T-test analyses revealed that although 1) total CCS scores did not differ based on parental incarceration, ($t(15.868) = -.897, p = .383, d = .24$), and 2) HRBs did not differ based on parental incarceration, ($t(13.57) = .051, p = .960, d = -.02$), 3) total CCS scores were associated with HRBs, ($r(137) = .377, p = .000$). However, it was not possible to examine whether total CCS scores partially mediated the relation between parental incarceration and HRBs.

Discussion

The current study is the first to examine the role cognitions play in mediating the relation between ACEs (including parental incarceration) and HRBs in college students. Although the findings indicate that total ACE scores predict specific HRBs in college students, including illicit drug use risk behaviors and sexual risk behaviors, it does not appear that total ACE scores or parental incarceration predict overall involvement in HRBs. Overall, it appears that

cognitive impairments do not mediate the relation between ACEs and HRBs. The results of the present study demonstrate a need for research to continue to assess factors that mediate the relation between ACEs and involvement in HRBs among college students.

The Relation between Adverse Childhood Experiences and Health Risk Behaviors

Linear regressions revealed two graded relation between 1) ACE scores and illicit drug use risk behaviors, and 2) ACE scores and risky sexual behaviors. Even after taking into account age, gender, race, social status, and verbal IQ, the findings revealed that as ACE scores increased, so did the number of reported illicit drug use risk behaviors and sexual risk behaviors. College students who have experienced a greater number of ACEs had a greater likelihood of reporting more illicit drug use risk behaviors and sexual risk behaviors than college students who reported fewer ACEs.

Closer examinations into the effect ACE categories have on HRBs revealed that the relation between ACEs and HRBs is not universal. Students reporting ACEs related to abuse had an increase in the likelihood of reporting a greater number of overall HRBs. This relation appeared strongest between students reporting emotional abuse. Furthermore, students reporting household criminality had a greater likelihood of engaging in HRBs even though this effect was only marginally significant and household challenges as a category did not predict HRBs among college students. Household challenges and household criminality demonstrated a stronger prediction of sexual risk behaviors, in

particular. College students reporting ACEs related to household challenges and specifically reporting household criminality had a greater likelihood of reporting sexual risk behaviors in comparison to students not reporting these ACEs. These findings indicate that ACEs related to abuse appear to have the greatest effect on overall HRBs, while ACEs related to household challenges have the greatest effect specifically on sexual risk behaviors.

Overall, it appears that the relation between ACEs and HRBs among college students cannot be explained by cognitive impairment. However, this study demonstrated that the relation between ACE scores and sexual risk behaviors was partially mediated by the Negative Attitudes toward Authority subscale of the CCS. These findings indicate that students reporting a greater number of ACEs were more likely to have higher scores on the Negative Attitudes toward Authority subscale, and thus more likely to engage in sexual risk behaviors. Although this relation is not entirely clear, it provides insight into the relations between individual ACEs and HRBs. For instance, although ACE scores may influence sexual risk behaviors due to a specific cognitive impairment, other HRBs (e.g., tobacco risk) may in part be due to factors not measured in the present study such as social and emotional impairments.

This study supports previous research, which demonstrates a graded relation between ACEs, illicit drug use risk behaviors, and sexual risk behaviors (Campbell et al., 2016; Dube et al., 2003; Felitti et al., 1998). The present study expanded on the original ACE study (Felitti et al., 1998), by including parental separation or divorce, emotional neglect, and physical neglect in the total ACE

score. Furthermore, a sexual risk behavior category was included in the present study, which previous research has yet to demonstrate a graded relation between. Additionally, this study also corroborates previous research, which revealed that individual ACEs vary in their effect on specific outcomes (Campbell et al., 2016; Dube et al., 2003). Although Campbell and colleagues (2016) included a variety of negative health outcomes, Dube and colleagues (2003) focused specifically on illicit drug use risk. The present study expands on both of these studies by assessing the strength of ACE categories as a predictor for an overall HRB variable including tobacco risk behaviors, alcohol risk behaviors, marijuana risk behaviors, illicit drug use risk behaviors, and sexual risk behaviors. Moreover, this study provides insight into the differential strength of ACEs related to household challenges as predictors specifically for sexual risk behaviors.

Although most prior research focusing on ACEs has assessed outcomes among adult populations, this study contributes to the growing literature assessing ACEs among college samples (Boynton Health Service, 2015; Filipkowski et al., 2016; Karatekin & Ahluwalia, 2016; McGavock & Spratt, 2014; Smyth et al., 2008). Previous research has primarily assessed the prevalence of ACEs among college samples; however, the present study examined HRBs associated with ACEs and differential effects of each ACE category. In support of the findings of Filipkowski and colleagues (2016) and Karatekin and Ahluwalia (2016), early adversity is associated with negative outcomes among college students. However, in comparison to Karatekin and Ahluwalia (2016) who

primarily focused on mental health and emotional well-being, this study and Filipkowski and colleagues (2016) assessed health risk behaviors. Although the present study corroborates Filipkowski and colleagues' (2016) finding that early adversity is associated with sexual risk behaviors, an association between illicit drug use and ACEs was also demonstrated in the present study, which did not appear in Filipkowski and colleagues' (2016) sample until after the first semester of college.

Although the present study revealed that ACE scores predict illicit drug use risk behaviors and sexual risk behaviors, the findings did not demonstrate an association between ACE scores and overall HRBs. With most studies assessing negative outcomes in an adult population, it is possible that the failure to detect an association between ACE scores and overall HRBs was due to the sample only including college students. With HRBs being highly prevalent in college samples, it is possible that the HRBs resulting from ACEs were convoluted with the social acceptance of HRBs in college. Due to the social acceptance, more college students would report engaging in HRBs, and consequently, involvement in HRBs would be less likely to differ based on early childhood experiences.

The failure to detect an association between parental incarceration and HRBs may in part be due to the analyses being underpowered with only three participants reporting maternal incarceration and 10 reporting paternal incarceration. Furthermore, this prevented the present study from examining the differential effects of maternal incarceration versus paternal incarceration. Previous research has demonstrated associations between parental

incarceration and HRBs, and revealed that maternal incarceration is associated with greater odds of negative outcomes than paternal incarceration (Khan et al., 2015; Kopak & Smith-Ruiz, 2015; Roettger et al., 2011). Consequently, it is possible that similar patterns would have emerged in the present study if power were improved.

Overall, the present study failed to demonstrate a relation between ACEs and HRBs that is partially mediated by cognitive impairments including *k*, total TOH scores, and total CCS scores. Failing to detect partial mediation of *k* and total TOH scores may in part be due to the gradual maturation of the prefrontal cortex throughout adolescence and young adulthood (Harden & Tucker-Drob, 2011). As the prefrontal cortex develops, impulse control improves and the likelihood of engaging in HRBs decreases. Although previous research demonstrates a positive association between impulsivity, risky decision-making and HRBs (Kim-Spoon et al., 2016; Stanford et al., 1996), the risks associated with an underdeveloped prefrontal cortex may be hidden by normal social patterns among college students and the prevalence of HRBs.

Additionally, the failure to detect a partial mediation model including total CCS scores may in part be due to the poor internal consistency of the CCS in this sample (α ranging from .459 to .589). This suggests that the CCS may not be suitable for use in a college sample where criminal activity is low. Although underage alcohol consumption and illicit drug use are illegal, these behaviors may not be thought of as delinquent to college students where the use is widespread. This is further supported by Tangney and colleagues (2007) who

explain that criminogenic cognitions may not be the best explanation for individuals dealing with substance abuse and dependence and demonstrate relatively weak correlations between CCS subscales and alcohol and drug use (ranging from $r = .00$ to $r = .28$). Consequently, in a sample of college students where the highest number of HRBs reported were related to alcohol, the CCS may not correctly address the cognitions preceding common HRBs among college students. The low reliability of the CCS in the present population and the CCS not being an appropriate measure for college students could also explain the non-significant factor loading of the CCS measurement model despite the model demonstrating good fit.

Future Directions

The present study sought to determine whether cognitive impairments partially mediated the relation between ACEs and HRBs in college students. However, failure to demonstrate a significant partial mediation between one of the three cognitive impairment indicators and ACE scores and HRBs suggests that other impairments leading to HRBs should be tested as potential mediators. Based upon the original ACE framework, untreated ACEs also have the potential to result in social and emotional impairments (Felitti et al., 1998; see Figure 1). While the present study sought to determine the role that cognitive impairments play in mediating the relation between ACEs and HRBs, future research should consider the role that social and emotional impairments play in mediating this relation.

In regard to social impairments, ACEs such as physical abuse have been

associated with an inability to develop effective peer relationships (Dodge, Pettit, & Bates, 1994). Peer relationships are particularly important during college, especially during the first year, when students are free of parental control and are largely influenced by their peers. This is particularly concerning considering the association between the involvement in HRBs and peer relationships. Borsari and Carey (2006) explain that peer relationships during college can influence involvement in HRBs (specifically, alcohol use) via three pathways: lack of high quality relationships, peer interactions centering around alcohol use, and peer approval of alcohol use. College students with a history of ACEs may be particularly vulnerable to the first pathway (lack of high quality relationships) due to their heightened inability to form effective peer relationships. Future studies examining the relation between ACEs and HRBs in college students, should also consider how this relation might be impacted by quality of peer relationships.

In regard to emotional impairments, previous research demonstrates that negative early life experiences such as child maltreatment disrupt development of emotion regulation (Dvir, Ford, Hill, & Frazier, 2014). Two studies have revealed that psychological distress mediates the relation between ACEs and alcohol use among men and women (Strine et al., 2012a) and smoking in women (Stine et al., 2012b). Consequently, examining the role emotion regulation plays in the association between ACEs and HRBs in college students is a logical pathway.

Additionally, exploratory gender analyses revealed that ACE scores significantly predicted female students' tobacco risk behaviors and that the abuse

subcategory marginally predicted female students' overall HRBs. However, due to low power additional gender differences may not have been detected. Future research should consider further fleshing out gender differences in HRB outcomes related to ACEs.

Strengths and Limitations

One strength of the present study is its expansion of the literature focusing on the association between ACEs and HRBs among college students. With HRBs being highly prevalent among college students, it is important to understand all factors that may place them at a heightened risk to engage in these behaviors. Although there is limited literature focusing on ACEs among college students, most of the existing literature focuses on the prevalence of ACEs rather than negative outcomes. Furthermore, of the studies examining negative outcomes among college students, only two so far have examined HRBs (Berzenski & Yates, 2011; Filipkowski, Heron, & Smyth, 2016).

Additionally, the present study contributed to the existing literature that focuses on differentiating the strength of each ACE as a predictor for negative outcomes. To my knowledge, no studies have assessed the strength of each ACE as a predictor for HRBs among college students other than the present study. Three studies have assessed odds ratios (Campbell et al., 2016; Dube et al., 2003, Dube et al., 2006); however, these studies did not focus on college students and one did not include the neglect subcategories. Berzenski and Yates (2011) also assessed the strength of ACEs as predictors of psychological health, but only included emotional and physical abuse.

Due to the sensitive nature of the present study, all interviews were conducted in a private location. Furthermore, participants completed the YRBS and ACE questionnaire on their own without the interviewer in the room. These procedures were taken to ensure confidentiality and privacy in hopes of promoting honest responses. However, as is common with sensitive data, participants may not have responded truthfully and it is possible that participants underreported ACEs and HRBs.

An additional limitation to the present study is that partial mediation was assessed rather than full mediation. Because all data was collected at the same time, full mediation could not be examined. One possible solution would be to design a study similar to that of Filipkowski and colleagues (2016). This would involve participants completing two interviews, in which the first interview would be conducted during their first semester of college to gather information related to ACEs, parental incarceration, and baseline HRBs. The second interview would then be conducted during the second semester to assess how their HRBs have changed over the course of their first year in college and how this is related to ACEs and cognitive impairments.

Lastly, the sample was fairly homogenous in terms of including at-risk individuals. The majority of the sample had not experienced an ACE or parental incarceration. This largely resulted in analyses being underpowered with only enough power to detect medium to large effects. For example, it was not possible to differentiate between maternal incarceration and paternal incarceration because only three participants reported experiencing maternal incarceration.

Similarly, no participants reported experiencing physical neglect so this ACE was removed from all analyses including ACE scores and the subcategory, neglect. Attempting to gain a larger representation from at-risk individuals will help improve the power of future analyses. Additionally, it is possible that at-risk individuals are more sensitive to cognitive impairments; however, due to a generally low-risk sample, these differences could not be detected. Future plans include the recruitment of higher-risk individuals, including individuals who are currently involved with criminal justice system and individuals recruited from the surrounding community who have not enrolled in higher education or received more than a high school diploma.

Implications

College students' involvement in HRBs is a growing public health concern with widespread engagement that has both immediate and long-term negative consequences. These consequences call for policies to prevent and reduce HRBs among college students. A report from the U.S. Department of Education (2008) provides a list of strategies derived from 34 university award-winning programs to reduce alcohol and drug abuse among college students. These strategies include partnering with local communities to ensure alcohol is not served to minors, strengthening academic requirements, keeping the library and recreational facilities open longer, providing alcohol-free social activities, and notifying parents of alcohol abuse. Although these strategies have proven successful, these strategies do not address the risk for HRBs that result from early life adversity.

Findings from this study reveal that the higher a student's ACE score, the greater the likelihood they will engage in illicit drug use risk behaviors and sexual risk behaviors. Thus, it is particularly important that educators and administrators develop policies to protect the health of their students by incorporating strategies to address early life adversity. For example, the National Institute on Alcohol Abuse and Alcoholism (NIAAA; Saltz, 2004) recommends cognitive behavioral skills training (e.g., stress management) in addition to motivational enhancement interventions to reduce alcohol use and abuse. Although cognitive behavioral skills training may primarily focus on stress that occurs as a result of college, basic life skills training such as stress management could also be beneficial in addressing stress as a result of early life adversity. Consequently, programs incorporating cognitive behavioral skills training may have the potential to reduce college students' involvement in HRBs resulting from ACEs.

While policies should generally address HRBs, a blanket approach may not be as effective as targeting specific outcomes. For example, the report from the U.S. Department of Education (2008) does not directly address sexual risk behaviors among college students, especially those resulting from ACEs. Although not specific to college students, the U.S. Preventive Services Task Force (USPSTF; 2016) recommends behavioral counseling interventions focusing on education and awareness via face-to-face counseling, videos, written materials, and telephone support to reduce sexually transmitted infections. In comparison to the strategies provided by the U.S. Department of Education (2008), which focused on social changes and consequences (e.g., alcohol-free

events, notifying parents), USPSTF recommends education and awareness. These policies recommend differing approaches for the reduction of different HRBs; therefore, rather than a universal policy for all HRBs, separate policies for individual HRBs may better meet students' needs.

Conclusions

The current study takes the first step in exploring the role cognitive impairment plays in the relation between ACEs and HRBs in college students. These results highlight the graded relation between ACE scores, illicit drug use risk behaviors, and sexual risk behaviors. Furthermore, findings support differential effects between ACE categories and HRBs. Although this study was not able to clearly conclude whether impaired cognitions are guiding the relation between ACEs and HRBs, exploratory analyses revealed that a subscale of the CCS partially mediated the relation between ACEs and HRBs. While it is possible that cognitive impairments may play a role, it was not possible to detect in the present study. Thus, this is an area worth exploring in future research as it may guide interventions to reduce HRBs in college students coming from at-risk backgrounds. Future studies should also attempt to explore other avenues that may explain the relation between ACEs and HRBs such as the social and emotional impairments resulting from ACEs.

References

- Ahonniska, J., Ahonen, T., Aro, T., Tolvanen, A., & Lyytinen, H. (2000). Repeated assessment of the Tower of Hanoi test: Reliability and age effects. *Assessment, 7*(3), 297–310.
- Anton, W. D., & Reed, J. R. (1991). College adjustment scales: Professional manual. *Odessa, FL: Psychological Assessment Resources.*
- Baker, R. W., & Siryk, B. (1999). *Student adaptation to college questionnaire: Manual.* Western Psychological Services.
- Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology, 51*(6), 1173.
- Barratt, W. (2006). The Barratt simplified measure of social status (BSMSS). *Terre Haute, IN: Indiana State University.*
- Berzenski, S. R., & Yates, T. M. (2011). Classes and consequences of multiple maltreatment: A person-centered analysis. *Child Maltreatment, 16*(4), 250–261. <https://doi.org/10.1177/1077559511428353>
- Blishen, B. R., Carroll, W. K., & Moore, C. (1987). The 1981 socioeconomic index for occupations in Canada. *Canadian Review of Sociology and Anthropology, 24*, 465-488.
- Borsari, B., & Carey, K. B. (2006). How the quality of peer relationships influences college alcohol use. *Drug and alcohol review, 25*(4), 361-370.
- Boynton Health Service. (2015). Health and health-related behaviors, University of Minnesota-Twin Cities students. Regents of the University of

Minnesota. Retrieved from http://www.bhs.umn.edu/surveys/survey-results/2015/UofMTwinCities_CSIS Report_2015.pdf

- Brener, N. D., Billy, J. O., & Grady, W. R. (2003). Assessment of factors affecting the validity of self-reported health-risk behavior among adolescents: Evidence from the scientific literature. *Journal of Adolescent Health, 33*(6), 436-457.
- Brener, N. D., Collins, J. L., Kann, L., Warren, C. W., & Williams, B. I. (1995). Reliability of the youth risk behavior survey questionnaire. *American Journal of Epidemiology, 141*(6), 575-580.
- Brener, N. D., Kann, L., McManus, T., Kinchen, S. A., Sundberg, E. C., & Ross, J. G. (2002). Reliability of the 1999 Youth Risk Behavior Survey questionnaire. *Journal of Adolescent Health, 31*, 36-442.
- Brener, N. D., Kann, L., Shanklin, S., Kinchen, S., Eaton, D. K., Hawkins, J., & Flint, K. H. (2013). Methodology of the youth risk behavior surveillance system—2013. *Morbidity and Mortality Weekly Reports. Recommendations and Reports, 62*(1), 1–20.
- Briere, J. (1998). *IASC, Inventory of Altered Self-Capacities: Professional manual*. Psychological Assessment Resources.
- Bronfenbrenner, U. (1994). Ecological models of human development. *Readings on the Development of Children, 2*(1), 37-43.
- Burke, A. S. (2011). Under construction: Brain formation, culpability, and the criminal justice system. *International Journal of Law and Psychiatry, 34*(6), 381–385. <https://doi.org/10.1016/j.ijlp.2011.10.001>

- Bylund, C. L., Imes, R. S., & Baxter, L. A. (2005). Accuracy of parents' perceptions of their college student children's health and health risk behaviors. *Journal of American College Health, 54*(1), 31–37.
<https://doi.org/10.3200/JACH.54.1.31-37>
- Campbell, J. A., Walker, R. J., & Egede, L. E. (2016). Associations between adverse childhood experiences, high-risk behaviors, and morbidity in adulthood. *American Journal of Preventive Medicine, 50*(3), 344–352.
<https://doi.org/10.1016/j.amepre.2015.07.022>
- Casey, B., Jones, R. M., & Somerville, L. H. (2011). Braking and accelerating of the adolescent brain. *Journal of Research on Adolescence, 21*(1), 21–33.
<https://doi.org/10.1111/j.1532-7795.2010.00712.x>
- Cirino, P. T., Chin, C. E., Sevcik, R. A., Wolf, M., Lovett, M., & Morris, R. D. (2002). Measuring socioeconomic status: Reliability and preliminary validity for different approaches. *Assessment, 9*(2), 145-155.
- Cooper, J. E., Sartorius, N., & Wing, J. K. (1974). The measurement and classification of psychiatric symptoms.
- Crawford, J. R., Stewart, L. E., Cochrane, R. H. B., Parker, D. M., & Besson, J. A. O. (1989). Construct validity of the National Adult Reading Test: A factor analytic study. *Personality and Individual Differences, 10*(5), 585-587.
- Crawford, J. R., Stewart, L. E., Parker, D. M., Besson, J. A. O., & Cochrane, R. H. B. (1989). Estimation of premorbid intelligence: Combining psychometric and demographic approaches improves predictive accuracy.

Personality and Individual Differences, 10(7), 793–796.

- Derogatis, L. R. (1994). *SCL-90-R: Symptom Checklist-90-R: administration, scoring and procedures manual*. NCS Pearson.
- Dodge, K. A., Pettit, G. S., & Bates, J. E. (1994). Effects of physical maltreatment on the development of peer relations. *Development and Psychopathology*, 6(01), 43-55.
- Doremus-Fitzwater, T. L., Varlinskaya, E. I., & Spear, L. P. (2010). Motivational systems in adolescence: Possible implications for age differences in substance abuse and other risk-taking behaviors. *Brain and Cognition*, 72(1), 114–123. <https://doi.org/10.1016/j.bandc.2009.08.008>
- Douglas, K. A., Collins, J. L., Warren, C., Kann, L., Gold, R., Clayton, S., ... & Kolbe, L. J. (1997). Results from the 1995 national college health risk behavior survey. *Journal of American College Health*, 46(2), 55-67.
- Drillien, C. M. (1963). *The growth and development of the prematurely born infant*. E. and S. Livingston Ltd., Edinburgh.
- Dube, S. R., Dong, M., Chapman, D. P., Giles, W. H., Anda, R. F., & Felitti, V. J. (2003). Childhood abuse, neglect, and household dysfunction and the risk of illicit drug use: The Adverse Childhood Experiences Study. *Pediatrics*, 111(3), 564–572.
- Dube, S. R., Miller, J. W., Brown, D. W., Giles, W. H., Felitti, V. J., Dong, M., & Anda, R. F. (2006). Adverse childhood experiences and the association with ever using alcohol and initiating alcohol use during adolescence. *Journal of Adolescent Health*, 38(4), 444-e1.

<https://doi.org/10.1016/j.jadohealth.2005.06.006>

- Dube, S. R., Williamson, D. F., Thompson, T., Felitti, V. J., & Anda, R. F. (2004). Assessing the reliability of retrospective reports of adverse childhood experiences among adult HMO members attending a primary care clinic. *Child Abuse & Neglect, 28*(7), 729-737.
- Dunn, L. M., & Dunn, D. M. (2007). *PPVT-4: Peabody picture vocabulary test*. Pearson Assessments.
- Dvir, Y., Ford, J. D., Hill, M., & Frazier, J. A. (2014). Childhood maltreatment, emotional dysregulation, and psychiatric comorbidities. *Harvard review of psychiatry, 22*(3), 149.
- Elliott, A. N., Alexander, A. A., Pierce, T. W., Aspelmeier, J. E., & Richmond, J. M. (2009). Childhood victimization, poly-victimization, and adjustment to college in women. *Child Maltreatment, 14*(4), 330–343.
<https://doi.org/10.1177/1077559509332262>
- Farley, J. P., & Kim-Spoon, J. (2015). Longitudinal associations among impulsivity, friend substance use, and adolescent substance use. *Journal of Addiction Research & Therapy, 6*(2). <https://doi.org/10.4172/2155-6105.1000220>
- Felitti MD, F., Vincent J., Anda MD, M., Robert F., Nordenberg MD, D., Williamson MS, P., ... & Marks J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine, 14*(4), 245–258.

[https://doi.org/10.1016/S0749-3797\(98\)00017-8](https://doi.org/10.1016/S0749-3797(98)00017-8)

- Filipkowski, K. B., Heron, K. E., & Smyth, J. M. (2016). Early adverse experiences and health: The transition to college. *American Journal of Health Behavior, 40*(6), 717–728. <https://doi.org/10.5993/AJHB.40.6.4>
- Finkelhor, D., Turner, H. A., Shattuck, A., & Hamby, S. L. (2013). Violence, crime, and abuse exposure in a national sample of children and youth: An update. *Journal of the American Medical Association: Pediatrics, 167*(7), 614. <https://doi.org/10.1001/jamapediatrics.2013.42>
- Friedman, S. L., Scholnick, E. K., Bender, R. H., Vandergrift, N., Spieker, S., Hirsh Pasek, K., ... & The NICHD Early Child Care Research Network. (2014). Planning in Middle Childhood: Early Predictors and Later Outcomes. *Child Development, 85*(4), 1446–1460. <https://doi.org/10.1111/cdev.12221>
- Galvan, A., Hare, T., Voss, H., Glover, G., & Casey, B. J. (2007). Risk-taking and the adolescent brain: Who is at risk? *Developmental Science, 10*(2), F8–F14. <https://doi.org/10.1111/j.1467-7687.2006.00579.x>
- Gover, A. R., Kaukinen, C., & Fox, K. A. (2008). The relationship between violence in the family of origin and dating violence among college students. *Journal of Interpersonal Violence, 23*(12), 1667–1693. <https://doi.org/10.1177/0886260508314330>
- Harden, K. P., & Tucker-Drob, E. M. (2011). Individual differences in the development of sensation seeking and impulsivity during adolescence: Further evidence for a dual systems model. *Developmental Psychology,*

47(3), 739–746. <https://doi.org/10.1037/a0023279>

- Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. Guilford Press.
- Hollingshead, A. B. (1975). Four factor index of social status. New Haven, CT: Yale University Department of Psychiatry.
- Humes, G. E., Welsh, M. C., Retzlaff, P., & Cookson, N. (1997). Towers of Hanoi and London: Reliability and validity of two executive function tasks. *Assessment*, 4(3), 249–257.
- Johnson, M. W., & Bickel, W. K. (2002). Within-subject comparison of real and hypothetical money rewards in delay discounting. *Journal of the Experimental Analysis of Behavior*, 77(2), 129–146.
- Johnson, J. G., Cohen, P., Smailes, E. M., Skodol, A. E., Brown, J., & Oldham, J. M. (2001). Childhood verbal abuse and risk for personality disorders during adolescence and early adulthood. *Comprehensive Psychiatry*, 42(1), 16–23. <https://doi.org/10.1053/comp.2001.19755>
- Kahn, R. E., Holmes, C., Farley, J. P., & Kim-Spoon, J. (2015). Delay discounting mediates parent–adolescent relationship quality and risky sexual behavior for low self-control adolescents. *Journal of Youth and Adolescence*, 44(9), 1674–1687. <https://doi.org/10.1007/s10964-015-0332-y>
- Karatekin, C., & Ahluwalia, R. (2016). Effects of adverse childhood experiences, stress, and social support on the health of college students. *Journal of Interpersonal Violence*, [epub ahead of print].
- Kaufman, A. R., Land, S., Parascandola, M., Augustson, E., & Backinger, C. L.

- (2015). Tobacco use transitions in the United States: The National Longitudinal Study of Adolescent Health. *Preventive Medicine, 81*, 251–257. <https://doi.org/10.1016/j.ypmed.2015.08.026>
- Kendler, K. S., Bulik, C. M., Silberg, J., Hettema, J. M., Myers, J., & Prescott, C. A. (2000). Childhood sexual abuse and adult psychiatric and substance use disorders in women: An epidemiological and cotwin control analysis. *Archives of General Psychiatry, 57*(10), 953–959. <https://doi.org/10.1001/archpsyc.57.10.953>
- Khalsa, J. H., Treisman, G., McCance-Katz, E., & Tedaldi, E. (2008). Medical consequences of drug abuse and co-occurring infections: Research at the National Institute on Drug Abuse. *Substance Abuse, 29*(3), 5–16.
- Khan, M. R., McGorray, S., Scheidell, J. D., Vaddiparti, K., & Brotman, L. M. (2015). Childhood parental incarceration and HIV-related drug and sex risk over the young adult life course. *Drug and Alcohol Dependence, 156*, e109.
- Kim-Spoon, J., Deater-Deckard, K., Holmes, C., Lee, J., Chiu, P., & King-Casas, B. (2016). Behavioral and neural inhibitory control moderates the effects of reward sensitivity on adolescent substance use. *Neuropsychologia, 91*, 318–326. <https://doi.org/10.1016/j.neuropsychologia.2016.08.028>
- Kirby, K. N., Petry, N. M., & Bickel, W. K. (1999). Heroin addicts have higher discount rates for delayed rewards than non-drug-using controls. *Journal of Experimental Psychology: General, 128*(1), 78.
- Kirby, K. N., Winston, G. C., & Santiesteban, M. (2005). Impatience and grades:

Delay-discount rates correlate negatively with college GPA. *Learning and Individual Differences*, 15(3), 213–222.

<https://doi.org/10.1016/j.lindif.2005.01.003>

Kolbe, L. J., Kann, L., & Collins, J. L. (1993). Overview of the youth risk behavior surveillance system. *Public Health Reports*, 108(Suppl 1), 2.

Kopak, A. M., & Smith-Ruiz, D. (2015). Criminal justice involvement, drug use, and depression among African American children of incarcerated parents. *Race and Justice*, 6(2), 89-116.

<https://doi.org/10.1177/2153368715586633>

Kugler, K. C., Vasilenko, S. A., Butera, N. M., & Coffman, D. L. (2015). Long-term consequences of early sexual initiation on young adult health a causal inference approach. *The Journal of Early Adolescence*, [epub ahead of print].

Lagorio, C. H., & Madden, G. J. (2005). Delay discounting of real and hypothetical rewards III: Steady-state assessments, forced-choice trials, and all real rewards. *Behavioural Processes*, 69(2), 173–187.

<https://doi.org/10.1016/j.beproc.2005.02.003>

Lerner, R. M., & Castellino, D. R. (2002). Contemporary developmental theory and adolescence: Developmental systems and applied developmental science. *Journal of Adolescent Health*, 31(6), 122–135.

Leshem, R., & Glicksohn, J. (2007). The construct of impulsivity revisited. *Personality and Individual Differences*, 43(4), 681–691.

<https://doi.org/10.1016/j.paid.2007.01.015>

- MacPherson, L., Magidson, J. F., Reynolds, E. K., Kahler, C. W., & Lejuez, C. W. (2010). Changes in sensation seeking and risk-taking propensity predict increases in alcohol use among early adolescents. *Alcoholism, Clinical and Experimental Research, 34*(8), 1400–1408.
<https://doi.org/10.1111/j.1530-0277.2010.01223.x>
- McGavock, L., & Spratt, T. (2014). Prevalence of adverse childhood experiences in a university population: Associations with use of social services. *British Journal of Social Work, 44*(3), 657–674.
<https://doi.org/10.1093/bjsw/bcs127>
- Molnar, B. E., Buka, S. L., & Kessler, R. C. (2001). Child sexual abuse and subsequent psychopathology: Results from the National Comorbidity Survey. *American Journal of Public Health, 91*(5), 753–760.
- Mospens, S. M. (2008). *The effect of social class on first-year college student engagement and satisfaction*. ProQuest.
- Mullen, P. E., Martin, J. L., Anderson, J. C., Romans, S. E., & Herbison, G. P. (1996). The long-term impact of the physical, emotional, and sexual abuse of children: A community study. *Child Abuse & Neglect, 20*(1), 7–21.
- Murphy, A., Steele, M., Dube, S. R., Bate, J., Bonuck, K., Meissner, P., ... & Steele, H. (2014). Adverse Childhood Experiences (ACEs) Questionnaire and Adult Attachment Interview (AAI): Implications for parent child relationships. *Child Abuse & Neglect, 38*(2), 224–233.
<https://doi.org/10.1016/j.chiabu.2013.09.004>
- Nakao, K., & Treas, J. (1992). The 1989 socioeconomic index of occupations:

Construction from the 1989 occupational prestige scores (General Social Survey Methodological Report No. 74). Chicago: University of Chicago, National Opinion Research Center

Nelson, H. E., Wilson, J. (1991). *National Adult Reading Test (NART)*. Windsor: NFER-Nelson.

Norman, R. E., Byambaa, M., De, R., Butchart, A., Scott, J., & Vos, T. (2012). The long-term health consequences of child physical abuse, emotional abuse, and neglect: A systematic review and meta-analysis. *PLoS Medicine*, 9(11), e1001349. <https://doi.org/10.1371/journal.pmed.1001349>

Patrick, K., Covin, J. R., Fulop, M., Calfas, K., & Lovato, C. (1997). Health risk behaviors among California college students. *Journal of American College Health*, 45, 265-272.

Paus, T. (2005). Mapping brain maturation and cognitive development during adolescence. *Trends in Cognitive Sciences*, 9(2), 60–68. <https://doi.org/10.1016/j.tics.2004.12.008>

Pearson, M. R., Liese, B. S., & Dvorak, R. D. (2017). College student marijuana involvement: Perceptions, use, and consequences across 11 college campuses. *Addictive Behaviors*, 66, 83–89. <https://doi.org/10.1016/j.addbeh.2016.10.019>

Rabinowitz, A. R., & Arnett, P. A. (2012). Reading based IQ estimates and Actual premorbid cognitive performance: Discrepancies in a college athlete sample. *Journal of the International Neuropsychological Society*, 18(01), 139–143. <https://doi.org/10.1017/S1355617711001275>

- Rachlin, H., Raineri, A., & Cross, D. (1991). Subjective probability and delay. *Journal of the Experimental Analysis of Behavior*, *55*(2), 233–244.
- Reckdenwald, A., Ford, J. A., & Murray, B. N. (2016). Alcohol use in emerging adulthood: Can Moffitt's developmental theory help us understand binge drinking among college students? *Journal of Child & Adolescent Substance Abuse*, *25*(6), 497–503.
<https://doi.org/10.1080/1067828X.2015.1103347>
- Richmond, J. M., Elliott, A. N., Pierce, T. W., Aspelmeier, J. E., & Alexander, A. A. (2009). Polyvictimization, childhood victimization, and psychological distress in college women. *Child Maltreatment*, *14*(2), 127–147.
<https://doi.org/10.1177/1077559508326357>
- Roettger, M. E., Swisher, R. R., Kuhl, D. C., & Chavez, J. (2011). Paternal incarceration and trajectories of marijuana and other illegal drug use from adolescence into young adulthood: Evidence from longitudinal panels of males and females in the United States. *Addiction*, *106*(1), 121–132.
<https://doi.org/10.1111/j.1360-0443.2010.03110.x>
- Romer, D., Duckworth, A. L., Sznitman, S., & Park, S. (2010). Can adolescents learn self-control? Delay of gratification in the development of control over risk taking. *Prevention Science*, *11*(3), 319–330.
<https://doi.org/10.1007/s11121-010-0171-8>
- Saltz, R. F. (2004). Preventing alcohol-related problems on college campuses: Summary of the final report of the NIAAA Task Force on College Drinking. *Alcohol Research & Health*, *28*(4), 249-252.

- Schorling, J. B., Gutgesell, M., Klas, P., Smith, D., & Keller, A. (1994). Tobacco, alcohol and other drug use among college students. *Journal of Substance Abuse, 6*(1), 105-115.
- Senices, J. (2006). *Skin Color and Its Relationship to Hispanics' Acculturation Process*. ProQuest.
- Simon, H. A. (1975). The functional equivalence of problem solving skills. *Cognitive Psychology, 7*(2), 268–288.
- Smyth, J. M., Hockemeyer, J. R., Heron, K. E., Wonderlich, S. A., & Pennebaker, J. W. (2008). Prevalence, type, disclosure, and severity of adverse life events in college students. *Journal of American College Health, 57*(1), 69–76.
- Springer, K. W., Sheridan, J., Kuo, D., & Carnes, M. (2007). Long-term physical and mental health consequences of childhood physical abuse: Results from a large population-based sample of men and women. *Child Abuse & Neglect, 31*(5), 517–530. <https://doi.org/10.1016/j.chiabu.2007.01.003>
- Stanford, M. S., Greve, K. W., Boudreaux, J. K., Mathias, C. W., & L. Brumbelow, J. (1996). Impulsiveness and risk-taking behavior: Comparison of high-school and college students using the Barratt Impulsiveness Scale. *Personality and Individual Differences, 21*(6), 1073–1075. [https://doi.org/10.1016/S0191-8869\(96\)00151-1](https://doi.org/10.1016/S0191-8869(96)00151-1)
- Steinberg, L. (2009). Adolescent development and juvenile justice. *Annual Review of Clinical Psychology, 5*(1), 459–485. <https://doi.org/10.1146/annurev.clinpsy.032408.153603>

- Steinberg, L. (2010). A dual systems model of adolescent risk-taking. *Developmental Psychobiology*, *52*(3), 216–224.
<https://doi.org/10.1002/dev.20445>
- Steinberg, L., Albert, D., Cauffman, E., Banich, M., Graham, S., & Woolard, J. (2008). Age differences in sensation seeking and impulsivity as indexed by behavior and self-report: Evidence for a dual systems model. *Developmental Psychology*, *44*(6), 1764–1778.
<https://doi.org/10.1037/a0012955>
- Strine, T. W., Dube, S. R., Edwards, V. J., Prehn, A. W., Rasmussen, S., Wagenfeld, M., ... & Croft, J. B. (2012a). Associations between adverse childhood experiences, psychological distress, and adult alcohol problems. *American Journal of Health Behavior*, *36*(3), 408-423.
- Strine, T. W., Edwards, V. J., Dube, S. R., Wagenfeld, M., Dhingra, S., Prehn, A. W., ... & Croft, J. B. (2012b). The mediating sex-specific effect of psychological distress on the relationship between adverse childhood experiences and current smoking among adults. *Substance Abuse Treatment, Prevention, and Policy*, *7*(1), 30.
- Sykes, G. M., & Matza, D. (1957). Techniques of neutralization: A theory of delinquency. *American Sociological Review*, *22*(6), 664.
<https://doi.org/10.2307/2089195>
- Tangney, J. P., Mashek, D., & Stuewig, J. (2007). Working at the social–clinical–community–criminology interface: The George Mason University inmate study. *Journal of Social and Clinical Psychology*, *26*(1), 1–21.

<https://doi.org/10.1521/jscp.2007.26.1.1>

- Tangney, J. P., Stuewig, J., Furukawa, E., Kopelovich, S., Meyer, P. J., & Cosby, B. (2012). Reliability, validity, and predictive utility of the 25-item Criminogenic Cognitions Scale (CCS). *Criminal Justice and Behavior*, 39(10), 1340–1360. <https://doi.org/10.1177/0093854812451092>
- Teicher, M. H., Samson, J. A., Polcari, A., & McGreenery, C. E. (2006). Sticks, stones, and hurtful words: Relative effects of various forms of childhood maltreatment. *American Journal of Psychiatry*, 163(6), 993–1000. <https://doi.org/10.1176/ajp.2006.163.6.993>
- U.S. Department of Education, Office of Safe and Drug-Free Schools. (2008). Alcohol and other drug prevention on college campuses: Model programs. Washington, D.C.
- U.S. Preventive Services Task Force. (2016). *Final Recommendation Statement: Sexually Transmitted Infections: Behavioral Counseling*. Retrieved from <https://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/sexually-transmitted-infections-behavioral-counseling1#Pod1>
- Weafer, J., Baggott, M. J., & de Wit, H. (2013). Test–retest reliability of behavioral measures of impulsive choice, impulsive action, and inattention. *Experimental and Clinical Psychopharmacology*, 21(6), 475–481. <https://doi.org/10.1037/a0033659>
- Wechsler, H., Davenport, A., Dowdall, G., Moeykens, B., & Castillo, S. (1994). Health and behavioral consequences of binge drinking in college. *Journal*

of the American Medical Association, 272(21), 1672–1677.

Welsh, M. C., Satterlee-Cartmell, T., & Stine, M. (1999). Towers of Hanoi and London: Contribution of working memory and inhibition to performance.

Brain and Cognition, 41(2), 231-242

Wright, M. O., Crawford, E., & Del Castillo, D. (2009). Childhood emotional maltreatment and later psychological distress among college students:

The mediating role of maladaptive schemas. *Child Abuse & Neglect,*

33(1), 59–68. <https://doi.org/10.1016/j.chiabu.2008.12.007>

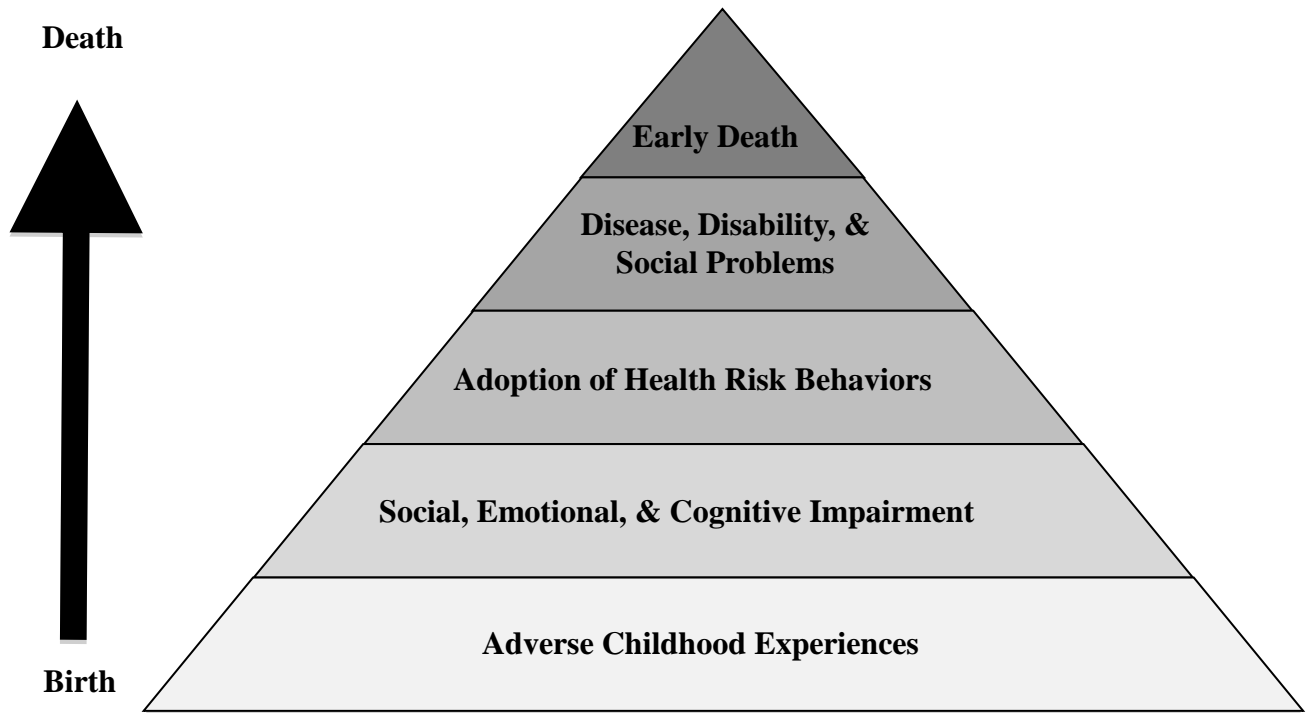


Figure 1. ACE Pyramid from Felitti and colleagues (1998).

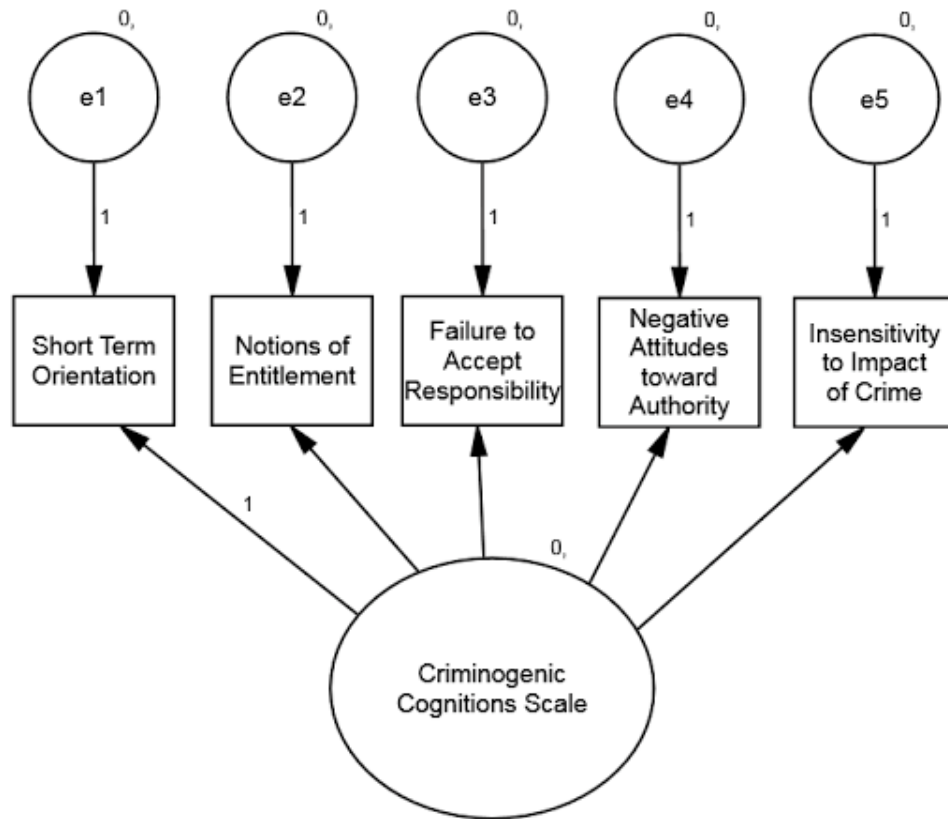


Figure 2. Criminogenic Cognitions Scale Measurement Model. Note: $\chi^2(5) = 2.401$, $p = .791$; TLI = 2.460, CFI = 1.000, RMSEA = .000; RMSEA 90% CI [.000, .075].

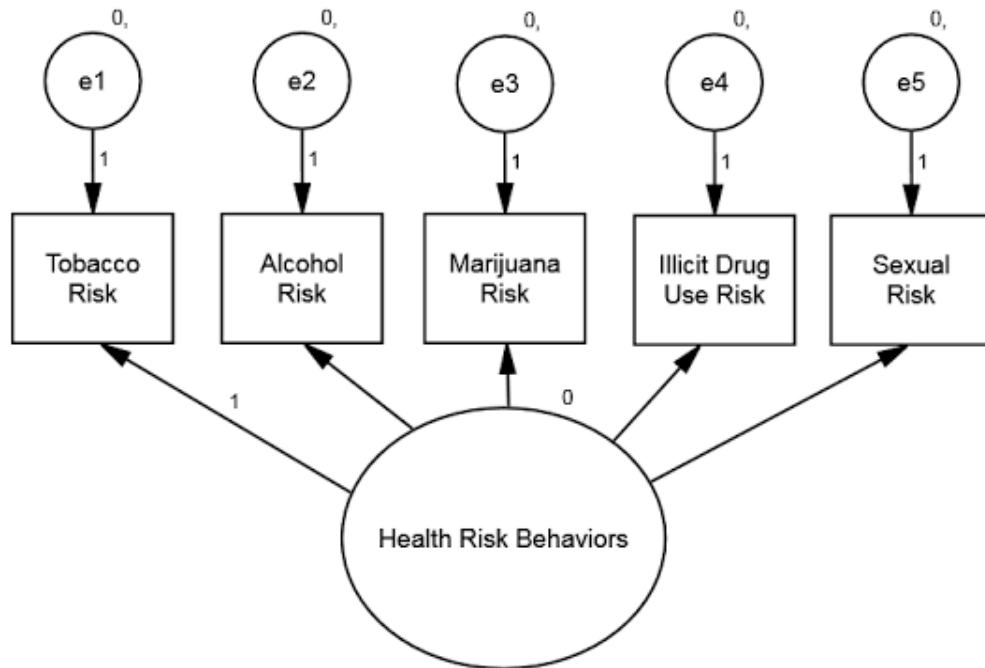


Figure 3. Health Risk Behavior Measurement Model. Note: $\chi^2(5) = 8.131, p = .149$; TLI = .928, CFI = .976, RMSEA = .066; RMSEA 90% CI [.000, .145].

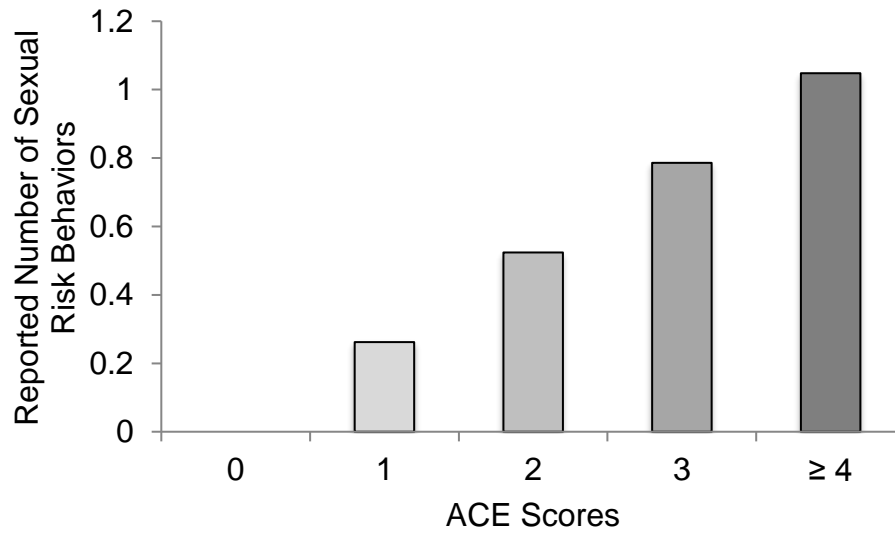


Figure 4. Graded Relation between ACE Scores and Sexual Risk Behaviors. Note: Linear regression model demonstrating a .246 unit increase in the number of reported risky sexual behaviors for every one unit increase in total ACE scores. ($F(6, 134) = 7.91$, $p = .000$, $R^2 = .262$). ($\beta = .246$, $p = .003$, $\Delta r^2 = .052$, $p = .003$). ACE = adverse childhood experiences.

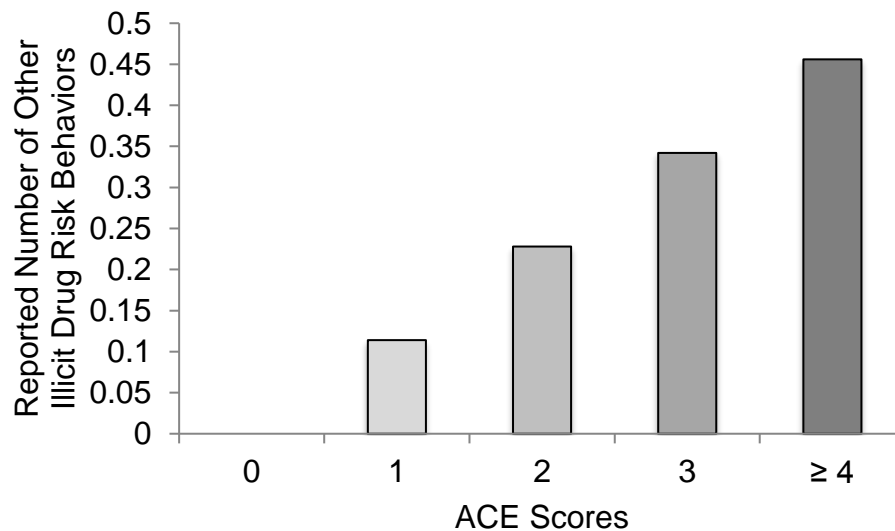


Figure 5. Graded Relation between ACE Scores and Illicit Drug Use Risk Behaviors.
Note: Linear regression model demonstrating a .114 unit increase in the number of reported illicit drug use risk behaviors for every one unit increase in total ACE scores. ($F(6, 134) = 3.61, p = .002, R^2 = .139$). ($\beta = .114, p = .015, \Delta r^2 = .039, p = .015$). ACE = adverse childhood experiences.

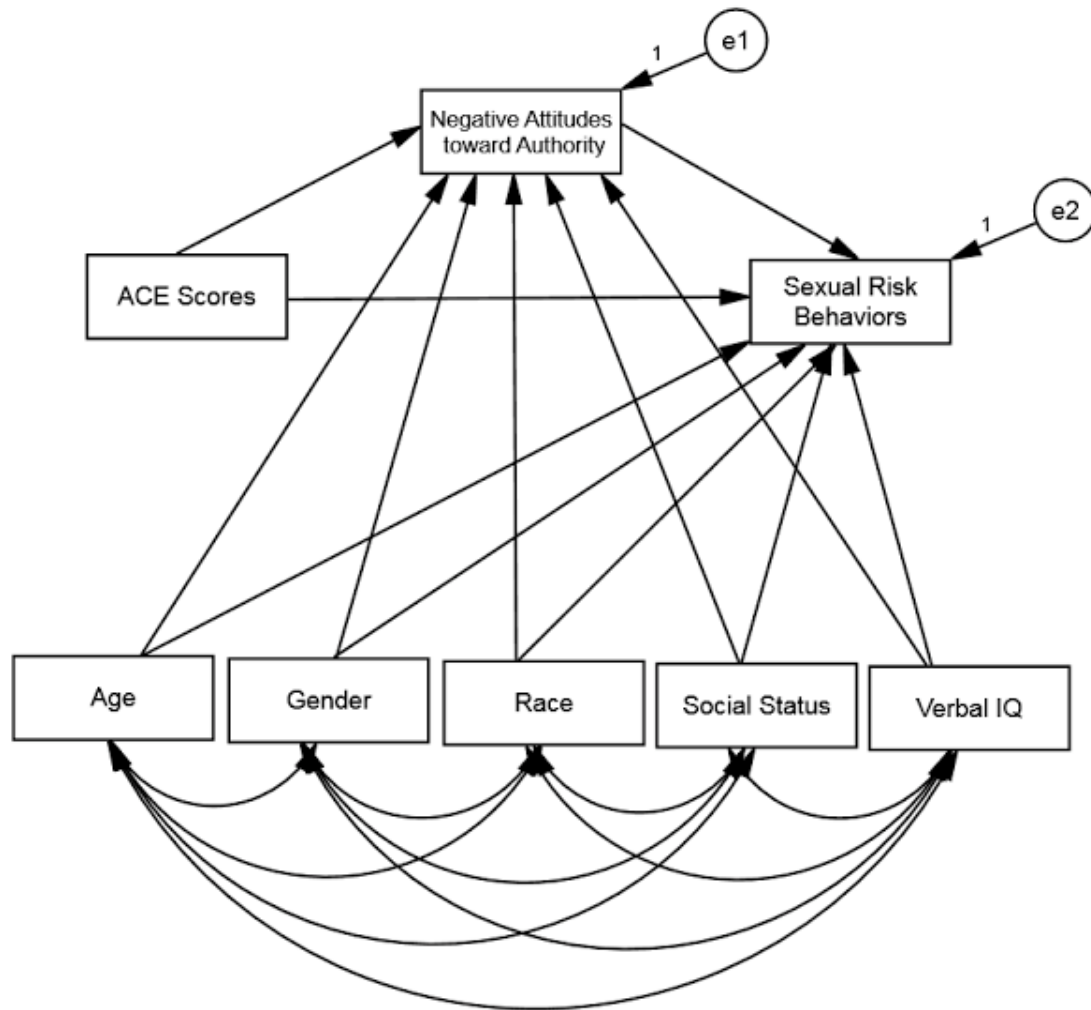


Figure 6. Path Model Examining the Relation between Household Challenges and Sexual Risk Behaviors as Mediated by Negative Attitudes toward Authority. $df = 0$.

Table 1
Participant Characteristics

Participant Characteristic	<i>N</i> (%)
Age (<i>M, SD</i>), <i>N</i> = 144	18.92 (0.95)
Race, <i>N</i> = 144	
White	92 (63.9%)
African American	10 (6.9%)
Asian	21 (14.6%)
Native American	3 (2.1%)
Other	18 (12.5%)
Gender, <i>N</i> = 144	
Male	63 (43.8%)
Female	81 (56.3%)
Social Status (<i>M, SD</i>), <i>N</i> = 144	54.40 (11.66)
PPVT Verbal IQ (<i>M, SD</i>), <i>N</i> = 144	112.72 (12.61)
ACE Total Score (<i>M, SD</i>), <i>N</i> = 141	0.78 (1.26)
Abuse, <i>N</i> = 143	0.20 (0.54)
Physical Abuse	8 (5.6%)
Emotional Abuse	18 (12.5%)
Sexual Abuse	3 (2.1%)
Neglect, <i>N</i> = 144	0.06 (0.23)
Physical Neglect	0 (0.0%)
Emotional Neglect	8 (5.6%)
Household Challenges, <i>N</i> = 144	0.52 (0.90)
Parental Separation or Divorce	22 (15.3%)
Mother Treated Violently	2 (1.4%)
Household Substance Abuse	16 (11.1%)
Household Mental Illness	24 (16.7%)
Household Criminality	10 (6.9%)
Parental Incarceration, <i>N</i> = 144	
Yes	13 (9.0%)
No	131 (91.0%)

Note: PPVT = Peabody Picture Vocabulary; ACE = Adverse Childhood Experience.

Table 2
Descriptive Data

Variable	<i>M (SD)</i>
Dependent Variables (HRBs)	
Total Tobacco Use Risk, <i>N</i> = 142	0.33 (0.72)
Total Alcohol Use Risk, <i>N</i> = 140	2.36 (1.70)
Total Marijuana Use Risk, <i>N</i> = 143	0.39 (0.64)
Total Illicit Drug Use Risk, <i>N</i> = 144	0.49 (0.92)
Total Sexual Risky Behavior, <i>N</i> = 144	0.99 (1.33)
Overall HRBs	4.45 (3.71)
Mediators	
Impulsivity	
<i>k</i> , <i>N</i> = 139	0.01 (0.02)
Planning	
Total TOH Score, <i>N</i> = 144	29.07 (5.38)
Criminogenic Cognitions	
Total CCS Score, <i>N</i> = 142	1.82 (0.23)
Short Term Orientation, <i>N</i> = 143	1.72 (0.41)
Notions of Entitlement, <i>N</i> = 144	2.13 (0.38)
Failure to Accept Responsibility, <i>N</i> = 143	1.66 (0.38)
Negative Attitudes toward Authority, <i>N</i> = 144	2.01 (0.32)
Insensitivity to Impact of Crime, <i>N</i> = 144	1.57 (0.61)

Note: HRBs = health risk behaviors; TOH = Tower of Hanoi; *k* = discounting rate parameter; CCS = Criminogenic Cognitions Scale.

Table 3
Correlations Between Observed Variables and Control Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
Controls																					
1. Age	-	-.081	-.153 [†]	.189*	.232**	.143 [†]	-.045	.389**	.312**	-.044	-.105	-.077	.027	.078	.139 [†]	.075	.044	-.026	-.091	.062	.137
2. PPVT		-	.148 [†]	-.149 [†]	-.020	.079	-.119	-.065	-.029	.030	.052	-.024	.015	-.073	.132	-.048	-.018	-.139 [†]	.033	-.050	.025
3. BSMSS			-	.126	.143 [†]	.124	.232**	.140 [†]	.204**	-.056	-.132	-.088	.010	-.111	.078	.139	-.010	.119	-.025	-.015	.226**
HRBs																					
4. Tobacco Risk				-	.415**	.458**	.467**	.374**	.690**	.097	.115	-.028	.071	-.047	.045	.194*	.050	.128	.014	.134	.158 [†]
5. Alcohol Risk					-	.450**	.314**	.408**	.825**	-.107	-.005	-.106	-.122	-.084	.060	.334**	.147 [†]	.047	.012	.029	.459**
6. Marijuana Risk						-	.254**	.354**	.678**	.035	.053	-.102	.045	-.160 [†]	-.020	.186*	-.073	.012	.034	.233**	.229**
7. Illicit Drug Use Risk							-	.282**	.576**	.156 [†]	.066	.002	.133	-.091	-.002	.144 [†]	.003	.059	.017	.095	.164*
8. Risky Sexual Behavior								-	.725**	.193*	.071	-.089	.241**	-.050	.085	.255**	.073	.089	.093	.167*	.207*
9. Overall HRB									-	.073	.084	-.097	.074	-.095	.070	.377**	.118	.099	.052	.181*	.411**
ACE																					
10. Total Score										-	.727**	.434**	.852**	-.067	-.215*	.046	-.078	-.104	.237**	.146 [†]	-.014
11. Abuse											-	.475**	.293**	-.057	-.163 [†]	.061	-.017	-.108	.277**	.185*	.063
12. Neglect												-	.063	-.017	-.306**	-.001	-.023	-.165*	.141 [†]	.048	.001
13. Household Challenges													-	-.049	-.116	.030	-.091	-.041	.126	.085	.023
DDT																					
14. <i>k</i>														-	.153 [†]	-.074	.015	.015	-.031	-.075	-.097
TOH																					
15. Total Score															-	-.003	-.023	.034	-.101	-.052	.090
CCS																					
16. Total Score																-	.536**	.434**	.583**	.423**	.640**
17. STO																	-	.046	.171*	.066	.154 [†]
18. NoE																		-	.185*	.079	-.009
19. FAR																			-	.196*	.126
20. NATA																				-	.039
21. IIC																					-

Note: PPVT = Peabody Picture Vocabulary Test; BSMSS = Barratt Simplified Measure of Social Status; HRBs = heal risk behaviors; ACE = adverse childhood experiences; DDT = delay discounting task; *k* = discounting rate parameter; TOH = Tower of Hanoi; CCS = Criminogenic Cognitions Scale; STO = Short Term Orientation; NoE = Notions of Entitlement; FAR = Failure to Accept Responsibility; NATA = Negative Attitudes toward Authority; IIC = Insensitivity to Impact of Crime. [†] = $p < .10$. * = $p < .05$. ** = $p < .01$.

Table 4
Differences Between Observed Variables Based on Gender

	Male, <i>M (SD)</i>	Female, <i>M (SD)</i>	Test Statistic	Effect Size
HRBs				
Tobacco Risk	0.52 (0.82)	0.19 (0.60)	$t = 2.75^{**}$	$d = 0.46$
Alcohol Risk	2.38 (1.84)	2.34 (1.60)	$t = 0.12$	$d = 0.02$
Marijuana Risk	0.37 (0.68)	0.41 (0.61)	$t = -0.34$	$d = -0.06$
Illicit Drug Use Risk	0.68 (1.08)	0.35 (0.74)	$t = 2.22^*$	$d = 0.36$
Risky Sexual Behavior	1.08 (1.32)	0.92 (1.33)	$t = 0.74$	$d = 0.13$
Overall HRBs	4.92 (4.04)	4.09 (3.41)	$t = 1.38$	$d = 0.22$
Predictor variables				
ACE Score	0.60 (0.97)	0.92 (1.44)	$t = -1.54$	$d = -0.27$
Abuse Subcategory	0.11 (0.36)	0.28 (0.64)	$t = -1.82^{\dagger}$	$d = -0.32$
Neglect Subcategory	0.03 (0.18)	0.07 (0.26)	$t = -1.10$	$d = -0.19$
Household Challenges Subcategory	0.45 (0.76)	0.58 (0.99)	$t = -0.81$	$d = -0.14$
Parental Incarceration	4/63	9/81	$\chi^2 = 0.98$	$\Phi = 0.82$
Mediators				
Impulsivity				
<i>k</i>	0.02 (0.02)	0.01 (0.01)	$t = 2.54^*$	$d = 0.42$
Planning				
Total TOH Score	30.18 (5.00)	28.20 (5.53)	$t = 2.20^*$	$d = 0.38$
Criminogenic Cognitions				
Total CCS Score	1.84 (0.27)	1.79 (0.19)	$t = 1.32$	$d = 0.22$
Short Term Orientation	1.73 (0.50)	1.70 (0.33)	$t = 0.48$	$d = 0.08$
Notions of Entitlement	2.18 (0.41)	2.09 (0.36)	$t = 1.42$	$d = 0.24$
Failure to Accept Responsibility	1.68 (0.39)	1.64 (0.38)	$t = 0.65$	$d = 0.11$
Negative Attitudes toward Authority	1.99 (0.32)	2.03 (0.32)	$t = -0.68$	$d = -0.11$
Insensitivity to Impact of Crime	1.63 (0.63)	1.53 (0.59)	$t = 1.01$	$d = 0.17$

Note: HRBs = health risk behaviors; ACE = adverse childhood experiences; *k* = discounting rate parameter; TOH = Tower of Hanoi; CCS = Criminogenic Cognitions Scale. $^{\dagger} = p < .10$. $^* = p < .05$. $^{**} = p < .01$.

Table 5
Differences Between Observed Variables Based on Race

	Other, <i>M (SD)</i>	African American, <i>M (SD)</i>	Test Statistic	Effect Size
HRBs				
Tobacco Risk	0.34 (0.74)	0.20 (0.42)	$t = 0.95$	$d = 0.23$
Alcohol Risk	2.39 (1.69)	2.00 (1.94)	$t = 0.61$	$d = 0.21$
Marijuana Risk	0.41 (0.65)	0.20 (0.42)	$t = 1.42$	$d = 0.38$
Illicit Drug Use Risk	0.50 (0.94)	0.40 (0.52)	$t = 0.55$	$d = 0.13$
Risky Sexual Behavior	0.98 (1.30)	1.10 (1.73)	$t = -0.22$	$d = -0.08$
Overall HRBs	4.49 (3.70)	3.90 (3.90)	$t = 0.46$	$d = 0.16$
Predictor variables				
ACE Score	0.71 (1.20)	1.70 (1.70)	$t = -1.81^t$	$d = -0.53$
Abuse Subcategory	0.18 (0.47)	0.50 (1.08)	$t = -0.93$	$d = -0.38$
Neglect Subcategory	0.04 (0.19)	0.30 (0.48)	$t = -1.71^t$	$d = -0.72$
Household Challenges Subcategory	0.49 (0.87)	0.90 (1.20)	$t = -1.06$	$d = -0.39$
Parental Incarceration	10/134	3/10	$\chi^2 = 5.76^*$	$\Phi = 0.20$
Mediators				
Impulsivity <i>k</i>	0.01 (0.02)	0.01 (0.01)	$t = 0.27$	$d = 0.06$
Planning				
Total TOH Score	29.30 (5.32)	26.05 (5.60)	$t = 1.77^t$	$d = 0.59$
Criminogenic Cognitions				
Total CCS Score	1.82 (0.23)	1.78 (0.15)	$t = 0.75$	$d = 0.20$
Short Term Orientation	1.71 (0.43)	1.76 (0.21)	$t = -0.65$	$d = -0.15$
Notions of Entitlement	2.14 (0.39)	2.00 (0.41)	$t = 1.07$	$d = 0.36$
Failure to Accept Responsibility	1.66 (0.38)	1.62 (0.39)	$t = 0.30$	$d = 0.10$
Negative Attitudes toward Authority	2.01 (0.32)	2.06 (0.35)	$t = -0.46$	$d = -0.16$
Insensitivity to Impact of Crime	1.58 (0.60)	1.46 (0.70)	$t = 0.54$	$d = 0.19$

Note: HRBs = health risk behaviors; ACE = adverse childhood experiences; *k* = discounting rate parameter; TOH = Tower of Hanoi; CCS = Criminogenic Cognitions Scale. * = $p < .05$. ** = $p < .01$.

Table 6
Unstandardized, Standardized, and Significance Levels for HRB Measurement Model and CCS Measurement Model

Parameter Estimate	Unstandardized	Standardized	<i>p</i>
HRB Measurement Model Estimates ^a			
HRB Factor → Tobacco Risk	1.000 (-)	.710	-
HRB Factor → Alcohol Risk	2.162 (.361)	.654	.000
HRB Factor → Marijuana Risk	.742 (.130)	.603	.000
HRB Factor → Illicit Drug Use Risk	.942 (.182)	.534	.000
HRB Factor → Risky Sexual Behavior	1.482 (.268)	.579	.000
CCS Measurement Model Estimates ^b			
CCS Factor → Short Term Orientation	1.000 (-)	.264	-
CCS Factor → Notions of Entitlement	.883 (.555)	.253	.111
CCS Factor → Failure to Accept Responsibility	2.383 (1.630)	.684	.144
CCS Factor → Negative Attitudes toward Authority	.834 (.497)	.282	.093
CCS Factor → Insensitivity to Impact of Crime	1.086 (.795)	.195	.172

Note: Standard errors in parentheses. *N* = 144. HRB = health risk behavior; CCS = Criminogenic Cognitions Scale; STO = Short Term Orientation; NoE = Notions of Entitlement; FAR = Failure to Accept Responsibility; NATA = Negative Attitudes toward Authority; IIC = Insensitivity to Impact of Crime.

^a $\chi^2(5) = 8.131$, $p = .149$; TLI = .928, CFI = .976, RMSEA = .066; RMSEA 90% CI [.000, .145].

^b $\chi^2(5) = 2.401$, $p = .791$; TLI = 2.460, CFI = 1.000, RMSEA = .000; RMSEA 90% CI [.000, .075].

Table 7
Unstandardized Coefficients, Standardized Coefficients, and Significance Levels for Total ACE Scores Predicting HRBs

Parameter Estimate	Unstandardized	Standardized	<i>p</i>
Overall HRBs	.372 (.248)	.127	.120
Illicit Drug Use Risk	.114 (.046)	.205	.015
Sexual Risk Behavior	.246 (.080)	.236	.003

Note: Standard errors in parentheses. HRBs = health risk behaviors; ACE = adverse childhood experiences.

Table 8
Unstandardized Coefficients, Standardized Coefficients, and Significance Levels for Total ACE Scores Predicting HRBs by Gender

Parameter Estimate		Unstandardized	Standardized	<i>p</i>
Tobacco	Males	.169 (.105)	.198	.112
Risk	Females	.092 (.042)	.249	.032
Illicit Drug	Males	.178 (.111)	.205	.113
Use Risk	Females	.062 (.048)	.149	.202

Note: Standard errors in parentheses. HRBs = health risk behaviors; ACE = adverse childhood experiences.

Table 9
Unstandardized Coefficients, Standardized Coefficients, and Significance Levels for Individual ACE Scores and Parental Incarceration Predicting HRBs

Parameter Estimate	Unstandardized	Standardized	<i>p</i>
Abuse	1.253 (.550)	.185	.024
Physical Abuse	2.072 (1.276)	.131	.107
Emotional Abuse	1.984 (.880)	.180	.026
Sexual Abuse	1.402 (2.087)	.055	.503
Neglect (Emotional)	-.650 (1.320)	-.041	.623
Household Challenges	.300 (.329)	.073	.364
Parental Separation or Divorce	.521 (.822)	.051	.527
Mother Treated Violently	.932 (2.490)	.030	.709
Household Substance Abuse	.118 (.959)	.010	.903
Household Mental Illness	.093 (.785)	.010	.906
Household Criminality	2.036 (1.132)	.142	.074
Parental Incarceration	.964 (1.039)	.076	.355

Note: Standard errors in parentheses. ACE = adverse childhood experiences; HRBs = health risk behaviors.

Table 10
Unstandardized Coefficients, Standardized Coefficients, and Significance Levels for the ACE Abuse Category Predicting HRBs by Gender

Parameter Estimate		Unstandardized	Standardized	<i>p</i>
Abuse	Males	1.684 (1.435)	.155	.246
	Females	1.024 (.573)	.193	.078
Physical Abuse	Males	1.070 (3.948)	.034	.787
	Females	1.960 (1.269)	.164	.127
Emotional Abuse	Males	2.425 (1.795)	.181	.182
	Females	1.542 (.997)	.163	.126
Sexual Abuse	Males	-	-	-
	Females	1.291 (1.950)	.073	.510

Note: Standard errors in parentheses. ACE = adverse childhood experiences; HRBs = health risk behaviors.

Table 11
Unstandardized Coefficients, Standardized Coefficients, and Significance Levels for the Household Challenges Category of the ACE Questionnaire Predicting Sexual Risk Behaviors

Parameter Estimate	Unstandardized	Standardized	<i>p</i>
Household Challenges → Sexual Risk Behavior	.338 (.109)	.230	.002
Parental Separation or Divorce → Sexual Risk Behavior	.469 (.280)	.128	.096
Mother Treated Violently → Sexual Risk Behavior	.691 (.874)	.061	.431
Household Substance Abuse → Sexual Risk Behavior	.414 (.323)	.100	.201
Household Mental Illness → Sexual Risk Behavior	.439 (.269)	.125	.106
Household Criminality → Sexual Risk Behavior	1.453 (.377)	.284	.000

Note: Standard errors in parentheses. ACE = adverse childhood experiences; HRBs = health risk behaviors.

Table 12

Independent Samples T-test for Observed Variables Based on Parental Incarceration

	PI <i>M (SD)</i>	No PI <i>M (SD)</i>	Test Statistic	Effect Size
Tobacco Risk	0.15 (0.38)	0.35 (0.75)	$t = 1.58$	$d = 0.37$
Alcohol Risk	1.77 (1.69)	2.42 (1.70)	$t = 1.32$	$d = 0.38$
Marijuana Risk	0.46 (0.66)	0.39 (0.64)	$t = -0.40$	$d = -0.12$
Illicit Drug Use Risk	0.46 (0.78)	0.50 (0.93)	$t = 0.15$	$d = 0.04$
Sexual Risk	1.54 (1.90)	0.93 (1.25)	$t = -1.13$	$d = -0.38$
Overall HRB Risk	4.39 (4.61)	4.45 (3.62)	$t = 0.05$	$d = -0.02$
k	0.02 (0.01)	0.01 (0.02)	$t = -0.80$	$d = 0.22$
Total TOH Score	26.00 (4.92)	29.37 (5.34)	$t = 2.34^*$	$d = -0.66$
Total CCS Score	1.86 (0.19)	1.81 (0.23)	$t = -0.90$	$d = 0.24$

Note: PI = parental incarceration; HRB = health risk behaviors; k = delay discounting parameter; TOH = Tower of Hanoi; CCS = Criminogenic Cognitions Scale. * = $p < .05$.

Table 13
Correlations Between Observed Variables and Control Variables for Males

	1	2	3	4	5
HRBs					
1. Tobacco Risk	-	.495**	.184	-.121	.025
2. Illicit Drug Use Risk		-	.050	-.111	.047
ACE					
3. Abuse			-	-.025	-.056
DDT					
4. k				-	.209
TOH					
5. Total Score					-

Note: HRBs = health risk behaviors; ACE = adverse childhood experience; DDT = delay discounting task; k = discounting rate parameter; TOH = Tower of Hanoi. ** = $p < .01$.

Table 14
Correlations Between Observed Variables and Control Variables for Females

	1	2	3	4	5
HRBs					
1. Tobacco Risk	-	.346**	.161	-.058	-.010
2. Illicit Drug Use Risk		-	.141	-.181	-.124
ACE					
3. Abuse			-	-.050	-.176
DDT					
4. k				-	.010
TOH					
5. Total Score					-

Note: HRBs = health risk behaviors; ACE = adverse childhood experience; DDT = delay discounting task; k = discounting rate parameter; TOH = Tower of Hanoi. ** = $p < .01$.

Table 15

Unstandardized, Standardized, and Significance Levels for Path Analysis Including Total ACE Scores, Negative Attitudes toward Authority (CCS), and Sexual Risk Behavior

Parameter Estimate	Unstandardized	Standardized	<i>p</i>
Total ACE Scores, NATA, Illicit Drug Use Risk, Sexual Risk Behavior ^a			
Age → NATA	.022 (.029)	.065	.437
Gender → NATA	.021 (.054)	.032	.702
Social Status → NATA	.000 (.002)	.014	.870
Verbal IQ → NATA	-.001 (.002)	-.047	.577
Race → NATA	.012 (.108)	.010	.910
Age → Sexual Risk Behavior	.597 (.102)	.425	.000
Gender → Sexual Risk Behavior	-.280 (.194)	-.105	.149
Social Status → Sexual Risk Behavior	.025 (.008)	.217	.003
Verbal IQ → Sexual Risk Behavior	-.007 (.008)	-.071	.334
Race → Sexual Risk Behavior	.001 (.385)	.000	.997
Total ACE Scores → NATA	.037 (.022)	.143	.097
Total ACE Scores → Sexual Risk Behavior	.233 (.079)	.221	.003
NATA → Sexual Risk Behavior	.471 (.299)	.114	.115

Note: Standard errors in parentheses. *N* = 144. ACE = adverse childhood experience; CCS = Criminogenic Cognitions Scale; HRBs = health risk behaviors; NATA = Negative Attitudes toward Authority; FAR = Failure to Accept Responsibility. ^a $\chi^2(16) = 10.973$, *p* = .811; TLI = 1.322; CFI = 1.000; RMSEA = .000; RMSEA 90% CI [.000, .049].

Appendix A
Demographic and Parental Incarceration

1. What is your age (in years): _____
2. What is your gender: MALE FEMALE
3. What is your ethnicity or race:
 - White
 - Black
 - Asian
 - Native American
 - Other (please describe): _____
4. As far as you know, has your biological mother ever been incarcerated?

YES NO
5. As far as you know, has your biological father ever been incarcerated?

YES NO

Appendix B
Criminogenic Cognitions Scale

	Strongly Disagree	Disagree	Agree	Strongly Agree	
1. When I want something, I expect people to deliver.	1	2	3	4	
2. Bad childhood experiences are partly to blame for my current situation.	1	2	3	4	
3. The future is unpredictable and there is no point planning for it.	1	2	3	4	
4. My crime(s) did not really harm anyone.	1	2	3	4	NA
5. I feel like what happens in my life is mostly determined by powerful people.	1	2	3	4	
6. I will never be satisfied until I get all that I deserve.	1	2	3	4	
7. A theft is all right as long as the victim is not physically injured.	1	2	3	4	
8. Even though I got caught, it was still worth the risk.	1	2	3	4	NA
9. Because of my history I get blamed for a lot of things I did not do.	1	2	3	4	
10. Most of the laws are good.	1	2	3	4	
11. Victims of crime usually get over it with time.	1	2	3	4	
12. When you commit a crime the only one affected is the victim.	1	2	3	4	
13. Most police officers/guards abuse their power.	1	2	3	4	
14. Society makes too big of a deal about my crime(s).	1	2	3	4	NA
15. Sometimes I cannot control myself.	1	2	3	4	
16. I expect people to treat me better than other people.	1	2	3	4	
17. People in authority are usually looking out for my best interest.	1	2	3	4	
18. Why plan to save for something if you can have it now.	1	2	3	4	
19. I insist on getting the respect that is due me.	1	2	3	4	
20. If a police officer/guard tells me to do something, there's usually a good reason for it.	1	2	3	4	
21. People in positions of authority generally take advantage of others.	1	2	3	4	
22. I am just a "born criminal."	1	2	3	4	
23. I deserve more than other people.	1	2	3	4	
24. I think it is better to enjoy today than worry about tomorrow.	1	2	3	4	
25. I do not like to be tied down to a regular work schedule.	1	2	3	4	

Appendix C
Barratt Simplified Measure of Social Status

Level of School Completed	Mother	Father	Spouse	You
Less than 7 th grade				
Junior high/Middle school (9 th grade)				
Partial high school (10 th or 11 th grade)				
High school graduate				
Partial college (at least one year)				
College education				
Graduate degree				

Occupation	Mother	Father	Spouse	You
Day laborer, janitor, house cleaner, farm worker, food counter sales, food preparation worker, busboy				
Garbage collector, short-order cook, cab driver, shoe sales, assembly line workers, masons, baggage porter				
Painter, skilled construction trade, sales clerk, truck driver, cook, sales counter or general office clerk				
Automobile mechanic, typist, locksmith, farmer, carpenter, receptionist, construction laborer, hairdresser				
Machinist, musician, bookkeeper, secretary, insurance sales, cabinet maker, personnel specialist, welder				
Supervisor, librarian, aircraft mechanic, artist and artisan, electrician, administrator, military enlisted personnel, buyer				
Nurse, skilled technician, medical technician, counselor, manager, police and fire personnel, financial manager, physical/occupational/speech therapist				
Mechanical/nuclear/electrical engineer, educational administrator, veterinarian, military officer, elementary/high school/special education teacher				
Physician, attorney, professor, chemical and aerospace engineer, judge, CEO, senior manager, public official, psychologist, pharmacist, accountant				

Appendix D
Youth Risk Behavior Survey

The next 8 questions ask about tobacco use.

1. Have you ever tried cigarette smoking, even one or two puffs?
 - A. Yes
 - B. No

2. How old were you when you smoked a whole cigarette for the first time?
 - A. I have never smoked a whole cigarette
 - B. 8 years old or younger
 - C. 9 or 10 years old
 - D. 11 or 12 years old
 - E. 13 or 14 years old
 - F. 15 or 16 years old
 - G. 17 years old or older

3. During the past 30 days, on how many days did you smoke cigarettes?
 - A. 0 days
 - B. 1 or 2 days
 - C. 3 to 5 days
 - D. 6 to 9 days
 - E. 10 to 19 days
 - F. 20 to 29 days
 - G. All 30 days

4. During the past 30 days, on the days you smoked, how many cigarettes did you smoke **per day**?
 - A. I did not smoke cigarettes during the past 30 days
 - B. Less than 1 cigarette per day
 - C. 1 cigarette per day
 - D. 2 to 5 cigarettes per day
 - E. 6 to 10 cigarettes per day
 - F. 11 to 20 cigarettes per day
 - G. More than 20 cigarettes per day

5. During the past 30 days, how did you **usually** get your own cigarettes? (Select only **one** response.)
 - A. I did not smoke cigarettes during the past 30 days
 - B. I bought them in a store such as a convenience store, supermarket, discount store, or gas station
 - C. I got them on the Internet
 - D. I gave someone else money to buy them for me
 - E. I borrowed (or bummed) them from someone else
 - F. A person 18 years old or older gave them to me
 - G. I took them from a store or family member
 - H. I got them some other way

6. During the past 12 months, did you ever try **to quit** smoking cigarettes?
- A. I did not smoke during the past 12 months
 - B. Yes
 - C. No
7. During the past 30 days, on how many days did you use **chewing tobacco, snuff, or dip**, such as Redman, Levi Garrett, Beechnut, Skoal, Skoal Bandits, or Copenhagen?
- A. 0 days
 - B. 1 or 2 days
 - C. 3 to 5 days
 - D. 6 to 9 days
 - E. 10 to 19 days
 - F. 20 to 29 days
 - G. All 30 days
8. During the past 30 days, on how many days did you smoke **cigars, cigarillos, or little cigars**?
- A. 0 days
 - B. 1 or 2 days
 - C. 3 to 5 days
 - D. 6 to 9 days
 - E. 10 to 19 days
 - F. 20 to 29 days
 - G. All 30 days

The next 2 questions ask about electronic vapor products, such as blu, NJOY, or Starbuzz. Electronic vapor products include e-cigarettes, e-cigars, e-pipes, vape pipes, vaping pens, e-hookahs, and hookah pens.

9. Have you ever used an electronic vapor product?
- A. Yes
 - B. No
10. During the past 30 days, on how many days did you use an electronic vapor product?
- A. 0 days
 - B. 1 or 2 days
 - C. 3 to 5 days
 - D. 6 to 9 days
 - E. 10 to 19 days
 - F. 20 to 29 days
 - G. All 30 days

The next 6 questions ask about drinking alcohol. This includes drinking beer, wine, wine coolers, and liquor such as rum, gin, vodka, or whiskey. For these questions, drinking alcohol does not include drinking a few sips of wine for religious purposes.

11. During your life, on how many days have you had at least one drink of alcohol?
- A. 0 days
 - B. 1 or 2 days
 - C. 3 to 9 days
 - D. 10 to 19 days
 - E. 20 to 39 days
 - F. 40 to 99 days
 - G. 100 or more days
12. How old were you when you had your first drink of alcohol other than a few sips?
- A. I have never had a drink of alcohol other than a few sips
 - B. 8 years old or younger
 - C. 9 or 10 years old
 - D. 11 or 12 years old
 - E. 13 or 14 years old
 - F. 15 or 16 years old
 - G. 17 years old or older
13. During the past 30 days, on how many days did you have at least one drink of alcohol?
- A. 0 days
 - B. 1 or 2 days
 - C. 3 to 5 days
 - D. 6 to 9 days
 - E. 10 to 19 days
 - F. 20 to 29 days
 - G. All 30 days
14. During the past 30 days, on how many days did you have 5 or more drinks of alcohol in a row, that is, within a couple of hours?
- A. 0 days
 - B. 1 day
 - C. 2 days
 - D. 3 to 5 days
 - E. 6 to 9 days
 - F. 10 to 19 days
 - G. 20 or more days
15. During the past 30 days, what is the largest number of alcoholic drinks you had in a row, that is, within a couple of hours?
- A. I did not drink alcohol during the past 30 days
 - B. 1 or 2 drinks
 - C. 3 drinks
 - D. 4 drinks
 - E. 5 drinks
 - F. 6 or 7 drinks
 - G. 8 or 9 drinks
 - H. 10 or more drinks

16. During the past 30 days, how did you **usually** get the alcohol you drank?
- A. I did not drink alcohol during the past 30 days
 - B. I bought it in a store such as a liquor store, convenience store, supermarket, discount store, or gas station
 - C. I bought it at a restaurant, bar, or club
 - D. I bought it at a public event such as a concert or sporting event
 - E. I gave someone else money to buy it for me
 - F. Someone gave it to me
 - G. I took it from a store or family member
 - H. I got it some other way

The next 3 questions ask about marijuana use. Marijuana also is called grass or pot.

17. During your life, how many times have you used marijuana?
- A. 0 times
 - B. 1 or 2 times
 - C. 3 to 9 times
 - D. 10 to 19 times
 - E. 20 to 39 times
 - F. 40 to 99 times
 - G. 100 or more times
18. How old were you when you tried marijuana for the first time?
- A. I have never tried marijuana
 - B. 8 years old or younger
 - C. 9 or 10 years old
 - D. 11 or 12 years old
 - E. 13 or 14 years old
 - F. 15 or 16 years old
 - G. 17 years old or older
19. During the past 30 days, how many times did you use marijuana?
- A. 0 times
 - B. 1 or 2 times
 - C. 3 to 9 times
 - D. 10 to 19 times
 - E. 20 to 39 times
 - F. 40 or more times

The next 10 questions ask about other drugs.

20. During your life, how many times have you used **any** form of cocaine, including powder, crack, or freebase?
- A. 0 times
 - B. 1 or 2 times
 - C. 3 to 9 times
 - D. 10 to 19 times
 - E. 20 to 39 times
 - F. 40 or more times

21. During your life, how many times have you sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high?
- A. 0 times
 - B. 1 or 2 times
 - C. 3 to 9 times
 - D. 10 to 19 times
 - E. 20 to 39 times
 - F. 40 or more times
22. During your life, how many times have you used **heroin** (also called smack, junk, or China White)?
- A. 0 times
 - B. 1 or 2 times
 - C. 3 to 9 times
 - D. 10 to 19 times
 - E. 20 to 39 times
 - F. 40 or more times
23. During your life, how many times have you used **methamphetamines** (also called speed, crystal, crank, or ice)?
- A. 0 times
 - B. 1 or 2 times
 - C. 3 to 9 times
 - D. 10 to 19 times
 - E. 20 to 39 times
 - F. 40 or more times
24. During your life, how many times have you used **ecstasy** (also called MDMA)?
- A. 0 times
 - B. 1 or 2 times
 - C. 3 to 9 times
 - D. 10 to 19 times
 - E. 20 to 39 times
 - F. 40 or more times
25. During your life, how many times have you used **synthetic marijuana** (also called K2, Spice, fake weed, King Kong, Yucatan Fire, Skunk, or Moon Rocks)?
- A. 0 times
 - B. 1 or 2 times
 - C. 3 to 9 times
 - D. 10 to 19 times
 - E. 20 to 39 times
 - F. 40 or more times

26. During your life, how many times have you taken **steroid pills or shots** without a doctor's prescription?
- A. 0 times
 - B. 1 or 2 times
 - C. 3 to 9 times
 - D. 10 to 19 times
 - E. 20 to 39 times
 - F. 40 or more times
27. During your life, how many times have you taken a **prescription drug** (such as OxyContin, Percocet, Vicodin, codeine, Adderall, Ritalin, or Xanax) without a doctor's prescription?
- A. 0 times
 - B. 1 or 2 times
 - C. 3 to 9 times
 - D. 10 to 19 times
 - E. 20 to 39 times
 - F. 40 or more times
28. During your life, how many times have you used a needle to inject any **illegal** drug into your body?
- A. 0 times
 - B. 1 time
 - C. 2 or more times
29. During the past 12 months, has anyone offered, sold, or given you an illegal drug **on school property**?
- A. Yes
 - B. No

The next 7 questions ask about sexual behavior.

30. Have you ever had sexual intercourse?
- A. Yes
 - B. No
31. How old were you when you had sexual intercourse for the first time?
- A. I have never had sexual intercourse
 - B. 11 years old or younger
 - C. 12 years old
 - D. 13 years old
 - E. 14 years old
 - F. 15 years old
 - G. 16 years old
 - H. 17 years old or older

32. During your life, with how many people have you had sexual intercourse?
- A. I have never had sexual intercourse
 - B. 1 person
 - C. 2 people
 - D. 3 people
 - E. 4 people
 - F. 5 people
 - G. 6 or more people
33. During the past 3 months, with how many people did you have sexual intercourse?
- A. I have never had sexual intercourse
 - B. I have had sexual intercourse, but not during the past 3 months
 - C. 1 person
 - D. 2 people
 - E. 3 people
 - F. 4 people
 - G. 5 people
 - H. 6 or more people
34. Did you drink alcohol or use drugs before you had sexual intercourse the **last time**?
- A. I have never had sexual intercourse
 - B. Yes
 - C. No
35. The **last time** you had sexual intercourse, did you or your partner use a condom?
- A. I have never had sexual intercourse
 - B. Yes
 - C. No
36. The **last time** you had sexual intercourse, what **one** method did you or your partner use to **prevent pregnancy**? (Select only **one** response.)
- A. I have never had sexual intercourse
 - B. No method was used to prevent pregnancy
 - C. Birth control pills
 - D. Condoms
 - E. An IUD (such as Mirena or ParaGard) or implant (such as Implanon or Nexplanon)
 - F. A shot (such as Depo-Provera), patch (such as Ortho Evra), or birth control ring (such as NuvaRing)
 - G. Withdrawal or some other method
 - H. Not sure

Appendix E
Adverse Childhood Experiences Questionnaire

For the next set of statements, please indicate whether you experienced any of the following before your 18th birthday:

1. Did a parent or other adult in the household often or very often swear at you, insult you, put you down, or humiliate you? Or, act in a way that made you afraid that you might be physically hurt?

YES NO

2. Did a parent or other adult in the household often or very often push, grab, slap, or throw something at you? Or, ever hit you so hard that you had marks or were injured?

YES NO

3. Did an adult or person at least 5 years older than you ever touch or fondle you or have you touch their body in a sexual way? Or, attempt or actually have oral, anal, or vaginal intercourse with you?

YES NO

4. Did you often or very often feel that no one in your family loved you or thought you were important or special? Or, your family didn't look out for each other, feel close to each other, or support each other?

YES NO

5. Did you often or very often feel that you didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? Or, your parents were too drunk or high to take care of you or take you to the doctor if you needed it?

YES NO

6. Were your parents ever separated or divorced?

YES NO

7. Was your mother or stepmother often or very often pushed, grabbed, slapped, or had something thrown at her? Or, sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something hard? Or, ever repeatedly hit over at least a few minutes or threatened with a gun or knife?

YES NO

8. Did you live with anyone who was a problem drinker or alcoholic, or who used street drugs?

YES NO

9. Was a household member depressed or mentally ill, or did a household member attempt suicide?

YES NO

10. Did a household member go to prison?

YES NO

Appendix F
Delay Discounting Task

Please decide from each of the following if you would prefer the smaller, immediate reward or the larger, delayed reward. Circle the reward chosen. This is hypothetical and not for real money, but please take the choices seriously.

	SIR	LDR	Delay
1	\$54	\$55	117
2	\$55	\$75	61
3	\$19	\$25	53
4	\$31	\$85	7
5	\$14	\$25	19
6	\$47	\$50	160
7	\$15	\$35	13
8	\$25	\$60	14
9	\$78	\$80	162
10	\$40	\$55	62
11	\$11	\$30	7
12	\$67	\$75	119
13	\$34	\$35	186
14	\$27	\$50	21
15	\$69	\$85	91
16	\$49	\$60	89
17	\$80	\$85	157
18	\$24	\$35	29
19	\$33	\$80	14
20	\$28	\$30	179
21	\$34	\$50	30
22	\$25	\$30	80
23	\$41	\$75	20
24	\$54	\$60	111
25	\$54	\$80	30
26	\$22	\$25	136
27	\$20	\$55	7

Appendix G
Tower of Hanoi

Task 1:

4 Rings, 7 Moves

(Size)		T
	T	S
	S	M
	<u>L</u> <u>M</u> _____	<u>L</u> _____
	Start Position	Goal Position

Task 2:

4 Rings, 11 Moves

(Size)		T
		S
	T	M
	<u>S</u> <u>M</u> <u>L</u>	<u>L</u> _____
	Start Position	Goal Position

Task 3:

4 Rings, 15 Moves

(Size)	T	T
	S	S
	M	M
	_____ <u>L</u>	<u>L</u> _____
	Start Position	Goal Position