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The Impact of Adverse Childhood Experiences on Physical Health in College Students: A Replication and Extension of the ACE Study

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THE IMPACT OF ADVERSE CHILDHOOD EXPERIENCES ON PHYSICAL HEALTH IN COLLEGE STUDENTS: A REPLICATION AND EXTENSION OF THE ACE STUDY

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Adverse Childhood Experiences (ACEs) are linked to poor adult health (Felitti et al., 1998; Brown et al., 2010). Research on ACEs exposure in college students is lacking. This study examined the impact of ACEs, health risk behaviors, and resiliency factors on objective and subjective measures of health in college students. ACEs and health risk behaviors emerged as significant predictors of both measures of health. However, when resiliency factors were accounted for, gender and life satisfaction and perceived stress were the only significant predictors of health problems. Similarly, gender, health risk behaviors, social support and perceived stress were the only significant predictors of self-rated health. Gender and perceived stress emerged as predictors of health risk behavior engagement, the impact of ACE score approached significance. When less conservative models of mediation were used, health risk behaviors mediated the relationship between ACE score and both measures of health. Similarly, satisfaction with life and perceived stress mediated the relationship between ACE score and health problems. Social support and perceived stress mediated the relationship between ACE score and self-rated health. Findings suggest that ACE exposure has a lasting impact on health. The ability of resiliency factors to predict health has important implications for working with college students.

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CHAPTER I

INTRODUCTION

Statement of the Problem

Research on adult community samples has established a relationship between childhood maltreatment and poor physical health in adulthood. The Adverse Childhood Experiences (ACE) Study (Felitti et al., 1998) was the first to establish a relationship between detrimental experiences in childhood and physical health and disease in adulthood. The ACE studies, along with similar studies in the field, have found that experiencing multiple forms of adversity and maltreatment in childhood substantially increases risk for disease conditions which are the leading cause of death in U.S adults; these include cancer, cardiovascular disease and chronic obstructive pulmonary disease (Felitti et al., 1998; Anda et al., 2008; Brown et al., 2010; Danese et al., 2009; Dong et al., 2004b; Fuller-Thomson & Brennenstuhl, 2009). Chronic pain syndromes, gastrointestinal disorders and neuromuscular disorders also emerge in higher rates in participants with a history of multiple adverse experiences (Kendall-Tackett, 2000; Talley, Fett, Zinsmeister & Melton, 1994, Drossman et al., 1990, Walker et al., 1999; Lesserman et al., 1996; Sachs-Ericsson, Kendall-Tackett & Hernandez, 2007; Chartier, Walker & Naimark, 2010). Decreased health-related quality of life, increased health care utilization and premature mortality are also linked to adversity and maltreatment in childhood (Edwards, Anda, Gu, Dube & Felitti, 2007; Corso, Edwards, Fang & Mercy, 2008; Brown et al., 2009).

Detrimental childhood experiences are also linked to engagement in health damaging behaviors in adulthood. Exposure to maltreatment predicts increased risk for alcohol dependence and abuse and alcohol related problems (Anda et al., 2002; Breslau, Davis & Schultz, 2003; Dube et al., 2001b; Dube, Anda, Felitti, Edwards & Croft, 2002; Dube et al., 2006), smoking,

and smoking persistence in the face of a smoking-related medical condition (Edwards, Anda, Gu, Dube & Felitti, 2007; Ford et al., 2011; Anda et al., 1999), use of illicit drugs, particularly injectable drugs (Dube et al., 2003a; Dong, Dube, Felitti, Giles & Anda, 2003), sexual health risk behaviors, such as having a high number of sexual partners, failure to use protection against sexually transmitted diseases (STDs), experiencing an unplanned pregnancy, and contracting a STD (Felitti & Anda, 2010; Hillis, Anda, Felitti, Nordenberg & Marchbanks, 2000). ACEs are also linked to disturbances in sleep (Kendall-Tackett, 2007; Chapman et al., 2011; Clum, Nishith & Resick, 2011).

Three explanatory models have been proposed to further the understanding of the relationship between exposure to childhood adversity and physical health in adulthood. Biological theory posits that early adversity and trauma causes systemic dysregulation, for example, impacting the hypothalamic-pituitary-adrenal (HPA) axis which fuels over and under-production of neuroendocrines such as cortisol in response to internal and external stimuli, such as additional stress (Middlebrooks & Audage, 2008; Taylor, Way & Seeman, 2011; Danese et al., 2007; Danese et al., 2011). Psychological theory posits that early adversity leads to psychopathology and emotional distress, which in turn fuels ill health and increases perceptions of somatic complaints, such as pain (Van der Kolk, Perry & Herman, 1991; Ford et al., 2011; Jumper, 1995). Behavioral theory posits that biological and psychological dysregulation leads to engagement in health risk behaviors as a short-term solution to reduce distress and regulate emotion. Disease and illness are the maladaptive long-term consequences of these behaviors. At the same time, health risk-behaviors serve an adaptive function to the individual in the short term (Flood et al., 2009; Felitti et al., 1998; Pomerleau & Pomerleau, 1987; Anda et al., 2007; Lissau & Sørensen, 1994).

While the link between adverse experiences in childhood and physical health in adulthood is well established, there is a dearth of research addressing this relationship in college students. There is a growing recognition that university students are a unique population with unique needs (Arnett, 2000; Arnett, 2005; Flood et al., 2009). Research has demonstrated that trauma exposure in this population is comparable to community samples (Rutter, Weatherill, Krill, Orazem & Taft, 2013; Anders, Frazier & Shallcross, 2012). However, college students differ in fundamental ways in how they respond to adversity. College students are younger, and while alcohol and substance use patterns often emerge in early or mid-adolescence (Hingson et al., 2003), college entry creates a window of time for health behaviors to solidify or change. Age also relates to the emergence of physical health problems. The consequences of health risk behaviors initiated in early adulthood are likely to manifest later in life as mid and late ago-of-onset diseases such as cardiovascular disease and COPD (Felitti et al., 1998; Anda et al., 2008; Dong et al., 2004b). Studies examining the impact of childhood maltreatment on psychological factors find that college students have lower levels of psychopathology and distress as compared to community samples (Rutter et al., 2013; Flood et al., 2009). Differences in prevalence rates of disease conditions, disorders and syndromes in this population, differences in health risk behavior engagement, as well as differences in other major health outcomes (e.g., psychopathology) lend evidence to the premise that the relationship between adverse childhood experiences and physical health may show unique and different patterns in college students (Anders et al., 2012). These differences have important implications for working with college students with a maltreatment history in academic, therapeutic and administrative capacities.

There are some major gaps and flaws in the existing research on the impact of child maltreatment in college students. Research tends to focus on single categories of maltreatment (e.g., sexual abuse or physical abuse only) and ignores the fact that one form of maltreatment often co-occurs with, and fuel, other categories of adverse childhood experiences (e.g., intimate partner violence, drug alcohol abuse; Brener, McMahon, Warren & Douglas, 1999; Briere, 1992). Studies have demonstrated that individuals who endure multiple categories of abuse or trauma evidence more physical and mental health symptoms, as compared to individuals experiencing one event (Felitti, 2002; , Kendall-Tackett, 2000; Brown et al., 2009). However, a thorough understanding of the cumulative effects of abuse, particularly in college student populations, is lacking.

Furthermore, research on college populations tends to examine the impact of trauma experiences as a whole, or the impact of post-traumatic stress disorder symptoms on health, rather than traumatic maltreatment in childhood (Anders et al., 2012, Flood et al., 2011; Rutter et al., 2013; Reed, Anthony & Breslau, 2007). The impact of trauma across the lifespan, may be very different than the impact of experiences that occur during critical periods of great developmental vulnerability (Felitti & Anda, 2010; Taylor et al., 2011; Middlebrooks et al., 2008; Dong et al., 2004a). Few studies have examined the specific influence of maltreatment early in life on young adult well-being; those that have tend to focus on one category of maltreatment, or a sub-population (e.g., college women rather than all college students; Runtz, 2002). Research addressing the impact of adverse experiences in childhood on health risk behaviors and physical health in male and female college students is lacking. This study seeks to replicate and extend upon Felitti and colleagues' (1998) work by examining the impact of ACEs on physical health in a college student population.

CHAPTER II

REVIEW OF THE LITERATURE

Maltreatment in Childhood and Physical Health

The connection between adverse childhood experiences and physical health was first documented in Felitti and colleagues' (1998) seminal publication on the Adverse Childhood Experiences (ACE) study. This epidemiological study assessed the relationship of health risk behaviors, health status, and disease to childhood exposure to physical, psychological and sexual abuse, as well as four measures of household dysfunction (i.e., witnessing violence against mother, living in a household with a member who was previously incarcerated, mentally ill/suicidal or an alcoholic/drug user). ACE score was created using an integer count of seven interrelated and co-occuring exposures to childhood adversity (Felitti & Anda, 2009). Subsequent publications addressed the relationship between ACEs and a range of health risk behaviors and physical health/medical disorders (Anda et al., 1999; Anda et al., 2006; Anda et al., 2008; Brown et al., 2009; Brown et al., 2010; Chapman et al., 2011; Dong et al., 2003; Dong et al., 2004; Dube et al., 2001; Dube et al., 2002, Dube et al., 2003a; Dube et al., 2003b; Dube et al., 2006; Edwards et al., 2007; Felitti et al., 1998; Hillis et al., 2000)

This literature review examines the prevalence rates of childhood maltreatment as reported in adulthood, the relationship between maltreatment and health risk behaviors, and the relationship between maltreatment and adult physical health and medical disease conditions. Proposed models governing the relationship between adversity and childhood and adult health will be reviewed. Prevalence rates of childhood maltreatment in university populations will be examined. Research addressing the impact of maltreatment on health risk behaviors and physical health in university students will also be reviewed; gaps in the research will be discussed.

Prevalence and Co-Occurrence of Maltreatment in Adults

Childhood adversity occurs with great frequency. Fifty-two percent of respondents in the original ACE study reported exposure to at least one adverse childhood experience, 25% of respondents reported exposure to two or more adverse childhood experiences, and 6.2% reported four or more (Felitti et al., 1998). Exposure to one ACE category significantly increased the likelihood of exposure to another ACE category. The probability of one additional exposure ranged from 65-93%, the probability of two additional exposures ranged from 40-74%. The high co-occurrence of ACEs highlights the importance of studying the impact of a range of detrimental early experiences on an individual, rather than focusing on one category of event, such as child sexual abuse.

In the 2009 Behavioral Risk Factors Surveillance System (BRFSS), which assessed ACEs in over 29,000 participants, 22.4% of participants reported one ACE. Thirty-seven percent of participants reported two or more ACEs. A total of 59% of participants reported experiencing one or more ACEs (Morbidity and Mortality Weekly Report, 2010). Utilizing data from the Ontario Health Survey, Chartier, Walker and Naimark (2010) found that of 9,953 respondents, age 15 and older, 72% reported at least one ACE, while 37% reported two or more ACEs. Analyzing National Comorbidity Study data, Sachs-Ericsson and colleagues (2007) found that 3.8% of participants reported being physically abused, 5% reported being sexually abused, and 1.8% reported both physical and sexual abuse. Of the 66,798 female participants in Rich-Edwards and colleagues (2012) study, 65% reported some form of abuse. Mild physical abuse and unwanted sexual touching were most common categories endorsed. Severe physical abuse was reported by 9%, forced sexual intercourse by 11%. A high co-occurrence between severe physical abuse and forced sexual intercourse was observed.

Participants reporting parental alcohol abuse were significantly more likely to endorse having all nine ACEs utilized in a study by Anda and colleagues (2002). Having at least one alcoholic parent resulted in 2 to 3-fold increases in reported emotional, physical and sexual abuse and parent separation/divorce, as well as a 2 to 5-fold increase in living with a drug user, criminal or mentally ill/suicidal individual. A study by Dube and colleagues (2001) found that having at least one alcoholic parent created a 2 to 13-fold increase in likelihood of ACE exposure. Parental alcohol use is strongly linked to the presence of ACEs, at the same time childhood maltreatment increases risk of alcoholism in adulthood, creating high likelihood for intergenerational replication of adverse experiences in childhood.

Adverse Experiences in Childhood and Disease Conditions in Adulthood

A dose-response relationship has been observed between the number of ACE categories endorsed and the presence of disease in adulthood. The presence of an adverse childhood experience increases the risk of having one or more of the top ten disease causes of mortality in the U.S (Felitti & Anda, 2010). Relationships between the number of ACE categories endorsed and ischemic heart disease, cancer, chronic obstructive pulmonary disease (COPD), liver disease, skeletal fractures and poor self-rated health are strongest. For example, participants endorsing exposure to four or more ACEs had 1.6-fold increased risk for the presence of diabetes and skeletal fractures in adulthood and a 2.4-fold increased risk for stroke and liver disease (Felitti et al., 1998).

Chartier and colleagues (2010) found that the odds of poor adult health increased for each additional ACE endorsed. The risk of having two or more medical conditions had a 1.22-fold increase with each additional ACE endorsed. This translated to a 22% increase in medical conditions for participant endorsing one ACE, a 48% increased for participants endorsing two

ACEs, and 172% for respondents reporting 5 or 6 ACEs. Schafer and Ferraro (2012) found that higher levels of childhood misfortune (e.g., abuse) were associated with a lower likelihood of disease avoidance in adulthood for a large set of chronic conditions. In 27 out of 28 disease conditions examined, participants without the disease had consistently lower levels of childhood misfortune than participants with the disease. Impact of childhood misfortune on disease avoidance was approximately equal to the impact of moderate lifetime smoking and obesity combined.

In a meta-analysis examining 24 studies, Wegman and Stetler (2009) found a small to medium association between child abuse and negative medical outcomes in adulthood. Neurological and musculoskeletal problems were most strongly related to child abuse history. Respiratory problems, cardiovascular disease (CVD), as well as metabolic and gastrointestinal disorders also showed strong associations. The effect size was similar to effect sizes identified in meta-analyses examining the impact of child abuse on psychological outcomes (Kendall-Tackett, Williams & Finkelhor, 1993; Paolucci, Genuis & Violato, 2001). The link between abuse and physical health appeared stronger for female participants (Wegman & Stetler, 2009). Findings on the relationship between adverse experiences in childhood and specific disease conditions and disorders are reviewed below. Research on quality of life, premature mortality and healthcare utilization are also discussed.

Cardiovascular disease. Rich-Edwards and colleagues (2012) identified a strong association between severe physical abuse in childhood and cardiovascular disease (CVD) encompassing transient ischemic heart attack, myocardial infarction, and stroke. Participants reporting severe physical abuse in childhood had a 46% increased risk for CVD in adulthood as compared to participants reporting no abuse. Increased risk for CVD events was marginally

significant in relation to mild to moderate forms of sexual abuse. Risk of CVD was highly significant in relation to severe sexual abuse, such that participants endorsing experiences of severe sexual abuse had a 56% increased risk of CVD.

Dong and colleagues (2004b) found a strong relationship between the presence of ACEs and increased risk for ischemic heart disease. With the exception of parental divorce/separation, presence of any one of the ten ACEs categories produced a 1.3 to 1.7-fold increase in risk of ischemic heart disease. Participants endorsing 7 or more ACEs were 3.6 times more likely to have ischemic heart disease (IHD) as compared to participants endorsing no ACEs. Felitti and colleagues (1998) identified a 2.2-fold increase for heart disease in participants reporting four or more ACEs.

After adjusting for social and cardiovascular disease risk factors, sexually abused men evidenced three times more heart attacks as compared to men with no history of sexual abuse (Fuller-Thomson et al., 2012). Increased risk was equal to, or greater than, that of traditional risk factors (e.g., diabetes increased the risk of heart attack by 3-fold, smoking lead to a 1.5-fold increase) For women, child sexual abuse was not associated with heart attacks when data was adjusted for differences in age and race, or when it was adjusted for all 15 social and cardiovascular disease risk factors. These findings contrast with other studies on ACEs and cardiovascular disease, which show increased risk for cardiovascular disease given a history of ACEs in both men and women. Fuller-Thomson and colleagues (2012) postulated that a narrow focus on only heart attacks, rather than all forms of cardiovascular diseases, may have led to significant results for males but not for females. Additionally, unlike other studies, this one narrowly defined sexual abuse as only penetrative forced intercourse.

Psychological risk factors had a strong dose-response relationship with likelihood of ischemic heart disease (IHD), for participants with 4 or more ACEs. Depressed affect produced a 2 to 3-fold increase in IHD. Psychological factors were also stronger mediators of the ACEs-IHD relationship as compared to traditional risk factors (smoking, obesity, physical inactivity, hypertension and diabetes). Adjustment for traditional and psychological variables produced a 50 to 100% reduction in the strength of the ACEs-IHD relationship. However this relationship continued to remain significant despite adjustment for risk factors, suggesting unidentified mechanisms linking ACEs and IHD (Dong et. al., 2004b).

Cancer. Felitti and colleagues (1998) found a 1.9-fold increase for cancer in participants endorsing four or more ACEs. Fuller-Thomson and Brennenstuhl (2009) examined the association between childhood abuse and cancer in adulthood, while controlling for three groups of risk factors: childhood stressors, adult health behaviors, and adult socioeconomic status. Participants endorsing a history of childhood physical abuse had a 49% increased risk of cancer when adjusting for age, sex and race. When adjustments were made for the three groups of risk factors, risk of cancer decreased slightly to 47%. Even after controlling for health-behaviors such as alcohol consumption and obesity, the link between childhood physical abuse and cancer remained strong.

ACEs score showed a strong dose-response relationship to incidence of lung cancer, particularly for participants who died of cancer at a young age. Participants endorsing 6 or more ACEs evidenced a 3-fold increase in risk of lung cancer. Lung cancer sufferers who endorsed six or more ACEs were on average approximately 13 years younger than subjects with lung cancer who endorsed no adverse childhood experiences. ACE score also evidenced a strong dose-response relationship to smoking behaviors. When smoking behaviors were factored in, risk for

lung cancer was attenuated toward the null. However the ACEs-lung cancer relationship was not completely mediated by smoking, suggesting unidentified mechanisms by which childhood stressors negatively impact health (Brown et al., 2010).

Chronic Obstructive Pulmonary Disease (COPD). Felitti and colleagues (1998) found a strong, graded relationship between ACE score and COPD (i.e., chronic bronchitis and chronic emphysema) in adulthood, such that there was a 3.9-fold increase for the presence of COPD for participants endorsing four or more ACEs. A follow-up study by Anda and colleagues (2008) added an eighth ACEs category of parental separation or divorce. Participants who endorsed 5 or more ACEs had a 2.6-fold increase in self-reported COPD, a 2-fold increase in COPD-related hospitalizations, and a 1.6-fold increase in the rate of medications prescribed to treat COPD. An increased ACEs score corresponded to a decrease in mean age at which COPD-related hospitalization occurred. Smoking status was only a partial mediator for the relationship between ACEs score and COPD diagnosis, raising questions as to what other biopsychosocial factors may contribute to this relationship (Anda et al., 2008).

Liver disease. Dong and colleagues (2003) identified a dose-response relationship between number of ACEs endorsed and liver disease. Participants endorsing six or more ACEs were 2.6 times more likely to have liver disease. Presence of any one of the ten ACEs increased risk of liver disease 1.2 to 1.6 times. Felitti and colleagues (1998) identified a 2.4-fold increase in liver disease for participants endorsing four or more ACEs. Liver disease is predominantly caused by alcohol abuse and two types of viral hepatitis, hepatitis B (HBV) and C (HBC). Illicit drug use and high-risk sexual behavior accounts for most cases of hepatitis B and C infection. Hepatitis C infection and alcohol abuse can be co-active, speeding progression of liver injury, and increasing incidence of cirrhosis and hepatocellular carcinoma (MedLine Plus, 2013).

ACE score was strongly related to eight health risk behaviors associated with liver disease. In particular, risk for liver disease had a 1.6-fold increase for participants engaging in high-risk sexual activities, and a 7.7-fold increase for participants who reported using injectable drugs. Participants reporting a history of alcoholism and injectable drug usage were 10 times more likely to report having liver disease, as compared to participants with no alcoholism/injectable use history. Adjustment for liver disease-related risk behaviors reduced the strength of association between number of ACEs and liver disease by 38 to 50% for both viral and alcohol-induced disease, suggesting that risk behaviors mediate this relationship (Dong et. al., 2003).

Autoimmune diseases. Dube and colleagues (2009) studied the impact of ACEs on 21 selected autoimmune diseases (AD), including celiac disease, insulin dependent diabetes mellitus (Type 1), irritable bowel disease, multiple sclerosis, psoriasis, and rheumatoid arthritis (please see Dube et. al., 2009 for full list of ADs studied). Autoimmune disease prevalence in the U.S is approximately 3 to 8%. Autoimmune diseases typically peak between 30-60 years of age. Approximately 80% of sufferers are women, stemming from sex differences in basic immune response (e.g., women have stronger immune system activation via antibody production in response to infection or trauma while inflammation is more severe in men).

Adults endorsing two or more ACEs had a higher likelihood of being diagnosed with an autoimmune disease. This relationship was statistically significant for women but not for men. For every increase in ACE score, likelihood of hospitalization for participants age 19 to 64 increased by 20% regardless of gender. Participants with two or more ACEs had a 70% increased risk of hospitalization for a T-helper 1 disease, 80% increased risk for a T-helper 2 disease and a 100% increased risk for a rheumatic disease.

Chronic pain disorders. A variety of chronic pain syndromes in adulthood have been linked to adverse childhood experiences. Childhood trauma can also alter perceptions of pain. Sachs-Ericsson and colleagues (2007) found that 37% of participants with a history of child abuse reported a health problem in the past 12 months, as compared to 22% of participants with no abuse history. Among participants with a current health problem, those with a history of abuse reported more pain then their non-abused counterparts. Depression independently contributed to pain reports and did not mediate the relationship between childhood abuse and pain in adulthood. Kendall-Tackett and colleagues (2003) found that women reporting a history of childhood abuse or domestic abuse were significantly more likely to report pain symptoms. No significant differences were evidence between women reporting child abuse or domestic abuse alone. Chartier and colleagues (2010) found that risk of pain which restricts daily activity increased 1.24-fold for each ACE endorsed, as did risk of disability related to a medical condition.

Irritable Bowel Syndrome (IBS). IBS, considered a chronic pain syndrome, is a lower-gastrointestinal tract disorder of unknown causes demarcated by bloating, diarrhea or constipation, and abdominal pain or cramping. It is often diagnosed as idiopathic, after all organic causes of symptoms have been ruled out. No laboratory tests can be done to confirm its existence and IBS is highly comorbid with psychiatric illness (Kendall-Tackett, 2000; Talley et al., 1995; Lesserman et al., 1996). Talley and colleagues (1995) found that participants reporting a history of abuse were twice as likely to have IBS, compared to participants who did not report abuse. IBS patients were also more likely to report a sexual or physical abuse history when compared with patients in treatment for gastrointestinal disorders with known organic causes. Patients also reported higher rates of sexual victimization (54% vs. 5%), severe sexual trauma

(32% vs. 0%) and severe child sexual abuse (11% vs. 0%). Abuse severity contributed more to variance in poor overall health than education level, functional vs. organic gastrointestinal diagnosis and neuroticism (Drossman et al., 1990; Kendall-Tacket, 2000).

Lesserman and colleagues (1996) found that among patients referred to a gastroenterology clinic, participants with a history of sexual abuse reported experiencing significantly more pain, non-gastrointestinal somatic symptoms, bed-disability days, lifetime surgeries and psychological distress, as well as worse functional status. Scarini and colleagues (1994) found that irritable bowel syndrome (IBS) patients with a history of abuse had lower pain threshold levels and were faster to judge stimuli as noxious, as compared to IBS patients with no abuse history. Sexual abuse survivors differed significantly from controls on all measures of health status. Participants with a history of physical abuse reported more pain, non-gastrointestinal somatic symptoms and surgeries, as well as poorer functional status (Lesserman et al., 1996).

Fibromyalgia Syndrome (FMS). FMS is a chronic pain disorder characterized by diffuse soft tissue pain (Kendall-Tackett, 2009). Biosset-Pioro and colleagues (1995) found that FMS patients were more likely to report being physically abused as children and adults, as well as being physically and sexually abused in childhood. Patients with a history of abuse, particularly sexual abuse, had worse pain experiences than non-abused FMS patients. Comparing a group of fibromyalgia (FM) patients with a group of rheumatoid arthritis (RA) patients, Walker and colleagues (1997) found greater rates of childhood physical abuse, child sexual abuse involving penetration, and adult physical and sexual assault. FM patients were more likely to have repeated incidences of abuse. FM patients reported more emotional abuse in childhood, lower parental availability in childhood and more unhappiness in childhood.

Frequent headaches and migraines. ACEs have been linked to frequent headaches and migraines in a dose-response fashion. For persons endorsing five or more ACEs, risk of frequent headaches increased 2-fold (Anda et al., 2010). Each of the eight ACEs studied was also associated with increased frequent headaches, ranging from a 1.1-fold increase related to parent separation/divorce to a 1.7-fold increase related to emotional and physical abuse. Felitti and colleagues (1998) also noted a higher frequency of severe headaches in victims of childhood abuse.

Chronic Fatigue Syndrome (CFS). CFS is demarcated by changes in the central nervous system, neuroendocrine system and immune system. It is often triggered by stress, and results in fatigue, sleep disruption, cognitive impairment and pain. CFS affects 2.5% of the U.S adult population (Heim et al., 2009; Taylor et al., 2001). Heim, Wagner, Maloney and Papanicolaou (2006) found that participants with CFS had significantly higher childhood trauma scores as compared to controls, and were more likely to experience multiple types of trauma. Sixty-two percent of CFS patients were positive for at least one form of childhood trauma, as compared to 24% of control participants. Exposure to one form of trauma was associated with a 5.6-fold increased risk for CFS. A dose-response relationship emerged, such that for every additional category of exposure endorsed, risk for CFS doubled. History of sexual abuse, emotional abuse or emotional neglect was most strongly predictive of CFS in adulthood. Participants with childhood trauma exposure and CFS also evidenced decreased mean salivary cortisol levels upon awakening, indicating neuroendocrine dysfunction (Heim et al., 2009). This was not observed in control participants or in CFS patients with no history of childhood trauma.

Health-related quality of life. Edwards, Holden, Felitti and Anda (2003) found an inverse relationship between the number of ACEs endorsed and self-reported health, such that individuals endorsing more ACEs evidenced poorer self-rated health. Chartier et al. (2010) found that risk of poor self-rated health increased 1.18-fold with each additional ACE endorsed. Felitti and colleagues (1998) found that participants with four or more ACEs also had a 2.2-fold increase in self-reported fair or poor health. Research has demonstrated that self ratings of health are strong predictors of mortality for participants with existing medical diagnoses (Idler, Leventhal, McLaughlin & Leventhal, 2004).

Corso, Edwards, Fang and Mercy (2008) examined the impact of ACEs on health-related quality of life. Using quality adjusted life years (QALY) to estimate quality of life while accounting for life expectancy, the study found that individuals endorsing any category of maltreatment evidenced a yearly loss of .03 QALYs, which equates to 11 days per year. When taken individually, physical abuse, sexual abuse and emotional neglect significantly reduced yearly health-related quality of life. Individuals experiencing childhood maltreatment had significant and lasting losses in health-related quality of life. Loss in utility, as measured in QALYs, was highest for participants age 18 to 39 was .042, equating to 15 days per year.

Corso and colleagues' (2008) data suggests that experiencing any ACEs leads to a decrease in at least 2 years of undiscounted quality-adjusted life expectancy. Thus it can be argued that for every case of child maltreatment prevented, two QALY's can be saved. This estimate is conservative, as it does not take into account health-related risk behaviors that further decrease life span and quality, nor does it take into account the impact of chronic disease, also associated with ACEs. Finally, this estimate does not account for losses in health-related quality of life occurring during the actual time of maltreatment.

Premature mortality. Brown and colleagues (2009) examined the impact of ACEs on mortality by computing expected years of life lost (YLL) and years of potential life lost (YPLL). Participants who endorsed six or more ACEs at the start of the study died approximately 25 years earlier, on average, as compared to participants who endorsed no ACEs. Adults with 6 or more ACEs were 1.7 times more likely to die before the age of 75 and 2.4 times more likely to die before the age of 65. Increased risk of death was only partially mediated by health and social problems, suggesting that other unexplained mechanisms may contribute to the relationship between ACEs and premature death.

Health care utilization. Chartier and colleagues (2010) identified a strong relationship between ACEs and health care utilization. Odds for high health-care utilization increased with each additional ACE endorsed. Risk of heavy general practitioner use, defined as 6 or more visits in the past 12 months, increased 1.12-fold for every additional ACE endorsed. Risk of heavy emergency room use, defined as 2 or more trips in past 12 months, increased 1.29-fold for each additional ACE endorsed. Risk of high health professional use, defined as 25 visits or more in past 12 months, increased 1.19-fold for each ACE endorsed. Health professionals included family doctors, medical specialists, nurses, optometrists, chiropractors, physiotherapists, dentists, pharmacists, psychologists or other health professionals.

Adverse Experiences in Childhood and Health Risk Behaviors in Adulthood

Studies examining the relationship between ACEs and health risk behaviors tend to find a dose-response relationship between the number of ACEs categories endorsed and health risk behaviors. Compared to participants reporting no ACEs exposure, individuals who endorsed 4 or more categories of exposure evidenced a 1.3 to 2.2-fold increase in health risks, such as physical inactivity, severe obesity and current smoking. This group also evidenced a 2.5 fold increase in

history of STD contraction. They were 3.2 times more likely to have 50 or more sexual intercourse partners. Participants with a history of four or more ACEs also evidenced a 4.7 to 10.3-fold increase in history of illicit drug use, self-reported alcoholism, and history of injected drug use. Number of ACEs categories endorsed was strongly related to number of health risk behaviors endorsed. For participants endorsing zero ACEs, 56% also endorsed zero of the ten health risk behaviors. For participants endorsing 4 or more ACEs categories, only 14% endorsed zero of the ten health risk factors (Felitti et al., 1998).

Health risk behavior engagement has a strong impact on disease condition risk in adulthood. For example, Rich-Edwards and colleagues (2012) found that a history of abuse was associated with adult lifestyle and medical risk factors for cardiovascular disease (i.e., hypertension, excess weight, smoking and diabetes mellitus), leading to a 1.13-fold increased risk of cardiovascular disease for victims of severe physical abuse, and a 1.25-fold increased risk for victims of forced sexual intercourse. Adult health risk factors accounted for as much as 79% of the association between severe physical abuse and cardiovascular disease and 63% of the association with severe sexual abuse. Relationships between adverse experiences in childhood and specific health risk behaviors are reviewed below.

Alcohol use. ACEs score shows a strong dose-response relationship with alcohol initiation in early adolescence, such that participants endorsing 4 or more ACEs had a 6.2-fold increase in initiation of alcohol use before the age of fourteen. All ACE categories increased the likelihood of initiation of alcohol use in early adolescence as opposed to adulthood. Participants who endorsed experiencing contact sexual abuse had a 2.8-fold increase in alcohol initiation during early adolescence, and a 1.5-fold increase in initiation in mid-adolescence (Dube et al., 2006). Early initiation is associated with increased risk for alcohol-related disorders, such as

dependence, later in life (Hingson et al., 2003). There was a dose-response relationship between ACE score and ever consuming alcohol, such that participants with 4 or more ACEs had a 3.2-fold increase in ever drinking (Dube et. al., 2006). ACEs are associated with higher risk of alcohol abuse in adulthood. Presence of four or more ACEs was associated with a 2-fold increase in heavy drinking, a 3-fold increase in self-reported alcohol problems, and a four-fold increase in alcoholism. Adults reporting four or more ACEs and one alcoholic parent had the highest rates of self-reported alcoholism (21.4%) (Dube et al., 2002).

Smoking. A relationship between exposure to ACE categories and smoking initiation in young age, and smoking initiation in adulthood has been established (Anda et al., 1999). High ACE score was also associated with smoking persistence in the face of smoking-related symptoms and illness. Depression significantly predicted smoking-persistence in the wake of smoking-related diagnosis. At the same time depression only slightly attenuated the relationship between ACE score and smoking-persistence, raising the possibility that other mechanisms may be at play in the relationship between ACE exposure and smoking in adulthood (Edwards et al., 2007).

A dose-response relationship between number of ACEs endorsed and smoking behaviors was replicated by Ford and colleagues (2011) in their examination of ACEs using the 2009 Behavioral Risk Factor Surveillance System (BRFSS), which collected data from 29,212 participants across five states. Participants endorsing five or more ACEs were 2.22 times more likely to be current smokers, and 1.8 times more likely to have ever smoked. Additionally, participants endorsing five or more ACEs were significantly less likely to have quit smoking, as compared to participants with no ACEs. Each of the eight ACEs studied was associated with an increase in smoking in this population.

Illicit drug use. Each ACE led to a 2 to 4-fold increase in likelihood of drug initiation at age fourteen or younger, as well as an increase in likelihood of lifetime use. Number of ACEs endorsed had a strong dose-response relationship to initiation of drug use in early, mid and late adolescence. For every increase in ACEs, likelihood of drug use initiation increased by 40% during adolescence, 10% during mid and late adolescence and 30% across the lifetime (Dube et al., 2003). Participants endorsing five or more ACEs were seven to ten times more likely to report drug use problems (e.g., drug addiction, injection drug use). For every increase in ACEs there was a 30-40% increase in likelihood of drug use problems (Dong et al., 2003).

Sexually Transmitted Diseases (STDs). In a study examining STD rates, Hillis and colleagues (2000) found a 2.5-fold increase in STD contraction for women reporting four to five ACEs and a 3.4-fold increase for women reporting six to seven ACEs when data was adjusted to account for age at interview and race. Men reporting four to five ACEs had a 2.07-fold increase in STD contraction, with a 5.3-fold increase in STDs reported by men endorsing six to seven ACEs.

As compared to participants with an ACE score of zero, STD risk increased by 100% for women who had lived with a family member who had been incarcerated, 90% for women who experienced child sexual abuse, 70% for those who experienced emotional abuse, and 60% for those who experienced physical abuse. For men, STD risk increased by 160% for those who had lived with a family member who had been incarcerated, 90% for those with a sexual abuse history, 50% for those who had lived with a battered mother, and 50% for those who had lived with a substance abuser. The link between ACEs and STD risk was partially or completely mediated when early initiation of intercourse, having 30 or more sexual partners and substance abuse were taken into account (Hillis et al., 2000).

In examining the impact of health risk behaviors on liver disease, Dong and colleagues (2003) found a dose-response relationship between the number of ACE categories endorsed and engagement in eight liver disease-related risk behaviors studied. Most prominently, having over 30 sexual partners and alcohol-related problems were strongly predictive of liver disease. These risk behaviors were 22.8 times more likely in participants with 6 or more ACEs (Dong et al., 2003)

Obesity. Felitti and colleagues (1998) found that participants endorsing 4 or more ACEs had a 1.6-fold increased risk for severe obesity (BMI > 35) and a 1.3-fold increased risk for physical inactivity. Williamson, Thompson, Anda, Dietz and Felitti (2002) found a strong association between physical/verbal abuse in childhood and obesity. The 2.5% of participants who reported being "often hit or injured" weighed four kilograms more, and had a 39% increased risk of a BMI equal to or greater than 30, as compared to participants reporting zero ACEs. The 9.5% of participants who reported being "often verbally abused" had an 88% increased risk of having a BMI greater than or equal to 40. Participants reporting physical abuse, sexual abuse and attempted sexual abuse had increased risks of BMI ≥ 40 of 71%, 42% and 37% respectively. Risk of BMI ≥ 30 and BMI ≥ 40 increased with the number of severe ACEs categories endorsed. These associations were not independent, as abuse types have high rates of co-occurrence.

In one of the few prospective studies on child maltreatment, Lissau and Sørensen (1994) examined the impact of childhood abuse and neglect on obesity in adulthood. They obtained teacher ratings of students' family structure, perceived parent support, use of school medical services and subjective assessment of the child's general hygiene. Ten years later, parental neglect (defined as children receiving no parental support) predicted a 7-fold increase in obesity. Parental overprotection also resulted in an increased risk of obesity, although this effect was not

significant. Children who were identified by teachers as "dirty and neglected" were 10 times more likely to be obese as adults, compared to children who were not identified as neglected. Kong and Bernstein (2009) found a strong relationship between childhood trauma and eating psychopathology in adulthood. This relationship was partially mediated by depression, but was not mediated by obsessive-compulsive symptoms.

Sleep disturbance. Chapman and colleagues (2011) examined the impact of ACEs on rates of self-reported sleep disturbance (i.e., "trouble falling asleep or staying asleep", "feel tired, even after a good night's sleep"). The eight ACEs categories studied were associated with increased likelihood of self-reported sleep disturbance. Participants endorsing 5 or more ACEs were twice as likely to report sleep disturbances, compared to participants reporting no history of adverse experiences.

Examining sexual abuse survivors in a primary care sample, Hulme (2000) found that 52% of survivors reported being unable to sleep at night, as compared with 24% of participants with no history of sexual abuse. Likewise, 36% reported having nightmares, compared with 13% of participants with no child sexual abuse (CSA) history. Fifty-three percent of survivors reported intrusive and sudden thoughts and images, compared with 18% of non-abused participants. Bader, Schaefer, Schenkel, Nissen and Schwander (2007) found that 46% of insomniac patients in their study reported moderate to severe adverse experiences in childhood. Insomniacs with moderate to severe levels of ACEs experienced more awakenings throughout the night, more movement arousals, more stage one sleep (light sleep) and less slow wave sleep (deep sleep), compared to patients with low ACE exposure. The high ACEs group also evidenced more disturbed sleep, increased nocturnal activity, and decreased sleep efficiency on actigraphic data.

Links Between ACEs and Physical Health in Adults: Three Models

Three major theories have been proposed to explain the relationship between adverse experiences in childhood and physical health in adulthood. The biological theory posits that early adversity and trauma causes dysregulation in bodily systems, such as hyperarousal in the immune system, during a critical period in development. This leads to continual under- and over-regulation in response to internal and external stimuli, such as additional stress (Middlebrooks & Audage, 2008; Taylor, Way & Seeman, 2011; Danese et al., 2007; Danese & McEwen, 2012). The psychological theory posits that early adversity leads to psychopathology and emotional distress, which in turn fuels ill health and increases perceptions of somatic complaints (e.g., pain) (Van der Kolk et al., 2011; Ford et al., 2011; Jumper, 1995). Finally, the behavioral theory posits that biological and psychological dysregulation leads to engagement in health risk behaviors as a short-term solution to reduce distress and regulate emotion. Disease and illness are the maladaptive long-term consequences of these behaviors, which serve an adaptive function to the individual in the short term (Flood et al., 2009; Felitti et al., 2008; Pomerleau & Pomerleau, 1987, Wright et al., 2004; Anda et al., 2007; Lissau & Sørensen, 1994). These three theories, along with supporting research, are discussed in more detail below.

Biological Model

ACE exposure during critical periods of brain development can disrupt and dysregulate vulnerable biological processes, leading to the development of a low stress threshold and over-reactivity to adverse experiences throughout life (Middlebrooks & Audage, 2008). "Allostatic load" refers to physiological dysregulation in multiple bodily systems as a consequence of continuously attempting to adapt to environmental demands. Presented with a chronic need for adaptation, biological systems undergo wear and tear, losing the ability to function adaptively

and efficiently (Taylor et al., 2011). Childhood maltreatment has been linked to enduring dysregulatory changes in the nervous, immune and endocrine system (Danese & McEwan, 2012).

Several studies have demonstrated the lasting impact of traumatic stress in childhood via permanent damage to the central nervous system. Most prominently, childhood trauma has been shown to lead to increased activity in the hypothalamic–pituitary–adrenal (HPA) axis (Taylor et al., 2011; Somaini et al., 2011; Danese et al., 2009; Danese & McEwan, 2011). The HPA axis regulates the stress response via the release of corticotropin releasing factor (CRF) and adrenocorticotropin hormone (ACTH). ACTH is involved in production of gluccocorticoids, such as cortisol, a steroid hormone with anti-stress and anti-inflammatory functions. Cortisol regulates storage of carbohydrates, reduces inflammation following injury and helps the body return to baseline following a stress response (Taylor et al., 2011). Glucccorticoids have metabolic, behavioral and immunoregulatory effects that help adapt to challenge.

Insufficient gluccocorticoid levels are linked to increased immune activation and inflammatory response (Taylor et al., 2011). Acute stress is linked to an increase in cortisol and therefore a suppression of the immune response. Increased CRF, resulting from acute stress, leads to systematic elevations in corticosteroid levels. Acute stress may initially increase inflammation which will eventually be downregulated by glucocorticoids as the body attempts to maintain homeostasis. Chronic stress may lead to HPA dysregulation which may lead to decrease in cortisol and thereby increased inflammatory markers (e.g., decreased glucocorticoid levels) (Taylor et al. 2011). While temporary increases in inflammation can fight infections, chronic inflammation causes disease (Danese et al., 2009; Danese & McEwan, 2011; Kendall-Tackett, 2007). Kiecolt-Glaser (2005) found that increased inflammatory markers relating to hostile

marital interactions in couples led to delayed wound healing. Childhood abuse has been linked to long-term changes in immune response assessed 20 years later, including elevated c-reactive protein levels (a biomarker for inflammation), elevated white blood cell counts and other markers of a high inflammation response in adults who were abused as children, independent of other early life risk factors or health-behaviors and stress in adulthood (Danese et al., 2007). C-reactive protein has been linked to cardiovascular disease in adults exposed to a "risky family environment" in childhood (Taylor et al., 2011).

High cortisol levels can suppress the immune response, including killer NK -cell activity, phagocytosis and inflammatory cytokine production, which can protect against development of tumors (Dube et al., 2009; Fuller-Thomson et al., 2009). Research by Taylor and colleagues (2011) found that participants with a history of childhood maltreatment had continually elevated cortisol levels in response to a stress test, as compared to participants with no history of maltreatment, for whom cortisol peaked and then declined. Chronically high cortisol levels can also damage the hippocampus, which is responsible for learning and memory (Kendall-Tackett, 2007). Women with a history of physical and sexual abuse evidence increased stress sensitivity in the HPA axis, and maximum ACTH and cortisol levels in response to a stress test. High cortisol production in response to stress has been linked to increased cardiovascular disease in men (Fuller-Thomson et al., 2012). Disrupted daytime variation in cortisol production, caused by chronic stress activation, has been shown to be predictive of early mortality in patients with metastatic breast cancer (Taylor et al., 2011). HPA dysfunction has been linked to low cortisol secretion in chronic fatigue syndrome patients, with risk for CFS strongly linked to ACE exposure (Heim et al., 2009). HPA activation may increase DNA damage via epigenetic change, alterations in DNA repair and inhibition of apoptosis (Reiche, Nunes & Morimoto, 2004).

Exposure to adverse experiences in childhood is also linked to permanent changes in other brain regions. A higher percentage of brain wave abnormalities are seen in participants with early trauma, when measuring limbic irritability via EEG (Teicher et al., 2003). Children exposed to maltreatment have smaller prefrontal cortex volume, greater HPA axis activation and elevated inflammation levels. Adults with a history of maltreatment show these same changes, and along with decreased hippocampal volume (Danese & McEwan, 2012). Participants from "risky families" had atypical amygdal responses to emotional stimuli (Taylor et al., 2011).

Neurobiological factors in early development may explain why the relationship between ACEs and health risk-behavior engagement does not change across history, in the face of seemingly powerful cultural, legal, and socioeconomic changes pertaining to health-risk behaviors, such as smoking. For example, Dube and colleagues (2003) found that the relationship between ACE exposure and smoking in adulthood remained stable across four birth cohorts, dating back to 1900. Adverse experiences can impact brain development, leading to social, emotional and cognitive impairments, and thereby increasing the risk of engagement in health-behaviors and prevalence of mental health issues. Chronic stress can lead to dysregulation in brain regions as well as the neuroendocrine system. Such stress during childhood impacts stress regulation systems during a critical period of development, locking in dysregulated and maladaptive responses to stress in the body and brain (Taylor et al., 2011; Kendall-Tackett, 2009, Teicher et al., 2003).

Psychological Models

Childhood maltreatment, demarcated by exposure to multiple ACE categories, is associated with anxiety and depression, feelings of hostility and anger, affective dysregulation, post-traumatic stress symptoms and suicidality (Carlson, McNutt & Choi, 2003; Cuevas,

Finkelhor, Ormrod & Turner, 2009; Turner, Finkelhor & Ormrod, 2006, van der Kolk et al., 1991). Victims of child abuse evidence significantly more psychological symptomology, depression and self-esteem impairment in adulthood (Jumper, 1995). Edwards and colleagues (2003) found that exposure to ACEs had a dose-response relationship with poorer mental health outcomes. Chapman and colleagues (2004) found that ACE exposure predicted depression in adulthood in a dose-response fashion. This relationship was attenuated, but remained significant, when controlling for the adverse experience of residing with a mentally ill family member in childhood. In a study by Dube and colleagues (2001) participants endorsing 4 or more ACEs were 460% more likely to be depressed and 1220% more likely to attempt suicide. ACE score has shown a dose-response relationship to alcoholism and depression in adulthood. High rates of depression in adulthood are linked to having an alcoholic parent, and this link is accounted for by higher risk of exposure to ACEs (Anda et al., 2002; Felitti & Anda, 2010b). ACE score has also been linked to experiencing hallucinations independent of substance abuse history (Whitfield, Dube, Felitti & Anda, 2005). Higher ACE scores are also linked to increased psychotropic prescription drug use, including antidepressants, anxiolytics, and mood stabilizers (Anda et al., 2007).

Psychological functioning has been linked to physical health outcomes. Dong and colleagues (2004b) found that participants endorsing depressed affect were 2.1 times more likely to have ischemic heart disease (IHD). Endorsement of anger (assessed with the question: “Have you ever had a reason to fear your anger getting out of control?”) led to a 2.5-fold increase in IHD, while traditional risk factors were associated with a 1.2 to 2.7-fold increase in IHD. Smith and Ruiz (2002) highlight the role of depression, anxiety and hostility as contributors to heart disease, along with social isolation, interpersonal conflict and stress. Chronic fatigue syndrome

(CFS) patients with a history of trauma were more likely to meet criteria for severe depression, anxiety and Posttraumatic Stress Disorder (PTSD). High levels of PTSD symptoms further increased the risk of having CFS as a function of childhood trauma (Heim et al., 2009). Sareen and colleagues (2007) found that PTSD was associated with physical health outcomes, such as cardiovascular disease, gastrointestinal disease, respiratory disease, chronic pain disorders, and cancer, as well as mental health outcomes such as suicide attempts, poor quality of life, and disability status.

Disrupted neurodevelopment may also be a potential pathway for affective dysregulation, which may fuel psychopathology. Adverse early experiences impact the limbic system in lasting ways, leading to disordered affect regulation, including depression, anxiety and difficulty with anger control (Ford et al., 2011). In turn, depression and anger can cause changes in endocrine and immune functioning. For example, they can lead to the release of corticosteroids and catecholamines that influence platelet functioning and the clotting process in coronary arteries, resulting in acute or chronic physiological changes that lead to coronary artery disease (Kendall-Tackett, 2007). Research has also demonstrated that trauma and abuse in childhood can produce long-term physiological changes that may impact ability to self-regulate emotion and behavior, as well as cope with negative emotions (van der Kolk et al., 1991). Larkin and colleagues (2014) highlight the impact of chronic exposure to adversity on allostatic load and in turn lifetime responses to stress.

While several researchers have highlighted the relationship between ACEs and physical health and ACEs and mental health, the causal pathways between these constructs remain unclear. Some research suggests that ACEs concurrently impact physical and mental health through underlying mechanisms such as neurobehavioral dysregulation (Martin, 2000, Sachs-

Ericsson et al., 2007, Heckman, Moon, Pinto, Savelyev & Yavitz, 2010; Connor & Leonard, 1998). For example, Repetti, Taylor and Seeman (2002) highlight the impact risky family environments have on physical and mental health throughout the lifespan. In contrast, some researchers suggest that ACEs may lead to deficits in mental health, which in turn lead to poor physical health (Springer, 2009, Lee, 2010). For example, Chartier and colleagues (2009) found that ACE exposure in childhood was linked to poor health in adulthood, this relationship was partially mediated by mental health problems and health risk behaviors. Butterfield and colleagues (2000) found a strong relationship between hostility and poor self-rated health in female veterans with posttraumatic stress disorder.

Behavioral Models

The strong relationships evidenced between ACEs exposure, health risk behaviors and disease in adulthood lend evidence to the premise that ACEs exposure is likely to lead to high engagement in risk behaviors as a way to chronically cope with, and alleviate, the chronic psychological distress associated with a history of maltreatment and a lack of safety and security in childhood (Felitti et al., 2008; Flood et al., 2009; Pomerleau & Pomerleau, 1987, Wright et al., 2004; Anda et al., 2007; Lissau & Sørensen, 1994). Many health risk behaviors have neuroregulatory functions. For example, smoking increases mood, and alcohol use decreases anxiety (Pomerleau & Pomerleau, 1984). Obesity may stem from compulsive eating, which may serve as attempted management of the negative emotions related to adverse experience in childhood (Lissau & Sørensen, 1994; Williamson et al., 2002).

High psychotropic drug prescription rates (i.e., anxiolytics, antidepressants, antipsychotics and mood stabilizers) have been identified for participants endorsing a high number of ACEs (Anda et al., 2007). This relationship may be explained by the persistent impact

of ACEs on brain areas governing emotional regulation in adulthood. Thus, health risk behaviors considered maladaptive, in that they increase the likelihood of succumbing to a chronic and potentially fatal disease conditions, may serve a strong short-term adaptive function for individuals with a history of maltreatment, in that they may diminish and regulate psychological distress.

The link between ACE exposure and health risk behaviors is further supported by the persistence of this relationship throughout history despite drastic changes in trends such as smoking and recreational drug use across the century (Dube et al. 2003). Socioeconomic forces, public health campaigns and medical campaigns have increased the public's awareness and altered engagement in health risk behaviors. For example, tobacco usage and cigarette smoking have historically fluctuated, due to public health campaigns and laws aimed at decreasing smoking in the latter half of the century. From 1900-1917 cigarette consumption was very low, smoking peaked in the 1960's and began to decline significantly following the surgeon general's report in 1964 (Giovino, Henningfield, Tomar & Slade, 1995). Despite these large scale social changes, the strength and consistency of the relationship between ACE score and five health and mental health factors (i.e., depressed mood, suicide attempts, multiple sexual partners, STDs, and alcoholism) remained steady for participants across five birth cohorts (Dube et al. 2003). Across all five cohorts, participants endorsing four or more ACEs had significant increased risk for all five health and mental health factors studied. This suggests that the relationship between ACEs and health risk behaviors is not influenced by sociohistorical changes occurring across time.

At the same time, several studies have shown that health risk behaviors contribute to, but do not completely mediate, the relationship between ACE exposure and disease (Anda et al., 1999; Dong et al., 2003). The relationship between ACEs and coronary artery disease persists

when health risk factors such as conventional risk factors like cholesterol and smoking are controlled (Dong et al., 2004b). Risk of liver disease grows as ACEs score increases, even when major risk factors for the disease, such as alcohol abuse and sexual promiscuity are controlled for (Dong et al., 2003). These findings suggest that mechanisms other than health risk behaviors may mediate the relationship between childhood trauma and disease in adulthood.

Trauma, Health Risk Behaviors and Physical Health in College Students

While historically college students have been considered a convenience sample in psychological research, there is a growing awareness of the unique qualities and needs of this population (Arnett, 2000; Arnett, 2005). College students are younger than community samples and should therefore evidence better physical health, especially in regard to medical conditions with a late age-of-onset. Additionally, research on psychological outcomes in adults maltreated as children has found lower levels of psychopathology and maladjustment in college student samples as compared to community and clinical samples (Brener et al., 1999; Rutter et al., 2013; Watson & Haynes, 2007).

The youngest community sample participants in the ACE studies were 25 year-olds (Felitti et al., 1998). Research can benefit from data regarding an earlier cohort, specifically 18-24 year-old college students. Understanding the interrelationships between health risk behaviors and physical health in this population is particularly important for counseling and clinical psychologists who work with students in academic, therapeutic and administrative capacities.

Limitations of Existing Maltreatment Research in College Samples

The research on trauma experiences in college populations does not address the construct of adverse childhood experiences. Instead, research tends to focus on specific categories of abuse experiences (e.g., child sexual abuse; Runtz, 2002) or on trauma experiences across the lifespan

(Anders et al., 2012; Rutter et al., 2013). Single category research is problematic, as studies have demonstrated that maltreatment experiences tend to be highly interrelated and have cumulative effects, such that experiencing one form of abuse drastically increases the risk of experiencing another form of abuse and the negative outcomes of adversity (e.g., health risk behaviors, psychopathology, disease) increase greatly for each additional category of experience endorsed (Felitti et al., 1998; Wegman et al., 2009; Schafer and Ferraro, 2012; Jumper 1995, Dong et al., 2004a, Briere, 1992).

Research assessing trauma experiences as a whole is also problematic, in that early adversity, occurring during periods of great developmental vulnerability is likely to have a very different impact on well-being in adulthood, as compared to events that take place after the critical window of development has closed (Kendall-Tackett et al., 2000). Additionally, studying trauma as a whole makes it difficult to prove temporal and casual relationships. It is a reasonable assumption that childhood abuse took place prior to engagement in adult health risk behaviors, such as smoking, and the onset of adult diseases, such as liver disease (Felitti et al., 2010; Dong et al., 2004a). It is more difficult to establish the relationship between trauma that may have occurred in early adulthood and health risks or diseases that may emerge within the same window of time.

Despite its flaws, existing research on trauma experiences can still offer valuable insight into the relationship between early adverse experiences and physical health outcomes. Due to the dearth of research on the impact of adverse childhood experiences within a university population, the following review of childhood maltreatment research in college samples addresses research on childhood trauma, trauma as a whole, and the role of PTSD symptomology in a university population.

Prevalence of ACEs and Trauma in College Students

Trauma exposure rates in a university population range from 52% to 96% (Owens & Chard, 2006; Scarpa et al., 2001). Runtz (2002) found that 18.5% of a female sample of university students reported childhood sexual abuse, while 19.7% reported childhood physical abuse. Of women reporting sexual or physical abuse, 21.8% reported experiencing both. Roemmele and Messman-Moore (2011) found that 25.6% of their female college student sample reported experiencing some form of child physical abuse; 12.6% reported experiencing emotional abuse as children and 6% reported experiencing child sexual abuse.

Frazier and colleagues (2009) found that 85% of their college student sample had experienced a traumatic event in their lifetime, with an additional 21% experiencing a traumatic event during a 2-month period in college. Female and minority college students reported more lifetime traumatic events as compared to men and White students. The most common trauma reported by at both sampling times was the unexpected death of a loved one. Watson and Haynes (2007) found that 85% of participants in their ethnically diverse college sample had experiences at least one traumatic event. Forty-one percent of women reported at least one instance of physical assault, sexual assault or both. Brener, McMahon, Warren and Douglas (1999) found that twenty percent of female college students reported ever being forced to have sexual intercourse, most commonly during adolescence. Of women reporting rape, 16% reported their first experience at age 12 or under. Read and colleagues (2011) found that 66% of their college sample reported exposure to trauma.

Trauma and Mental Health in College Students

Psychopathology. Prevalence rates for the development of posttraumatic stress disorder (PTSD) following trauma in college students range from 6 to 12% (Frazier et al., 2009). Watson and Haynes (2007) found that 25% of participants in their study reported two or more PTSD symptoms, with 11% meeting symptom criteria. In a sample of student smokers, 19% met partial criteria for PTSD. An additional 21% met full criteria for the disorder (Read et al., 2011). Sexual assault was most strongly linked to emergence of PTSD symptoms, particularly among students endorsing sexual assault as their worst trauma event (Frazier et al., 2009; Read et al., 2011). Higher distress levels were reported for events that were intentionally caused, as well as events characterized by intense fear, horror and helplessness (e.g., sexual assault and family violence) (Frazier et al., 2009). Interpersonal trauma (e.g., physical assault, sexual assault) was linked to the highest rates of psychiatric diagnoses, levels of distress and impairment in social, school and family functioning. Twenty-five percent of female college students who reported traumatic assault experiences met full criteria for PTSD (Watson & Haynes, 2007). Twenty-five percent of victims of interpersonal trauma met criteria for lifetime diagnosis of anxiety disorders, one-third met criteria for a lifetime diagnosis of lifetime substance abuse/dependence and two-thirds met criteria for lifetime diagnosis of major depressive disorder. Multiple traumas and ongoing abuse were also linked to greater distress (Krupnick et al., 2004). Nine percent of college students met criteria for PTSD in Read and colleagues' (2011) study, with rates of PTSD increasing as the number of traumatic events endorsed increased.

Childhood sexual abuse involving physical contact was linked to increase psychological symptoms, as measured by the Behavioral Symptom Index (BSI), in a sample of university men. This included elevated scores relating to somatization, obsessive-compulsiveness, interpersonal

sensitivity, anxiety, depression, phobic symptoms, paranoia and psychoticism. Abusive or rejective parenting was highly predictive of childhood sexual abuse in boys, which lead to increase psychological symptomology (Collings, 1995). Higher distress was also seen in students with a higher total number of lifetime traumas, supporting theories that traumatic events may have cumulative effects on functioning (Frazier, 2009; Fellitti et al., 1998).

Adjustment to trauma beyond psychopathology. Comparisons of university students to community or clinical samples tend to find that student samples evidence smaller and more homogeneous effect sizes when the influence of child sexual abuse on adult psychological adjustment is examined, indicating that college students may experience less maladjustment than other groups (Jumper 1995; Rind, Tromovitch & Bauserman 1998). However, it is important to study subclinical issues in this population, as even moderate levels of maladjustment can have significant implications on college success and completion (Duncan, 2000; Rosenthal and Wilson, 2003).

Anders and colleagues (2012) found that students endorsing more lifetime trauma events had poorer outcomes with regard to physical health, mental health and GPA. Duncan (2000) found that students reporting more than one form of childhood abuse (i.e., physical, sexual, emotional) were significantly more likely to leave college prior to completion, as compared to college students with no reported history of abuse. Likewise, participants who had a history of sexual assault alone were also significantly more likely to drop out. The greatest number of dropouts occurred at the end of first year. Post-traumatic stress disorder symptoms assessed early in the first year were predictive of failure to remain enrolled in the fourth year. In the fourth year, 35% of victims reporting multiple types of abuse remained enrolled, as well as 50% of victims reporting sexual abuse only, while sixty-percent of participants with no abuse history remained

enrolled in college in their fourth year. Rosenthal and Wilson (2003) found that exposure to community violence impacted college persistence in a sample of college students of color, and this relationship was mediated by psychological distress. In Felitti and colleagues' (1998) study, college graduates were found to endorse fewer categories of ACE exposure compared to participants with lower levels of education, including those who had completed "some college".

Trauma and Physical Health in College Students

In a study by Anders and colleagues (2012), ninety-nine percent of participants reported at least one traumatic lifetime event, with a mean of 15.48 total lifetime events. Functional physical health was assessed, including self-reported perceptions of physical health, limitations in activities/work, energy and body pain. Participants exposed to trauma reported poorer physical health and more limitations on activities. They also evidenced lower GPAs as compared to participants reporting no trauma. Interpersonal trauma and directly experienced events were more strongly correlated with negative outcomes. Eight percent of participants met criteria for PTSD (Anders et al., 2012). Posttraumatic stress symptoms were linked to overall health symptoms, cardiovascular, muscular-skeletal and neurological issues, functional impairment (e.g., pain, decreased vitality, activity limitations), number of health conditions in the past six months and lifetime number of health conditions (Flood et al., 2009)

Runtz (2002) conducted one of the only studies assessing the impact of physical and sexual maltreatment in childhood on physical health in college students. Examining female students, this study found that a history of maltreatment was related to more general health symptoms, as well as pre-menstrual and menstrual symptoms. Participants with a history of maltreatment were significantly more likely to experience heart palpitations, muscle weakness, blurred vision, numbing of body parts, blurred vision, burning sensations in genitals and rectum,

genital pain, and bleeding between menstrual episodes. Endorsement of both physical and sexual abuse in childhood increased risk of greater emotional and behavioral premenstrual distress in adulthood. Severity and duration of sexual abuse was related to higher premenstrual distress.

Trauma and Health Risk Behaviors in College Students

Research has demonstrated a relationship between trauma exposure in a college student population and engagement in health risk behaviors. Students with a history of rape were more likely to report health risk-behavior engagement, including physically fighting with a romantic partner, driving under the influence of alcohol, smoking cigarettes, drug and alcohol use in conjunction with sexual intercourse, and multiple sexual partners. They were also more likely to have considered suicide in the 12 months preceding the survey. Rape history did not predict heavy episodic drinking or marijuana use. Heavy drinking and marijuana use emerged as significantly related to rape history when age, parents' education, race/ethnicity and sorority membership were controlled for (Brener et al., 1999).

Flood and colleagues (2009) found significant correlations between PTSD symptomology and average number of cigarettes per day, frequency of alcohol use, alcohol-related problems, frequency of drug use, and drug abuse severity. Substance use was also correlated with health problems, particularly in relation to alcohol use problems. Substance use was found to moderately mediate the relationship between PTSD symptoms and physical health, with no mediation effect observed for smoking. The presence of full or partial PTSD at the start of college was predictive of more alcohol and drug-related consequences. Substance use consequences were greatest for PTSD participants at the beginning of the academic year. Reed and colleagues (2007) found a link between PTSD and increased risk for drug abuse and dependence. Exposure to trauma alone did not predict drug abuse or dependence, or emergence

of problematic use. Trauma severity influenced rates of drug and alcohol related consequences. Rutter and colleagues (2013) found that PTSD symptoms and depressive symptoms were associated with poorer functional and physical health. Exercise mediated this relationship, such that participants with more symptoms were less likely to engage in physical activity.

Alcohol. Research on initiation of alcohol use has found that participants who begin drinking prior to the age of 14 are more likely to experience alcohol independence as adults, independent of family history of alcoholism. Early alcohol initiation was also linked with greater frequency of heavy drinking in adolescence and adulthood (Hingson et al., 2003). Initiation prior to the age of 14 was linked to a tendency to believe that one could consume more alcohol while driving legally and safely. The likelihood of believing one could competently operate a vehicle under the influence of multiple drinks was related to the likelihood of driving after drinking, driving after consuming five or more drinks, getting in a car with a high or drunk driver, and incurring injury within six hours of alcohol consumption.

Goldstein, Flett and Wekerle (2010) found increased alcohol consumption in male and female college students with a history of child maltreatment. Alcohol-related consequences were associated with depression, anxiety and enhancement needs in men with a history of abuse. Conformity emerged as an important predictor of drinking in men with a history of maltreatment. Drinking in women was mediated by a need to cope with depression.

Smoking. Read and colleagues (2012) found that smoking declined during the first semester for smokers entering college. This relationship emerged across all groups (i.e., students with no PTSD symptoms, partial PTSD and full PTSD). During the second semester, cigarette usage increased at an escalated rate for college students who met full criteria for PTSD at matriculation, while rising only slightly for students who met partial criteria for PTSD or did not

meet criteria. This falls in line with theories on substance use, which propose that use often starts in a social context, but as time progresses internal processes and pharmacological factors maintain use and dependence (Stevens, Smith & Reiner, 2009).

Sexual health risk behaviors. Roemmele and Messman-Moore (2011) found positive correlations between all three forms of childhood abuse (physical, sexual, and emotional) and lifetime number of sexual partners in college students. Physical and sexual abuse were correlated with high-risk sexual behavior (e.g., not using protection against pregnancy) with a regular partner over the past 6 months. Childhood abuse was related to schemas of emotional deprivation, mistrust and abuse, abandonment and instability, as well as defectiveness and shame. Schemas centering on defectiveness/shame and abandonment partially mediated lifetime number of sexual partners and risky sexual behaviors in participants with a history of childhood physical and sexual abuse. These negative schemas fully mediated the relationship between childhood emotional abuse and lifetime number of sexual partners. This suggests that sexual risk-taking may be reflective of attempts to reduce fears of abandonment or increase perceptions of self-worth.

Summary of the Literature

A strong relationship between adverse childhood experiences and physical health has been established in adult community samples, such that each additional category of ACE exposure endorsed substantially increases risk for a wide range of diseases. This relationship holds for the top ten disease-related causes of death in adults, including heart disease and cancer (Anda et al., 1999; Dong et al., 2003; Dube et al., 2001; Dube et al., 2002, Edwards et al., 2007; Felitti et al., 1998). Health-related quality of life, health care utilization and premature mortality are also linked to ACEs exposure in a dose-response fashion (Brown et al., 2009; Corso et al.,

2008). ACE exposure is also linked to health risk behaviors, such as alcohol use, smoking, illicit drug use, sleep disturbance and sexual health risk behaviors (Anda et al., 1999; Anda et al., 2002; Dube et al., 2003a; Hillis et al., 2000). Biological, psychological, and behavioral explanatory models have been proposed to ascertain the mechanisms governing the relationship between early adverse experiences and physical health (Taylor et al., 2011; Kendall-Tackett, 1993; Jumper, 1995).

There is a growing recognition that university students are a unique population, with unique needs (Arnett 2000; Arnett, 2005). Research has demonstrated that trauma exposure in college students is comparable to community samples, but psychological, behavioral and physiological outcomes may play out differently in this unique population (Brener et al., 1999; Rind et al., 1998; Watson & Haynes, 2007). As demonstrated by Duncan and colleagues (2011), as well as Anders and colleagues (2012) adjustment difficulties following trauma can have profound effects on college students, including increased risk for dropping out of college, poorer grades, and poorer self-rated health, even if symptoms of maladjustment do not reach pathological levels.

There remains a dearth of research on the impact of childhood maltreatment and adversity on physical health and health risk behaviors in college students. With the exception of one study focusing only on functional health and menstrual symptoms in female college students (Runtz, 2002), there is no research on the impact of adverse childhood experiences on physical health, disease conditions and health-care utilization in college students. Furthermore, the ACE framework for assessing early adverse experiences has never been applied to a college sample.

Additionally, when physical health is studied in college students, functional and self-rated health is often assessed rather than specific disorders and disease conditions. Research on the impact of ACEs on health risk behaviors in this population is also sparse, and has significant gaps. For example, no studies have addressed obesity in this sample, minimal attention has been paid to physical inactivity, research on sexual health in this population (e.g., number of partners, rates of prophylactic usage to protect against STDs, rates of contraceptive usage to protect against pregnancy) is lacking, and no work has been done on sleep disturbances.

The Present Study

This study seeks to rectify existing gaps in the research. The primary goal is to examine the prevalence of ACEs in a university sample of both men and women. This will lend a greater understanding of the role of adverse experiences in childhood, rather than trauma experiences as a whole. It will also shed light on the interrelationships and cumulative effects of multiple ACEs in this population. Thus, the first research question addressed is stated as: are prevalence rates for ACE exposure in male and female university students similar to rates of ACE exposure in the adult community population? The hypothesis is as follows:

> Hypothesis 1.1: Rates of ACEs exposure in college students will be similar to rates of exposure in a community sample, such that approximately 50% of participants will endorse exposure to one or more ACEs, approximately 25% will endorse exposure to two or more ACEs and approximately 10% will endorse exposure to four or more ACEs.

A second goal of this research is the assessment of self-rated health and specific disease conditions, syndromes and disorders, as related to ACEs exposure. The few studies conducted with university students tend to focus on functional health without assessing for existing conditions. Thus, the second research question addressed is stated as: is there a relationship between ACE exposure in childhood and physical health/self-rated health in college students?

Hypotheses are as follows:

> Hypothesis 2.1: Exposure to multiple categories of ACEs will have a significant negative impact on health problems, such that students reporting high ACE scores will endorse more health disorders and health problem categories, as compared to students with lower ACE scores.
>
> Hypothesis 2.2: Exposure to multiple ACEs categories will have a significant negative impact on self-rated health, such that students with higher ACE scores will endorse poorer self-rated health, as compared to students endorsing lower ACE scores.

While health risk behaviors have been studied more extensively in this population, fundamental gaps exist in the research. An additional goal of this study is to examine the relationship between ACE exposure and health risk behaviors. Previous studies have explored the relationship between health risk behaviors and trauma exposure across the lifespan or PTSD symptomology in response to trauma, not adverse events in childhood. This study also seeks to fill major gaps in health risk behavior research, specifically by assessing the risk behaviors of physical inactivity, obesity, and sexual-risk behaviors in a university sample, variables which have received little or no research attention. Thus the research question addressed is stated as: is their a relationship between ACE exposure and engagement in health risk behaviors in a university student population? Hypothesis is as follows:

> Hypothesis 3.1: Exposure to multiple categories of ACEs will have a significant negative impact on health risk behaviors, such that students with high ACE scores will endorse higher engagement in health risk behaviors, as compared to students with lower ACE scores.

Previous research assessing the role of health risk behaviors in the relationship between ACEs and physical health has often found that health risk behaviors partially mediate, but do not completely account for, the relationship between ACEs and health. Little research has been done on the role of health risk behaviors in the relationship between ACEs and physical health in college students. Thus, the research question is stated as follows: do health risk behaviors mediate the relationship between ACEs and physical health in college students? The hypotheses are as follows:

> Hypothesis 4.1: Exposure to multiple categories of ACEs will have a negative impact on health problems. This relationship will be partially mediated by health risk behaviors, such as smoking, illicit drug use, obesity, physical inactivity and sexual health risk behaviors.
>
> Hypothesis 4.2: Exposure to multiple categories of ACEs will have a negative impact on self-rated health. This relationship will be partially mediated by health risk behaviors, such as smoking, illicit drug use, obesity, physical inactivity and sexual health risk behaviors.

CHAPTER III

METHODS

Overview

The present study is an extension of Felitti and colleagues (1998) study. This study sought to examine the relationship between ACEs exposure in childhood and health problems/self-rated health in adulthood, in a college student sample. Participants completed eight measures. The modified Family History questionnaire collected demographic information and assessed for ACEs exposure, as well as current health risk behaviors (Appendix A). The Health Appraisal questionnaire assessed for current and past health problems and disease conditions (Appendix B). The RAND 36 assessed functional health across eight domains, including physical functioning and general health (Appendix C).

Participants also completed the Positive and Negative Affect Schedule (PANAS), the Satisfaction with Life Scale (SWLS), the Perceived Stress Scale (PSS), the Perceived Social Support Scale (PSS), and the Protective Factors in Childhood Survey. These five measures were used to assess the role of resiliency factors in the relationship between ACE score and the outcome variables. The PANAS assessed for current affect (Appendix D). The SWLS assessed for current life satisfaction (Appendix E). The Perceived Stress Scale (Appendix F) assessed the degree to which current life events are perceived as stressful. The Perceived Social Support scale (Appendix G) assessed subjective perceptions of social support adequacy. The Protective Factors in Childhood Survey (Appendix H) assessed protective factors in families.

Participants completed survey measures in a computer laboratory classroom. Participants were presented with an informed consent form (Appendix L) that contained a description of the purpose of the study and detailed participants' rights to withdraw from the study at any time

without suffering any penalties. Survey measures were administered via a computer-based survey program; questionnaires were counterbalanced to mitigate the possible effects of order of presentation. Total completion time ranged from 30 to 45 minutes. Participants were provided with a debriefing form at the end of the study, as well as a referral sheet listing mental health resources in the community.

Table 1 details participant characteristics. Approximately 57% of participants were male and 43% were female. With regards to age, the majority of participants (40%) were 19 years old, closely followed by 18 years old (37.6%). The majority of participants were college freshmen. The sample was predominantly Caucasian (84.4%).

Frequency analyses were used to determine the rates of ACEs exposure in this college student sample. Additional frequency analyses were used to examine ACEs exposure rates as related to demographic variables, such as gender. Multiple regression models were used to test the following research questions: 1) Does ACE score have a significant relationship with health problems and with self-rated health? 2) Does ACE score have a significant relationship with total number of health risk behaviors? Barron and Kenny's (1986) approach to mediation analysis and bootstrapping procedures were used to examine mediation models. It was hypothesized that health risk behaviors would mediate the relationship between ACEs and health problems, and ACEs and self-rated health. Exploratory analyses were conducted to examine the possibility that other variables in this study mediated the relationship between ACEs and health problems and ACEs and self-rated health.

Table 1

Frequencies for Demographic Variables

		n	%
Gender			
	Male	121	57.1
	Female	91	42.9
Race/Ethnicity			
	Asian	3	1.4
	Black	22	10.4
	American Indian	1	.5
	White	179	84.4
	Hispanic	2	.9
	Other	5	2.4
Age*			
	18	79	37.6
	19	84	40
	20	29	13.8
	21	14	6.7
	22	2	1.0
	23	1	.5
	24	1	.5
College Status			
	Freshman	141	66.5
	Sophomore	55	25.9
	Junior	9	4.2
	Senior	7	3.3
Family Income			
	$0-$15,000	7	3.3
	$15,001-$25,000	18	8.5
	$25,001-$35,000	24	11.3
	$35,001-$55,000	47	22.2
	$55,001-$75,000	40	18.9
	More than $75,001	76	35.8

*N=210

Survey Measures

Participants completed eight measures. The Family History questionnaire and the Health Appraisal questionnaire were adapted from Felitti and colleagues' (1998) study and modified for use with a college sample. The RAND 36 assessed for subjective perceptions of health. Participants completed the Positive and Negative Affect Schedule, the Satisfaction with Life

Scale, the Perceived Stress Scale, the Perceived Social Support scale and the Protective Factors in Childhood Survey. These measures controlled for the impact of current affect, life satisfaction, perceived stress, perceived social support, and protective factors in childhood on the relationship between ACEs and physical health, self-rated health, and health risk behaviors.

Family History Questionnaire

The Family History questionnaire (Appendix A), as utilized by Felitti and colleagues, was used to collect a broad range of demographic information as well as personal information and family history. Test-retest reliability for a version of the Family History questionnaire that utilized eight ACEs categories was found to be good, weighted kappa-statistics ranged from .52 to .72 for ACE items. Witnessing one's mother "ever threatened or hurt by a knife or gun" had the lowest reliability coefficient (.52). Weighted kappa-coefficients for overall ACE score was .64 (Dube et al., 2004). Kappa values of >.75 represent excellent agreement. Values ranging from .40 to .75 represent good agreement.

The core questions assessing ACEs are detailed in Appendix I. Scoring criteria was established based on information provided by the Center for Disease Control (CDC; Adverse Childhood Experiences [ACEs], 2016) and the original ACE study (Felitti et al., 1998). ACE score was obtained by determining if criteria was met for a particular category and summing the categories for which criteria was met. The response categories for physical abuse, psychological abuse, and witnessing maternal battering questions were: never, once or twice, sometimes, often, or very often. The response categories for emotional neglect and physical neglect were: never true, rarely true, sometimes true, often true, very often true. The response categories for the remaining five ACE categories were "yes" or "no."ACE categories were defined and scored as follows:

- Physical Abuse: Two questions were used to identify childhood physical abuse: "Sometimes parents or other adults hurt children. While you were growing up, that is, during your first 18 years of life, how often did a parent, stepparent, or adult living in your home: 1) actually push, grab, shove, slap, or throw something at you? 2) hit you so hard that you had marks or were injured?" Participants met criteria for this category if they responded "often" or "very often" to the first question or "once or twice," "sometimes," "often" or "very often" to the second question.
- Psychological Abuse: Two questions assessed for psychological abuse: "Sometimes parents or other adults hurt children. While you were growing up, that is, during your first 18 years of life, how often did a parent, stepparent, or adult living in your home: 1) swear at you, insult you, or put you down? 2) act in a way that made you afraid that you might be physically hurt?" Participants met criteria for this category if they responded "often" or "very often" to either question.
- Sexual Abuse: Four questions assessed for sexual abuse: "Some people, while growing up in their first 18 years of life, had a sexual experience with an adult or someone at least five years older than themselves. These experiences may have involved a relative, family friend, or stranger. 1) During the first 18 years of life, did an adult or older relative, family friend, or stranger ever touch or fondle your body in a sexual way? 2) During the first 18 years of life, did an adult or older relative, family friend, or stranger ever have you touch their body in a sexual way? 3) During the first 18 years of life, did an adult or older relative, family friend or stranger ever attempt to have any type of sexual intercourse (oral, anal, or vaginal) with you? 4) During the first 18 years of life, did an

adult or older relative, family friend or stranger ever actually have any type of sexual intercourse (oral, anal, or vaginal) with you?" Participants met criteria for sexual abuse if they responded "yes" to any of the four questions.

- Physical Neglect: Five questions assessed for physical neglect: "While you were growing up, during your first 18 years of life, how true were each of the following statements: 1) you didn't have enough to eat. 2) you knew there was someone there to take care of you and protect you. 3) your parents were too drunk or too high to take care of the family. 4) you had to wear dirty clothes. 5) there was someone to take you to the doctor if you needed it." Participants met criteria for this category if they responded "often true" or "very often true" to items one, three or four, or "never true" or "rarely true" to items two or five.
- Emotional Neglect: Five questions assessed for emotional neglect: "While you were growing up, during your first 18 years of life, how true were each of the following statements: 1) there was someone in your family who helped you feel important or special. 2) you felt loved. 3) people in your family looked out for each other. 4) people in your family felt close to each other. 5) your family was a source of strength and support." Participants met criteria for this category if they responded "never true" or "rarely true" to any of the items.
- Witnessing Maternal Battering: Four questions assessed for witnessing maternal battering: "Sometimes physical blows occur between parents. While you were growing up in your first 18 years of life, how often did your father (or stepfather) or mother's boyfriend do any of these things to your mother (or stepmother): 1) push, grab, slap, or throw something at her? 2) kick, bite, hit her with a fist, or hit her with something hard?

3) repeatedly hit her over at least a few minutes? 4) threaten or hurt her with a knife or gun, or use a gun or knife to hurt her?" Participants met criteria for the category if they responded "often" or "very often" to the first item, "sometimes," "often"or "very often" for the second item, or "once or twice" "sometimes" often" or "very often" for the third and fourth items.

- Household Mental Illness: Two questions assessed for household mental illness: 1) "Was someone in your household depressed or mentally ill?" and 2) "Did someone in your household attempt or commit suicide?"Participants met criteria for this category if they answered "yes" to either question.
- Household Substance Abuse**:** Two questions assessed for household substance abuse: 1) "During your first 18 years of life did you live with anyone who was a problem drinker or alcoholic?" and 2) "During your first 18 years of life did you live with anyone who used street drugs?" Participants met criteria for this category if they answered "yes" to either question.
- Household Criminal Activity: Two questions assessed for household criminal activity: 1) "Did anyone in your household ever go to prison?"and 2) "Did anyone in your household ever commit a serious crime?" Participants met criteria for this category if they answered "yes" to either question.
- Parental Divorce or Separation: One question assessed for parental divorce or separation: "Were your parents ever separated or divorced?" Participants met criteria for this category if they answered "yes" to either question.

Possible ACE scores ranged from a score of zero (endorsing no ACEs) to a score of 10 (endorsing all ten ACEs). In the present study, ACE scores ranged from 0 to 6 with a mean ACE

score of 1.67 and a median ACE score of 1 *(SD=1.54)*. For the purpose of statistical analyses ACE scores with low frequencies were collapsed into broader categories. ACE scores of 5 (five participants) and 6 (four participants) were collapsed into one category of 5.

The Family History Questionnaire assessed for five categories of health risk behaviors. Seven items assessed for sexual health risk behaviors. Six items assessed for cigarette usage. Three items assessed for exercise frequency and weight. Five items assessed for alcohol drinking patterns and problematic use. Three items assessed for the use of street drugs. Appendix J details the health risk behaviors assessed and criteria for positive endorsement of the particular health risk behaviors. Participants met criteria for the particular health risk behavior if they met criteria for any of the questions within that category. Health risk behavior score was obtained by summing up total health risk behaviors for which criterion was met, with possible scores ranging from zero to five health risk behaviors. For the present study, Health Risk Behavior score ranged from 0 to 5 with a mean of 1.93 *(SD=1.09)*.

The Family History questionnaire was modified for use with a college student population. With regard to health risk behaviors, three new items were added to assess for the usage of other tobacco products, such as chewing tobacco. In conjunction with items assessing exercise frequency and weight, an additional item assessing for height at the time the individual weighed most was added to allow for the calculation of highest BMI ever for the participant. In addition to items assessing alcohol use, an additional item from the Health Assessment Questionnaire was added (i.e., "I sometimes wonder if I drink more than is good for me").

Health Appraisal Questionnaire (HAQ)

Felitti and colleagues (1998) utilized the Health Appraisal Questionnaire (HAQ) to assess for disease conditions and self-rated health in their study. This is an extensive health survey

utilized by Kaiser Permanente (the study sponsor) for all patients receiving services through this Health Maintenance Organization (HMO). As such, it is representative of health questionnaires that patients fill out during the first visit to a new doctor, or the kinds of questions a physician might ask of a new patient. The HAQ is comprised of approximately 200 questions assessing demographic data, mental health, functional health, abuse history, self-rated health and physical health/disease conditions through a comprehensive review of body systems. In medical practice, 75-80% of patient information regarding current disease conditions and disease history is obtained via patient self-report, much like this questionnaire, rather than through more objective measure such as medical records and laboratory tests (V. Felitti, personal communication, September 8, 2013; September 14, 2013).

The Health Appraisal Questionnaire was shortened for the purpose of the present study. An open-ended item was added to each body systems category list and to the end of the questionnaire. These items prompted participants to write in any additional health conditions which were included in the questionnaire. The modified HAQ utilized in the present study consists of 15 body systems categories, including a Men's Health and a Women's Health category. The modified Health Appraisal Questionnaire is contained in Appendix B.

A total health problems score was derived from this measure. Health problems scores were derived by summing the number body systems categories a participant endorsed. Appendix K lists the body systems categories assessed by the HAQ. The maximum possible score for total health problems is fifteen; fourteen health problems listed, plus one “any other health problems not listed” category for health problems not falling into any of these categories. In the present study, scores ranged from 0 to 11 with a mean of 3.71 *(SD=2.57)*. For the purpose of statistical analyses health problem scores with low frequencies were collapsed into broader categories.

Health problem scores of 6, 7 and 8 were collapsed into one category coded as 6. Scores of 9, 10 and 11 were collapsed into one category, coded as 7.

RAND 36

The RAND 36-Item Health Survey (Hays, Sherbourne & Mazel, 1993) assessed functional health across eight domains: physical functioning, bodily pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, general mental health, social functioning, energy/fatigue, and general health perceptions. An additional item also assessed for perceived change in health. The RAND 36 consists of 36 items (Appendix C).

Previous research shows good reliability and validity for the RAND 36. Reliability coefficients exceeded .70 for every scale. Cronbachs's alpha for Physical Functioning and General Health was .93 and .78, respectively (Hayes et al., 1995). In the present study, Cronbach's alpha was .79 for the General Health scale which was utilized as a measure of self-rated health in this study.

The RAND 36 is scored by re-coding all items on a 0 to 100 scale (e.g., “not at all” is scored as 0, “a little bit” is scored as 25, “moderately” is scored as 50, “quite a bit” is scored as 75, “extremely” is scored as 100). Select items are reverse coded. Higher scores represent a better state of health. Scale items are then averaged together to create the scale. Items left blank are not taken into account when calculating averages, as such, the scale score represents the average of all the items that were answered. The present study utilized the General Health scale as a measure of self-rated health. Responses on this scale ranged from 0 to 100, with a mean of 68.4 *(SD=19.22)*.

Positive Affect Negative Affect Schedule (PANAS)

The PANAS assessed for current affect (Appendix D; Watson et al., 1988b). The measure was used to assess for, and control, the impact of current affect on the relationship between self-reported ACEs and self-reported health problems/self-rated health. The PANAS consists of 20 emotion items. Participants were asked to rate- on a scale of one to five- to what extent they experienced a certain emotion "... in general, that is, on average."

The PANAS has been found to have good construct validity, with latent modeling resulting in two correlated factors (positive affect and negative affect) corresponding to the PA and NA scales (Crawford & Henry, 2004). Watson and colleagues (1988b) report moderately good reliability. In their study, the Cronbach's alpha coefficient ranged from 0.86 to 0.90 for the PA scale, and from 0.84 to 0.87 for the NA scale. Test-retest correlations for the positive affect scale range from 0.47 to 0.68. For the negative affect scale, test-retest correlations range from 0.39 to 0.71 (Watson et al., 1988b). As affect changes over time, it would be expected that affect scores do not remain stable. In the present study, Cronbach's alpha for PA and NA was .90 and .87, respectively.

Positive Affect (PA) score was derived by summing ten "positive affect" items. Possible scores ranged from 10 to 50. A higher score indicates greater positive affect. Negative Affect (NA) score was derived by summing ten "negative affect" items. Possible score ranged from 10 to 50, a higher score indicates greater negative affect. An Affective Balance score was then computed by subtracting the Negative Affect score from the Positive Affect score (Liu, Wang & Lü, 2013). In the present study, Positive Affect scores ranged from 11 to 50 with a mean score of 35.09 *(SD=7.22)*. Negative Affect scores ranged from 10 to 44 with a mean of 22.15 *(SD=7.22)*. Affective Balance scores ranged from -27 to 37 with a mean score of 12.95 *(SD=11.9)*.

Satisfaction With Life Scale (SWLS)

The Satisfaction with Life Scale (SWLS; Diener, Emmons & Larsen, 1985; Kaczmarek, Bujacz & Eid, 2015; Appendix E) assessed for life satisfaction. It was used in this study to assess for the impact of current perceptions of life satisfaction on the relationship between self-reported ACEs and self-reported health problems/self-rated health. In previous studies, the two-month test-retest correlation coefficient for the SWLS was .82. Coefficient alpha was .87. Factor analysis on the inter-item correlation matrix produced one factor, which accounted for 66% of the variance. Factor loadings for each item ranged from .61 to .84. Item-total correlations ranged from .57 to .75 (Diener et al., 1985). In the present study, Cronbach's alpha was .92.

The SWLS consists of five items. Participants are asked to indicate their agreement with each item on a seven point Likert scale, with "1" indicating strong agreement and "7" indicating strong disagreement. A total scale score is obtained by summing the scores for each of the items. Scores range from 5 to 35, with scores of 5 to 9 indicating extreme dissatisfaction with life and scores of 31 to 35 indicating extreme satisfaction with life. In the present study, SWLS scores ranged from 5 to 35 with a mean of 25.19 *(SD=6.77)*.

Perceived Stress Scale (PSS)

The Perceived Stress Scale (PSS) assessed the degree to which an individual perceives current life events as stressful (Appendix F) (Cohen et al., 1983). The measure was used to assess for the impact of current perceived stress on the relationship between self-reported ACEs and self-reported health problems/self-rated health. In three separate college student samples, internal consistency was found to be .84, .85, and .86 (Cohen et al., 1983). Test-retest reliability was found to be .85 in a sample of college students who were re-tested after two days, and .55 in a sample of college students re-tested after six weeks. However, it would be expected that

perceived stress would change over a six week period. In the present study, Cronbach's alpha was .84 for the twelve item version of the PSS.

The PSS consists of fourteen items assessing emotions and cognitions related to stress (e.g., “In the last month, how often have you been angered because of things that were outside your control?”). Participants are asked to rate, on a scale of one to four, how often they have felt or thought a certain way over the past month (0 = Never; 4 = Very Often). PSS score is derived by reverse scoring seven positively stated items, and then summing all fourteen items. Higher scores indicate greater levels of stress.

In the present study, item one was omitted in error. Reliability analysis for the remaining 13 items revealed a slightly negative Cronbach's alpha coefficient for item twelve. As such, this item was removed and a twelve item version of the PSS was used for this study. PSS scores ranged from 4 to 37, with a mean of 20.18 (*SD*=6.80).

Perceived Social Support Scale (PSS)

The Perceived Social Support scale (PSS; Turner and Marino, 1994) assessed participant's subjective perceptions of social support. This scale was used in this study to assess for the impact of social support on the relationship between self-reported ACEs and self-reported health problems/self-rated health. In an epidemiological study (Turner & Marino, 1994) alpha coefficients were .83 for spouse/partner support, .94 for friend support, .94 for relative support, and .75 for co-worker support. Factor analysis conducted on a version of the Perceived Social Support scale that assessed only family and friend support produced two factors: family support and friend support (Turner & Marino, 1994). In the present study, alpha coefficients were .95 for friend support, .99 for relative support, and .92 for work support. Cronbach's alpha for the four scales was .513.

The PSS consists of 25 items assessing perceived social support across four domains, spouse/partner support, friend support, relative support, work support (Appendix G). As the study sample consisted of college students, many of whom are not in stable romantic relationships; perceived social support was calculated by averaging the three domains of "friend support" "family support" and "work support." Participants used a four point Likert scale to indicate to what extent statement matched their subjective experiences. The ratings on each item of the PSS ranged from one, indicating that the statement is "very much like my experience" to four, indicating that the statement is "not at all like my experience." In the original measure, lower scores indicate greater perceived social support. For the purpose of this study, items were reverse coded such that lower scores indicated less social support. This allowed for more intuitive data interpretation. A total scale score is obtained by averaging all items. In the present study, PSS scores, obtained by averaging the "friend support" "family support" and "work support." domains, ranged from 1.21 to 4, with a mean of 3.30 *(SD=.58)*.

Protective Factors in Childhood

The Protective Factors in Childhood scale was modified from the Protective Factors Survey (PFS; Counts, Buffington, Chang-Rios, Rasmussen & Preacher, 2010). The PFS is intended for use with families with young children. This measure was created using exploratory factor analysis to arrive at a four factor solution, with Family Functioning (FF), Emotional Support (ES), Concrete Support (CS), and Nurturing and Attachment (NA) as factors (Counts et al., 2010). Coefficient alpha was .94 for FF, .86 for ES, .83 for NA, and .63 for CS.

The PFS assesses for protective factors in families. The Protective Factors in Childhood Survey was used in this study to assess for the impact of protective factors in childhood on the relationship between ACE score and health problems/self-rated health. Language and items were

modified for use with college students reflecting on their childhood experiences. Question stems such as “My family…” were replaced with “When I was growing up, my family…” Items pertaining to the experience of parents were deleted. The modified measure contains 21 items (see Appendix H). Seven items collected historical demographic information (e.g., family income while growing up, parents’ level of education, and history of homelessness), five items assessed for Family Functioning/Resiliency, three items assessed for Social/Concrete Support, two items assessed for Child Development/Parenting Knowledge and four items assessed for Nurturing and Attachment.

Items are scored on a Likert Scale from one to seven. For the Family Functioning/Resiliency, Child Development/Parenting Knowledge, and Nurturing and Attachment scales, responses range from Never to Always. For the Social/Concrete Support scale, responses ranged from Strongly Disagree to Strongly Agree. Two negatively worded items are reverse scored. Higher scores indicate higher levels of protective factors in childhood. For the purpose of this study, a Protective Factors in Childhood Composite Score was created, which averaged scores on fourteen items spanning four scales. Protective Factors in Childhood Composite Scores ranged from 2.64 to 7, with a mean of 5.2 *(SD=1.08)*. In the present study, Cronbach's alpha was .908 for Family Functioning, .715 for Social/Concrete Support, and .934 for Nurturing/Attachment. Cronbach's alpha for the Protective Factors in Childhood Composite Score was .918.

Procedures

Participants completed survey measures in a computer laboratory classroom. Ten participants were invited to take part in each data collection session. Care was taken to ensure that the seat behind, in front, and to the left and right of each subject was empty, this allowed for subjects to be sufficiently spaced apart, ensuring privacy and anonymity. Participants were presented with an informed consent form (Appendix L) that contained a vague description of the purpose of the study, to avoid biasing participants. The informed consent form detailed participants' rights to withdraw from the study at any time without suffering any penalties.

Survey measures were administered via a computer-based survey program. The order in which questionnaires were administered was randomized to mitigate the possible effects of order of presentation, such that a set of eight participants would receive the eight measures in a different order. Participants were allowed as much time as needed to complete all eight measures. Total administration time was 30 to 45 minutes. Participants were provided with a debriefing form at the end of the study, as well as a referral sheet listing mental health resources in the community.

Participants

Participants were Indiana University of Pennsylvania (IUP) undergraduate students, currently enrolled in an introductory Psychology course. For the purpose of this study, traditional college students were defined as being between 17 and 24 years of age. Additionally, as per the institution's IRB guidelines, participants under 18 were not invited to participate in this study. As part of their introductory Psychology course completion requirements, IUP students are invited to participate in departmental research to receive research credits that are incorporated into their final grade for the class. Participants who do not wish to participate in research for

credit are provided with an alternative assignment. Following the IUP subject pool protocol, identifying information was collected in order to grant research credit. Once credit was granted, all identifying information was destroyed. As stated above, participants were clearly informed that they could withdraw from this study at any time without jeopardizing their research credits.

Sample Size

Myers, Gamst, and Guarino (2006) advocate for an estimated sample size of approximately 20 participants per predictor for a multiple regression model. The two most complex multiple regression models utilized in this study were anticipated to contain nine predictor variables: sex, parental education, ACE score, health risk behaviors score, perceived stress, life satisfaction, perceived social support, affective balance and protective factors in childhood composite score. As such, adequate sample size is approximately 180 participants. This study aimed to recruit approximately 200 participants to account for the possibility that some participants would withdraw prior to completion of all measures and some participant data would need to be discarded due to incomplete measures. Data was collected from 216 participants. Table 1 details participant characteristics.

Safeguards

Due to the sensitive nature of the information gathered in this survey, several safeguards were put into place in the event that any of the participants experienced negative reactions. Participants were informed that they could withdraw from this study at any time without any penalties. Measures were administered in a computer classroom under the supervision of a graduate student in clinical psychology who was able to monitor for signs of anxiety or distress. A licensed psychologist was present in the building during the hours of data collection. All participants were provided with a mental health resources referral sheet at the end of the study,

with contact information on IUP's counseling center, and community mental health resources (Appendix M). In the event that a participant evidenced distress or withdrew early, the study supervisor would encourage the participant to make use of referral resources.

Analyses

SPSS was utilized to address the four main research questions. Hayes' PROCESS macro was downloaded as an add-on to SPSS and used for mediation analyses (Hayes, 2012). The four main research questions were as follows. 1) What are the rates of ACEs exposure in this college population? 2) Does ACE score have a significant relationship with total number of health problems and with self-rated health? 3) Does ACE score have a significant relationship with health risk behaviors? 4) Do health risk behaviors mediate the relationship between ACEs and health problems, and between ACEs and self-rated health?

Frequency analysis was used to address research question one. Correlation and multiple regression analyses were utilized to address research questions two and three. Barron and Kenny's approach to mediation (1986) and bootstrapping procedures were used to address research question four and any exploratory analyses as to the role of health risk behaviors and resiliency factors as mediators.

Research Question One

The first research question examined whether prevalence rates for ACE exposure in male and female university students were similar to rates of ACE exposure in the adult community population. Frequency analysis was used to determine the rate of ACEs (as assessed in the Family History questionnaire) in this college student sample. A frequency analysis was also conducted to determine rates of engagement in health risk behaviors (as assessed in the Family History questionnaire).

Research Question Two

The second research question examined whether a relationship existed between ACE exposure in childhood and physical health/self-rated health in college students. Zero-order correlations were used to examine relationships among variables and guide decision-making regarding how to best construct a multiple regression model. A multiple regression model was used to analyze the predictive value of ACE score on health problems in college students. A multiple regression model also was used to analyze the predictive value of ACE score on self-rated physical health (i.e., the General Health Scale from the RAND 36). Statistical assumptions were tested for all variables to ensure that data met assumptions for multiple regression models.

Research Question Three

The third research question examined whether a relationship existed between ACEs exposure and engagement in health risk behaviors in a university student population. A multiple regression model was used to analyze the predictive value of ACEs on health risk-behaviors in college students. Statistical assumptions were tested for all variables to ensure that data met assumptions.

Research Question Four

The fourth research question examined whether health risk behaviors mediate the relationship between ACEs and physical health in college students. Mediation was tested according to procedures outlined in Baron and Kenny (1986). In order to establish a mediational relationship: 1) The independent variable (ACE score) and dependent variable (health problems/self-rated health) must be significantly associated, 2) The proposed mediating variable (health risk behaviors) must be significantly associated with the dependent variable (health problems/self-rated health), 3) The proposed mediating variable (health risk behaviors) must be

significantly associated with the independent variable (ACE score), 4) Finally, the relationship between the independent variable (ACE score) and the dependent variable (health problems/self-rated health) must be significantly reduced after controlling for the mediating variable (health risk behaviors).

In order to examine the role of health risk behaviors as a potential mediator in the relationship between ACEs and health problems, three multiple regression analyses were conducted, in line with the first three conditions described above. Sobel tests were used to assess for the role of health risk behaviors as a potential mediator in the relationship between ACEs and health problems. Of note, the Sobel test is not recommended for small sample sizes where the raw data is available, as it imposes distributional assumptions, (Kenny, 2015). Bootstrapping procedures were also used to test for the indirect effect of ACEs on health problems. A 95% confidence interval was computed, if this confidence interval did not include zero it was determined that an indirect effect differed from zero. Bootstrapping procedures are a less conservative method of assessing mediation (Kenny, D., 2014; Hayes, 2015). Similar procedures were used to test the hypothesis that health risk behaviors mediate the relationship between ACEs and self-rated health.

Exploratory analyses. In multiple regression models, satisfaction with life and perceived stress emerged as predictors of health problems. Similarly, social support and perceived stress emerged as predictors of self-rated health. Exploratory analyses were conducted to examine the role of these variables as potential mediators in the proposed relationship between ACE score and health problems. Additionally, exploratory analyses were conducted to assess for mediation effects when covariates were excluded. As outlined above, identical procedures for the evaluation of mediation were also used for exploratory analyses.

CHAPTER IV

RESULTS

Preliminary Analyses

Missing Data

Every participant who started the survey completed it. However, there was some incomplete data. Participants who left more than 10% of data incomplete were removed from the analysis. Based on this criteria, two participants were deleted from the data. Two participants were also removed from the data because they fell outside of the age range specified for this study, resulting in a total of 212 participants.

For measures where less than 10% of data was incomplete, mean substitution, using the mean of the sample item, was used to replace responses left blank. An alternate procedure was used for ACE score, health risk behavior and health problem data. When questions were left blank, it was assumed that non-response was equivalent to non-endorsement of the item. As such, all unanswered items were coded as 0, or a "no" response. BMI and "number of sexual partners ever" and "number of sexual partners in the past year" were the exception. Mean substitution was used to replace blank responses for BMI. As "number of sexual partners ever" and "number of sexual partners in the past year" were highly skewed variables, mode was used to replace blank responses.

Assumptions for Multiple Regression

The data were examined for potential multiple regression assumption violations, including outliers and violations of normality, linearity and homoscedasticity. Outliers were identified by examining extreme value tables, stem-and-leaf plots and histograms generated in SPSS. No extreme outliers were identified for any of the independent or dependent variables.

Although participant age was not included in the multiple regression models, a 17 year-old participant and a 27 year-old participant were identified through examination for outliers, and eliminated from the analyses. Mahalanobis distance was calculated for all cases to examine for multivariate outliers. No multivariate outliers were identified among the continuous variables.

Skewness and kurtosis were examined to ensure that all variables met assumptions of normality. No violations were identified as skewness and kurtosis for all variables fell within the -1.0 to +1.0 range. Probability plots also indicated no violations of normality for the data. A scatterplot matrix was used to examine linearity, with no major violations noted. Homogeneity of variance was examined for all variables using Box's test, which was not statistically significant, indicating equality of variance-covariance matrices.

In order to further assess for statistical assumption violations, a preliminary multiple regression was run using health problems as the outcome variable and residual scatterplots were examined. Case wise diagnostics identified one residual outlier that was 3.007 standard deviations above the mean. As the residuals were normally distributed, and this outlier fell only slightly above the three standard deviations cut-off point, a decision was made to not remove this case. The residual scatterplot showed that residuals were normally distributed indicating that a linear model is appropriate for the data.

Descriptive Analyses

Participant Characteristics

As detailed in Table 1, the study sample consisted of 121 male participants (57.1%) and 91 female participants (42.9%). The majority of participants identified as White. The majority of participants identifying as “other” specified their identification as "Biracial.” Two participants did not provide their ages. Of the remaining 210 participants, approximately 38% of participants

were 18 years of age and 40% were 19 years of age. The majority of participants attended college full-time, and were freshmen.

The Protective Factors in Childhood Survey contained items assessing family income, and parents' education level. Table 1 depicts frequencies for family income; Table 2 depicts frequencies for parents' level of education. Mean substitution was utilized for one participant who did not report parent education level. The majority of participants reported a family income of $75,000 or greater. High School Diploma was the most common level of education reported (30% of mothers and 34% of fathers). For the purpose of statistical analyses, parents' level of education was numerically coded; mother's highest level of education and father's highest level of education was averaged together.

Table 2

Parents' Level of Education

	Mother		Father	
Parents' Level of Education	N	%	N	%
Elementary or Junior High School	0	0	1	.5
Some High School	2	.9	5	2.4
High School Diploma or GED	63	29.7	71	33.5
Trade/Vocational Training	11	5.2	21	9.9
Some College	23	10.8	26	12.3
Two-Year College Degree (Associate's)	34	16	17	8.0
Four-Year College Degree (Bachelor's)	44	20.8	41	19.3
Master's Degree	33	15.6	21	9.9
PhD or Other Advanced Degree	2	.9	9	4.2

Note. N=212

Rates of ACEs

The first research question sought to examine the rates of ACEs in college students. Table 3 details the frequency and percentage of ACE scores for this sample. An ACE score of zero was most commonly reported (28.8%), followed by ACE scores of one and two (24.1% and 19.8%, respectively). Exposure to one or more ACEs was reported by 71.3% of participants; 47.2% reported exposure to two or more ACEs, 27.4% reported exposure to three or more ACEs, and 15.1% reported exposure to four or more ACEs.

Table 3

ACE Score Frequencies

ACE Score	N	%
0	61	28.8
1	51	24.1
2	42	19.8
3	26	12.3
4	23	10.8
5	5	2.4
6	4	1.9

Note. N=212

Table 4 details the frequency of endorsement for each ACE category. Parental divorce or separation was most frequently reported by participants (33.5%, *n*=71), followed by household substance abuse (30.2%, *n*=64). The least common adverse experience was witnessing maternal battering (2.8%, *n*=6). Table 5 details ACE score by gender. Women were more likely to report an ACE score of one or higher (77% vs. 67.1%).

Table 4

Frequency of ACE Categories

ACE Category	N	%
Physical Abuse	32	15.1
Psychological Abuse	32	15.1
Sexual Abuse	7	3.3
Physical Neglect	28	13.2
Emotional Neglect	33	15.6
Witnessing Maternal Battering	6	2.8
Household Mental Illness	59	27.8
Household Substance Abuse	64	30.2
Household Criminal Activity	22	10.4
Parental Divorce or Separation	71	33.5

Note. N=212

Table 5

ACE score by Gender

		Gender			
		Male	% male*	female	% female**
ACE	0	40	33.1	21	23.1
Score	1	30	24.8	21	23.1
	2	21	17.4	21	23.1
	3	14	11.6	12	13.2
	4	12	9.9	11	12.1
	5	2	1.7	3	3.3
	6	2	1.7	2	2.2

Note. N=212
*n=121 male participants
**n=91 female participants

Health Problems

Table 6 details the frequency and percentage of health problems endorsed by participants. Health problem scores ranged from 0 to 11, with a mean score of 3.66 *(SD=2.56)*. Table 7 details the frequency of health problem categories endorsed. Surgical History was most commonly endorsed by participants (49.1%, *n*=104), these included fairly routine surgical procedures, such

as tonsillectomies, as well as more serious interventions such as appendectomies. Examining female participants, 75% (*n*=69 of 91 female participants) endorsed a reproductive/gynecological health problem; irregular periods and heavy periods were most commonly reported.

Table 6

Frequencies for Health Problem Scores

Health Problem Score	Frequency	Percent
0	15	7.1
1	33	15.6
2	35	16.5
3	36	17
4	13	6.1
5	36	17
6	15	7.1
7	9	4.2
8	9	4.2
9	5	2.4
10	3	1.4
11	3	1.4

Note. N=212

Self-Reported Health

Table 8 details frequencies of self-reported health scores. This construct was measured using the General Health Scale of the RAND-36. Item responses are converted to a 0 to 100 scales, with higher scores indicating better health. Scores of 75 to 100 were most common. The mean score for this sample was 68.37 *(SD=19.22)*.

Table 7

Frequency of Health Problem Categories

Health Problems	Frequency	Percentage
Head/Brain	95	44.8
Eyes	40	18.9
Ears	46	21.7
Nose	65	30.7
Mouth	60	28.3
Lungs	77	36.3
Cardiovascular	32	15.1
Skin	47	22.2
Digestive	44	20.8
Surgical History	104	49.1
Cancer	2	.9
Men's Health	20	16.5*
Women's Health	68	75.8**
Musculoskeletal	76	35.8
Autoimmune	0	0

Note. N=212
*n=121 male participants
**n=91 female participants

Table 8

Self-Rated Health

General Health Scale Score	Frequency	Percent
0-24	4	2
25-49	22	10.4
50-74	88	41.5
75-100	98	46.1

Note. N=212

Health Risk Behaviors

Table 9 details the frequency and percentage of health risk behaviors endorsed by participants. Involvement in two health risk behaviors was most commonly reported (35.8%, *n*=76), followed by involvement in one health risk behavior (27.4%, *n*=58) and involvement in three health risk behaviors (18.9%, *n*=40). Table 10 details the frequency of each health risk behavior category endorsed.

Table 9

Frequency of Health Risk Behavior Scores

Health Risk Behavior Score	Frequency	Percent
0	18	8.5
1	58	27.4
2	76	35.8
3	40	18.9
4	19	9.0
5	1	.5

Note. N=212

Table 10

Frequency of Health Risk Behavior Categories

Health Risk Behavior	Frequency	Percent
Risky Sex Behaviors	14	6.6
Smoking	89	42
Low Exercise/High BMI	63	29.7
Alcohol	177	83.5
Drug Use	75	35.4

Note. N=212

Zero-Order Correlations

Table 11 presents zero-order correlations for all variables utilized in this study. Measures of objective (e.g., health problems) and subjective health (e.g. the General Health Scale of the RAND 36) were significantly correlated, such that higher health problem scores were associated with a lower General Health scores, lending support to the assertion that these variables measured a similar construct. Protective Factors in Childhood was significantly correlated with ACE score, supporting the assertion that these variables are likely measuring a similar construct. ACE score was significantly correlated with health problems and general health. The correlation between ACE score and health risk behaviors approached statistical significance (p = .07).

Table 11

Zero-Order Correlations

	1	2	3	4	5	6	7	8	9	10	11
1. ACE Score	--										
2. Health Problems	.209**	--									
3. General Health	-.153*	-.381**	--								
4. Gender[§]	.114	.258**	-.162*	--							
5. Parental Education	-.126	-.113	.003	-.105	--						
6. Protective Factors in Childhood	-.452**	-.244**	.186**	.017	.007	--					
7. Health Risk Behaviors	.123	.096	-.173**	-.273**	.044	-.032	--				
8. Perceived Stress	.206**	.353**	-.407**	.120	.043	-.398**	.265**	--			
9. Social Support	-.271**	-.207**	.289**	.070	-.095	.553**	-.057	-.283**	--		
10. Affective Balance	-.249**	-.313**	.550**	-.147*	-.106	.374**	-.218**	-.715**	.350**	--	
11. Satisfaction with Life	-.296**	-.327**	.272**	.079	-.009	.426**	-.175*	-.519**	.409**	.500**	--

*p<.05, **p<.01

[§] Gender was re-coded, such that 0=male and 1=female

Examination of the correlation table revealed highly significant correlations between Protective Factors in Childhood, ACE score, and all four resiliency variables. Affective balance was highly correlated with perceived stress, social support, and satisfaction with life. This raised concerns that high intercorrelations between resiliency factors would impact the statistical power of variables and mask relationships between ACE score, health risk behaviors, and resiliency factors that were important to the primary questions of this study. In addition to highly correlating with the four resiliency factors, the measure of protective factors in childhood overlapped conceptually and statistically with ACE score. To reduce the likelihood that highly inter-correlated variables would mask statistically significant relationships, protective factors in childhood and affective balance were removed from multiple regression and mediation analyses.

Multiple Regression Analyses

The Impact of Adverse Childhood Experiences on Health

The second research question examined whether a relationship existed between ACE exposure in childhood and physical health/self-rated health in college students. Two hierarchical regression analyses were conducted to examine the relative contributions of seven predictor variables in explaining the variance in health problems and self-rated health. The order in which predictor variables were entered into the model was based on theoretical knowledge. As this study sought to examine the independent contributions of ACE score, health-risk behaviors, and resiliency factors, these variables were entered into separate blocks of the model. Control variables were entered into block one (gender and parental education), followed by variables that occurred early in life (ACE score was entered into block two). Currently occurring variables were entered into blocks three (health risk behaviors) and four (life satisfaction, perceived stress, social support).

To assess for multicollinearity, tolerance and variance inflation factors (VIF) were examined. Multicollinearity is indicated if a tolerance value is .01 or less, or if VIF is greater than 10 (Meyers, Gamst & Guarino, 2006). Tolerance for both models (e.g., health problems as the outcome variable and self-rated health as the outcome variable) ranged from .619 to .989 and the VIF ranged from 1.011 to 1.615. Thus no high intercorrelations were identified among the independent variables, indicating that each independent variable brought independent variance to the model.

Health problems. Table 12 depicts the results of a hierarchical regression model with health problems as the outcome variable. In the final block of the model, all seven predictor variables accounted for 24% of the variance in Health Problems, *adjusted* R^2= .214, F (7, 204) = 9.185, $p < .001$.

The first block of the hierarchical regression model examined gender and parental education as control variables. These variables explained 7.4% of the variance in Health Problems, *adjusted* R^2= .065, F (2, 209) = 8.364, $p < .001$. Female participants reported more health problems than male participants (β = .25, t = 3.72, $p < .001$). Parental education did not exert a significant effect on health problems.

The influence of ACE score, entered into the second block of the model, was statistically significant and explained an additional 3% of the variance in health problems, (F (1, 208) = 6.85, p = .01). Participants reporting higher ACE scores also reported more health problems (β = .17, t = 2.62, p = .01). Health risk behaviors, entered into the third block of the model, also emerged as statistically significant and explained an addition 2.2% of variance, (F (1, 207) = 5.23, p = .023). Participants who reported more health risk behavior engagement reported more health problems (β = .16, t = 2.29, p = .023).

In the final step of the model, three resiliency factors (perceived stress, social support, and satisfaction with life), entered into the fourth and final block of the model, together explained an additional 11.4% of the variance in health problems, (F (3, 204) = 10.19, $p < .000$). Of the three resiliency factors, satisfaction with life and perceived stress reached statistical significance. Low life satisfaction (β = -.20, t = -2.59, p = .01) and high perceived stress (β = .16, t = 2.16, p = .032) predicted high health problem scores.

As depicted in Table 12, when all of the predictors were included in the model, the following variables emerged as statistically significant predictors of health problems: gender, perceived stress and satisfaction with life. While ACE score and health risk behaviors were statistically significant predictors of health problems in the second and block of the model, they were no longer statistically significant predictors of health problems in the final block of the model.

Self-rated health. A similar hierarchical regression analysis was conducted to examine the relative contributions of the same seven predictor variables in explaining the variance in self-rated health. Table 13 depicts the results of a hierarchical regression model with self-rated health as the outcome variable. In the final block of the model, all seven predictor variables accounted for 23.3% of the variance in self-rated health, *adjusted* R^2= .206, F (7, 204) = 8.84, $p < .000$.

The first block of the hierarchical regression model examined gender and parental education as control variables. These variables explained 2.7% of the variance in self-rated health, *adjusted* R^2= .017, F (2, 209) = 2.86, p = .06. Female participants reported poorer self-rated health than male participants (β = -.16, t = -2.39, p = .018). Parental education did not exert a significant effect on self-rated health.

Table 12

Multiple Regression Model Examining Predictors of Health Problems

	R	Adjusted R^2	R^2 Change	B	Std. Error	B	t	Sig.
Block 1	.272	.065						
Gender				1.04	.28	.25	3.72	.000
Parent Education				-.11	.09	-.09	-1.30	.194
Block 2	.322	.091	.030					
Gender				.96	.28	.23	3.48	.001
Parent Education				-.09	.09	-.07	-1.01	.314
ACE Score				.24	.09	.17	2.62	.010
Block 3	.355	.109	.022					
Gender				1.15	.29	.28	4.03	.000
Parent Education				-.09	.08	-.07	-1.10	.272
ACE Score				.21	.09	.15	2.23	.027
Health Risk Behaviors				.30	.13	.16	2.29	.023
Block 4	.490	.214	.114					
Gender				1.12	.28	.27	4.01	.000
Parent Education				-.13	.08	-.10	-1.63	.104
ACE Score				.05	.09	.04	.55	.586
Health Risk Behaviors				.16	.13	.09	1.28	.204
Perceived Stress				.05	.02	.16	2.16	.032
Social Support				-.33	.25	-.09	-1.33	.185
Satisfaction with Life				-.06	.02	-.20	-2.59	.010

The influence of ACE score, entered into the second block of the model, was statistically significant and explained an additional 1.9% of the variance in self-rated health, (F (1, 208) = 4.16, p = .043). Participants reporting higher ACE scores also reported poorer self-rated health (β = -.14, t = -2.04, p = .043. Health risk behaviors, entered into the third block of the model, also emerged as statistically significant and explained an addition 4.3% of variance, (F (1, 207) = 9.65, p = .002). Participants who reported more health risk behavior engagement reported poorer self-rated health (β = -.22, t = -3.11, p = .002).

In the final step of the model, three resiliency factors (perceived stress, social support, and satisfaction with life), entered into the fourth and final block of the model, together explained an additional 14.4% of the variance in health problems, (F (3, 204) = 12.8, $p < .001$). Of the three resiliency factors, perceived stress ($\beta = -.27$, $t = -3.57$, $p < .001$) and social support ($\beta = .21$, $t = 2.95$, $p = .004$) reached statistical significance. Higher perceived stress and lower social support were associated with poorer self-rated health. Health risk behaviors remained significant in the final step of the model ($\beta = -.13$, $t = -1.98$, $p = .049$).

As depicted in Table 13, when all of the predictors were included in the model gender, health risk behaviors, social support, and perceived stress emerged as statistically significant. While ACE score was a statistically significant predictor of self-rated health in the second block of the model, it was no longer a statistically significant predictor of self-rated health in the final block of the model.

The Impact of ACEs on Health Risk Behaviors

The third research question examined whether a relationship existed between ACEs exposure and engagement in health risk behaviors in a university student population. A hierarchical regression model was utilized to examine the impact of ACE score and the three resiliency factors on health risk behaviors. Based on theoretical knowledge, gender and parental education was entered into block one as control variables, followed by ACE score in block two. Resiliency factors were entered into block three. Tolerance and VIF were examined for multicollinearity. Multicollinearity is indicated if a tolerance value is .01 or less or if VIF is greater than 10 (Meyers, Gamst & Guarino, 2006). Tolerance ranged from .618 to .989, VIF ranged from 1.01 to 1.619. As such, no high intercorrelations were identified among the independent variables in this model.

Table 13

Multiple Regression Model Examining Predictors of General Health (Self-Rated Health)

	R	Adjusted R^2	R^2 Change	B	Std. Error	β	t	Sig.
Block 1	.163	.017						
Gender				-6.35	2.66	-.16	-2.39	.018
Parent Education				-.17	.81	.01	-.21	.837
Block 2	.214	.032	.019					
Gender				-.5.80	2.66	-.15	-2.19	.030
Parent Education				-.36	.81	-.03	-.44	.660
ACE Score				-.1.80	.89	-.14	-2.04	.043
Block 3	.297	.071	.043					
Gender				-8.23	2.71	-.21	-3.03	.003
Parent Education				-.27	.80	-.02	-.34	.734
ACE Score				-1.36	.88	-.11	-1.54	.125
Health Risk Behaviors				-3.81	1.23	-.22	-3.11	.002
Block 4	.482	.206	.144					
Gender				-7.08	2.62	-.18	-2.71	.007
Parent Education				.27	.74	.02	.36	.716
ACE Score				.14	.87	.01	.16	.870
Health Risk Behaviors				-2.35	1.19	-.13	-1.98	.049
Perceived Stress				-.77	.22	-.27	-3.57	.000
Social Support				6.84	2.32	.21	2.95	.004
Satisfaction with Life				.115	.22	.04	.52	.603

Table 14 depicts the results of a hierarchical regression model with health risk behaviors as the outcome variable. In the final block of the model, all six predictor variables accounted for 18.1% of the variance in health risk behaviors, *adjusted R2*= .16, F (6, 205) = 7.55, $p < .001$.

The first block of the hierarchical regression model examined gender and parental education as control variables. These variables explained 7.5% of the variance in health risk behaviors, *adjusted R2*= .066, F (2, 209) = 8.47, $p < .001$. Male participants reported more health risk behaviors than female participants (β = -.27, t = -4.06, $p < .001$). Parental education did not exert a significant effect on health risk behaviors.

Table 14

Multiple Regression Model Examining Predictors of Health Risk Behaviors.

	R	Adjusted R^2	R^2 Change	B	Std. Error	B	t	Sig.
Block 1	.274	.066						
Gender				-.60	.14	-.27	-4.06	.000
Parent Education				.01	.05	.02	.23	.816
Block 2	.316	.087	.025					
Gender				-.64	.15	-.29	-4.33	.000
Parent Education				.02	.05	.03	.51	.610
ACE Score				.12	.05	.16	2.40	.017
Block 3	.425	.157	.081					
Gender				-.73	.15	-.33	-5.02	.000
Parent Education				.01	.04	.02	.31	.755
ACE Score				.09	.05	.13	1.84	.067
Perceived Stress				.05	.01	.31	4.07	.000
Social Support				.16	.14	.08	1.16	.246
Satisfaction with Life				.00	.01	.02	.19	.851

ACE score was entered into the second block of the model. ACE score was statistically significant and explained an additional 2.5% of the variance in health risk behaviors, (F (1, 208) = 5.78, p = .017). Participants reporting higher ACE scores reported more health risk behaviors (β = .16, t = 2.4, p = .017).

In the final step of the model, three resiliency factors (perceived stress, social support, and satisfaction with life), entered into the third and final block of the model, together explained an additional 8.1% of the variance in health problems, (F (3, 205) = 6.75, p < .001). Of the three resiliency factors, perceived stress (β = .31, t = 4.07, p < .001) reached statistical significance. Higher perceived stress was associated with more health risk behaviors. ACE score approached significance (β = .13, t = 1.84, p = .067). As depicted in Table 14, when all of the predictors were included in the model gender and perceived stress emerged as statistically significant. ACE score approached significance.

Mediation Models

The fourth research question examined whether health risk behaviors and resiliency factors mediate the relationship between the number of ACEs endorsed and health problems/self-rated physical health in college students. Previous research on ACEs, health-risk behaviors and health has often identified health-risk behaviors as a partial mediator in the relationship between ACE score and health (Felitti et al., 1998; Brown et al., 2010; Chartier et al., 2009; Dong et al., 2003). As such, the present study predicted that a similar relationship would emerge between these variables in a college student sample.

Baron and Kenny (1986) outline four steps for establishing mediation: 1) the predictor variable must be related to the outcome variable (Figure 1, path c), 2) the predictor variable must be related to the mediator (Figure 1, path a), 3) the mediator must be related to the outcome variable (Figure 1, path b), 4) the effect of the predictor variable on the outcome variable controlling for the mediator (Figure 1, path c') should be reduced, as compared to the effect of the predictor variable on the outcome variable when the mediator is not accounted for (Figure 1, path c). As such, a test of the mediation involves estimating three regression equations: 1) regressing the outcome (dependent) variable on the independent variable (i.e., health on ACE score), (2) regressing the mediator on the independent variable (i.e., health risk behavior engagement on ACE score) and (3) regressing the outcome variable on both the independent variable and the mediator to control for the effect of the mediator (i.e., health on health risk behavior and ACE score). The mediational role of health risk behavior engagement would be established if the four following conditions were met.

The first condition requires that ACE score have a significant effect on health. As this study examined two measures of health (objective health and subjective health), this mediation

requirement was examined by performing two hierarchical multiple regressions, one with health problems as the outcome variable, and one with self-rated health as the outcome variable. It was predicted that ACE score would have a significant effect on health problems and self-rated health. This is depicted in Figure 1 as *path c*. All hierarchical regressions analyses controlled for potential influences of covariates that were utilized in the models (i.e., gender, parental education, and the four resiliency variables).

To meet the second condition, ACE score must exert a significant effect on health risk behavior engagement. It was predicted that higher ACE scores would be linked with more health risk behavior engagement. This is depicted in Figure 1 as *path a*.

To meet the third mediation requirement, the mediator (i.e., health risk behaviors) must be related to health. As was done for condition one, this mediation requirement was examined by performing two hierarchical multiple regressions, one with health problems as the outcome variable, and one with self-rated health as the outcome variable. It was predicted that higher health risk behavior engagement would be linked to more health problems and poorer self-rated health. This is depicted in Figure 1 as *path b*.

To meet the fourth mediation condition, the direct effect of the independent variable (i.e., ACE score) on the dependent variable (i.e., health) must decrease when the mediator (i.e., health risk behaviors) is accounted for. As such, the standardized coefficient for the effect of ACE score on health must be lower in magnitude when health risk behavior engagement is added to the model (Figure 1, path *c'*) as compared to its magnitude when the mediator (i.e., health risk behavior) is not included in the model (Figure 1, path *c*). The indirect effect of ACE score on health problems via health risk behavior engagement was assessed using the Sobel test (Kenny, 2014).

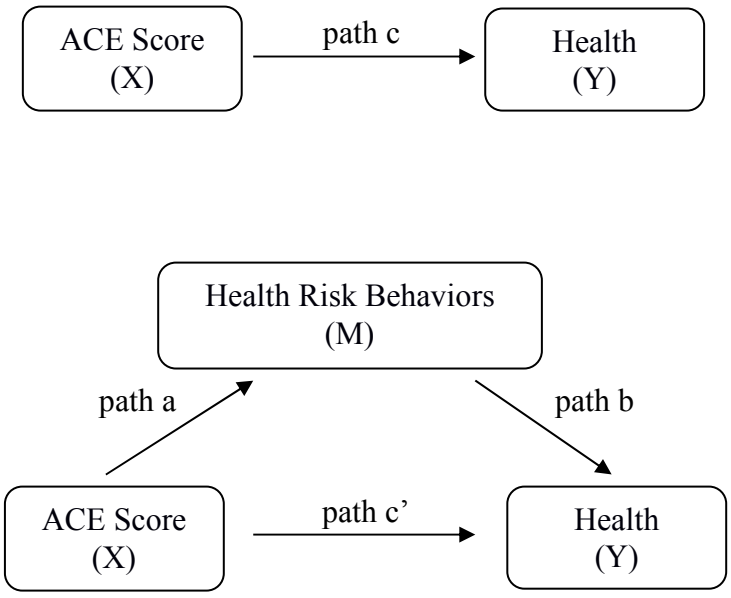

Figure 1. Health risk behavior engagement as a mediator in the relationship between ACE score and objective/subjective measures of health.

Bootstrapping procedures (Hayes, 2012; Hayes, 2015) were also utilized to test the hypotheses that health risk behaviors mediate the relationship between ACEs and health, controlling for all other predictor variables utilized in the multiple regression models. Standardized indirect effects were computed for 1,000 bootstrapped samples. As advised by Hayes, when the bias correction was large, the bootstrapping sample was gradually increased until bias correction was no longer an issue (Hayes, 2015). Bootstrapping samples larger than 1,000 are noted below as necessary. The 95% confidence interval was used to determine the indirect effects at the 2.5th and 97.5th percentile.

Health Risk Behavior Engagement as Mediator

This study sought to examine the potential role of health risk behavior engagement as a mediator in the relationship between ACE score and the objective measure of health (e.g., health problems). However, multiple regression analyses indicated that the model did not meet the first

three conditions required for mediation. When all covariates were included in the model, 1) ACE score did not exert a significant effect on health problems, 2) ACE score exerted a marginally significant effect on health risk behaviors (***B*** = .09, t = 1.84, p = .067), and 3) health risk behaviors did not exert a significant effect on health problems. As such, the four conditions for mediation were not met. Health risk behaviors did not mediate the relationship between ACE score and health problems when all covariates were accounted for.

Secondly, this study sought to examine the potential role of health risk behavior engagement as a mediator in the relationship between ACE score and the subjective measure of health (i.e., self-rated health). Similar to the model discussed above, multiple regression analyses indicated that this model did not meet all of the conditions required for mediation. When all covariates were included in the model, 1) ACE score did not exert a significant effect on self-rated health, 2) ACE score exerted a marginally significant effect on health risk behaviors (***B*** = .09, t = 1.84, p = .067), and 3) health risk behaviors exerted a significant effect on self-rated health (***B*** = -2.35, t = -1.98, p = .048) As such, health risk behaviors did not mediate the relationship between ACE score and health problems when all covariates (i.e., gender, parental education, perceived stress, social support and satisfaction with life) were accounted for.

Exploratory Analyses

Health Risk Behaviors

As discussed above, the most conservative analyses of the role of health risk behaviors in the relationship between ACE score and health included all of the covariates utilized in the multiple regression models, namely the control variables of gender and parental education level, and the resiliency factors of social support, perceived stress, and satisfaction with life. However, these models did not meet the four conditions required for mediation. As such, exploratory

analyses were conducted to examine the potential role of health risk behaviors as a mediator between ACE score and health when resiliency factors were excluded from the model.

Health risk behaviors were examined as a potential mediator in the relationship between ACE score and health problems, controlling for gender and parental education (see Table 15). With regard to the conditions required for mediation: 1) ACE score exerted a significant effect on health problems (***B*** = .24, t = 2.62, p = .010), 2) ACE score exerted a significant effect on health risk behaviors (***B*** = .12, t = 2.40, p = .017) and 3) health risk behaviors exerted a significant effect on health problems (***B*** = .29, t = 2.29, p = .023) when controlling for ACE score. To examine the fourth condition, the size of the indirect effect of ACE score on health problems through health risk behavior engagement was assessed with the indirect effect ratio (Kenny, 2014); it was not statistically significant (z = 1.59, p= .113).

However, when bootstrapping procedures were utilized, health risk behaviors emerged as a mediator in the relationship between ACE score and health problems. The bootstrapped standardized indirect effect was .026, and the 95% confidence interval ranged from .004 to .067. As such, the indirect effect was statistically significant.

Table 15

Health Risk Behaviors as a Mediator in the Relationship between ACE Score and Health Problems (resiliency factors excluded)

Effect	Outcome Variable	
	B	***t***
Direct Effect		
path c (YX)	.24**	2.62
Mediator (Health Risk Behaviors)		
path a (MX)	.12*	2.40
path b (YM.X)	.29*	2.29
path c' (YX.M)	.21*	2.23
Indirect Effect	*Sobel test = - 1.59*	*(p=.113)*

Note. Statistical significance: *p < .05; **p < .01; ***p < .001

Similarly, health risk behaviors were examined as a potential mediator in the relationship between ACE score and self-rated health, controlling for gender and parental education (see Table 16). With regard to the conditions required for mediation: 1) ACE score exerted a significant effect on self-rated health (***B*** = -1.81 t = -2.04, p = .043), 2) ACE score exerted a significant effect on health risk behaviors (***B*** = .12, t = 2.40, p = .017) and 3) health risk behaviors exerted a significant effect on self-rated health when controlling for ACE score (***B*** = -3.81, t = -3.11, p = .002). To examine the fourth condition, the size of the indirect effect of ACE score on self-rated health through health risk behavior engagement was assessed with the indirect effect ratio (Kenny, 2014); it approached statistically significance (z = -1.84, p= .066). Utilizing bootstrapping procedures, health risk behaviors also emerged as a mediator in the relationship between ACE score and self-rated health. The bootstrapped standardized indirect effect was -.035, and the 95% confidence interval ranged from -.082 to -.006. As such, the indirect effect was statistically significant.

Table 16

Health Risk Behaviors as a Mediator in the Relationship between ACE Score and Self-Rated Health (resiliency factors excluded)

Effect	Outcome Variable	
	B	***t***
Direct Effect		
path c (YX)	-1.81*	-2.04
Mediator (Health Risk Behavior)		
path a (MX)	.12*	2.40
path b (YM.X)	-3.81**	-3.11
path c' (YX.M)	-1.36	-1.54
Indirect Effect	*Sobel test = - 1.84*	*(p=.066)*

Note. Statistical significance: *p < .05; **p < .01; ***p < .001

Resiliency Factors

Barron and Kenny's (1986) approach to detecting mediation, and bootstrapping procedures were also used to examine potential mediation models for all predictors that exerted a significant effect on health problems and self-rated health. For health problems, perceived stress and satisfaction with life were examined as potential mediators. For self-rated health, perceived stress and social support were examined as potential mediators. The four proposed mediation models are as follows: 1) perceived stress mediates the relationship between ACE score and health problems, 2) satisfaction with life mediates the relationship between ACE score and health problems 3) perceived stress mediates the relationship between ACE score and self-rated health, and 4) social support mediates the relationship between ACE score and self-rated health.

In order to examine the potential role of resiliency factors as mediators in the relationship between ACE score and health, multiple regression analyses were conducted to examine whether these models met the second condition required for mediation. Namely, multiple regression models were used to examine whether ACE score exerted a significant effect on satisfaction with life, perceived stress, and social support, accounting for all other covariates in the models. The results of these analyses are detailed in Tables 17, 18, and 19. ACE score emerged as a significant predictor of satisfaction with life (***B*** = -.70, t = -2.62, p = .0095) and social support (***B*** = -.07, t = -2.90, p = .004). ACE score did not exert a significant effect on perceived stress.

Table 17

ACE Score as a Predictor of Satisfaction with Life

	B	t	Sig.
ACE Score	-.70	-2.62	.0095
Gender	1.90	2.34	.020
Parent Education	.11	.48	.634
Health Risk Behaviors	.07	.19	..851
Perceived Stress	-.44	-7.21	.000
Social Support	2.78	3.94	.000

Table 18

ACE Score as a Predictor of Perceived Stress

	B	t	Sig.
ACE Score	-.03	-.10	.919
Gender	3.21	3.95	.000
Parent Education	.18	.75	.455
Health Risk Behaviors	1.50	4.07	.000
Social Support	-1.13	-1.51	.132
Satisfaction with Life	-.46	-7.21	.000

Table 19

ACE Score as a Predictor of Social Support

	B	t	Sig.
ACE Score	-.07	-2.90	.004
Gender	.11	1.37	.172
Parent Education	-.04	-1.68	.094
Health Risk Behaviors	.04	1.16	.246
Perceived Stress	.01	-1.51	.132
Satisfaction with Life	.03	3.94	.000

When the conditions required for mediation were examined, none of the four proposed models met the first condition requirement. ACE score did not exert a significant effect on health problems when all covariates were included in the model. Similarly, ACE score did not exert a significant effect on self-rated health when all covariates were included in the model. Additionally, because ACE score was not a significant predictor of perceived stress, mediation models 1 and 3 did not meet the second condition for mediation. As such, when all covariates were included in the model, none of the resiliency factors emerged as mediators in the relationship between ACE score and health problems, or ACE score and self-rated health.

Mediation analyses excluding covariates. Similar to models examining health risk behaviors as a mediator, the most conservative analyses of the role of resiliency factors in the relationship between ACE score and health included all of the covariates utilized in the multiple

regression models. However, as discussed above, these models did not meet the four conditions required for mediation. As such, exploratory analyses were conducted to examine the potential role of resiliency factors as mediators between ACE score and health controlling only for gender and parental education.

Perceived stress was examined as a potential mediator in the relationship between ACE score and health problems (see Table 20). With regard to the conditions required for mediation: 1) ACE score exerted a significant effect on health problems (***B*** = .24, $t = 2.62$, $p = .010$), 2) ACE score exerted a significant effect on perceived stress (***B*** = .93, $t = 3.00$, $p = .003$), and 3) perceived stress exerted a significant effect on health problems when controlling for ACE score (***B*** = .094, $t = 4.82$, $p < .001$). To examine the fourth condition, the size of the indirect effect of ACE score on health problems through perceived stress was assessed with the indirect effect ratio (Kenny, 2014); it was statistically significant (z = 2.51, p= .012).

Table 20

Perceived Stress as a Mediator in the Relationship between ACE Score and Health Problems

Effect	Outcome Variable	
	B	T
Direct Effect		
path c (YX)	.24**	2.62
Mediator (Perceived Stress)		
path a (MX)	.93**	3.00
path b (YM.X)	.09***	4.82
path c' (YX.M)	.154	1.71
Indirect Effect	*Sobel test = 2.51 (p = .012)*	

Note. Statistical significance: *p < .05; **p < .01; ***p < .001

Similarly, perceived stress mediated the relationship between ACE score and health problems when bootstrapping procedures were utilized. The bootstrapped standardized indirect effect was .065, and the 95% confidence interval ranged from .022 to .123. As such, the indirect effect was statistically significant.

Satisfaction with life was examined as a potential mediator in the relationship between ACE score and health problems. With regard to the conditions required for mediation: 1) ACE score exerted a significant effect on health problems ($\boldsymbol{B}$ = .24, t = 2.62, p = .010), 2) ACE score exerted a significant effect on satisfaction with life ($\boldsymbol{B}$ = -1.42, t = -4.71, p < .001) and 3) satisfaction with life exerted a significant effect on health problems when controlling for ACE score ($\boldsymbol{B}$ = -.10, t = -5.00, p < .001). To examine the fourth condition, the size of the indirect effect of ACE score on health problems through satisfaction with life was assessed with the indirect effect ratio (Kenny, 2014); it was statistically significant (z = 3.39, p= .001).

Similarly, perceived stress mediated the relationship between ACE score and health problems when bootstrapping procedures were utilized. The bootstrapped standardized indirect effect was .106, and the 95% confidence interval ranged from .050 to .175. As such, the indirect effect was statistically significant.

Table 21

Satisfaction with Life as a Mediator in the Relationship between ACE Score and Health Problems

Effect	Outcome Variable	
	B	T
Direct Effect		
path c (YX)	.24**	2.62
Mediator (Satisfaction with Life)		
path a (MX)	-1.42***	-4.71
path b (YM.X)	-.10***	-5.00
path c' (YX.M)	.10	1.07
Indirect Effect	*Sobel test = 3.39*	*(p=.001)*

Note. Statistical significance: *p < .05; **p < .01; ***p < .001

Perceived stress was examined as a potential mediator in the relationship between ACE score and self-rated health (see Table 22). With regard to the conditions required for mediation: 1) ACE score exerted a significant effect on self-rated health (***B*** = -1.81, t = -2.04, p = .04), 2) ACE score exerted a significant effect on social support (***B*** = .93, t = 3.00, p = .003) and 3) perceived stress exerted a significant effect on self-rated health when controlling for ACE score (***B*** = -1.08, t = -5.88, p < .001). To examine the fourth condition, the size of the indirect effect of ACE score on self-rated health through perceived stress was assessed with the indirect effect ratio (Kenny, 2014); it was statistically significant (z = -2.64, p= .008).

Similarly, perceived stress mediated the relationship between ACE score and self-rated health when bootstrapping procedures were utilized. The bootstrapped standardized indirect effect was -.078 and the 95% confidence interval ranged from -.142 to -.027. As such, the indirect effect was statistically significant.

Table 22

Perceived Stress as a Mediator in the Relationship between ACE Score and Self-Rated Health

Effect	Outcome Variable	
	B	T
Direct Effect		
path c (YX)	-1.81*	-2.04
Mediator (Perceived Stress)		
path a (MX)	.93**	3.00
path b (YM.X)	-1.08***	-5.88
path c' (YX.M)	-.802	-.955
Indirect Effect	*Sobel test = -2.64*	*(p=.008)*

Note. Statistical significance: *p < .05; **p < .01; ***p < .001

Social support was examined as a potential mediator in the relationship between ACE score and self-rated health (see Table 23). With regard to the conditions required for mediation: 1) ACE score exerted a significant effect on self-rated health (***B*** = -1.81, t = -2.04, p = .043), 2) ACE score exerted a significant effect on social support (***B*** = -.11, t = -4.45, p < .001) and 3) social support exerted a significant effect on self-rated health when controlling for ACE score (***B*** = 9.56, t = 4.17, p < .001). To examine the fourth condition, the size of the indirect effect of ACE score on self-rated health through social support was assessed with the indirect effect ratio (Kenny, 2014); it was statistically significant (z = -3.00, p= .003).

Similarly, social support mediated the relationship between ACE score and self-rated health when bootstrapping procedures were utilized. The bootstrapped standardized indirect effect was -.085 and the 95% confidence interval ranged from -.157 to -.031. As such, the indirect effect was statistically significant.

Table 23

Social Support as a Mediator in the Relationship between ACE Score and Self-Rated Health

Effect	Outcome Variable	
	B	T
Direct Effect		
path c (YX)	-1.81*	-2.04
Mediator (Social Support)		
path a (MX)	-.11***	-4.45
path b (YM.X)	9.56***	4.17
path c' (YX.M)	-.71	-.79
Indirect Effect	*Sobel test = - 3.00 (p=.003)*	

Note. Statistical significance: *p < .05; **p < .01; ***p < .001

Summary of Mediation Analyses

Mediation analyses suggested that health risk behaviors did not mediate the relationship between ACE score and health problems or ACE score and self-rated health when covariates were included in the analyses. When resiliency factors were excluded from the analyses, health risk behaviors mediated the relationship between ACE score and health problems, only when less conservative bootstrapping procedures were utilized. Health risk behaviors mediated the relationship between ACE score and self-rated health. With regard to resiliency factors, when covariates were included in the analyses, none of the resiliency factors emerged as statistically significant mediators in the relationships between ACE score and health problems or ACE score and self-rated health. One reason for this was that ACE score did not significantly predict health problems or self-rated health when covariates were included in the models. When mediation analyses were conducted with only gender and parental education as covariates, each of the resiliency factors emerged as a mediator. Perceived stress and satisfaction with life mediated the relationship between ACE score and health problems. Perceived stress and social support mediated the relationship between ACE score and self-rated health.

CHAPTER V

DISCUSSION

The purpose of the present study was to examine rates of Adverse Childhood Experiences (ACEs) in college students, and the relationship between ACEs and physical health in this population. A growing body of research has demonstrated a relationship between adverse experiences in childhood and poor physical health in adulthood (Felitti et al., 1998; Anda et al., 2008; Brown et al., 2010; Danese et al., 2013; Dong et al., 2003; Fuller-Thomson et al., 2009). At the same time, there is a limited body of research on adverse childhood experiences in college students (Rutter et al., 2013; Anders et al., 2012; Runtz, 2002) alongside a growing recognition that emerging adulthood is a unique developmental stage (Arnett, 2000; Arnett, 2005; Flood et al., 2009). It is important to clarify if the relationship between ACE exposure and health during this stage differs from what is found in adult community samples.

Studies conducted with college students tend to focus on a single category of maltreatment, or examined trauma across the lifespan, rather than focusing on adverse experiences in childhood. Existing research has demonstrated that the age of exposure to trauma (Taylor et al., 2011; Middlebrooks et al., 2008), and exposure to multiple categories of trauma (Briere, 1992; Felitti, 2002; Kendall-Tackett, 2000; Brown et al., 2009; Dong et al., 2004) lead to different long-term effects. A thorough understanding of the cumulative subjective and objective effects of early abuse and neglect in college student populations is lacking. This study is one of the first to apply the ACEs framework to a college student population.

Rates of ACEs in College Students

Exposure to one or more ACEs was reported by 71.3% of participants in this study. This rate was higher than the rate of exposure in the original ACEs study. Felitti and colleagues (1998) found that approximately 50% of participants endorsed exposure to one or more ACEs, approximately 25% endorsed exposure to two or more ACEs and approximately 10% endorsed exposure to four or more ACEs. In the present study, college students also endorsed higher ACE scores at greater rates; 47.2% of participants endorsed two or more ACEs and 15.1% of participants endorsed four or more ACEs.

Other studies with adult community samples have demonstrated findings similar to Felitti and colleagues' (1998) original findings. Surveying over 26,000 adults across five states, Bynum and colleagues (2009) found that 59.5% of adults reported exposure to one or more ACEs, 37.1% reported exposure to two or more ACEs, 24% reported exposure to three or more ACEs, and 15.2% reported exposure to four or more ACEs. Utilizing a different set of questions to measure trauma in childhood, Kopec and Sayre (2004) found that 45.6% of participants reported exposure to at least one traumatic event, and 20.7% reported exposure to two or more traumatic events.

Of note, studies often use different definitions with regard to what qualifies as meeting criteria for an ACE category. Some studies utilize "yes" and "no" response options (*MMWR,* 2010). Some studies consider a participant to have met criteria for a category if they answer "sometimes" to a question, whereas other studies will consider the participant to have met the criteria only if they respond "often" or "very often." As such, cross-study comparisons of rates of ACEs should be done with caution.

The finding that ACEs exposure was higher in this college student sample is surprising. As college-educated individuals are considered to be high functioning members of society, the

expectation might have been that they experienced lower levels of adversity in childhood, as compared to the general population (Anders et al., 2012). Studies examining trauma exposure across the lifespan find high rates of trauma in college students when trauma includes a broad spectrum of events such as sexual assault, being discriminated against and facing a life threatening illness. Examining research on trauma across the lifespan, Anders and colleagues (2012) found that 89% of college students reported experiencing at least one lifetime traumatic event that met A1 criterion for posttraumatic stress disorder. Read and colleagues (2011) used a measure assessing seven traumatic life events, and found that 24% of their college student sample reported exposure to physical violence, and 7% reported experiencing unwanted sex. Overall, 23% of participants in this study reported exposure to one traumatic event, 20% reported exposure to two events, and 25% reported exposure to three or more events. Watson and Haynes (2007) found that 40% of college student participants reported exposure to at least one physically or sexually assaultive traumatic event.

In contrast, the present study examined only intra-family trauma that occurred before age 18. Runtz (2002) conducted one of the few studies that focused specifically on childhood maltreatment in female college students. She found that 19% of the all-female sample reported a history of childhood sexual abuse, while 20% reported childhood physical maltreatment. In the present study 19% of participants reported a history of childhood physical abuse, while 3.3% reported childhood sexual abuse.

There are several possible explanations for why ACEs exposure was higher in this college student population, as compared to studies conducted with community samples. One potential explanation is that rates of ACEs may have increased since Felitti and colleagues' 1998 study. However, this is not supported by recent research on adult community samples (Bynum et

al., 2009; Kopec & Sayre, 2004), which has continued to find similar rates of ACEs as the original study.

A second possibility is that college students, particularly those taking introductory psychology courses, receive more education about mental health, neglect, sexual abuse and related topics, which may improve participants' ability to identify personal exposure to these events. Another possibility is that various characteristics of community samples may be related to more stigmatization, denial or difficulty accurately labeling adverse childhood experiences resulting in higher rates of reporting in a college student sample. Conversely, college students may be more susceptible to over-endorsement of ACE categories, perhaps due to greater emotional volatility or greater inner conflict regarding their families at this developmental stage. Another explanation is that these younger participants, who have recently left their childhood homes, may be better able to recall adverse childhood experiences as compared to older adults who must reach further back in time to retrospectively report adverse events (Briere, 1992).

Finally, it is possible that young adults enrolled in college have more adverse experiences in childhood as compared to their peers who do not matriculate, although this potential explanation is somewhat contradicted by Anders and colleagues' (2012) findings that community college students had higher rates of trauma than college students. It is also contradicted by Felitti and colleagues' (2008) finding that participants who completed college reported lower ACE scores then those in other educational categories.

ACE Score and Health

Research has established a link between ACEs and health problems in adult community samples with regard self-rated health (Chartier et al., 2010; Corso et al., 2008) and specific disorders and health problems (Felitti et al., 1998; Anda et al., 2008; Dong et al., 2013; Danese et

al., 2013; Wegman et al., 2009). Several studies have also established that health is adversely impact by childhood maltreatment and lifetime trauma in college students (Runtz, 2002; Anders et al., 2012; Duncan, 2000). In line with previous research on the impact of ACEs on health in adult community samples (Brown et al., 2010; Danese et al., 2013; Dong et al., 2003), it was expected that high ACE scores would predict more health problems and poorer self-rated health in college students.

This hypothesis was partially supported by the present study. Exposure to adverse childhood experiences predicted both objective and subjective measures of health in college students. However, when factors that support resilient functioning were taken into account, the contribution of ACE exposure was reduced. ACE score ceased to significantly predict health problems or self-rated health. Satisfaction with life and perceived stress emerged as the strongest predictors of health problems. Low life satisfaction and higher perceived stress predicted higher rates of health problems. Similarly, greater social support and lower perceived stress emerged as the strongest predictors of self-rated health.

Mediation analyses, controlling for only gender and parental education, found that health risk behaviors mediated the relationship between ACE score and self-rated health. Health risk behaviors also mediated the relationship between ACE score and health problems, but only using a less conservative method of analysis. Of note, when resiliency factors were included in these models, health risk behaviors failed to mediate the relationship between ACEs and health, indicating that resiliency factors have a powerful role in the relationship between these two variables. Mediation models also indicated that perceived stress and satisfaction with life mediated the relationship between ACE score and health problems. Similar analyses found that perceived stress and social support mediated the relationship between ACE score and self-rated

health. As such, these models suggest that ACE exposure exerts an influence on health in college students via risk and resiliency factors, including health risk behaviors.

Health Risk Behaviors

Research has established a link between ACE exposure and health risk behaviors in adult community samples (Springs & Friedrich, 1992, Chartier et al., 2009; Anda et al., 1999; Breslau et al., 2003; Brown et al., 2010; Dong et al., 2003; Edwards et al., 2007) and a link between childhood trauma and health risk behaviors in college students (Collings, 1995; Flood et al., 2009; Goldstein et al., 2010; Read et al., 2012; Roemmele & Messman-Moore, 2011). In the present study, the ability of ACE score to predict health risk behaviors approached significance. Higher ACE scores and more perceived stress were predictive of increased engagement in health risk behaviors. In contrast to models examining the impact of ACE score on health, ACE score continued to predict health risk behaviors when resiliency factors were added to the model.

The finding that ACE exposure and perceived stress are predictive of health risk behavior engagement is consistent with existing research. As detailed above, previous studies have identified the link between ACE exposure and increased health risk behaviors during emerging adulthood and throughout the lifespan. The finding that perceived stress predicts health risk behavior engagement is well-supported by existing research (Nelson, Lust, Story & Ehlinger, 2008; Ng & Jeffery, 2003; Rod et al., 2009; Naquin & Gilbert, 1996).

Research on childhood maltreatment and engagement in health risk behaviors in college students tends to demonstrate a relationship between these variables (Roemmele & Messman-Moore, 2011; Goldstein et al., 2010; Rind et al., 1998). Likewise, research on lifetime exposure to trauma also supports the assertion that trauma across the lifespan is linked to increased engagement in health risk behaviors (Brener et al., 1999; Read et al., 2012; Rutter et al., 2013).

The present study sought to examine a potential pathway, whereby high ACE exposure in childhood led to health risk behavior engagement in adulthood, which in turn led to poor health. Previous research (Brown et al., 2010; Dong et al., 2003; Edwards et al., 2007; Felitti et al., 1998) has established a relationship between ACE score and health risk behaviors in community and college samples. This relationship is also supported in the present study. Studies have also identified a link between health risk behaviors and health problems/self-rated health in community samples (Dube et al., 2006; Anda et al., 2009; Williamson et al., 2002).

Research on the role of health risk behaviors as a mediator in the relationship between childhood trauma and health in college students is limited. The existing research tends to identify health risk behaviors as a partial mediator in the relationship between various forms of trauma and physical health. For example, Flood and colleagues (2009) found that substance abuse mediated the relationship between PTSD and health outcomes, including subjective perceptions of health. Rutter and colleagues (2013) found that exercise mediated the relationship between PTSD and physical health.

This study examined the relationship between ACEs and health-risk behaviors, the relationship between health risk behaviors and health, and the role of health risk behaviors as a potential mediator in the relationship between ACEs and health. In examining the impact of ACE score on health risk behavior engagement, ACE score emerged as a predictor of health risk behaviors, along with perceived stress and gender. In examining the impact of health risk behavior engagement on objective and subjective measures of health, health risk behaviors emerged as a significant predictor of health problems and self-rated health. When health problems served as the outcome variable, this effect was rendered insignificant once factors that support resilience were accounted for. When self-rated health served as the outcome variable,

health-risk behaviors remained a significant predictor even with the introduction of resiliency variables.

In examining the potential role of health risk behaviors as a mediator in the relationship between ACE score and health, health risk behaviors did not emerge as a mediator when resiliency factors were controlled for. However, when resiliency factors were not controlled for, health risk behaviors mediated the relationship between ACE score and self-rated health. Health risk behaviors also mediated the relationship between ACE score and health problems, but only when a less conservative test of mediation was used. The finding that ACE exposure predicts health risk behaviors in college students is consistent with existing research (Flood et al., 2009; Rutter et al., 2013). The finding that perceived stress predicts health risk behavior engagement is well-supported by existing research (Nelson, Lust, Story & Ehlinger, 2008; Ng & Jeffery, 2003; Rod et al., 2009; Naquin & Gilbert, 1996).

Studies on the role of health risk behaviors as mediators in the relationship between ACE exposure and health have produced a mixed, and at times conflicting, findings. Studies utilizing adult community samples tend to show that health risk behaviors partially mediate the relationship between ACEs and health problems (Felitti et al., 1998; Anda et al., 2008; Brown et al., 2010; Kendall-Tackett, 2009; Chartier et al., 2009). At the same time, several studies have found results that paint a more complicated picture. For example, Dong and colleagues (2004) found that while health risk behaviors partially mediated the relationship between ACEs and ischemic heart disease, psychological factors, such as depressed affect and anger, emerged as stronger mediators. Del Gaizo and colleagues (2011) found that substance abuse did not mediate the relationship between PTSD and physical health. Schnurr and Spiro (1999) found that smoking did not mediate the relationship between PTSD and health status in combat veterans.

Taken together, some of this research lends support to the hypothesis that health risk behaviors mediate the relationship between ACE score and health, while other studies suggest that factors other than health risk behaviors may serve as stronger predictors of health. As such, the finding that health risk behaviors mediate the relationship between ACE exposure and health, only when resiliency factors were not accounted for, is consistent with previous research.

Resiliency Factors

Prior research has investigated the impact of ACE exposure on factors that support resilient functioning in adulthood, and the impact of resiliency factors on health. However, few studies have explored both the role of developmental risk and resiliency factors in the development of health problems. The present study contributes to a limited body of research on the role of resiliency variables in the relationship between ACEs and health. It is one of the first studies to examine the interplay between these three constructs in a college student sample.

In the present study perceived stress emerged as a predictor of health problems and self-rated health. Satisfaction with life emerged as a predictor of objective measures of health. Social support emerged as a strong predictor of subjective measures of health. These three variables also emerged as mediators in the relationship between ACEs and health when less conservative means of analysis were used. Possible explanations for these findings are explored below.

Satisfaction With Life

Research on childhood trauma and life satisfaction indicates that adverse experiences in childhood reduce life satisfaction in adulthood (Krause, 2004; Royse, Rompf & Dhooper, 1991). Hinnen, Sanderman and Sprangers (2009) found that negative childhood memories were linked to lower life satisfaction in adulthood. This relationship was mediated by attachment style, such that participants with negative childhood memories were more likely to have an insecure

attachment style. Life satisfaction has also been linked to parenting style, such that children raised under an authoritative parenting style, where they are given age-appropriate freedom to make decisions and age-appropriate limits on their behavior, are likely to evidence greater life satisfaction as adults than children raised under an authoritarian parenting style, which relies on an overly rigid family structure, harsh discipline and over-control of behavior (Milevsky, Schlechter, Netter & Keehn, 2007; Suldo & Huebner, 2004). In the present study, ACE score also emerged as a significant predictor of life satisfaction.

Research on health and satisfaction with life has identified a strong correlation between these two variables. Palmore and Luikart (1972) found that self-rated health exerted the strongest influence on life satisfaction in middle age. Likewise, Willits and Crider (1988) found that self-rated health predicted overall life satisfaction, as well as marital, community, and job satisfaction. Strine and colleagues (2008) found that life satisfaction was inversely related to fair/poor general health and disability. Zullig and colleagues (2005) found a relationship between decreased health and life satisfaction in teenagers.

Social Support

Several studies lend support for the role of social support as an intermediary in the relationship between trauma exposure and health. Kimerling and Calhoun (1994) found that social support moderated the relationship between sexual assault and somatic symptoms, and sexual assault and subjective health in female survivors. Examining soldiers, Martin and colleagues (2000) found that social support from unit leaders moderated the relationship between accumulated trauma exposure and both physical and psychological health. Springs and Freidrich (1992) found a link between childhood sexual abuse and health problems in women; higher levels of social support predicted lower rates of gynecological problems. In contrast, Fuller-

Thomson and colleagues (2012) found that males with a history of childhood sexual abuse had higher rates of myocardial infarction even when controlling for social support.

Perceived Stress

The link between perceived stress and health is well-supported by research. Studies have linked higher levels of stress to chronic diseases (Rod, Grønbæk, Schnohr, Prescott & Kristensen, 2009; Reiche et al., 2004), as well as infectious (Cohen, Tyrrell & Smith, 1993; Cohen & Williamson, 1991) and inflammatory conditions (Kiecolt-Glaser et al., 2005; Connor & Leonard, 1998). The emerging field of psychoneuroimmunology highlights a range of biological pathways by which chronic psychosocial stress can increase the risk for immune and inflammatory diseases (Kendall-Tackett, 2010).

Intriguingly, the link between childhood maltreatment is somewhat more complex and understudied (Spaccarelli, 1994). Some studies find that childhood abuse is linked to greater perceived stress in adulthood (Hyman, Paliwal & Sinha, 2007), while other studies do not find a significant relationship. In the present study, ACE score did not emerge as a predictor of perceived stress. Researchers have also proposed theoretical pathways by which stress functions as a mediator in the relationship between ACE score and health (Lee, 2010; Kendall-Tackett, 2000), supported by studies that examine neurobiological markers of stress.

Implications

This study has several important implications. First, high rates of exposure to adverse childhood experiences were found in this population, with approximately 70% of students reporting exposure to at least one ACE. Rates of ACEs in this college student sample were higher than what is often observed in studies with adult community samples. It remains unclear whether these high rates are a product of increased ACE exposure in younger generations,

increased ACE exposure in college students as compared to community samples, or an artifact of differences in reporting between college students and the general adult population.

Secondly, this study found that health risk behaviors in college students were predicted by perceived stress and ACE score. Health risk behaviors predicted self-rated health in college students, but not health problems. Satisfaction with life and perceived stress emerged as the strongest predictors of health problems. Health risk behaviors, social support and perceived stress emerged as significant predictors of self-rated health. Mediation models also suggested that ACE score exerts an influence on measures of health via health risk behaviors and resiliency factors, but this mediation effect was not significant when resiliency factors and health risk behaviors were included as controls in the models.

When all variables were included in the models, resiliency factors accounted for the greatest share of the variance in health measures, over and above ACE score and health risk behaviors. A possible explanation for these findings is that while ACE exposure leads to increased health risk behaviors in college students, these students are too young to evidence the negative impact on health that health risk behaviors will exert as they begin to age. At this stage in life, resiliency factors may be more likely to influence the relationship between ACE exposure and health. It may be that if health risk behavior engagement is time-limited and tapers off once students leave college, then these behaviors may not lead to later health problems. Conversely, if health risk behaviors become chronic responses to life stress, they will eventually exert an impact on health.

The present study suggests that ACE exposure in childhood may lead to decreased access to resiliency factors, such as social support and subjective well-being, which in turn may lead to poorer health. It also raises the intriguing possibility that for individuals with high ACE

exposure, improving current life satisfaction, social support and stress can lead to improved health.

Several studies lend support to the idea that childhood adversity can impact social psychological resources, which in turn can impact health. For example, Kendall-Tackett (2002) notes that internal working models (i.e., cognitive frameworks by which an individual interprets stressful events and the motivations of others) may lead ACE survivors to see the world as a dangerous place and to underestimate their self-efficacy and self-worth in dealing with danger. Teegan (1999) found that women with a history of sexual abuse reported high levels of fear, and were likely to describe their views of life, and themselves, as very negative. Examining adult survivors of child neglect, Gauthier and colleagues (1995) identified high levels of anxiety, paranoia and hostility. Kimerling and Clum (2000) found that the hyperarousal cluster of PTSD uniquely accounted for variance in health complaints. In one of the few studies that specifically examined the role of affect in the relationship between ACEs and health, Dong and colleagues (2004) found that the relationship between ACEs and ischemic heart disease was more strongly mediated by anger and depressed affect, than by traditional risk factors for heart disease such as obesity and smoking. Chronically negative and stressful thoughts stemming from childhood maltreatment can influence health through biological pathways, for example, leading to constant elevation of cortisol levels, which can suppress immune functioning and slow healing (Kendall-Tackett, 2002).

Existing research on childhood adversity, resiliency factors and health is correlational. As such, this research often supports the assertion that there is a relationship between these variables, but does not explain the nature of the relationship (Hampson et al., 2016). The present study suggests that ACE exposure in childhood may lead to lower life satisfaction, poorer social

support, and higher levels of stress in emerging adulthood, which in turn, may lead to increases in health problems. However, the relationships between childhood adversity, risk and resilience-promoting behaviors, and health in adulthood is likely complex and not unidirectional. For example, ACE score may exert an impact on life satisfaction, which may lead to poor health. Conversely ACE score may lead to poor health via different causal mechanisms and poor health may in turn lead to low life satisfaction. Even more complex models may exist, for example ACE score may lead to low life satisfaction, leading to poor health which in turn further impacts life satisfaction. Further research on the role of resiliency factors in the relationship between ACEs and health is needed to clarify potential causal pathways between these variables.

Limitations

Several limitations of the present study should be noted. This study was correlational and cross-sectional in nature. As such, limited conclusions can be made regarding causal relationships between variables, particularly the directional relationship between ACEs and health. However, a focus on ACEs in childhood, rather than trauma across the lifespan, makes it likely that childhood events preceded and impacted health in adulthood. Although challenging to implement, prospective longitudinal studies and controlled experiments can contribute to our knowledge of causal pathways in the relationship between ACE exposure and health.

The retrospective, cross-sectional nature of this study also made it difficult to conceptualize models of causation when conducting analyses for mediation effects. Mediation models are causal models and use statistics to evaluate a model that is grounded in theory (Kenny, 2014). This study suggests that ACE score can lead to reductions in life satisfaction, and in turn, poor life satisfaction can lead to poorer health. However, alternative causal models are possible. For example, high ACE exposure can lead to poorer health, which in turn can lead to

lower life satisfaction. As such, the mediation model utilized in this study should be interpreted with caution, and additional research is needed in this area.

Additionally, this study relied on participant self-report for all measures. This form of data collection may be susceptible to a range of influences. For example, reports of adverse experiences might have been susceptible to forgetting, and health-risk-behaviors might have been under-reported due to denial and shame. Research has also demonstrated that participants may under-report or fail to recall adverse experiences (Williams, 1994; Widom & Shepard, 1996). As such, retrospective studies like this one may under-represent the actual rate of ACEs and their impact on health. On the other hand, several studies have also demonstrated that self-rated health better predicts mortality then objective measures of health status, highlighting the fact that in some cases self-report measures may provide highly valid and useful data (Idler & Benyamini, 1997; Idler et al., 2004). Despite these potential influences, self-report methods are widely used in research, and have demonstrated validity and reliability. Dube and colleagues (2004) found that test-retest reliability for retrospective self-reported adverse experiences in childhood ranged from good to substantial.

It is also important to note that this study was conducted on a rural college campus. Study participants were predominantly White. As such, it is possible that the findings of this study would differ with a more diverse sample of participants in an urban academic environment. Additional research to assess the generalizability of current findings and assess potential differences in urban versus rural populations and across ethnic groups would contribute to the existing body of research.

Variability in how adverse childhood experiences are defined and scored may provide another explanation for why rates of ACEs differed in this study. While this study found higher

rates of ACE exposure in this college student sample, a review of the ACEs literature revealed that different studies differ in their criteria for what constitutes as ACE exposure. Additionally, the earliest studies utilizing the ACEs construct used eight ACE categories rather than ten (Felitti et al., 1998). However, the present study used fairly conservative definitions of adverse experiences. For many questions, participants had to report that experiences happened "often" or "very often" in order to meet criteria for the ACE category. Nonetheless, differences in how ACEs are scored and interpreted across studies make it difficult to compare rates of adverse childhood experiences across these studies. The ACE construct has become a popular and useful way to measure childhood adversity in research. As such, the field is likely to benefit from a manualized, uniform approach to ACE scoring that will increase the validity of cross-study comparisons.

Finally, there is much debate in the research with regard to how to best define the construct of resiliency and what social psychological resources best capture resiliency (Hamby, Banyard & Grych, 2016; Shaw, McLean, Taylor, Swartout & Querna, 2016). This study sought to explore the role of potential protective and palliative factors in the relationship between ACE score and health in a college student sample. High conceptual overlap and statistical inter-correlations (e.g., overlap between ACE score and protective factors in childhood, high inter-correlations among the four resiliency factors) led to variables being excluded from analyses in order to increase the validity of this study. Despite the challenge of operationalizing resiliency factors in the present study, the impact of these resiliency factors on health within this population was surprising. Future studies should focus on defining valid and reliable measures of resiliency in this population to allow for further exploration of how resiliency mitigates the relationship between ACE score and health.

Future Directions

The ultimate goal of this line of research is to understand the impact of adverse experiences in childhood on health in early adulthood, and to identify effective methods of reducing and preventing the long-term impact of ACEs. The findings of this study, and the body of research upon which it is based, are promising, in that they suggest that resiliency factors have the power to mitigate and alleviate the relationship between ACE exposure and health. Future research should focus on elucidating the role of mediating factors in the relationship between ACEs and health. Future projects should also examine rates of ACEs across different groups, and should compare emerging adults who do not enter college with those that do. This line of research can shed light on characteristics of resiliency that may differentiate college students from the general population. Research should also continue to examine the role of resiliency factors in the relationship between ACEs and health, and why resiliency factors seem to impact measures of health outcomes differently. Replication of the present study can strengthen support for these findings. Alternatively, replication may shed light on how participant characteristics, study design and measures may have played a role in impacting the study findings.

Research should continue to explore rates of ACE exposure in young adults, particularly differences in exposure between young adults who attend college, those who do not attend college, and those who begin college but do not complete their education. As discussed above, different studies utilize different versions of the ACE questionnaire and different definitions of whether criteria are met. A uniform manualized administration tool and scoring guidelines would allow for more valid cross-study comparisons of rates of ACEs in different groups. Additionally, research on differences in ACE exposure in rural and urban settings, and across ethnic groups, can contribute to our understanding of childhood maltreatment. The contributions of risk and

resiliency factors may differ across ethnic and socioeconomic groups. Awareness of these differences can help service providers implement appropriate and effective community-based interventions.

The difference in rates of ACEs in college students and adult community samples highlights the possibility that within-group characteristics may be responsible for these divergent findings. Further research should examine whether manipulating intra-individual characteristics can lead to over-endorsement of adverse childhood experiences, or increase accurate endorsement of ACE categories. For example, research should examine if exposure to educational materials on childhood maltreatment increases participants' endorsement of ACE categories. The body of research can also benefit from studies that examine whether temporarily manipulating psychological factors (e.g., mood) can impact patterns of ACE endorsement. For example, studies have examined whether manipulating mood impacts the association between socioeconomic status and self-rated health (Kraus, Adler & Chen, 2013), participant reports of negative life events and perceived social support (Cohen, Towbes & Flocco, 1988), and satisfaction with life (Schwarz & Clore, 1983). Finally, it is important to understand if participants' endorsement of ACE categories changes over time. For example, if participants will endorse a similar number of ACEs at age 18 and twenty years later, at age 38.

Additional research is also needed to further our understanding of the role of health risk behaviors in the relationship between ACE score and health, specifically, how the role of health risk behaviors in this relationship may change over the lifespan. Furthermore, while several studies examine the role of resilience in long-term outcomes for childhood abuse survivors (Liem, James, O'Toole & Boudewyn, 1997; Kaye-Tzadok & Davidson-Arad, 2016; Rosenberg et al., 2014), these studies differ widely in how they define and measure resilience. A unified,

agreed upon method of defining and measuring resiliency would contribute to a better understanding of the pathways by which ACE exposure impacts resiliency factors, and how resiliency factors impact health.

Although challenging to implement, prospective, longitudinal studies and controlled experiments can contribute to our knowledge of causal pathways in the relationship between ACE exposure and health. A longitudinal study examining the impact of ACE exposure on physical health and psychological health throughout college would be a feasible and valuable direction for future research (D. Corwin, personal communication, August 25, 2015). More research is needed to further elucidate and inform the inter-relationships between ACEs, health risk behaviors, resiliency factors, and health. Specifically, the possibility that perceived social support and stress exert direct effects on health status in college students, over and above ACEs and health risk behaviors, has significant implications for mental health and medical professionals. Longitudinal research can also shed light on developmental considerations with regard to risk and resiliency factors. For example, it may be that resiliency factors are important predictors of health in college students, but health risk behaviors exert a greater impact on health in older populations. The findings of this study evoke intriguing questions. For example, does lower life satisfaction lead to poor health? Or, does poor health lead to lower life satisfaction? There is theoretical support for the concept that health problems reduce satisfaction with life (Willits, & Crider, 1988; Strine et al., 2008), and for the concept that low life satisfaction contributes to poor health (Kendall-Tackett, 2002; Teegan, 1999; Gauthier et al., 1995; Kendall-Tackett, 2002). Research on possible causal models, specifically whether social psychological resources contribute to changes in health, is essential.

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Appendix A

Family History Questionnaire

1. What is your birthdate?
   Month ____ Day__ Year ____

2. What is your sex?
   [ ] Male
   [ ] Female
   [ ] Other _____

3 What is your race?
   [ ] Asian
   [ ] Black
   [ ] American Indian
   [ ] White
   [ ] Other

4. Are you of Mexican, Latino, or Hispanic origin?
   [ ] Yes
   [ ] No

5. Please check how far you've gone in school. (Choose one)
   [ ] College freshman
   [ ] College sophomore
   [ ] College junior
   [ ] College senior

6. What is your current marital status?
   Are you now...
   [ ] Single
   [ ] In a committed relationship
   [ ] Not married but living together with a partner
   [ ] Married
   [ ] Widowed
   [ ] Separated
   [ ] Divorced

7. Are you currently...
   [ ] living alone
   [ ] living with a companion/roommate
   [ ] living with family
   [ ] living with a spouse/romantic partner

8. Which of the following best describes your current employment status?
   [ ] Full-time (35 hours or more)
   [ ] Part-time (1-34 hours)
   [ ] Not employed

9. Which of the following best describes your current college attendance?
   [ ] Full-time (12 or more credits)
   [ ] Part-time (1 to 11 credits)

In order to get a more complete picture of the health of participants, the next three questions are about voluntary sexual experiences only.

10. How old were you the first time you had sexual intercourse?
    Age _____
    [ ] Never had intercourse

11. With how many different partners have you ever had sexual intercourse?
    Number of partners _____

12. During the past year, with how many different partners have you had sexual intercourse?
    Number of partners _____

13. Have you smoked at least 100 cigarettes in your entire life?
    [ ] Yes
    [ ] No

14. How old were you when you began to smoke cigarettes fairly regularly?
    Age _____

15. Do you smoke cigarettes now?
    [ ] Yes
    [ ] No

16. If "Yes" on average, about how many cigarettes a day do you smoke?
    Number of cigarettes _____

17. Do you use other tobacco products?
    [ ] Yes
    [ ] No

18. If "Yes", which:
    [ ] Cigars
    [ ] Pipe
    [ ] Snuff
    [ ] Chewing Tobacco

19. If “Yes”, how many times per day?
    Number of times per day _____

20. If you used to smoke cigarettes but don't smoke now, about how many cigarettes a day did you smoke?
    Number of cigarettes _____

21. How old were you when you quit?
    Age _____

22. During the past month, about how many days per week did you exercise for recreation or to keep in shape?
    [ ] 0
    [ ] 1
    [ ] 2
    [ ] 3
    [ ] 4
    [ ] 5
    [ ] 6
    [ ] 7

23. During the past month, when you exercised for recreation or to keep in shape how long did you usually exercise (in minutes)?
    [ ] 1-19
    [ ] 20-29
    [ ] 30-39
    [ ] 40-49
    [ ] 50-59
    [ ] 60 or more

24. What is the most you have ever weighed?
    Weight in pounds: _____

25. What was your approximate height at this time?
    Height: ___ ft. ___ in.

26. How old were you then?
    Age _____

27. During the past month, have you had any beer, wine, wine coolers cocktails or liquor?
    [ ] Yes
    [ ] No

28. During the past month, how many days per week did you drink any alcoholic beverages on average?

[ ] 0
[ ] 1
[ ] 2
[ ] 3
[ ] 4
[ ] 5
[ ] 6
[ ] 7

29. On the days when you drank, about how many drinks per day did you have on average?

[ ] 1
[ ] 2
[ ] 3
[ ] 4 or more
[ ] didn't drink in past month

30. Considering all types of alcoholic beverages, how many times during the past month did you have 5 or more drinks on an occasion?

Number of times: _____

31. I sometimes wonder if I drink more than is good for me.

[ ] Yes
[ ] No

32. Have you ever had a problem with your use of alcohol?

[ ] Yes
[ ] No

33. Have you ever considered yourself to be an alcoholic?

[ ] Yes
[ ] No

34. During your first 18 vears of life did you live with anyone who was a problem drinker or alcoholic?

[ ] Yes
[ ] No

35. If "Yes" check all who were:
    [ ] Father
    [ ] Mother
    [ ] Other Relative
    [ ] Other non-relative
    [ ] Brothers
    [ ] Sisters

36. Have you ever used street drugs?
    [ ] Yes
    [ ] No

37. About how many times have you used street drugs?
    [ ] 1-2
    [ ] 3-10
    [ ] 11-25
    [ ] 26-99
    [ ] 100+

38. Have you ever had a problem with your use of street drugs?
    [ ] Yes
    [ ] No

39. Have you ever considered yourself to be addicted to street drugs?
    [ ] Yes
    [ ] No

40. Have you ever injected street drugs?
    [ ] Yes
    [ ] No

41. During your first 18 years of life did you live with anyone who used street drugs?
    [ ] Yes
    [ ] No

42. Were your parents ever separated or divorced?
    [ ] Yes
    [ ] No

43. Did you ever live with a stepfather?
    [ ] Yes
    [ ] No

44. Did you ever live with a stepmother?
    [ ] Yes
    [ ] No

45. Did you ever live in a foster home?
    [ ] Yes
    [ ] No

46. Was anyone in your household depressed or mentally ill?
    [ ] Yes
    [ ] No

47. Did anyone in your household attempt to commit suicide?
    [ ] Yes
    [ ] No

48. Did anyone in your household ever go to prison?
    [ ] Yes
    [ ] No

49. Did anyone in your household ever commit a serious crime?
    [ ] Yes
    [ ] No

Sometimes physical blows occur between parents. While you were growing up in your first 18 years of life, how often did your father (or stepfather) or mother boyfriend do any of these things to your mother (or stepmother)?

50. Push, grab, slap or throw something at her?
    [ ] Never
    [ ] Once, twice
    [ ] Sometimes
    [ ] Often
    [ ] Very often

51. Kick, bite, hit her with a fist, or hit her with something hard?
    [ ] Never
    [ ] Often
    [ ] Once, twice
    [ ] Very often
    [ ] Sometimes

52. Repeatedly hit her over at least a few minutes?
[ ] Never
[ ] Once, twice
[ ] Sometimes
[ ] Often
[ ] Very often

53. Threaten her with a knife or gun, or use a knife or gun to hurt her?
[ ] Never
[ ] Often
[ ] Once, twice
[ ] Very often
[ ] Sometimes

Some parents spank their children as a form of discipline. While you were growing up during the first 18 years of life:

54. How often were you spanked?
[ ] Never
[ ] Many times a year
[ ] Once or twice
[ ] Weekly or more
[ ] A few times a year

55. How severely were you spanked?
[ ] Not hard
[ ] Quite hard
[ ] A little hard
[ ] Medium
[ ] Very Hard

While you were growing up, during your first 18 years of life, how true were each of the following statements:

56. You didn't have enough to eat.
[ ] Never true
[ ] Rarely true
[ ]Sometimes true
[ ] Often true
[ ] Very often true

57. You knew there was someone to take care of you and protect you.
    [ ] Never true
    [ ] Rarely true
    [ ]Sometimes true
    [ ] Often true
    [ ] Very often true

58. People in your family called you things like "lazy" or "ugly
    [ ] Never true
    [ ] Rarely true
    [ ]Sometimes true
    [ ] Often true
    [ ] Very often true

59. Your parents were too drunk or high to take care of the family
    [ ] Never true
    [ ] Rarely true
    [ ]Sometimes true
    [ ] Often true
    [ ] Very often true

60. There was someone in your family who helped you feel important or special
    [ ] Never true
    [ ] Rarely true
    [ ]Sometimes true
    [ ] Often true
    [ ] Very often true

61. You had to wear dirty clothes.
    [ ] Never true
    [ ] Rarely true
    [ ]Sometimes true
    [ ] Often true
    [ ] Very often true

62. You felt loved.
    [ ] Never true
    [ ] Rarely true
    [ ]Sometimes true
    [ ] Often true
    [ ] Very often true

63. You thought your parents wished you had never been born.
    [ ] Never true
    [ ] Rarely true
    [ ]Sometimes true
    [ ] Often true
    [ ] Very often true

64. People in your family looked out for each other
    [ ] Never true
    [ ] Rarely true
    [ ]Sometimes true
    [ ] Often true
    [ ] Very often true

65. You felt that someone in your family hated you
    [ ] Never true
    [ ] Rarely true
    [ ]Sometimes true
    [ ] Often true
    [ ] Very often true

66. People in your family said hurtful or insulting things to you
    [ ] Never true
    [ ] Rarely true
    [ ]Sometimes true
    [ ] Often true
    [ ] Very often true

67. People in your family felt close to each other
    [ ] Never true
    [ ] Rarely true
    [ ] Sometimes true
    [ ] Often true
    [ ] Very often true

68. You believe you were emotionally abused
    [ ] Never true
    [ ] Rarely true
    [ ]Sometimes true
    [ ] Often true
    [ ] Very often true

69. There was someone to take you to the doctor if you needed it
[ ] Never true
[ ] Rarely true
[ ]Sometimes true
[ ] Often true
[ ] Very often true

70. Your family was a source of strength and support.
[ ] Never true
[ ] Rarely true
[ ]Sometimes true
[ ] Often true
[ ] Very often true

Sometimes parents or other adults hurt children. While you were growing up, that is, during your first 18 years of life, how often did a parent, stepparent, or adult living in your home:

71. Swear at you, insult you, or put you down?
[ ] Never
[ ] Once, twice
[ ] Sometimes
[ ] Often
[ ] Very often

72. Threaten to hit you or throw something at you, but didn't do it?
[ ] Never
[ ] Once, twice
[ ] Sometimes
[ ] Often
[ ] Very often

73. Actually push, grab, shove, slap, or throw something at you?
[ ] Never
[ ] Once, twice
[ ] Sometimes
[ ] Often
[ ] Very often

74. Hit you so hard that you had marks or were injured?
[ ] Never
[ ] Once, twice
[ ] Sometimes
[ ] Often
[ ] Very often

75. Act in a way that made you afraid that you might be physically hurt?

[ ] Never
[ ] Once, twice
[ ] Sometimes
[ ] Often
[ ] Very often

Some people, while growing up in their first 18 years of life, had a sexual experience with an adult or someone at least five years older than themselves. These experiences may have involved a relative, family friend, or stranger.

76. During the first 18 years of life, did an adult or older relative, family friend, or stranger ever touch or fondle your body in a sexual way?

[ ] Yes
[ ] No

If "Yes":

The first time this happened how old were you?

Age _____

The last time it happened, how old were you?

Age _____

About how many times did this happen to you?

Times _____

How many different people did this to you?

People _____

What was the sex of the person(s) who did this?

[ ] Male
[ ] Female
[ ] Both

77. During the first 18 years of life, did an adult or older relative, family friend, or stranger ever have you touch their body in a sexual way?

[ ] Yes
[ ] No

If "Yes":

The first time this happened how old were you?

Age _____

The last time it happened, how old were you?

Age _____

About how many times did this happen to you?

Times _____

How many different people did this to you?

People _____

What was the sex of the person(s) who did this?

[ ] Male
[ ] Female
[ ] Both

78. During the first 18 years of life, did an adult or older relative, family friend, or stranger ever attempt to have any type of sexual intercourse (oral, anal, or vaginal) with you?

[ ] Yes
[ ] No

If "Yes":

The first time this happened how old were you?

Age _____

The last time it happened, how old were you?

Age _____

About how many times did this happen to you?

Times _____

How many different people did this to you?

People _____

What was the sex of the person(s) who did this?

[ ] Male
[ ] Female
[ ] Both

79. During the first 18 years of life, did an adult or older relative, family friend, or stranger ever actually have any type of sexual intercourse (oral, anal, or vaginal) with you?

[ ] Yes
[ ] No

If "Yes":

The first time this happened how old were you?
Age _____

The last time it happened, how old were you?
Age _____

About how many times did this happen to you?
Times _____

How many different people did this to you?
People _____

What was the sex of the person(s) who did this?
[ ] Male
[ ] Female
[ ] Both

If you answered "No" to each of the last 4 questions (76-79) about sexual experiences with older persons, please skip to question 94

Did any of these sexual experiences with an adult or person at least 5 years older than you involve:

80. A relative who lived in your home?
[ ] Yes
[ ] No

81. A non-relative who lived in your home?
[ ] Yes
[ ] No

82. A relative who didn't live in your home?
[ ] Yes
[ ] No

83. A family friend or person whom you knew and who didn't live in your home?
[ ] Yes
[ ] No

84. A stranger?
[ ] Yes
[ ] No

85. Someone who was supposed to be taking care of you?
[ ] Yes
[ ] No

86. Someone you trusted?
[ ] Yes
[ ] No

Did any of these sexual experiences involve:

87. Trickery, verbal persuasion, or pressure to get you to participate?
[ ] Yes
[ ] No

88. Being given alcohol or drugs?
[ ] Yes
[ ] No

89. Threats to harm you if you didn't participate?
[ ] Yes
[ ] No

90. Being physically forced or overpowered to make you participate?
[ ] Yes
[ ] No

91. Have you ever told a doctor, nurse or other health professional about these sexual experiences?
[ ] Yes
[ ] No

92. Has a therapist or counselor ever suggested to you that you were sexually abused as a child?
[ ] Yes
[ ] No

93. Do you think that you were sexually abused as a child?
[ ] Yes
[ ] No

Apart from other sexual experiences you have already told us about, while you were growing up during your first 18 years of life:

94. Did a boy or group of boys about your own age ever force you or threaten you with harm in order to have sexual contact?
    [ ] Yes
    [ ] No

95. If "Yes", did the contact involve someone touching your sexual parts or trying to have intercourse with you (oral, anal or vaginal)?
    [ ] Yes
    [ ] No

96. If "Yes" how many times did someone do this to you?
    [ ] Once
    [ ] Twice
    [ ] 3-5 times
    [ ] 6-10 times
    [ ] More than 10 times

97. Did the contact involve a person actually having intercourse with you (oral, anal, or vaginal)?
    [ ] Yes
    [ ] No

98. If "Yes", how many times did someone do this to you?
    [ ] Once
    [ ] Twice
    [ ] 3-5 times
    [ ] 6-10 times
    [ ] More than 10 times

Thank you for completing this survey.

If you are unsure about any of your answers or would like to talk to someone privately, please tell the person administering this study.

Appendix B

Health Appraisal Questionnaire

1. What do you consider your main health problem?

Head/Brain
Have you had or do you have:

problems with dizziness?	[ ] yes [ ] no
involuntary movements of your body?	[ ] yes [ ] no
a convulsion or seizure?	[ ] yes [ ] no
frequent headaches?	[ ] yes [ ] no
hallucinations at times?*	[ ] yes [ ] no
a psychological problem?*	[ ] yes [ ] no
a brain, nerve, or emotional problem not on this list?* If yes, please specify:	[ ] yes [ ] no

*questions pertaining to mental health were removed from the analyses, including responses referring to mental health problems for the open-ended question.

Eyes
Have you had or do you have:

a sudden loss of vision?	[ ] yes [ ] no
cataracts?	[ ] yes [ ] no
a retinal hemorrhage?	[ ] yes [ ] no
macular degeneration?	[ ] yes [ ] no
an eye problem not on this list? If yes, please specify:	[ ] yes [ ] no

Ears
Have you had or do you have:

trouble hearing?	[ ] yes [ ] no
frequent ear infections?	[ ] yes [ ] no
a draining ear?	[ ] yes [ ] no
an ear problem not on the list? If yes, please specify:	[ ] yes [ ] no

Nose/Sinuses

Have you had or do you have:

hay fever or allergic rhinitis?	[ ] yes	[ ] no
colored mucus often draining from your nose?	[ ] yes	[ ] no
frequent nose bleeds?	[ ] yes	[ ] no
nasal polyps?	[ ] yes	[ ] no
nasal problem not on the list? If yes, please specify:	[ ] yes	[ ] no

Mouth, Throat, Neck

Have you had or do you have:

a tooth or gum problem?	[ ] yes	[ ] no
mouth, tongue or jaw problem?	[ ] yes	[ ] no
thyroid disease?	[ ] yes	[ ] no
lump or swelling in neck?	[ ] yes	[ ] no
a mouth, throat or neck problem not on the list? If yes, please specify:	[ ] yes	[ ] no

Lungs

Have you had or do you have:

shortness of breath?	[ ] yes	[ ] no
an episode of coughing up blood in the past year?	[ ] yes	[ ] no
emphysema?	[ ] yes	[ ] no
pneumonia?	[ ] yes	[ ] no
chronic bronchitis?	[ ] yes	[ ] no
a lung or chest problem not on the list? If yes, please specify:	[ ] yes	[ ] no

Cardiovascular

Have you had or do you have

high blood pressure?	[ ] yes	[ ] no
a cholesterol problem?	[ ] yes	[ ] no
a heart attack?	[ ] yes	[ ] no
congestive heart failure?	[ ] yes	[ ] no
abnormal blood clot formation?	[ ] yes	[ ] no
blood clots	[ ] yes	[ ] no

a heart or circulatory problem not on this list? If yes, please specify:	[ ] yes [ ] no

Skin
I have:

a sore that doesn't heal.	[ ] yes [ ] no
eczema.	[ ] yes [ ] no
psoriasis.	[ ] yes [ ] no
a skin problem not on this list If yes, please specify:	[ ] yes [ ] no

Digestive
During the last year I have had:

recurrent nausea or vomiting.	[ ] yes [ ] no
recurrent abdominal pain.	[ ] yes [ ] no
an episode of vomiting blood.	[ ] yes [ ] no
visible blood in bowel movements.	[ ] yes [ ] no
inability to control my bowels.	[ ] yes [ ] no
digestion problem not on the list. If yes, please specify:	[ ] yes [ ] no

I have been diagnosed by a doctor with:
Have you had or do you have

peptic ulcer	[ ] yes [ ] no
gastrointestinal bleeding	[ ] yes [ ] no
irritable bowel syndrome	[ ] yes [ ] no
borderline diabetes	[ ] yes [ ] no
diabetes type I	[ ] yes [ ] no
diabetes type II	[ ] yes [ ] no
a gastrointestinal problem not on the list If yes, please specify:	[ ] yes [ ] no

Have you ever had any surgical operations?
If yes, please list the surgeries you have had:

Have your ever been diagnosed with cancer?
If yes, what type?

Do you regularly take any medications?

If yes, please list the medications you take:

If you identify as female, please answer the questions marked "Women's Health" below. If you identify as male, please answer the questions marked "Men's Health" below.

Women's Health

I have a:

Colored or bloody nipple discharge	[ ] yes	[ ] no
Other breast problem If yes, please specify:	[ ] yes	[ ] no
Vaginal itching	[ ] yes	[ ] no
Pain with sexual intercourse	[ ] yes	[ ] no
Chronic pelvic pain	[ ] yes	[ ] no
Other vaginal problem. If yes, please specify:	[ ] yes	[ ] no

Women's Health

I currently have:

No periods If yes, please specify why:	[ ] yes	[ ] no
Irregular periods	[ ] yes	[ ] no
Heavy periods	[ ] yes	[ ] no

Women's Health

I have:

Had blood in my urine	[ ] yes	[ ] no
Repeated urinary tract infections	[ ] yes	[ ] no
A urinary problem not on the list If yes, please specify:	[ ] yes	[ ] no

Women's Health

I have had:

An infected tube or other pelvic infection	[ ] yes	[ ] no
Ectopic pregnancy	[ ] yes	[ ] no
A kidney stone	[ ] yes	[ ] no
A lot of pain with my periods	[ ] yes	[ ] no

Men's Health

I have had:

Urethritis	[ ] yes	[ ] no
Nephritis	[ ] yes	[ ] no
A kidney stone	[ ] yes	[ ] no
A genital or urinary problem not on the List	[ ] yes	[ ] no

Men's Health

I have had:

Problems starting or stopping urine	[ ] yes	[ ] no
Occasional loss of urine	[ ] yes	[ ] no
To get up several times each night to Urinate	[ ] yes	[ ] no
Pain or burning sensation when urinating	[ ] yes	[ ] no
Blood in urine	[ ] yes	[ ] no

Men's Health

I have had:

Problems getting an erection	[ ] yes	[ ] no
Problems maintaining an erection or impotence during sex	[ ] yes	[ ] no
A genital, urinary or sexual problem not on the list If yes, please specify:	[ ] yes	[ ] no

I am:

Not sexually active and have never been sexually active	[ ] yes	[ ] no
Satisfied with my sex life	[ ] yes	[ ] no
Possibly at risk for HIV/AIDS	[ ] yes	[ ] no
Diagnosed with HIV/AIDS	[ ] yes	[ ] no

I have had:

Genital Herpes	[ ] yes	[ ] no
Gonorrhea	[ ] yes	[ ] no
Syphilis	[ ] yes	[ ] no
A sexually transmitted disease not on the list If yes, please specify:	[ ] yes	[ ] no

I have had:

Reproductive, urinary or sexual problems not mentioned If yes, please specify:	[ ] yes [ ] no

Muscoloskeletal

I have had:

a fracture of the pelvis	[ ] yes [ ] no
three of more fractures in my life	[ ] yes [ ] no
a fracture that is not on the list If yes, please specify:	[ ] yes [ ] no
a bone or ligament injury that never healed	[ ] yes [ ] no

I currently have:

pain or stiffness in my joints on most days	[ ] yes [ ] no
a musculoskeletal problem not on the list If yes, please specify:	[ ] yes [ ] no

I have been diagnosed with:

rheumatoid arthritis	[ ] yes [ ] no
other forms of arthritis If yes, please specify:	[ ] yes [ ] no
Osteoporosis	[ ] yes [ ] no
Lupus	[ ] yes [ ] no
fibrositis or fibromyalgia	[ ] yes [ ] no
chronic fatigue syndrome	[ ] yes [ ] no

Please list all medical and psychiatric hospitalizations not previously mentioned:

Please list any serious illness for which you were not hospitalized which have not been previously mentioned:

Appendix C

RAND 36

1. In general, would you say your health is:

Excellent	1
Very good	2
Good	3
Fair	4
Poor	5

2. **Compared to one year ago**, how would you rate your health in general **now**?

Much better now than one year ago	1
Somewhat better now than one year ago	2
About the same	3
Somewhat worse now than one year ago	4
Much worse now than one year ago	5

The following items are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?
(Circle One Number on Each Line)

	Yes, Limited a Lot	Yes, Limited a Little	No, Not limited at All
3. **Vigorous activities**, such as running, lifting heavy objects, participating in strenuous sports	[1]	[2]	[3]
4. **Moderate activities**, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	[1]	[2]	[3]
5. Lifting or carrying groceries	[1]	[2]	[3]
6. Climbing **several** flights of stairs	[1]	[2]	[3]
7. Climbing **one** flight of stairs	[1]	[2]	[3]
8. Bending, kneeling, or stooping	[1]	[2]	[3]
9. Walking **more than a mile**	[1]	[2]	[3]
10. Walking **several blocks**	[1]	[2]	[3]
11. Walking **one block**	[1]	[2]	[3]
12. Bathing or dressing yourself	[1]	[2]	[3]

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?
(Circle One Number on Each Line)

	Yes	No
13. Cut down the amount of time you spent on work or other activities	1	2
14. **Accomplished less** than you would like	1	2
15. Were limited in the **kind** of work or other activities	1	2

16. Had **difficulty** performing the work or other activities (for example, it took extra effort) 1 2

During the **past 4** weeks,have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?
(Circle One Number on Each Line)

	Yes	No
17. Cut down the **amount of time** you spent on work or other activities	1	2
18. **Accomplished less** than you would like	1	2
19. Didn't do work or other activities as **carefully** as usual	1	2

20. During the **past 4 weeks,** to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?
(Circle One Number)

Not at all	1
Slightly	2
Moderately	3
Quite a bit	4
Extremely	5

21. How much **bodily** pain have you had during the **past 4 weeks**?
(Circle One Number)

None	1
Very mild	2
Mild	3
Moderate	4
Severe	5
Very severe	6

22. During the **past 4 weeks,** how much did **pain** interfere with your normal work (including both work outside the home and housework)?
(Circle One Number)

Not at all	1
A little bit	2
Moderately	3
Quite a bit	4
Extremely	5

These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the **past 4 weeks**. . .
(Circle One Number on Each Line)

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
23. Did you feel full of pep?	1	2	3	4	5	6
24. Have you been a very nervous person?	1	2	3	4	5	6
25. Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
26. Have you felt calm and peaceful?	1	2	3	4	5	6
27. Did you have a lot of energy?	1	2	3	4	5	6
28. Have you felt downhearted and blue?	1	2	3	4	5	6
29. Did you feel worn out?	1	2	3	4	5	6
30. Have you been a happy person?	1	2	3	4	5	6
31. Did you feel tired?	1	2	3	4	5	6

32. During the **past 4 weeks,** how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives, etc.)?
(Circle One Number)

All of the time	1
Most of the time	2
Some of the time	3
A little of the time	4
None of the time	5

How TRUE or FALSE is <u>each</u> of the following statements for you.
(Circle One Number on Each Line)

	Definitely True	Mostly True	Don't Know	Mostly False	Definitely False
33. I seem to get sick a little easier than other people	1	2	3	4	5
34. I am as healthy as anybody I know	1	2	3	4	5
35. I expect my health to get worse	1	2	3	4	5
36. My health is excellent	1	2	3	4	5

Appendix D

Positive and Negative Affect Schedule (PANAS)

This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. Indicate the extent you have been feeling this way in general, that is, on average.

1	2	3	4	5
Very Slightly or Not at All	A Little	Moderately	Quite a Bit	Extremely

_____ 1. Interested

_____ 2. Distressed

_____ 3. Excited

_____ 4. Upset

_____ 5. Strong

_____ 6. Guilty

_____ 7. Scared

_____ 8. Hostile

_____ 9. Enthusiastic

_____ 10. Proud

_____ 11. Irritable

_____ 12. Alert

_____ 13. Ashamed

_____ 14. Inspired

_____ 15. Nervous

_____ 16. Determined

_____ 17. Attentive

_____ 18. Jittery

_____ 19. Active

_____ 20. Afraid

Appendix E

Satisfaction with Life Scale (SWLS)

Below are five statements that you may agree or disagree with. Using the 1 - 7 scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Please be open and honest in your responding.

7 - Strongly agree
6 - Agree
5 - Slightly agree
4 - Neither agree nor disagree
3 - Slightly disagree
2 - Disagree
1 - Strongly disagree

____ In most ways my life is close to my ideal.
____ The conditions of my life are excellent.
____ I am satisfied with my life.
____ So far I have gotten the important things I want in life.
____ If I could live my life over, I would change almost nothing.

Appendix F

Perceived Stress Scale

INSTRUCTIONS: The questions in this scale ask you about your feelings and thoughts during THE LAST MONTH. In each case, please indicate your response by placing an "X" over the number representing HOW OFTEN you felt or thought a certain way.

Never	Almost Never	Sometimes	Fairly Often	Very Often
0	1	2	3	4

1. In the last month, how often have you been upset because of something that happened unexpectedly?*	**0 1 2 3 4**
2. In the last month, how often have you felt that you were unable to control the important things in your life?	**0 1 2 3 4**
3. In the last month, how often have you felt nervous and "stressed"?	**0 1 2 3 4**
4. In the last month, how often have you dealt successfully with day to day problems and annoyances?	**0 1 2 3 4**
5. In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?	**0 1 2 3 4**
6. In the last month, how often have you felt confident about your ability to handle your personal problems?	**0 1 2 3 4**
7. In the last month, how often have you felt that things were going your way?	**0 1 2 3 4**
8. In the last month, how often have you found that you could not cope with all the things that you had to do?	**0 1 2 3 4**

9. In the last month, how often have you been able to control irritations in your life?	**0 1 2 3 4**
10. In the last month, how often have you felt that you were on top of things?	**0 1 2 3 4**
11. In the last month, how often have you been angered because of things that happened that were outside of your control?	**0 1 2 3 4**
12. In the last month, how often have you found yourself thinking about things that you have to accomplish?*	**0 1 2 3 4**
13. In the last month, how often have you been able to control the way you spend your time?	**0 1 2 3 4**
14. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	**0 1 2 3 4**

*Items omitted from analysis

Appendix G

Perceived Social Support (PSS)

For each of these statements, please list the number from the scale below which best describes your experience:

Scale

1 Very much like my experience
2 Like my experiences
3 Somewhat like my experience
4 Not at all like my experience

Spouse/Partner Support

1. I feel very close to my husband/wife/partner. _____
2. I have a husband/wife/partner who would always take the time to talk over my problems, should I want to. _____
3. My husband/wife/partner often lets me know that he/she thinks I am a worthwhile person. _____
4. When I am with my husband/wife/partner I feel completely able to relax and be myself. ____
5. No matter what happens I know that my husband/wife/partner will always be there for me should I need him/her. _____
6. I know that my husband/wife/partner has confidence in me. _____

Friends Support

1. I feel very close to my friends. _____
2. I have friends who would always take the time to talk over my problems, should I want to. _____
3. My friends often let me know that they think I am a worthwhile person. _____
4. When I am with my friends I feel completely able to relax and be myself. _____
5. No matter what happens I know that my friends will always be there for me should I need them. _____
6. I know my friends have confidence in me. _____
7. I feel that my friends really care about me. _____
8. I often feel really appreciated by my friends. _____

Relatives Support

1. I feel very close to my relatives _____
2. I have relatives who would always take the time to talk over my problems should I want to. ____
3. My relatives often let me know that they think I am a worthwhile person. _____
4. When I am with my relatives I feel completely able to relax and be myself. _____
5. No matter what happens I know that my relatives will be there for me when I need them.
6. I know that my relatives have confidence in me. _____
7. I feel that my relatives care about me. _____
8. I often feel appreciated by my relatives. _____

Work/School Support

1. I feel close to people at work/school _____
2. I have people at work/school who would always take the time to talk over my problems, should I want to. _____
3. I often feel really appreciated by people I work/go to school with. _____

Appendix H

Protective Factors in Childhood

1. For most of my childhood my family lived in:

□A home we owned □A home we rented □A home we shared with relatives/friends

At some point during my childhood my family lived in:
□A Temporary Home (shelter, temporary with friends/relatives)

At some point during my childhood my family was:
□Homeless

2. When I was growing up, my Family Income was around:

□ $0-$15,000 □ $15,001-$25,000 □ $25,001-$35,000
□ $35,001-$55,000 □ $55,001-$75,000 □ more than $75,001

3. My Mother's (or Mother figure) Highest Level of Education:

□ Elementary or junior high school □ Some high school □ High school diploma or GED
□ Trade/Vocational Training □ Some college □ 2-year college degree (Associate's)
□ 4-year college degree (Bachelor's) □ Master's degree □ PhD or other advanced degree

4. My Father's (or Father figure) Highest Level of Education:

□ Elementary or junior high school □ Some high school □ High school diploma or GED
□ Trade/Vocational Training □ Some college □ 2-year college degree (Associate's)
□ 4-year college degree (Bachelor's) □ Master's degree □ PhD or other advanced degree

5. When I was growing up, my family received: (Check all that apply)

□ Food Stamps □ Medicaid (State Health Insurance) □Public Assistance
□ Don't know/Not sure □None of the above

Part I. Please ***circle*** the number that describes how often the statements are true for **your family when you were growing up**. The numbers represent a scale from 1 to 7 where each of the numbers represents a different amount of time. The number 4 means that the statement is true about half the time.

	Never	Very Rarely	Rarely	About Half the Time	Frequently	Very Frequently	Always
In my family, we talked about problems.	1	2	3	4	5	6	7
When we argued, my family listened to "both sides of the story."	1	2	3	4	5	6	7
In my family, we took time to listen to each other.	1	2	3	4	5	6	7
My family pulled together when things were stressful.	1	2	3	4	5	6	7
My family was able to solve our problems.	1	2	3	4	5	6	7

Part II. Please *circle* the number that best describes how much you agree or disagree with the statement.

	Strongly Disagree	Mostly Disagree	Slightly Disagree	Neutral	Slightly Agree	Mostly Agree	Strongly Agree
I had others who listened when I needed to talk about my problems.	1	2	3	4	5	6	7
When I was lonely there were several people that I could talk to.	1	2	3	4	5	6	7
I would not know where to go for help if I had trouble.	1	2	3	4	5	6	7

Part III. Please tell us how often each of the following happened in your family.

	Never	Very Rarely	Rarely	About Half the Time	Frequently	Very Frequently	Always
My parents praised me when I behaved well.	1	2	3	4	5	6	7
When my parents disciplined me they lost control.	1	2	3	4	5	6	7
My parents were happy being with me.	1	2	3	4	5	6	7
My parents and I were very close to each other.	1	2	3	4	5	6	7
My parents were able to soothe me when I was upset.	1	2	3	4	5	6	7
My parents spent time with me doing things I like to do.	1	2	3	4	5	6	7

Appendix I

Items assessing for ACEs in the Family History Questionnaire

ACE Category	Item	Response Categories/**Criteria**[§]
Physical abuse	Sometimes parents or other adults hurt children. While you were growing up, that is, during your first 18 years of life, how often did a parent, stepparent, or adult living in your home:	
	1) actually push, grab, shove, slap, or throw something at you?	Never, Once or Twice, Sometimes, **Often, Very Often**
	2) hit you so hard that you had marks or were injured?	Never, **Once or Twice, Sometimes, Often, Very Often**
Psychological abuse	Sometimes parents or other adults hurt children. While you were growing up, that is, during your first 18 years of life, how often did a parent, stepparent, or adult living in your home:	
	1) swear at you, insult you, or put you down?	Never, Once or Twice, Sometimes, **Often, Very Often**
	2) act in a way that made you afraid that you might be physically hurt?	Never, Once or Twice, Sometimes, **Often, Very Often**

Sexual abuse	Some people, while growing up in their first 18 years of life, had a sexual experience with an adult or someone at least five years older than themselves. These experiences may have involved a relative, family friend, or stranger.	
	1) During the first 18 years of life, did an adult or older relative, family friend, or stranger ever touch or fondle your body in a sexual way?	**Yes**/No
	2) During the first 18 years of life, did an adult or older relative, family friend, or stranger ever have you touch their body in a sexual way?	**Yes**/No
	3) During the first 18 years of life, did an adult or older relative, family friend, or stranger ever attempt to have any type of sexual intercourse (oral, anal, or vaginal) with you?	**Yes**/No
	4) During the first 18 years of life, did an adult or older relative, family friend, or stranger ever actually have any type of sexual intercourse (oral, anal, or vaginal) with you?	**Yes**/No

Physical neglect*	While you were growing up, during your first 18 years of life, how true were each of the following statements:	
	1) you didn't have enough to eat.	Never true, Rarely true, Sometimes true, **Often true, Very often true**
	2) you knew there was someone there to take care of you and protect you.	**Never true, Rarely true**, Sometimes true, Often true, Very often true
	3) your parents were too drunk or too high to take care of the family.	Never true, Rarely true, Sometimes true, **Often true, Very often true**
	4) you had to wear dirty clothes.	Never true, Rarely true, Sometimes true, **Often true, Very often true**
	5) there was someone to take you to the doctor if you needed it.	**Never true, Rarely true**, Sometimes true, Often true, Very often true

Emotional Neglect**	While you were growing up, during your first 18 years of life, how true were each of the following statements:	
	1) there was someone in your family who helped you feel important or special.	**Never true, Rarely true**, Sometimes true, Often true, Very often true
	2) you felt loved.	**Never true, Rarely true**, Sometimes true, Often true, Very often true
	3) people in your family looked out for each other.	**Never true, Rarely true**, Sometimes true, Often true, Very often true
	4) people in your family felt close to each other.	**Never true, Rarely true**, Sometimes true, Often true, Very often true
	5) your family was a source of strength and support.	**Never true, Rarely true**, Sometimes true, Often true, Very often true

Witnessing maternal battering	Sometimes physical blows occur between parents. While you were growing up in your first 18 years of life, how often did your father (or stepfather) or mother's boyfriend do any of these things to your mother (or stepmother):	
	1) push, grab, slap, or throw something at her?	Never, Once or Twice, Sometimes, **Often, Very Often**
	2) kick, bite, hit her with a fist, or hit her with something hard?	Never, Once or Twice, **Sometimes, Often, Very Often**
	3) repeatedly hit her over at least a few minutes?	Never, **Once or Twice, Sometimes, Often, Very Often**
	4) threaten or hurt her with a knife or gun, or use a gun or knife to hurt her?	Never, **Once or Twice, Sometimes, Often, Very Often**
Household mental illness	Was someone in your household depressed or mentally ill?	**Yes**/No
	Did someone in your household attempt or commit suicide?	**Yes**/No
Household substance abuse	During your first 18 years of life did you live with anyone who was a problem drinker or alcoholic?	**Yes**/No
	During your first 18 years of life did you live with anyone who used street drugs?	**Yes**/No
Household criminal activity	Did anyone in your household ever go to prison?	**Yes**/No
	Did anyone in your household ever commit a serious crime?	**Yes**/No
Parental divorce or separation	Were your parents ever separated or divorced?	**Yes**/No

[§]Responses are bolded when this response meets criteria for endorsement of this ACE category

*Physical neglect items: item 2 and 5 are reverse scored.

**Emotional neglect items are reverse scored.

Appendix J

Items assessing for Health Risk Behaviors

Health Risk Behavior	Questions	Criterion
Sexual health	With how many different partners have you ever had sexual intercourse?	25 or more
	Over the past year, with how many different partners did you have sexual intercourse?	10 or more
	Have you ever had a sexually transmitted disease? (five items assessing specific STDs; pulled from Health Appraisal questionnaire)	Yes
Smoking	Have you smoked at least 100 cigarettes in your life?	Yes
	Do you smoke cigarettes now?	Yes
	If "yes" on average how many cigarettes a day do you smoke?	One or more per day
	Do you use other tobacco products	Yes
	If "yes" how many times per day?	Once a day or more
	If you used to smoke cigarettes but don't smoke now, how many times a day did you smoke?	Once or more
Exercise/Weight	During the past month, how many days per week did you exercise for recreation or to keep in shape?	None
	What is the most you have ever weighed? What was your approximate height at this time?	BMI >30

Alcohol	During the past month how many days per week did you drink any alcoholic beverages?	5 or more
	On the days when you drank, about how many drinks did you have on average?	four or more
	How many times in the past month did you have five or more drinks on one occasion?	Once or more
	I sometimes wonder if I drink more than is good for me	Yes
	Have you ever had a problem with alcohol?/Do you consider yourself to be an alcoholic?	Yes
Drug Use	About how many times have you used street drugs	Three or more
	Have you ever had a problem with your use of street drugs?	Yes
	Have you ever considered yourself to be addicted to street drugs?	Yes
	Have you ever injected street drugs?	Yes

Appendix K

Health Problems assessed via the Health Appraisal questionnaire

Health Problems
Head/Brain
Eyes
Ears
Nose
Mouth/Throat/Neck
Lungs
Cardiovascular
Skin
Digestive/Gastrointestinal
Surgical History
Cancer
Men’s Health/Women's Health
Musculoskeletal
Autoimmune

Appendix L

Informed Consent

My name is Irina Khrapatina, and I am a graduate student at IUP. I am inviting you to participate in a research study. Involvement in the study is voluntary. You may choose to participate or not. You may withdraw from this study at any time, and will not lose research credits if you chose to withdraw. I am now going to explain the study to you. Please feel free to ask any questions that you may have about the research; I will be happy to explain anything in greater detail.

I am interested in learning more about participants' personal history and medical history. You will be asked to fill out five surveys. This will take approximately an hour and a half of your time. All information will be kept anonymous and confidential. This means that your name will not appear anywhere.

You will be asked to sign your name on a sign-up sheet at the start of this study, this is to ensure that you receive research credit for participating in this study. Your name cannot be linked to the survey measures you complete, and once participants are granted research credit the sign-up sheets will be destroyed.

The benefit of this research is that you will be helping us to understand the personal and medical history of college students. This information should help us to better understand the needs of college students, and provide resources to meet those needs.

Some of these questions may be of a sensitive nature. At the end of this study you will be provided with a referral sheet for mental health resources within IUP and in the community, in the event that you want to speak to someone. If you do not wish to continue, you have the right to stop answering questions and withdraw from the study, without penalty, at any time.

Participant: All of my questions and concerns about this study have been addressed. I choose, voluntarily, to participate in this research project. I certify that I am at least 18 years of age.

_____
print name of participant

_____ _____
signature of participant date

_____
print name of investigator

_____ _____
signature of investigator date

Appendix M

Mental Health Resources Referral Sheet

CAMPUS & COMMUNITY RESOURCES:

COUNSELING/PSYCHOTHERAPY RESOURCES:

1. **I.U.P. Counseling and Student Development Center**
   Suites on Maple East, G31
   724-357-2621

2. **CRISIS INTERVENTION, DRUG AND ALCOHOL COUNSELING:**
   Open Door Counseling and Crisis Center
   334 Philadelphia St.
   Indiana, PA (724) 465-2605
   (suicide hotline, toll-free: (800) 794-2112)

3. **Indiana County Guidance Center**
   793 Old Rt 119 Highway North
   Indiana, PA (724) 465-5576

4. **Center for Applied Psychology**
   (Includes Stress and Habit Disorders Clinic, Child and Family Clinic, Assessment Clinic)
   210 Uhler Hall
   I.U.P. (724) 357-6228

DOMESTIC VIOLENCE OR RAPE CRISIS:

5. **Alice Paul House (724) 349-4444**
   or toll-free (800)435-7249

CHILD ABUSE OR NEGLECT:

6. **Indiana County Children and Youth**
   350 N. 4th Street
   Indiana, PA 724-465-3895

EDUCATIONAL AND SUPPORT SERVICES:

7. **NAMI (National Alliance for the Mentally Ill)**
   Southwestern Pennsylvania 412-366-3788
   Indiana County: Michael Sterley 724-349-3251
   Ten week educational groups as well as support groups for family members of the Mentally Ill.

ACADEMIC/LEARNING DIFFICULTIES:

8. Tutorial Center
Pratt 306
I.U.P. 357-2159

9. Advising and Testing/Disability Services
Pratt 106
(724) 357-4067

10. Learning Center
Pratt 202
(724) 357-2729

CAREER PLANNING:

11. Career Services
Pratt 302
I.U.P. (724) 357-2235

LEGAL SERVICES:

12. Student Legal Services
936 Philadelphia Street
I.U.P. (724) 349-6020

INFORMATION ABOUT STUDENT ACTIVITIES/EVENTS ON CAMPUS:

13. Center for Student Life
Student Activities and Organizations
Pratt 102
I.U.P. (724) 357-2315

14. Student Cooperative Association
Hadley Union
I.U.P. (724) 357-2590

15. Gay, Lesbian, Bisexual, and Transgender Concerns
Dr. Rita Drapkin email:safe-zone@iup.edu

RELIGIOUS ORGANIZATIONS

16. Interfaith Council
http://www.iup.edu/page.aspx?id=5035