Adverse Childhood Experiences and Adult Depression: Resilience as a Moderator

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Adverse Childhood Experiences and Adult Depression:
Resilience as a Moderator

by

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A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE
DEGREE OF MASTER OF SCIENCE

GRADUATE PROGRAM IN CLINICAL PSYCHOLOGY

CALGARY, ALBERTA

AUGUST, 2016

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Abstract

Adverse childhood experiences (ACEs), such as childhood abuse and neglect, have been identified as salient risk factors for adult depression. However, not all individuals who experience ACEs go on to develop depression. To assess the extent to which resilience- or the ability to demonstrate stable levels of functioning despite adversity- moderates the association between ACEs and depression, 4,006 adult primary care patients completed self-report questionnaires on their childhood experiences and current depressive symptoms and resilience. Results indicated that resilience moderated the association between ACEs and depression, $F(10, 3039) = 174.36, p < .001, R^2 = .365$. Specifically, the association between ACEs and depression was stronger among individuals with low resilience relative to those with high resilience. Findings have the potential to inform the development of a treatment program aimed to reduce symptoms of depression among primary care patients with a history of childhood adversity.
Acknowledgments

I am extremely appreciative of the tremendous efforts of all members of the ACEs-Alberta Research Team and focus groups, without whom this work would not have been possible. I would also like to acknowledge the Palix Foundation, who funded the ACEs-Alberta Study on which this project was based.

On a personal note, I have benefitted greatly from the support of my research supervisor and mentor, Dr. Keith Dobson, and comments from my committee members, Dr. Keith Yeates and Dr. Suzanne Tough. I have also received an immense amount of love, support, and encouragement from my family and my partner, for which I am very grateful.
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Chapter 1: Background

The extant literature demonstrates robust associations between adverse childhood experiences (ACEs) and ensuing psychosocial problems (Hillis et al., 2004; Anda et al., 2002), health-risk behaviours (Dube et al., 2006; Ford et al., 2011), disease (Anda et al., 2008; Dong et al., 2004), and other undesirable long-term outcomes. One area of particular interest has been the influence of ACEs on the development and maintenance of depressive symptoms in adulthood. Research in this area suggests that childhood adversity is predictive of an increased prevalence of lifetime and recent depressive disorders in adulthood (see Heim et al., 2008 for a review).

Although ACEs are widely accepted as an important risk factor for the development of major depressive disorder (MDD), not all individuals who experience adversity as children go on to experience MDD as adults. Individuals who demonstrate stable and healthy levels of functioning despite experiences of adversity are commonly referred to as “resilient”. Resilience is often defined as the ability to cope adaptively with adversity or trauma (Luthar et al., 2000) and has been conceptualized as a complex and multidimensional construct that includes characteristics of tenacity, self-efficacy, emotional and cognitive control under pressure, adaptability, tolerance of negative affect, and goal orientation (Connor & Davidson, 2003).

Understanding the extent to which resilience influences depressive symptoms in adults who experienced adversity as children has the potential to: 1) contribute to the conceptual model of depression, and 2) inform the development of psychological interventions that may be offered to adults who have endured childhood adversity and demonstrate low levels of resilience. The role of resilience as a protective factor of depression in adults with a history of ACEs has not yet been adequately explored.

1.1 Major Depressive Disorder (MDD) in Adulthood

Major depressive disorder (MDD) is one of the most commonly diagnosed disorders
among adults (Kessler et al., 2003). MDD ranks third among all disorders responsible for the global disease burden and is projected to rank even higher in the near future in developed countries (Mathers & Loncar, 2006). The most recently conducted nationally representative community health survey in Canada estimated the lifetime prevalence of MDD to be 11.3%, or about 3.2 million affected Canadians (Pearson et al., 2013).

The average episode of MDD lasts 13-17 weeks and the disorder is often chronic and reoccurring. Approximately 60% of individuals who develop a first lifetime episode will incur a second episode, 70% of those with a second episode will suffer a third, and 90% of those with three or more episodes will experience further reoccurrences (APA, 2000). Individuals with MDD are at increased risk for disruptions in emotion, such as feelings of sadness or emptiness; behavior, such as diminished pleasure in all or almost all activities; physiology, such as fatigue or loss of energy; and cognitions, such as excessive feelings of worthlessness or guilt (APA 2013). Not surprisingly, rates of suicide attempts and completions are elevated among individuals with MDD relative to the population at large (Coryell and Young, 2005). Individuals who suffer from MDD also tend to report increased use of social and medical services (Simon, 2003), functional impairment associated with their depressive symptoms (e.g., social and/or work impairment) (Kessler et al., 2003), and lost productivity as a result of impairment at work or absenteeism (Wang et al., 2006). A global review of published cost-of-illness studies of depression found that the average annual direct excess costs for a depressed individual range from $1,000 to $2,500, varying as function of differing modes of health care systems (Luppa et al., 2007).

Given the tremendous consequences of MDD, there is significant interest in the identification of empirically sound models of depression and associated risk and protective factors. Conceptual models of MDD should address interactions among genetic, biological, and 
psychosocial factors (e.g., Nolen-Hoeksema, 1994; Morris et al., 2014). As individuals develop, they continually interact with the environment, and such processes of transactional development influence variables within and outside of the individual (Hammen, 2006). Beck’s (2008) recent cognitive model proposes that experiences of adversity early in life represent a risk factor for the formation of dysfunctional attitudes and negative cognitions. When such attitudes and cognitions are activated by daily life events, they produce attentional biases, negatively biased interpretations, and symptoms of depression. With repeated activation prior to and following depressive episodes, these attitudes and cognitions become more salient and resistant to change, resulting in chronic and recurring major depressive disorder. Indeed, contemporary theoretical models highlight the role of childhood experiences in the development and maintenance of subsequent depression (Morris et al., 2014).

1.2 The Association between Adverse Childhood Experiences and Depression

Adverse childhood experiences (ACEs) are defined as exposure to childhood emotional, physical, and sexual abuse; emotional and physical neglect; and household dysfunction (i.e., caregiver substance abuse, domestic violence, mental illness, criminal behavior, parental separation or divorce) prior to the age of 18 years. A growing literature demonstrates the vastly detrimental effects of exposure to adversity during sensitive developmental periods on subsequent trajectories of emotional, behavioural, cognitive, and social development.

A wide range of research has identified associations between deleterious mental health outcomes in adulthood with physical abuse (Thompson et al., 2004), sexual abuse (Hill et al., 2001), emotional abuse (Ferguson & Dacey, 1997), neglect (Nikulina et al., 2011), and household dysfunction (Edwards et al., 2003). The landmark ACE study, conducted in San Diego, California between 1995-1997, gathered data on the early life experiences and current mental and physical health status of over 17,000 middle-class adults (Felitti et al., 1998).
ACE study illustrated the pervasiveness of adverse childhood experiences in the American population, as more than half of participants (64%) reported exposure to at least one type of adversity in childhood and 12% reported at least four types of exposures (Dube et al., 2001). Moreover, the majority of respondents who were exposed to one type of childhood adversity were also exposed to another, highlighting the co-occurring nature of ACEs and calling attention to the importance of assessing a wide range of types of ACEs (Edwards et al., 2003). Subsequent research to utilize measures of childhood adversity similar to those of the original ACE Study, such as the Ontario Health Survey (Canadian) (MacMillan et al., 2001), the National Comorbidity Survey (American) (Molnar et al., 2001), and a New Zealand community survey (Mullen et al., 1996), reported consistent findings. The consequences of ACEs on mental health outcomes appear to be a global concern.

Individuals who are exposed to adversity as children appear particularly at risk for the development of MDD. Data from the original ACE study and additional studies, including two twin studies, have shown robust associations between ACEs and the prevalence of depression and suicidal behaviours across the lifespan (Afifi et al., 2008; Chapman et al., 2004; Kendler et al., 2000; McCauley et al., 1997; Nelson et al., 2002). There is evidence of a strong dose-response relationship between ACEs and depressive symptoms, as individuals who report increasing amounts of cumulative childhood adversity tend to also report more symptoms of depression. For instance, Chapman et al. (2004) found that women who reported five or more types of ACEs were 4.4 times more likely to report recent depressive symptoms in adulthood than women who reported no ACEs. Additionally, Dube et al (2001) found that each ACE increased risk of attempted suicide across the lifespan 2- to 5-fold. Such dose-response relationships highlight the importance of assessing the cumulative impact of multiple types of ACEs. Further, these findings have important implications for treatment planning, as individuals
who report multiple types of adversity may be at greater risk for the development of depression than those who report fewer types of adversity.

Research suggests that some types of childhood adversity may have a more significant influence on the development of subsequent depression than others. Despite discrepancies, the most compelling research suggests that emotional abuse is more strongly associated with depression than other types of childhood abuse. The salient impact of emotional abuse may be due to the fact that emotional abuse often co-occurs with other forms of abuse, thereby intensifying its influence (Ferguson & Dacey, 1997; Chapman et al., 2004). Other theories suggest that children who are psychologically or emotionally abused tend to hear negative statements, which may encourage the formation and maintenance of negative cognitive self-schemas and thus increase the onset and maintenance of depression (Wells et al., 2014).

1.2.1 The Effects of Gender on the Association between Adverse Childhood Experiences and Depressive Symptoms

While ACEs are strongly associated with increased risk for lifetime and current mental health issues among both men and women, there is evidence that these associations may vary as a function of gender. First, girls and boys tend to be exposed to different types of childhood adversity. Specifically, research suggests that girls are more likely to be victims of sexual abuse while boys are more likely to be victims of physical abuse or neglect (US National Child Abuse and Neglect Data System, 2000). Second, with the exception of physical abuse, women report greater levels of exposure to childhood adversity than men (Thompson et al., 2004). Indeed, data from the original ACE study found that 20.8% of women reported exposure to three or more ACEs, while only 14.0% of men reported the same (Chapman et al., 2004).

The impact of ACEs on adult depression also seems to vary as a function of gender. Specifically, the relationship between cumulative ACE exposure and depression is generally
stronger among women than men (Chapman et al., 2004). It has been postulated that greater
care. Childhood adversity and an increased vulnerability to these experiences may, in part, explain
gender differences in overall prevalence rates of depression. Specifically, rates of depression are
approximately twice as high for adult females as for males (Kessler et al., 2005). Clearly, issues
of gender must be addressed when examining the influences of ACEs on depressive disorders.

1.3 ACEs, Depression, and Psychological Resilience

A burgeoning field of empirical and theoretical research on protective factors associated
with depression may explain why certain individuals are able to achieve positive developmental
outcomes despite exposure to significant social, emotional, and/or behavioural obstacles. One
such protective factor to have been identified is psychological resilience. Early theories of
resilience stemmed from the observation that some children are able to progress through normal
development despite exposure to significant adversity (Werner & Smith, 1992). Current theories
conceptualize resilience as the adaptive ability to cope with adversity or trauma (Bonanno,
2004). Resilience is generally regarded as a multidimensional construct that appears to arise from
the interaction between constitutional factors (e.g., personality and temperament), biological
factors (e.g., stress reactivity), cognitive factors (e.g., intelligence, locus of control, self-
regulation), and interpersonal factors (e.g., supportive relationships) (e.g., Caspi et al., 2002;
Feder et al., 2009; Luther et al., 2000; Wright et al., 2013).

Resilience is a dynamic construct and, although it is often considered to include trait-like
characteristics, longitudinal research suggests that resilience is a modifiable factor (Montpetit et
al., 2010). Characteristics associated with resilient functioning include the use of active and
adaptive coping strategies (e.g., problem solving, cognitive reappraisal, positive reframing)
(Southwick et al., 2005), dispositional optimism and positive emotions (Charney, 2004;
Southwick et al., 2005; Ong et al., 2006; Tugade & Fredrickson, 2004), and purpose in life (Alim
et al., 2008; Southwick et al., 2005). The study of resilience holds the potential to inform practice, prevention, and policy efforts that aim to foster resilience, particularly among vulnerable populations (Wright et al., 2013).

Despite growing interest in the concept of resilience and considerable empirical research on resilience among children exposed to adversity, only three studies to date have simultaneously examined the associations among childhood adversity, psychiatric symptoms (e.g., depression), and resilience. While each study offers unique and valuable findings, all suffer from significant methodological limitations and, as a set, leave several important questions unanswered.

Campbell-Sills and colleagues (2006) investigated the relationship of resilience to childhood trauma and psychological distress in a sample of 132 American undergraduate students. Results indicated that resilience moderated the relationship between childhood emotional neglect and current psychiatric symptoms, in that individuals who reported high levels of emotional neglect during childhood also endorsed higher levels of current psychological distress, but only if they scored low on resilience. In contrast, individuals who reported high levels of emotional neglect and who scored high on resilience reported the lowest levels of current psychological distress, even when compared to individuals who experienced low levels of emotional neglect but scored high on resilience. The authors referred to Bonanno’s (2004) theory that resilience lends itself not solely to recovery, but also to growth and fortitude following adversity, and to Rutter’s stress inoculation theory (1987), whereby a psychological and physiological strengthening occurs as a result of exposure to stress or adversity.

While it is generally accepted that emotional abuse is a particularly salient ACE for subsequent mental health outcomes (e.g., Chapman et al., 2004), Campbell-Sills and colleagues opted to utilize data from only the emotional neglect subscale of their measure of childhood adversity. This decision was based on the fact that the emotional neglect subscale had a more
favorable distribution in their sample than the measure’s other subscales (i.e. emotional, sexual, and physical abuse and physical neglect). Deviations from normal distributions in the other subscales were due to a relatively low incidence of reported childhood trauma in their sample, as indicated by their positively skewed distributions. The authors’ decision to exclude these subscales from analyses leaves unanswered whether the moderating effect of resilience holds for other types of childhood adversity. Further, their outcome variable of psychological distress and their utilization of an undergraduate sample limit the generalizability of their findings.

Wingo et al (2010) utilized a cross-sectional design to examine the associations among childhood abuse and/or “other trauma exposure” during adulthood (e.g., serious transportation accidents, physical or sexual assault, unexpected or sudden death of a loved one), resilience, and symptoms of depression among a sample of 792 low-income American adults. As predicted, symptoms of depression in adulthood were positively associated with both childhood abuse and other trauma exposure and were negatively associated with resilience. Also as expected, resilience moderated symptoms of depression as an interaction with other trauma exposure. Specifically, when similar levels of other trauma exposure were reported, individuals with high levels of resilience had lower rates of depression than the medium or low resilience group, and the medium resilience group had lower rates of depression than the low resilience group.

Contrary to expectation, however, Wingo and colleagues found that resilience did not moderate the relationship between childhood abuse and depression. This result was surprising, given predictions based on pre-existing literature on childhood adversity, resilience, and depression and the earlier findings reported by Campbell-Sills and colleagues (2006). It is important to note, however, that Wingo and colleagues’ sample reported a median of zero experiences of childhood abuse. Specifically, 62% of participants reported no abuse, 20% reported one type of abuse, 8% reported two types of abuse, and 9% reported three types of
These rates of childhood abuse are surprising given that they are lower than those reported among American samples of the general population (e.g., Felitti et al., 1998; Chapman et al., 2004) and that previous research has shown increased risk for various types of traumatic events among ethnic minorities as compared to the majority population (e.g., Finkelbor et al., 2005). It is also possible that experiences of childhood abuse are “normalized” and consequently underreported by minority groups. Regardless, findings based on a sample of low-income African Americans cannot necessarily be generalized to other populations.

Seok et al (2012) investigated the associations among early-life stress (i.e., emotional, physical, and sexual abuse; neglect; and inter-parental violence), resilience, and MDD. A sample of 26 patients in a Korean hospital were compared to age- and gender-matched healthy controls. The authors found that hospitalized patients reported significantly higher levels of exposure to inter-parental violence and significantly lower levels of resilience than did the control group. Further, in hospitalized patients, the severity of depressive symptoms was positively correlated with emotional and physical abuse and inter-parental violence and negatively correlated with resilience. Among the control group, depressive symptoms were not significantly correlated with any type of early-life stress. Linear regression analyses showed that resilience characteristics of self-efficacy, self-confidence, and self-control were all significantly associated with depressive symptoms in both the patients and controls, consistent with pre-existing theories regarding how resilience may affect depressive symptoms (see Elisei et al., 2013). In the final regression model, however, early life stress did not show a significant association with depressive symptoms, contrary to what the literature would suggest (e.g., Afifi et al., 2008; Chapman et al., 2004; Kendler et al., 2000; McCauley et al., 1997). The authors attributed this absence of association to their relatively small sample size and consequentially insufficient power to detect significant associations. Further, as culture has a significant influence on experiences of early adversity
(Schilling et al., 2007), resilience (Campbell-Sills et al., 2006), and depression (Kleinman, 2004), findings from a Korean sample cannot necessarily be generalized to other populations.

1.4 Rationale and Significance

Resilience in adulthood is an understudied phenomenon that warrants further attention. One goal of the current study was to elucidate risk and protective factors involved in the development of depressive symptoms among adult Albertan primary care patients. Prior to the current research, there was virtually no information on the associations between ACEs, depression, and resilience among Canadian samples and, as noted above, existing literature from other samples suffers from considerable methodological limitations. Results from this study were particularly informative for at least two reasons. First, this research further clarified the association between a risk factor that is prevalent in our society (i.e., ACEs) and a consequential health outcome (i.e., depression). Second, this research examined a potential buffer of the impact of ACEs on depression. Given that ACEs represent a distal- or historical- risk factor in the development of depression, it is critical that research works to identify potential targets for treatment. Indeed, empirical findings that improve our understanding of the factors and processes involved in positive adaptation are invaluable at the personal, familial, and societal levels, particularly in light of current concerns regarding rising costs of healthcare in Canada.

1.5 Research Hypotheses

Hypothesis 1: There would be a positive association between cumulative ACEs and symptoms of depression.

Hypothesis 2: ACEs related to emotional abuse would be more strongly associated with MDD than any other type of ACE.

Hypothesis 3: There would be gender differences in the number of depressive symptoms reported, such that women would report a greater number of symptoms.
Hypothesis 4: There would be gender differences in the number of ACEs reported, such that women would report a greater number of cumulative ACEs.

Hypothesis 5: Resilience would moderate the association between ACEs and depressive symptoms. Specifically, the association between ACEs and depressive symptoms would be stronger among individuals with low resilience than among individuals with high resilience.

Chapter 2: Methods

2.1 Participants

The current study was part of the ACEs-Alberta (ACEs-A) Study, a large-scale research program that investigated the relationship between ACEs and physical and mental health outcomes among Albertan adult primary care patients. The ACEs-A Study was approved by the University of Calgary’s Human Research Ethics Board and consists of four distinct phases. Phase I (completed) identified a measure of ACEs that demonstrates strong psychometric properties and is useful in primary care settings. Phase II (completed) examined ACEs in relation to adult mental and physical health and health care utilization. Phase III and IV will involve the development and evaluation of an intervention protocol that is suitable for use with individuals with a history of ACEs and will be delivered in Albertan primary care settings.

The current study utilized data from Phase II. Data were collected from 4,006 primary care patients aged 18 years and older. Participants were recruited from 11 primary care clinics in the greater Calgary area. Recruitment took place from October 2014 to July 2015.

2.2 Procedure

Primary care physicians at clinics in Calgary, AB and surrounding rural areas were invited to participate in the ACEs-A Study. If the invitation was accepted, staff were provided with a presentation from an ACEs-A team member regarding the history of the original ACE study, a summary of the ACEs-A Study, and the potential role of the clinic in data collection.
Primary care settings that participated in the study allowed ACEs-A team members to be in their clinic. Each clinic was paid a fee ($1,000) in consideration of the staff time and disruption that the study entailed. Recruitment at each clinic lasted, on average, approximately six weeks.

During recruitment, trained research assistants approached patients in clinic waiting areas after patients had registered at the front desk and were waiting to see their physician. Following a brief description of the study, written informed consent and contact information was obtained from interested patients. Patients were offered a choice between an online or paper format to complete the study questionnaire package. Patients who specified a preference for completing the survey online were provided with a flash card that outlined instructions to access the online survey, which expired two weeks following initiation. Individuals who specified a preference to complete the paper survey were provided with the survey and a pre-addressed and pre-paid envelope to mail the completed survey back to the research team. All participants were provided with a $25.00 gift card following completion of the questionnaire package.

2.3 Measures

**Demographic information.** Information on age, gender, ethnicity, education, annual household income, marital status, and employment status was obtained from all participants. Response options for gender included male, female, and other. Response options for ethnicity included: Caucasian, Black, Asian, South Asian, First Nations, and other. Response options for education included: didn’t go to high school, did some high school, high school graduate or equivalent, some college or university, college diploma, university undergraduate, and graduate degree. Response options for income included: less than $20,000, $20,000-39,999, $40,000-$59,999, $60,000-$79,999, and greater than $80,000. Response options for marital status included: married, not married but living together, widowed, divorced, separated, and never married. Response options for employment full-time, part-time, not employed outside the home,
and retired. For inclusion in regression analyses, the following variables were dummy coded:
ethnicity, education, marital status, and employment status.

**Adverse Childhood Experiences (ACEs).** Experiences of childhood adversity were measured using the *Adverse Childhood Experiences (ACE) Questionnaire*, a 29-item scale adapted from a variety of published questionnaires including the Conflict Tactics Scale (Straus, 1979), The Child Trauma Questionnaire (Bernstein et al., 2003), and the Wyatt (1985) questions on sexual abuse. Items pertained to childhood sexual abuse (four items), physical abuse (two items), emotional abuse (two items), physical neglect (five items), emotional neglect (five items), as well as questions related to forms of household dysfunction including: substance abuse (two items), mental illness in the household (two items), violence between caregivers (four items), criminal behavior in the household (two items), parental separation or divorce (one item). Response options to items include “Never”, “Once or twice”, “Sometimes”, “Often, or “Very Often”. Respondents who provided affirmative responses (i.e. anything other than “Never”) to any item included in a given type of ACE were coded as having experienced that type of ACE. Thus, each type of ACE was coded as a binary variable (occurred: “1”, did not occur: “0”). The total number of ACEs reported by participants represents the “total ACE score” (range: 0-10), which was used to assess the cumulative effect of multiple ACEs.

The psychometric properties of the ACE questionnaire were assessed during Phase I of the ACEs-A Study and found to be appropriate for use with an Albertan primary care sample as it demonstrated excellent internal consistency (Cronbach’s α=.95) and construct validity (correlated with both the Child Abuse and Trauma Scale (CATS; r=.94), and the Childhood Trauma Questionnaire (CTQ; r=.95) (Dobson et al., unpublished results)). Previously reported measures of test-retest reliability have reported substantial reliability (Kappa = .64) (Dube et al., 2004; Sim & Wright, 2005).
**Symptoms of Depression.** Symptoms of depression were measured with the Patient Health Questionnaire-9 (PHQ-9), a self-rated 10-item scale used to assess the presence and severity of the nine major symptoms of depression as outlined by the *Diagnostic and Statistical Manual of Mental Disorders*, 5th edition (DSM-5) (Spitzer et al., 1999; APA, 2013). The first nine items ask respondents to rate their experience of each symptom of depression over the last 2 weeks according to the four response options of “Not at all”, “Several days”, “More than half the days”, “Nearly every day”. The final question asks respondents “how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?” and is used to assess impaired functioning as a result of depression. Total scores on the PHQ-9 range from 0-27, wherein increasing scores indicate greater severity of depression.

The PHQ-9 can be utilized as a binary indication of MDD according to criteria outlined by the DSM-5. To meet the diagnostic criteria for MDD, respondents must endorse the following: 1) *either* “little interest or pleasure in doing things” *or* “feeling down, depressed or hopeless” for more than half the days or nearly every day, 2) a total of five symptoms for more than half the days or nearly every day, and 3) indication that these problems have caused significant impairments in work, home, or social functioning. Use of the continuous total PHQ-9 score and the binary score have been validated among primary care samples and demonstrated excellent psychometric properties (e.g., Cronbach’s $\alpha = 0.89$; test-retest reliability $r = 0.84$, 48-hours; construct validity as indicated by associations with other validated measures of depression) (Kroenke et al., 2001; Lowe et al., 2004; Williams et al., 2002).

**Resilience.** Resilience was measured with the brief 10-item Connor-Davidson Resilience Scale (CDRISC), a self-rated scale comprised of items that assess core aspects of resilience such as a sense of personal competence, tolerance of negative affect, adaptability, ability to focus under pressure, and an action-oriented approach to problem solving (Connor & Davidson, 2003).
Respondents are asked to rate the degree to which characteristics in response to challenge (e.g., “able to adapt to change”) apply to them. Response options range from “not at all” (0) to “true nearly all the time” (4). Total scores on the CDRISC range from 0 to 40 with higher scores indicating greater resilience. The CDRISC demonstrates excellent psychometric properties, such as internal consistency (Cronbach’s $\alpha = 0.85$), test-retest reliability ($r = 0.87$), and discriminant and convergent validity (Campbell-Sills et al., 2006; Campbell-Sills & Stein, 2007). The 10-item CDRISC has correlated highly with the full CDRISC ($r = 0.92$; Campbell-Sills & Stein, 2007).

Chapter 3: Statistical Analyses

3.1 Data Screening and Management

Prior to proceeding with data analyses, all variables were screened for missing values and outliers, as well as for possible statistical assumption violations. First, participants who endorsed the gender option of “other” were removed from analyses, due to their small representation in the sample ($n = 8$). Cases with missing values represented less than 5% of total cases for the majority of variables (i.e. PHQ-9 score, CDRISC score, gender, ethnicity, education, household income, marital status, and employment status) and less than 10% for the ACE score variable. Missing data of this proportion is below recommended cut-offs for missing value imputation, particularly for large sample sizes, and was thus not of concern (Bennett, 2001). Missing values for the variable of gender, however, represented 11.2% of total cases. Results of Little’s MCAR test, chi-square= 108.30 (df = 28, $p<.05$), suggested that data were not missing completely at random. To address this issue, t-tests were performed to evaluate whether the main study variables (i.e., ACE score, PHQ-9 score, CDRISC score) were significantly associated with the binary missing vs. non-missing variable of age, and cross-tabulations were performed to evaluate whether the categorical covariate variables (i.e., gender, ethnicity, education, household income, marital status, and employment status) were significantly associated with the binary missing vs.
non-missing variable of age. Results indicated non-significance with all variables, \( p > .05 \), providing evidence that missing data were missing at random. As such, list-wise deletion was utilized to handle missing data in all analyses.

An analysis of standard residuals was conducted to identify outliers. On the main variables of interest (i.e., ACE, CDRISC, and PHQ-9 scores), the data contained 34 outliers (standardized residual minimum= -3.29, standard residual maximum= 3.29). These cases were consequently removed from further analyses. Tests to determine whether the data met the assumption of collinearity indicated that multicollinearity was not a concern, as tolerance values ranged from .63 to .95 and VIF values ranged from 1.05 to 1.6. The histogram of standardized residuals indicated that the data contained approximately normally distributed errors, as did the normal P-P plot of standardized residuals, which showed points that were close to the line. The scatterplot of standardized residuals showed that the data met the assumptions of homogeneity of variance and linearity. The data also met the assumption of non-zero variances (variances ranged from .22 to 288.55).

3.2 Preliminary Analyses

All analyses were performed using IBM SPSS Software, version 21. Statistical significance required a two-sided \( p \)-value of \(< .05 \) for all \textit{a priori} hypotheses. Descriptive variables were calculated for the sample as a whole and, in addition, were compared between those identified as depressed vs. non-depressed. To evaluate the internal consistency of the PHQ-9 and CD-RISC measures with the ACEs-A sample, Cronbach’s \( \alpha \) (Cronbach, 1951) was calculated for each measure.

3.3 Main Analyses

To assess the relationship between ACEs and depression (Hypothesis #1), a two-stage hierarchical linear regression analysis was used, with scores on the PHQ-9 as the dependent
measure. In the first block, age, gender, ethnicity, education, household income, marital status, and employment were simultaneously entered as predictors to control for possible effects of the covariates. In the second block, total ACE score was entered as the primary predictor of interest.

To assess the associations between each type of ACE and depression (Hypothesis #2), adjusted odds ratios (ORs) and 95% confidence intervals (CIs) from logistic regression models were used to model the binary variable of MDD. Ten separate analyses were conducted to evaluate the association of each of type of ACE (coded as binary variables; occurred vs. did not occur), and the dependent variable of depression, with “depressed” as the target category and “non-depressed” as the reference category. All analyses included age, gender, ethnicity, education, income, marital status, and employment as predictors to control for covariates.

To assess for gender differences in the symptoms of depression reported (Hypothesis #3) and in the cumulative ACEs reported (Hypothesis #4), separate one-way between subjects ANCOVAs were performed. In both analyses, gender was entered as the factor. To examine Hypothesis #3, depression was entered as the dependent variable. To examine Hypothesis #4, ACE score was entered as the dependent variable. Both analyses included age, gender, ethnicity, education, income, marital status, and employment as predictors to control for covariates.

To assess whether resilience moderated the association between ACEs and symptoms of depression (Hypothesis #5), hierarchical regression analyses were utilized to evaluate the interaction effect between total ACEs and total resilience on symptoms of depression. Analyses included age, ethnicity, education, income, marital status, and employment as predictors to control for covariates.

Chapter 4: Results

Table 1 summarizes descriptive data of the sample. Approximately 68% of the respondents were women. Participants ranged in age from 18 to 92 years ($M = 44$ years, $SD =$
Eighty three percent of respondents were White, 1% were Black, 7.3% were Asian, 0.9% Native American, and 5.3% were of other races. In general, the sample was of relatively high socioeconomic status (approximately 49% of the sample reported a yearly income of greater than $80,000 CAD) and was highly educated (approximately 57% of the sample had obtained post-secondary or graduate degrees). Most respondents (64.2%) were married or living with their partner. Table 1 includes separate demographic variables for participants who met the criteria for MDD (7.4%) and for those who did not (92.6%). As can be seen, the two groups differed significantly on all variables with the exception of gender, $\chi^2(1)= 2.28, p = .13$.

Means, standard deviations, ranges, and Pearson’s correlations were calculated for the main variables of interest and are presented in Table 2. Depression was significantly associated with both the total number of ACEs, $r = .35, p < .001$, and resilience, $r = -.50, p < .001$. According to Colton (1974), correlations from .25 to .50 indicate a moderate relationship among large sample sizes. The total number of ACEs and resilience were also significantly correlated, $r= -.19, p < .001$, however, a correlation coefficient of this size indicates only a minimal relationship (Colton, 1974). Cronbach’s α (Cronbach, 1951) was calculated for the PHQ-9 (9 items), $\alpha = 0.89$, and the CD-RISC (10 items), $\alpha = 0.93$. These values indicate excellent internal consistency of these measures with the ACEs-A sample (George & Mallery, 2003).

Results of the hierarchical regression analysis used to assess Hypothesis #1, that there would be a positive association between cumulative ACEs and symptoms of depression, are shown in Table 3. When the covariates were entered on the first block, the prediction model was statistically significant, $F(7,3097) = 58.79, p < .001$, $R^2 = .117$, Adjusted $R^2 = .115$. Gender did not predict depression, however age, ethnicity, education, income, marital status, and employment did ($p < .05$). When ACE score was entered on the second block, the model increased substantially in its predictive power, $F(8,3096) = 105.02, p < .001$, $R^2 = .213$, Adjusted
$R^2 = .211$. Therefore, as indexed by the $R^2$ statistic, the addition of ACE score to the model accounted for 9.6% of explained variance in depressive symptoms, beyond the effects of the covariates. Of all predictors entered into the model, ACE score was shown to have the strongest relationship to depressive symptoms, as indexed by its $\beta$ value of .32. Thus, as hypothesized, a greater number of total ACEs predicted a greater number of symptoms of depression, even with all other predictors in the analysis statistically controlled. For ease of interpretation, the association between ACE score and PHQ-9 score is also presented graphically (Figure 1).

Ten separate binary logistic regressions were used to assess Hypothesis #2, that ACEs related to emotional abuse would be more strongly associated with MDD than any other type of ACE. Results of logistic analyses indicated that each of the predictor models provided a statistically significant prediction of depression, as chi-square values ranged from $\chi^2 (8, N = 3241) = 161.00, p < .001$ to $\chi^2 (8, N = 3241) = 209.95, p < .001$. The Nagelkerke pseudo $R^2$ values indicated that the models accounted for a range of approximately 12% to 15% of the total variance in MDD diagnosis. Table 4 presents the partial regression coefficients, the Wald test, the prevalence rates, odds ratios [Exp(B)], and the 95% confidence intervals (CI) for the odds ratios of each type of ACE. The Wald test indicated that each type of ACE was a statistically significant predictor of MDD ($p < .001$). As was hypothesized, the association between emotional abuse and MDD was the strongest of any type of ACE and MDD. Specifically, individuals with a history of emotional abuse were 3.51 times (CI = 2.62 - 4.69) more likely than those without a history of emotional abuse to meet the criteria for MDD, adjusting for age, gender, ethnicity, education, income, marital status, and employment status.

A one-way between subjects ANCOVA was used to assess Hypothesis #3, that women would report a greater number of depressive symptoms than men. Data conformed to additional ANCOVA assumptions of linearity of regression (linear relationships were observed between
each of the covariates and the PHQ-9 dependent variable) and homogeneity of regression (none of the covariate x PHQ-9 effects were significant, ranging from $F(1, 3281)= .01, p = .921$ to $F(1, 3281)= 2.625, p = .105$). Results of the analysis are summarized in Table 5. The effects of all covariates were statistically significant, including ethnicity, $F(1, 3294) = 6.98, p < .01$, education, $F(1, 3294) = 14.61, p < .001$, income, $F(1, 3294) = 71.61, p < .001$, marital status, $F(1, 3294) = 32.56, p < .001$, employment status, $F(1, 3294) = 18.54, p < .001$, and age, $F(1, 3294) = 134.07, p < .001$. Interestingly, there was not a statistically significant effect of gender, $F(1, 3294) = 2.61, p = .106, \eta^2 = .001$. Pairwise $t$ tests with a Bonferroni correction indicated that, when corrected for the covariates, symptoms of depression were not significantly higher among females (adjusted $M = 4.93, SE = .10, 95\% CI = 4.73, 5.13$) than among males (adjusted $M = 4.64, SE = .15, 95\% CI = 4.35, 4.93$).

A one-way between subjects ANCOVA analyses was used to assess Hypothesis #4, that women would report a greater total number of ACEs than men. Results of the analysis are summarized in Table 6. The effects of several covariates on total ACE score were significant, including age, $F(1, 3184) = 10.64, p = .001$, ethnicity, $F(1, 3184) = 7.17, p < .01$, education, $F(1, 3184) = 18.03, p < .001$, and income, $F(1, 3184) = 19.76, p < .001$. Marital status and employment did not significantly predict ACE score ($p > .05$). There was a significant effect of gender on total ACE score, $F(1, 3184) = 17.95, p < .001$, although the effect size was small, $\eta^2 = .006$ (Cohen, 1988). Pairwise $t$ tests with a Bonferroni correction indicated that females endorsed significantly more ACEs when corrected for the covariates (adjusted $M = 2.05, SE = .05, 95\% CI = 1.96, 2.14$) than males (adjusted $M = 1.70, SE = .07, 95\% CI = 1.57, 1.83$).

A hierarchical linear regression analysis was used to assess Hypothesis #5, that resilience would moderate the association between ACEs and symptoms of depression (see Table 7). In preparation for the analysis and in accord with the recommendations of Aiken and West (1991)
and Cohen et al (2003), the two predictors (ACE and resilience score) were centered. On the first step, the covariates of age, gender, ethnicity, education, income, marital status, and employment status were entered and significantly predicted depression, $F(7, 3042) = 48.35, p < .001, R^2 = .100$, adjusted $R^2 = .098$. When the ACEs and resilience variables were entered on the second block, the model explained an additional 25.4% of variance in symptoms of depression while controlling for the covariates, $F(9, 3040) = 184.81, R^2 = .354$, adjusted $R^2 = .352$. When the ACEs X resilience interaction term was entered on the third block, the model explained an additional 1.1% of variance in symptoms of depression, $F(10, 3039) = 174.36, p < .001, R^2 = .365$, adjusted $R^2 = .362$.

Given that the ACEs X resilience interaction was a statistically significant predictor of depression, two additional analyses were performed treating resilience as the moderator variable. The first analysis was carried out at a resilience level of +1 SD unit by re-centering the resilience variable at that value; the intercept and raw regression coefficient for ACEs were 5.25 and .34 ($SE = .05$), respectively. The second analysis was carried out at a resilience level of -1 SD unit by centering the resilience variable at that value; the intercept and raw regression coefficient for ACEs were 9.18 and .76 ($SE = .042$), respectively. A graphic representation of the interaction effect is presented in Figure 2. As can be seen, depression increased with increasing number of ACEs across the range of resilience, but the rate of increase was more pronounced at lower levels of resilience. Generally, higher resilience acts as a buffer to lower depression with increased rates of ACEs.

**Chapter 5: Discussion**

The current study evaluated retrospective reports of adverse childhood experiences (ACEs) as a risk factor for recent depression in a large sample of adult primary care patients. The results indicated that the majority of participants were exposed to at least one type of ACE, and
that such exposure increased the risk for deleterious mental health outcomes. Consistent with
study hypotheses and previous research, participants who reported greater cumulative exposure
to ACEs were more likely to report increased symptoms of depression. Across the ten types of
ACEs, emotional abuse was identified as the most salient predictor of MDD. Females reported a
greater total number of ACEs than males, but not a greater number of depressive symptoms.
Finally, this research examined the role of psychological resilience as a buffer of depression for
adults with a history of childhood adversity. Resilience moderated the relationship between
ACEs and depression, such that cumulative ACEs were more strongly associated with total
symptoms of depression among individuals with low resilience than among those with high
resilience.

Approximately 7.6% of respondents in the current study reported recent symptoms of
depression that met the diagnostic criteria for MDD. Although prevalence rates of MDD among
Canadian primary care patients have not been reported, rates identified in this research are
consistent with those reported among primary care samples in the United States and New
Zealand (range from 6.6% to 8.6%; Arroll et al., 2010; Kessler et al., 2003). These prevalence
rates reinforce the importance of the identification, assessment, and treatment of risk factors for
depression within primary care settings.

Generally, participants who met the diagnostic criteria for MDD reported lower levels of
education, annual household income, and full-time employment. They were also less likely to be
in long-term romantic relationships than those who did not meet the criteria for MDD. The
descriptive analyses reported here are consistent with previous literature that has identified each
of these characteristics as risk factors for and correlates with depression (Kleinman, 2004; Lorant
et al., 2007; Ross & Mirowsky, 2006; Zimmerman & Katon, 2005).
The majority of respondents in the current study (70%) reported exposure to at least one type of childhood adversity, and almost half of respondents (45.6%) reported two or more ACEs. These rates are consistent with those reported in the original ACE study (Chapman et al., 2004; Dube et al., 2002) and in general Canadian samples. For instance, a population-based study in Ontario \((n = 9,953)\) found that 72% of respondents reported at least one ACE, while 37% reported two or more ACEs (Chartier et al., 2010). The fact that over one third of adults typically report more than one type of childhood adversity underscores the need to screen for multiple types of exposure to childhood adversity in health-care settings.

Respondents in this study who met the diagnostic criteria for MDD reported higher total ACE scores than those who did not meet the criteria for MDD, and the positive association between ACE score and depressive symptoms remained significant even when other personal and social factors were held constant. This finding is consistent with previous research, which has repeatedly found associations between early life trauma or adversity and subsequent depression (Afifi et al., 2008; Chapman et al., 2004; Kendler et al., 2000; Nelson et al., 2002). The differences in the prevalence rates of ACEs reported by study participants who met the criteria for MDD as compared to those who did not are notable. While 32.2% of participants without depression reported no exposure to childhood adversity, only 12.7% of participants with depression reported the same pattern. Conversely, 16.4% of participants without depression reported exposure to four or more ACEs, compared to 41% of participants with depression.

This research sought to further elucidate the association between ACEs and depression by separately evaluating each type of ACE and its association to MDD. Results indicate that, although all types of ACEs are predictive of MDD, the association between emotional abuse and MDD was larger than that of any other type of ACE and MDD. Specifically, participants who were exposed to emotional abuse as children were almost 3.5 times more likely to meet the
diagnostic criteria for MDD than those who were not exposed to emotional abuse. This finding is consistent with that of other research, including rates of depression that were 3.1 and 3.3 times higher among women and men who reported emotional abuse, respectively, than those who did not (Chapman et al., 2004; Gibb et al., 2007).

Given that many participants in the current study endorsed more than one type of ACE and that analyses did not directly compare differences between the associations of each type of ACE and MDD, it cannot be concluded that the association between emotional abuse and MDD is statistically stronger than the associations between other types of ACEs and MDD. However, the notion that childhood emotional abuse may contribute a more potent vulnerability to depression than other types of childhood abuse is consistent with cognitive theoretical frameworks. For instance, Rose and Abramson (1992) posit that repeated exposure to emotional abuse provides direct depressive cognitions from abusers (e.g., “you’re worthless”) that contribute to the development of cognitive attributions most consistent with depression (e.g., “I am worthless”). Alternatively, abusers who perpetrate physical or sexual abuse may not provide direct attributions regarding the cause of the abuse, and therefore victims may be less likely to make negative attributions about themselves (Rose & Abramson, 1992).

Research has provided support for theories that describe a unique association between emotional abuse and depression. For instance, Gibb et al (2007) found that childhood experiences of emotional abuse were more strongly predictive of MDD than were those of physical abuse or sexual abuse in a sample of psychiatric outpatients. Conversely, all three types of childhood abuse were equally predictive of Posttraumatic Stress Disorder. Relatedly, previous research has identified unique cortisol responses associated with emotional abuse as compared to other types of ACEs. Carpenter et al (2009) found that childhood emotional abuse was associated with dampened cortisol reactivity in adulthood for both men and women, while other types of
childhood maltreatment (i.e., physical abuse, sexual abuse, physical neglect, emotional neglect) were not. The notion that cortisol responses differ as a consequence of ACEs is consistent with the concept of allostatic load (McEwan, 1998), or the physiological “wear and tear” that occurs with repeated or chronic stress, and with research that has shown blunted responses of cortisol to daily events among adults with MDD (Burke et al., 2004; Peeters et al., 2003).

In order to further explicate risk factors for depression among adults with a history of childhood adversity, the current study also examined gender differences in reported ACEs and depressive symptoms. Consistent with previous research, female participants in this study reported a greater number of cumulative ACEs (Chapman et al., 2004; Thompson et al., 2004). Although female participants also reported greater symptoms of depression than males, this difference was not statistically significant. This result is contrary to the study hypothesis and a broad range of literature that cites increased prevalence of depression among females in the general population (Hasin et al., 2005; Patten et al., 2006). Such discrepancies may be explained by the current study’s recruitment strategy. Indeed, previous research conducted within primary care settings has reported equivalent rates of depression among male and female patients (Coyne et al., 1994) and similar proportions of physician billing related to depression and anxiety for Canadian male and female patients (Tannenbaum, 2009).

A novel contribution of the current study was the exploration of resilience as a protective factor of depression among individuals with a history of childhood adversity. This research was the first to report rates of resilience as captured by the CD-RISC in a Canadian primary care population. Results indicate that levels of resilience were comparable (range: 0-40; median = 31) to those reported by American primary care samples (range: 0-40; median = 35) (Wingo et al., 2010). As was hypothesized, resilience was associated with lower symptoms of depression among adults with a history of childhood adversity. Although total ACE scores were positively
associated with symptoms of depression across all participants, this association was stronger for individuals with low resilience than for those with high resilience. This finding was inconsistent with results reported by Wingo et al (2010), who found that resilience did not moderate the association between childhood adversity and depression. The interpretation of this discrepancy, however, must be considered in light of several key differences between the former and current studies. First, participants in the Wingo et al (2010) study were almost entirely African American (94%) and low-income (63% reported a monthly income of <$1,000) and thus differed from the predominantly Caucasian, high-income sample of the current study. Such differences may be important, as resilience appears to differ as a function of both ethnicity (Campbell-Sills et al., 2006) and income (Wagnild, 2003). Further, the participants in Wingo and colleague’s study were recruited from both primary care clinics and obstetrical-gynecological clinics, but the proportion of the sample recruited from each type of clinic was not stated, nor was the proportion of pregnant women in the sample. It is quite likely that individuals undergoing major life changes, such as pregnancy, may respond differently to questionnaire items on childhood trauma, resilience, and depression than individuals who are not undergoing such life changes. Finally, Wingo et al (2010) reported a median of zero experiences of childhood abuse in their sample. Low rates of child abuse among this sample may reflect the authors’ utilization of a self-report measure that does not capture a wide range of ACEs (i.e., the Childhood Trauma Questionnaire; does not measure childhood neglect or household dysfunction), or the possibility that child abuse may be normalized- and consequentially underreported- among groups of ethnic minorities in which child abuse is more common (Finkelbør et al., 2005).

Although one previous study found that resilience was a moderator of ACEs on adult mental health outcomes, their findings were not entirely consistent with those of the current study. Campbell-Sills et al (2006) found that highly resilient individuals who experienced high
levels of emotional neglect reported the lowest levels of current psychological distress, even when compared to highly resilient individuals who experienced low-level levels of emotional neglect. In contrast, the present research found that highly resilient individuals reported the lowest level of depressive symptoms when ACEs were low. This discrepancy may be due to the fact that Campbell-Sills and colleagues examined only one type of ACE (i.e., neglect), whereas the current study evaluated the cumulative effect of multiple types of ACEs. Alternatively, the interactive effect of resilience and childhood adversity may differ for depression as an outcome as compared to psychological distress as an outcome. Future research should evaluate the role of various ACEs and the trajectories of diverse psychological disorders as a function of resilience and childhood adversity.

5.1 Strengths and Limitations

The current study: 1) examined the multifaceted relationships between exposure to childhood adversity and adult symptoms of depression, and 2) evaluated why not all children exposed to adversity experience depression as adults. This research was based on strong theoretical rationale and results have important theoretical implications (e.g., how ACEs, resilience, and depression are conceptualized within primary care settings) and practical implications (e.g., how ACEs, resilience, and depression are assessed and treated within primary care settings). Additional strengths of this research include analyses of a large sample highly relevant to health-care providers, the evaluation of a wide range of ACEs, and the selection of assessment measures with strong psychometric properties.

Despite the current study’s strengths, the results should be considered in light of several limitations. First, the reliance on a cross-sectional design precludes inferences about causality. For instance, it is possible that the onset of depressive symptoms may have occurred prior to exposure to ACEs, in which case it would be inaccurate to conclude that ACEs are predictive of
depression. However, the strong associations between ACEs and recent symptoms of depression (i.e., within the last two weeks) seem to negate this concern. Relatedly, it was hypothesized that increased resilience would be associated with decreased symptoms of depression among individuals with a history of childhood adversity. However, it is possible that symptoms of depression cause individuals to perceive themselves as less resilient. Future research that utilizes prospective or longitudinal designs would clarify the direction and temporal order of relationships among ACEs, resilience, and depression.

The reliance on self-report data also represents a limitation of the current research, as self-report measures are susceptible to recall bias or deficits. However, each of the measures utilized has demonstrated strong psychometric properties. Further, longitudinal follow-up of adults who reported childhood abuse has demonstrated that reports of childhood abuse often underestimate actual occurrence, which might attenuate the association between ACEs and depression (Hardt & Rutter, 2004). Relatedly, while it is possible that current mood may bias the recall of childhood events or that respondents may have difficulty recalling childhood events, data from the original ACE Study reported good test-retest reliability of the ACE measure (kappa = .64; Dube et al., 2004).

Consistent with previous research to utilize the ACE Questionnaire, the current study did not weigh ACEs according to severity. Consequently, ACEs that seem relatively mild (e.g., living with a family member who has anxiety) may be equally weighed with those that seem more malignant (e.g., repeated exposure to sexual abuse). Relatedly, the ACEs Questionnaire does not obtain information regarding the timing and duration of each ACE. The absence of this information may have important implications, as longitudinal research with children suggests that ACEs may have differential effects on mental health outcomes, depending on the time of exposure (Heim & Binder, 2012; Keiley et al., 2001). This limitation requires further
investigation, however, as no research has evaluated whether timing of ACEs has differential effects on depression in adulthood.

5.2 Conclusions and Future Directions

The accumulated evidence that childhood adversity is a risk factor for depression, particularly among utilizers of primary care services, supports the application of a developmental model in the assessment and treatment of adult mental health complaints. In particular, the identification of resilience as a buffer against depression among adults with a history of childhood adversity holds immense potential to guide treatment programs. Previous research has demonstrated that many of the characteristics associated with resilience can be enhanced through practice and training. Indeed, resilience training programs, such as hardiness training (Maddi et al., 2002) and the Penn Resiliency Program (Gillham et al., 2006), have been shown to improve rates of depression among undergraduate students and adolescents. Such programs have not, however, been evaluated in primary care settings. Further, the mechanisms by which resilience training programs improve depression remain relatively unclear (Brunwasser et al., 2009).

Future research may do well to develop and evaluate an evidence-based treatment protocol that recognizes the long-term and cumulative effects of ACEs and emphasizes the development of resilience. It will be important to demonstrate that such a program is cost-effective and transferable to a range of settings and populations. Further, research to evaluate the mechanisms and moderators responsible for outcomes of such programs will provide important insights regarding how successful adaptation may be promoted, even under adverse conditions.
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Kessler, R. C., Berglund, P., Demler, O., Jin, R., Koretz, D., Merikangas, K. R., Rush, J.,


## Appendix A: Tables and Figures

### Table 1. Demographic characteristics of the sample.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Entire Sample</th>
<th>Non-Depressed</th>
<th>Depressed</th>
<th>Sig. Test (Non-Dep. vs. Dep.)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>% / M(SD)</td>
<td>n</td>
<td>% / M(SD)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
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<tr>
<td>Mean</td>
<td>3509</td>
<td>44.13(16.98)</td>
<td>3139</td>
<td>44.45(16.93)</td>
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<tr>
<td><strong>Gender</strong></td>
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<tr>
<td>Male</td>
<td>1269</td>
<td>31.8%</td>
<td>1131</td>
<td>32.0%</td>
</tr>
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<td>Female</td>
<td>2719</td>
<td>68.2%</td>
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<td><strong>Education</strong></td>
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<tr>
<td>Less than high school</td>
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<td>5.0%</td>
<td>164</td>
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<td>High school or equiv.</td>
<td>612</td>
<td>15.4%</td>
<td>525</td>
<td>14.9%</td>
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<tr>
<td>Some post-secondary</td>
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<td>22.4%</td>
<td>776</td>
<td>22.0%</td>
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<td>Post-secondary</td>
<td>1872</td>
<td>47.0%</td>
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<td>Graduate degree</td>
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<td>10.2%</td>
<td>376</td>
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<tr>
<td><strong>Income</strong></td>
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<tr>
<td>Less than 20,000</td>
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<td>20,000-39,999</td>
<td>480</td>
<td>12.3%</td>
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<td>11.9%</td>
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<td>40,000-59,999</td>
<td>573</td>
<td>14.6%</td>
<td>493</td>
<td>14.2%</td>
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<tr>
<td>60,000-79,999</td>
<td>542</td>
<td>13.8%</td>
<td>489</td>
<td>14.1%</td>
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<td>Greater than 80,000</td>
<td>1924</td>
<td>49.2%</td>
<td>1781</td>
<td>51.4%</td>
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<tr>
<td><strong>Marital Status</strong></td>
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<tr>
<td>Married/Common Law</td>
<td>2557</td>
<td>64.2%</td>
<td>2342</td>
<td>66.5%</td>
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<tr>
<td>Never married</td>
<td>911</td>
<td>22.9%</td>
<td>752</td>
<td>21.4%</td>
</tr>
<tr>
<td>Widowed</td>
<td>107</td>
<td>2.7%</td>
<td>95</td>
<td>2.7%</td>
</tr>
<tr>
<td>Separated/Divorced</td>
<td>405</td>
<td>10.2%</td>
<td>331</td>
<td>9.4%</td>
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<tr>
<td><strong>Employment</strong></td>
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</tr>
<tr>
<td>Full-Time</td>
<td>1859</td>
<td>46.7%</td>
<td>1,670</td>
<td>47.5%</td>
</tr>
<tr>
<td>Part-Time</td>
<td>848</td>
<td>21.3%</td>
<td>724</td>
<td>20.6%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>617</td>
<td>15.5%</td>
<td>519</td>
<td>14.8%</td>
</tr>
<tr>
<td>Retired</td>
<td>654</td>
<td>16.4%</td>
<td>605</td>
<td>17.2%</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
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<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td>3302</td>
<td>83.0%</td>
<td>2931</td>
<td>83.2%</td>
</tr>
<tr>
<td>African American</td>
<td>39</td>
<td>1.0%</td>
<td>36</td>
<td>1.1%</td>
</tr>
<tr>
<td>Asian</td>
<td>289</td>
<td>7.3%</td>
<td>344</td>
<td>9.7%</td>
</tr>
<tr>
<td>First Nations</td>
<td>35</td>
<td>0.9%</td>
<td>22</td>
<td>0.7%</td>
</tr>
<tr>
<td>Other</td>
<td>209</td>
<td>5.3%</td>
<td>188</td>
<td>5.3%</td>
</tr>
<tr>
<td><strong>ACES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1132</td>
<td>30.7%</td>
<td>1,067</td>
<td>32.2%</td>
</tr>
<tr>
<td>1</td>
<td>878</td>
<td>23.8%</td>
<td>815</td>
<td>24.6%</td>
</tr>
<tr>
<td>2</td>
<td>620</td>
<td>16.8%</td>
<td>558</td>
<td>16.8%</td>
</tr>
<tr>
<td>3</td>
<td>379</td>
<td>10.3%</td>
<td>332</td>
<td>10.0%</td>
</tr>
<tr>
<td>4 or more</td>
<td>677</td>
<td>18.4%</td>
<td>545</td>
<td>16.4%</td>
</tr>
<tr>
<td>Total score</td>
<td>3686</td>
<td>1.92(2.12)</td>
<td>3315</td>
<td>1.79(2.02)</td>
</tr>
<tr>
<td><strong>CDRISC</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total score</td>
<td>3836</td>
<td>30.15 (7.21)</td>
<td>3413</td>
<td>30.97</td>
</tr>
</tbody>
</table>

Note. ***p<.001; Sig. test= significance test. ACES= total number of adverse childhood experiences. CDRISC= Connor Davidson Resilience Scale.
Table 2. Correlations among ACEs, Resilience and Depression (Means and Standard Deviations on the Diagonal)

<table>
<thead>
<tr>
<th></th>
<th>ACEs</th>
<th>CDRISC</th>
<th>PHQ-9</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACEs</td>
<td>1.92 (2.12)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CDRISC</td>
<td></td>
<td>30.27 (7.07)</td>
<td></td>
</tr>
<tr>
<td>PHQ-9</td>
<td>.35***</td>
<td></td>
<td>4.84 (5.08)</td>
</tr>
</tbody>
</table>

Note. ***Correlation is significant at < .001 level (2-tailed). ACEs= total score on the Adverse Childhood Experiences Questionnaire; CDRISC= total score on the Connor Davidson Resilience Scale; PHQ-9= total score on the Patient Health Questionnaire.
## Table 3. Hierarchical regression model for Patient Health Questionnaire-9 (PHQ-9)

<table>
<thead>
<tr>
<th>Block</th>
<th>$R^2$</th>
<th>Model</th>
<th>$b$</th>
<th>SE-b</th>
<th>Beta</th>
<th>t</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.117</td>
<td>(Constant)</td>
<td>8.366</td>
<td>.866</td>
<td>9.665</td>
<td>.001</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age***</td>
<td>-.060</td>
<td>.005</td>
<td>-.201</td>
<td>-11.956</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gender</td>
<td>.209</td>
<td>.184</td>
<td>.019</td>
<td>1.134</td>
<td>.257</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ethnicity*</td>
<td>-.578</td>
<td>.234</td>
<td>-.043</td>
<td>-2.467</td>
<td>.014</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education**</td>
<td>-.661</td>
<td>.219</td>
<td>-.052</td>
<td>-3.018</td>
<td>.003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Income***</td>
<td>-.541</td>
<td>.067</td>
<td>-.152</td>
<td>-8.091</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marital status***</td>
<td>1.113</td>
<td>.197</td>
<td>.107</td>
<td>5.643</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Employment***</td>
<td>.997</td>
<td>.237</td>
<td>-.073</td>
<td>4.215</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>2</td>
<td>.213</td>
<td>(Constant)</td>
<td>6.103</td>
<td>.825</td>
<td>7.393</td>
<td>&lt;.001</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age***</td>
<td>-.055</td>
<td>.005</td>
<td>-.182</td>
<td>-10.549</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gender</td>
<td>.055</td>
<td>.175</td>
<td>-.005</td>
<td>-.314</td>
<td>.753</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ethnicity</td>
<td>-.362</td>
<td>.222</td>
<td>-.027</td>
<td>-1.635</td>
<td>.102</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education</td>
<td>-.347</td>
<td>.207</td>
<td>-.027</td>
<td>-1.674</td>
<td>.094</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Income***</td>
<td>-.450</td>
<td>.063</td>
<td>-.126</td>
<td>-7.102</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marital status***</td>
<td>1.078</td>
<td>.186</td>
<td>.103</td>
<td>5.790</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Employment***</td>
<td>.916</td>
<td>.223</td>
<td>.067</td>
<td>4.099</td>
<td>&lt;.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total ACEs***</td>
<td>.733</td>
<td>.038</td>
<td>.315</td>
<td>19.455</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

Note. *$p < .05$, **$p < .01$, ***$p < .001$. 
Figure 1. The relationship between total ACE score and mean PHQ-9 score.
Table 4. Prevalence and adjusted odds ratio of each type of adverse childhood experience (ACE) endorsed by participants without depression and with depression.

<table>
<thead>
<tr>
<th>Type of ACE Endorsed</th>
<th>B</th>
<th>SE-B</th>
<th>Wald</th>
<th>No MDD, % (n)</th>
<th>MDD, % (n)</th>
<th>OR (95% CI)</th>
</tr>
</thead>
</table>
| Emotional Abuse              | 1.254 | .148  | 71.326| 14.2% (487)   | 39.4% (111)| 3.504 (2.620 - 4.686)***
| Emotional Neglect            | 1.098 | .163  | 45.419| 10.4% (359)   | 28.8% (80) | 2.598 (2.179 - 4.126)***
| Physical Abuse               | 1.003 | .165  | 37.108| 12.1% (418)   | 27.4% (77) | 2.726 (1.974 - 3.764)***
| Physical Neglect             | .919  | .200  | 21.130| 6.5% (225)    | 16.5% (46) | 2.207 (1.694 - 3.710)***
| Sexual Abuse                 | 1.035 | .152  | 46.598| 19.5% (675)   | 36.7% (104)| 2.814 (2.091 - 3.787)***
| Domestic Violence            | .830  | .164  | 25.502| 12.0% (415)   | 27.0% (76) | 2.293 (1.661 - 3.164)***
| Substance Abuse              | .808  | .142  | 32.462| 30.0% (1037)  | 47.0% (133)| 2.244 (1.699 - 2.963)***
| Parental Separation or Divorce| .665  | .143  | 21.775| 25.2% (873)   | 43.3% (122)| 1.943 (1.471 - 2.571)***
| Incarcerated Household Member | .862  | .187  | 21.328| 7.9% (274)    | 19.3% (54) | 2.369 (1.643 - 3.416)***
| Mentally Ill Household Member | 1.163 | .157  | 54.872| 43.3% (1498)  | 71.6% (202)| 3.208 (2.353 - 4.354)***

Note. df=1. The dependent variable was MDD with MDD as the target category and no MDD as the reference category. Each logistic regression analysis adjusted for age, gender, ethnicity, education, income, marital status, and employment status. OR indicates odds ratio; 95% CI (confidence interval) shown in parentheses; The Nagelkerke $R^2$ values ranged from .12 to .15.

***OR significant at < .001 level.
Table 5. Analysis of Covariance (ANCOVA) results with total score on the PHQ-9 as the dependent variable.

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>9949.31</td>
<td>7</td>
<td>1421.33</td>
<td>63.52***</td>
<td>.119</td>
</tr>
<tr>
<td>Intercept</td>
<td>3029.33</td>
<td>1</td>
<td>3029.33</td>
<td>135.37***</td>
<td>.039</td>
</tr>
<tr>
<td>Age</td>
<td>3000.23</td>
<td>1</td>
<td>3000.23</td>
<td>134.07***</td>
<td>.039</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>156.11</td>
<td>1</td>
<td>156.11</td>
<td>6.98**</td>
<td>.002</td>
</tr>
<tr>
<td>Education</td>
<td>327.01</td>
<td>1</td>
<td>327.01</td>
<td>14.61***</td>
<td>.004</td>
</tr>
<tr>
<td>Income</td>
<td>1602.57</td>
<td>1</td>
<td>1602.57</td>
<td>71.61***</td>
<td>.021</td>
</tr>
<tr>
<td>Marital status</td>
<td>728.57</td>
<td>1</td>
<td>728.57</td>
<td>32.56***</td>
<td>.010</td>
</tr>
<tr>
<td>Employment</td>
<td>414.85</td>
<td>1</td>
<td>414.85</td>
<td>18.54***</td>
<td>.006</td>
</tr>
<tr>
<td>Gender</td>
<td>58.35</td>
<td>1</td>
<td>58.35</td>
<td>2.61</td>
<td>.001</td>
</tr>
<tr>
<td>Error</td>
<td>73712.33</td>
<td>3294</td>
<td>22.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>160958.00</td>
<td>3302</td>
<td>3302</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>83661.64</td>
<td>3301</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. **p < .01, ***p < .001.
Table 6. Analysis of Covariance (ANCOVA) results with total score on the ACE questionnaire as the dependent variable.

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean</th>
<th>F</th>
<th>Partial Eta Squared</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrected Model</td>
<td>434.20</td>
<td>7</td>
<td>62.03</td>
<td>13.87***</td>
<td>.030</td>
</tr>
<tr>
<td>Intercept</td>
<td>453.99</td>
<td>1</td>
<td>453.99</td>
<td>101.48***</td>
<td>.031</td>
</tr>
<tr>
<td>Age</td>
<td>47.60</td>
<td>1</td>
<td>47.60</td>
<td>10.64**</td>
<td>.003</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>32.09</td>
<td>1</td>
<td>32.09</td>
<td>7.17**</td>
<td>.002</td>
</tr>
<tr>
<td>Education</td>
<td>80.67</td>
<td>1</td>
<td>80.67</td>
<td>18.03***</td>
<td>.006</td>
</tr>
<tr>
<td>Income</td>
<td>88.42</td>
<td>1</td>
<td>88.42</td>
<td>19.76***</td>
<td>.006</td>
</tr>
<tr>
<td>Marital status</td>
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<td>1.46</td>
<td>0.33</td>
<td>.000</td>
</tr>
<tr>
<td>Employment</td>
<td>6.00</td>
<td>1</td>
<td>6.00</td>
<td>1.34</td>
<td>.000</td>
</tr>
<tr>
<td>Gender</td>
<td>80.31</td>
<td>1</td>
<td>80.31</td>
<td>17.95***</td>
<td>.006</td>
</tr>
<tr>
<td>Error</td>
<td>14244.64</td>
<td>3184</td>
<td>4.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>26671.00</td>
<td>3192</td>
<td>4.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corrected Total</td>
<td>14678.84</td>
<td>3191</td>
<td>4.47</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note. **p < .01, ***p < .001.
Table 7. Hierarchical regression model for Patient Health Questionnaire-9 (PHQ-9)

<table>
<thead>
<tr>
<th>Block</th>
<th>R²</th>
<th>Model</th>
<th>b</th>
<th>SE-b</th>
<th>Beta</th>
<th>sr²</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.100</td>
<td>(Constant)***</td>
<td>8.707</td>
<td>.855</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age***</td>
<td>-.068</td>
<td>.006</td>
<td>-.227</td>
<td>.040</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gender</td>
<td>.297</td>
<td>.188</td>
<td>.028</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ethnicity</td>
<td>-.435</td>
<td>.239</td>
<td>-.032</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education**</td>
<td>-.762</td>
<td>.222</td>
<td>-.060</td>
<td>.003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Income***</td>
<td>-1.062</td>
<td>.188</td>
<td>-.106</td>
<td>.009</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marital status***</td>
<td>1.251</td>
<td>.198</td>
<td>.120</td>
<td>.012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Employment</td>
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<td>.202</td>
<td>.025</td>
<td>.001</td>
</tr>
<tr>
<td>2</td>
<td>.354</td>
<td>(Constant)***</td>
<td>6.489</td>
<td>.728</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Age***</td>
<td>-.037</td>
<td>.005</td>
<td>-.123</td>
<td>.011</td>
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<tr>
<td></td>
<td></td>
<td>Gender</td>
<td>-.280</td>
<td>.160</td>
<td>-.026</td>
<td>.001</td>
</tr>
<tr>
<td></td>
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<td>.203</td>
<td>-.021</td>
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<tr>
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<td>.190</td>
<td>.006</td>
<td>.000</td>
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<td>.160</td>
<td>-.054</td>
<td>.003</td>
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<tr>
<td></td>
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<td>.596</td>
<td>.035</td>
<td>.256</td>
<td>.062</td>
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<td></td>
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<td>Total Resilience***</td>
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<td>.011</td>
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<td>.152</td>
</tr>
<tr>
<td>3</td>
<td>.365</td>
<td>(Constant)***</td>
<td>6.247</td>
<td>.723</td>
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<td></td>
<td></td>
<td>Age***</td>
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<td>.005</td>
<td>-.124</td>
<td>.011</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Gender</td>
<td>-.254</td>
<td>.159</td>
<td>-.024</td>
<td>.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ethnicity</td>
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<td>.201</td>
<td>-.019</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Education</td>
<td>-.045</td>
<td>.188</td>
<td>-.004</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Income**</td>
<td>-.494</td>
<td>.159</td>
<td>-.049</td>
<td>.002</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Marital status***</td>
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<td>.167</td>
<td>.107</td>
<td>.009</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Employment</td>
<td>.110</td>
<td>.171</td>
<td>.010</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total ACEs***</td>
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<td>.035</td>
<td>.239</td>
<td>.052</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total Resilience***</td>
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<td>.011</td>
<td>-.396</td>
<td>.140</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ACE X Resilience***</td>
<td>-.031</td>
<td>.004</td>
<td>-.108</td>
<td>.011</td>
</tr>
</tbody>
</table>

Note. sr² is the squared semi-partial correlation.
*p < .05, **p < .01, ***p < .001.
Figure 2. The effect of adverse childhood experiences on depressive symptoms in adulthood and the moderating effect of resilience.