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Childhood Adversity and Its Effects on Military Members' Health and Readiness:
The Mediating and Moderating Effects of Social Support

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Childhood Adversity and Its Effects on Military Members' Health and Readiness:
The Mediating and Moderating Effects of Social Support

by

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Dedication

For Audrey. In all that I do, I think of you. May this work inspire you to love and serve others, no matter the path you choose.

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For my military social work community: Drs. Keller and Applewhite – thank you for introducing and drawing me in to military social work. To Dr. Freeman and my entire faculty at the Army MSW Program, thank you for demonstrating how amazing military social work can be. Not a social worker, thank you Dr. Riviere for sharing this data with me to do this work.

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For my family: Thank you, mom and dad. You constantly support me in all that I choose to do. I hope that in your eyes I, "went hard and did good." To my kids, Audrey

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To my heavenly Father, you deserve all the glory for all that I endeavor to accomplish. "…'My grace is sufficient for you, for my power is made perfect in weakness.' Therefore I will boast all the more gladly of my weaknesses, so that the power of Christ may rest upon me." - 2 Corinthians 12:9

Abstract

Childhood Adversity and Its Effects on Military Members' Health and Readiness:
The Mediating and Moderating Effects of Social Support

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This cross-sectional study examined (a) the mediating role of several social pathways (i.e., unit cohesion, task cohesion, organizational support, positive and negative perceptions of officer and noncommissioned officer support, and anxiety in experiencing close relationships) on the relationship between adverse childhood experiences (ACEs) and service members' mental health, and (b) the moderating effect of the aformentioned social support types on ACEs' effect on service members' mental health. A secondary analysis of data through structural equation modeling (SEM) and linear regression was conducted using responses from 1,285 active duty Army soldiers (1,137 males and 148 females) from a single brigade combat team (BCT) six months post-deployment. The Walter Reed Army Institute of Research (WRAIR) provided the data. SEM demonstrated that the effects of ACEs on several mental health outcomes were consistently mediated by the perceptions of poor officer and noncommissioned officer leader support and positive officer leader support, and anxiety in experiencing close relationships, but buffered by organizational support. Linear regression analyses also demonstrated that ACE's effects on various mental health outcomes was positively or negatively moderated by distinct types of military

cohesion (e.g., positive and negative officer and noncommissioned officer leadership, organizational support, anxiety in experiencing close relationships) and military cohesion appears to have a more important moderating effect among women than for men (e.g., among women, the effect of ACE on aggressive behavior and PTSD decreased as positive NCO leader support increased; and the effect of ACE on alcohol problems increased as poor NCO leader support increased). These findings broaden knowledge about ACEs as a growing antecedent for mental health problems among service members, elucidate key mechanisms through which ACEs are linked to service members' mental health, and demonstrate that distinct types of vertical cohesion (i.e., organizational and supportive leader support behaviors) appear to be robust health capacity builders and military strength-multipliers.

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Chapter 1: Introduction

Using a life-course perspective, mental health and mental illness can be framed as a convergence of biological and social influences that operate across the lifespan (Brundtland, 2000). Adapting to chronic or even punctuated stress during childhood severely taxes the body's varied physiological stress response systems, producing broad and cascading physiological damage in the form of allostatic load that can last a lifetime (Ganzel, Morris, & Wethington, 2010). As a biological risk factor, allostatic load is often magnified in adulthood as described in various stress models. These models posit that childhood adversity either inclines a person to experience more stress in adulthood, imparts additive influences on later physical and mental health, or amplifies reactions to stressors encountered later, subsequently increasing the likelihood of poor and enduring physical and mental health reactions (Bandoli et al., 2017; Grosse et al., 2016; Hostinar, Lachman, Mroczek, Seeman, & Miller, 2015; Monroe & Simons, 1991; Thalida, Arpawong, & Phillips, 2016). For example, data from a US population-based study of adults aged 50 and older demonstrated that childhood trauma increases the effect of adulthood stress on depressive symptoms (Thalida et al., 2016). Childhood trauma also magnified the risk of 30-day major depressive episodes or generalized anxiety disorders among newly recruited Army soldiers following high levels of recent stressful experiences (Bandoli et al., 2017). In other words, early-life adversities impart lasting consequences on future stress responses, charting a course for a lifetime of poorer physical and mental health (Von Cheong, Sinnott, Dahly, & Kearney, 2017). Though allostatic load affects both physical and mental health, this dissertation will focus exclusively on mental health.

Adverse childhood experiences (ACEs) are forms of abuse, neglect, and household dysfunction perpetrated by a parent or other adult in the home, whereby harm, or the probability for harm, occurs to a child in his/her first 18 years of life (Felitti et al., 1998; Gilbert et al., 2009; Von Cheong et al., 2017). Robust evidence shows that ACEs are linked to long term negative mental and physical health outcomes (Cole, 2014; Dube et al., 2001; Gilbert et al., 2015; Liming & Grube, 2018; Oshri et al., 2015; Zheng et al., 2016). Much of the ACE research has produced insights into the origins of disorder and disease (Mersky, Janczewski, & Topitzes, 2017). Recently, the World Health Organization described strong empirical evidence based on prospective studies showing that, worldwide, several of the health and social challenges that adults face are associated with ACEs (Liming & Grube, 2018).

Evidence is also building that military personnel experience similar health risks related to their service. Military service more than epitomizes the stressful form of many present-day work settings, as members perpetually face environments high in physical risk to self and others, swelling occupational demands, and waning resources (Tucker, Sinclair, & Thomas, 2005). It is also clear that the military population enters service with significantly more ACE-related risks than its civilian counterparts (Afifi et al., 2016; Blosnich, Dichter, Cerulli, Batten, & Bossarte, 2014; Katon et al., 2015). Detecting factors that identify how and under what conditions ACE-exposed service members experience military service-related stress may assist in maximizing comprehensive fitness efforts aimed at preventing or mitigating ACEs' long-term, negative mental health consequences.

PROBLEM OVERVIEW

ACE research has demonstrated robust evidence for the destructive consequences of childhood trauma and persistent neglect on the developing brain and health throughout life. The growing body of international research linking ACEs with leading causes of adult morbidity and mortality recognizes ACEs' harmful effects on mental health across the lifespan (Gilbert et al., 2015; Hughes et al., 2017). The high prevalence of ACEs, combined with data on their influence on future health, life satisfaction, and health care costs are providing a significant opportunity for rethinking childhood adversity as a public health issue (Bethell et al., 2017; Kwong & Hayes, 2017; Young, Hansen, Gibson, & Ryan, 2006). Simply stated, ACEs are now firmly regarded as key determinants of health and social wellbeing and are implicated as key epidemiological factors informing illness prevention strategies (Edwards, Holden, Felitti, & Anda, 2003; Felitti et al., 1998; Kalmakis & Chandler, 2015; Larkin & Records, 2007).

The robust and growing body of research on the impact of ACEs on adult health is also spawning investigations of ACEs in various subpopulations. For instance, at least three North American studies demonstrate a markedly higher frequency of ACEs in military personnel compared to civilians (Afifi et al., 2016; Blosnich et al., 2014; Katon et al., 2015). And though most service members adapt well to military service, a sizable minority manifest significant mental health challenges that strain families, military resources, and military organizations themselves through decreased readiness, increased healthcare care costs, and attrition (Bandoli et al., 2017; Lee, Phinney, Watkins, & Zamorski, 2016). Only within the past decade have researchers begun probing pre-enlistment characteristics such as the quality of earlier family relationships that may increase susceptibility to combat trauma (Iversen et al., 2007; Lee et al., 2016). These exploratory inquiries are important, as the literature clearly indicates an elevated risk for

morbidity and other health risk behaviors among those exposed to ACEs across all populations regardless of demographic characteristics.

STATEMENT OF THE PROBLEM

Despite recent improvements in ACE-military research efforts, studies of factors that can mitigate or amplify ACEs' effects on mental health during service is sparse. Researchers have explored the role of past exposure to ACEs as a fundamental contributor to mental health problems among military personnel (Cabrera, Hoge, Bliese, Castro, & Messer, 2007; Lee, Phinney, Watkins, & Zamorski, 2016; Seifert, Polusny, & Murdoch, 2011). However, little research has examined factors that can mediate or moderate the relationship between service members' experiences of ACEs and their current mental health. Nor has much research been conducted on protective factors that can be enhanced, i.e., purposefully manipulated, to improve the wellbeing of ACE-exposed service members.

Current Department of Defense (DOD) instruction mandates that health promotion and disease prevention be used to lower healthcare costs and enhance mission and wartime readiness, unit performance, and military members, medical beneficiaries, and civilian DOD employees' fitness by creating a culture of health and wellness (Secretary, 2014). The goal is for the military to become a more prevention-oriented community, utilizing a wide-range of evidence-based interventions in both medical and non-medical programming (Secretary, 2014). Yet, a recent systematic review and critique of DOD resilience and prevention strategies on the psychological health of service members and their families indicates that this goal is not being achieved. The review

found that a majority of programs utilized were not supported by evidence, that programs were rarely assessed, and that they raise concerns that the DoD does not methodically evaluate the cost-effectiveness of its programs to assure that resources are guided to platforms that maximize outcomes per dollar spent (Denning, Meisnere, & Warner, 2014).

Evidence has already firmly established the strong dose-response relationship between ACE and health, as well as the substantially higher prevalence of ACE among military members compared to comparable civilians. Given this, it is vital that research examine health and resilience initiatives for military populations by including a broad range of mediating and moderating factors between ACE and mental health risk. Such efforts align with current efforts to improve military members' health and resilience.

Social support is one factor that can provide a preventive or buffering effect in the face of stressful experiences because it can assist people in reframing their stressful experiences in a more adaptive manner (Evans, Steel, & DiLillo, 2013; Thoits, 1986). Substantial evidence documents the inoculating effect of social relationships on health (Cohen, Doyle, Turner, Alper, & Skoner, 2003). Social support has been found to be a central concept in wellness literature across a range of mental and physical health outcomes (Lakey & Orehek, 2011; Lakey, Vander Molen, Fles, & Andrews, 2016; Woods, Lakey, & Sain, 2016). Those with greater perceived support (i.e., the belief that they would receive support if they needed it) have lower rates of depression (Lakey & Cronin, 2008), decreased PTSD severity (Brewin, Andrews, & Valentine, 2000), fewer psychotic symptoms (Gayer-Anderson & Morgan, 2013), less psychological distress

(Barrera, 1986), higher positive and lower negative affect (Finch, Okun, Pool, & Ruehlman, 1999), fewer negative cognitions (Lakey & Tanner, 2013), and greater overall contentment (Lakey, 2013).

Though these findings are promising, it is unknown how social pathways (e.g., support from peers or leaders) are associated with health outcomes of ACE-exposed service members – a group highly vulnerable to health risks. Thus, the primary purpose of this study is to assess the mediating paths and moderating effects of social support on the risk factor of ACE exposure on service members' mental health. In other words, does the association between ACE and health occur through, or vary depending on, modifiable social factors? Specifically, this dissertation will examine the mediating and moderating effects of various forms of military social support on the mental health risks associated with ACE-exposure in a military sample.

The next chapter addresses literature related to the proposed study. It presents a broad overview of the military as a distinct health-risk culture, embodying unique hardships that produce long-term negative outcomes simply by affiliation. This is followed by an introduction to the ACE construct, and how it is believed to interact with stress in adulthood producing morbidity. Next, a review of ACEs mental health outcome studies among military members presented, highlighting the major gaps of this literature. Lastly, pertinent theoretical and empirical literature on social support is discussed, anchoring this dissertation in the literature on ACEs among military-members.

Chapter 2: Literature Review

MILITARY HEALTH RISKS

Military service is an inherently stressful, dangerous, and hazardous profession. The strain of combat is well-documented, but military training itself is an intense and demanding period when members are intentionally and regularly exposed to a mix of dangerous and stressful experiences (Lin et al., 2015). The confluence of combat, occupational, and operational stress, environmental factors, and hierarchical organization exclusive to military service engenders a distinct risk to military personnel's biopsychosocial functioning, as chronic exposure to stressors compromises immune system functioning and mental health (Britt, Wright, & Moore, 2012). Simply put, stress is a constant and pervasive phenomenon in military service (Osa-Afiana, 2015).

Despite these structural challenges, positive aspects of the military, including a strong sense of identity, occupational structure, social support, purposeful employment, and stable income, are thought to attenuate these risks (Afifi et al., 2016; Iversen et al., 2007). Although most service members perform exceptionally well throughout their service, the current military cohort is more vulnerable to health risk than previous cohorts. For example, over 2.5 million service members have deployed in support of the lengthy Global War on Terrorism (GWOT), which includes such operations as Iraqi Freedom, Enduring Freedom, New Dawn, and Inherent Resolve (Seamone et al., 2014). These deployments equal close to 2 million troop-years (i.e., the sum of deployed years for each soldier) in support of those campaigns between 2001 and 2011 alone (Lee,

Warner, & Hoge, 2015). This cohort of armed forces have also endured the lengthiest, most recurrent, and highest cumulative number of deployments in U.S. history (Kang et al., 2015; Turner, Finkelhor, Hamby, & Henly, 2017).

Against this background, it is not surprising that a sizeable minority (researchers estimate up to one third of military) are projected to have war-zone-based stress injuries and many other psychopathologies (Hoge et al., 2004; Ramchand, Rudavsky, Grant, Tanielian, & Jaycox, 2015; Seamone et al., 2014). The Department of Veterans Affairs estimated that 20% of the 2.5 million service members who have served in support of the GWOT are experiencing depression, anxiety, stress, or PTSD (Cobley, 2015). Over one third of Iraq war veterans utilized mental health services during their first year after redeploying, and of those, 12% met diagnostic criteria for a known mental disorder (Hoge, Auchterlonie, & Milliken, 2006). During the same period, another study discovered that close to 18% of US Army and Marines met screening criteria for major depression, generalized anxiety, or PTSD (Levy & Sidel, 2013). Among a sample of nearly 10,000 United Kingdom OIF/OEF veterans, predicted probabilities of PTSD and symptom prevalence of mental disorders were 4.0% and 19.7%, respectively. Sixteen months after 522 UK reservists returned from deployment to Iraq in 2003, deployment was associated with common mental disorders, PTSD, and poor general health (Levy & Sidel, 2013). Given the stigma associated with reporting or disclosing mental illness and the reluctance to voluntarily seek treatment, prevalence rates of mental disorders are likely underestimated (Cederbaum, Wilcox, Sullivan, Lucas, & Schuyler, 2017).

The effects of potential traumatic event exposure, community support disruptions, and difficulties reintegrating back into civilian society can create additional stressors that extend far past the deployment experience itself (Turner et al., 2017). Military members participate in impulsive and dangerous actions including substance abuse, self-harm, and violence more frequently than their civilian counterparts (Lusk, Sadeh, Wolf, & Miller, 2017; MacManus et al., 2015). Veterans are more likely to suffer unemployment and be imprisoned for violent offenses than nonveterans (Elbogen et al., 2014; Elbogen et al., 2012; Kleykamp, 2013; Orcutt, King, & King, 2003; Sreenivasan et al., 2013). Service members and veterans also bear a substantial burden of psychopathology including PTSD, depression, drug and alcohol use, and suicide and have elevated risks of physical illness (Hoge et al., 2004; Kline et al., 2010; Larson et al., 2013; Lee et al., 2015; Lusk et al., 2017; Milliken, Auchterlonie, & Hoge, 2007; Turner et al., 2017; Vaughan, Schell, Tanielian, Jaycox, & Marshall, 2014).

The pervasiveness of excessive alcohol consumption and misuse in the military is also well established in the research literature (Bray et al., 2010; Clarke-Walper, Riviere, & Wilk, 2014; Santiago et al., 2010; Shirvani, Reed, & Clingan, 2017). The National Institutes of Health (2013) found that excessive alcohol consumption occurs at considerably greater rates among military personnel than civilians, with nearly half of all active duty service members reporting binge drinking (Lusk et al., 2017). In fact, historical drinking cultures are well known across the various service branches, creating an enduring but unspoken socialization and normalization of alcohol use (Shirvani et al., 2017). Between 1998 and 2008, rates of excessive drinking within the military increased

consecutively and significantly, with surveys showing a 35% to 45% increase in binge drinking coinciding with the War on Terrorism; military members frequently use alcohol to cope with stress, boredom or loneliness and for fun or camaraderie (Bray et al., 2010; Shirvani et al., 2017). The social and financial costs associated with alcohol use are significant, as alcohol misuse is strongly associated with misconduct, poor unit effectiveness, premature separation from service, suicide, and domestic violence (Clarke-Walper et al., 2014).

ADVERSE CHILDHOOD EXPERIENCES HEALTH RISKS

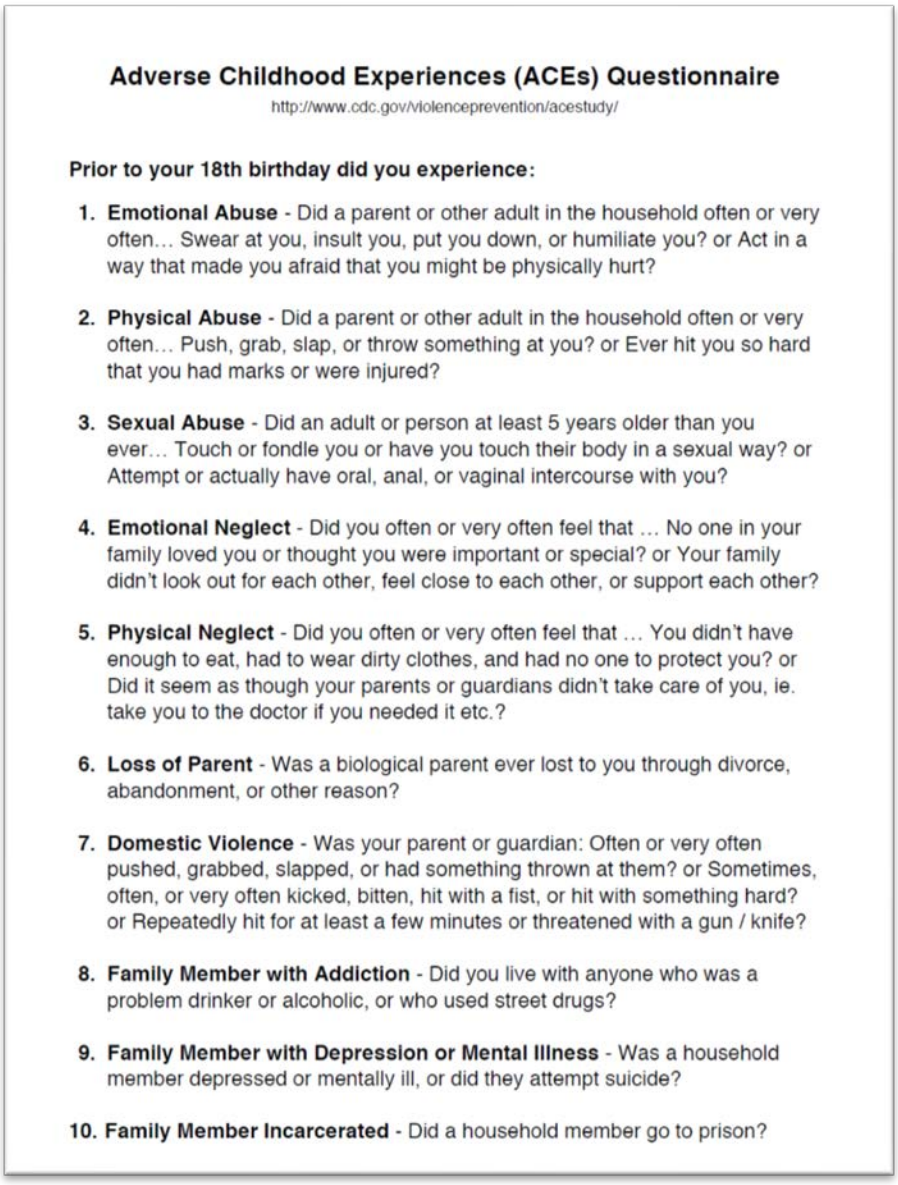
Brief History. The association between child trauma and adult illness first appeared in the health science literature in the 1990s. However, an understanding of the cumulative physical and mental health effects of childhood trauma – often termed adverse childhood experiences (ACE) – on adult health outcomes originated serendipitously in an obesity clinic in San Diego in the mid-1980s. At the time, Dr. Vincent Felitti, a physician and researcher, was confounded by how, over a period of five years, the majority of his morbidly obese patients terminated their treatment midway through the weight loss program even though they were losing weight (Stevens, 2012).

In investigating this phenomenon, Felitti found that his dropouts had not been born overweight, nor did they gradually gain weight over time. After interviewing hundreds of disenrolled patients, he discovered that their rapid weight gain began following instances of sexual abuse as children. Moreover, patients whose weight returned in less than two years tended to have a history of substantial emotional trauma in childhood (Felitti & Williams, 1998). In addition, rather than seeing their weight gain as

a problem, these patients almost universally viewed their eating as either a fix to cope with the consequences of traumatic childhood experiences, or as a protective factor helping them remain a less attractive target of abuse (Cole, 2014). Consequently, weight loss substantively increased patients' anxieties, fears, and other forms of psychopathology (Stevens, 2012).

Armed with a new framework for viewing obesity, primarily as a coping mechanism for childhood trauma, Felitti's work introduced a new conceptual framework, suggesting biochemical coping (e.g., nicotine, alcohol, psychoactive drugs, food, sex, etc.) as a form of self-medication or adjustment to the neurological influence of serious childhood trauma. Child abuse was now being considered a fundamental contributor to many forms of poor health outcomes and health risk behaviors among adults including alcohol-related problems, heart disease, drug use, teen pregnancy, and tobacco use (Cole, 2014; Stevens, 2012).

The ACE Study. In an attempt to affirm the role of child abuse in future health, Felitti's findings led to a collaboration with Robert Anda, a Centers for Disease Control and Prevention (CDC) epidemiologist. In 1995, the two led the initial and landmark ACE study with a nationally representative sample of more than 17,000 participants to test for associations between childhood exposure to a range of adverse experiences (including physical, emotional, and sexual abuse and household dysfunction, illustrated in Figure 2.1) and health risk behavior and disease in adulthood (Cole, 2014; Dube et al., 2009; Felitti et al., 1998).



Adverse Childhood Experiences (ACEs) Questionnaire

http://www.cdc.gov/violenceprevention/acestudy/

Prior to your 18th birthday did you experience:

1. **Emotional Abuse** - Did a parent or other adult in the household often or very often… Swear at you, insult you, put you down, or humiliate you? or Act in a way that made you afraid that you might be physically hurt?
2. **Physical Abuse** - Did a parent or other adult in the household often or very often… Push, grab, slap, or throw something at you? or Ever hit you so hard that you had marks or were injured?
3. **Sexual Abuse** - Did an adult or person at least 5 years older than you ever… Touch or fondle you or have you touch their body in a sexual way? or Attempt or actually have oral, anal, or vaginal intercourse with you?
4. **Emotional Neglect** - Did you often or very often feel that … No one in your family loved you or thought you were important or special? or Your family didn't look out for each other, feel close to each other, or support each other?
5. **Physical Neglect** - Did you often or very often feel that … You didn't have enough to eat, had to wear dirty clothes, and had no one to protect you? or Did it seem as though your parents or guardians didn't take care of you, ie. take you to the doctor if you needed it etc.?
6. **Loss of Parent** - Was a biological parent ever lost to you through divorce, abandonment, or other reason?
7. **Domestic Violence** - Was your parent or guardian: Often or very often pushed, grabbed, slapped, or had something thrown at them? or Sometimes, often, or very often kicked, bitten, hit with a fist, or hit with something hard? or Repeatedly hit for at least a few minutes or threatened with a gun / knife?
8. **Family Member with Addiction** - Did you live with anyone who was a problem drinker or alcoholic, or who used street drugs?
9. **Family Member with Depression or Mental Illness** - Was a household member depressed or mentally ill, or did they attempt suicide?
10. **Family Member Incarcerated** - Did a household member go to prison?

Figure 2.1. ACE Questionnaire, Centers for Disease Control & Prevention.

ACE study results. Felitti et al. (1998) discovered that ACEs are common, with 52% of participants reporting having experienced at least one ACE. Moreover, compared to those with no ACEs, having four or more categories of ACEs, was associated with a 4 to 12 times greater risk for alcoholism, drug abuse, depression, and attempted suicide; 2

to 4 times the risk of smoking, poor self-rated health, sexually transmitted disease; and a 1.4 to 1.6 times increase in sedentary lifestyle and extreme obesity. Results further demonstrated a dose-response relationship, i.e., as the number of exposure categories increased, so did the number and severity of health problems (Felitti et al., 1998).

ACE study replicated results. Since publication of the original ACE study, close to 100 CDC-sponsored studies and countless independent and external ACE investigations have extended Felitti et al. (1998) findings across various health outcomes, consistently leading researchers to recognize that serious and chronic childhood adversity is common and tied to health-risk behaviors, disease, and death, and to propose ACEs as a causal pathway to adult health problems (Cole, 2014; Dong et al., 2004; Dube et al., 2001; Hostinar, Lachman, Mroczek, Seeman, & Miller, 2015; Hughes et al., 2017; Kalmakis & Chandler, 2015). Felitti et al.'s ACEs Study is characterized throughout health science research, linking childhood experiences of abuse, neglect, and domestic dysfunction with future health outcomes (see Figure 2.2).

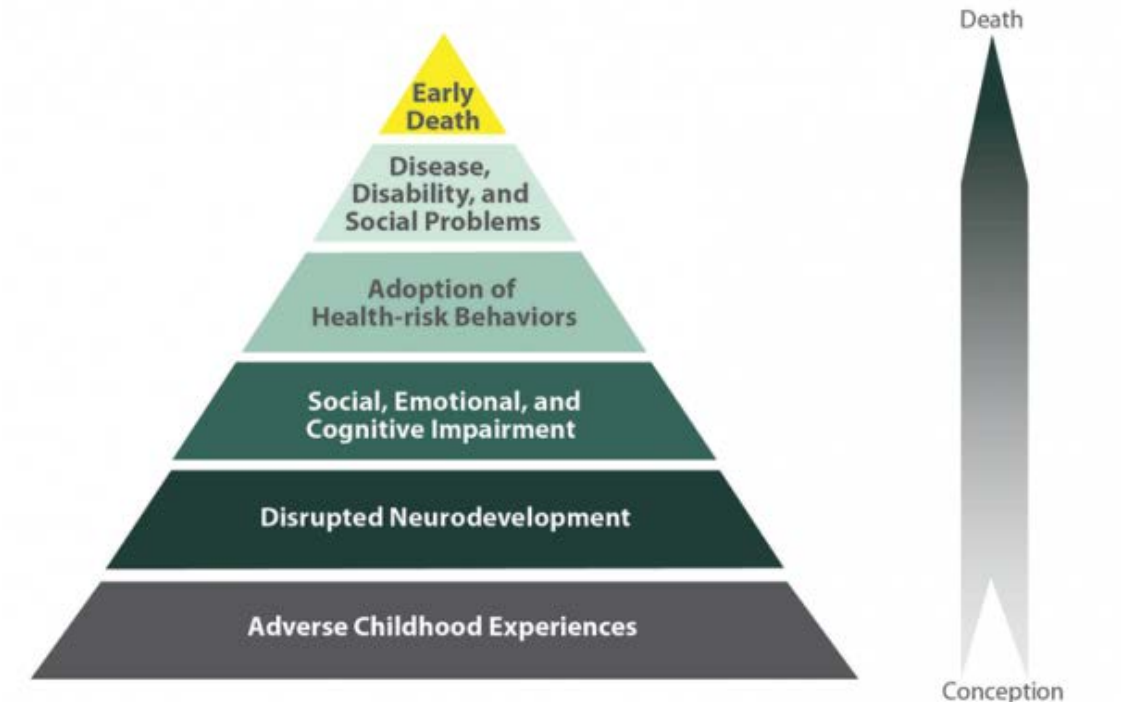


Figure 2.2. ACE pyramid, Centers for Disease Control & Prevention.

Even after controlling for demographics and health-related behaviors, ACEs have been independently associated with poor physical and mental health outcomes throughout adulthood (Kalmakis & Chandler, 2014) and early mortality related to mental and physical disorders and disease (Cronholm et al., 2015). Studies in various low-, middle-, and high-income countries have replicated these findings (Hughes et al., 2017). Though research findings have been inconsistent with regard to whether certain ACEs have greater predictive power than others, the point is that there is a dose-response relationship between extent of exposure and risk for poor health (Mersky, Janczewski, & Topitzes, 2017).

THE PHYSIOLOGICAL FOUNDATION OF ACES AND FUTURE HEALTH

Allostatic Load. Allostasis is a modification of the classic theory of homeostasis, which explains the way internal systems interact to restore baseline autonomic nervous system (ANS) and hypothalamus-pituitary-adrenal (HPA) functioning in response to stress (Ganzel, Morris, & Wethington, 2010; McEwen & Seeman, 2004). The allostatic model recognizes that stress responses are important, promoting adaptive biological and behavioral responses in the short term where the body remains in allostasis (Ellis & Del Giudice, 2014). However, prolonged stimulation of stress response systems tends to be toxic, because the release of excessive stress hormones produces a state of biological risk called high allostatic load (see Figure 2.3) – a condition that occurs when the body's metabolic, cardiovascular, immune, and nervous systems are harmed due to toxic stress (Ellis & Del Giudice, 2014; Gilbert et al., 2015; McEwen, 2007; Widom, Horan, & Brzustowicz, 2015). Research demonstrates that both punctuated and sustained stress exposure during childhood affects brain development by overstimulating various biological systems like the ANS (Kalmakis & Chandler, 2015; Pervanidou & Chrousos, 2007; Tyrka, Burgers, Philip, Price, & Carpenter, 2013) and by impairing the HPA-axis (Kalmakis & Chandler, 2015; Trickett, Noll, Susman, Shenk, & Putnam, 2010). Evidence demonstrates that among those exposed to ACE, the HPA-axis functions differently, although there are differences in strength and direction of the associations depending on when, how long, and what type of adversity was experienced (Bandoli et al., 2017; McCrory, De Brito, & Viding, 2012).

Evidence indicates that without predictable, supportive, and reassuring relationships in childhood, these stress response systems often remain activated for extended periods of time and stress consequently becomes 'toxic,' disrupting developing brain circuits and numerous biological systems such that eventually the body becomes so worn down that the child lacks the ability to handle routine stress (Nakazawa, 2015). This is especially troubling for children experiencing ACEs as disrupted nervous system development affects growth of brain regions linked to planning, problem solving, behavior management, and emotional regulation (Gilbert et al., 2015). Damage to the nervous system inclines a child to several cognitive, mental, social, and physical health challenges, increasing the prospect for unhealthy behaviors (Gilbert et al., 2015; Rogosch, Dackis, & Cicchetti, 2011).

ACEs have been linked to maladaptive health risk behaviors, which add to risk for persistent morbidity. Prospective longitudinal research confirms that the direct effect of ACEs predict allostatic load, controlling for age, gender, and ethnicity, and other covariates (Widom et al., 2015). By and large, the greater one's early emotional suffering from exposure to ACEs, the greater one's allostatic load, producing greater and more frequent early life physical and neural inflammation, resulting in sharp physical and neural structural disadvantages in adulthood impairing future health and even accelerating the aging process (Maestripieri & Hoffman, 2011; Nakazawa, 2015). This deterioration (i.e., allostatic load) of the body will now be discussed as it relates to stress experienced in adulthood.

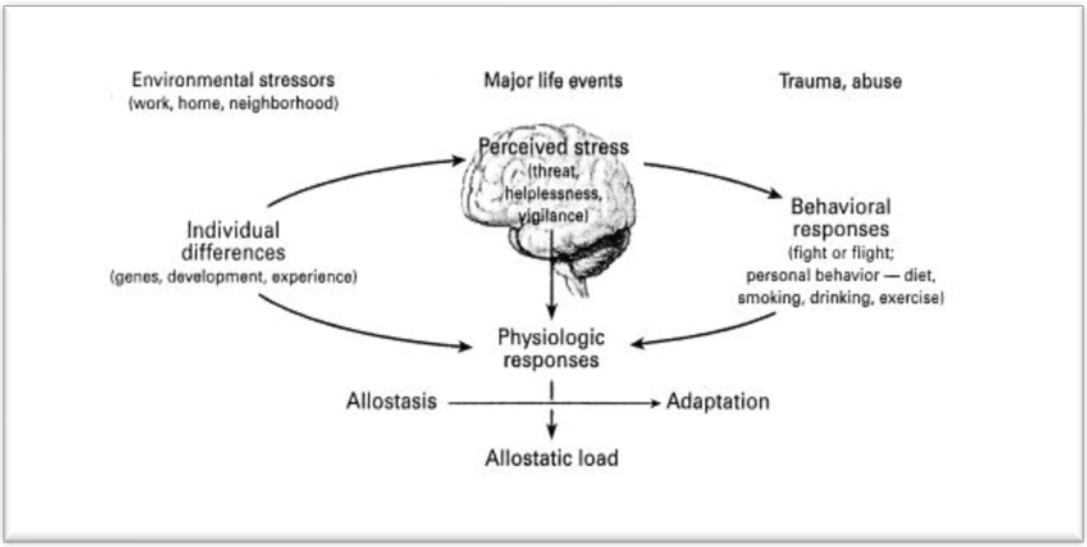


Figure 2.3. The Stress Response and Development of Allostatic Load (McEwen, 2007).

THE INTERACTION BETWEEN ACE AND STRESS IN ADULTHOOD

Stress Generation Model. The *stress generation model* postulates that early-life stress biases individuals to, at least in part, create negative experiences leading to suffering greater stress in adulthood (Hostinar et al., 2015). That is, ACEs appear to be a risk for disease in adulthood because of how ACE exposure shapes the very belief systems, hopes, personal attributes, and behaviors of its victims (Alloy, Liu, & Bender, 2010; Hostinar et al., 2015). This could occur in various ways. One such way follows a behavioral path where ACE exposure lends persons to future health risk through the adoption of maladaptive coping behavior (e.g., substance misuse, eating disorders, suicidal thoughts, risky sexual behavior, etc.) (Kendall-Tackett, 2002; Lee et al., 2016). Another proposition is more cognitively focused. ACEs lead to the creation of an internal psyche where the world is automatically viewed as dangerous. Recalling the helplessness from their childhood adversities, persons may exaggerate threats and hardship in their

current environment (Hostinar et al., 2015; Kendall-Tackett, 2002; Lee et al., 2016). These cognitive prejudices towards dangers, such that even vague stimuli are construed as hazardous, and real hazards are apportioned gratuitously more biologic regulating responses, compound levels of distress and strain over the lifespan (Hostinar et al., 2015; Kendall-Tackett, 2008). A social pathway has also been proposed relating ACEs to adult health. Researchers find that greater ACE exposure leads to challenges in creating and preserving social relationships, thereby impairing relational support as a resource and burdening coping capacity (Kendall-Tackett, 2002; Lee et al., 2016). This relational dysfunction is often characterized by inhibited relational intimacy, scarce social connections, or conversely, being excessively difficult and controlling (Becker-Lausen & Mallon-Kraft, 1997). Cumulatively, these forces increase the odds that ACEs are a causal pathway for adult stress and subsequent health risk, backing the chief presumption of this theoretical model (Hostinar et al., 2015).

Stress Accumulation Model. The *stress accumulation model* assumes that even if the stress generation model is accurate, there are additional pathways linking early adversity and later health; i.e., this model views stressors as having an additive influence on later health (Grosse et al., 2016; Hostinar et al., 2015). The central premise of this model is that stressors add together without any interactive or augmentative effects, as reflected in Felitti et al. (1998) landmark ACE study, which demonstrated a linear dose-response relationship between number of ACEs and the prevalence of adult health conditions. However, Hostinar et al. (2015) note the need for more research on the stress

accumulation model as not all subsequent adult health conditions demonstrated the same linear response pattern.

Early-life Stress Sensitization Model. Lastly, in opposition to the stress generation model's assumption that most consequences of early experience operate through adult exposure to stress, the *early-life stress sensitization* model suggests the possibility of interactive effects between childhood and adult adversity (Hostinar et al., 2015). During childhood, the body is more sensitive to adverse events. Stressful environmental phenomena in childhood condition future risk for disease by functioning during times when the biological system is particularly malleable and structurally immature, entrenching future biological processes in ways that amplify future stress reactions and risk to subsequent disease (Bandoli et al., 2017; Gluckman, Hanson, Cooper, & Thornburg, 2008; Hostinar et al., 2015). In other words, persistent and punctuated stress in childhood biologically reprograms reactions to stressful events throughout the lifespan (Nakazawa, 2015).

ACE-Specific Military Challenges

A burgeoning body of literature focuses on ACEs among military members. A title and abstract search of CINAHL, Psych INFO, and PsycARTICLES databases from 2001 to 2018 was conducted to identify these studies supplemented by hand searches of bibliographies of articles. The search included only published peer-reviewed journal articles that were based on samples of adult military populations and were written in English. Search terms included "adverse childhood experiences" or "ACE" or "adverse experience" or "childhood maltreatment" and "service member" or "veteran" or "Iraq" or

"Afghanistan" or "military" or "soldier" or "marine" or "deploy" or "army." Inclusion criteria were met by 33 articles with over 750,000 study participants.

Overview. Overwhelmingly, the empirical literature on ACE in military populations is based on retrospective self reports, cross-sectional data, and samples ranging from small clinical and convenience samples to larger population-based samples used in epidemiological studies. Health outcomes discussed below are grouped into the following categories: anxiety, PTSD, depression, suicide, alcohol use, and non-specific mental health & self-rated general health. In addition to descriptive survey research, mediation and moderation, as well as exploratory studies, are included.

Anxiety. Between 2010 and 2017, four articles reported on ACE as a predictor of anxiety disorders in the military (Bandoli et al., 2017; Fritch, Mishkind, Reger, & Gahm, 2010; Hammond, Ben-Ari, Laundry, Boyko, & Samore, 2015; Sareen et al., 2013). Bandoli et al. (2017) found that newly recruited Army soldiers who were exposed to childhood emotional, physical, and/or sexual maltreatment were at an increased risk of 30-day generalized anxiety disorder (GAD) following high numbers (3 or more) of stressful experiences in the past 12 months. ACE independently predicted 30-day GAD even after multivariate adjustment. Fritch et al. (2010) found that across multivariate models, higher levels of childhood abuse were significant predictors of anxiety in a sample of over 1,000 active duty and activated Reservists and National Guard veterans from the OIF and OEF wars. In their study of over 243,000 VA-treated Gulf war veterans, Hammond et al. (2015) also found that ACE was a significant predictor of an anxiety order diagnosis (OR = 1.53, [95%CI:1.51, 1.55], $p<.001$).

PTSD. Ten studies published between 2007 and 2016 explored the relationship between childhood adversity and various measures of PTSD in the military (Agorastos et al., 2014; Cabrera et al., 2007; Fritch et al., 2010; Hammond et al., 2015; Iversen et al., 2007; LeardMann, Smith, & Ryan, 2010; Owens et al., 2009; Rudenstine et al., 2015; Sareen et al., 2013; Van Voorhees et al., 2012; Zheng et al., 2016). All but two of these studies demonstrated significant findings (Rudenstine et al., 2015; Sareen et al., 2013). Agorastos et al. (2014) found that among never-deployed young Marines, multiple childhood adversities increased the probability of adult PTSD symptomology (OR: 3.1, 95% CI: 1.5–6.2). In their study comparing pre and post deployed active duty soldiers, Cabrera et al. (2007) found that soldiers who disclosed two or more categories of ACE demonstrated higher post-traumatic stress symptoms, above the anticipated contribution of combat exposure. Fritch et al. (2010) studied active duty and activated Reservists and National Guard OIF and OEF veterans and found significant main effects for the relationship of childhood physical abuse and PTSD ($\beta = 0.31$). Hammond et al. (2015) found a significant increase in PTSD for every unit increase in ACE exposure (AOR: 1.40 [95% CI: 1.39, 1.42], $p < .001$). Believed to be the first epidemiological study of military members, Iversen et al. (2007) also compared deployed vs non-deployed UK military personnel and found significant dose-response relationship of the prevalence of PTSD cases as ACE scores increased (OR ranging from 1.04 to 2.75). LeardMann et al. (2010) found that previously deployed OIF/OEF Marines who endorsed two or more categories of ACE were significantly more likely to be diagnosed with post deployment PTSD (HR = 1.57; 95% CI = 1.09, 2.26). A study of veterans from earlier campaigns

(Korean war, WWII, Vietnam, and the first Gulf war) demonstrated a complex relationship between childhood adversity and PTSD severity whereby low levels of combat exposure were associated with high levels of childhood adversity (Owens et al., 2009). After controlling for combat exposure, Van Voorhees et al. (2012) discovered that childhood trauma was associated with PTSD symptoms in adulthood. Lastly, Zheng et al. (2016) found that veterans who reported more ACEs were more likely to report symptoms of PTSD.

Depression. Eight studies examined ACEs as a predictor of depression among military and veteran personnel between 2007 and 2017 (Agorastos et al., 2014; Bandoli et al., 2017; Cabrera et al., 2007; Fritch et al., 2010; Hammond et al., 2015; Rudenstine et al., 2015; Sareen et al., 2013; Youssef et al., 2013). Agorastos et al. (2014) sample of 1,254 never-deployed Marines demonstrated that regardless of the number of ACEs experienced, their risk for depression symptoms was significant (OR: 2.2, 95% CI: 1.3–3.8 for one ACE and OR: 2.1, 95% CI: 1.2–3.5 for more than one ACE). Aiming to test the stress sensitization theory that persons previously exposed to childhood adversity are more susceptible to adult mental disorders from recent stressors, Bandoli et al. (2017) found that newly recruited Army soldiers had an increased risk of 30-day major depressive episode (MDE) following high levels of recent stressful experiences – if they were exposed to childhood maltreatment. In other words, ACE independently predicted 30-day MDEs. Cabrera et al. (2007) found ACE was a significant predictor of screening positive for depression across pre/post-deployed active duty soldiers, with odds ratios ranging from 2.2 for having one ACE to 6.1 four or more ACEs; confidence intervals

associated with depression were more stable with exposure to more than one ACE. Fritch et al. (2010) found that higher levels of childhood abuse were significant predictors of screening positive for depression among 1,000+ active duty and activated reservists and national guard veterans from the OIF and OEF wars. In their novel study of over 243,000 VA-treated Gulf war veterans based on 44.7 million clinical notes and discharge summaries, Hammond et al. (2015) found depression was significantly associated with per unit increase in ACE scores (OR = 1.71, [95%CI:1,68, 1.74], $p < .001$). In their investigation of previously deployed OIF/OEF veterans, Rudenstine et al. (2015) found that experiencing any form of child abuse was significantly associated with new-onset depression (AOR: 1.8; 95% CI: 1.0–3.1). However, the extreme lower end of the CI includes 1.0; thus, though it is likely that there is a significant difference, the authors are taking some liberty in stating their claim without describing any qualifiers for their conclusion. Sareen et al. (2013) found that ACEs were significantly associated with major depression among active duty males from the Canadian armed forces (OR 1.43, 95%CI: 1.11 – 1.86, $p <.05$). Lastly, Youssef et al. (2013) found that traumatic childhood events were significantly associated with depressive symptoms, depressive symptom severity, and cognitive-related depressive symptoms among post-9/11 2001 active military and veterans.

Alcohol. Ten studies published between 2004 and 2018 examined the association between ACE and alcohol use using survey data (Agorastos et al., 2014; Clarke-Walper et al., 2014; Evans, Upchurch, Simpson, Hamilton, & Hoggatt, 2017; Fritch et al., 2010; Hammond et al., 2015; Iversen et al., 2007; Trent, Stander, Thomsen, & Merrill, 2007;

Vest, Hoopsick, Homish, Daws, & Homish, 2018; Young, Hansen, Gibson, & Ryan, 2006; Zheng et al., 2016). In all but two of these investigations (Agorastos et al., 2014; Fritch et al., 2010), ACE was significantly associated with alcohol use. Clarke-Walper et al. (2014) found a 1.3 to 1.9 times greater likelihood of active duty service members meeting criteria for alcohol misuse, or between 1.4 and 2.4 times greater likelihood of misuse with risky behaviors, i.e., driving after heavily drinking, knowingly riding with a driver who had several drinks, being late to formation or missing duty due to drinking, or having been arrested due to driving under the influence. Evans et al. (2017) found that male veterans with childhood adversity were more likely than civilians with childhood adversity to have alcohol use disorders (AUD). In Hammond et al.'s study of over 243,000 VA-treated Gulf war veterans based on 44.7 million clinical notes and discharge summaries, ACE was a significant predictor of alcohol use disorders (OR = 1.65, 95% CI [1.63, 1.67}, $p<.001$). Iversen et al. (2007) also found a significant dose-response relationship; i.e., higher ACE scores were associated with more severe alcohol use disorders identification test (AUDIT) scores (odds ratio ranged from 1.91 to 4.39). Trent et al. (2007) study of U.S. Navy recruits showed a significant relationship between a history of ACE and current alcohol problems and alcohol abuse across genders, and sexual abuse victimization was more strongly associated with binge drinking and alcoholism in men than in women. Young et al. (2006) analyses found significant associations between higher risky drinking scores and childhood adversity. Zheng et al. (2016) also found that Australian Defense Force Veterans who had more ACE were more likely to report increased levels of alcohol problems.

Non-specific mental health problems and self-rated general health. Seven studies published between 2007 and 2016 reviewed ACE as a predictor of self-rated mental or general physical health or unspecified mental disorders (Agorastos et al., 2014; Iversen et al., 2007; Katon et al., 2015; LeardMann et al., 2010; Lee et al., 2016; Montgomery, Cutuli, Evans-Chase, Treglia, & Culhane, 2013; Sareen et al., 2013). In a cohort of non-deployed marines, Agorastos et al. (2014) found a dose-dependent negative relationship between childhood trauma and health-related quality of life (HRQoL). Iversen et al. (2007) compared deployed and non-deployed male UK military members and found ACE to be a significant predictor of self-rated general health problems in a dose-response fashion (OR ranging from 1.22 to 2.56). Katon et al. (2015) found that in relation to civilians, male and female veterans had more total ACEs; however, only among female veterans was general health more strongly associated with ACEs compared to civilians. After adjusting for covariates, LeardMann et al. (2010) found that male Marines who had deployed and reported experiencing at least two ACEs were at significant risk for being diagnosed with mental health disorders not specific to PTSD (HR=1.41; 95% CI=1.10, 1.80) compared to those who reported no ACE. Lee et al. (2016) found that ACEs were associated with poorer mental health ($\beta=-.14$, $p<.001$) in Canadian Armed Forces. Montgomery et al. (2013) found that the association between ACE score and mental health problems was stronger for those with military service (Exp[B] = 1.95; $p<.001$) relative to those without a history of active military service (Exp[B] = 1.63; $p<.001$). Among male Canadian armed forces, Sareen et al. (2013) found that ACE exposure was significantly associated with past-year mood or anxiety disorders

among males [AOR 1.34, 99% CI 1.03–1.73, p<0.01] and females [AOR 1.37, 99% CI 1.00–1.89, p=0.01].

Exploratory Studies. Applewhite, Arincorayan, and Adams (2016) sampled deployed soldiers in Iraq who were seeking behavioral health care and found that 83% reported experiencing at least one ACE and 40% four or more ACEs, suggesting that enduring toxic family settings seems to be a common experience for soldiers who seek behavioral health care in a combat deployment. Blosnich, Dichter, Cerulli, Batten, and Bossarte (2014) compared ACE prevalence among civilian and military stratified by sex, finding that in the all-volunteer era, both men and women with military service had a higher prevalence of ACEs. Among men, there were significant differences in all 11 ACEs, while among women, differences were significant in 3 of 11 categories. McCauley, Blosnich, and Dichter (2015) found that female veterans reported a higher prevalence of 7 of 11 ACEs and higher mean ACE scores than non-veteran females.

Mediation. Mediation attempts to clarify how, or why, two variables are associated, where the mediating variable is presumed to intervene in the link between the predictor and outcome variables (Fairchild & MacKinnon, 2009). Lee et al. (2016) study of psychosocial pathways (i.e., mediation) linking ACEs to mental health found that low social support, low mastery, and greater number of combat stressors explained 42.6% of this association, with social support having the strongest mediating effect. As a significant amount of variance in mental health outcomes was not explained, future research could aim to expand on these findings.

Moderation. Moderation tests if some third (i.e., moderating) variable affects the magnitude or direction (i.e., conditional effect) of the association between a predictor and outcome variable (Fairchild & MacKinnon, 2009). Findings from ACE moderation models vary. Several studies hypothesized that ACE would moderate the effect of combat exposure (CES) on veterans' health risks such that higher ACE would exacerbate mental health risks following combat. After finding a significant direct effect of ACE on mental health, Cabrera et al. (2007) explored whether the conditional effect of CES on post-traumatic stress symptoms and depression depended on ACE exposure. They found a surprising interaction whereby those with no ACE were found to have more post-traumatic stress and depressive symptoms than those with ACE (Cabrera et al., 2007). Another study that examined the same interaction of ACE on CES and PTSD suggested that for high CES, increased levels of ACE are associated with decreased PTSD severity (Owens et al., 2009). Conversely, among those with lower CES, higher ACE severity was associated with higher PTSD severity (Owens et al., 2009). However, another study (limited in that ACE was measured by just a single item) found that CES's effects on mental health did not depend on ACE exposure (Fritch et al., 2010). Another study also found no evidence that ACE modified the association between traumatic CES and PTSD, mild mental disorder, or high levels of alcohol-related problems (Zheng et al., 2016). A final study exploring the interaction of combat exposure and a broad range of ACEs on mood disorders found no significant interactions (Sareen et al., 2013). In sum, the evidence on whether childhood adversity modifies the association between combat exposure and poor mental health is mixed.

Other models explored moderation beyond the additive effect of ACE on combat exposure and mental health. One study tested the moderation effect of a history of military service on the effect of ACE on adult homelessness, health problems, and mental health problems, finding each of the interaction terms significant (Montgomery et al., 2013). However, a follow-up investigation discovered that only the relationship between ACE score and mental health problems was stronger for those with a history of active military service compared to those without a history of active military service (Montgomery et al., 2013). Another study looked at the moderating effect of relationship status and military unit cohesion on the association between ACE and suicidality. Only the interaction between military unit cohesion and ACE was associated with suicidal ideation, such that stronger unit cohesion weakened the association between ACE and suicidal ideation (Skopp, Luxton, Bush, & Sirotin, 2011). The moderating effect of ACE was explored in the relationship between stressful experiences (e.g., death, divorce, infidelity, or a close friend or family member's serious illness or injury) and experiencing either depression or anxiety, finding a significant increased risk for both outcomes among those with higher ACE (Bandoli et al., 2017). A recent moderation investigation found that ACE and combat trauma have dissimilar effects on alcohol use in that combat trauma may not add to alcohol use among those with more ACEs but may promote greater alcohol use among those with lower ACEs (Vest et al., 2018). The same study also found that combat trauma did add to the effect of ACEs on lifetime drug use (Vest et al., 2018).

Exceptions: Nonsignificant findings. A few studies reported non-significant findings across health outcomes. McCauley et al. (2015) found that although female

veterans had a higher prevalence of 7 of 11 ACEs and a higher mean ACE score than non-veteran females, they did not report increased mental health risk markers or poorer physical health. Agorastos et al. (2014) found no association between childhood trauma and alcohol abuse among non-deployed U.S. Marines. Fritch et al. (2010) also found that ACE had no significant effect on alcohol use among OIF and OEF veterans. Rudenstine et al. (2015) did not find a significant association between any form of ACE and PTSD across service members as a whole; however, among female service members, ACEs were found to predict PTSD (AOR: 3.6; 95% CI 1.7 – 7.4). Despite finding several associations between ACE and several measures of mental health, Sareen et al. (2013) found no significant associations specific to PTSD. And although Zheng et al. (2016) found a direct association between ACE and mental health, they found no interaction of ACE on the relationship between later traumatic event exposure and mental health. Zheng et al. (2016) also found that though ACEs were associated with higher odds of poorer mental health, ACEs were not found to moderate the association between traumatic combat exposure and mental health.

Summary. Most ACE studies have methodological limitations, primarily the use of cross-sectional designs and retrospective self-reports of health and mental health status. Causal relationships cannot be established in cross-sectional studies, and recall bias makes self-reports suspect. Though findings suggest that retrospective reports of ACEs are mostly stable over time, some studies suggest that their reliability is related to respondents' mental health state at the time of the report (Cabrera et al., 2007). Prospective, longitudinal studies are needed to increase knowledge along with

consideration of factors that may mediate or moderate ACEs' effects on military members' physical and mental health. Preventing and treating the effects of ACEs is vital to military members' health and readiness.

However, this literature review shows that the overwhelming preponderance of ACEs research demonstrates a robust dose-response association between ACE exposure and all health risk categories/types examined, suggesting that ACEs significantly contribute to some of the most pressing health needs among military members and veterans. The few exceptions to this apparently normative relationship (e.g., among female veterans) do not negate the overall findings about ACEs' impact on military members.

Notable Gaps. Research clearly demonstrates that ACEs are associated with a greater likelihood of mental health problems. Knowledge of the possible pathways that can explain how ACEs influence – and if their impact changes – health-risk across military communities is limited. This review found few investigations of this type.

Mediation. Only a single mediation model (Lee et al. (2016) was discovered in this review, finding significant mediated pathways in the relationship between ACE and mental health through psychosocial pathways (where 42.6% of the relationship was explained by the mediating effects of low social support, low mastery, and a greater number of combat stressors). However, this study utilized just a single item to assess social support (e.g., "In the last four weeks, how much have you been bothered by having no one to turn to when you have a problem?"), greatly limiting the generalizability of the alleged explanatory (and potentially protective) value from the social support construct

on service member health. Nonetheless, these results are both original and promising, as social pathways are known to link ACEs to future mental health (Becker-Lausen & Mallon-Kraft, 1997; Hostinar et al., 2015; Kendall-Tackett, 2002; Lee et al., 2016). Lee et al. (2016) findings do suggest the need for research on support and intervention strategies targeting specific psychosocial pathways (i.e., mediated paths).

Moderation. Most moderation studies have examined *fixed* factors, i.e., factors the DOD cannot directly alter. For instance, ACEs were often regarded as a moderating variable between some predictor and service member health. However, the DOD cannot change a service member's ACE exposure since ACEs by definition occur prior to military service. Though there is some exploratory value in seeing if the conditional effect of some predictor on service member health changes (i.e., is moderated) depending on ACE exposure, little practical benefit can come from this type of investigation because ACEs cannot be changed.

Combat exposure was also investigated as a variable that changes (i.e., moderates) the strength of the relationship between ACEs and health. This is interesting given these models are examining one known risk factor (ACEs) on another known risk factor (combat exposure). These investigations are more theoretically beneficial as both combat exposure and ACEs are known to predict mental health outcomes among military members (though it should be noted that ACEs are more strongly correlated with poorer health than combat exposure), and seeing if one changes the conditional effect of the other on service member health makes some theoretical sense. Yet, the same issue mentioned above regarding the practical benefit of examining the moderating effect of

combat exposure on the conditional effect of ACE on health resurfaces. Combat exposure (i.e., the sum exposure to, and specific types of, combat a service member may encounter) is a relatively fixed factor in that no amount of military training can completely eliminate the physical and mental health risks associated with it. Combat will always involve potentially traumatic event exposure(s) and high stress situations known to increase health risk.

Of all moderation studies, only a single study theorized that *modifiable* factors (e.g., those that can be purposefully manipulated) would lessen the strength of the conditional effect of ACE on health. Skopp et al. (2011) novel investigation on the interaction between military unit cohesion (i.e., the horizontal bonding together of soldiers within a military unit) and ACE was associated with suicidal ideation, such that stronger unit cohesion weakened the conditional effect of ACE on suicidal ideation. Given that this study suggests later-life positive social experiences may reduce ACEs' deleterious effects on poor health, more research is needed to advance the possibility that modifiable factors (e.g., various forms of social support) may reduce the conditional effect of ACE on health risks in military samples. In other words, it is of more theoretical import and practical benefit for military-ACE research to examine factors that may change the strength of (i.e., moderate) the conditional effect of ACE on health.

THEORETICAL AND CONCEPTUAL FRAMEWORK FOR THIS STUDY

Framework for Mediation Analysis. The need for more mediation studies extends beyond just the simple replicative value that they may offer the military-ACE field, but are strongly theoretically justified. Recall the allostatic load model that posits

there are long-term biologic consequences from ACE exposure. The evidence for the consequences of allostatic load then manifest in adulthood through the *stress generation model* – where persons essentially become active participants (e.g., through automatic negative thoughts about the world being dangerous, exaggerated perceptions of adversity, and impairment in forming social connections, etc.) in their chronic stress leading to greater health disparities compared to non ACE-exposed populations (Hammen, 2006; Hostinar et al., 2015). Reflecting this model, a growing body of evidence finds that adults with previous ACE exposure are frequently overprotective and mistrusting of others, with consistent problems making and maintaining close social ties (Umberson, Williams, Thomas, Liu, & Thomeer, 2014).

The stress generation concept originated in depression research following work by Brown and Harris (2012) that first examined the role of contextual factors in assessing for depression over more traditional self-report measures. Rooted in action theory – wherein persons are instrumental in forming their own environments – this early depression research introduced methods allowing for the distinction of stressful events brought on independent of, versus those that were at least partly dependent on, individual characteristics (Brown & Harris, 2012). There are now substantial data that (but not exclusive to) depressed populations experience an abundance of stressors, in part due to their own vulnerabilities (Hammen, 1991; Hammen, Davila, Brown, Ellicott, & Gitlin, 1992; Hammen, Shih, & Brennan, 2004; Hankin, Kassel, & Abela, 2005).

There is also evidence supporting the penalty of allostatic load manifesting in adulthood through the *stress sensitization model*. Recall that in this model, vulnerability

to the effects of later stressful life events are amplified because of ACE exposure (Hostinar et al., 2015). In other words, ACEs condition people towards psychopathology by decreasing their tolerance to comparatively insignificant stressors in adulthood (McLaughlin, Conron, Koenen, & Gilman, 2010). Several nationally representative, clinical, community, and military sample studies document this 'sensitizing effect' between ACEs and mental health, across depression, anxiety, and PTSD (Bandoli et al., 2017; Dougherty, Klein, & Davila, 2004; Espejo et al., 2007; Hammen, Henry, & Daley, 2000; Harkness, Bruce, & Lumley, 2006; Kendler, Kuhn, & Prescott, 2004; McLaughlin et al., 2010; Rudolph & Flynn, 2007; Thalida, Arpawong, & Phillips, 2016). However, this research includes only a single military sample (new recruits), greatly reducing the generalizability of this phenomenon across more representative military samples.

Collectively, these models provide strong theoretical reasons to suspect that ACE exposure will create distinct causal pathways that link relationships in adulthood to health in this military sample. It is not known however if relational pathways are significantly implicated in ACE-exposed service members.

Framework for Moderation Analysis. The benefits of positive social support on health and longevity are widely acknowledged by experts and policymakers (Umberson et al., 2014). Substantial research has found that social support predicts both better physical (Uchino, 2009) and mental health, lower prevalence of morbidity and mortality, and longer life (Cohen et al., 2003; Thoits, 2011; Uchino, 2006). In addition to received social support, evidence shows that those who expect to receive support from others when needed, i.e., they perceive social support (PSS), are protected from the unhealthy

effects of life stress (Cohen, 2004). Research on PSS consistently demonstrates strong associations with lowered stress and better mental health. In fact, some studies show that PSS is a greater safeguard against mental health problems than received (actual) social support (Cohen & Wills, 1985; Evans et al., 2013), and others show that perceived support is more consistently linked to positive health outcomes than actual social support (Haber, Cohen, Lucas, & Baltes, 2007).

Military social support and cohesion. Workplace social support has to do with receiving or perceiving the availability of support offered to a worker and is generally concerned with countering occupational stress (Beehr, 2014). Workplace social support may be provided by persons internal to organizations (e.g., supervisors, coworkers, subordinates) and by persons outside of the organization (e.g., family members and friends). This is echoed in military research, where social support is conceptualized either as formal support from military leaders (i.e., vertical leader behaviors that reinforce subordinate perceptions of competence in the leader, which promote trust and confidence in the organization) and informal (i.e., horizontal or peer to peer bonding) support from unit members along with family and friends (Bowen & Martin, 2011; Cederbaum et al., 2017; Keller, 2005; Wilcox, 2010). Regarding overall employee health and wellness, research demonstrates that the strongest effects occur between employee and supervisor (Beehr, 2014). The evidence is mixed on whether or not this framework holds true in military samples.

For example, military leadership is known to positively influence soldiers' health and their ability to adapt to stress especially in combat (Britt et al., 2012). Yet, there is

also evidence that informal social support is critical to military members' general functioning (Burrell, Durand, & Fortado, 2003). A meta-analysis of the military unit cohesion literature found that cohesion was positively related to self-rated physical and psychological wellbeing (Oliver, Harman, Hoover, Hayes, & Pandhi, 1999). More recently, an exhaustive review by Keller (2005) demonstrated the instrumental effect of military leadership on service member wellbeing while also finding signficant effects from unit cohesion. His review found that leadership consistently demonstrated a stress-buffering effect related to lower combat and occupational stress, lower psychological distress, improved unit performance, and similarly, that unit cohesion was associated with greater resolve to accomplish the mission in stressful situations, lower combat stress, greater empathy towards group members in stressful situations, higher job satisfaction, and better performance (Keller, 2005).

Most recently, substantial research shows that social support provided by both military unit personnel and family and friends is related to less fewer PTSD symptoms and even decreased symptom severity following military deployment (Armistead-Jehle, Johnston, Wade, & Ecklund, 2011; Boscarino, 1995; Brailey, Vasterling, Proctor, Constans, & Friedman, 2007; Dickstein et al., 2010; Han et al., 2014; King, King, Fairbank, Keane, & Adams, 1998; King, King, Vogt, Knight, & Samper, 2006; Pietrzak et al., 2010). Only a single study was inconclusive on whether social support moderated the effect of combat exposure on PTSD (Moore et al., 2017). Social support was also found to be a protective factor for depressive symptoms and expressions of violence in

military samples (Elbogen et al., 2014; Pietrzak, Johnson, Goldstein, Malley, & Southwick, 2009; Van Voorhees et al., 2018).

Stress Buffering Theory. Despite decades of research, and universal agreement on the worth of social support in increasing social and psychological well-being and reducing stress, social scientists have failed to identify a single, unifying theory behind the social support thesis (Rodwell & Munro, 2013). Stress buffering is one of the two theories that dominates the literature. Stress buffering happens when social support protects people from the negative effects of stress. In other words, when those in stressful situations receive support that matches the demand of the stressor enacted, they are protected from the stress (Cohen & Hoberman, 1983; Lakey et al., 2016). Often this effect is demonstrated by an interaction between 'stress' and 'support' in general linear modeling (Lakey et al., 2016). A tremendous amount of research on social support is guided by the assumption that social support's link to mental health reflects stress buffering. Evidence for stress buffering is indicated when the link between life stress and poor mental health is stronger for people with low social support than for people with high social support or when in the face of stress, people with higher social support maintain better mental health than people with less social support (Woods et al., 2016).

Main Effects/Relational Regulation Theory. Although the stress buffering theory has historically dominated social support research, well replicated main effects models between *perceived* social support and mental health, *regardless of the presence of stress*, demonstrate a shortcoming of the stress buffering/coping theory (Lakey & Orehek, 2011; Lakey et al., 2016; Rodwell & Munro, 2013). In other words, main effects occur when

people with high social support have better mental health than those with low social support, regardless of stress levels. Simply put, the relationship between social support and mental health may not depend on experienced stress. Relational regulation theory (RRT) surmises that people regulate their affect by means of their connections in a variety of relationships to advance their mental health, regardless of the presence of perceived stress (Rodwell & Munro, 2013). According to this theory, individuals adjust their affect, cognitions, and behaviors on a near constant basis through ordinary conversation and shared experiences (Woods et al., 2016). When breakdowns in such regulation occur (e.g., experiencing disruptions in social networks, living in isolation, etc.), poorer mental health, including mental disorders, result (Woods et al., 2016). The chief tenet of this theory is that social support is a essentially a relational structure, and as such, people create their ideas of support through interaction (i.e., conversation, common activities, making relationships) (Rodwell & Munro, 2013). Thus, as perceived support develops through regular social contact, perceived support should be strongly relational, too (Kenny, 1994). Rather than interactions and conversations about learning how to cope with stress, Lakey and Orehek (2011) posit that the connection between perceived support and mental health arises principally out of the routine, yet affectively influential, conversations about everyday life, and through shared, common experience. As noted, this theory posits that main effects occur when people with high support demonstrate better mental health that those with low support, regardless of the presence or absence of stress. Direct effects are manifest through simple correlations between support and mental health where there is no interaction effect (Lakey et al., 2016).

Summary. In sum, the research covered in this review clearly indicates that compared to those without military experience, military members possess far greater exposure to ACEs – a primary contributor of allostatic load. Further, military service is a highly-relational and often highly-stressful occupation. Various stress theories and empirical research demonstrate that ACEs are a well-established pre-service vulnerability that could potentially be reactivated through military service-related stress. Although research on this phenomena is limited, there is sufficient reason to suspect that ACEs may be associated with military members' mental health risk through social pathways. More research on social factors that may mediate this relationship is clearly indicated.

Research also demonstrates that social support is a powerful factor that may assist in protecting against the negative effects of stress. There is empirical support that increased military unit cohesion enhances resilience (i.e., the ability to handle typical military-related stressors) (Brailey et al., 2007). Yet there has been little exploration of the unique contribution of distinct types of social support on this relationship among military members (Hoge et al., 2004) in general or on ACE-exposed military members who are among the most vulnerable health demographic in the military.

Based on the theories and empirical research discussed in this dissertation, and given that the various forms of social support can be fostered (i.e., manipulated through training or leader development), social support is an important source of resilience for military-related stressors. This also indicates that social support should be a critical element of prophylactic mental healthcare policy, practice, and research (Brailey et al., 2007). Thus, the primary purposes of this dissertation are to determine if (1) various

social factors mediate the relationship between ACEs and service members' mental health, and (2) do the effects of ACEs on service member mental health depend on various social support behaviors. This project follows the progression of military ACE-related research grounded in theory and a firm empirical basis with the potential to help protect against ACE-implicated mental health risks among military members.

RESEARCH QUESTIONS AND HYPOTHESES

Research Question 1. Do social factors (e.g., unit cohesion, task cohesion, perceived organizational support, anxiety in experiencing close relationships, NCO and officer leader support) and alcohol misuse, mediate the relationship between ACEs and anxiety, PTSD, depression, aggressive behavior, somatic symptoms, and self-rated health. Figure 3.5 is an example of the structure for testing each hypothesis outlined below and will be repeated for each variable of interest.

Hypothesis Testing. H1a: ACEs will have a *direct positive* effect on poor NCO and officer leader support, anxiety in experiencing close relationships, and alcohol problems. In turn, poor NCO and officer leader support, anxiety in experiencing close relationships. and alcohol problems will each have a *direct positive* effect on aggressive behavior, depression, anxiety, PTSD symptoms, and somatic symptoms and a *direct negative* effect on self-rated health.

Hypothesis Testing. H1b: ACEs will have a *direct negative* effect on positive NCO and officer leader support, unit cohesion, organizational support, and task cohesion. Subsequently, positive NCO and officer leader support, unit cohesion, organizational support, and task cohesion will each have a direct negative effect on aggressive behavior,

depression, anxiety, PTSD symptoms, somatic symptoms and a *direct positive* effect on self-rated health.

Research Question 2. Does social support (e.g., unit cohesion, task cohesion, perceived organizational support, perceived officer and noncommissioned officer support, and anxiety in experiencing close relationships) moderate the effect of ACEs on anxiety, PTSD, depression, alcohol misuse, aggressive behavior, somatic symptoms, and self-rated health? Figure 3.6 is an example of the structure for testing each hypothesis outlined below and will be repeated for each variable of interest.

Hypothesis Testing. H2: The effect of ACEs on anxiety, PTSD, depression, alcohol misuse, aggressive behavior, somatic symptoms, and self-rated health will be weaker among persons who perceive their NCO leader support quality to be high and stronger among service members who perceive their NCO leader support to be low; weaker among service members who perceive their officer leader support quality to be high and stronger among service members who perceive their officer leader support to be low; weaker among service members who perceive their units to be more cohesive and stronger among service members who perceive their unit to be less cohesive; weaker among service members who perceive a greater sense of unity towards a common task/ mission completion and stronger among service members who perceive less unity towards a common task/mission; weaker among service members who perceive their organization to be more supportive and stronger among service members who perceive their organization to be less supportive; and stronger among service members who

experience greater anxiety in close relationships and weaker among service members who experience less anxiety in close relationships.

The following chapter describes the research methods that will be used in this dissertation. It will describe study design, participants, and procedures, followed by an overview of the data analytic methods used in the study. Lastly, it describes the operationalization of the study variables.

Chapter 3: Study Methods

Analysis Introduction

The study employed a cross-sectional data set gathered through the Walter Reed Army Institute of Research (WRAIR) Military Operational Medicine Research Program (MOMRP) funded protocol – *The Land Combat Study 2: Impact of Deployment and Combat Experiences on the Mental Health and Well-being of Military Service Members and their Families*. The original study protocol was initiated in 2008 for a period of up to ten years with the aim of obtaining data on the mental health and well-being of service members and their spouses to inform the military about the pervasiveness of mental health and alcohol use problems, barriers to seeking or receiving care, risk and protective factors for mental health, and estimates of comorbid mental and physical health problems to help inform intervention strategies (Riviere, 2018).

Under the WRAIR IRB protocol the researchers were allowed to enroll up to 70,000 service members and 10,000 spouses in the study. The core protocol functioned as the umbrella under which sub-studies occurred, allowing for many data collection opportunities over time. Study sites were determined in cooperation with local military leadership and were based on unit availability and deployment status in both the Continental United States and at locations outside the Continental United States (Riviere, 2018).

Study Design. The current study used data from a survey implemented in garrison (i.e., where troops are stationed when not deployed) settings where the research staff maintained control over all aspects of survey distribution and collection. The study

design was a unit-based (battalion-level) single time point (cross-sectional) collection using a unique personal study pin code to track individuals within the units. Battalions vary in size from several hundred to one-thousand soldiers. Each one is commanded (i.e., led) by a senior officer (e.g., lieutenant colonel) along with a senior NCO (e.g., command sergeant major) who serves as the commander's principal advisor for all soldier affairs. Soldiers were given participant information sheets that provided study details, informed individuals that participation was voluntary, and listed the contact information of the PIs as well as the WRAIR Human Subjects Protection Branch (HSPB). Only data from those persons who agreed to have their responses used for research purposes were utilized in this sample. An education partnership agreement (EPA) was established between WRAIR and the University of Texas at Austin, and each IRB approved this study's protocol. Data were deidentified prior to the University of Texas at Austin receiving the data.

Participants. For the purposes of this dissertation, participants are limited to soldiers enrolled under a site-specific addendum (SSA) to the core protocol. Self-reported survey responses were collected from 1,316 soldiers from a single U.S. Army brigade combat team (BCT) six months after they returned from a deployment to Iraq in 2009 (Santiago et al., 2010). BCTs contain several battalions, comprised typically of 1,200 to 3,000 soldiers. During deployments, BCTs are sufficiently staffed and resourced to conduct independent combat operations (as opposed to battalions that are generally not equipped to conduct and sustain indepedent operations). Survey items used in this dissertation include demographic characteristics, ACEs, combat experience, social

support experience, mental health problems, and maladaptive coping behaviors. Approximately 50% of soldiers from the participating unit were available during survey administration, with the remainder unavailable primarily due to duty obligations or training. Participants received a complete description of the study and the survey at their duty station, and written informed consent was obtained. Participation was voluntary, and responses were anonymous

ANALYTIC METHODS

Mediation Analysis. This dissertation employed structural equation modeling (SEM) using the statistical package SPSS/AMOS (v25) for the mediation analysis to analyze data extracted from the Land Combat 2 study (2009). SEM integrates measurement theory, factor analysis, regression analysis, simultaneous equation modeling, and path analysis (Kline, 2015). SEM applies a "confirmatory (i.e., hypothesis-testing) procedure to the analysis of a structural theory on some phenomenon" (Byrne, 2016, p. 3). In other words, SEM is an exemplar of theory-based path analysis using latent variables, and now commonly used to depict causal or significantly contributory relationships in multivariate behavioral science data (McDonald & Ho, 2002).

SEM's appeal for this proposal is threefold: First, SEM is suitable for analyzing large sample data (Kline, 2011). Second, SEM is useful to behavioral scientists who are often interested in examining theoretical constructs (e.g., depression, anxiety, bipolar, etc.) that cannot be plainly seen (directly perceived) and therefore cannot be directly quantified or evaluated. As Figure 3.4 shows, SEM allows researchers to operationalize latent variables (depicted by elipses) in terms of visible behavior believed to most aptly

express them (depicted by rectangles) (Byrne, 2016). Lastly, SEM has the capacity to blend multivariate techniques such as linear regression analysis and factor analysis–all at once–as a means to execute total model testing of several latent variables, in contrast with testing singular latent variables through a repeated set of models (Kline, 2015; Rizzo & Kintner, 2013). Generally speaking, four steps are involved in structural equation modeling: model specification, model identification, model estimation, and model fit (Kenny, 2011b).

Model Specification. This first step is essentially a statement of the theoretical model as a set of structural equations (e.g., regressions) (Kenny, 2011b). Generally, this statement involves stating the statistical hypothesis consisting of two main parts: The measurement model and the structural/path model (Byrne, 2016; McDonald & Ho, 2002; Schreiber, Nora, Stage, Barlow, & King, 2006).

Measurement Model. The measurement model, "defines relations between the observed and unobserved variables" (Byrne, 2016, p. 13). In other words, it focuses on how and to what extent the observed variables are linked to their underlying latent factors (Kline, 2015). This is accomplished primarily through confirmatory factor analysis (CFA). First, several indicator variables are developed for each model. Then, using a sufficiently large (i.e., representative sample), factor analysis is used to establish whether the latent variable accounts for all of the correlations between the indicator variables (Figure 3.4). Testing the structural model occurs only after ensuring that the measurement model has been validated.

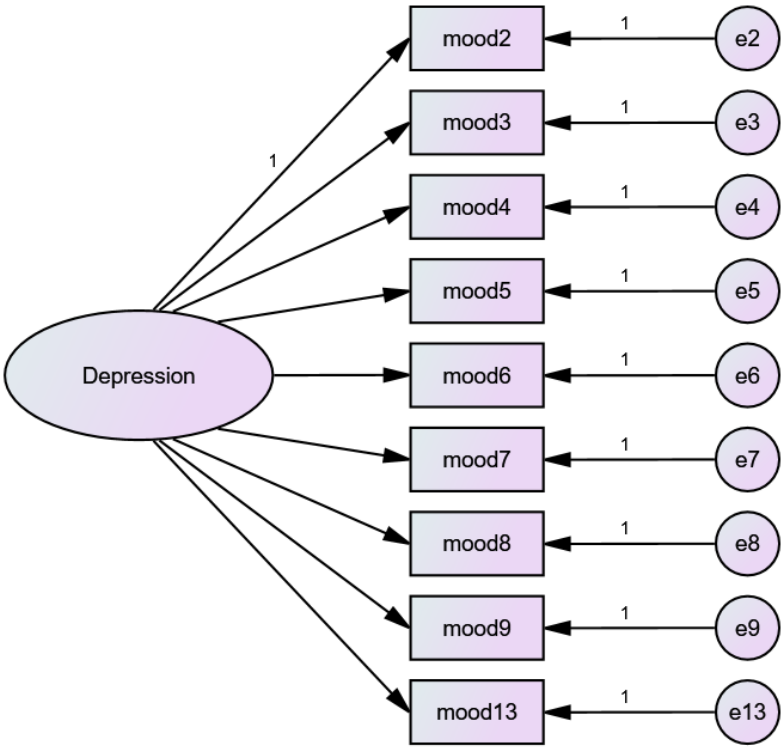


Figure 3.1. Example of a confirmatory factor anlaysis for Depression. e=error.

Structural Model. Based on theory and empirical research, a statistical model is hypothesized (Figures 3.5 and 3.6). This structural/path model portrays relations traditionally acknowledged to be approximately causal between the variables (McDonald & Ho, 2002). Testing the structural/path model is accomplished primarily through path analysis with latent variables (Kline, 2015).

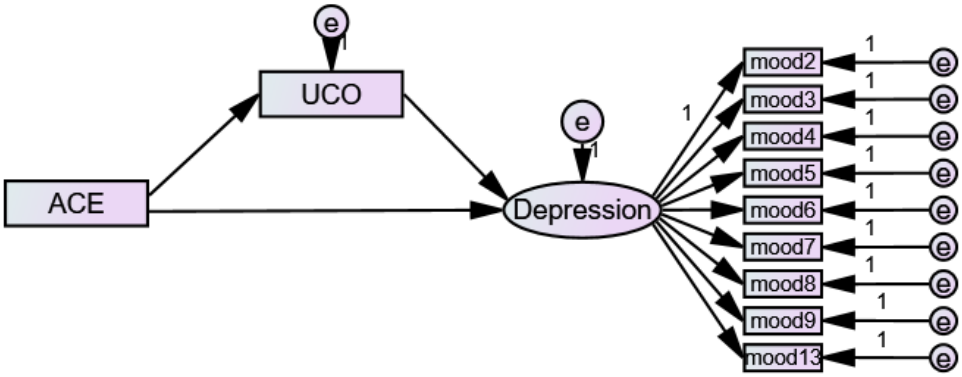


Figure 3.2. Example of a hypothesized structural model of unit cohesion mediating the effect of ACE on depression.

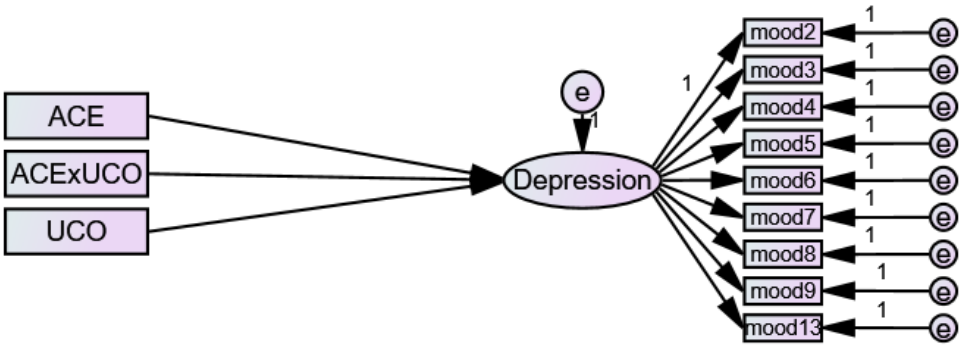


Figure 3.3. Example of a hypothesized structural model of unit cohesion moderating the effect of ACE on depression.

***Model Identification*.** In the second step, model identification, a determination is made about whether the model can–in theory and in practice–be estimated with observed data (Kenny, 2011b). Identification refers to the relationship between what will be estimated (the unknown or free parameters) and the known values (i.e., variances and covariances) used to derive these estimates. Establishing the number of degrees of freedom for a model involves subtracting the number of free (or unknown) parameters

from the known values (Byrne, 2016; Kenny, 2011b). A model is said to be identified if there is a unique solution for all of the model's parameters. In other words, the number of known values must equal or exceed the number of free parameters–this is sometimes referred to as the t rule (Crockett, 2012). If there is no unique solution (i.e., the number of known values does not equal or is less than the number of free parameters in the model), then the model is under-identified, cannot be estimated, and should be rejected (Kenny, 2011b). A model is just-identified/saturated if the number of free parameters exactly equals the number of known values, (i.e., a model with zero degrees of freedom). A model is over-identified if there are more known than unknown parameters–this type of model is preferred. If a model is just- or over-identified, analysis may proceed (Kenny, 2011b; McDonald & Ho, 2002).

***Model Estimation*.** Model estimation, the third step, involves evaluating how well the hypothesized model fits the observed data by statistically estimating the best parameters for a proposed model from the data (Myung, 2003). Various estimation procedures can be used in SEM (e.g., maximum likelihood, ordinary least squares, generalized least squares) (McDonald & Ho, 2002). Maximum likelihood estimation (MLE) is the default estimation method for estimating parameters in SPSS/AMOS and will be used in this project. The goal of MLE is to determine the parameter values that maximize the likelihood that the model's iterative process generated the observed data (Myung, 2003). Or stated differently, the focus of this estimation process is to produce "parameter estimates such that the residual between the sample covariance matrix and the population covariance matrix implied by the model is minimal" (Byrne, 2016, p. 90).

Assessment of Model Fit. Assessment of fit has to do with determining the goodness-of-fit between the hypothesized model and the sample data. Good-fitting models are those that are consistent enough with the data that they do not need re-specification (Kenny, 2014). There are a variety of ways to assess fit. Evaluating the model should take multiple perspectives, focusing on the adequacy of the parameter estimates and the model as a whole (Kline, 2015). When considering parameter estimates, generally, what matters most is the feasibility of the parameter estimates, the appropriateness of the standard errors, and the statistical significance of the parameter estimates (Byrne, 2016; Kline, 2015). When observing model fit, various indices should be reviewed. What follows is a brief overview of the most critical goodness-of-fit statistics based on their support in literature as vital fit indices that should be reported (Byrne, 2016).

Absolute fit indices. Absolute measures of fit assume that the best fitting model has a perfect fit (chi square=0). Because these fit statistics govern how far the model is from a perfect fit, they are typically "badness" measures of fit in that the larger the index, the worse the fit is (Kenny, 2014). Included first is the $\chi 2$ (CMIN), where the aim is to reproduce the estimated model. This index represents the discrepancy between the unrestricted covariance matrix and the restricted covariance matrix. Lower $\chi 2$ and non-significant p values are preferred (Kline, 2015). However, this statistic can be affected by poor model fit, non-normal data, larger correlations that can inflate the $\chi 2$, and larger sample sizes, and is therefore not considered to be the most useful fit index among researchers (Newsom, 2012). Another absolute fit statistic is the relative $\chi 2$ (CMIN/DF).

This statistic is the $\chi 2$ divided by the degrees of freedom. This index is considered to be less sensitive to sample size. The criterion for acceptance varies across researchers, ranging from less than 2 (Ullman & Bentler, 2012) to less than 5 (Lomax & Schumacker, 2004). A final absolute fit statistic is the Root Mean Square Error of Approximation (RMSEA). Again, an optimal score is 0, but scores ≤ 0.05 are acceptable, or ≤ 0.08 with lower confidence intervals (Kline, 2015). Generally, the RMSEA value decreases with more degrees of freedom or larger sample sizes. Another absolute measure of fit is the Standardized Root Mean square Residual (SRMR) where a value of $<.08$ is considered a good fit. A final index to be mentioned is the Expected Cross Validation Index (ECVI). The ECVI is an example of a transformation of the $\chi 2$, representing whether or not there is a change in model fit when comparing models. Specifically, individual values have no meaning, but to the extent that those values continue to decrease, those values do matter.

Incremental fit indices. Similar to the R2 test statistic, this index represents how close data are to the fitted regression line. Since it measures the relative improvement in the fit of the model over that of a baseline model (independence or null) (Kline, 2015), a value of zero shows the worst possible model, whereas a value of one demonstrates the best possible fit (Kenny, 2014). Examples of these statistics include the Normed Fit Index (NFI), where values between .90 and .95 are considered marginal, above .95 is good, and below .90 is considered to be a poor fitting model (Kenny, 2014). However, because this particular statistic underestimates fit in smaller samples, other incremental indices are recommended (Kline, 2015). One of them, the comparative fit index (CFI), adjusts for sample size and is often reported in the literature, with values ≥ 0.95 indicating a good

fitting model. Another index, the Tucker-Lewis Index (TLI), reflects the amount by which the hypothetical model improves fit compared to the null model, and like the CFI, is generally not influenced by sample size (Kline, 2015).

***Model Modification and Respecification*.** Even though SEM is considered a confirmatory statistical approach, modifications to the hypothesized model are allowed as long as they are in line with theory (Rizzo & Kintner, 2013). Validation of both the measurement and structural (path) model often occurs through model respecification, whereby empirical tests (e.g., modification indices and other coefficient values) are used to adjust one or more models to improve model fit, (i.e., the extent to which the covariances predicted by the model correspond to the observed variances in the data), and to the extent that such changes are warranted by theory (Kenny, 2011a; Schreiber et al., 2006). Model respecification to improve fit may include adding covariance lines between error terms, eliminating non-significant covariances or path lines, or adding significant paths.

Moderation Analysis. The main statistical analyses for testing moderation were carried out with MPlus software, version 7.2. This portion of the dissertation focused on examining the moderating effect of various types of social support on the conditional effect of ACE on various health outcomes among military members. The primary data analytic approach for this portion of the study was a test of moderation to determine if, and when, the circumstances for the conditional effect of the predictor variable ACE on various health outcomes is present, enhanced, or inhibited by different types of social support. In these moderation models, the outcome variables of depression, anxiety,

PTSD, alcohol problems, self-rated health, aggressive behavior, and somatic symptoms were individually regressed on ACE, and with the interaction terms of ACE*each measure of social support. Criteria for determining statistical significance in these analytic models was $p < .05$.

MEASURES

Dependent (Endogenous) Variables.

Anxiety (GAD-7). The GAD-7 is a 7-item screening tool and symptom severity measure for the four most common anxiety disorders (Generalized Anxiety Disorder, Panic Disorder, Social Phobia and Posttraumatic Stress Disorder). Scores for each of the seven items range from "0" (not at all) to "3" (extremely difficult), providing a severity range of 0–21. Higher GAD-7 scores correlate well with anxiety symptom-related problems. Anxiety severity scoring is as follows: 0–4, none; 5–9, mild; 10–14, moderate; ≥15, severe (Spitzer, Kroenke, Williams, & Löwe, 2006). The GAD is 70-90% sensitive and 80-90% specific across disorders (Kroenke, Spitzer, Williams, Monahan, & Löwe, 2007; Ruiz et al., 2011; Spitzer et al., 2006).

Post-Traumatic Stress Disorder Checklist (PCL). Demonstrating good psychometric properties, the PCL is a 17-item tool measuring the severity of *Diagnostic and Statistical Manual of Mental Health Disorders*, Fourth Edition (DSM-IV-TR) PTSD symptoms. All items are assessed on a 5-point Likert scale ranging from 1 ("Not at all") to 5 ("Extremely"). Versions of the PCL have been validated for use with military personnel or veterans and civilians, and for assessment of specific traumatic experiences (Adler, Bliese, McGurk, Hoge, & Castro, 2011; Holliday, Smith, North, & Surís, 2015).

Symptom severity scores are provided for the total (ranging from 17–85) and for each symptom cluster (intrusive re-experiencing, avoidance and numbing, and hyperarousal). Symptoms rated 3 ("Moderately") or higher suggest clinically distressing symptoms. The PCL demonstrates strong internal consistency across each symptom cluster group, and the total symptom score with Cronbach's α ranging from 0.92–0.97 (Holliday et al., 2015). It also has strong test-retest reliability (r = 0.96) and equally strong concurrent validity to other PTSD measures (Holliday et al., 2015). In the Land Combat Study 2, the PCL was used to measure symptoms over the past year, relative to a specific military-related trauma (Holliday et al., 2015).

Depression (PHQ-9). The Patient Health Questionnaire (PHQ)-9 is the Major Depressive Disorder (MDD) module of the full PHQ. This 9-item tool has good psychometric properties and assesses an individual's degree of depression. Scores for each of the nine items range from "0" (not at all) to "3" (nearly every day), providing a severity score of 0-27. Higher PHQ-9 scores are associated with decreased functional status and increased depressive symptom-related difficulties (depression severity scoring: between 0–4, minimal or none; 5–9, mild; 10–14, moderate; 15–19, moderately severe; 20–27 severe). PHQ-9 scores ≥10 have both sensitivity and specificity of 88% in detecting MDD (Arroll et al., 2010). The PHQ-9's criterion and construct validity were assessed with 3,000 primary care patients and replicated with 3,000 obstetrics-gynecology patients and found to be reliable (Arroll et al., 2010; Kroenke, Spitzer, & Williams, 2001).

Somatic Symptoms (PHQ-15). This is the somatic symptom module of the full PHQ. The instrument assesses self-reported physical (somatic) symptoms. Research supports the PHQ-15's reliability as a gauge of somatization syndromes in the general population (Kocalevent, Hinz, & Brähler, 2013; Kroenke et al., 2001). In *The Land Combat Study 2*, 12 of the original PHQ-15 items and two items that are similar to items from the PHQ-9 as substitutions for measuring sleep quality were used. Items are scored on a 3-point scale with "Not bothered" =0, "Bothered a little" =1, "Bothered a lot" =2. Items are summed with scores ranging from 0–28 and higher scores indicating greater symptom severity.

Alcohol Misuse (ALC). This is a combined measure merging Brown, Leonard, Saunders, and Papasouliotis (2001) Two-Item Conjoint Screen (TICS) for alcohol use and an abbreviated alcohol-related risk behavior inventory. TICS was developed to quickly screen young and middle-aged adults for alcohol and drug problems in civilian primary care settings. The TICS version utilized by the DoD was adapted to measure alcohol use only. The DoD selected and adapted the TICS because of its brevity and acceptable psychometric properties, and it demonstrated good psychometric properties in a military population against structured clinical interviews (Santiago et al., 2010; Wilk et al., 2010). In its present form, soldiers are asked nine 'yes' (scored 1) or 'no' (scored 0) questions. Scores range from 0–9, with higher scores indicative of more alcohol use problems.

Aggressive Behavior (AB). This 4-item measure assess problems with aggression. The items were informed by the literature (Killgore et al., 2008; Kulka et al., 1990;

Spielberger, 1999) and based on longer aggression/hostility scales. Items are scored on a 5-point scale and summed to create a composite score (ranging from 4–20) with higher scores indicating higher aggression levels (Cabrera, Bliese, Hoge, Castro, & Messer, 2010).

Self-rated Health (SRH). This item measures self-rated health, specifically self-rated general health. Soldiers are asked how they rated their overall health (from "poor" to "excellent" with scores ranging from 1-5). Research demonstrates that self-rated health is a strong predictor of mortality (Schnittker & Bacak, 2014). Two systematic reviews of the association between self-rated health and mortality found notably consistent findings (DeSalvo, Bloser, Reynolds, He, & Muntner, 2006; Idler & Benyamini, 1997). Persons who rated their health as poor had twice the risk of mortality compared to those who reported excellent health, and this relationship remained robust even after adjusting for covariates (DeSalvo et al., 2006).

Independent (Exogenous) Variables.

Adverse Childhood Experiences (ACE). ACEs were measured with a modified (4-item) version of Felitti et al. (1998) 10-item ACE questionnaire, representing the cumulative burden of childhood maltreatment, abuse, and adversity. Felitti et al. (1998) original questionnaire measures the direct experience of any three different categories of childhood abuse: physical abuse, psychological abuse, or contact sexual abuse in the home, along with four categories of household dysfunction: substance abuse, mental illness, intimate partner violence, and incarceration of a nuclear family member before age 18. Several investigators report that the ACE questionnaire has good test-retest

reliability and strong internal consistency with Cronbach's α ranging from 0.81 to 0.91 (Bruskas & Tessin, 2013; Dube, Williamson, Thompson, Felitti, & Anda, 2004; Larkin & Park, 2012; Murphy et al., 2014). For the Land Combat Study, the ACE was abbreviated to four-items. In present form, this measure includes two items for witnessing household dysfunction (e.g., "When you were growing up, was a relative living in your home depressed or mentally ill?"and "When you were growing up, did you live with a relative who was a problem drinker or alcoholic?") and two items for directly experiencing neglect and/or abuse (e.g., "When you were growing up, how often did a parent or adult living in your home swear at you, insult you, or put you down?" and "When you were growing up, how often did a parent or adult living in your home push, grab, shove, slap or throw something at you?"). Responses to each item are 'Yes' (1 point) or 'No' (0 points) and are summed to create a composite score (0–4), with higher scores indicating greater exposure to different categories of childhood abuse and household dysfunction.

Sociodemographic factors. The demographic characteristics used in this dissertation study include age, gender, rank, number of deployments, combat experiences/exposure, and years of service.

Mediating/Moderating Variables.

Officer (OLDR+, OLDR-) and Noncommissioned Officer (NCOLDR+, NCOLDR-) Leader Support. It is well known that leaders can offer diverse forms of support and resources to lessen the adverse health consequences of occupational stress. Simply stated, leader support is essential to, and influences, soldiers' abilities to adapt and remain healthy despite extreme occupational stress (Britt, Davison, Bliese, & Castro,

2004). In this dissertation, perceptions of leadership were assessed with two scales concentrating on officer and Noncommissioned officer (NCO) support. In the U.S. Army, NCOs have the most direct contact and communication with soldiers and are in charge of direct training, while officers have a more indirect influence but have greater responsibility for unit performance (Britt, Dickinson, Moore, Castro, & Adler, 2007). WRAIR generated the leadership items. The scales contain items that evaluate a leader's skill to initiate structure and show consideration for their soldiers (Britt et al., 2007). Previous military research has used this leadership support scale to examine the role of NCO and Officer leader support in military settings (Britt et al., 2004; Britt et al., 2012; Wright et al., 2009). As both positive and negative leader behaviors are assessed, this scale was divided into two subscales representing positive leader support and negative leader support in the current study. The positive leadership subscale contains four behaviors that soldiers rate using a five-point scale ranging from "strongly disagree" to "strongly agree." Scores range from 4–20. The negative leadership subscale contains three behaviors that soldiers rate using the same five-point scale with scores ranging from 3–15. For positive officer and NCO leader support subscales (OLDR+, NCOLDR+), higher scores indicate higher quality officer and NCO leader support, whereas for negative officer and NCO leader support scales (OLDR-, NCOLDR-), higher scores are indicative of poorer officer and NCO leader support

Unit Cohesion (UCO). The measure of unit cohesion was revised from a cohesion scale developed by (Podsakoff & MacKenzie, 1994). Unit cohesion is a military concept, defined by a former United States Army Chief of Staff in the early 1980s as "the bonding

together of soldiers in such a way as to sustain their will and commitment to each other, the unit, and mission accomplishment, despite combat or mission stress" (Manning, 1994). The abbreviated version contains three-items, each measured on a five-point scale ranging from strongly disagree (1) to strongly agree (5). Scores are summed with higher scores representing higher perceived unit cohesion. Both the original and modified scales exhibit acceptable reliability and validity with Cronbach's α ranging from .88-.90 (Britt et al., 2007; Edens, Riviere, Hoge, & Bliese, 2010; Podsakoff & MacKenzie, 1994).

Task Cohesion/Readiness (TCO). WRAIR created a 4-item construct to measure perceptions of unit readiness/collective efficacy (Tucker, Sinclair, & Thomas, 2005). Items are scored on a 5-point scale and summed to create a composite score ranging from 4–20 with higher scores representing higher perceptions of unit/collective readiness. The TCO had good internal consistency (Cronbach's α=0.80).

Perceived organizational support (ORGSPRT). The POS survey measures the extent to which employees perceive that the organization values their contributions and supports their well-being. Often such support is expressed through coaching and mentorship (Wright, Kim, Wilk, & Thomas, 2012), both of which are essential and explicit principles of instruction on effective Army leadership (Army, 2006). The original POS contains 36 items. Lynch, Eisenberger, and Armeli (1999) modified the measure to a short POS (SPOS) scale containing 8 items. The SPOS scale was used with military populations and found to be reliable with a Cronbach's α of 0.92 (Wright et al., 2012). For the Land Combat study, the POS was abbreviated to four-items, each scored on a 5-

point scale and summed to create a composite score of 4–20 with higher scores indicating greater perceived organizational support.

Anxiety in Experiencing Close Relationships (AECR). Following strong empirical interest in adult attachment over the past few decades, there is considerable agreement that adult attachment consists of two dimensions: *anxiety* and *avoidance* (Mikulincer, Shaver, & Pereg, 2003). The AECR scale measures both anxiety and avoidance. In its present form, anxiety items reflect worry about interpersonal rejection or abandonment, an extreme demand for acceptance from others, and anguish when one's romantic partner is unreachable or indifferent (Wei, Russell, Mallinckrodt, & Vogel, 2007). Avoidance items reflect a fear of dependence and interpersonal closeness, an immoderate need for self-sufficiency, and unwillingness to self-disclose (Wei et al., 2007). In the Land Combat Study, WRAIR substituted ‘network of close relationships’ for ‘romantic partner.’

The AECR scale is a 12-item short form of Brennan, Clark, and Shaver (1998) 36-item Experiences in Close Relationships Scale. While being developed, a series of six studies assessed the reliability and factor structure of this construct, finding a good fit to the data (Wei et al., 2007). People who score high on either or both dimensions are assumed to have an insecure adult attachment orientation. By contrast, people with low levels of attachment anxiety and avoidance can be viewed as having a secure adult attachment orientation.

Chapter 4: Results

This chapter describes the results of all dissertation analyses. First, descriptive statistics will be described. Multiple mediation model results will follow. Lastly, moderation model results will be described.

PRELIMINARY ANALYSIS

Sample descriptive statistics are summarized in Table 4.1. The majority of the participants are junior enlisted (43.98%) males (88.48%) with an average of 5.38 (SD=4.89) years of service and 1.52 (SD=1.38) combat deployments. Female participants are also predominately junior enlisted (60.14%) with an average of 5.53 (SD=5.16) years of service and 1.20 (SD=1.08) combat deployments.

Estimates of national ACEs prevalence are collected through the Behavioral risk Factor Surveillance System (BRFSS) – the largest annual state-based survey in the U.S., collecting adult health conditions and risk factor data. Fewer male and female service members (28.8%, 24.3%, respectively) have no ACE exposure compared to nationally representative male and female adults (39.3%, 37.6%, respectively). Fewer male and female service members (17.3% 12.5%, respectively) have one ACE compared to nationally representative male and female adults (24.5%, 22.7%, respectively). More male and female service members (25.9%, 33.8%, respectively) have two ACEs compared to nationally representative male and female adults (13.9%, 12.9%). More male and female service members (17.5%, 17.6%, respectively) have three ACEs compared to nationally representative male and female adults (8.6%, 9.0%, respectively);

Data comparing at least four ACEs cannot be reviewed as this dissertation's data stops at four and nationally representative data combine four or more into one category.

Table 4.1

Sample characteristics, N=1285

Category	**Male** n=1,137 (n) **M/SD**	**%**	**Female** n=148 (n) **M/SD**	**%**
Age				
18-19	(30)	2.60	(7)	4.73
20-24	(500)	43.98	(56)	37.84
25-29	(322)	28.32	(39)	26.35
30-39	(235)	20.67	(38)	25.68
40 or older	(50)	4.39	(6)	4.10
Rank				
E1-E4	(649)	57.08	(89)	60.14
E5-E-9 (NCOs)	(395)	34.74	(43)	29.06
Officer	(88)	7.74	(14)	9.46
Years	5.38/4.89		5.53/5.16	
Deployments	1.52/1.38		1.20/1.08	
Combat Exposure Sum	6.53/5.32		3.08/3.59	
ACE	1.53/1.34		1.68/1.32	
0	327	28.8	33	24.3
1	197	17.3	17	12.5
2	295	25.9	46	33.8
3	199	17.5	24	17.6
4	95	8.3	14	10.3
Outcome Variables				
Depression	13.55/5.58		13.76/6.25	
Anxiety	10.81/5.11		11.57/6.04	
PTSD Symptoms	28.80/14.25		28.31/15.49	
Alcohol Problems	1.19/1.72		0.86/1.64	
Self-rated Health	3.28/1.18		3.01/1.21	
Somatic Symptoms	5.81/5.05		6.99/5.50	
Aggressive Behavior	6.56/3.34		6.39/3.06	
Social Support				

Table 4.1 cntd.

Unit Cohesion	9.67/3.17	8.56/3.57
Task Cohesion	9.51/3.30	8.84/3.56
Organizational Support	11.46/4.47	10.77/4.48
Positive NCO Support	13.29/4.08	12.59/4.41
Negative NCO Support	8.56/3.36	8.16/3.32
Positive Officer Support	12.63/4.30	11.58/4.67
Negative Officer Support	6.43/3.15	6.16/3.28
Anxiety in Close Relationships	18.72/7.06	19.01/7.89

Notes: n=number of participants by gender, *M*=mean, SD=standard deviation, %=percent of each gender's *n*.

Data cleaning deals with determining and eliminating major errors and discrepancies from data to refine the quality of data (Rahm & Do, 2000). Descriptive statistics assessed for outliers and other data quality problems with IBM SPSS software (version 25). Core assumptions about data when using SEM are that the data be continuous and are multivariate normally distributed. All data in this sample were continuous. However, since some data were multivariate nonmormal data, standard errors could be underestimated leading to the potential for Type 1 errors. Therefore, for all mediation analyses, bootstrapping was employed to provide bias-corrected standard errors and 90% confidence intervals. Bootstraping is a resampling procedure that can provide more accurate estimations of parameter estimates through a process where multiple samples of the same size are drawn randomly (with replacement) from the original sample (Byrne, 2016). Lastly, there were minimal univariate outliers and only the most extreme univariate outliers (e.g., cases that have values more than three times

greater than the 75th percentile) were listwise deleted (Inc, 1990), reducing the sample size from 1316 to 1285.

For moderation analyses using linear regression, the ordinary least squares (OLS) assumptions of linearity between the predictors against outcome variables was met, as examinations of scatterplots for each predictor against the outcome variables revealed no clear violations of linearity. Another requirement of OLS estimation is the absence of perfect multicollinearity, as its presence complicates distinguishing the independent effects of the regressors ("The SAGE Encyclopedia of Social Science Research Methods," 2004). Variance inflation factors (VIFs) measuring the impact of collinearity among the independent variables failed to demonstrate multicollinearity as VIF factors were well below the threshold (e.g., highest VIFs were less than 3). Given the data was multivariate nonnormal, the potential for heteroscedastic distributions was present. Histograms of residuals indicated a nonnormal distribution of residuals, confirmed by Kolmogorov-Smirnonov tests. Non-linear transformations failed to fix this issue, resulting in clear violations of homoscedasticity. Without correction, parameter estimates could be unreliable or biased, producing discrepant significance tests (Hayes & Cai, 2007). Therefore, heteroscedasticity-consistent standard error (HCSE), a robust standard errors technique, was employed to provide parameter estimates with unbiased standard errors of ordinary least squares (OLS) coefficients under heteroscedasticity (Hayes & Cai, 2007). Using this technique, models were estimated with OLS, while substituting a different procedure that estimates the standard errors without assuming homoskedasticity (Hayes & Cai, 2007).

MULTIPLE MEDIATION ANALYSES

This portion of the dissertation focused on examining the mediating effect of various types of social support on the effect of ACE on various health outcomes among military members. This section attempts to discern how ACE affects military members' mental health. As previously described, SEM involves testing the measurement model(s) through confirmatory factor analysis (CFA) processes, followed by verifying the models' theoretical projections through path analysis in the structural model (Rizzo & Kintner, 2013). This section reviews results from individual latent factor CFAs, entire-measurement model CFAs, and all hypothesized mediation structural models.

Absolute fit indices govern how well an a priori model fits the sample data, indicating which proposed model fits best (McDonald & Ho, 2002). Chi square (χ^2) was used as it is the traditional measure for evaluating model fit. However, as χ^2 is influenced by sample size and model complexity, other absolute and incremental fit indices were utilized. CMIN/DF was utilized as it helps minimize the impact of sample size on the model (Hooper, Coughlan, & Mullen, 2008). The Comparative fit index (CFI) was utilized as it takes into account sample size – essentially comparing the model to a model that has no relationships (Hooper et al., 2008). Kenny (2014) recommends using the Non-Normed Fit Index (NNFI), also known as the Tucker Lewis Index (TLI) as it is sensitive to more complex models (i.e., the index doesn't increase just because more parameters are added to the model). The root mean square error of approximation (RMSEA) was also utilized as it tells how well the model would fit the populations covariance matrix; in other words, it compares it to the optimal model (Hooper et al., 2008). The ECVI is an

example of a transformation of the χ^2, representing whether or not there is a change in the model fit when comparing models. Specifically, individual values have no meaning, but to the extent that those values continue to decrease, those values do matter. Characteristics of target fit indices are listed in Table 4.2, given the sample size (N = 744) and number of observed variables [m] between 3 and 17.

Table 4.2

Characteristics of Different Fit Indices Demonstrating Goodness-of-Fit

Fit Index	**m < 12**	**12 < m < 30**
χ^2 / *p*-value	Non-significant *p*-values	Non-significant *p*-values
CMIN/DF	Between 2-5	Between 2-5
CFI or TLI	Above .95 or better	Above .92
RMSEA	Values < .07 with CFI ≥.97	Values < .07 with CFI ≥.92
ECVI	That values continue to decrease	That values continue to decrease

Note: m = number of observed variables

CFAs were performed using SPSS/AMOS (25) on data from 744 service members (the maximum number of cases with complete data on all variables used throughout the analysis, including covariates). All CFAs employed Maximum Likelihood Estimation to estimate all parameters. CFAs were first performed on individual latent factors to test the stability of their observed indicators, and then on the full measurement models to identify the degree of interrelationships and covariation between latent constructs for each endogenous primary outcome variable.

Individual latent factor CFAs. Across all latent factors, preliminary evaluations of the assumptions of multivariate normality were all indicative of nonnormally distributed data. Further, having already trimmed the data (i.e. no missing data) for the purpose of establishing appropriate measurement models, no univariate outliers were observed requiring the deletion of additional cases. When indicated by modification indices (MI) suggesting that the model fit could be improved, model respecification (i.e., covarying error terms of survey items) were made one at a time and only when justified by sufficient content overlap (evidenced by similar wording of the survey items), in addition to the expected decrease in the MI score and expected parameter change.

Endogenous variables (outcome). Tables 4.3 through 4.9 and Figures 4.1 through 4.13 summarize initial and final respecified goodness of fit statistics for each individual latent factor. For the sake of brevity, only the indices for the original and final respecified models are presented. In sum, all factors loaded well to the data. Where individual CFA models were just identified (e.g., 0 degrees of freedom), model fit statistics could not be determined; thus, only standardized parameter estimates and squared multiple correlations are presented in Figures 4.6 through 4.8.

Table 4.3

Original and Respecified CFA of Aggressive Behavior, N = 744

Fit Indices	**Original**	**Final**
χ^2 / *p*-value	46.26/ *p*<.001	5.20/ *p*<.05
CMIN/DF	23.13	5.20
CFI	.94	.99
TLI	.82	.97
RMSEA	.17	.07
DF	2	1

Note: DF = degrees of freedom

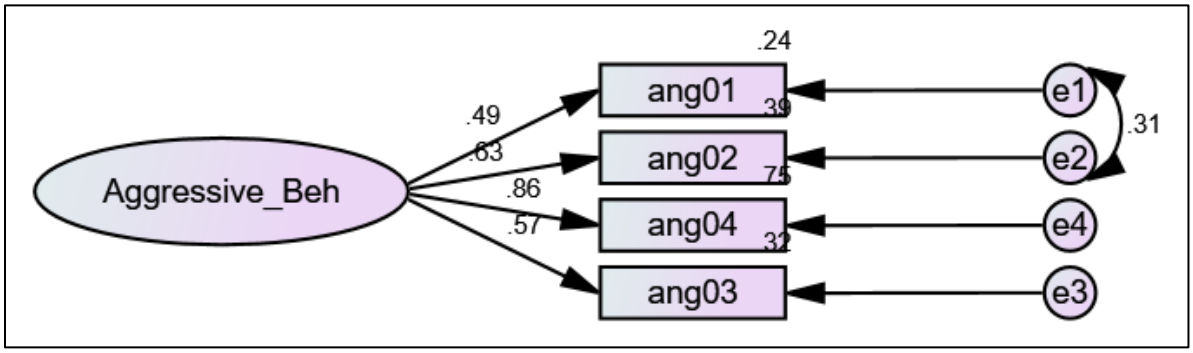


Figure 4.1. CFA of aggressive behavior with standardized estimates

Table 4.4

Original and Respecified CFA of Depression, N = 744

Fit Indices	Original	Final
χ^2 / *p*-value	371.71 / *p*<.001	80.12 / *p*<.001
CMIN/DF	13.77	3.82
CFI	.90	.98
TLI	.87	.97
RMSEA	.13	.06
DF	27	21

Note: DF = degrees of freedom

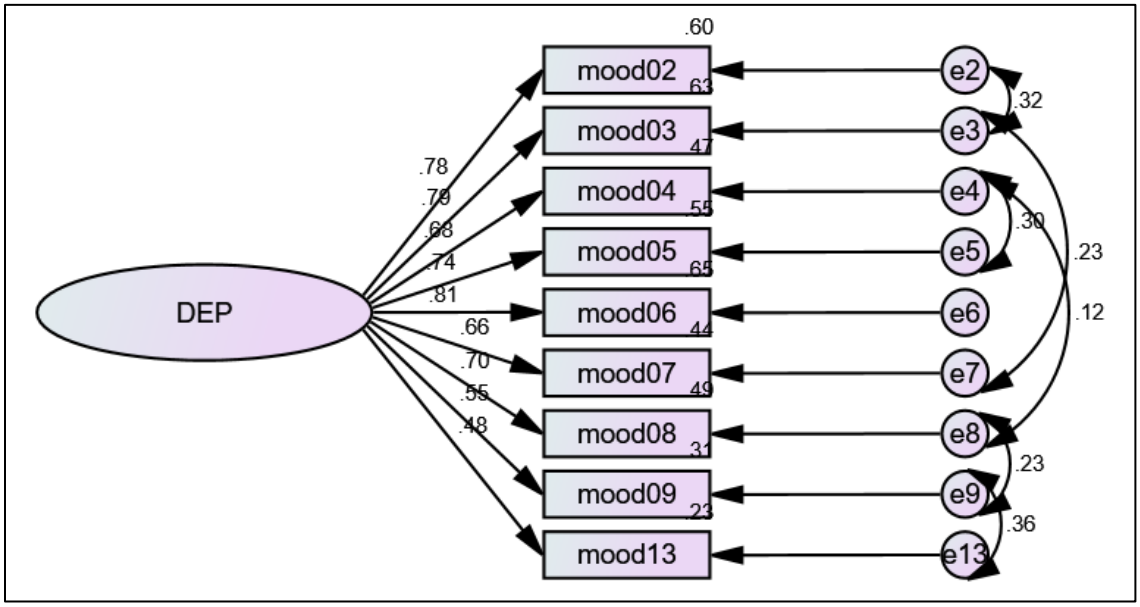


Figure 4.2. CFA of depression (DEP) with standardized estimates

Table 4.5

Original and Respecified CFA of Anxiety, N = 744

Fit Indices	**Original**	**Final**
χ^2 / *p*-value	3257.97 / *p*<.001	51.85 / *p*<.001
CMIN/DF	19.84	5.76
CFI	.96	.99
TLI	.94	.98
RMSEA	.12	.08
DF	14	9

Note: DF = degrees of freedom

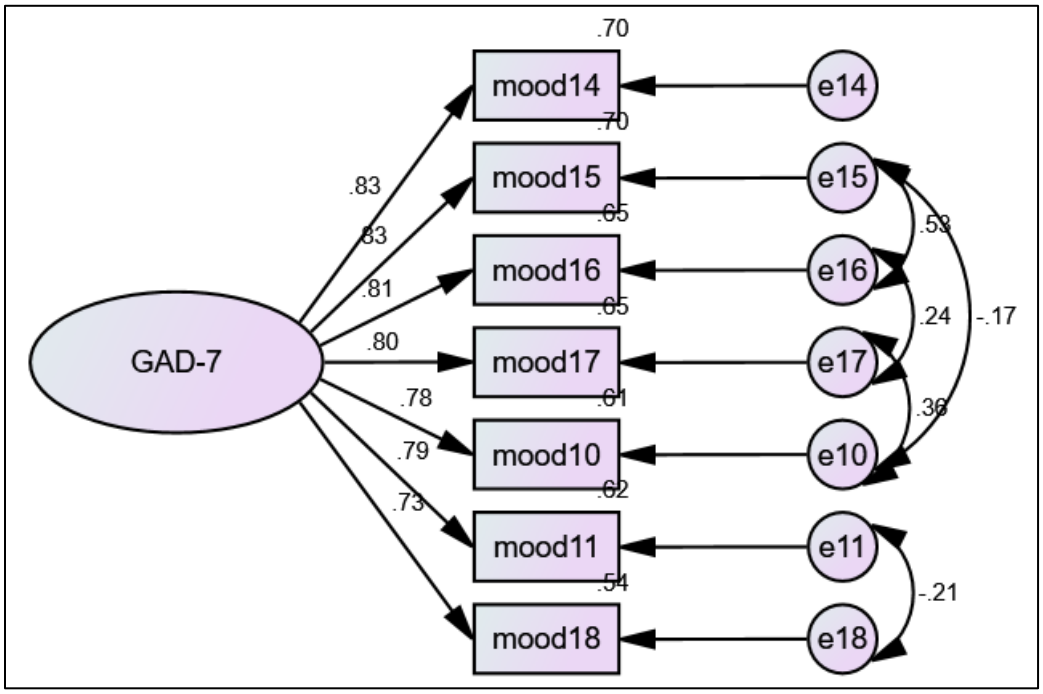


Figure 4.3. CFA of anxiety with standardized estimates

Table 4.6

Original and Respecified CFA of PTSD, N = 744

Fit Indices	Original	Final
χ^2 / *p*-value	1609.09/ *p*<.001	729.18/ *p*<.001
CMIN/DF	13.87	6.8
CFI	.85	.94
TLI	.83	.92
RMSEA	.13	.08
DF	116	107

Note: DF = degrees of freedom

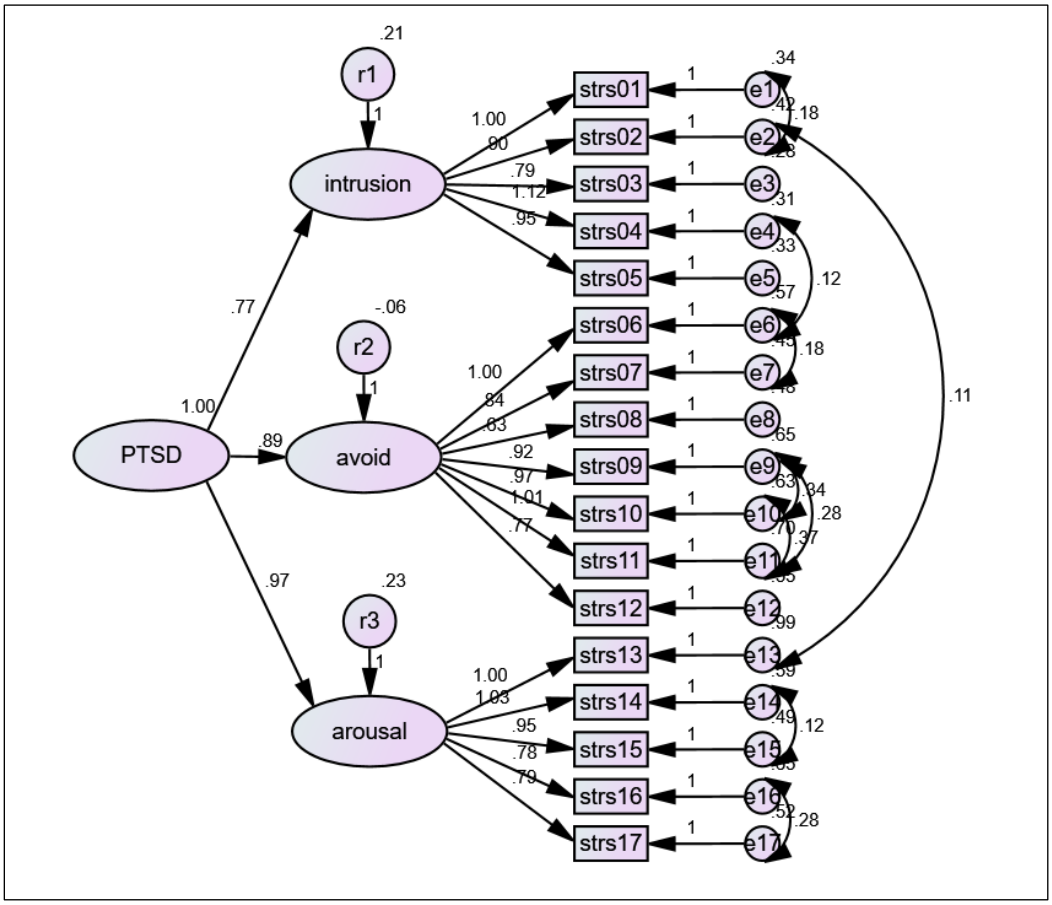


Figure 4.4. CFA of PTSD with standardized estimates

Table 4.7

Original and Respecified CFA of Somatic Symptoms (PHQ15), N = 744

Fit Indices	Original	Final
χ^2 / *p*-value	567.65/ *p*<.001	235.75/ *p*<.001
CMIN/DF	7.37	3.19
CFI	.84	.95
TLI	.81	.93
RMSEA	.09	.05
DF	77	74

Note: DF = degrees of freedom

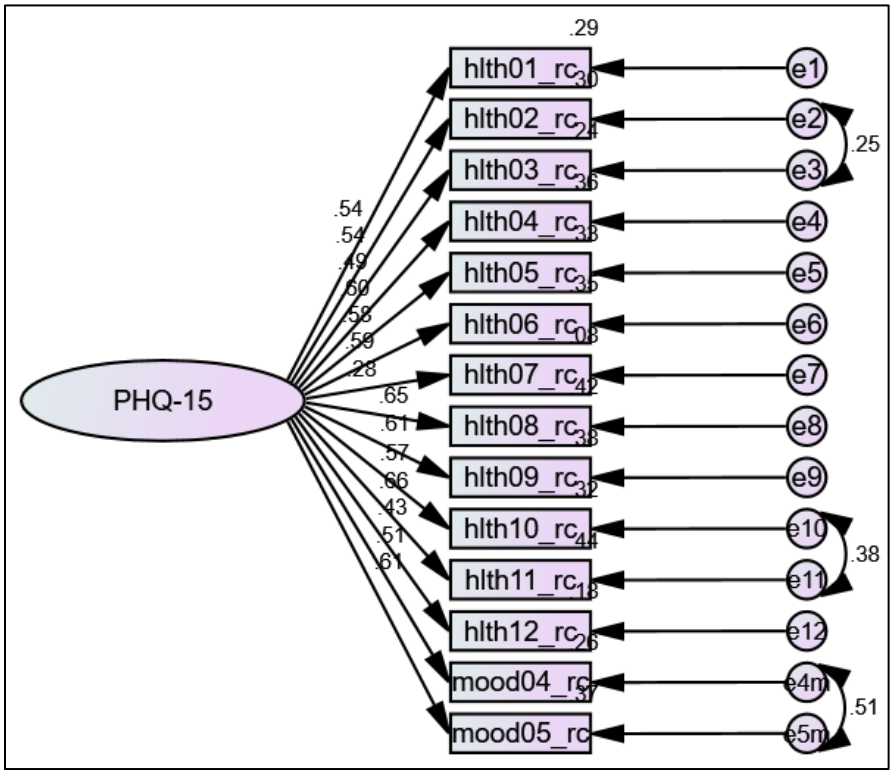


Figure 4.5. CFA of somatic symptoms (PHQ-15) with standardized estimates

Endogenous variables (mediating). Three latent mediating constructs, UCO, OLDR-, and *NCOLDR*-, were only just identified and therefore model fit could not be determined. However, all indicator variables loaded well to their latent constructs as

;indicated by their factor loadings and variances (e.g., squared multiple correlations)

listed in Figures 4.6 through 4.8.

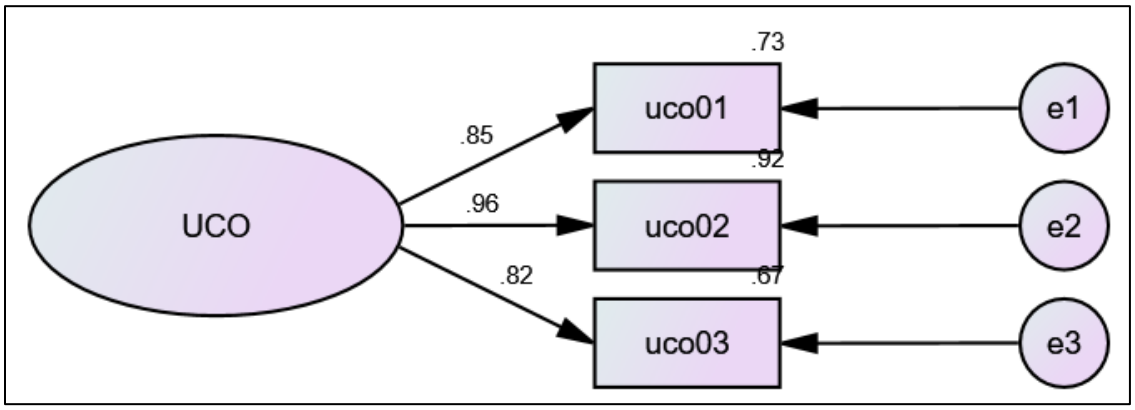


Figure 4.6. CFA of unit cohesion with standardized estimates. Coefficients above single headed arrows = factor loadings. Coefficients above each rectangle = squared multiple correlation (i.e., the unique variance of the observed variable accounted for by the latent factor).

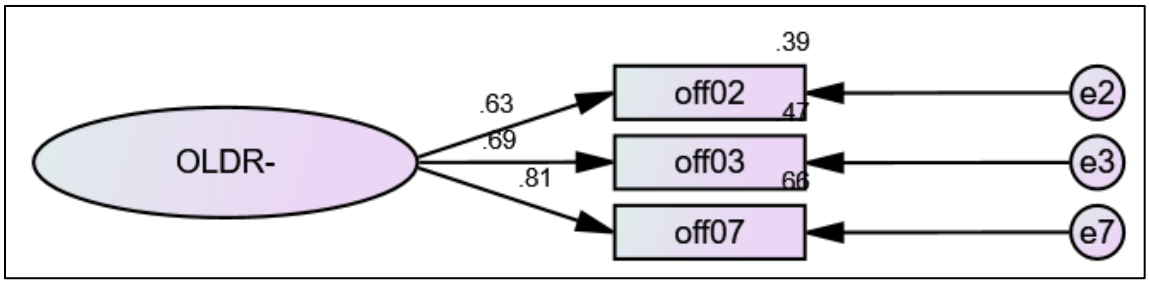


Figure 4.7. CFA of perceived negative officer support (OLDR-) with standardized estimates. Coefficients above single-headed arrows = factor loadings. Coefficients above each rectangle = squared multiple correlation (i.e., the unique variance of the observed variable accounted for by the latent factor).

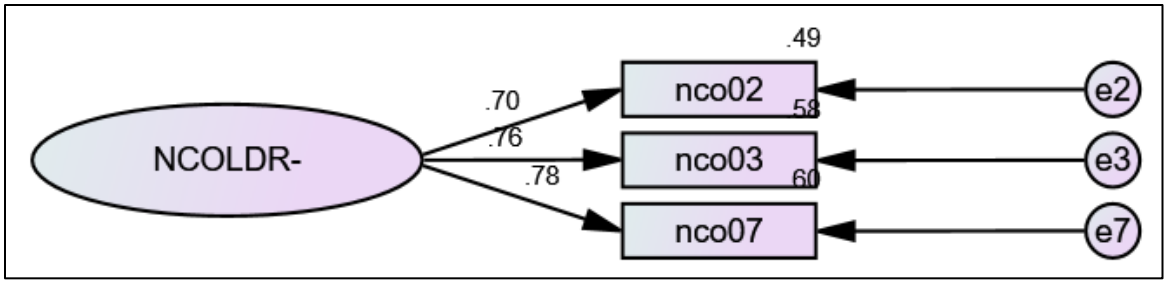


Figure 4.8. CFA of perceived negative noncommissioned officer support (NCOLDR-) with standardized estimates. Coefficients above single-headed arrows = factor loadings. Coefficients above each rectangle = squared multiple correlation (i.e., the unique variance of the observed variable accounted for by the latent factor).

Because of their good fit indexes, the three latent constructs of *OLDR+* (χ^2=8.73, p<.05; CMIN/DF=4.37; CFI=0.99; TLI=0.98; RMSEA=.07), ORGSPRT (χ^2=3.93, p<.05; CMIN/DF=1.97; CFI=0.99; TLI=0.99; RMSEA=.04), and TCO (χ^2=4.03, p>.05; CMIN/DF=2.02; CFI=0.99; TLI=0.99; RMSEA=.04) did not require any post-hoc modifications.

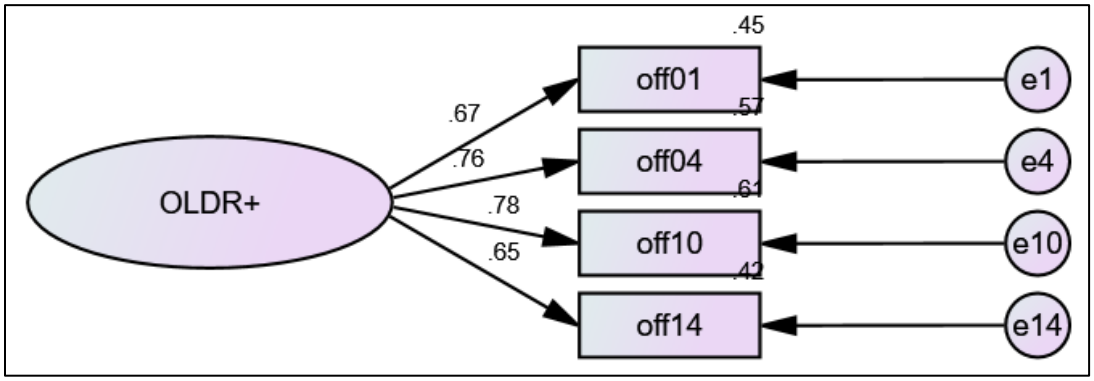


Figure 4.9. CFA of perceived positive officer support (OLDR+) with standardized estimates. Coefficients above single-headed arrows = factor loadings. Coefficients above each rectangle = squared multiple correlation (i.e., the unique variance of the observed variable accounted for by the latent factor).

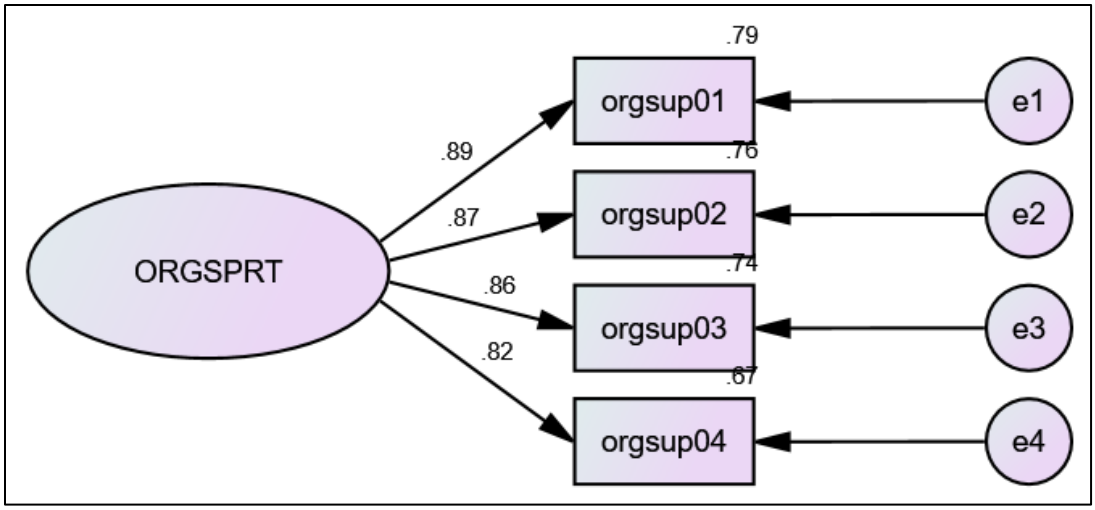


Figure 4.10. CFA of organizational support with standardized estimates. Coefficients above single-headed arrows = factor loadings. Coefficients above each rectangle = squared multiple correlation (i.e., the unique variance of the observed variable accounted for by the latent factor).

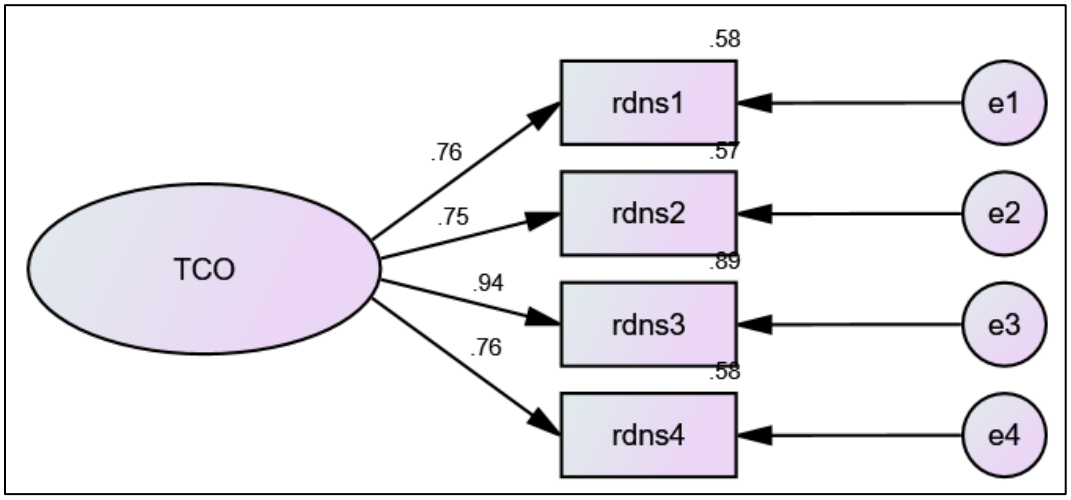


Figure 4.11. CFA of task cohesion with standardized estimates. Coefficients above single-headed arrows = factor loadings. Coefficients above each rectangle = squared multiple correlation (i.e., the unique variance of the observed variable accounted for by the latent factor).

Two latent constructs were respecified: NCOLDR+ and AECR. AECR was originally a two-factor latent construct comprised of an anxiety and avoidance factor.

However, the avoidance model demonstrated such a poor fit to the data that it was not included in the final measurement model.

Table 4.8

Original and Respecified CFA of positive Noncommissioned Officer support, N = 744

Fit Indices	**Original**	**Final**
χ^2 / *p*-value	34.54 / *p*<.001	5.51/ *p*>.05
CMIN/DF	17.27	2.75
CFI	.98	.99
TLI	.93	.98
RMSEA	.15	.08
DF	2	1

Note: DF = degrees of freedom

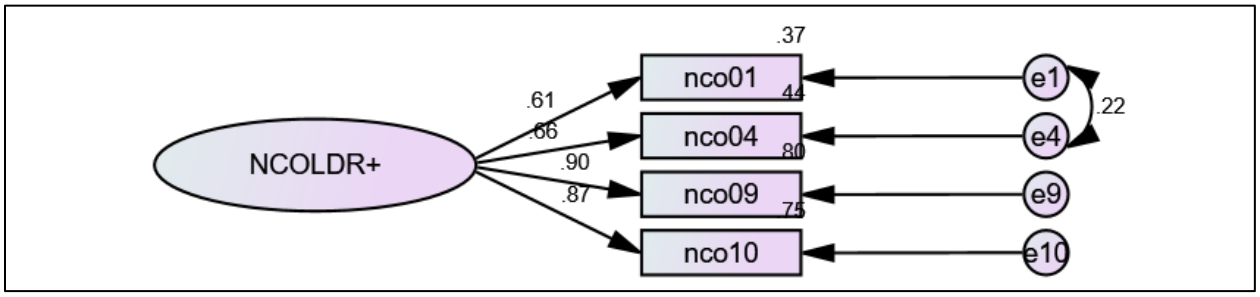


Figure 4.12. CFA of positive noncommissioned officer support with standardized estimates. Coefficients above single-headed arrows = factor loadings. Coefficients above each rectangle = squared multiple correlation (i.e., the unique variance of the observed variable accounted for by the latent factor).

Table 4.9

Original and Respecified CFA of Anxiety in Experiencing Close Relationships, N = 748

Fit Indices	**Original**	**Final**
χ^2 / *p*-value	65.99 / *p*<.001	20.23 / *p*<.001
CMIN/DF	7.33	2.89
CFI	.97	.99
TLI	.95	.99
RMSEA	.09	.05
DF	9	7

Note: DF = degrees of freedom

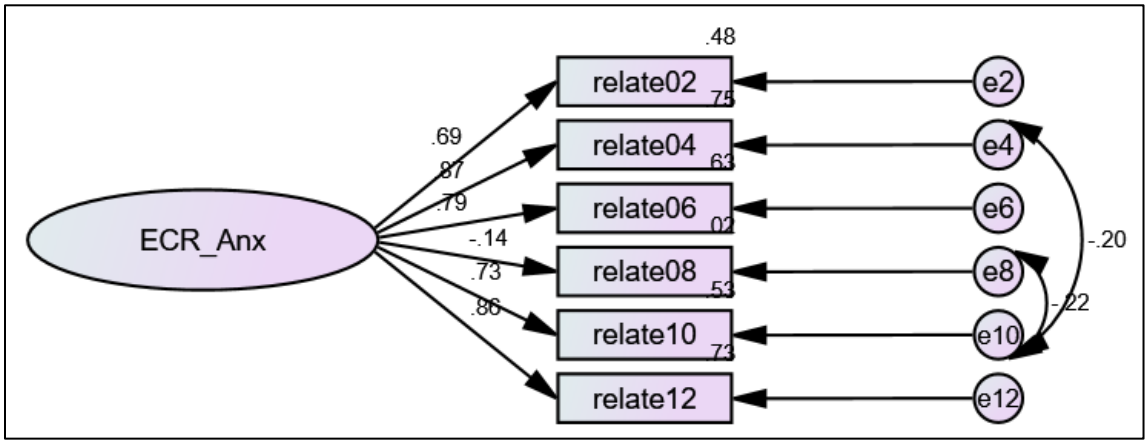


Figure 4.13. CFA of anxiety in experiencing close relationships with standardized estimates. Coefficients above single-headed arrows = factor loadings. Coefficients above each rectangle = squared multiple correlation (i.e., the unique variance of the observed variable accounted for by the latent factor).

Full measurement models. Having established the validity of all individual latent constructs through CFAs, five separate 'full measurement model' CFAs were then executed to ensure the maximal overall goodness of fit of each hypothesized structural model. This is a vital step ensuring that any structural model respecification or fit issues

be handled at the measurement model stage. Therefore, when conducting the full structural model analyses, any misspecifications can be attributed solely to the path model. All initial measurement models fit well with the data, as all model fit statistics were well within acceptable ranges, evidenced by table 4.10 below. Model respecification was not indicated.

Table 4.10

Goodness-of-Fit Statistics, full measurement models, by outcome variable

Fit Indices	Depression	Anxiety	PTSD	Aggressive Behavior	Somatic Symptoms
χ^2, *p*-value	1493.44, *p*<.001	1399.02, *p*<.001	2378, *p*<.001	1258.39, *p*<.001	1698.09, *p*<.001
CMIN/DF	2.15	2.26	2.32	2.43	1.89
CFI	.95	.96	.94	.95	.95
TLI	.95	.95	.94	.94	.95
RMSEA	.04	.04	.04	.04	.04
DF	695	620	1026	519	899

Note: χ^2= Chi square, CMIN/DF = normed Chi Square, CFI = comparative fit index, TLI = Tucker-Lewis index, RMSEA = root mean square error of approximation, DF = degrees of freedom.

Structural Models

Structural Model Results. Estimation of the full structural models was performed using SPSS/AMOS (25) on data after removing only the extreme univariate outliers identified through boxplots using SPSS, resulting in a final sample size of N=1285. Structural models employed Full Information Maximum Likelihood Estimation (FIML), estimating means and intercepts as there were missing data (6.75% of cases). FIML in SEM presumes multivariate normality, and it is often problematic for social and behavioral research to satisfy this assumption (McDonald & Ho, 2002). However, various

studies demonstrate that parameter estimates remain sound despite the nonnormality, although standard errors do not (McDonald & Ho, 2002). Because data are multivariate nonnormally distributed, and as described in the previous chapter, bootstrapping was employed to provide corrected standard errors and confidence intervals. As the bootstrapping procedure required a dataset with no missing data, the bootstrapping procedure was estimated by repeating all structural models using a sufficiently large dataset (n = 744) with no missing data. Minimal discrepancy between the original and bootstrap S.E.s suggests that the risk for potential Type 1 errors is minimal. Bootstrap standard errors from the bootstrapping estimation were compared against the standard errors reported for each hypothesized structural model (see Tables 4.17 through 4.22).

For each hypothesized structural model, direct and indirect path analyses were simultaneously executed (i.e., multiple mediation). Six observed exogenous variables (covariates) were included in each hypothesized structural model: age, gender, rank, years of service, number of deployments, and combat exposure. Hypothesized structural models are described graphically in Figures 4.14 through 4.19. All covariate paths and endogenous residuals were removed from the conceptual graphics for purpose of simplifying each graphic.

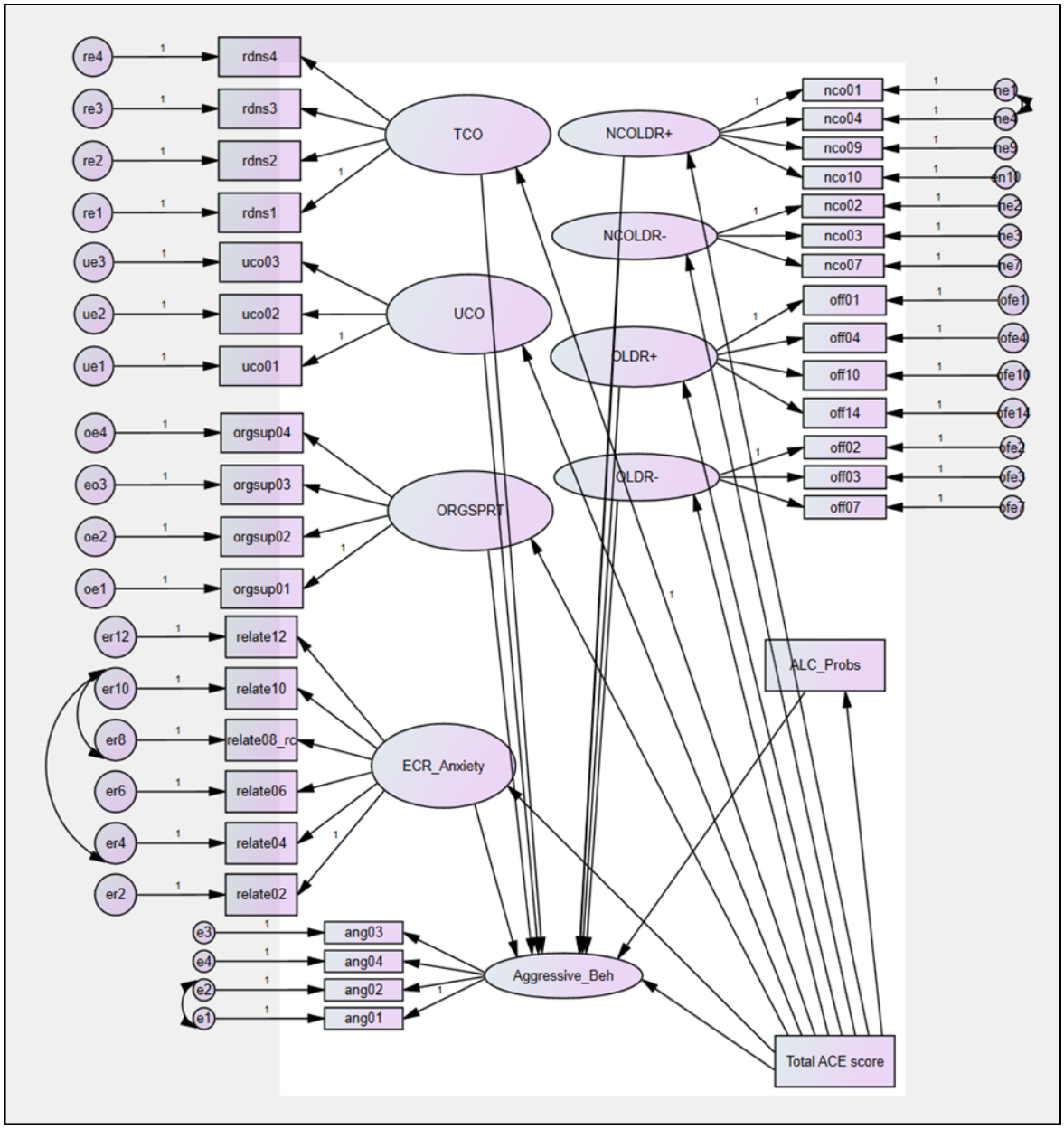


Figure 4.14. Hypothesized structural model of factors mediating relationship between ACE and Aggressive Behavior, covariates and endogenous residuals removed.

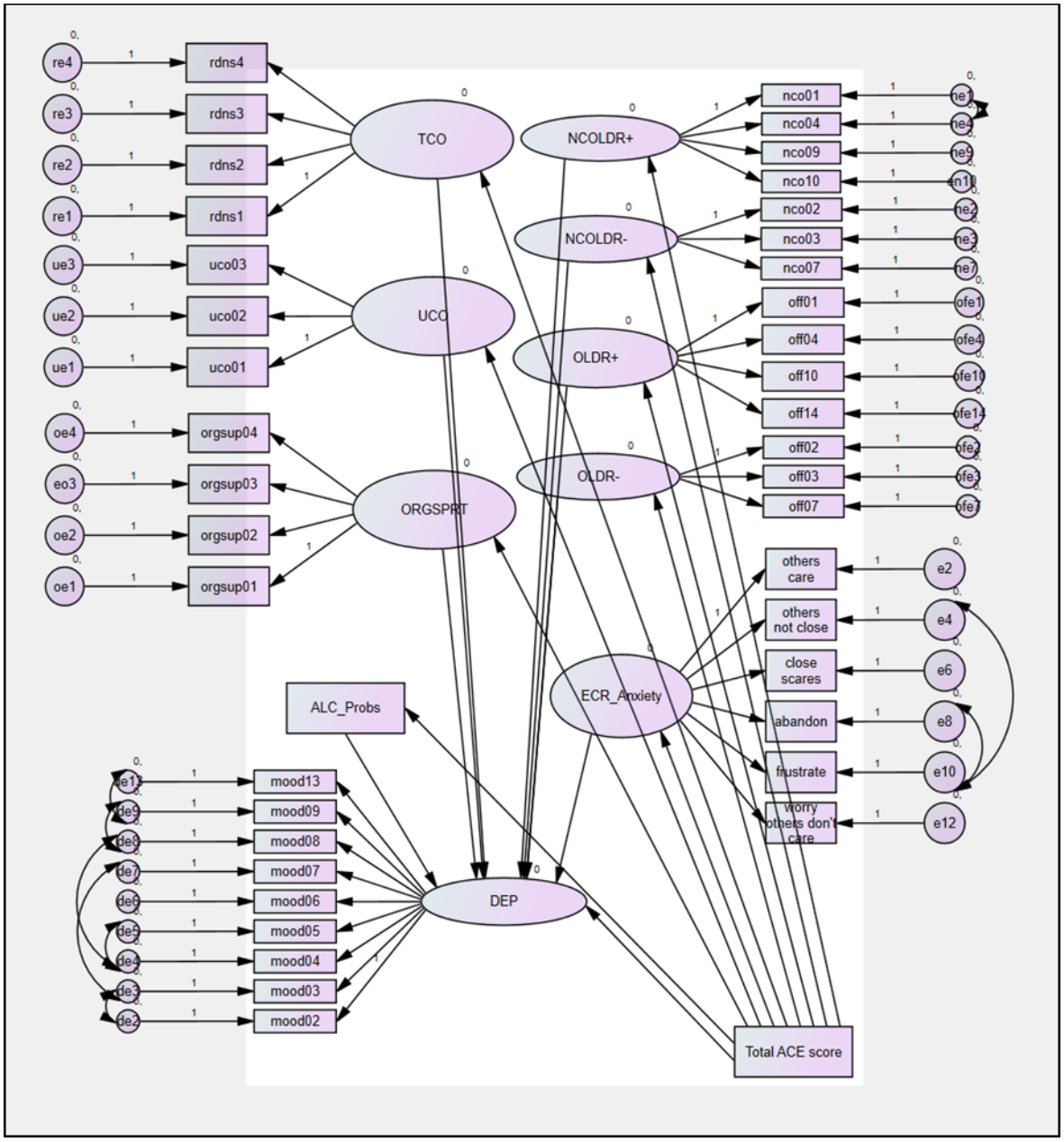


Figure 4.15. Hypothesized model of factors mediating relationship between ACE and depression, covariates and endogenous residuals removed.

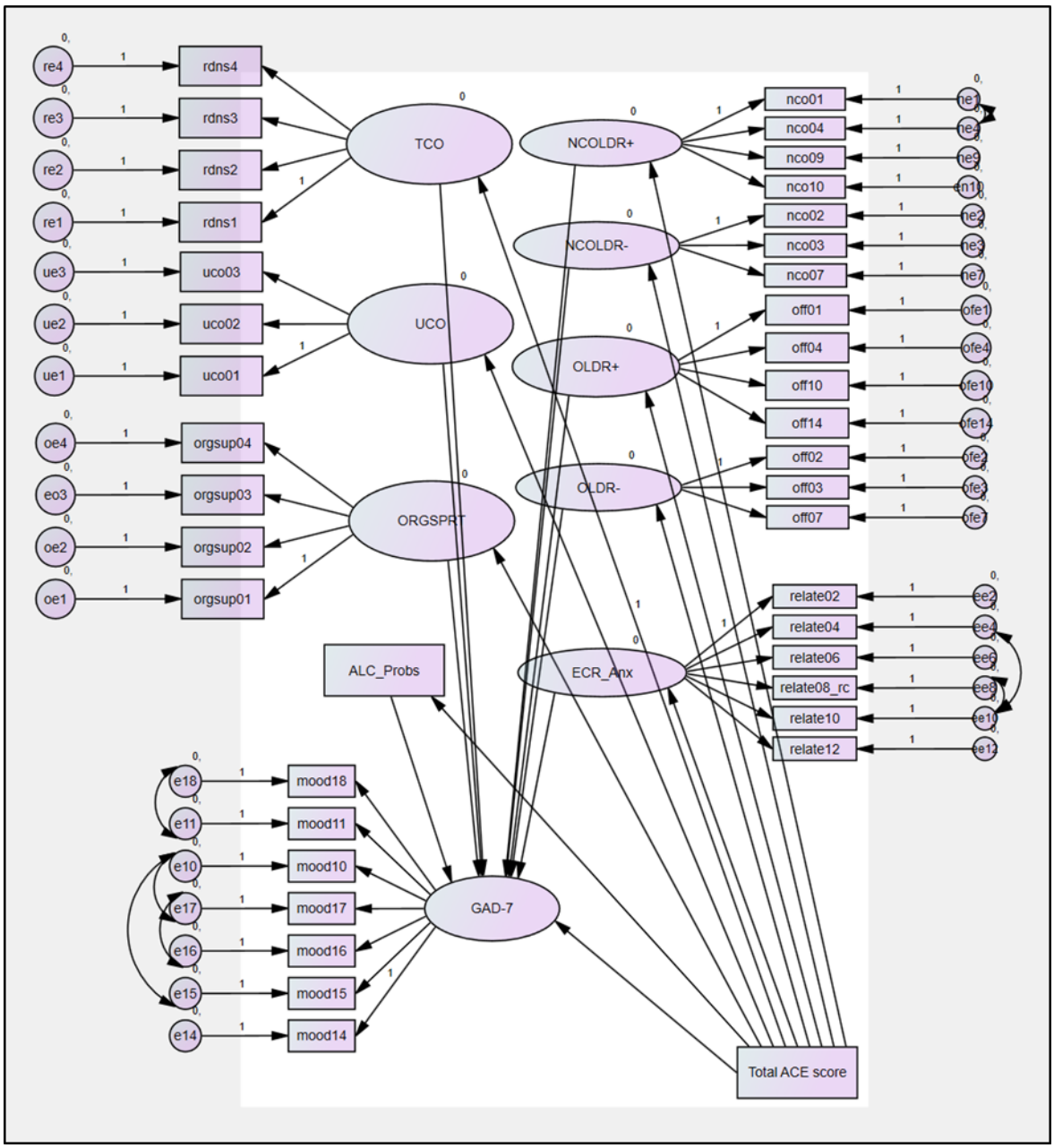


Figure 4.16. Hypothesized model of factors mediating relationship between ACE and anxiety, covariates and endogenous residuals removed.

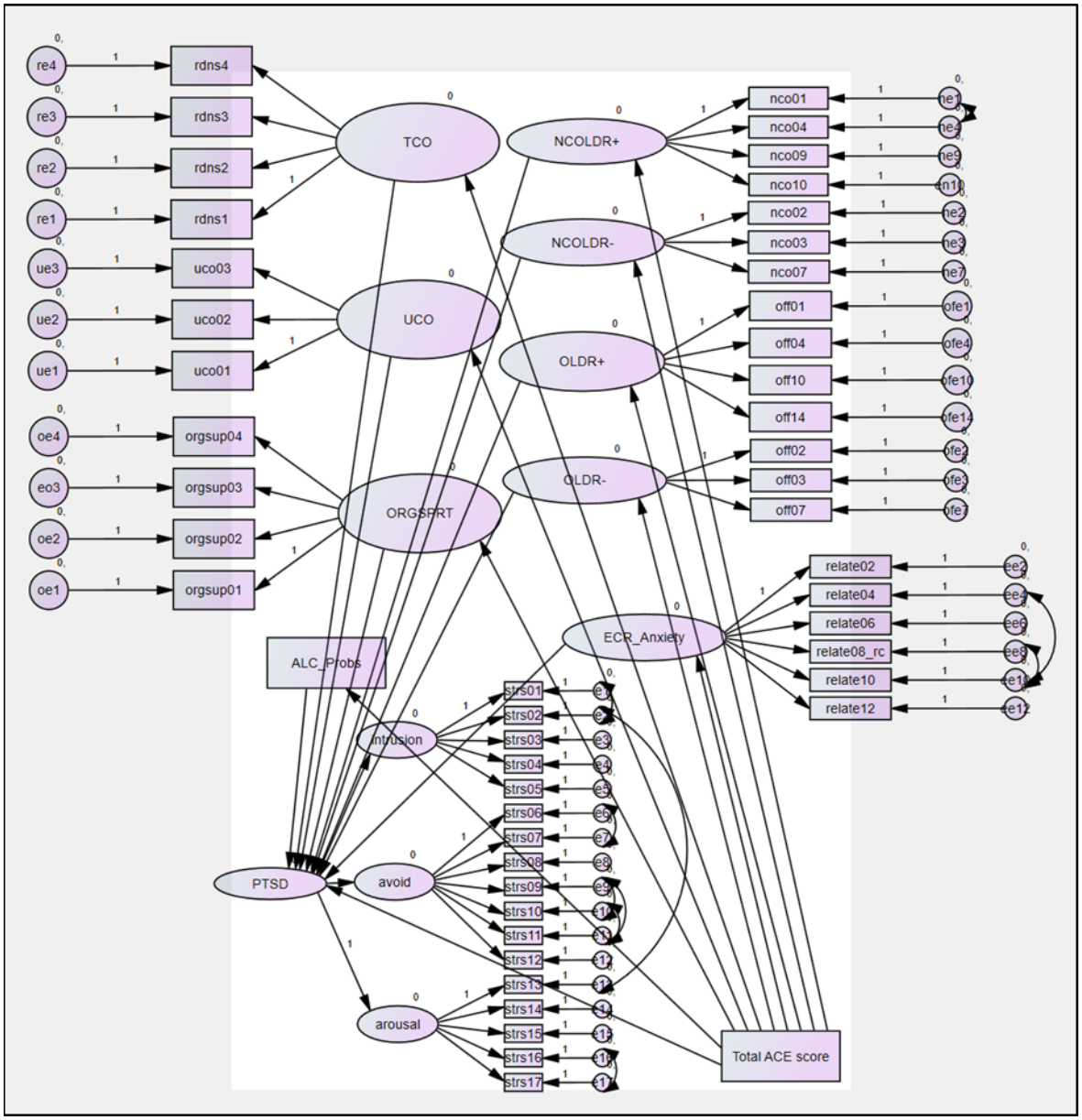


Figure 4.17. Hypothesized model of factors mediating relationship between ACE and PTSD, covariates and endogenous residuals removed.

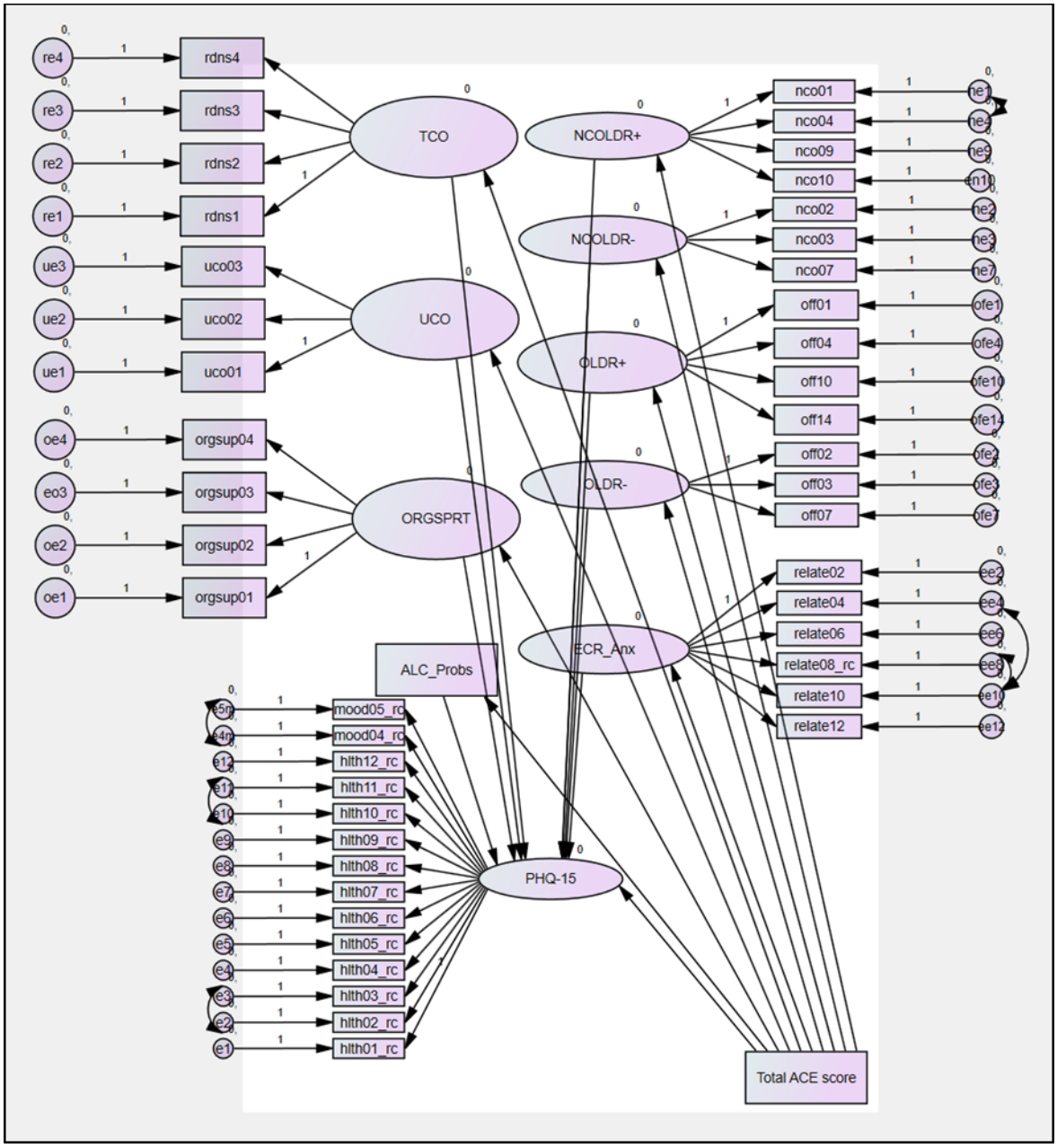


Figure 4.18. Hypothesized model of factors mediating relationship between ACE and somatic symptoms, covariates and endogenous residuals removed.

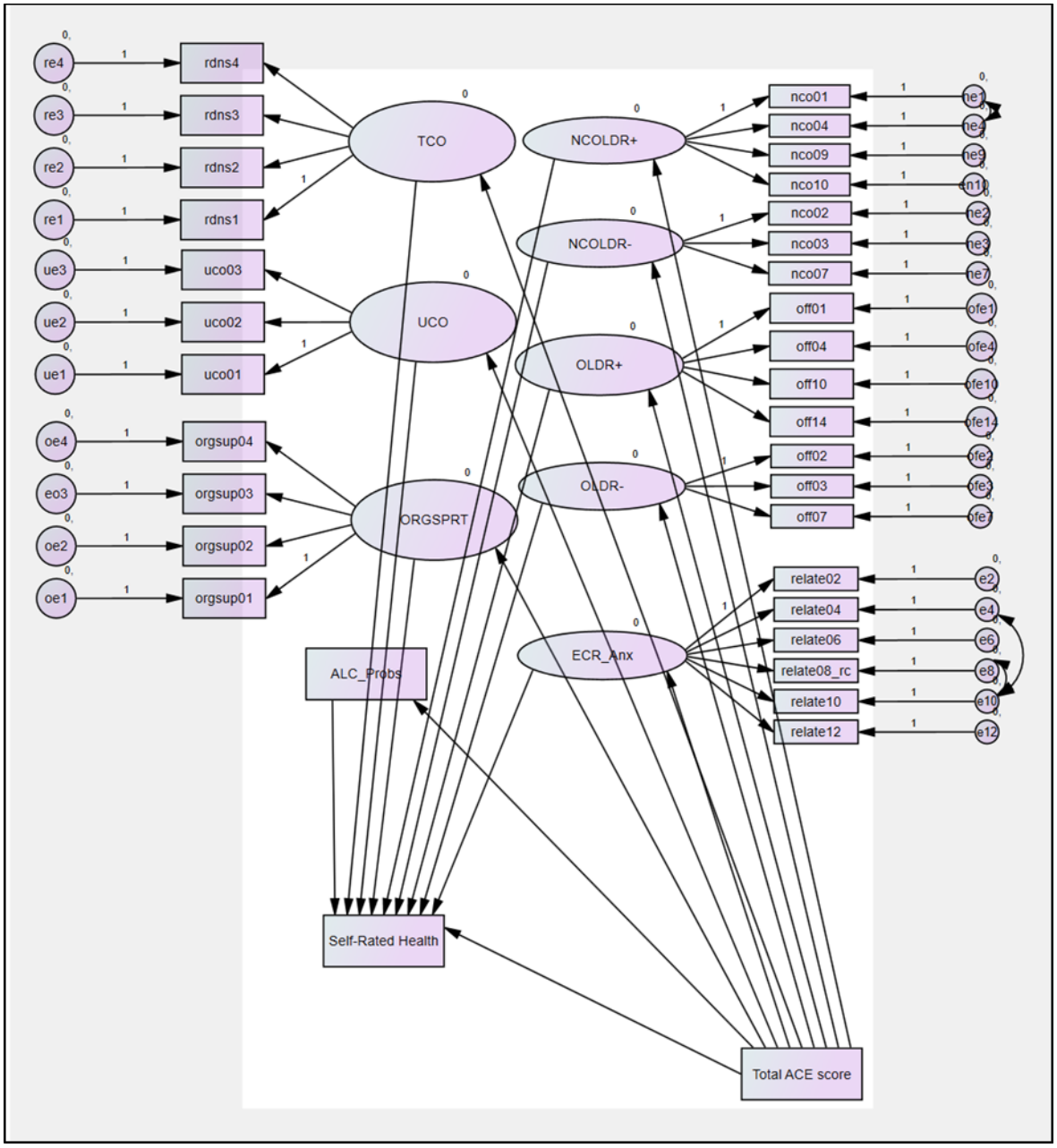


Figure 4.19. Hypothesized model of factors mediating relationship between ACE and self-rated health, covariate paths and endogenous residuals removed.

Structural model fit. Structural paths not contributing meaningfully to structural models were removed individually, based on theoretical equivalence and modification

indices, and until the Expected Cross-Validation Index (ECVI) demonstrated no further decrease in score. Model respecification (e.g., trimming path lines with nonsignificant effects) aligns with the literature on establishing more parsimonious structural models (Garson, 2009; Rizzo & Kintner, 2013). In addition to the statistical justification for modifying structural models, Schreiber et al. (2006) state there must also be theoretical justification for modifications. Thus, model trimming that deviates from a confirmatory towards a more exploratory analysis across models is theoretically justifiable and aligns with the aim of this research question hypothesizing that social support –specifically attempting to identify which type – mediates the relationship between ACE and service member health.

Toward that end, original structural model results missed adequately fitting the data by at least one goodness of fit index (top line labeled, *ORIGINAL,* Tables 4.11 through 4.16). Sequential model trimming was then executed to achieve more parsimonious structural models (see Tables 4.11 through 4.16). Final structural models include only those pathways that significantly contributed to each endogenous health outcome against the background of several covariates, that were held constant (see Figures 4.20 through 4.25 for final structural models). In sum, all respecified structural models fit the data well.

Table 4.11

Sequential Model Respecification and Model Fit Statistics of Social Support on Aggressive Behavior (AB), N = 1285

Post-hoc Modifications	χ^2/p-value	SM	PAR	DF	CMIN /DF	CFI	TLI	RMSEA	ECVI
ORIGINAL	3099.82 / p<.001	989	233	756	4.10	.91	.89	.05	2.78
1 AB <--- OLDR-	2658.60/ p<.001	860	215	645	4.12	.92	.90	.05	2.41
2 AB <--- OLDR+	1986.35 / p<.001	702	194	508	3.91	.93	.91	.05	1.85
3 AB <--- UCO	1665.77/ p<.001	594	175	419	3.98	.93	.91	.05	1.57
4 AB <--- UCO	1321.27/ p<.001	464	153	311	4.25	.93	.91	.05	1.27
5 AB <--- NCOLDR+	593.34/ p<.001	350	131	220	2.70	.97	.96	.04	0.66

Note: χ^2= Chi square, CMIN/DF = normed Chi Square, CFI = comparative fit index, TLI = Tucker-Lewis index, RMSEA = root mean square error of approximation, DF = degrees of freedom. Red text denotes poor fit to the data whereas green text denotes a good fit to the data.

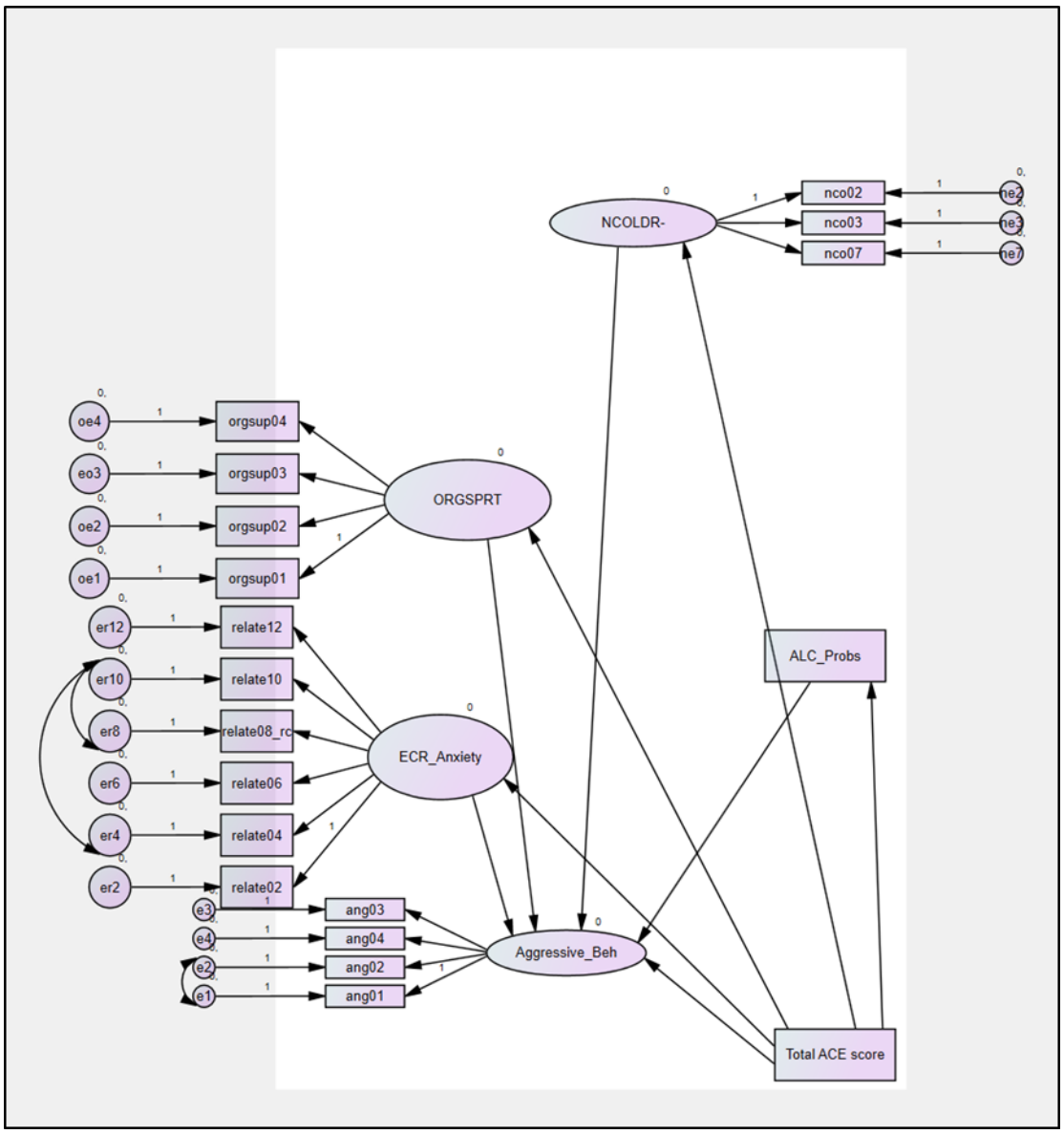


Figure 4.20. Final structural model of factors mediating relationship between ACE and Aggressive Behavior, covariates, endogenous residuals, and all non-significant paths removed. Regression weights reported in Table 4.17, N = 1285.

Table 4.12

Sequential Model Respecification and Model Fit Statistics of Social Support on Depression (DEP), N = 1285

Post-hoc Modifications	χ^2/p-value	SM	PAR	DF	CMIN/DF	CFI	TLI	RMSEA	ECVI
ORIGINAL	3498.75 / p<.001	1224	253	971	3.60	.92	.90	.05	3.12
1 DEP <--- OLDR-	3023.70 / p<.001	1080	235	845	3.58	.93	.91	.05	2.72
2 DEP <--- TCO	2657.38.99 / p<.001	902	212	690	3.85	.93	.91	.05	2.40
3 DEP <--- UCO	2223.85/ p<.001	779	194	585	3.82	.93	.91	.05	2.04
4 DEP <--- OLDR+	1614.11/ p<.001	629	173	456	3.54	.94	.92	.04	1.53
5 DEP <--- NCOLDR+	839.83/ p<.001	495	151	344	2.44	.97	.96	.03	0.89

Note: χ^2= Chi square, CMIN/DF = normed Chi Square, CFI = comparative fit index, TLI = Tucker-Lewis index, RMSEA = root mean square error of approximation, DF = degrees of freedom. Red text denotes poor fit to the data whereas green text denotes a good fit to the data.

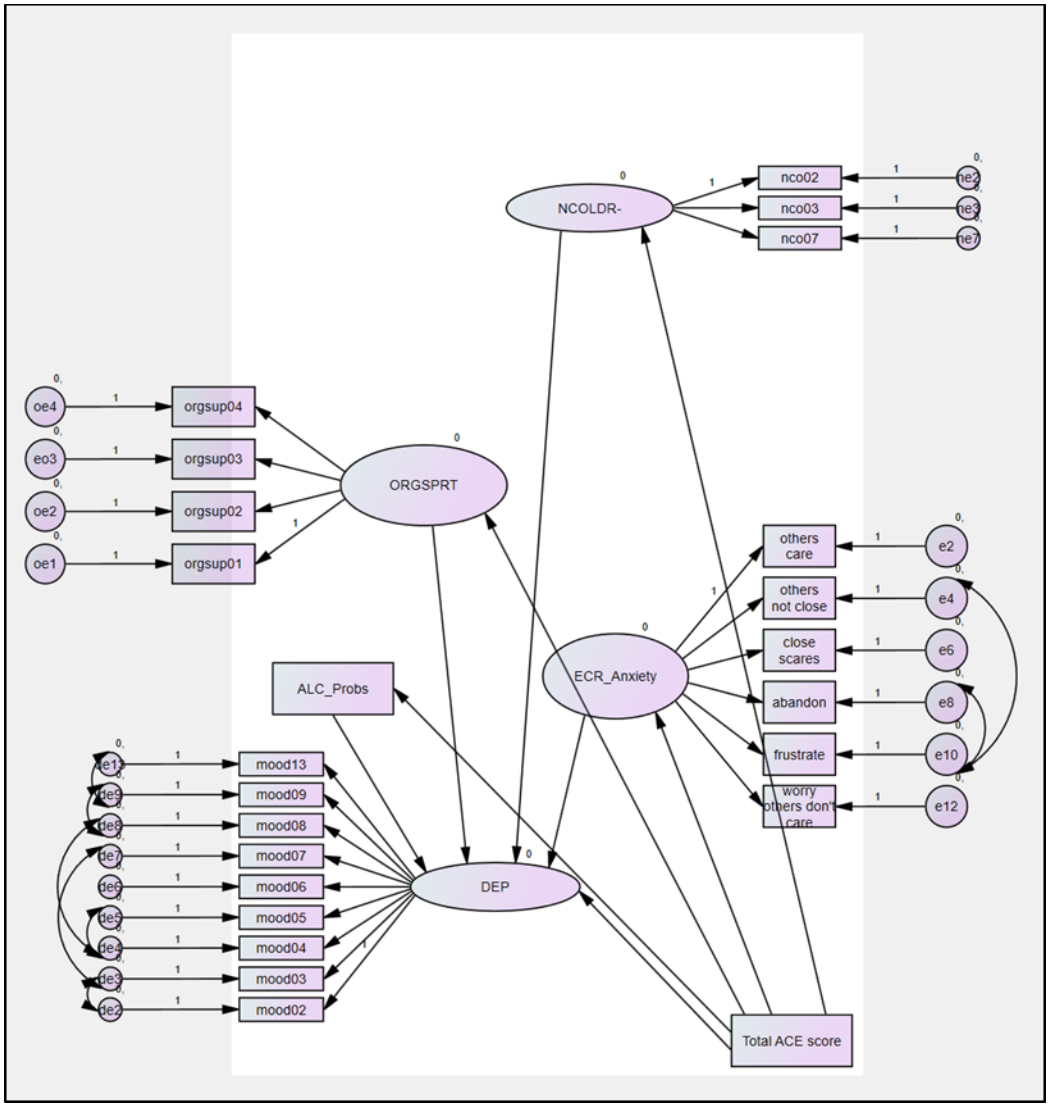


Figure 4.21. Final structural model of factors mediating relationship between ACE and depression, covariates, endogenous residuals, and all non-significant paths removed. Regression weights reported in Table 4.18, N = 1285.

Table 4.13

Sequential Model Respecification and Model Fit Statistics of Social Support on Anxiety (GAD-7), N = 1285

Post-hoc Modifications	***χ^2/p-value***	**SM**	**PAR**	**DF**	**CMIN/DF**	**CFI**	**TLI**	**RMSEA**	**ECVI**
ORIGINAL	4632.56 / p<.001	1127	244	883	5.25	.88	.86	.06	3.99
1 GAD-7 <--- OLDR+	4349.58/ p<.001	989	225	764	5.69	.88	.85	.06	3.73
2 GAD-7 <--- NCOLDR+	3417.56 / p<.001	819	203	616	5.55	.89	.87	.06	2.98
3 GAD-7 <--- UCO	3126.29/ p<.001	702	184	518	6.04	.88	.85	.06	2.72
4 GAD-7 <--- TCO	1411.67/ p<.001	560	163	397	3.56	.95	.93	.05	1.35
5 GAD-7 <--- OLDR-	677.01/ p<.001	434	143	291	2.33	.98	.97	.03	0.75

Note: χ2= Chi square, CMIN/DF = normed Chi Square, CFI = comparative fit index, TLI = Tucker-Lewis index, RMSEA = root mean square error of approximation, DF = degrees of freedom. Red text denotes poor fit to the data whereas green text denotes a good fit to the data.

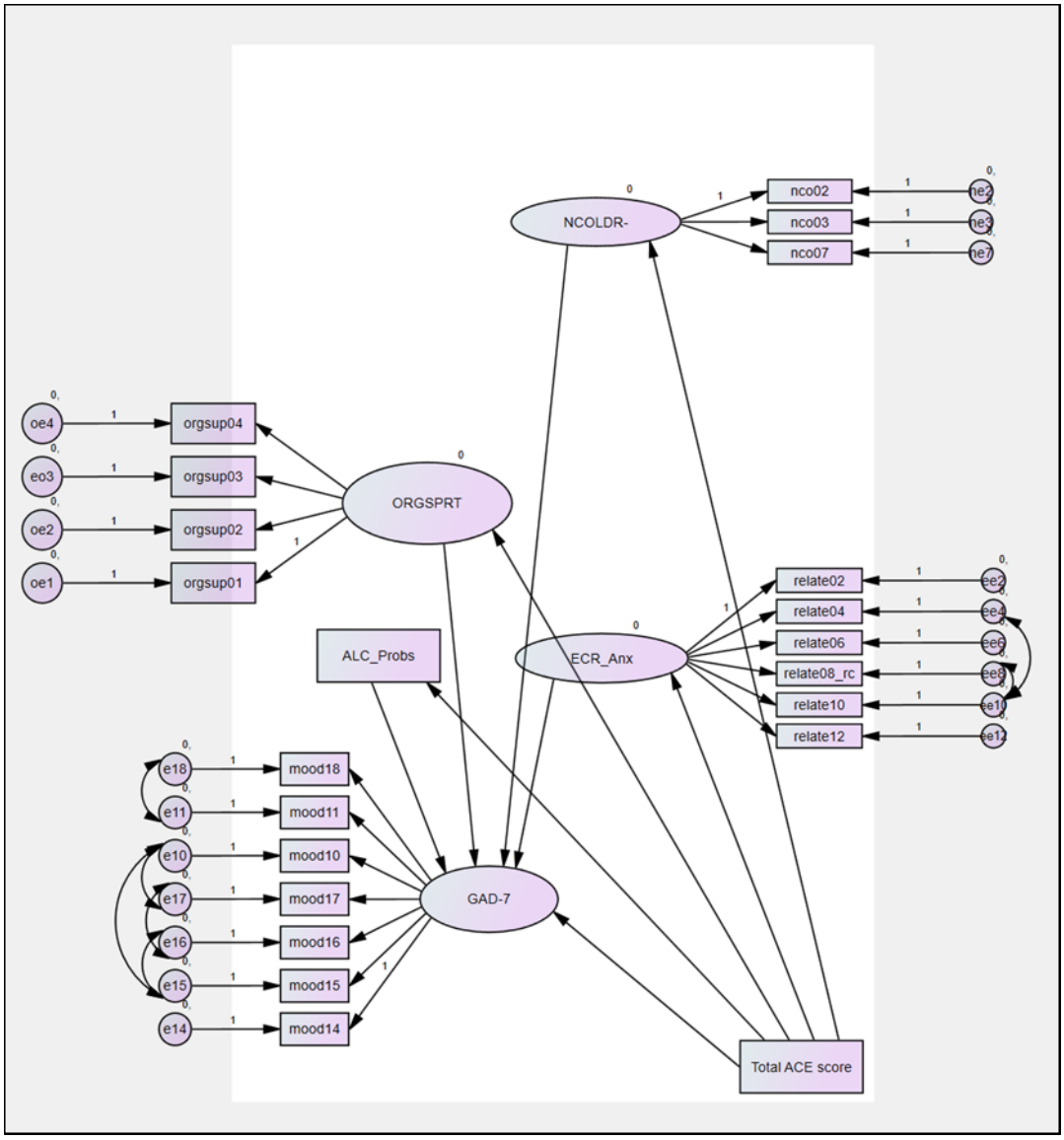


Figure 4.22. Final structural model of factors mediating relationship between ACE and anxiety, covariates, endogenous residuals, and all non-significant paths removed. Regression weights reported in Table 4.19, N = 1285.

Table 4.14

Sequential Model Respecification and Model Fit Statistics of Social Support on PTSD symptoms, N = 1285

Post-hoc Modifications	***χ^2/p-value***	**SM**	**PAR**	**DF**	**CMIN/DF**	**CFI**	**TLI**	**RMSEA**	**ECVI**
ORIGINAL	4702.67 / p<.001	1652	283	1369	3.44	.92	.91	.04	4.10
1 PTSD <--- NCOLDR+	3810.35/ p<.001	1430	260	1170	3.26	.93	.92	.04	3.37
2 PTSD <--- UCO	3477.33/ p<.001	1274	241	1033	3.37	.93	.92	.04	3.08
3 PTSD <--- OLDR+	2660.52/ p<.001	1080	221	859	3.10	.94	.93	.04	2.42
4 PTSD <--- NCOLDR-	2245.78/ p<.001	945	201	744	3.02	.95	.94	.04	2.06
5 PTSD <--- TCO	1963.68/ p<.001	779	179	600	3.27	.95	.94	.04	1.82

Note: χ2= Chi square, CMIN/DF = normed Chi Square, CFI = comparative fit index, TLI = Tucker-Lewis index, RMSEA = root mean square error of approximation, DF = degrees of freedom. Red text denotes poor fit to the data whereas green text denotes a good fit to the data.

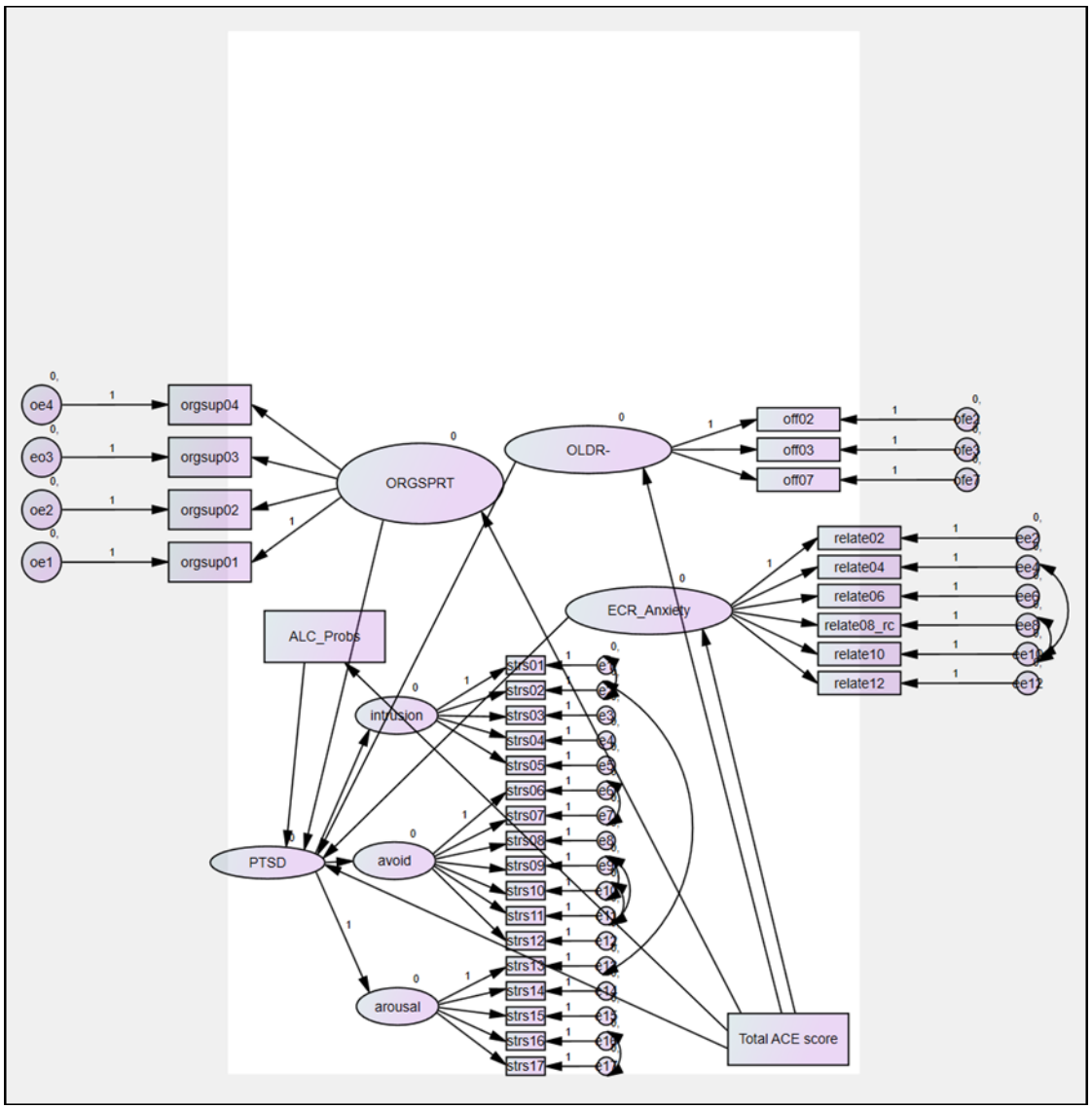


Figure 4.23. Final structural model of factors mediating relationship between ACE and PTSD, covariates, endogenous residuals, and all non-significant paths removed. Regression weights reported in Table 4.20, N = 1285.

Table 4.15

Sequential Model Respecification and Model Fit Statistics of Social Support on Somatic symptoms, N = 1285

Post-hoc Modifications	***χ^2/p-value***	**SM**	**PAR**	**DF**	**CMIN/DF**	**CFI**	**TLI**	**RMSEA**	**ECVI**
ORIGINAL	4095.82 / p<.001	1484	266	1218	3.36	.91	.89	.04	3.60
1 PHQ-15 <-- NCOLDR+	3223.31/ p<.001	1274	243	1031	3.13	.92	.91	.04	2.89
2 PHQ-15 <-- UCO	2878.72/ p<.001	1127	224	903	3.19	.92	.90	.04	2.59
3 PHQ-15 <-- OLDR-	2417.04/ p<.001	989	206	783	3.09	.93	.91	.04	2.20
4 PHQ-15 <-- OLDR+	1670.45/ p<.001	819	186	633	2.64	.95	.94	.04	1.59

Note: χ2= Chi square, CMIN/DF = normed Chi Square, CFI = comparative fit index, TLI = Tucker-Lewis index, RMSEA = root mean square error of approximation, DF = degrees of freedom. Red text denotes poor fit to the data whereas green text denotes a good fit to the data.

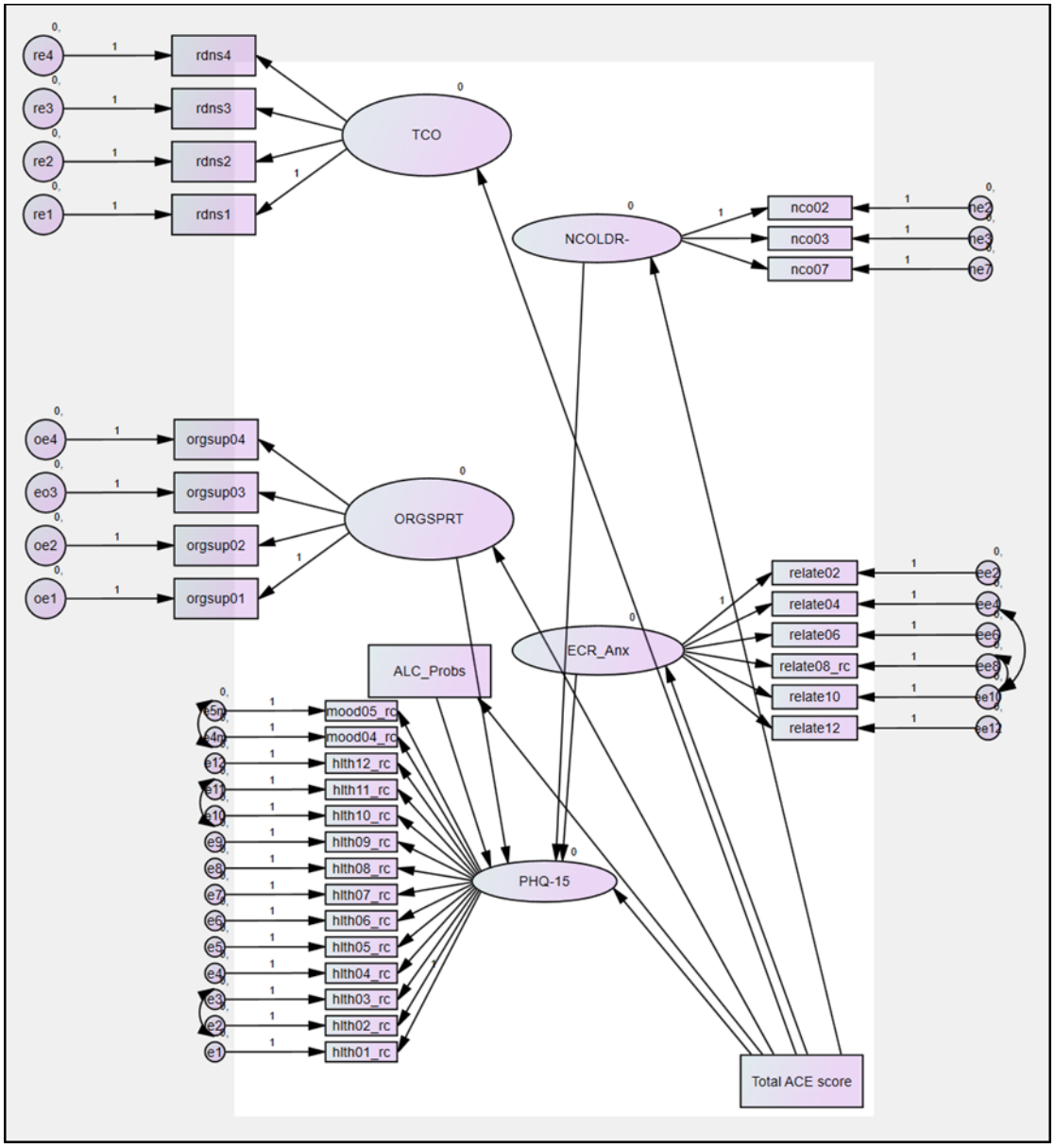


Figure 4.24. Final structural model of factors mediating relationship between ACE and somatic symptoms, covariates, endogenous residuals, and all non-significant paths removed. Regression weights reported in Table 4.21, N = 1285.

Table 4.16

Sequential Model Respecification and Model Fit Statistics of Social Support on Self-rated Health, N = 1285

Post-hoc Modifications	***χ^2/p-value***	**SM**	**PAR**	**DF**	**CMIN/DF**	**CFI**	**TLI**	**RMSEA**	**ECVI**
ORIGINAL	2815.41/ p<.001	860	224	636	4.43	.91	.89	.05	2.54
1 SRHLTH <--OLDR-	2378.15/ p<.001	740	206	534	4.45	.92	.90	.05	2.17
2 SRHLTH <-TCO	2067.67/ p<.001	594	183	411	5.03	.92	.89	.06	1.90
3 SRHLTH <-UCO	1655.56/ p<.001	495	165	330	5.02	.92	.89	.06	1.55
4 SRHLTH <-NCOLDR+	956.91/ p<.001	377	142	235	4.07	.95	.92	.05	0.97
5 SRHLTH <-NCOLDR-	853.92/ p<.001	299	123	176	4.85	.94	.91	.06	0.86

Note: χ^2= Chi square, CMIN/DF = normed Chi Square, CFI = comparative fit index, TLI = Tucker-Lewis index, RMSEA = root mean square error of approximation, DF = degrees of freedom. Red text denotes poor fit to the data whereas green text denotes a good fit to the data.

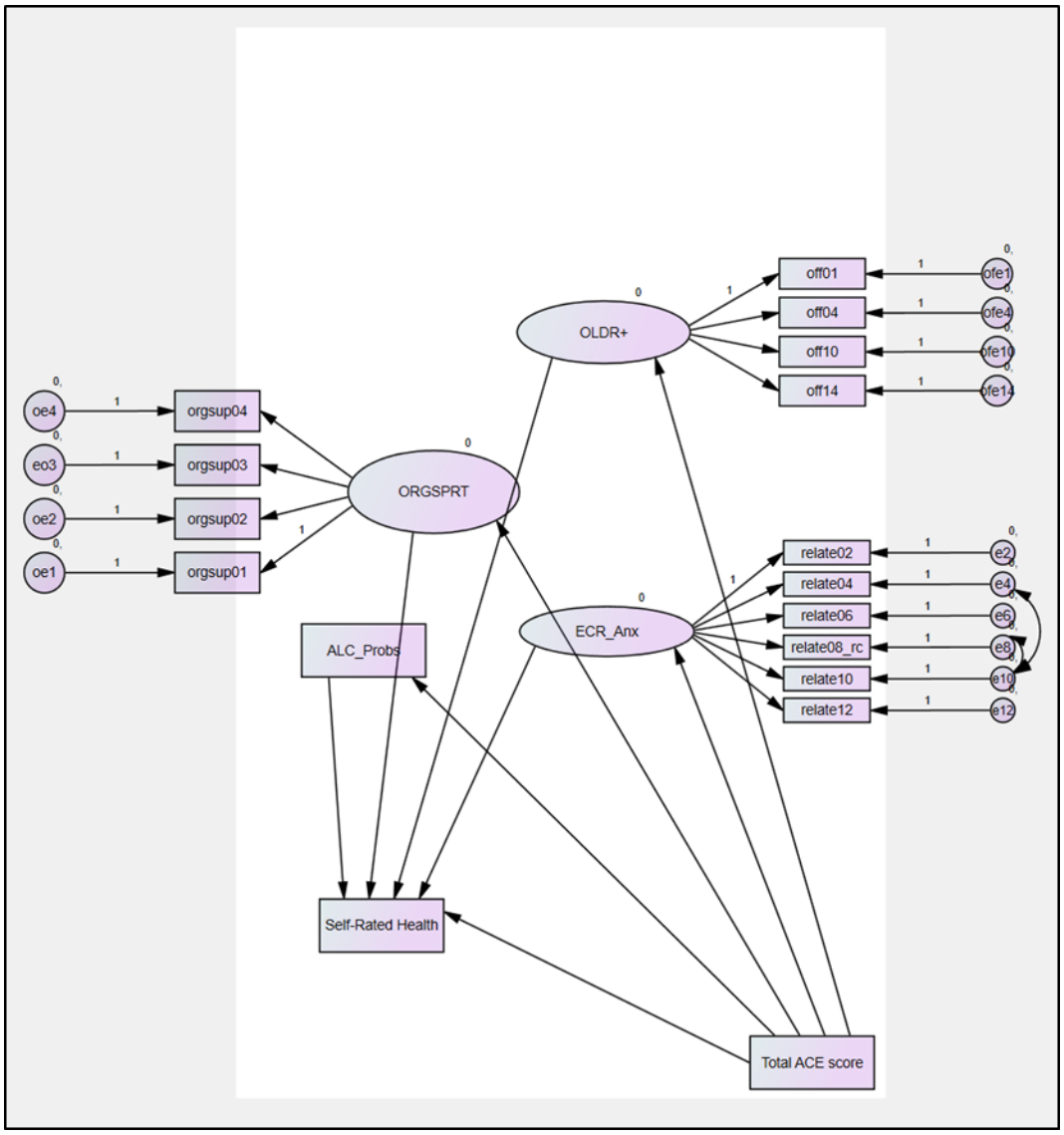


Figure 4.25. Final structural model of factors mediating relationship between ACE and somatic symptoms, covariates, endogenous residuals, and all non-significant paths removed. Regression weights reported in Table 4.22, N = 1285.

Effects. As hypothesized, ACE was related to all health outcomes and all hypothesized mediators. Common paths mediating the relationship between ACE across all structural models included organizational support, anxiety in experiencing close relationships, and alcohol problems (see Figures 4.20 through 4.25). In all but two

models (PTSD, self-rated health), ACE was also the strongest exogenous predictor (i.e., direct effect) of health (see Tables 4.17, 4.18, 4.19, and 4.21).

Aggressive behavior. The direct effect of ACE on aggressive behavior was significant (β=.21, p<.001). Figure 4.20 demonstrates that four factors mediated this direct effect. All endogenous direct effects were in the expected direction and significant (p<.05 and below). The unstandardized indirect effect from ACE to aggressive behavior through poor NCO support was *B*=.02, SE=.01, 90% CI [.01, .03]; through organizational support was *B*=.01, SE=.01, 90% CI [.01, .03]; through anxiety in experiencing close relationships was *B*=.01, SE=.01, 90% CI [.01, .02]; and through alcohol problems *B*=.04, SE=.01, 90% CI [.02, .06]. That is, poor NCO leader support, organizational support, anxiety in experiencing close relationships, and problematic alcohol use each partially mediated the relationship between ACE and aggressive behavior. The entire indirect (mediated) effect of these four factors on aggressive behavior is *B*=.06. The squared multiple correlation (i.e., amount of variance in aggressive behavior accounted for by the regressor variables) is *B*=.291, SE=.04, 90% CI [.29, .42], p<.01. In sum, it is estimated that these four factors explain 29.1% of the variance in aggressive behavior.

Table 4.17

Regression Table of Social Support on Aggressive Behavior, N = 1285

Parameter			*B*	S.E.	β	Bootstrap S.E.	Bootstrap 90% CI (LL, UL)	*p*
NCOLDR-	<---	ACE	.112	.019	.184	.025	(.06, .14)	***
ORGSPRT	<---	ACE	-.106	.023	-.135	.031	(-.18, -.08)	***
ECR_Anxiety	<---	ACE	.097	.025	.113	.035	(.03, .15)	***
ALC_prb	<---	ACE	.231	.036	.176	.053	(.15, .33)	***
Aggressive_Beh	<---	ACE	.147	.021	.212	.030	(.14, .24)	***
Aggressive_Beh	<---	NCOLDR-	.188	.050	.170	.069	(.06, .28)	***
Aggressive_Beh	<---	ORGSPRT	-.084	.033	-.100	.052	(-.20, -.03)	.012
Aggressive_Beh	<---	ECR_Anxiety	.079	.024	.103	.038	(.04, .17)	.001
Aggressive_Beh	<---	ALC_prb	.109	.016	.212	.030	(.10, .19)	***
Aggressive_Beh	<---	age1	-.113	.037	-.126	.042	(-.14, -.01)	.002
Aggressive_Beh	<---	gender	.017	.083	.006	.103	(-.10, .25)	.834
Aggressive_Beh	<---	rank6	.005	.046	.004	.059	(-.07, .13)	.907
Aggressive_Beh	<---	yrsmil1	.005	.008	.031	.006	(-.01, .01)	.515
Aggressive_Beh	<---	dply30	.012	.025	.019	.021	(-.05, .02)	.629
Aggressive_Beh	<---	sumcombat	.029	.006	.170	.005	(.05, .02)	***

Note: B = unstandardized coefficient, S.E. = standard error, β = standardized coefficient, Bootstrap S.E. = standard error after bootstrapping procedure, Bootstrap 90% CI (LL, UL) = 90% confidence interval, lower limit, upper limit, *p* = significance level (*** = <.001).

Depression. ACE significantly predicted depression (β=.16, *p*<.001). Figure 4.21 demonstrates that four factors mediated this direct effect. All endogenous direct effects were significant (at *p*<.01 and below) and in the expected direction. The unstandardized indirect effect from ACE to depression through poor NCO leader support was *B*=.01, SE=.01, 90% CI [.01, .02]; through organizational support was *B*=.02, SE=.01, 90% CI [.02, .06]; through anxiety in experiencing close relationships was *B* = .03, SE=.01, 90% CI [.01, .04]; and through alcohol problems was *B* =.03, SE=.01, 90% CI [.01, .03].

Similar to the previous model, the factors of perceived poor noncommissioned officer support, perceived organizational support, anxiety in experiencing close relationships, and problematic alcohol use each partially mediated the relationship between ACE and the outcome variable (depression). The entire indirect (mediated) effect of these four factors on depression is *B*=.11. The squared multiple correlation (amount of variance in depression accounted for by the regressor variables) is *B*=.296, SE=.03, 90% CI [.24, .34], *p*<.05, i.e., all factors account for 30% of the variance in depression.

Table 4.18

Regression Table of Social Support on Depression, N = 1285

Parameter			***B***	**S.E.**	**β**	**Bootstrap S.E.**	**Bootstrap 90% CI (LL, UL)**	***p***
NCOLDR-	<---	ACE	.112	.019	.184	.025	(.05, .14)	***
ORGSPRT	<---	ACE	-.104	.023	-.133	.031	(-.18, -.08)	***
ECR_Anxiety	<---	ACE	.096	.025	.112	.034	(.03, .15)	***
ALC_prb	<---	ACE	.229	.036	.175	.053	(.15, .33)	***
Depression	<---	ACE	.079	.013	.164	.018	(.05, .11)	***
Depression	<---	age1	.071	.024	.108	.032	(.04, .14)	.004
Depression	<---	gender	.134	.056	.066	.090	(.13, .43)	.016
Depression	<---	rank6	-.028	.031	-.029	.042	(-.09, .05)	.365
Depression	<---	yrsmil1	-.006	.006	-.047	.005	(-.01, .01)	.280
Depression	<---	dply30	-.008	.017	-.017	.014	(-.03, .02)	.642
Depression	<---	sumcombat	.019	.004	.152	.003	(.01, .02)	***
Depression	<---	ALC_prb	.062	.010	.170	.016	(.05, .10)	***
Depression	<---	ORGSPRT	-.112	.022	-.183	.033	(-.17, -.06)	***
Depression	<---	NCOLDR-	.084	.033	.107	.045	(-.01, .14)	.010
Depression	<---	ECR_Anxiety	.160	.017	.284	.023	(.12, .20)	***

Note: B = unstandardized coefficient, S.E. = standard error, β = standardized coefficient, Bootstrap S.E. = standard error after bootstrapping procedure, Bootstrap 90% CI (LL, UL) = 90% confidence interval, lower limit, upper limit, *p* = significance level (*** = <.001).

Anxiety. The effect of ACE on anxiety was significantly different than zero (β=.18, p<.001). Figure 4.22 demonstrates that four factors mediated this direct effect. All endogenous direct effects were significant (p<.01) in the expected direction. The unstandardized indirect effect from ACE to anxiety through poor NCO leader support was *B*=.01, SE=.01, 90% CI [.01, .02]; through organizational support was *B*=.01, SE=.01, 90% CI [.01, .02]; through anxiety in experiencing close relationships was *B*=.01, SE=.01, 90% CI [.01, .02]; and through alcohol problems was *B*=.02, SE=.01, 90% CI [.01, .03]. Similar to the two previous models, the factors of perceived poor noncommissioned officer support, perceived organizational support, anxiety in experiencing close relationships, and problematic alcohol use each partially mediated the relationship between ACE and the outcome variable anxiety. The entire indirect (mediated) effect of these four factors on anxiety is *B*=.11. The squared multiple correlation (amount of variance in anxiety accounted for by the regressor variables) is *B*=.296, SE=.03, 90% CI [.24, .34], p<.05, i.e., all factors account for 30% of the variance in.

Table 4.19

Regression Table of Social Support on Anxiety, N = 1285

Parameter			***B***	**S.E.**	**β**	**Bootstrap S.E.**	**Bootstrap 90% CI (LL, UL)**	***p***
NCOLDR-	<---	ACE	.110	.019	.181	.025	(.05, .14)	***
ORGSPRT	<---	ACE	-.104	.023	-.132	.031	(-.18, -.08)	***
ECR_Anxiety	<---	ACE	.095	.025	.112	.035	(.03, .15)	***
ALC_prb	<---	ACE	.229	.036	.175	.053	(.15, .33)	***
GAD	<---	ACE	.088	.013	.183	.017	(.07, .12)	***
GAD	<---	NCOLDR-	.104	.032	.132	.044	(.05, .19)	.001
GAD	<---	ORGSPRT	-.088	.022	-.145	.030	(-.10, -.01)	***
GAD	<---	ECR_Anxiety	.144	.016	.255	.022	(.11, .18)	***
GAD	<---	ALC_prb	.060	.010	.163	.014	(.04, .09)	***
GAD	<---	sumcombat	.023	.004	.181	.003	(.01, .02)	***
GAD	<---	dply30	-.012	.016	-.026	.013	(-.04, .01)	.461
GAD	<---	yrsmil1	-.003	.005	-.024	.004	(-.01, .01)	.566
GAD	<---	rank6	-.033	.030	-.034	.039	(-.10, .03)	.269
GAD	<---	gender	.203	.054	.100	.095	(.17, .47)	***
GAD	<---	age1	.049	.024	.075	.031	(-.01, .10)	.038

Note: B = unstandardized coefficient, S.E. = standard error, β = standardized coefficient, Bootstrap S.E. = standard error after bootstrapping procedure, Bootstrap 90% CI (LL, UL) = 90% confidence interval, lower limit, upper limit, *p* = significance level (*** = <.001).

PTSD. ACE was a significant predictor of PTSD symptom severity (β=.14, *p*<.001). Figure 4.23 demonstrates that four factors mediated this direct effect, and all endogenous direct effects were significant (*p*<.01) and in the expected direction. The unstandardized indirect effect from ACE to PTSD symptoms through poor officer leader support was *B*=.01, SE=.01, 90% CI [.00, .01]; through organizational support was *B*=.02, SE=.01, 90% CI [.01, .03]; through anxiety in experiencing close relationships was *B*=.02, SE=.01, 90% CI [.01, .03]; and through alcohol problems was *B*=.03, SE=.01,

90% CI [.01, .04]. Similar to the three previous models, perceived poor officer support (in lieu of poor noncommissioned officer support), perceived organizational support, anxiety in experiencing close relationships, and problematic alcohol use partially mediated the relationship between ACE and the outcome variable (PTSD symptom severity). The entire indirect (mediated) effect of these four factors on PTSD symptoms is *B*=.11. The squared multiple correlation (amount of variance in depression accounted for by the regressor variables) is *B*=.324, SE=.03, 90% CI [.29, .38], $p<.05$, i.e., all factors account for 32% of the variance in PTSD symptom severity.

Table 4.20

Regression Table of Social Support on PTSD Symptoms, N = 1285

Parameter			***B***	**S.E.**	**β**	**Bootstrap S.E.**	**Bootstrap 90% CI (LL, UL)**	***p***
OLDR-	<---	ACE	.040	.016	.080	.019	(-.01, .06)	.012
ORGSPRT	<---	ACE	-.104	.023	-.132	.031	(-.18, -.08)	***
ECR_Anxiety	<---	ACE	.096	.025	.113	.034	(.03, .15)	***
ALC_prb	<---	ACE	.229	.036	.175	.053	(.15, .33)	***
PTSD	<---	ACE	.096	.019	.135	.029	(.08, .17)	***
PTSD	<---	ORGSPRT	-.143	.026	-.158	.035	(-.20, -.08)	***
PTSD	<---	OLDR-	.166	.043	.115	.068	(.04, .26)	***
PTSD	<---	ECR_Anxiety	.200	.025	.238	.033	(.17, .28)	***
PTSD	<---	ALC_prb	.090	.015	.165	.024	(.06, .14)	***
PTSD	<---	dply30	.009	.024	.013	.027	(-.01, 0.15)	.716
PTSD	<---	yrsmil1	-.001	.008	-.003	.008	(.29, .75)	.934
PTSD	<---	rank6	-.022	.043	-.015	.057	(-.01, .15)	.619
PTSD	<---	gender	.247	.080	.082	.138	(.03, .05)	.002
PTSD	<---	age1	.031	.035	.032	.047	(.80, 1.01)	.372
PTSD	<---	sumcombat	.062	.006	.333	.005	(.71, .89)	***

Note: B = unstandardized coefficient, S.E. = standard error, β = standardized coefficient, Bootstrap S.E. = standard error after bootstrapping procedure, Bootstrap 90% CI (LL, UL) = 90% confidence interval, lower limit, upper limit, *p* = significance level (*** = <.001).

Somatic Symptoms. ACE was a significant predictor of somatic symptoms (β=.18, *p*<.001). Figure 4.24 demonstrates that four factors mediated this direct effect, and all endogenous direct effects were significant (*p*<.05) and in the expected direction. The standardized indirect effect from ACE to somatic symptoms through poor NCO leader support was *B*=.01, SE=.01, 90% CI [.00, .01]; through organizational support was *B*=.02, SE=.01, 90% CI [.00, .01]; through anxiety in experiencing close relationships was *B*=.02, SE=.01, 90% CI [.00, .01]; and through alcohol problems was *B*=.02, SE=.01,

90% CI [.00, .01]. An additional direct path from ACE to task cohesion was significant (β = -.08, $p<.05$); however, the effect of task cohesion on somatic symptoms was not significant. Similar to the five previous models, the factors of perceived poor NCO support, organizational support, anxiety in experiencing close relationships, and problematic alcohol use each partially mediated the relationship between ACE and the outcome variable (somatic symptoms). The entire indirect (mediated) effect of these four factors on somatic symptoms is *B*=.08. The squared multiple correlation (amount of variance in somatic symptoms accounted for by the regressor variables) is .258, *B*=.324, SE=.03, 90% CI [.19, .29], $p<.05$, i.e., the factors account for 26% of the variance in somatic symptoms.

Table 4.21

Regression Table of Social Support on Somatic Symptoms (PHQ-15), N = 1285

Parameter			*B*	S.E.	β	Bootstrap S.E.	Bootstrap 90% CI (LL, UL)	*p*
NCOLDR-	<---	ACE	.112	.019	.183	.025	(.05, .14)	***
T_CO	<---	ACE	-.047	.018	-.076	.025	(-.12, -.04)	.010
ORGSPRT	<---	ACE	-.105	.022	-.139	.031	(-.18, -.08)	***
ECR_Anxiety	<---	ACE	.096	.025	.113	.034	(.03, .15)	***
ALC_prb	<---	ACE	.228	.036	.174	.053	(.15, .33)	***
PHQ-15	<---	ACE	.039	.006	.190	.008	(.03, .053)	***
PHQ-15	<---	NCOLDR-	.044	.014	.130	.021	(.02, .05)	.002
PHQ-15	<---	T_CO	.023	.012	.069	.018	(-.06, .06)	.060
PHQ-15	<---	ORGSPRT	-.041	.012	-.150	.018	(-.06, -.01)	***
PHQ-15	<---	ECR_Anxiety	.059	.008	.246	.010	(.03, .07)	***
PHQ-15	<---	ALC_prb	.011	.005	.071	.006	(.01, .02)	.015
PHQ-15	<---	age1	.023	.011	.082	.013	(.01, .06)	.034
PHQ-15	<---	gender	.117	.025	.136	.041	(.07, .21)	***
PHQ-15	<---	rank6	-.019	.014	-.045	.017	(-.05, .01)	.172
PHQ-15	<---	yrsmil1	-.001	.002	-.011	.002	(-.01, .01)	.804
PHQ-15	<---	dply30	.009	.007	.044	.008	(-.01, .01)	.246
PHQ-15	<---	sumcombat	.009	.002	.177	.002	(.01, .02)	***

Note: B = unstandardized coefficient, S.E. = standard error, β = standardized coefficient, Bootstrap S.E. = standard error after bootstrapping procedure, Bootstrap 90% CI (LL, UL) = 90% confidence interval, lower limit, upper limit, *p* = significance level (*** = <.001).

Self-rated health. ACE was a significant predictor of self-rated health (β=-.10, *p*<.001). Figure 4.25 demonstrates that all endogenous direct effects were significant (*p*<.05 and below) and in the expected direction. The standardized indirect effect from ACE to self-rated health through positive officer support was *B*=-.01, SE=.01, 90% CI [-.02, .01]; through organizational support was *B*=-.03, SE=.01, 90% CI [-.05, -.02]; through anxiety in experiencing close relationships was *B*=-.02, SE=.01, 90% CI [-.03, -

.01]; and through alcohol problems was *B*=-.01, SE=.01, 90% CI [-.02, .00]. This mediation model differed from previous mediation models in that the indirect effect from an officer or NCO was not significant, as evidenced by the confidence interval in the path from ACE to the outcome variable self-rated health through positive officer support including "0". Thus, organizational support, anxiety in experiencing close relationships, and problematic alcohol use each partially mediated the relationship between ACE and the outcome variable (self-rated health). Again, though all direct effects were significant, the entire indirect effect of the three mediating factors on self-rated health is *B*=.06. The squared multiple correlation (amount of variance in self-rated health accounted for by the regressor variables) is *B*=.165, SE=.02, 90% CI [.12, .19], $p<.05$, i.e., the factors account for 17% of the variance in self-rated health.

Table 4.22

Regression Table of Social Support on Self-rated Health (SR_health), N = 1285

Parameter			*B*	S.E.	β	Bootstrap S.E.	Bootstrap 90% CI (LL, UL)	*p*
OLDR+	<---	ACE	-.073	.019	-.119	.024	(-.12, -.04)	***
ORGSPRT	<---	ACE	-.106	.023	-.134	.031	(-.18, -08	***
ECR_Anxiety	<---	ACE	.096	.025	.113	.034	(.03, .15)	***
ALC_prb	<---	ACE	.230	.036	.176	.053	(.15, .33)	***
SR_HEALTH	<---	ACE	-.084	.022	-.102	.031	(-.14, -.03)	***
SR_HEALTH	<---	OLDR+	.081	.040	.060	.076	(-.03, .21)	.042
SR_HEALTH	<---	ORGSPRT	.229	.029	.220	.049	(.15, .31)	***
SR_HEALTH	<---	ECR_Anxiety	-.161	.027	-.167	.036	(-.24, -.12)	***
SR_HEALTH	<---	ALC_prb	-.049	.017	-.078	.021	(-.08, -.01)	.004
SR_HEALTH	<---	sumcombat	-.007	.006	-.030	.005	(-.02, -.01)	.302
SR_HEALTH	<---	dply30	-.088	.028	-.112	.037	(-.11, .01)	.002
SR_HEALTH	<---	yrsmil1	-.001	.009	-.004	.010	(-.02, .02)	.919
SR_HEALTH	<---	rank6	.137	.051	.082	.065	(.05, .26)	.008
SR_HEALTH	<---	gender	-.262	.093	-.076	.119	(-.53, -.13)	.005
SR_HEALTH	<---	age1	-.090	.041	-.080	.054	(-.27, -.09)	.028

Note: B = unstandardized coefficient, S.E. = standard error, β = standardized coefficient, Bootstrap S.E. = standard error after bootstrapping procedure, Bootstrap 90% CI (LL, UL) = 90% confidence interval, lower limit, upper limit, *p* = significance level (*** = <.001).

MODERATION ANALYSES

Testing all interaction effects between each moderator and outcome variable of resulted in 48 models. Tables 4.23 through 4.29 summarize the results of the significant moderation models. In sum, the estimated difference in the interaction between ACE and social support was statistically different than zero in seven models, which will be discussed below. That is, the ACE's effect on several health outcomes depended on both type and level of social support.

Post hoc analyses (Figures 4.26 through 4.32) represent the conditional effect of ACE on health outcomes as a function of the various social support constructs (moderators). The dotted lines are the upper and lower bounds of a 95% confidence interval. Shaded areas represent the area of significance across the social support scores where the effect is significant. Where there is no shaded area, there is no area of significance.

Results (Females)

Among females, the interaction effect of ACE*Positive NCO leader support on PTSD symptoms was significant (B=-2.61, p<.001). That is, the effect of ACE on PTSD symptoms depends on positive NCO leader support. More specifically, as positive NCO leader support increased by one unit, the relationship between ACE and PTSD symptoms decreased by 2.61 units. A post hoc analysis (Figure 4.26) represents the conditional effect of ACE on PTSD symptoms as a function of positive NCO leader support scores. At all positive NCO leader support values, the effect of ACE on PTSD symptoms was significant different from zero. That is, the conditional effect of ACE on PTSD symptoms depended on poor NCO leader support, and was significant for all poor NCO leader support scores evidenced by the shaded area spanning across the entire range of scores.

Table 4.23

Regression Table on PTSD Symptoms, n = 140 females

PTSD Symptoms on	***B***	**S.E.**	**β**	***p***
Age	2.12	.1.76	0.14	0.23
Rank	-0.88	1.50	-0.04	0.56
Years in Military	-0.38	0.30	-0.13	0.21
# of Deployments	-0.54	1.05	-0.04	0.61
Combat Exposure	.147	0.42	0.39	***
ACE	.188	0.89	0.18	*
Positive NCO Support	-.084	0.89	-0.17	*
ACE* Positive NCO Support	-2.61	0.80	-0.19	***

Note: B=unstandardized coefficient, S.E.=standard error, β=standardized beta,
p = significance level (* p < .05, ** p < .01, *** p < .001).

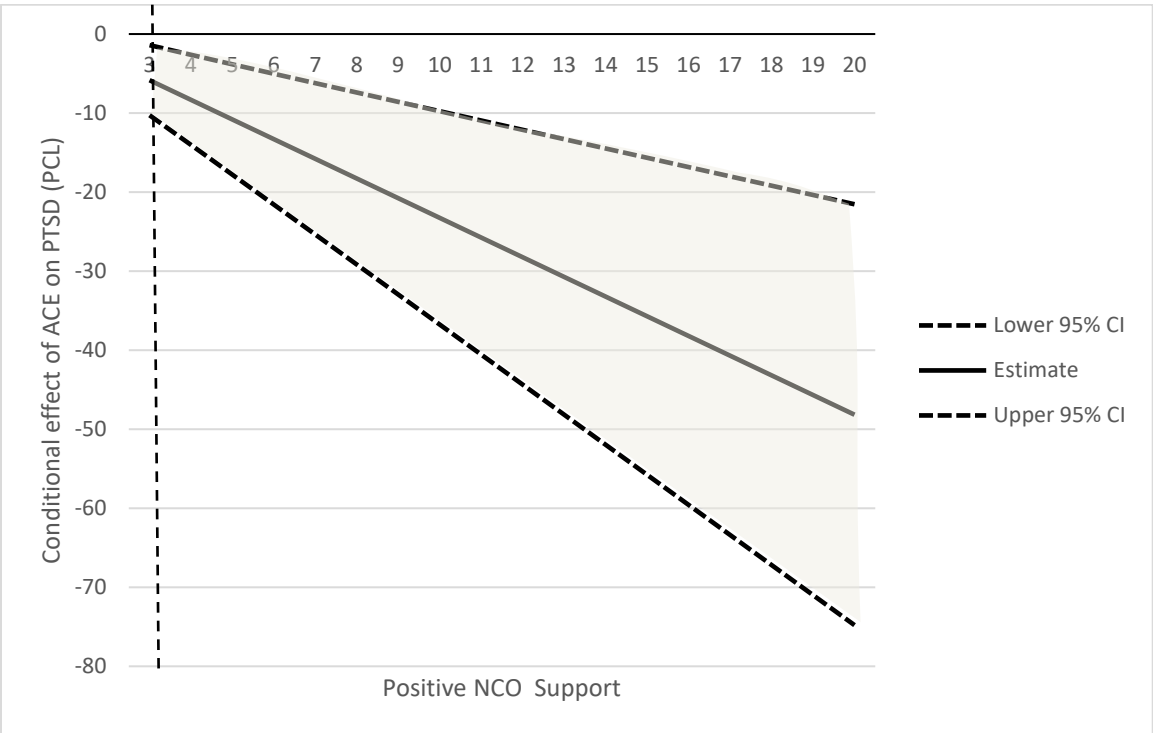


Figure 4.26. Moderation model, conditional effect of ACE on PTSD symptoms as a function of positive NCO support scores (n=140 females). Shaded area = region of significance.

The interaction of ACE*Poor NCO leader support on alcohol problems was significant (B=0.31, p<.05). That is, the effect of ACE on alcohol problems depends on Poor NCO leader support. More specifically, as poor NCO leader support increased by one unit, the relationship between ACE and aggressive behavior increased by .31 units. A post hoc analysis (Figure 4.27) represents the conditional effect of ACE on alcohol problems as a function of poor NCO leader support scores. At all poor NCO leader support values, the effect of ACE on alcohol problems was significantly different from zero. That is, the conditional effect of ACE on alcohol problems depended on poor NCO leader support, and was significant for all poor NCO support scores.

Table 4.24

Regression Table on Alcohol Problems, n = 140 females

Alcohol Problems on	***B***	**S.E.**	**β**	***p***
Age	-0.10	0.16	-0.04	0.54
Rank	-0.14	0.16	-0.09	0.38
Years in Military	0.04	0.03	0.03	0.30
# of Deployments	-0.14	0.18	-0.11	0.44
Combat Exposure	0.08	0.06	0.06	0.17
ACE	0.23	0.11	0.26	*
Poor NCO Support	0.04	0.04	0.03	0.28
ACE* Poor NCO Support	0.31	0.15	0.31	*

Note: B=unstandardized coefficient, S.E.=standard error, β=standardized beta,
p = significance level (* p < .05, ** p < .01, *** p < .001).

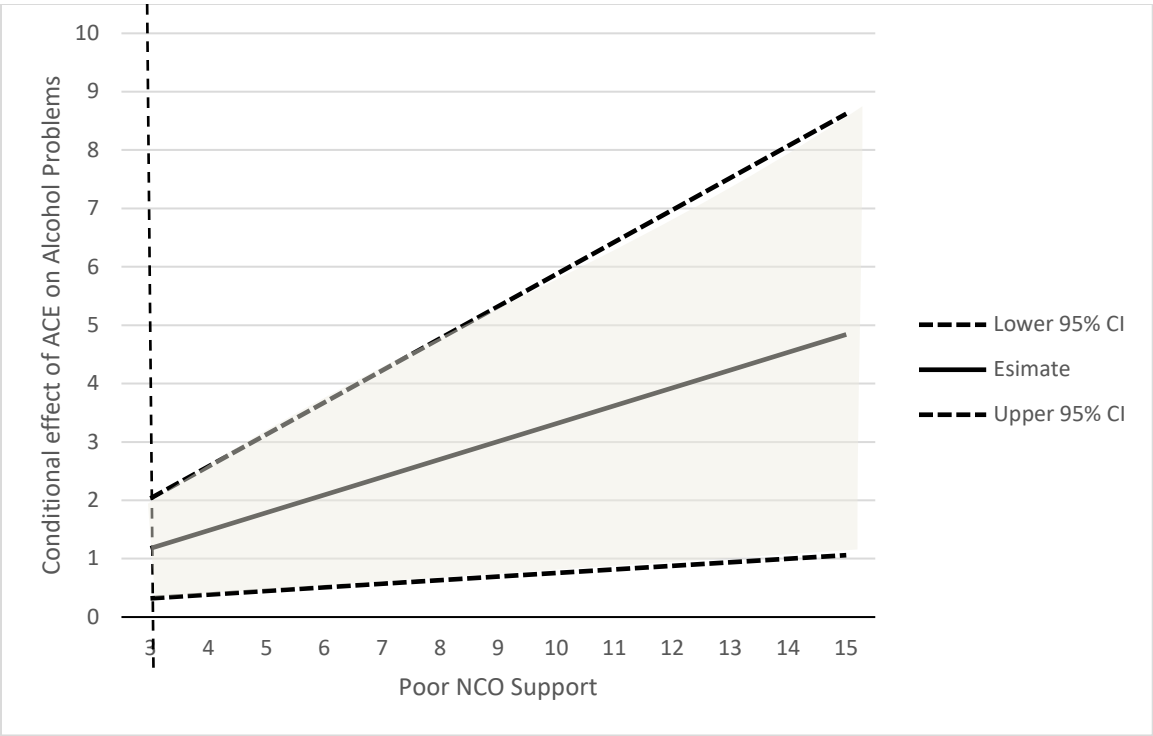


Figure 4.27. Moderation model, conditional effect of ACE on alcohol problems as a function of poor NCO support scores (n=140 females). Shaded area = region of significance.

The estimated difference in the interaction of ACE*Positive NCO leader support on aggressive behavior was significantly different that zero (*B*=-0.54, *p*<.05). That is, the effect of ACE on aggressive behavior depends on positive NCO leader support. More specifically, as positive NCO leader support increased by one unit, the relationship between ACE and aggressive behavior decreased by .54 units. A post hoc analysis (Figure 4.28) represents the conditional effect of ACE on aggressive behavior as a function of positive NCO leader support scores. The region of significance for the conditional effect of positive NCO leader support values ranges between 4 and 20. That is, the conditional effect of ACE on alcohol problems depended on poor NCO leader support scores greater than 3.

Table 4.25

Regression Table on Aggressive Behavior, n = 140 females

Aggressive Behavior on	***B***	**S.E.**	**β**	***p***
Age	-0.11	0.30	-0.04	0.71
Rank	-0.77	0.30	-0.18	*
Years in Military	0.12	0.08	0.21	0.16
# of Deployments	-0.07	0.35	-0.02	0.84
Combat Exposure	0.01	0.08	0.01	0.97
ACE	0.55	0.16	0.24	***
Positive NCO Support	-0.17	0.06	-0.23	**
ACE* Positive NCO Support	-0.54	0.20	-0.20	**

Note: B=unstandardized coefficient, S.E.=standard error, β=standardized beta,
p = significance level (* p < .05, ** p < .01, *** p < .001).

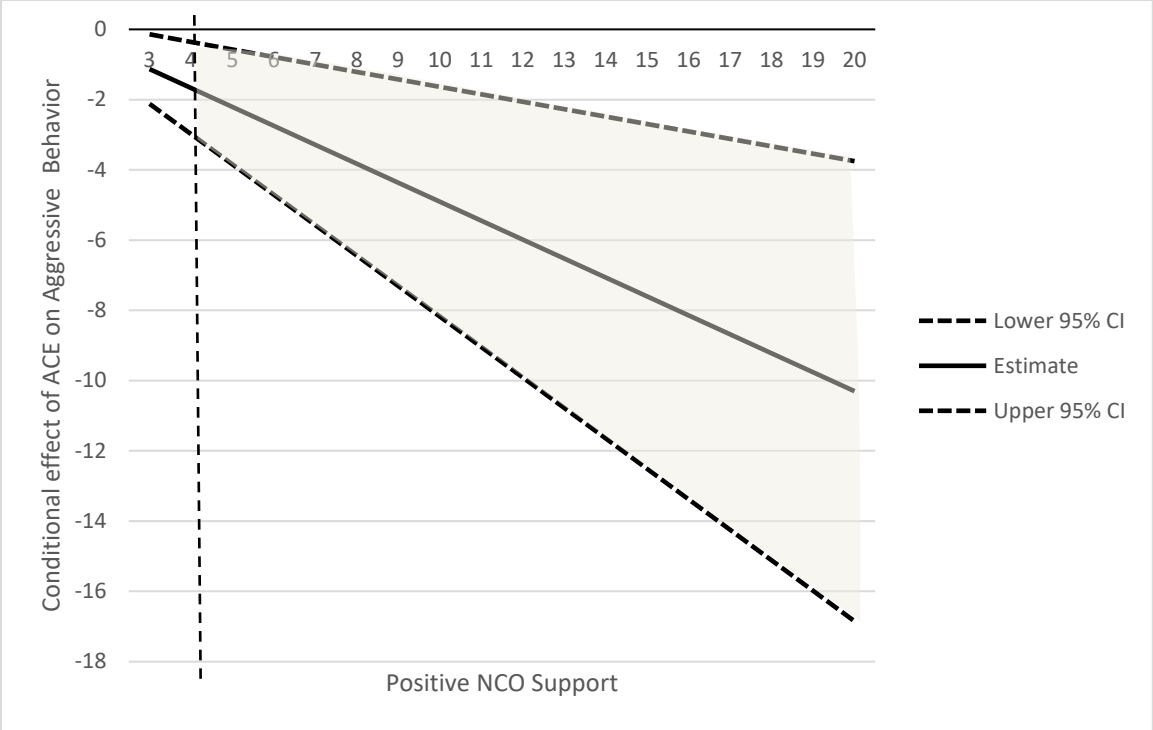


Figure 4.28. Moderation model, conditional effect of ACE on aggressive behavior as a function of positive NCO support scores (n=140 females). Shaded area = region of significance.

Results (Males)

Among males, the estimated difference in the interaction of ACE*Positive NCO leader support on aggressive behavior was significantly different that zero (*B*=-0.18, *p*<.05). That is, the effect of ACE on aggressive behavior depends on the positive NCO leader support. More specifically, as positive NCO leader support increased by one unit, the relationship between ACE and aggressive behavior decreased by .18 units. However, the post hoc analysis (Figure 4.29) representing the conditional effect of ACE on aggressive behavior as a function of positive NCO leader support did not find any values of positive NCO leader support significantly different than zero, evidenced by the lack of shaded area.

Table 4.26

Regression Table on Aggressive Behavior, n = 1094 males

Aggressive Behavior on	***B***	**S.E.**	**β**	***p***
Age	-0.37	0.12	-0.11	**
Rank	-0.04	0.15	-0.01	0.78
Years in Military	0.01	0.02	0.02	0.66
# of Deployments	0.01	0.08	0.01	0.97
Combat Exposure	0.12	0.02	0.20	***
ACE	0.70	0.07	0.29	***
Positive NCO Support	-0.13	0.03	-0.15	***
ACE* Positive NCO Support	-0.18	0.09	-0.06	*

Note: B=unstandardized coefficient, S.E.=standard error, β=standardized beta,
p = significance level (* p < .05, ** p < .01, *** p < .001).

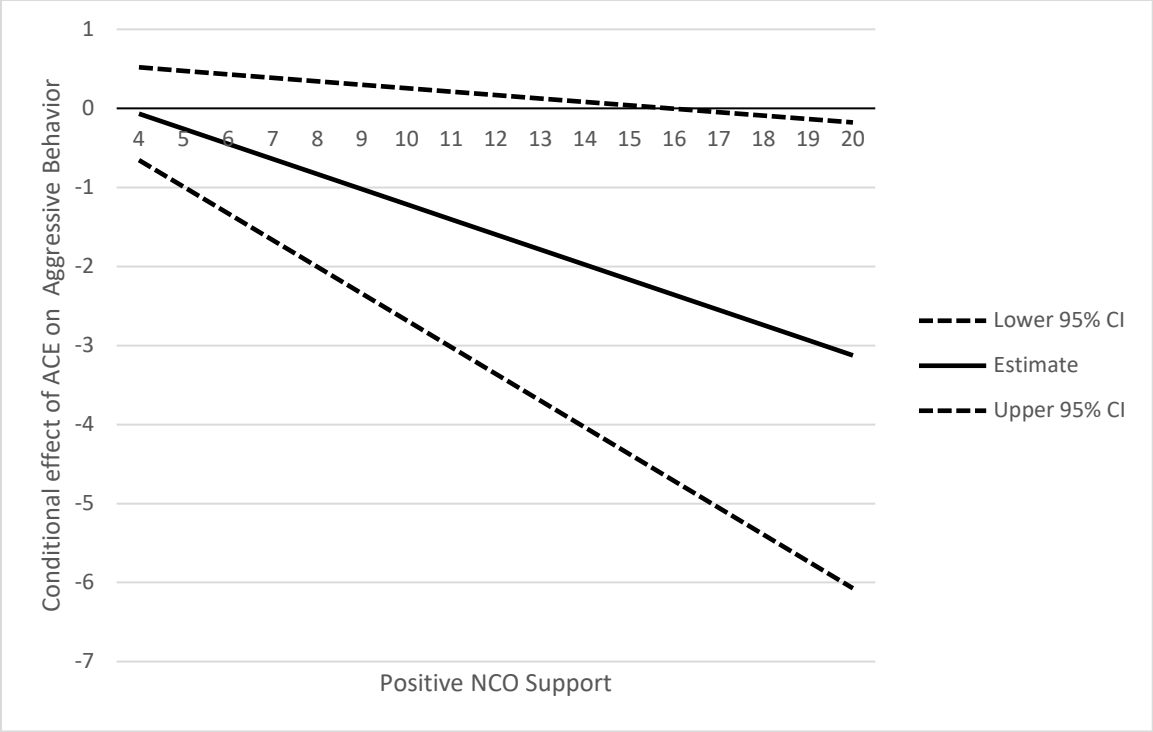


Figure 4.29. Moderation model, conditional effect of ACE on aggressive behavior as a function of positive NCO support scores (n=1094 males).

The estimated difference in the interaction of ACE*Organizational support on somatic symptoms was significantly different than zero (*B*=0.34, *p*<.05) for the males. That is, the effect of ACE on somatic symptoms depends on organizational support. More specifically, as organizational support increased by one unit, the relationship between ACE and somatic symptoms increased by .34 units. A post hoc analysis (Figure 4.30) represents the conditional effect of ACE on somatic symptoms as a function of organizational support scores. At all organizational support values, the effect of ACE on somatic symptoms was significantly different from zero. That is, the conditional effect of ACE on somatic symptoms depended on organizational support, irrespective of the specific organizational support score.

Table 4.27

Regression Table on Somatic Symptoms, n = 1093 males

Somatic Symptoms on	***B***	**S.E.**	**β**	***p***
Age	0.20	0.2	0.04	0.31
Rank	-0.77	0.23	-0.10	**
Years in Military	0.03	0.05	0.02	0.59
# of Deployments	0.10	0.16	0.03	0.54
Combat Exposure	0.17	0.03	0.18	***
ACE	0.95	0.12	0.24	***
ORGSPRT	-0.22	0.34	-0.18	***
ACE* ORGSPRT	0.34	0.16	0.07	*

Note: B=unstandardized coefficient, S.E.=standard error, β=standardized beta,
p = significance level (* p < .05, ** p < .01, *** p < .001).

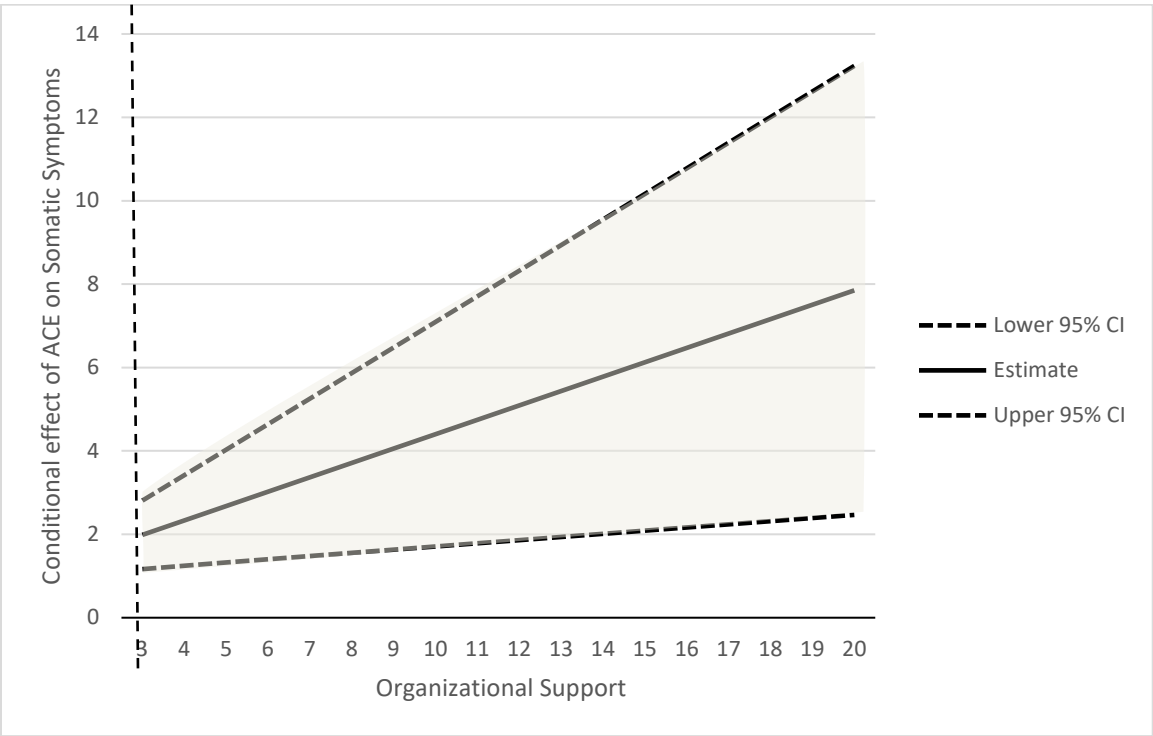


Figure 4.30. Moderation model, conditional effect of ACE on somatic symptoms as a function of organizational support scores (n=1093 males). Shaded area = region of significance.

The estimated difference in the interaction of ACE*Positive officer support on somatic symptoms was significantly different than zero (B=0.36, p<.05). That is, the effect of ACE on somatic symptoms depends on positive officer support. More specifically, as positive officer support increased by one unit, the relationship between ACE and somatic symptoms increased by .36 units. A post hoc analysis (Figure 4.31) represents the conditional effect of ACE on somatic symptoms as a function of positive officer support score. At all positive officer support values, the effect of ACE on somatic symptoms was significantly different from zero. That is, the conditional effect of ACE on somatic symptoms depended on positive officer support, irrespective of the specific positive officer support score.

Table 4.28

Regression Table on Somatic Symptoms, n = 1088 males

Somatic Symptoms on	***B***	**S.E.**	**β**	***p***
Age	0.20	0.20	0.04	0.32
Rank	-0.92	0.24	-0.12	***
Years in Military	0.02	0.05	0.02	0.60
# of Deployments	0.12	0.16	0.03	0.46
Combat Exposure	0.19	0.03	0.20	***
ACE	0.98	0.12	0.25	***
Positive Officer Support	-0.14	0.04	-0.10	**
ACE* Positive Officer Support	0.36	0.15	0.06	*

Note: B=unstandardized coefficient, S.E.=standard error, β=standardized beta,
p = significance level (* p < .05, ** p < .01, *** p < .001).

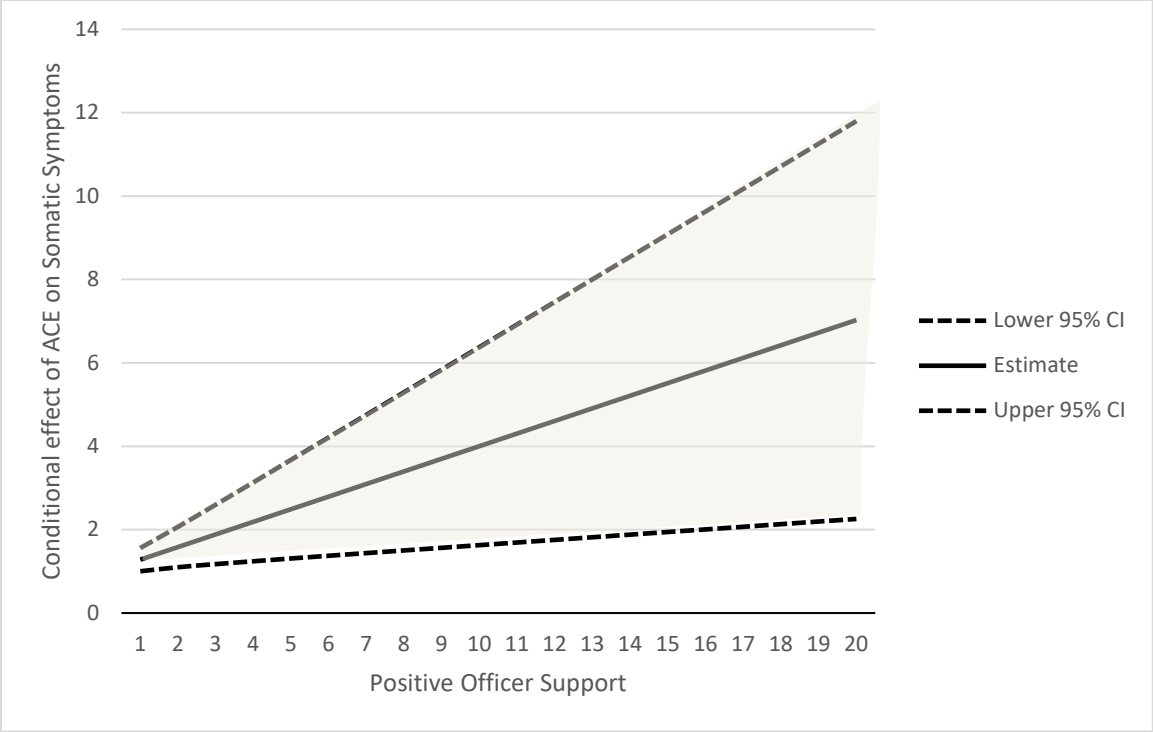


Figure 4.31. Moderation model, conditional effect of ACE on somatic symptoms as a function of positive officer support scores (n=1088 males). Shaded area = region of significance.

The estimated difference in the interaction of ACE*Anxiety in experiencing close relationships on PTSD symptoms was significantly different that zero (B=0.90, p<.05). That is, the effect of ACE on PTSD depends on anxiety in experiencing close relationships. More specifically, as anxiety in experiencing close relationships increased by one unit, the relationship between ACE and somatic symptoms increased by .90 units. A post hoc analysis (Figure 4.32) represents the conditional effect of ACE on PTSD as a function of anxiety in experiencing close relationships (AECR) score. At all positive officer support values, the effect of ACE on PTSD was significantly different from zero.

That is, the conditional effect of ACE on PTSD depended on anxiety in experiencing close relationships, irrespective of the specific AECR score.

Table 4.29

Regression Table on PTSD Symptoms, n=1099 males

PTSD on	***B***	**S.E.**	**β**	***p***
Age	-0.20	0.56	-0.1	0.73
Rank	-0.84	0.64	-0.04	0.19
Years in Military	-0.10	0.12	0.04	0.42
# of Deployments	-0.45	0.42	-0.05	0.28
Combat Exposure	-.95	0.08	0.36	***
ACE	2.30	0.29	0.22	***
Anxiety in Close Relationships	0.52	0.06	0.24	***
ACE* Anxiety in Close Relationships	0.90	0.37	0.07	*

Note: B=unstandardized coefficient, S.E.=standard error, β=standardized beta,
p = significance level (* p < .05, ** p < .01, *** p < .001).

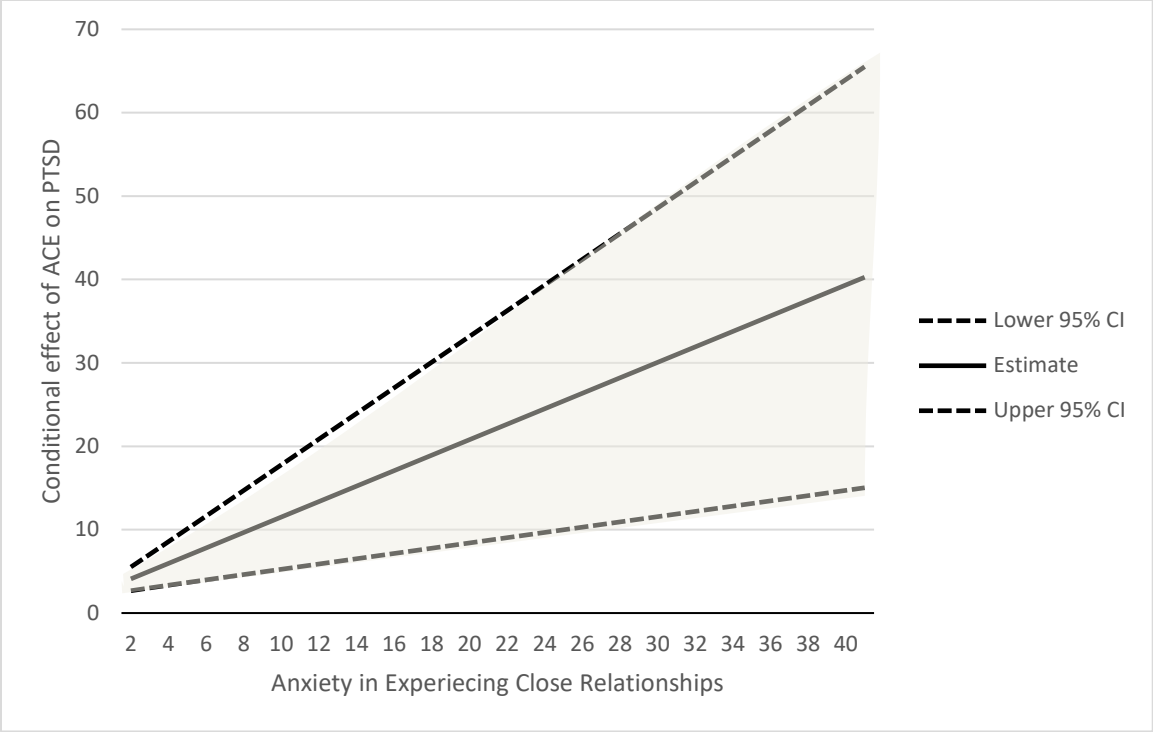


Figure 4.32. Moderation model, conditional effect of ACE on PTSD symptoms as a function of anxiety in experiencing close relationship scores (n=1099 males). Shaded area = region of significance.

Chapter 5: Discussion

The robust prevalence of ACEs among service members – and the known health risks associated with ACE exposure, combined with the unique stress and hazards commensurate with military service – highlight the importance of ongoing ACE-related military health research related to military readiness. Given the abundant literature on the protective factor of social support, surprisingly little research had explored how social support typology influences ACE's impact on service member health, leading to this study's first aim – to assess if ACE exerts its influence on service member health through social pathways. Secondly, this study sought to address if these modifiable situational factors (e.g., specific types of social support) significantly altered the well-known conditional effect of ACE on health among service members.

Discussion of Aim 1 – Mediation

Given the theoretical background of prominent stress models – where ACE either inclines persons to experience more stress in adulthood (stress generation), or imparts additive influences on later health (stress accumulation), or amplifies reactions to stressors encountered across the lifespan (stress sensitization), this study hypothesized that various types of social support, *anxiety in close relationships*, and maladaptive coping (*problematic alcohol use*) would mediate the relationship between ACE and several health outcomes in such a way that more ACE would accentuate negative perceptions of, or diminish positive perceptions of, social support, leading to poorer health. Results generally support this hypothesis. After eliminating nonsignificant

pathways in each SEM analysis, all models demonstrated that greater ACE-exposure was related to: lower *perceived organizational support,* greater *poor NCO leader support* (one model found lower *positive officer leader support* instead of *greater poor NCO leader support),* greater *anxiety in experiencing close relationships* and greater *problematic alcohol use,* all of which predicted all health outcomes in the expected direction. These pathways accounted for 28% of the variance (i.e., squared multiple correlation) in aggressive behavior; 30% of the variance in depression; 30% of the variance in anxiety; 32% of the variance in PTSD symptoms; 26% of the variance in somatic symptoms; and 17% of the variance in self-rated health.

Collectively, these findings are consistent with the general ACE literature on the long-term consequences of allostatic load proposed by the stress generation model. Recall this model's assumption that childhood toxic stress not only imparts biological developmental consequences, but also increases risk for successive stressors that can subdue individual coping and weaken recovery and health (Nurius, Green, Logan-Greene, & Borja, 2015). That this study consistently demonstrated social pathways mediating ACE's effect across several health outcomes undergirds literature showing that ACE-exposure influences the capability to trust and depend on others, often associated with later life isolation or negative ways of relating to and maintaining relationships (Kendall-Tackett, 2002; Lee et al., 2016). Consistent with relational regulation theory, this inhibited ability to trust and depend on others or "social disconnect," negatively impacts individuals' affect, cognitions, and behaviors underlying many known mental health disparities (Woods et al., 2016).

Looking at individual factors that consistently mediated the relationship between ACE and all health outcomes, a few highlights should be noted. *Perceived organizational support* has not been extensively investigated across high-risk occupations like the military (Barnes, Nickerson, Adler, & Litz, 2013). Only two previous studies specifically looked at the effect of such support on health among military samples. Barnes et al. (2013) longitudinal investigation of the association between perceived organizational support and PTSD symptoms among deployed US soldiers found that stress strongly influenced this relationship such that greater stress was related to degraded perceptions of support, suggesting a bi-directional relationship. However, the Barnes et al.'s study's results were greatly limited by the model's poor fit to the data (χ^2=118.50, p>.05; RMSEA=.067; CFI=.895; TLI=.860). Another study by Kelley, Britt, Adler, and Bliese (2014) found that stigma partially mediated the relationship between perceived organizational support and PTSD symptoms, suggesting that supportive organizational environments can help reduce stigma associated with help seeking behavior, which may help soldiers cope with PTSD symptoms.

This study found that greater ACE was related to lower *perceived organizational support* across all models, suggesting that ACE appears to reinforce service members' *perceptions* that their military units to which they are assigned fail to regard their personal opinions, goals, and values as important. Yet, despite this perceived indifference, across every model, the relationship between ACE and health was positively mediated by perceived organizational support. Said differently, even with greater ACE exposure, higher perceived support was related to better health outcomes. These results

suggest that mental health outcomes may be improved if service members believe that their organization supports them, specifically ACE-exposed military members. This assertion is not just speculative, but buttressed by organizational support theory (OST) – which proposes that members' create beliefs about how the organization values their input and involvement, and cares about their welfare, perceived or otherwise (Barnes et al., 2013; Kurtessis et al., 2017). Kurtessis et al. (2017) meta-analysis of 558 studies on OST found that perceptions of favorable or unfavorable treatment of workers improves or harms psychological well-being of employees, respectively.

It is also noteworthy that across five examples of social support typologies (e.g., organizational support, unit cohesion, task cohesion, positive NCO and officer leader support) analyzed in this study, *perceived organizational support* was the only factor that positively mediated ACE's effect on each and every health outcome. Why is this? Research finds that military leadership affects cohesion (Coulter, Lester, & Yarvis, 2010). It seems reasonable then to presume that among service members with greater ACE exposure, those who have positive perceptions of the organization's dedication to the service member's well-being, goals, and values would also have positive perceptions of unit cohesion (e.g., horizontal social bonds between peers) or its NCO and officer leader support behaviors (e.g., vertical bonds between leader and subordinate). Military sociologists firmly regard social cohesion as a 'strength multiplier' in that historically, the benefits of stable and socially cohesive units have included improved mission performance or psychological protection regarding service members' wellbeing (Coulter et al., 2010). Researchers should investigate whether this is because organizational

support best typifies the type of emotional and psychological support discussed in the military cohesion literature. Research may also seek to identify how the military can better facilitate organizational support among its members. and to further operationalize factors underlying this construct.

Considering implications for the mediated pathway of *anxiety in experiencing close relationships* on health, two observations are prominent – one will be discussed in this section and the other in the moderation section. *Anxiety in close relationships* consistently appeared as a causal pathway between ACE and every health outcome in the expected direction. This is not surprising as more of this anxiety is a measure of greater insecurity in relationships. Recall that research finds that ACE-exposure may create relational deficits that inhibit an individual from developing social connections and neglect social resources throughout life (Kendall-Tackett, 2002; Lee et al., 2016). But beyond its consistent presence in mediating all outcome variables, it was also the strongest mediator for the principal mental health measures (e.g., depression, anxiety, PTSD and somatic symptoms). These observations reinforce the well-known influence of social factors on the development and maintenance of mental health symptomology. Relational regulation theory (RRT) infers that social connectedness (e.g., ordinary conversation and shared experiences) is a key component in regulating affect, cognitions, and behaviors and thus influences mental health (Rodwell & Munro, 2013; Woods et al., 2016). When breakdowns in such regulation occur through living in isolation or disruptions in social networks, this produces poorer mental health (Woods et al., 2016).

In four out of six mediation models, *poor NCO leader support* consistently mediated the relationship between ACE, and in the expected direction on health outcomes. This echoes the indirect effect of lower *perceived organizational support* described above, where, in this case, greater ACE exposure appears to habituate service members' perceptions that their immediate supervisors fail to regard their unique contributions, show favoritism, or are not concerned for their wellbeing. However, unlike *perceived organizational support*, mediation models failed to demonstrate that when perceptions of *positive NCO leader support* increased, health outcomes improved. Though the reasons for this are unknown, there are some plausible explanations.

The day to day management of Army operations falls mainly to NCOs. That is to say, NCOs are accountable for the execution of established policies and standards pertaining to the training and conduct of enlisted personnel (Fisher, 2001). The disproportionate presence of ACEs among service members may present a unique bi-directional relational vulnerability between NCO and enlisted soldiers, given the relational deficits associated with higher ACE-exposure described earlier. That is to say, a destructive reciprocal interaction may be occurring where enlisted soldiers automatically regard their NCOs as untrustworthy, and NCOs automatically regard enlisted soldier misbehavior as moral failings. Contrarily, a systems perspective may help leaders assume a life-course perspective on trauma. With practical health knowledge, leaders might reframe individual or even patterned acts of misbehavior as a part of the soldier's to desire to become resilient; however, the leader might not know how to help the soldier change behaviors to those more fitting the military. With training, this leader

could see him/herself as part of the reciprocal transaction in the system over time, and through a sequence of interactions aim to help the ACE-exposed soldier adapt to the norms of the Army, and organization for which both volunteered to serve and support.

Lastly, *problematic alcohol use* was a significant mediator across all models. Biochemical coping (e.g., alcohol use) is a well-established health risk behavior among ACE-exposed persons (Cole, 2014; Felitti et al., 1998; Stevens, 2012). This problem is likely exacerbated by the prominent alcohol culture within the military as discussed earlier in this dissertation. The standardized indirect effect from ACE to all of the outcome variables (excluding self-reported health), through *problematic alcohol use*, was less weaker than that of the social support paths, possibly suggesting that the benefit of social support may be greater than the risk of alcohol problems on service members' health.

These mediation findings fit well with recent military social cohesion literature. Research by Zang et al. (2017) on the relationship of negative posttraumatic cognitions (e.g., negative cognitions about self and the world), personal resources (a latent factor including social support, unit cohesion, and personal resilience), and PTSD severity found that negative posttraumatic cognitions mediated the relationship between personal resources and PTSD severity among treatment seeking active duty soldiers. Their findings suggest that personal resources may mitigate PTSD severity by reducing negative posttraumatic cognitions (Zang et al., 2017). Conversely, when the social support is not actualized, this dissertation's findings found that greater ACE exposure may exacerbate PTSD symptom severity (and other psychopathology) through relational

deficits. That is, this data may be demonstrative of the protective factor of social resources. When social resources (e.g., a known relational protective factor which helps shape and form adaptive cognitions) either in stressful times (e.g., stress buffering) or regardless of the presence of stress (e.g., relational regulation) are lacking, those deficits are related to poorer mental health among ACE-exposed service members. Given the disproportionate number of ACEs across the military, researchers may wish to examine the potential protective effects of social support and unit cohesion on service members' mental health by comparing ACE and non-ACE exposed samples.

In addition to the military ACE literature, this dissertation also contributes to the military social cohesion literature. In their excellent review of military social cohesion, Coulter et al. (2010) reviewed cohesion as a means of enhancing the capacity of formal and informal networks as strength multipliers. They deconstructed the broad concept of military cohesion, only to reconstruct it as a latent social construct they termed *social fitness*, comprised of distinct, yet interrelated, factors of social connectivity, leadership skills, family relationships, friend relationships, unity and work relationships, and financial health. The components of their *social fitness* model appear to reflect the various descriptions of military unit cohesion throughout the literature – but now presented with a common vocabulary for military leaders. Additionally, they summarized a unique challenge regarding military cohesion: units must simultaneously focus on task cohesion (i.e., sharing common goals) for the sole purpose of accomplishing the mission while also providing social cohesion (i.e., emotional and psychological soldier support), which generally is found to undermine task cohesion. Coulter et al. end by proposing that

though units have historically been forced to choose one over the other (constrained by time and resources to accomplish both), reframing and clarifying cohesion into its various subcomponents in using their *social fitness* model may help build capacity and help anchor future prevention efforts for both military leaders and healthcare providers. They also note that research is needed to confirm their conceptual model. In other words, a new conceptual framework reflecting the clear contributions of distinct, yet interrelated, social support typology may help improve military effectiveness while remaining committed to protecting the health of the force.

This dissertation did not investigate the validity of Coulter et al.'s (2010) model. However, similar to their *social fitness* model, this dissertation's findings on the relationship between military cohesion and service members' health demonstrate the need for research on military member social support to adopt conceptual frameworks that recognize the unique risk and protective contributions of interrelated – yet distinct – types of social support. For example, regarding risk, NCO support as a risk pathway from ACEs to: aggressive behavior, depression, anxiety, and somatic symptoms, and officer support as a risk pathway from ACEs to: PTSD symptom severity and self-rated health. Regarding protection, organizational support as a supportive pathway from ACES to all mental health outcomes, as well as NCO support mitigating the effect of ACEs on PTSD symptom severity and aggressive behavior. Military health-related research that investigates broad concepts such as social support, social cohesion, or military cohesion is vital but by identifying the various types or aspects of these concepts, the military can better focus its efforts towards health promotion and improved readiness.

Coulter et al. (2010) also noted a lack of subpopulation data on military cohesion. This dissertation helps address that gap as it is believed that this is the first study to examine data distinguishing the effects of specific subtypes of military cohesion (e.g., positive officer/NCO leader support, negative officer/NCO leader support, unit cohesion, perceived organizational support, and task cohesion) on health outcomes common among ACE-exposed service members – a highly vulnerable health subpopulation.

DISCUSSION OF AIM 2 – MODERATION

This research demonstrates distinct gendered responses to social support. That is, social support seems to have a more important moderating effect among women than for men (e.g., among women, the conditional effect of ACE on aggressive behavior and PTSD decreased as positive NCO leader support increased; and the conditional effect of ACE on alcohol problems increased as poor NCO leader support increased, see Figures 4.26 through 4.28). The moderating effect of social support among females may be related to literature that suggests that women are more susceptible to the health risks associated with ACE, but more responsive to social support. Previous research that finds women to be more susceptible to neuroendocrine and autonomic stress responses, and that estrogen stimulates more neurons in the female brain during childhood adversity and thus perceive stress in larger amounts (Heim et al., 2000; Olff, Langeland, Draijer, & Gersons, 2007). In turn, when provided positive social interactions, especially with supervisors, ACE-related health risks significantly reduce among women. Previous research may support this conjecture. King, King, Foy, Keane, and Fairbank (1999) explored relationships among pre-service risk factors (e.g., family instability and early

trauma exposures), warzone stress, postwar resiliency factors (e.g., social support), and PTSD symptom severity among Vietnam veterans. They found greater effects between postwar resiliency factors on PTSD symptom severity among females than males, suggesting that women may be more skilled in mobilizing interpersonal resources in hard times compared to males (consistent with the stress buffering theory). In addition, traditional gender norms suggest that it is more socially acceptable for women to reach out for support. Research is needed regarding the apparent receptivity and benefits associated with vertical social support among women.

Conversely for men, the only clear model involving leader support (e.g., as NCO support increased, the conditional effect of ACE on aggressive behavior decreased, see Figure 4.32) was not found to be significant in a post hoc analysis and therefore offers little interpretive value. The two models that found that the conditional effect of ACE on somatic symptoms increased as positive officer leader support (Figure 4.30) and organizational support (Figure 4.31) increased is difficult to interpret. As expected, the direct effects of organizational support and positive officer support reduced somatic symptoms in the expected direction (β=-.18, p<.001; β=-.10, p<.01, respectively), however these factors did not interact with ACE in the expected direction (e.g. the effect of ACE on somatic symptoms increased as positive officer leader support and organizational support increased), leaving more questions than answers about this moderated effect. These findings may reflect Kelley, Britt, Adler, and Bliese's (2014) findings on the importance of organizational support in reducing stigma in military organizations. Perhaps this particular finding is suggestive of a similar phenomenon

where in reduced stigma environments (e.g., greater support from officers and their organization at large), service members become more aware of and more willing to disclose health issues like somatic symptoms. More work is needed to clarify this effect across other military samples.

Secondly, given the significant role that anxiety in experiencing close relationships plays as a pathway to poor mental health, it stands to reason that the conditional effect (moderation) of ACE on PTSD symptoms was greater as anxiety in experiencing close relationships increased among males (see Figure 4.32). In other words, if social support is essentially a relational structure, then perceptions of support must occur through interaction. And where there is greater insecurity in interacting with others, that the conditional effect of ACE on PTSD increases is not surprising. Conversely, there is some limited research suggesting the harmful pathway (anxiety in experiencing close relationships) from ACE to PTSD could be moderated by peer support (i.e., horizontal social bonding). Kelley et al. (2014) found that social support appeared to reduce negative cognitions associated with PTSD, thereby reducing PTSD severity among PTSD treatment seeking military members. Kelley et al. (2014) findings suggests the possibility that the protective effect of social support may change the strength of the health risk associated with anxiety in experiencing close relationships on PTSD. However, they did not investigate leader support (vertical bonding). Research should examine the social support's potentially moderating role on the effect of anxiety in experiencing close relationships on PTSD and other mental health risks of ACE-exposed military members.

HORIZONTAL AND VERTICAL SOCIAL SUPPORT IMPLICATIONS

Researchers have found that as unit cohesion (e.g., horizontal social bonding with fellow soldiers) increased, the effect of ACE on suicidal ideation decreased (Skopp et al., 2011). Yet, unit cohesion (i.e., horizontal bonding) was not found to moderate the conditional effect of ACE on any of this study's health outcomes, nor was it found to be a causal pathway in any of the mediation (SEM) models. The absence of unit cohesion (e.g., horizontal social bonding) across this study suggests that rather than horizontal bonding (i.e., peer support), vertical bonding (i.e., leader support) factors between employee (soldier) and supervisor (officer/NCO) may be of greater import to ACE-exposed service member health, and may better account for the variance in the conditional effect of ACE on service member health. This finding aligns with non-military workplace stress research that found the strongest effects of social support on wellbeing occur between employee and supervisor rather than between employees/peers (Beehr, 2014). It is important for future research to examine the risks and benefits of vertical support and horizontal support in other military samples.

NEW DIRECTIONS FOR MILITARY READINESS – A SYSTEMS PERSPECTIVE

A systems perspective sees phenomena occurring as a result of action, connection, and context ("The SAGE Encyclopedia of Marriage, Family, and Couples Counseling," 2017). Reflecting this perspective, health and social disparities occur through relationship, community, and cultural conditions (Porter, Martin, & Anda, 2016). This dissertation is essentially an attempt to explain ACEs and its relationship with service member health as it relates to military readiness from this viewpoint.

Background. The military-ACE literature had burgeoned over the past decade, but systems driven efforts to integrate whole-life trauma-informed knowledge into prevention and support activities have not yet materialized across the DOD. This may seem like a failure of the DOD to recognize the need for policies reflecting a recovery-oriented system of care. However, between 2010 to 2016, mandatory budget cuts forced the Army (the largest service branch) to essentially purge more than 100,000 troops from its ranks to achieve a force size of not more than 450,000 (Phillips, 2018). Such a significant troop drawdown (i.e., force reduction) required thousands of soldiers to be administratively separated (i.e., essentially 'fired' from their job) at the discretion of their command. Though not a dishonorable discharge (e.g., a punitive form of separation following conviction at a courts-martial), these administrative separations forced troops out for reasons including, but not limited to: poor duty performance, nonperformance of duties, weight control issues, insubordination, patterns of misconduct, etc.). (Vanden Brook, 2017). It may not be entirely speculative to say that the ACE literature reviewed in this dissertation suggests that some of those administratively separated service members typified those behaviors which are epidemic among ACE-exposed populations (e.g., behavioral and affective vulnerabilities that could be reactivated in combat and operational related stress, alcohol and drug use, impaired coping skills, difficulties in interpersonal relationships, obesity, etc.). These directives to downsize also have less obvious implications for creating recovery-oriented systems of care. For the past several years, the leader culture had been conditioned to adopt a near-zero tolerance policy towards soldier 'misbehavior' (i.e., a limitation imposed upon by external forces). This

external constraint (e.g., forced downsize) could potentially bias leaders to automatically regard any soldier 'misbehavior' as willful misconduct, ostensibly casting a stigma on these misbehaviors as moral failings.

However, in 2017 new policy guidance under the current US administration reversed course, directing the Army to expand to 483,500 by the end of 2018 as part a total Army effort to achieve a force size of over 500,000 by 2028. Suddenly, the Army went from being over-resourced to under-resourced. Highlighting the difficulty of this transition, for the first time in 13 years, the Army failed to achieve its recruiting goal in 2018 despite relaxed army recruiting standards accepting more marginally qualified recruits (e.g., those with poorer standard military exam scores and histories of marijuana use (use remains prohibited in the military) (Phillips, 2018).

Towards a Recovery-oriented System of Care. These recent changes demand fresh perspectives that rise above conventional thinking about health risk prevention and healthcare towards health and resilience promotion. Forced to retain more marginally performing soldiers and draw from a larger pool of likely ACE-exposed populations (along with the accompanying health risks), the Army now finds itself in a position to integrate new knowledge in creative ways that may help boost health equity. As one military service member stated, "…the military professional is a practically-minded individual. This is not, stereotypes aside, the result of an inflexible, unimaginative nature, but comes from pursuing a profession that emphasizes mission accomplishment above all else" (Durham, 1997). The author of this dissertation is hopeful that implications from this research can help inform original and creative ways achieve such equity.

The ACEs literature is replete with data demonstrating that health risk behaviors are common among groups with greater ACE exposure and that ACE exposure is greater among military members. Thus, this study's findings on the health risks implicated through various social pathways, as well as the protective factors associated with vertical social support (i.e., bonding between leader and subordinate) on the health of ACE-exposed military members has implications on the demand for growing personnel end strength goals. A systems perspective suggests that now may be the time for military health and leader development initiatives to integrate whole-life trauma-informed knowledge into prevention support activities.

For example, systems perspective research has demonstrated the value of educating communities, professionals, and service systems about ACEs in civilian settings (Edwards, Holden, Felitti, & Anda, 2003; Felitti et al., 1998; Larkin & Records, 2007). Mounting evidence suggests that coordinated or integrated approaches that address individual, family and community risk factors are more effective in promoting and improving worker health than traditional programs that focus only on individual factors (Sorensen et al., 2005). Various civilian public health approaches realize the wide-spread impact of childhood adversity and have responded by integrating trauma-informed knowledge into policies and practices through networks where organizations, agencies, and community members collaborate in prevention and treatment support activities (Larkin, Beckos, & Shields, 2012; Porter et al., 2016). Such 'recovery-oriented' systems of care, which integrate an understanding of adversity and trauma with social science research, practice knowledge, and community education and support demonstrate

that people can recover from prominent social and mental health challenges (Larkin & Records, 2007; Porter et al., 2016). The *Self-Healing Communities Model* in Washington state and the *Philadelphia ACE Task Force* in Philadelphia, PA typify specific, relevant, and recent examples that such collaborations can result in improvements in deeply entrenched health and social inequities across diverse communities (Pachter, Lieberman, Bloom, & Fein, 2017; Porter et al., 2016). The various military service branches would be wise to consider these approaches in creating their own recovery-oriented systems of care.

Implications on Military Health System. These findings also have clear implications for the future of the military health system (MHS). The MHS is responsible for providing care to active and retired military members through a "Quadruple Aim" strategy of delivering increased wartime readiness, better care, better health, and lower costs – prioritizing improved wartime readiness (Hudak et al., 2013; Mundell, Friedberg, Eibner, & Mundell, 2013). Despite consistent declines in the size of the DOD since the 1960s, personnel costs have grown fast, largely due to healthcare costs (Walker, 2012). Notably, military health care costs have increased from $19 billion in FY 2001 to $47.4 billion in FY 2015 (Walker, 2012), coinciding with this current 9/11 global war on terror (GWOT) military cohort.

This study shows that better health is strongly associated with social support. Future approaches that integrate ACE information within the MHS may support the priority MHS places on increasing wartime readiness, and at a lower cost. Concerted efforts to promote ACE awareness within the MHS could lead to a better understanding

of how persons develop resilience, and ostensibly, prevent future and more costly health consequences among ACE-exposed military members by matching them to resources earlier in their military lifecycle. This study demonstrates that an integrated approach between both MHS and military leadership communities can better address risk factors and improve wellbeing, leading to enhanced wartime readiness.

Previous declarations have been made highlighting the need for the Department of Defense (DOD) to place health in the greater context of community (Dorrance, Robbins, Kimsey, LaRochelle, & Durning, 2018). These calls often include the need for more attention to preventive measures that enhance the welfare and resilience of its members. Herein lies a unique contribution to the military-ACE literature. Even if efforts to synthesize whole-life trauma-informed knowledge and education and training fail to materialize across the DOD, this study provides evidence that social factors are associated with significant risks for ACE-exposed service members (who already make up a sizeable, and likely burgeoning minority, given current relaxed recruiting standards). This suggests that policies ought to include promoting relational strategies as a military force health protection measure. More specifically, this dissertation demonstrates that insecurity in close relationships may be a causal path linking ACE exposure to poorer mental health. It then stands to reason that leader development programs may be improved by incorporating education targeting this collective phenomena among its ranks. Expanding efforts to improve vertical bonding (e.g. supportive behaviors between soldier and supervisor and organization) may have an indirect effect on the health and readiness (i.e., deployability) of a very vulnerable subpopulation of the military.

Calls for embedding health in the greater context of community could not be timelier. The DOD recently released data on 2018 suicides. The active Army suicide rate was at a six year high (Myers, 2019). This study's findings may help propel novel approaches towards mitigating suicide risk in this population when we consider the social aspects of suicide.

As early as sixty years ago, Durkheim (2005) found lower suicide rates among persons who were part of an integrated social group with a strong sense of camaraderie – where members share group norms and values. Research on post-deployed military samples demonstrate greater suicide prevalence is associated with poorer leadership and group cohesion or where soldiers recently moved away from their units (Coulter et al., 2010). These observations are theoretically consistent, as the interpersonal-psychological theory of suicide proposes that in addition to possessing the ability (e.g., means) to die, a person will not die by suicide without an internalized perception of burdensomeness (i.e., that they are a burden to others) and thwarted belongingness (i.e., social disconnection) (Bryan, Morrow, Anestis, & Joiner, 2010).

Simply, this study's findings on relationship insecurity may reduce suicide risk. Relationship insecurity consistently mediated the relationship between ACE (a prominent risk factor for suicide, and in fact, an even greater risk factor than even combat exposure) and depression – another well-known suicide risk factor. However, perceived organizational support consistently mediated the relationship between ACE and depression, suggesting that where organizations and leaders can successfully communicate that their members matter to them, ACE-exposed service members' risk

associated with depression – and indirectly, suicide, may be reduced. In other words, this study finds that organizational and leader behaviors (i.e., supportive vertical relationships) may help stem the suicide epidemic facing active duty service members. There is a need for leaders who can embrace recovery-oriented systems of care.

IMPLICATIONS FOR SOCIAL WORK EDUCATION AND PRACTICE

Implications for Social Work Education. The Department of Veterans Affairs (VA) is the largest employer master's-degree social workers in the nation (NASW, 2015). It is therefore vital that masters level schools of social work that offer certifications or even coursework in military social work include training on childhood adversity. Specifically, schools of social work need to provide education on the prevalence of ACEs among service members, the health risks associated with ACEs, and the social pathways implicated in the association of ACEs with service member mental health (risk and protection).

Implications for Social Work Practice. Over the past decade the US Army transitioned from a centralized behavioral health care model to a community-based behavioral health model. Termed the Embedded Behavioral Health Team (EBHT), this model is a team of 13 multidisciplinary behavioral health civilian providers (where a majority are social workers), technicians, and support assistants located within an active component BCT's physical footprint. Chief goals for the new model are reducing barriers to care, increasing provider-leadership collaboration and improving treatment outcomes (Bicknell, 2012). At the time of writing there are no fewer than 50 EBHTs across US Army installations both in the United States and in Europe. Moreover, a social worker is

assigned to every BCT in the US Army to provide both clinical care to its members, and consultation to its operational leaders. Furthermore, beyond their EBHT and BCT roles, military social workers continue to establish themselves as healthcare leaders in medical treatment facilities and large medical centers across the joint services.

Given the sheer volume of social workers now operating as clinicians, advisors to leaders of operational units, and healthcare leaders, social workers are unprecedentedly well-postured, and must be a part of, helping establish recovery-oriented and trauma-informed communities. Recall that from a systems perspective, health and social disparities occur in the context of relationships, communities, and cultural conditions (Porter et al., 2016). Ingrained in professional social work education is the systems perspective that understands the critical role that social determinants have in health maintenance across the lifespan. Therefore, social workers must advocate for the integration of educating *life-course* perspectives on trauma and their associated health risks; they need to communicate how ACE-exposed service members present a growing health risk demographic, and how ACEs are linked to both health risk and protection through vertical cohesion (e.g., perceptions of leader and organizational support). Essentially, social workers are uniquely qualified and indispensable in efforts aiming to improve the health and readiness of the military.

LIMITATIONS

The limitations of dissertation must be noted. Though the sample is representative of the Army's basic unit of maneuver–the brigade combat team (BCT), the sample comes from a single military installation. Despite the transient nature of military service in

which service members often relocate to different installations throughout their service, the research aims of this dissertation would have been better served if data came from multiple installations organized by the same basic unit–the BCT. Additionally, most of the data came from male participants. Though the military is largely male, this limitation restricts the generalizability of findings in understanding female military members ACEs and ACE-related outcomes. The self-report nature of the data is another limitation. The use of true diagnostic criteria and assessment would have also strengthened the study.

Another study limitation is that data were collected at a single time point – approximately six months after participants returned from a combat deployment to Iraq, limiting the ability to make inferences about causal relationships over time. Longitudinal research designs with data across the lifecycle (e.g., pre-deployment, deployment, and post-deployment) would aid in understanding relationships between ACEs and health outcomes and factors that mediate or moderate these outcomes.

This dissertation does not assume that poor health outcomes are accounted for solely by the antecedent of ACE exposure. Nor are the mediated and moderated paths identified in this study assumed to be the only paths accounting for the variance between ACE exposure and health risk. Many individual factors could be contributing to the relationships discovered in this study. For instance, people enter military service (ACE-exposed or not) with various relational histories (positive, neutral, or negative), making some more inclined to utilize social support as a resource. This research may simply reflect those pre-existing skills rather than specific or exclusive contributions from specific types of military social support. Though this study did not account for

bidirectional influences of poor health outcomes variables on social support (i.e., the potential effect of mood states that may bias or influence perceptions of social support), by exploring several measures of social support concurrently, some protections are built into this analysis. Simply, though this dissertation did not examine the impact of poor health outcomes on the positive social support constructs, models did not reflect that poorer health outcomes were associated with a decrease across all forms of positive social support. Therefore, it is at least plausible that mood states are not causing changes in social judgements, as it would be expected that mood states would also be associated with significant decreases across all forms of social support.

CONCLUSION

This dissertation began by orienting the reader to ACEs as a key determinant of health and social wellbeing, followed by a literature review demonstrating the health risks associated with ACEs, which are not uncommon among military members. Unfortunately, studies of factors that can mitigate or amplify ACEs' effects on service member mental health during service is sparse, leading to this dissertation's examination of potentially modifiable (i.e., manipulatable) mediating and moderating social pathways.

A life-course perspective on mental health acknowledges that ACEs not only impart biological developmental consequences, but also increases risk for successive stressors (e.g., stress generation) that can subdue individual coping and weaken recovery and health. Undergirding this proposition, this study demonstrates such impaired coping in that the association between service members' ACE exposure and mental health was consistently mediated by the risks of social disjunction or isolation. Essentially, ACEs are

not only directly related to degraded military readiness through impaired service member mental health, but a sizeable portion of the variance in their mental health associated with ACEs occur through, or vary depending on, anxiety in experiencing close relationships and vertical cohesion – or are at least compounded by a perceived lack thereof. However, given that the association between service member ACE exposure and mental health was consistently buffered through organizational support, distinct types of vertical cohesion (i.e., organizational and supportive leader support behaviors) appear to be robust health capacity builders and military strength-multipliers. In short, if the military is to create a true culture of health that boosts military readiness, supportive leader behaviors represent an evidence-based, uniquely powerful, and modifiable protective factor that must be integrated into any such effort.

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