THE IMPACT OF CHILDHOOD TRAUMA ON ROMANTIC RELATIONSHIPS AND THE MEDIATING ROLE OF THE STRESS RESPONSE SYSTEM

A DISSERTATION

SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE DEGREE OF DOCTORATE OF PHILOSOPHY

IN THE GRADUATE SCHOOL OF THE

TEXAS WOMAN'S UNIVERSITY

DEPARTMENT OF HUMAN DEVELOPMENT, FAMILY STUDIES, AND COUNSELING

COLLEGE OF PROFESSIONAL EDUCATION

BY

JENNIFER KENDALL, B.S., M.S.

DENTON, TEXAS

DECEMBER 2022

ABSTRACT

JENNIFER KENDALL

THE IMPACT OF CHILDHOOD TRAUMA ON ROMANTIC RELATIONSHIPS AND THE MEDIATING ROLE OF THE STRESS RESPONSE SYSTEM
DECEMBER 2022

This study aims to expand the current body of research to understand further the underlying biological mechanism that mediates the relationship between experiencing childhood trauma and healthy adult romantic relationships and mental health. Positive relationships and good marital quality have been linked to better health and a lower risk of mortality (Robles & Kiecolt-Glaser, 2003; Robles et al., 2014). At the same time, childhood trauma has been linked with a higher incidence of morbidity and mortality (Grummittet al., 2021). There is no lack of evidence that early experiences of trauma impact relationship health and marital outcomes (DiLillo et al., 2009). The current study will examine these mechanisms using a publicly available data set, Midlife in the United States. Structural equation modeling will be utilized to test the relationship between childhood trauma and relationship risk and mental health, mediated by the biological correlate IL-6. Increased levels of IL-6 have been implicated in the activation of the stress response system and emotional dysregulation (Carpenter et al., 2010). Understanding this relationship can improve targeted therapeutic interventions for individuals and couples who have experienced childhood trauma.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Couples and Trauma

Couples and family therapists have long recognized the impact of early childhood relational trauma on adult relationships (Bradbury & Shaffer, 2012; Whisman, 2006). Research on the effects of childhood trauma (CT) has grown exponentially over the last 20 years. There is currently a gap in the literature examining the underlying biological mechanism for how CT impacts adult romantic relationships. The attachment and stress response systems are biologically wired from birth and intricately connected. These systems are also altered by early childhood experiences of stress and trauma (Fonagy, 2018; Kindsvatter & Geroski, 2014). New research is beginning to separate how different forms of abuse, threat, and deprivation alter these systems (Betz et al., 2021). Understanding these complex underlying mechanisms can help individuals and therapists focus on healing and repair interventions.

The literature well established that childhood adversity harms adult health and increases morbidity and mortality (Grummitt et al., 2021). The pivotal study that exposed childhood adversity (Felitti et al., 1998) as a significant threat to health was groundbreaking for individuals who experienced trauma and the medical community. Relationships and loneliness are critical to adult health, morbidity, and mortality (Henriksen et al., 2019; Loving & Slatcher; 2013; Priest et al., 2015). Robles and colleagues (2014) have found that relationship quality is crucial for adult health; better relationships are significantly related to better health. However, early trauma experiences have also increased relational distress and poor relationship satisfaction (DiLillo et al., 2009; Whisman, 2006). Understanding how CT impacts attachment and the ability to create and maintain healthy relationships is necessary for treatment and healing.

It is common knowledge that stress is bad for your health. During early childhood development, the brain is undergoing rapid growth; if the stress response system is overactivated by an unsafe environment, physical abuse, sexual abuse, or neglect, this can have long-term implications for nervous system development (Gunnar 2007; Kindsvatter & Geroski, 2014). When the stress response system is activated, the body releases chemical hormones that negatively impact the body's central systems (such as circulatory, digestive, and immune) through allostatic overload (McEwen et al., 2012). These chemicals alter how the brain responds to any event perceived as a threat. A critical component of the stress response system is the inflammatory cytokines. These include both pro-inflammatory and anti-inflammatory messengers (Gunnar, 2007). These chemical messengers are responsible for beginning many different biological processes.

High levels of IL-6 also have important implications for mental and physical health. It has also been implicated in chronic illnesses, such as heart disease, and mental conditions, such as post-traumatic stress disorder, depression, bipolar, and schizophrenia (Dennison et al., 2012; Gill et al., 2008; Quidé et al., 2019). Research using biological correlates can be challenging due to the systemic and multifaceted nature of these variables. However, discovering the underlying mechanism for intrapersonal and interpersonal distress can benefit the development of the mental health field.

Couple and family researchers are beginning to understand the delicate interplay between an individual's reaction to internal stress states and the impacts on family and romantic relationships. Interleukin-6 is a pro-inflammatory cytokine released by the hypothalamus in response to stress (Jankord et al., 2010). IL-6 has been associated with negative emotions (such as anger) and a reduction in emotional awareness, emotional regulation, and emotional thinking

in response to a stressful situation (Jung et al., 2019; Miyamoto et al., 2013). Trauma researchers have found that IL-6 is released when the stress response is activated. In individuals who experienced prolonged stress in childhood, these chemical messengers are found in much higher concentrations after a stress response (Carpenter et al., 2010). These findings have important implications for couples because every partner dyad will experience distress or disagreement at some point in a relationship. This is normal. Still, the ability to co-regulate and eventually repair predicts the long-term success of romantic relationships (Johnson et al., 2001).

Humans are physiologically wired to connect and bond with others. Attachment research tells us that our stress response systems become activated when this bond is threatened (Johnson et al., 2001). Previous research has found a significant relationship between perceived stress and attachment style. Specifically, the anxious attachment style predicted higher levels of perceived stress (Birnbaum et al., 1997; Reiner et al., 2010; Solomon et al., 1988). Currently, there is a gap in the literature regarding how an individual's stress response system can influence the couple's relationship. Research suggests that early trauma changes the brain in critical ways impacting both the attachment system and a person's ability to co-regulate the stress response systems and the physiological response to stress (Fonagy, 2018; Kindsvatter & Geroski, 2014). Experiencing a lack of safety in an early relationship alters the attachment system, including the view of self and others, which is essential for emotional regulation and bonding. The current study aims to examine the impacts of trauma on these two systems to add to the existing literature about the relationship between trauma and intimate relationships. The current study seeks to expand the literature to understand further how CT impacts adult relationships through a biopsychosocial lens.

Statement of the Problem

There is no lack of evidence to support that CT can cause many destructive and pervasive issues across the lifespan (Grummitt et al., 2021). The attachment research posits that family and partner relationships play a pivotal role in illness and health. Family and romantic relationships have also been implicated in developing and maintaining long-term health outcomes (Priest et al., 2015). The current study aims to test the validity of these ideas when CT is a factor. Little has been done to understand or define the biological mechanisms in adulthood that contribute to relational distress. Because CT causes systemic changes in the body's central stress response systems, this has important implications for developing and maintaining interpersonal relationships (Fonagy, 2018; Siegal, 2001). The current study adds to the existing literature regarding the mechanisms between CT and intimate partner relationships.

Purpose of the Study

The current study seeks to understand the role of pro-inflammatory cytokines, IL-6, in developing and maintaining relationships for individuals who have experienced CT. Understanding the factors that contribute to the effects of CT has far-reaching implications for individuals, clinicians, and medical professionals. Research indicates that experiencing adversity early in life can impact nervous system development and function (Gunnar, 2007; Kindsvatter & Geroski, 2014). CT has been linked to various health consequences and poor outcomes (Grummitt et al., 2021). Secure attachment in adulthood improves health and relationship health outcomes (McWilliams & Bailey, 2010). The current study aims to evaluate the biological mechanism through which CT impacts adult romantic relationships and health.

Research Question and Hypotheses

Research on childhood trauma has presented a devastating case for its impact on the mental and physical health of those who experienced adversity early in life (Chang et al., 2019; Felitti et al., 2019). However, individuals are resilient, and mediating factors between early childhood adversity and adult health still require more exploration and consideration. The current study seeks to expand the existing literature by testing the mediation pathways between CT as the independent variable and relationship risk and mental health as dependent variables with IL-6 as a mediator.

Hypothesis

The following mediation hypotheses are posited for the current project:

(1) Childhood trauma is significantly associated with relationship risk, including increased strain, probability of separation, and disagreement.

(2) Childhood trauma is significantly associated with poor mental health, including increased anxiety and depression.

(3) Childhood trauma is significantly associated with levels of IL-6.

(4) IL-6 will be significantly associated with relationship risk and mental health.

(5) A nonsignificant pathway occurs between childhood trauma, relationship risk, and mental health. A significant indirect relationship between childhood trauma, relationship risk, and mental health is mediated by the current IL-6.

Summary

CT has a pervasive impact across the lifespan that can impact health and mental health. One of the ways this occurs is by disrupting the attachment and stress response systems during development (Gunnar, 2007). The current study seeks to expand the current research regarding

these mechanisms by using a biopsychosocial lens to examine the underlying mechanism of child abuse and how it can impact adult romantic relationships and mental health outcomes. This expanded understanding of the impact of trauma can build on current research to improve interventions for distressed individuals and couples who have experienced childhood adversity.

CHAPTER II

LITERATURE REVIEW

Childhood Trauma

In 1998 Felitti and colleagues published a groundbreaking article about the health consequences of adverse childhood experiences (ACE). Since then, ACEs have been associated with adverse health outcomes resulting from high-risk behaviors such as smoking, drinking, drug use, and increased mortality and morbidity in adulthood (Chang et al., 2019; Felitti et al., 2019). Since then, CT has also been associated with changes in the stress-response systems, leading to neurological changes with social, emotional, and physiological impacts (Barboza Solís et al., 2015). Some of these outcomes have been attributed to brain structure changes during development, including increased amygdala activation, reduced function of the cerebellar vermis, and greater activation of the basal ganglia and prefrontal cortex (Siegel, 2020: Teicher et al., 2003).

The prevalence of CT is not easy to calculate because abuse is not always reported, and many types of abuse, such as emotional abuse, have no legal restrictions. In 2011 the US Department of Health and Human Services reported that there had been over 3.3 million reports of child abuse and neglect in that year. Yearly statistics on past abuse reports indicate that child abuse and neglect tend to co-occur with the health and stability of the economy (Malucio & Ainsworth, 2006). Given the strain placed on most families throughout the current pandemic, it could be assumed that child abuse and neglect are on the rise.

Another factor that makes trauma difficult to conceptualize is the lack of a consistent definition of trauma from a clinical standpoint. The *Diagnostic and Statistical* Manual (*DSM*) provides a conceptual framework of trauma, including incidences such as witnessing violence or

physical injury or maltreatment, sexual assault, and death or loss (American Psychiatry Association, 2013). From a neurodevelopmental perspective, trauma is defined as any experience(s) that repeatedly causes the stress system to become activated for a prolonged period. This can result from one severe event, which can cause repeated activation of the stress response system through the experience of post-trauma symptoms (nightmares, intrusive throughs) or the occurrence of ongoing, repeated events (Teicher et al., 2003).

Trauma and Health

Another impact of early trauma is on the allostatic systems, including the nervous and immune systems. One of the ways CT is posited to impact psychopathology is by increasing inflammatory markers such as IL-6 and C-reactive protein by the immune system. When developing brains are flooded by these markers, development can be impacted (Carpenter et al., 2010). Early life adversity has been demonstrated to cause increased blood levels of these markers in healthy adults (Danese & Baldwin, 2017). Researchers believe CT impacts the body in the same ways as physical trauma by releasing inflammatory markers causing a systemic inflammatory response (Danese & Baldwin, 2017). In a study of healthy adults, those who reported moderate to severe childhood maltreatment had significantly higher levels of IL-6, suggesting an amplified inflammatory response to stress in adulthood due to the trauma (Carpenter et al., 2010).

This biological response damages the developing brain, as indicated by an increase in the incidence of psychopathology (Danese & Baldwin, 2017). In adults, these pro-inflammatory cytokines have been implicated in major depressive disorder, post-traumatic stress disorder, anxiety, and server psychological illnesses such as schizophrenia (Carpenter et al., 2010; Luo et al., 2019; Valkanova et al., 2013). Increased levels of IL-6 have also been implicated in

rheumatoid arthritis, weight gain, sleep quality, autoimmune disorder, inflammatory bowel disease, asthma, multiple sclerosis, diabetes, and some types of cancer (Neurath & Finotto, 2011). Increased C-reactive protein levels have been associated with CT and are significantly linked to increased body mass index (BMI) in adults (Schrepf et al., 2014). Higher levels of C-reactive protein have also been found in individuals diagnosed with Bipolar I or II. Studies indicate that C-reactive proteins are highest during the manic phase of the disease, suggesting a link between mania and higher levels of inflammation (Fernandes et al., 2016).

Heart rate variability (HRV) is another physiological marker associated with biological changes caused by childhood adversity on adult mental and physical health (Jin et al., 2018). HRV measures nervous system activation, particularly the parasympathetic nervous system (Porges, 1995). Childhood trauma correlates significantly with low-frequency HRV (Jin et al., 2018). In adulthood, low-frequency HRV has been associated with depression and risk of cardiac disease (Koch et al., 2019; Stone et al., 2018). For individuals with schizophrenia, low HRV is consistently demonstrated as an increased risk factor for cardiovascular disease (Refisch et al., 2021). Low-frequency HRV has also been associated with increased plasma concentrations of IL-6 (Gonzales-Clemente et al., 2007; Tateishi et al., 2007). These findings exemplify the complex changes that are caused by early adversity.

Trauma and Attachment

Interpersonal trauma in childhood has a destructive effect on the ability of the child to develop securely attached relationships (Fonagy, 2018). Children who experience adversity early in life are at a greater risk of developing mental and physical health disorders, participating in high-risk behaviors, and other developmental disruptions (Kalmakis & Chandler, 2015). These consequences of trauma at an early age have been linked to changes in neurodevelopmental

mechanisms that impact the child's developing brain (Asmundson & Afifi, 2019). When a child experiences trauma, such as a car accident, research has shown that a secure attachment with a caretaker can reduce the psychological impacts of that trauma (Crusto et al., 2010). Conversely, when children are abused by their caretaker or if the caretaker is emotionally or physically unavailable, unsafe, or unpredictable, this can lead to long-term changes in the brain and attachment systems (Erozkan, 2016). When a child does not have a secure base to turn to, they must learn coping strategies to survive in these conditions. Often these coping strategies prioritize survival over a connection, leading to long-lasting patterns of relationship distress due to the inability to feel safe in relationships with others.

The most common forms of CT are physical abuse or neglect, emotional abuse or neglect, and sexual abuse. These interpersonal traumas impact the child's attachment systems and ability to connect with caregivers, peers, or other social supports (Erozkan, 2016). A significant link between childhood abuse and insecure attachment has been empirically validated (Raby et al., 2017). Research also suggests a correlation between the level of unresolved trauma in childhood and disorganized attachment styles (Erozkan, 2016). CT creates a dynamic in which a child's attachment needs are not met, resulting in the child struggling to connect even when a healthy caretaker or attachment figure is available. This inability to trust and connect with others negatively affects social and romantic relationships in adulthood.

Attachment Theory

Attachment theory (Bowlby 1969, 1973, 1980) was developed to explain observed differences in social and emotional behaviors in children. The central premise of this theory is that parent-child relationships are based on proximity and responsiveness, which can either promote a general sense of safety or create insecurity and anxiety in infants and children. This

initial theory grew into what researchers now know is a critical need for connection in individuals across the lifespan (Hazan et al., 2006). Attachment figures provide an initial blueprint for social relationships that becomes part of an individual's worldview for connection across a lifespan (McConnell & Moss, 2011). Attachment needs are the motivational drive that encourages individuals to seek proximity to others and promote social connection (Siegel, 2001). Attachment begins with the early bonds developed between baby and caregiver in infancy and childhood and then later shifts to romantic partners in adulthood. The attachment mechanism is neurologically based and hard-wired into every human brain (Siegel, 2001). Thus, this system is critical for thriving and surviving.

According to Bowlby (1988), the healthiest form of attachment is "secure attachment." Secure attachment develops when a caregiver is responsive to an infant's needs. The level of caregiver responsiveness becomes internalized as an "internal working model" through which a child learns whether they can rely on attachment figures for comfort and closeness or not (Bowlby, 1988). This develops into an early template for how a child views themselves and how they view others. Attachment research posits that children whose parents were stable and responsive tended to have a greater sense of felt security and demonstrate less anxious behavior patterns (Bowlby, 2005). One of the critical components of healthy attachment is the concept of co-regulation of emotions. Those who fall into the categories of insecure, anxious, or avoidant either become withdrawn from a caregiver in times of stress or inconsolable or panicked. These represent an inability to regulate emotional experience (Bowlby, 1988, 2005). These children cannot co-regulate with their caregivers and must develop strategies to cope and manage independently.

During infancy and childhood, the nervous system develops and establishes itself for survival in the child's present environment. Children with a responsive caregiver who creates safety and offers co-regulation support develop a brain wired to respond to a threat only when the nervous system detects danger. However, if an infant or child does not have this type of caretaker (attuned and responsive) and is often in an unsafe or chaotic environment, their nervous system will develop differently and be more sensitive to danger cues. This type of developmental environment results in the child constantly triggering the brain's fight or flight survival centers (Siegel, 2001). These early life experiences shape a person's view of relationships and the dependability of others. Though the development of attachment style is complex and dependent on multiple factors, the environment is a significant contributing influence (Del Giudice et al., 2011). The life history theory suggests that attachment difference varies but that a harsh early environment is mainly influential in developing insecure attachment. This evolutionary framework posits that attachment is an adaptive mechanism that responds to early life environments and promotes psychological and physiological adaptations that make individuals more capable of surviving and thriving in their current environment. These adaptations ensure that future generations will be adapted to surviving in the same environment (Szepsenwol & Simpson, 2019).

Adult Attachment

According to the life history theory, the attachment style developed in childhood has significant implications in adulthood. Early attachment systems impact adults in two main ways. First, the degree of responsiveness to the current environment is based on the level or degree of harshness or unpredictability experienced in early childhood. This suggests that CT impacts how alert the nervous system will be or how safe an adult will feel at any given time, based on the

early environment. The second way early attachment systems influence adults is through behavioral, emotional, and cognitive responses to the environment and the adapted attachment style (Szepsenwol & Simpson, 2019). In other words, coping mechanisms for early childhood experience can remain intact through adulthood and influence how an adult responds to stress in the current environment. Across the lifespan, attachment determines the quality of one's relationship and the individual's ability to maintain healthy romantic partnerships.

Romantic Relationships

From the first moments of life, proximity to an attachment figure becomes associated with an anxiety reduction and a felt sense of security. Attachment relationships are crucial to survival for infants, but the desire for closeness does not diminish across the lifespan; it simply adapts. Attachment needs are met by romantic partners for adults but can also be fulfilled by close friends and mentors such as coaches, teachers, or religious leaders who can step into that role (Siegel, 2020). Attachment figures support emotional regulation in childhood and adulthood through attunement, support, and comfort (Bowlby, 1988, 2005).

The boding system is part of nervous system regulation for infants and adults. When one partner's stress response system is activated, the attachment system is wired for co-regulation, whether from problems within or outside of the relationship. If one partner is dysregulated, the preference is for the other partner to help soothe them through co-regulation. This process allows a partner to calm the other dysregulated nervous system and supports the return to homeostasis (Johnson, 2019a). However, when the nervous system response from one partner starts the stress response system in the other, both cannot co-regulate, resulting in increased levels of distress for both parties. The ability to repair and return to homeostasis depends on the individual's working model of self and others and how they perceive the recent distress. This will mitigate whether the

partner moves toward the other for repair or away. These internal working models have been labeled by attachment researchers as attachment styles and are influenced by CT (Siegel, 2001).

Adult attachment styles are classified as secure or insecure, dismissing, fearful, or preoccupied (Bartholomew & Horowitz, 1991). Adults who develop a secure attachment to others report having had a dependable caregiver and a safe home environment. Those with dismissive attachment styles tend to be highly independent due to unresponsive caretakers experienced as unreliable (Woods & Riggs, 2009). Individuals who fall into the pre-occupied category report having inconsistent and unpredictable caregivers. Finally, adults classified as fearful have developed and internalized a negative sense of self-created in response to rejection by a caregiver (Woods & Riggs, 20009). This negative view of self creates a fear of rejection that causes the individual to volley between wanting closeness yet fearing rejection and pushing others away (Woods & Riggs, 20009). This push-pull dynamic leaves the individual craving connection but unable to trust others and allow the relationship to happen.

Insecure attachment styles such as ambivalent and avoidant also negatively impacted marital satisfaction (Mohammadi et al., 2016). These results can be understood in the context of stress and how insecure individuals deal with stress, whether external or relational. If an avoidant individual experiences distress in a relationship, they will be more likely to turn inward and pull away from their partner as a coping strategy to manage the distress. On the other hand, when anxiously attached individuals experience stress, they tend to seek closeness and yearn for greater connection (Simpson & Rholes, 2017). These two opposing coping styles can create a push-pull dynamic that does not allow either partner to get what they need from the other. Mohammadi and colleagues (2016) also suggest that the negative view of self that is perpetuated by a lack of self-confidence and fears of rejection and loneliness that is common in individuals

with insecure attachment styles creates additional stress internally that can be projected on the relationship. These intrapsychic factors combined with a partner's attachment behaviors can create distress in relationships for individuals with insecure attachment patterns.

Though attachment is established early in infancy, attachment styles are adaptive and can change over the lifespan. Researchers have identified various factors contributing to adult attachment style moving from secure to insecure. Some of these factors include adverse life events such as having a partner who abuses drugs or alcohol, the death of a family member, life-threatening illness, and divorce (McConnell & Moss, 2011). Research on attachment changes from insecurity to security has been more limited. However, relationship satisfaction and emotional openness in romantic partnerships have been linked to greater security in relationships (Egeland & Farber, 1984; McConnell & Moss, 2011).

The attachment style developed in childhood is generally stable across the lifespan but can shift in reaction to current relationships and life events. Recent research supports that individuals with insecure attachment can move to security if three critical processes occur. This process is first setting the intention to overcome barriers to growth while undergoing therapy in a setting where the therapist becomes a surrogate attachment figure, second making intrapersonal changes towards better mental health, and third making interpersonal changes such as making peace with the past and taking a relational risk with trust and vulnerability (Dansby Olufowote et al., 2020).

Couples can influence each other's emotional states at both a conscious and unconscious level. This process occurs through physical presence and emotional attunement or engagement, support, and comfort (Butner et al., 2007). A secure connection develops from a felt sense of security and through co-regulation in couple relationships. A growing body of research has

indicated that secure attachment in romantic partnerships promotes a sense of security, commitment, and longevity in a relationship (Mikulincer & Shaver, 2007). According to Greenberg & Goldman (2008), insecure attachment styles are a risk factor for relational distress because of the inability to seek comfort. A crucial factor for a healthy romantic partnership is proximity seeking, but individuals with insecure attachment styles tend to turn away from each other in times of stress. Shah et al. (2018) found that married individuals reported greater satisfaction if they had a secure attachment style instead of an insecure one. These results were supported in a subsequent study, which indicated that both attachment style and attachment behaviors are essential factors for relationship satisfaction and significantly predicted marital quality (Sandberg et al., 2017).

Health

Aside from its impact on relationships, adult attachment also has significant health implications. Secure attachment has been linked to better mental health outcomes in adulthood, while insecure attachment has increased psychopathology and engagement in risky behaviors (Mikulincer & Shaver, 2007). Insecure attachment styles have also been associated with poor emotional awareness and regulation and higher levels of depression (Owens et al., 2018). There is also evidence that insecure attachment has also been found to increase inflammation-based illnesses and impact heart rate, blood pressure, and stress management (Puig et al., 2013; Widom et al., 2018).

CT has also been implicated as a cause of poor mental and physical health outcomes. There is some evidence to support a mediation relationship between childhood trauma, insecure attachment, and the development of poor mental and physical health outcomes (Widom et al., 2018; Vig et al., 2020). The associations between insecure attachment and health may also be

associated with a dysregulated Hypothalamus-Pituitary-Adrenal (HPA) Axis. Individuals with higher levels of attachment anxiety, especially avoidant individuals, have been consistently found to have a lower threshold for attachment threat and heightened HPA activity (Diamond & Fagundes, 2010; Laurent & Powers, 2007). Quirin and colleagues (2008) identified anxious attachment as contributing to elevated HPA reactivity in adulthood. These results have also been demonstrated in a laboratory setting. In a study of intimate partners, those with an insecure attachment exposed to laboratory-induced conflict showed increased HPA activity and poor recovery after the event (Laurent & Powers, 2007).

Based on the research mentioned above, the current study seeks to identify underlying biological mechanisms that account for the connection of CT to a romantic relationship and mental health. A negative view of self and others is a detrimental consequence of early relational trauma (Mohammadi et al., 2016). Due to the connection between the stress response system and the attachment system, it is hypothesized that there will be a significant positive correlation between CT, inflammatory markers, and a negative view of self and others.

The Stress Response System

Stress System Development

Research on the stress response system has evolved tremendously over the last century. In 1935, Walter Cannon first coined the term “fight or flight” to explain how our bodies react behaviorally to threats. Cannon recognized early on that the body is in constant flux between states of calm (homeostasis) and alert states. The stress response system has developed in the nervous system as the mechanism that manages the body's internal state of arousal. Our brain is wired from birth to be adaptable to our environment. The nervous system is prepared to move

from a state of safe, calm, and open to connect to a stressed state such as fight or flight when an environmental threat is perceived (Heim & Nemeroff, 2001).

When the stress response system becomes activated, it instantly releases chemical messengers that shift the body from one state to another (Heim & Nemeroff, 2001). Gunnar (2007) referred to this system as a "motivational system" for the body's defenses. When a threat is perceived, the body diverts critical resources from storage to usable states, mobilizing some organs while limiting others and enhancing perception to focus on relevant environmental cues (Gunnar, 2007).

The stress response system is also responsible for encoding and filtering information from the environment. So not only does this system initiate the response, but it also determines the system's responsiveness to the stimulus, acting to amplify reactions when necessary (Tonhajzerova & Mestanik, 2017). Other brain and memory functions are altered so that meaningful previous connections and experiences can be drawn upon for survival (Gunnar, 2007). Then when the threat has subsided, the stress response system is responsible for bringing the body back to homeostasis. These systems have been referred to as the stress response system (Heim & Nemeroff, 2001) and the stress-emotion system (Gunnar, 2007).

Stress and Attachment

Stress is an important factor when discussing attachment. Attachment researchers have found that the prefrontal cortex (PFC), the area of the brain used for planning, memory, and other cognitive functions, is activated to regulate attachment-related thoughts. For example, the PFC functions by creating a protective plan for how a person can prevent separation and supports the ability to process rejection (Gillath et al., 2005). Once the HPA activates the stress response, the PFC processes emotional information and organizes behavior, decision-making, and rule

learning (Gillath et al., 2005). More recent research has identified the PFC as an essential factor in an individual's response to stress or threat (Wheelock et al., 2016). These functions of the PFC create the potential that stress, HPA, and PFC activation can lead to changes in the ability to form or maintain secure attachment.

Stress researchers have also found that chronic stress can reduce the activity in the PFC while strengthening activity in the amygdala, a part of the brain important for the fear response. The PFC is an essential top-down regulator. It works to inhibit impulsive behavior, discern reality, regulate attention and help gain insight into one's actions and the action of others (Arnsten et al., 2015). Without these abilities in place, connecting with others would be significantly inhibited.

The attachment diathesis-stress process model also identifies how the working models of self and others, developed in childhood, can impact adult relationships (Simpson & Rholes, 2017). This model focuses on how each partner handles internal and external sources of stress. The model outlines how both avoidant individuals and anxious individuals cope with perceived stress and how these coping styles tend to conflict when stress is present (Simpson & Rholes, 2017).

The Nervous System and Attachment Style. Tonhajzerova and Mestanik (2017) have identified four different phenotypes of nervous system development: sensitive, buffered, unemotional, and vigilant patterns. These phenotypes align with the four main attachment styles: secure, anxious pre-occupied, anxious-avoidant, and disorganized. The buffered phenotype is a pattern of nervous system activation initiated by the stress response system that develops due to predictable responsivity by caretakers and moderate repeated stress. This type of stress response activation is characterized by low anxiety and aggression in males and females. These

individuals are most aligned with a secure attachment, are sensitive to social feedback, and are most likely to have healthy, lasting romantic partnerships (Del Giudice et al., 2011; Tonhajzeroa & Mestanik, 2017)

The limbic-hypothalamic-pituitary-adrenal (LHPA) axis is the part of the stress response system implicated in regulating psychosocial stressors such as rejection, separation, family conflict, and social evaluation (Del Guidice et al., 2011). Early and continued activation of these neural networks can create adaptive learning that will become an integrated part of the nervous system in adulthood. Behaviorally this activation can look like fight or flight in sensitive children or adults (Tonhajzeroa & Mestanik, 2017). Gunnar (2005) suggested that family conflict early in life that results in frequent cortisol elevation creates behavioral patterns consistent with an insecure-anxious attachment style. Moreover, when an individual develops this highly reactive LHPA early in life, their stress response system will remain sensitive to social feedback, resulting in increased mobilization of the LHPA activity and metabolic and psychological changes when a threat is perceived (Del Giudice et al., 2011).

Due to the limited impact of environmental cues, risk-taking behaviors can occur, and lack of empathy and reduced social cooperation (Del Guidice et al., 2011). The stress response system has also been associated with muted emotional behavior patterns in males and females (Tonhajzeroa et al., 2017). Two separate pathways have been identified in the development of these patterns. One is a genetic predisposition, and the other is chronic stress in early childhood (Gunnar & Vazquez, 2006; Kessler et al., 2005). Limited emotionality has been linked to lower autonomic activation and HPA reactivity (Del Giudice et al., 2011). This type of activation results in a delayed fight or flight response, reduced sensitivity to social feedback, and inhibition

of social learning. This unemotional pattern is behaviorally consistent with the avoidant attachment style.

Tonhajzeroa and Mestanik (2017) have also identified a vigilant stress response pattern strongly linked to developmental trauma and overattentive and overprotective parenting (Rubin, 2002). The vigilant phenotype of nervous system activation arises from effective coping with repeated physical or social threats (Tonhajzeroa & Mestanik, 2017). This type of reactivity is characterized by high sympathetic and HPA activity, resulting in high responsiveness by the physiological systems (Porges, 2007). These activation patterns fluctuate between the states of alertness, including flight, fight, or freeze. Individuals who experience this activation pattern in response to stress take longer to return to baseline and recover from stress (Gunnar & Vazquez, 2006). There are also gender differences within this phenotype. Males tend to be more aggressive and impulsive and show externalizing behaviors. Females tend to become more socially anxious, have lower impulsivity, and have more internalizing behaviors. (Del Giudice et al., 2011).

The unemotional and vigilant response to stress results in destructive behavioral reactions when trying to maintain healthy romantic partnerships. When an individual with either phenotype becomes distressed by typical relational conflict, the resulting behaviors will not allow for co-regulation or favorable resolution. According to Porges (2007), when an individual has shifted into a fight, flight, or freeze state, the individual is no longer wired for connection but prioritizes self-protection.

Stress Response, Trauma, and Relationships

When the stress response system is activated frequently, an adaptive anticipatory stress response is learned and encoded into neurological pathways; this allows the brain to quickly evaluate a threat based on previous experience (Stefano et al., 2008). Though functional, this

adaptation can modify the nervous system in ways that make it overly sensitive, activating the stress response system without an actual threat (Shin & Liberzon, 2010). This oversensitive response can result from CT and damage relational health, particularly when a child has experienced abuse from an attachment figure. If the stress response system is continually activated by a romantic partner (attachment figure), the resulting physiological activation of the stress response system will keep the individual in an altered states, which interrupts the attachment system. Integrated memories of unsafe attachment figures from early abuse can lead to long-term deficits in a person's ability to connect in relationships.

Emotional Regulation and the HPA Axis

One of the ways in which stress impacts health is through the nervous system's HPA axis. When an individual experiences stress or fear, this system is activated and releases inflammatory cytokines (IL-6), triggering the release of steroids (cortisol) into the body. This cascade begins a regulatory process that helps the body prepare for alerted states such as fight, flight, or freeze. When the threat has passed, the HPA axis will release a different set of chemical messengers to return the body's processes to homeostasis (Porges, 2001). The physiological changes in the individual result in an emotional reaction that then influences behavior. This system is developed early on and is impacted by the experience of trauma throughout the life course, but more so during infancy and early childhood (Porges, 2001).

Continued activation of the nervous system can lead to persistent dysregulation in adulthood. Daily stress can repeatedly trigger the stress response system, resulting in chronically high IL-6 and cortisol levels. HPA dysregulation has been associated with mental health disorders such as anxiety and depression (Young et al., 1999) and chronic diseases such as diabetes, cardiovascular disease, hypertension, and cancer (McEwen, 2003; McEwen et al.,

2012). Individuals who report high levels of anxiety, indicative of HPA dysregulation, have also been found to have elevated levels of IL-6 (O'Donovan et al., 2010).

Chronic HPA dysregulation also impacts an individual's emotional experience as well. Higher HPA activation results in slower, less effective regulation of negative affect (Zobel et al., 2004). Negative emotional experiences have also been linked to higher levels of IL-6 and cortisol (Miyamoto et al., 2013). Negative personality traits such as high neuroticism and low conscientiousness have also been associated with elevated levels of IL-6. These personality types are negatively related to relationship satisfaction but have also been implicated in risky health behaviors such as overeating and smoking (Sutin et al., 2010). The converse has also supported that positive emotions can predict lower levels of pro-inflammatory cytokines, indicating less inflammation and better health (Anderson et al., 2015).

Previous research has also identified emotional dysregulation as a mediator between CT and relationship satisfaction (Bradbury & Shaffer, 2012), highlighting the critical role of emotional reactions in romantic relationships. Furthermore, a more recent study of women diagnosed with persistent PTSD indicated that women in this group displayed higher anticipatory sensitivity (anxiety), more intense negative emotional states, and higher levels of IL-6 (Newton et al., 2014). These findings can have important implications for an intimate partnership if one or both partners is frequently dysregulated and unable to manage their negative emotions. Additionally, there are implications for distress recovery and repair within the partner relationship.

Not only does IL-6 impact the emotional aspects of the partner's environment, but IL-6 and cortisol have also been found to disrupt secure attachment. In a study of children, high cortisol levels were associated with increased anxious attachment despite parental support

(Houbrechts et al., 2021). Furthermore, adolescents who demonstrated an insecure attachment to caregivers have been found to have more sensitive to uncontrollable stress, indicated by a high level of cortisol release in responses to mild stress (Bendezú et al., 2019). Similar results were found in adults with insecure attachment (Diamond, 2015).

Stress Response System and Health

Managing day-to-day stress is essential for both our mental and physical health. How an individual handles a stressful event can either reduce its overall impact or amplify it (Skinner et al., 2003). Experiencing early trauma can cause the stress response system to overwork daily. Having an overactive stress response system can result in daily stress being perceived as unmanageable, which would, in turn, cause the body's stress response systems to become activated. This continued activation due to everyday stress can increase allostatic changes in the body's central systems (McEwen et al., 2012).

Allostatic load is the “wear and tear” on the body caused by the brain and body systems’ reaction to stress that has been associated with various mental and physical health disorders. This system works using feedback loops and is how the body maintains stability despite an unpredictable environment (McEwen et al., 2012). Allostatic overload is how researchers have understood how social and environmental factors impact psychological function and physical health (Beckie, 2012). Allostatic stress comes from compounding daily stressors combined with provisional major life events. Additional forms of stress also de unhealthy coping mechanisms that have developed to deal with life stress, such as smoking, alcohol use, unhealthy diet, lack of exercise, and poor sleep. Exposure to frequent or repeated stressors can result in the stress response remaining active even when the stressor has ended, causing prolonged activation of the neuroendocrine and immune responses. When a person cannot cope with this cumulative stress,

adverse physiological changes occur, resulting in allostatic overload, negatively impacting health (Guidi et al., 2021).

Homeostasis is maintained in the body via negative feedback loops that respond to the rise of chemical messengers and work to restore biological balance (Ramsay & Woods, 2014). Allostatic load is measured by various biomarkers that quantify biological chemicals released during stress. High levels of these biomarkers, including IL-6, have been associated with higher morbidity and mortality as well as many chronic conditions, including: autoimmune disorders, musculoskeletal disorders, neurological disorders, diabetes, cancer, cardiovascular disease, periodontal disease, and rheumatoid arthritis (Guidi et al., 2021; Mattei et al., 2010; Santacroce & Crandell, 2014; Seeman et al., 1997). Thirteen different biomarkers have been recognized as indicators of allostatic load and increased mortality, these include; cardiovascular markers (heart rate variability and blood pressure), neuroendocrine levels (including cortisol, epinephrine, and norepinephrine), cholesterol, high-density protein (HDL), metabolic parameters (waist to hip ratio, glucose, and insulin levels), and inflammation markers (IL-6, C-reactive protein, albumin, fibrinogen; Gruenewald et al., 2006).

Individual differences in genetics, environment, and psychology can increase vulnerability to stress-related health disparities or promote resilience. Preventative measures and interventions can reduce the negative impacts of stress on health (Juster et al., 2010). According to Gruenewald and colleagues (2006), many chronic illnesses are preventable if early detection occurs through early warning signs, such as recognizing childhood trauma or biological indicators. Daily work stress, early life events, caregiving for others, and poor coping skills have all been found to increase allostatic overload (Guidi et al., 2021). Allostatic overload load has significant implications not just for physical health but mental health as well. High levels of

allostatic markers, including IL-6, have been associated with anxiety, depression, and schizophrenia (Berger et al., 2018; Juster et al., 2011).

Increased levels of IL-6 have been associated with morbidity and mortality in older individuals. Using biological correlates for research can be complex. Scientists have been trying to identify other factors related to IL-6 production. Age is a factor that has been suggested to impact serum levels of IL-6, but this theory has been negated (Young et al., 1999). Another factor to consider is gender. Previous research has found that hormone levels can influence endocrine production and levels of IL-6, further supporting the influence of gender on levels of IL-6 (Haden et al., 2000). Additional gendered effects have been found following a severe physical injury. In this study, the female gender was associated with the lower release of inflammatory cytokines, including IL-6, when compared to male gender patients (Mörs et al., 2016). These results support previous research that there are gender influences on IL-6 serum levels (Sperry et al., 2008).

Summary

Relationships and human connections are vital for humans to thrive and survive. Exposure to early adversity alters the stress response, and attachment systems function in critical ways. (Siegel, 2020). Furthermore, the biological changes following CT can have lifelong mental and physical health consequences (Felitti et al., 2019). Secure attachment in childhood has important implications for lifelong relationships and mental health. Early trauma experiences can reduce a person's ability to connect with a partner, making it challenging to navigate a romantic partnership complex (Mikulincer & Shaver, 2007). For individuals who have experienced chronic early stress, increased activation of the HPA axis has been associated with elevated

levels of IL-6. IL-6 has important implications for emotional regulation and attachment (Gunnar, 2007).

CHAPTER III

METHODOLOGY

Method

Research on CT has presented a devastating case for its impact on relationships, psychological wellbeing, and physical health for those who experienced adversity in childhood (Chang et al., 2019; Felitti et al., 2019). Chronic stress changes the nervous system, altering the ability to create and maintain secure relationships. However, individuals are resilient, and mediating factors between early childhood adversity and adult relationships still require more exploration and consideration. The current study further expands the existing literature by testing the mediation pathways between childhood trauma, IL-6, relationship risk, and mental health outcomes.

Sample

The study used data from the second wave of the publicly available data set, Midlife Development in the United States (MIDUS; Ryff et al., 2019), to determine whether IL-6 mediates the relationship between CT and relationship risk and mental health. Data collection for the MIDUS study began in 1995 and continued over the next 20 years. The data for this study has been published in three separate waves with numerous subsets. The information gathered for the MIDUS data set includes demographic information, health histories, socioeconomic data, relationship and social factors, behavioral and mental health questionnaires, physiological measures, childhood and family history, and occupational data (Delany, 2014). Initially, 7,108 individuals participated in the study. These participants ranged in age from 25-75 years old (Radler & Ryff, 2010). The sample included 46% males and 54% females with an average age of 55. One of the biggest criticisms of this data set is that 74% of the participants were white,

resulting in a lack of diversity in the sample. Of the sample, most were married (66%), and 31% were college-educated. The average salary was $27,100 (Radler & Ryff, 2010).

The second wave of data collected for this study was the MIDUS II, funded by the McArthur Foundation Research Network on Successful Midlife Development (Delany, 2014). Data collection for this wave took place from 2004 to 2005. For the current study, participants who complete Project 1 or MIDUS II (N = 4,006) and Project 4 (N = 1,255), the Biomarker Project was used (Ryff et al., 2013). When the two projects were combined, 1,054 participants completed both measures.

The data for Project 1 was collected via phone interviews. For Project 4, a subsample of Project 1 had to travel to a collection site where they stayed overnight (Ryff et al., 2013). While at the collection site, various physiological measures were taken for the biomarker project, including weight, blood pressure, fasting blood draws, urine, and saliva (Love et al., 2010). The demographics for this subset were 57% females and 43% males, with an average age of 54. Forty-two percent were college graduates, 69% were married, and the average income was $41,538 (Love et al., 2010).

Measures

Trauma

Trauma was measured using the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994). This assessment is a retrospective self-report measure, asking about the trauma that happened in the past. The measure consists of 70 items assessing abuse across five domains; childhood physical abuse, physical neglect, emotional abuse, emotional neglect, and sexual abuse (Bernstein et al., 1994). The responses are a 5-point Likert scale ranging from 1 = *never true* to 5 = *very often true*. Examples of questions include: “Didn't have enough to eat," "Knew

someone was there for me," "Family called me names," "Parents were drunk or high, no care was given," "Had to wear dirty clothes." The measure has good test re-test reliability (r = .88) and a Cronbach's alpha of .95 (Bernstein et al., 1994). This measure was collected as part of the MIDUS II, Project 4 Biomarker Project (Ryff et al., 2013). The current sample size was N = 731, with a Cronbach's alpha of .88.

The CTQ and ACEs scales were recently assessed for convergent validity. Results indicated good convergent validity for the two scales for total childhood maltreatment (Schmidt et al., 2020). The CTQ has also been used in various studies focused on understanding the allostatic effects of childhood trauma and its impact on relationships (Coelho et al., 2014; Fitzgerald et al., 2020; Fitzgerald & Gallus, 2020).

Relationship Risk

The following measures created a latent variable for the partner environment. The variables are intended to represent attachment constructs of view of self and view of other, including two variables that measure relationship distress. These measures were derived from the MIDUS II, Project 1 data set (Ryff et al., 2019). The sample size for this latent variable is N = 729 and has a Cronbach's alpha of .71.

Strain From Partner. This measure represented the attachment construct "view of other" in a relationship. This 6-item measure uses a four-point Likert scale to quantify strain in the participants' intimate relationships. The Likert scale goes from 4 = *never* to 1 = *often*. Items include questions such as: "How often does your partner make you feel tense?" "How often does your partner criticize you?" "How often does your partner argue with you?" For this measure, the scores were also reverse coded so that a higher score indicates more strain. The sample size for this measure was N = 729, and Cronbach's alpha was .87 (Ryff et al., 2019).

Strain Given to Partner. This measure represented the attachment construct “view of self” in a relationship, another important component of attachment. This 6-item measure uses a 4-point Likert scale to quantify strain in the participants' intimate relationships. The Likert scale goes from 4 = *never* to 1 = *often*. Items include questions such as: "How often do you let your partner down?" "How often do you criticize your partner?" "How often do you make your partner feel tense?" For this measure, the scores were also reverse coded so that a higher score indicates more strain. The sample size for this measure was N = 729, and the Cronbach's alpha was .75 (Ryff et al., 2019).

Probability of Separation. This 4-item measure uses a 4-point Likert scale to quantify the risk of separation or divorce in the participants' intimate relationships. The Likert scale goes from 4 = *not likely at all* to 1 = *very likely*. Items include questions such as: "It is always difficult to predict what will happen in a relationship, but realistically, what do you think the chances are that you and your partner will eventually separate?” and "During the past year, how often have you thought your relationship might be in trouble?" For this measure, the scores were also reverse coded so that a higher score indicates more distress. The sample size for this measure was N = 729, and Cronbach's alpha was .82 (Ryff et al., 2019).

Spouse/Partner Disagreement. This 6-item measure uses a 4-point Likert scale to quantify strain in participants' intimate relationships. The Likert scale goes from 4 = *never* to 1 = *often*. Items include questions such as: "Couples often disagree about many issues in life. How much do you and your partner disagree on the following issues?" These issues include finances, household tasks, and leisure time. For this measure, the scores were also reverse coded so that a higher score indicates more strain. The sample size for this measure was N = 729, and Cronbach's alpha was .87 (Ryff et al., 2019).

IL-6

Each participant from the Biomarker Project had fasting blood samples collected during the biomarker assessment. The serum was processed by the MIDUS Biocore Laboratory using a highly sensitive ELISA analysis (R & D system). The final results of the data were positively skewed so that a natural log transformation was used for the analysis (Reed et al., 2021; Ryff et al., 2013).

Mental Health

Mental health was measured using a single latent variable created from five measures. This latent variable had a sample size of $N = 731$ and a Cronbach's alpha of .88. Anxiety and depression was measured using The Mood and Symptom Questionnaire (MASQ), an empirically validated measure for anxiety and depressive symptomology (Watson & Clark, 1991). This measurement was collected in the MIDUS II, Project 4, and assessed anxiety and depression symptomology. According to Watson and Clark (1991), symptoms of anxiety and depression overlap and fluctuate over time. This assessment was created to account for various symptoms congruent with anxiety and depression.

For this study, four scales from the MASQ were used to create a single latent variable to represent mental health. The sub-scales used include the general-distress anxious symptom scale, anxious arousal sub-scale, loss of interest, and the general distress-depressive symptoms sub-scale. Depression was measured using the Center for Epidemiologic Studies Depression (CES-D) scale. This self-report screening tool has been found to detect depression in the general population (Ryff et al., 2013; Vilagut et al., 2016).

Analysis

The current study used the MIDUS II data set to test the above hypotheses (Ryff et al., 2019). Before the analysis, the individual data sets available for MIDUS II, Project 1, and Project 4, the Biomarker Project, were downloaded and combined in SPSS. Initially, the data sets were combined and cleaned by removing participants who did not have data for each measured variable. Participants who had not responded to the CTQ, relationship risk variables, IL-6, or mental health variables were removed listwise from the analysis. The final sample size was N = 729.

After the database had been cleaned, the relationship risk variables were reverse coded so that higher numbers indicate more significant distress. The Cronbach's alpha for each latent variable was checked for appropriate fit. Then the normality assumptions were tested, including multicollinearity, checks for variance, skewness, and kurtosis. Next, a new variable for IL-6 was created by taking the natural log on each data point to reduce the positive skew identified by the normality testing. Due to multicollinearity issues between the mental health variables, a single latent variable will be used for mental health. Finally, a correlation analysis was run for each latent variable, including trauma, relationship risk, and mental health (see Table 1).

Table 1

Descriptive Statistics (N = 729)

Variables	M	*SD*	Skewness	Kurtosis	Range
Trauma					
Emotional abuse	7.71	3.97	2.10	4.46	5-25
Physical Abuse	6.82	2.85	2.89	10.41	5-25
Sexual Abuse	6.24	3.31	3.41	12.37	5-25

Variables	M	*SD*	Skewness	Kurtosis	Range
Emotional Neglect	9.47	4.30	1.00	.46	5-25
Physical Neglect	6.61	2.51	2.08	4.74	5-25
Mediation Variable					
IL-6	.01	.31	.59	.73	-.40-1.36
Relationship Risk					
Partner disagreement	5.75	2.06	.74	.16	3-12
Marital risk	3.10	1.48	1.49	1.86	2-9
Strain from partner	12.92	.97	0.51	.17	6-24
Strain given to partner	12.0	3.65	0.38	.11	6-22
Mental Health					
MASQ: Anxious arousal	21.37	4.64	2.24	8.40	17-57
MASQ Anxious symptom	4.29	4.29	1.64	4.88	11-42
MASQ: depression	17.68	5.94	2.58	9.80	12-60
MASQ: Loss of interest	11.51	3.80	2.30	8.04	8-40
CESD	7.18	7.19	1.99	5.15	0-49

Next, a single-factor confirmatory factor analysis (CFA) was completed in Mplus to test the appropriateness of the latent variables. A single factor CFA requires that there must be at least three indicators that are continuous variables on the same scale for each latent variable (Kline, 2011). When the analysis was complete, the factor loading and model fit parameters were assessed for appropriateness and a good fit (Kline, 2011; see Table 2)

Table 2

Correlations of IV and DV (N = 729)

	Strain given	Strain received	Probability of separation	Partner disagreement
Emotion abuse	.15***	.17***	.19***	.12***
Emotion neglect	.13***	.19***	.22***	.15***
Physical Neglect	.10***	.13***	.12***	.12***
Physical Abuse	.07	.10*	.10*	.10
Sexual Abuse	.01	.10*	.07	.03

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Structural equation modeling (SEM) was then used to test each current hypothesis. SEM is a multivariate technique that uses path analysis to capture the relationships between observed and latent variables (Kline, 2011). Both latent and observed variables were used to do path analysis. Mplus (Version 7) was the statistical software program used to test path analysis. For this analysis, type is missing, maximum likelihood (ML) estimation was used, and iterations were set to 1,000. Bootstrapping was set to 2,000. The following assumptions were met before running the analysis: the observations were independent, the endogenous variables were normally distributed, the exogenous variables were independent and measured without error, and there was correct specification (Kline, 2011).

After the analysis was complete, the model fit was tested using the following indicators: chi-square test, comparative fit index (CFI), Tucker-Lewis coefficient (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). The model fit assumptions used were that the chi-square should be non-significant ($p > .05$), the CFI and TLI should be greater than .95, the RMSEA should be less than .05, and the SRMR should be less than .10 (Kline, 2011). Chi-squared is an essential indicator of model fit and significance,

but a large sample size can impact it. Since the current study has a relatively large sample, the additional model fit indicators were used for the evaluation because they do not vary in response to sample size (Kline, 2011). Finally, the control variable (gender) was tested to determine if it improved the model fit.

CHAPTER IV

RESULTS

SEM was used to test the hypothesized model. Before the model analysis, SPSS was used to test for missingness, correlations, normality, and reliability estimates for each latent variable (see Table 1). To reduce missingness, the data set was cleared of participants who did not have data for each test variable. Each variable was within the normal range for skewness and kurtosis except for sexual abuse, which was narrowly out of the range (skewness = 3.4, kurtosis = 12.4; see Table 2). According to Brown (2012), the acceptable range for kurtosis is between ±3 and ±10 for skewness.

A correlation analysis was conducted before the analysis. This analysis found significant correlations between emotional abuse, emotional neglect, and physical neglect and the relationship variables (strain given and received, marital risk, and partner disagreement). Physical abuse was significantly correlated to marital risk ($r = .11$, $p < .01$) and strain given from my partner ($r = .09$, $p < .01$). Sexual abuse was only correlated with strain from a partner ($r = .09$, $p < .01$). Significant bivariate correlations were also found between the five abuse variables, the three anxiety measures (general anxious symptoms, anxious arousal, and trait anxiety), and the three depression measures (distress depressive symptoms, loss of interest, CESD). IL-6 was significantly correlated to physical neglect ($r = .12$, $p < .01$) and anxious arousal ($r = .10$, $p < .01$).

Once the premilitary analysis was complete, CFA was conducted using Mplus 7 (Muthén & Muthén, 2017) to determine the model fit of the latent variables and analyze the standardized path coefficients for the SEM. Results for the CFA can be found in Table 3. Factor loading for each variable was expected to be approaching or above .40 to be included in the latent variable.

To test the indirect relationship between abuse and mental and relationship risk, nonparametric bootstrapping was set at 2,000 iterations (Kline, 2011). Full information maximum likelihood (FIML) was used to address missingness in the data. This was chosen because the data met the assumptions for normality and were within acceptable ranges, including skewness and kurtosis.

Table 3

Unstandardized, Standardized, and Significance for Confirmatory Factor Analyses (*N* = 729)

Parameter Estimate	*b*	*β*	*S.E.*
Confirmatory Factor Analysis Estimate for Abuse			
Emotional Neglect	1.00	.82**	.02
Emotional Abuse	.98	.87**	.02
Physical Abuse	.54	.66**	.04
Physical Neglect	.53	.74**	.04
Sexual Abuse	.41	.43**	.06
Confirmatory Factor Analysis Estimate for Relationship Risk			
Strain from partner	1.00	.78**	.02
Strain given to partner	.79	.80**	.03
Partner Disagreement	.47	.65**	.14
Probability of separation	.36	.71**	.02
Confirmatory Factor Analysis Estimate for Mental Health			
MASQ: General Depression	.74	.86**	.03
MASQ: Loss of Interest	.46	.83**	.00
CESD: Depression Scale	1.00	.95**	.03
MASQ: General Anxiety	.45	.72**	.10

Parameter Estimate	*b*	*β*	*S.E.*
MASQ: Anxious Arousal	.34	.51**	.01

Note. Model fit indices are $\chi^2(85) = 205.26$, $p < 0.001$; RMSEA = 0.04 (C.I. 0.4 - 0.05); CFI = 0.98, TLI = .98, SRMR = 0.04.

*$p < .05$. **$p < .01$. ***$p < .001$.

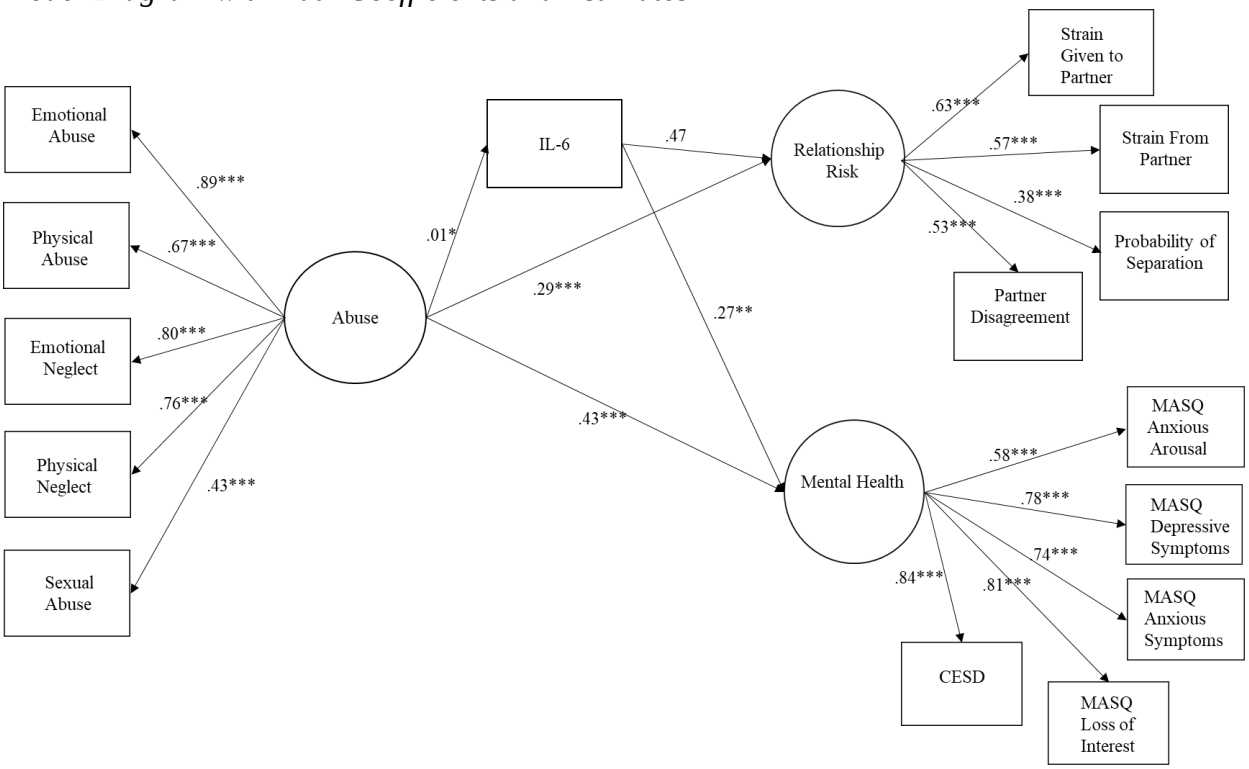
Model Results

The model tested direct and indirect pathway coefficients to determine whether the hypotheses stated in chapter 1 were supported. Results of the path analysis can be seen in Figure 1. The model fit statistics demonstrated a good fit for the hypothesized model ($\chi^2(85) = 205.26$, $p < 0.001$, RMSEA = 0.04, CFI = 0.98, TLI = 0.98, SRMR = 0.04). As expected, the chi-squared was largely due to its sensitivity to the sample size. Therefore, the other parameters were considered (Kline, 2011).

The results of the path analysis (see Table 4) supported the hypothesis of a direct association between childhood abuse, increased levels of IL-6, higher levels of anxiety and depression as well as worse relationship outcomes. Hypothesis 1 stated that there would be a direct relationship between relationship risk and childhood abuse. This suggests that higher levels of abuse will result in worse relationship outcomes. As Table 4 indicates, there is a significant association between CT and relationship risk ($\beta = .28$, $p < .001$). These results indicate that individuals who experienced abuse in childhood report a negative view of self and others, increased distress, and a great probability of separation.

Figure 1

Model Diagram with Path Coefficients and Estimates



Note. Model fit indices are χ^2 (85) = 205.26, $p < 0.001$; RMSEA = 0.04, C.I. = 0.04 - 0.05; CFI = 0.98; TLI = 0.99; SRMR = 0.04. *$p < .05$. **$p < .01$. ***$p < .001$.

Hypothesis 2 stated that there would be a direct relationship between childhood abuse and mental health with IL-6. This is based on previous research that indicates a strong relationship (Carpenter et al., 2010) between abuse and IL-6. The results of the current study found significant direct associations between both childhood abuse ($\beta = .43$, $p = .056$) and mental health ($\beta = .27$, $p < .01$) and IL-6. These results support previous research that early trauma is a significant risk factor for worse mental health outcomes in adulthood (Felitti et al., 1998). Additionally, the standardized path coefficients indicate a significant association between mental health and relationship risk ($\beta = .41$, $p < .001$). This significant relationship indicates that relationship risk can be impacted by early childhood experiences and present-day mental health.

Hypothesis 3 asserted that there would be a significant relationship between childhood abuse and IL-6. Previous research has supported the assertion that individuals who experience CT have elevated levels of IL-6. The results of the current study indicated that there is a significant association between childhood abuse and levels of IL-6 ($\beta = .01$, $p < .05$). This supports the theory that childhood abuse results in long-term changes to the brain and body.

Table 4

Unstandardized, Standardized, and Significance for Model Variables (*N* = 729)

Parameter Estimate	*b*	*β*	*S.E.*
Abuse → Risk	.17	.28***	.00
Abuse → Mental health	.75	.43***	.04
IL-6 → Risk	.26	.47	.24
IL-6→ Mental health	.42	.27**	.11
Abuse → IL-6	.01	.01**	.00
Risk WITH Mental health	4.43	.41***	.01
Emotional abuse WITH physical neglect	-1.58	-.53***	.11
Physical Abuse WITH Emotional abuse	.87	.23	.18
Physical Abuse WITH sexual abuse	.57	.08*	.04
Anxious arousal WITH general anxiety	3.00	.28***	.07
Anxious arousal WITH depression symptoms	2.02	.19***	.05
Anxious arousal WITH Loss of interest	1.11	.13*	.06
Depression WITH depression symptoms	7.10	.49***	.04

Parameter Estimate	*b*	*β*	*S.E.*
Depression WITH Loss of interest	3.22	.37	.21
Loss of interest WITH depression symptoms	3.33	.40***	.10
Strain from partner WITH Partner disagreement	2.15	.41***	.04
Strain from partner WITH probability of separation	1.81	.44***	.01
Partner disagreement WITH probability of separation	.78	.33***	.10

Note. The final model fit the data adequately X^2 (85) = 205.26 p < 0.001, RMSEA = 0.04 at 90%, CI 0.04-0.05, CFI = 0.98, TLI = 0.99, SRMR = 0.04.

*p < .05. **p < .01. ***p < .001.

Mediation Results

The path analysis for IL-6 produced mixed results. IL-6 was found to have a direct significant association with relationship risk (β = .28, p < .001). As expected, IL-6 was significantly associated with mental health (β = .43, p < .001).

Hypothesis 5 stated that IL-6 would mediate the relationship between childhood abuse and relationship risk and mental health. This suggests that the biological changes in the nervous system are responsible for these effects. The current study failed to support the mediation hypotheses for relationship risk and mental health; results can be found in Table 5. However, there was a small but significant mediation effect between childhood abuse, levels of IL-6, and relationship risk (β = .004, p < .001).

In summary, the model analysis results indicated significant results for each of the analyzed direct pathways. Overall, the model explained 96% of the variance for IL-6, 40% of the variance for strain given to my partner, 32% of the variance in strain from my partner, 15% of the variance in the probability of separation, and 28% of the variance for partner disagreement. However, standardized path coefficients demonstrated that childhood abuse is significantly associated with increased anxiety, depression, and more significant relationship risk. Il-6 was also significantly associated with anxiety and relationship risk. The model analysis failed to support the mediation hypothesis for abuse to anxiety and depression through IL-6. However, the mediation pathway between abuse and relationship risk mediated by IL-6 was significant.

Table 5

Unstandardized, Standardized, and Significance for Mediation Effects (*N* = 729)

Indirect Parameter Estimate	*b*	*β*	*Confidence*	*Interval*
			Lower .5%	Upper .5%
Abuse→IL-6→Risk	.002*	.004*	.003	.004
Abuse → Risk	.17**	.28**	.33	.33
Abuse→IL6 →Mental health	.004*	.002*	.003	.006
Abuse → Mental Health	.28**	.43**	.40	.45

Note. *$p < .05$. **$p < .01$. ***$p < .001$.

Control Variable

Gender was added as a control variable based on previous research that levels of IL-6 are influenced by gender (Mörs et al., 2016). Gender was significantly associated with both IL-6 ($\beta = .98$, $p < 0.001$) and mental health ($\beta = .27$, $p < 0.05$). Conversely, gender and relationship risk did not have a significant relationship ($\beta = -.45$, $p > 0.05$).

CHAPTER V

DISCUSSION

The current study used SEM to examine the relationship between CT, biological correlates of inflammation (IL-6), relationship risk (attachment), and mental health (anxiety and depression) while controlling for gender. The study tested 729 individuals using the MIDUS II data set. The study aimed to determine if the inflammatory marker, IL-6, mediated this sample's relationship between CT and relationship risk and mental health.

Hypotheses 1 and 2

The first two hypotheses were based on previous research supporting that CT has a negative effect on romantic relationships and mental health (Felitti et al., 2019; Whisman, 2006). The current project's results supported the assertion that CT directly and significantly negatively impacts romantic relationships. Specifically, this study used variables to account for critical aspects of attachment that included the view of self and the view of others. This, along with two other variables, accounts for increased disagreements between partners and a greater risk of divorce or separation based on participant reports. These results suggest that instability in early relationships with attachment figures can alter the ability to feel safe and connected in an adult romantic relationship.

Not surprisingly, the data also found significant results for the relationship between CT and anxiety and depression. CT has been associated with various mental health disorders (Felitti et al., 2019). It was important for the validity of this study to repeat these findings with this sample. These findings align with decades of previous research and suggest that the current sample reflects those used in previous studies. Another significant result from the current study was the strong correlation between mental health and relationship risk. These findings highlight

the importance of individual mental health for developing and maintaining a healthy romantic partnership.

Hypotheses 3 and 4

Hypothesis 3 focused on the relationship between abuse and IL-6. A significant association was found between CT and levels of IL-6. These findings support the understanding that early abuse causes long-term biological changes. These results support previous research that IL-6 levels in adults are impacted by early experiences of trauma (Quidé et al., 2019).

Hypothesis 4 posited that there would be a significant relationship between IL-6 and relationship risk and mental health outcomes. This hypothesis was partially supported. The association between IL-6 and relationship risk was nearing significant. Suggesting that there may be a relationship between higher levels of inflammatory markers, and further research is needed. Additionally, a significant, direct relationship was found between IL-6 and mental health, supporting previous research (Carpenter et al., 2010). These findings suggest that an alternative model for the relationship between CT, IL-6, mental health, and relationship risk should be considered.

Mediation Hypothesis 5

Hypothesis 5 was the mediation hypothesis and was not supported for relationship risk or mental health. Though the mediation pathways were not significant, these findings are informative nonetheless and suggest the need for future research. The significant direct relationships between all variables indicated that there might be better models to explain these relationships. Perhaps IL-6 is, in fact, an independent variable and not a mediator. Future

research should consider the relationship between IL-6 and relationship risk with mental health as a mediator.

Clinical Implications

Currently, there is a mental health crisis in the United States (Fitzpatrick et al., 2020). The results of the current study support previous research that poor mental health can negatively impact relationships. There is considerable evidence that mental health and family and partner relationships impact health and well-being. Addressing mental illness at its core is critical to protecting individuals' relationships and overall health (Priest et al., 2015). Currently, there are numerous modalities for clinical therapists to use to treat various types of mental illness. Many of these focus on behavioral or cognitive methodologies that can fail to address the deep biological roots of mental health. Understanding trauma's impact on individuals and relationships is key to finding and improving the utilization of trauma-informed treatments for individuals and couples. The current study emphasized that biological correlates impact relationships, health, and functioning in direct and indirect ways.

Family and couple relationships play a pivotal role in the development of and the management of mental illness. The current study sought to expand the literature to support therapeutic intervention at both the couple and family levels to improve overall mental and relationship health. Increasing understanding of this connection is essential for mental health clinicians to be aware of the need for assessment for childhood trauma and the potential negative impacts on relationships while highlighting the need for couples counseling when an individual has experienced childhood adversity. It is also critical for marriage and family therapists to understand how trauma in one partner may impact the system. Creating best practices for clinicians that advise each client to receive an assessment for trauma should be implemented.

Additionally, this study suggests that whether or not an individual has experienced trauma, poor mental health impacts can considerably reduce relationship satisfaction. This indicates that for family or couples therapy to be the most effective, individual mental health concerns such as anxiety and depression should be managed before beginning work on the larger relational systems.

It is postulated that relationship-focused interventions can impact individual health at a biological level if couples can be moved from insecure to more secure relating (Greenman & Johnson, 2021). It is well established that experiencing childhood maltreatment negatively impacts health, marital satisfaction, and attachment (DiLillo et al., 2009; Whismna, 2006). The current study added to existing research by examining the relationship between CT, biological correlates of inflammation, and relationship health.

Couples' researchers have considered the impact of relational distress on mental health extensively. To date, empirical evidence has been found to support the immediate impacts of couple distress on biological reactivity. Research in non-clinical populations has demonstrated a connection between relationship health and individual physiological reactivity (Levenson et al., 1994). This study found that physiological reactions were associated with negative affect; the more physiological responses, the more negatively a person reported feeling. A more significant negative effect was also correlated with lower marital satisfaction (Levenson et al., 1994).

Emotionally focused therapy (EFT; Johnson, 2019b) is currently considering a gold standard for couple's therapy. Studies regarding the efficacy of this model have found that treatment using EFT increased marital satisfaction at treatment completion and follow-up assessments (Beasley & Ager, 2019). This model addresses couples' distress by highlighting dysfunctional attachment behaviors and moving couples from insecure to secure relating. EFT

has also been adapted for use with families, aiming to improve attachment (Johnson, 2019b). However, EFT is not considered a trauma-informed approach, and there is little to no evidence that this therapeutic model alone can repair the damage done by CT. Based on the current findings, clinicians working with couples or families where an individual has experienced CT, the clinician should prioritize individual mental health first before working on building secure attachment.

However, couple and family therapists can continue to improve trauma treatment by incorporating empirically validated trauma treatments into relational therapy settings. The results of the present study stress the importance of incorporating bottom-up therapeutic approaches such as somatic therapies (Waheed, 2021), eye movement desensitization and reprocessing (EMDR; Shapiro, 1989), or Polyvagal theory (Porges, 1995).

Limitations and Future Research

The use of the MIDUS data set offers an extensive data set to be used for analysis. This is a great benefit to the study and offers powerful benefits statistically. However, the current study's results should be considered regarding its limitations. First, the sample does not represent various cultures, ethnicities, or individuals from different socioeconomic levels. The vast majority of the participants were middle-class and white. This lack of diversity in the sample limits the ability to generalize these results to other populations. Also, the data for the current study is cross-sectional. Using cross-sectional data limits the ability to make long-term assumptions regarding the impact of secure relating across the life span.

Another limitation of the study is that the partner and family measures and the CTQ are self-reports. Though self-reports are considered a reliable measure, they can be impacted by day-to-day changes in mood and stress levels. These reports also require participants to recall

historical facts about childhood. These memories could be incomplete or faulty, impacting the results of this study. Additionally, trauma can happen at any point across the lifespan, causing changes to the stress response system. Focusing only on complex trauma in childhood is another potentially limiting factor of this study. Despite these limitations, the current project offers new insight into the field and expands upon contemporary literature in a meaningful way.

The complexity of trauma and human biology is why future research should continue exploring alternative models of how biological changes can influence individual mental health and romantic relationships. Many factors can influence IL-6. Based on the results of the current study, alternative models where IL-6 is an independent variable with mental health as a mediating factor may yield informative results.

Future research should focus on integrating trauma-informed treatments such as EMDR into couple and family therapy. Currently, there is limited research on using EMDR with couples, but preliminary studies indicated promising results (Linder et al., 2021). Addressing individual mental health concerns is a necessary first step for couples therapy to be successful. For many couples healing personal trauma together through couples therapy can be a powerful experience. One that fosters safety and teaches vulnerability.

REFERENCES

Arnsten, A. F., Raskind, M. A., Taylor, F. B., & Connor, D. F. (2015). The effects of stress exposure on prefrontal cortex: Translating basic research into successful treatments for post-traumatic stress disorder. *Neurobiology of Stress, 1*, 89-99. https://doi.org/10.1016/j.ynstr.2014.10.002

American Psychiatric Association (2013). *Diagnostic and statistical manual of mental disorders: DSM-5* (Vol. 5).

Asmundson, G. J., & Afifi, T. O. (2019). *Adverse childhood experiences: Using evidence to advance research, practice, policy, and prevention*. Academic Press.

Barboza Solís, C., Kelly-Irving, M., Fantin, R., Darnaudéry, M., Torrisani, J., Lang, T., & Delpierre, C. (2015). Adverse childhood experiences and physiological wear-and-tear in midlife: Findings from the 1958 British birth cohort. *Proceedings of the National Academy of Sciences, 112*(7), E738-E746. https://doi.org/10.1073/pnas.1417325112

Bartholomew, K., & Horowitz, L. M. (1991). Attachment styles among young adults: A test of a four-category model. *Journal of Personality and Social Psychology, 61*(2), 226.

Beasley, C. C., & Ager, R. (2019). Emotionally focused couples therapy: A systematic review of its effectiveness over the past 19 years. *Journal of Evidence-Based Social Work, 16*(2), 144-159. http://doi.org/10.1080/23761407.2018.1563013

Beckie, T. M. (2012). A systematic review of allostatic load, health, and health disparities. *Biological research for nursing*, *14*(4), 311-346. https://doi.org/10.1177/1099800412455688

Bendezú, J. J., Loughlin-Presnal, J. E., & Wadsworth, M. E. (2019). Attachment security moderates effects of uncontrollable stress on preadolescent hypothalamic–pituitary–

adrenal axis responses: Evidence of regulatory fit. *Clinical Psychological Science, 7*(6), 1355-1371.

Berger, M., Juster, R. P., Westphal, S., Amminger, G. P., Bogerts, B., Schiltz, K., Bahn, S., Steiner, J., & Sarnyai, Z. (2018). Allostatic load is associated with psychotic symptoms and decreases with antipsychotic treatment in patients with schizophrenia and first-episode psychosis. *Psychoneuroendocrinology, 90*,35-42. https://doi.org/10.1016/j.psyneuen.2018.02.001

Bernstein, D. P., Fink, L., Handelsman, L., & Foote, J. (1994). *Childhood Trauma Questionnaire (CTQ)* [Database record]. APA PsycTests. https://doi.org/10.1037/t02080-000

Betz, L. T., Penzel, N., Rosen, M., & Kambeitz, J. (2021). Relationships between childhood trauma and perceived stress in the general population: A network perspective. *Psychological medicine*, *51* (15), 2696-2706. https://doi.org/10.1017/S003329172000135X

Birnbaum, G. E., Orr, I., Mikulincer, M., & Florian, V. (1997). When marriage breaks up-does attachment style contribute to coping and mental health?. *Journal of Social and Personal Relationships*, *14*(5), 643-654.

Bowlby, J. (1969). *Attachment and Loss, vol. I: Attachment*. Basic Books.

Bowlby, J. (1973). *Attachment and Loss, vol. 2: Separation*. Basic Books.

Bowlby, J. (1980a). *Attachment and Loss, vol. 3: Loss, sadness, and depression*. Basic Books.

Bowlby, J. (1988). *A secure base: Parent-child attachment and healthy human development*. Basic Books.

Bowlby, J. (2005). *A secure base: Clinical applications of attachment theory* (Vol. 393). Taylor & Francis.

Bradbury, L. L., & Shaffer, A. (2012). Emotion dysregulation mediates the link between childhood emotional maltreatment and young adult romantic relationship satisfaction. *Journal of Aggression, Maltreatment & Trauma*, *21*(5), 497-515.

Brown, C. E. (2012). *Applied multivariate statistics in geohydrology and related sciences*. Springer Science & Business Media.

Butner, J., Diamond, L. M., & Hicks, A. M. (2007). Attachment style and two forms of affect co-regulation between romantic partners. *Personal Relationships*, *14*(3), 431-455. https://doi.org/10.1111/j.1475-6811.2007. 00164.x

Cannon, W. B. (1935). Stress and strains of homeostasis. *American Journal of Medical Science*, *189*, 1-14.

Carpenter, L. L., Gawuga, C. E., Tyrka, A. R., Lee, J. K., Anderson, G. M., & Price, L. H. (2010). Association between plasma IL-6 response to acute stress and early-life adversity in healthy adults. *Neuropsychopharmacology*, *35*(13), 2617-2623. https://doi.org/10.1038/npp.2010.159

Chang, X., Jiang, X., Mkandarwire, T., & Shen, M. (2019). Associations between adverse childhood experiences and health outcomes in adults aged 18–59 years. *PloS one*, *14* (2), e0211850. https://doi.org/10.1371/journal.pone.0211850

Coelho, R., Viola, T. W., Walss-Bass, C., Brietzke, E., & Grassi-Oliveira, R. (2014). Childhood maltreatment and inflammatory markers: A systematic review. *Acta Psychiatrica Scandinavica*, *129* (3), 180-192. https://doi.org /10.1111/acps.12217

Crusto, A., Whitson, M. L., Walling, S. M., Feinn, R., Friedman, S.R., Reynolds, J., Amer, M., & Kaufman, J.S. (2010). Post-traumatic stress among young urban children exposed to family violence and other potentially traumatic events. *Journal of Traumatic Stress, 23(6),* 716-724. https://doi.org/10.1002/jts.20590

Dansby Olufowote, R. A., Fife, S. T., Schleiden, C., & Whiting, J. B. (2020). How can I become more secure: A grounded theory of earning secure attachment. *Journal of Marital and Family Therapy*, *46*(3), 489-506. https://doi.org/10.1111/jmft.12409

Danese, A., & Baldwin, J. R. (2017). Hidden wounds? Inflammatory links between childhood trauma and psychopathology. *Annual Review of Psychology, 68,* 517-544. https://doi.org/10.3389/fpsyt.2014.00080

Delaney, R. K. (2014). National survey of midlife development in the United States. *The International Journal of Aging and Human Development, 79(4),* 329-33.

Del Giudice, M., Ellis, B. J., & Shirtcliff, E. A. (2011). The adaptive calibration model of stress responsivity. *Neuroscience & Biobehavioral Reviews*, *35*(7), 1562-1592. https://doi.org/10.1016/j.neubiorev.2010.11.007

Dennison, U., McKernan, D., Cryan, J., & Dinan, T. (2012). Schizophrenia patients with a history of childhood trauma have a pro-inflammatory phenotype. *Psychological Medicine*, *42*(9), 1865-1871. doi:10.1017/S0033291712000074

Diamond, L. M. (2015). Stress and attachment. In Simpson, J.A. & Rholes, W. S. (Eds.), *Attachment theory and research: New directions and emerging themes* (p. 97- 123). Guilford Press.

Diamond, L. M., & Fagundes, C. P. (2010). Psychobiological research on attachment. *Journal of Social and Personal Relationships*, *27*(2), 218-225. https://doi.org/10.1177/0265407509360906

DiLillo, D., Peugh, J., Walsh, K., Panuzio, J., Trask, E., and Evans, S., (2009) Child maltreatment history among newlywed couples: A longitudinal study of marital outcomes and mediating pathways. *Faculty Publications, Department of Psychology, 397.* https://digitalcommons.unl.edu/psychfacpub/397

Egeland, B., & Farber, E. A. (1984). Infant-mother attachment: Factors related its development and changes over time. *Child Development*, 55, 753-771. http://www.jstor.org/stable/1130127.

Erozkan, A. (2016). The Link between Types of Attachment and Childhood Trauma. *Universal Journal of Educational Research*, *4*(5), 1071-1079. https://doi.org/10.13189/ujer.2016.040517

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., & Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The adverse childhood experiences (ACE) Study. *American Journal of Preventive Medicine*, *14*(4), 245-258. https://doi.org 10.1016/s0749-3797(98)00017-8.

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Koss, M. P. &. Marks, J. S. (2019). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The adverse childhood experiences (ACE) study. *American Journal of Preventive Medicine. 56(6)*, 774-786. https://doi.org/10.1016/j.amepre.2019.04.001

Fernandes, B. S., Steiner, J., Molendijk, M. L., Dodd, S., Nardin, P., Gonçalves, C. A., Jacka, F., Karmakar, C., Carvalho, A. F., & Berk, M. (2016). C-reactive protein concentrations across the mood spectrum in bipolar disorder: a systematic review and meta-analysis. *The Lancet Psychiatry*, *3*(12), 1147-1156. http://dx.doi.org/10.1016/ S2215-0366(16)30370-4

Fitzgerald, M., & Gallus, K. (2020). Emotional support as a mechanism linking childhood maltreatment and adult's depressive and social anxiety symptoms. *Child Abuse & Neglect, 108*, 104645. https://doi.org/10.1016/j.chiabu.2020.104645

Fitzgerald, M., Hamstra, C., & Ledermann, T. (2020). Childhood maltreatment and adult's provisions of emotional support given to family, friends, and romantic partners: An examination of gender differences. *Child Abuse & Neglect, 106*, 104520. https://doi.org/10.1016/j.chiabu.2020.104520

Fitzpatrick, K. M., Drawve, G., & Harris, C. (2020). Facing new fears during the COVID-19 pandemic: The State of America's mental health. *Journal of anxiety disorders*, *75*, 102291.

Fonagy, P. (2018). *Attachment theory and psychoanalysis*. Routledge.

Gill, J., Vythilingam, M., & Page, G. G. (2008). Low cortisol, high DHEA, and high levels of stimulated TNF-α, and IL-6 in women with PTSD. *Journal of Traumatic Stress: Official Publication of The International Society for Traumatic Stress Studies*, *21*(6), 530-539. https://doi.org/10.1002/jts.20372

Gillath, O., Bunge, S. A., Shaver, P. R., Wendelken, C., & Mikulincer, M. (2005). Attachment-style differences in the ability to suppress negative thoughts: Exploring the neural correlates. *NeuroImage, 28*, 835–847. https://doi.org/10.1016/j.neuroimage.2005.06.048

Gonzalez-Clemente, J. M., Vilardell, C., Broch, M., Megia, A., Caixas, A., Gimenez-Palop, O., Richart, C., Simon, I., Martinez-Riquelme, A., Arroyo, J., Mauricio, D., & Vendrell, J. (2007). Lower heart rate variability is associated with higher plasma concentrations of IL-6 in type 1 diabetes. *European Journal of Endocrinology*, *157*(1), 31-38. http://doi.org/10.1530/EJE-07-0090

Guidi, J., Lucente, M., Sonino, N., & Fava, G. A. (2021). Allostatic load and its impact on health: A systematic review. *Psychotherapy and Psychosomatics*, *90*(1), 11-27. https://doi.org/10.1159/000510696

Gunnar, M. (2005). Attachment and stress in early development. Carter, S., Lieselotte, A., Grossmann, S.B., Hrdy, M.E., Porges, W. & Sacher, N (Eds.), *Attachment and bonding: A new synthesis*, (pp. 245-255). MIT Press.

Gunnar, M. R. (2007). In Stress effects on the developing brain. In Romer, D. & Walker, E. F (Eds.), *Adolescent Psychopathology and the Developing Brain* (pp. 127–147). Oxford University Press.

Gunnar, M. R., & Vazquez, M. (2006). Stress neurobiology and developmental pathology. In Cicchetti D & Cohen, D (Eds.), *Developmental Psychopathology*: *Vol. 2. Developmental Neuroscience* (2nd ed., 533–577). Wiley.

Greenberg, L. S., & Goldman, R. N. (2008). *Emotion-focused couples therapy: The dynamics of emotion, love, and power*. American Psychological Association.

Greenman, P. S., & Johnson, S. M. (2022). Emotionally focused therapy: Attachment, connection, and health. *Current Opinion in Psychology*, *43*, 146-150. https://doi.org/ 10.1016/j.copsyc.2021.06.015

Gruenewald, T. L., Seeman, T. E., Ryff, C. D., Karlamangla, A. S., & Singer, B. H. (2006). Combinations of biomarkers predictive of later life mortality. *Proceedings of the National Academy of Sciences, 103*(38), 14158-14163. https://doi.org//10.1073/pnas.0606215103

Grummitt, L. R., Kreski, N. T., Kim, S. G., Platt, J., Keyes, K. M., & McLaughlin, K. A. (2021). Association of childhood adversity with morbidity and mortality in US adults: A systematic review. *JAMA Pediatrics*, *175*(12), 1269-1278. https://doi.org/10.1001/jamapediatrics.2021.2320

Haden, S. T., Glowacki, J., Hurwitz, S., Rosen, C., & LeBoff, M. S. (2000). Effects of age on serum dehydroepiandrosterone sulfate, IGF-I, and IL-6 levels in women. *Calcified tissue international*, *66*(6), 414-418.

Hazan, C., Campa, M., & Gur-Yaish, N. (2006). Attachment across the lifespan. In Noller, P. & Feeney, J. A. (Eds.), *Close relationships: Functions, forms and processes* (pp. 189–209). Psychology Press/Taylor & Francis (UK)

Heim, C., & Nemeroff, C. B. (2001). The role of childhood trauma in the neurobiology of mood and anxiety disorders. *Biological Psychiatry*, *49*, 1023–1039. https://doi.org/10.1016/S0006-3223(01)01157-X

Henriksen, J., Larsen, E. R., Mattisson, C., & Andersson, N. W. (2019). Loneliness, health, and mortality. *Epidemiology and Psychiatric Sciences*, *28*(2), 234-239. https://doi.org/10.1017/S2045796017000580

Houbrechts, M., Cuyvers, B., Goossens, L., Bijttebier, P., Bröhl, A. S., Calders, F., Chubar, V., Claes, S., Geukens, F., Van Leeuwen, K., Van Den Noorgate, W., & Bosmans, G. (2021).

Parental support and insecure attachment development: The cortisol stress response as a moderator. *Attachment & Human Development*, 1-13. https://doi.org/10.1080/14616734.2021.1907968

Jankord, R., Zhang, R., Flak, J. N., Solomon, M. B., Albertz, J., & Herman, J. P. (2010). Stress activation of IL-6 neurons in the hypothalamus. *American Journal of Physiology-Regulatory, Integrative and Comparative Physiology*, *299*(1), R343-R351. https://doi.org/10.1152/ajpregu.00131.2010

Jin, M. J., Kim, J. S., Kim, S., Hyun, M. H., & Lee, S. H. (2018). An integrated model of emotional problems, beta power of electroencephalography, and low frequency of heart rate variability after childhood trauma in a non-clinical sample: A path analysis study. *Frontiers in Psychiatry*, *8*, 314. https://doi.org/10.3389/fpsyt.2017.00314

Johnson, S. M. (2019a). *The practice of emotionally focused couple therapy: Creating connection*. Routledge.

Johnson, S. M. (2019b). *Attachment theory in practice: Emotionally focused therapy (EFT) with individuals, couples, and families*. Guilford Publications.

Johnson, S. M., Makinen, J. A., & Millikin, J. W. (2001). Attachment injuries in couple relationships: A new perspective on impasses in couple's therapy. *Journal of Marital and Family Therapy*, *27*(2), 145-155. https://doi.org/10.1111/j.1752-0606.2001.tb01152.x

Jung, Y. H., Shin, N. Y., Jang, J. H., Lee, W. J., Lee, D., Choi, Y., & Kang, D. H. (2019). Relationships among stress, emotional intelligence, cognitive intelligence, and cytokines. *Medicine*, *98*(18). https://doi.org/10.1097/MD.0000000000015345

Juster, R. P., McEwen, B. S., & Lupien, S. J. (2010). Allostatic load biomarkers of chronic stress and impact on health and cognition. *Neuroscience & Biobehavioral Reviews*, *35*(1), 2-16. https://doi.org/10.1016/j.neubiorev.2009.10.002

Juster, R. P., Marin, M. F., Sindi, S., Nair, N. V., Ng, Y. K., Pruessner, J. C., & Lupien, S. J. (2011). Allostatic load associations to acute, 3-year, and 6-year prospective depressive symptoms in healthy older adults. *Physiology & Behavior*, *104*(2), 360-364. https://doi.org/10.1016/j.physbeh.2011.02.027

Kalmakis, K. A., & Chandler, G. E. (2015). Health consequences of adverse childhood experiences: A systematic review. *Journal of the American Association of Nurse Practitioners*, *27*(8), 457-465. https://doi.org/10.1002/2327-6924.12215

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime prevalence and age-of-onset distributions of DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of General Psychiatry*, *62*(6), 593-602. https://doi.org/10.1001/archpsyc.62.6.593

Kindsvatter, A., & Geroski, A. (2014). The impact of early life stress on the neurodevelopment of the stress response system. *Journal of Counseling & Development*, *92*(4), 472-480. https://doi.org/10.1002/j.1556-6676.2014.00173.x

Kline, R.B. (2011). *Principles and practice of structural equation modeling* (3rd ed.). The Guilford Press.

Koch, C., Wilhelm, M., Salzmann, S., Rief, W., & Euteneuer, F. (2019). A meta-analysis of heart rate variability in major depression. *Psychological Medicine*, *49*(12), 1948- 1957. https://doi.org/10.1017/S0033291719001351

Laurent, H., & Powers, S. (2007). Emotion regulation in emerging adult couples: Temperament, attachment, and HPA response to conflict. *Biological Psychology, 76*(1-2), 61-71. https://doi.org/10.1016/j.biopsycho.2007.06.002

Levenson, R. W., Carstensen, L. L., & Gottman, J. M. (1994). Influence of age and gender on affect, physiology, and their interrelations: A study of long-term marriages. *Journal of Personality and Social Psychology, 67*(1), 56.

Linder, J. N., Niño, A., Negash, S., & Espinoza, S. (2021). Integrating EMDR and EFT to treat trauma in couple therapy: A literature review. *International Journal of Systemic Therapy, 32*(4), 251-272.

Love, D. G., Seeman, T. E., Weinstein, M., & Ryff, C. D. (2010). Bioindicators in the MIDUS national study: Protocol, measures, sample, and comparative context. *Journal of Aging and Health*, *22*(8), 1059-1080. https://doi.org/10.1177/0898264310374355

Loving, T. J., & Slatcher, R. B. (2013). Romantic relationships and health. In J. A. Simpson & L. Campbell (Eds.), *The Oxford handbook of close relationships* (pp. 617–637). Oxford University Press.

Luo, Y., He, H., Zhang, J., Ou, Y., & Fan, N. (2019). Changes in serum TNF-α, IL-18, and IL-6 concentrations in patients with chronic schizophrenia at admission and at discharge. *Comprehensive Psychiatry*, *90*, 82-87. https://doi.org/10.1016/j.comppsych.2019.01.003

Mattei, J., Demissie, S., Falcon, L.M., Ordovas, J.M., Tucker, K., (2010). Allostatic load is associated with chronic conditions in the Boston Puerto Rican. *Health Study Social Science Medicine, 70*, 1988-1996. https://doi.org/10.1016/j.socscimed.2010.02.024

McConnell, M., & Moss, E. (2011). Attachment across the life span: Factors that contribute to stability and change. *Australian Journal of Educational & Developmental Psychology*, *11*, 60-77. www.newcastle.edu.au/journal/ajedp/

McEwen, B. S. (2003). Mood disorders and allostatic load. *Biological psychiatry*, *54*(3), 200-207. https://doi.org/10.1016/S0006-3223(03)00177-X

McEwen, B. S., Nasveld, P., Palmer, M. & Anderson, R., (2012). *Allostatic load: A review of the literature.* Department of Veterans' Affairs.

McWilliams, L. A., & Bailey, S. J. (2010). Associations between adult attachment ratings and health conditions: Evidence from the National Comorbidity Survey Replication. *Health Psychology*, *29*(4), 446. https://doi.org/10.1037/a0020061

Mikulincer, M., & Shaver, P. R. (2007). *Attachment in adulthood: Structure, dynamics, and change*. Guilford Press.

Miyamoto, Y., Boylan, J. M., Coe, C. L., Curhan, K. B., Levine, C. S., Markus, H. R., Park, J., Kitayama, S., Kawakami, N., Karasawa, M., Love, G.D., & Ryff, C. D. (2013). Negative emotions predict elevated interleukin-6 in the United States but not in Japan. *Brain, Behavior, and Immunity*, *34*, 79-85. https://doi.org/10.1016/j.bbi.2013.07.173

Mohammadi, K., Samavi, A., & Ghazavi, Z. (2016). The relationship between attachment styles and lifestyle with marital satisfaction. *Iranian Red Crescent Medical Journal*, *18*(4). https://doi.org/10.5812/ircmj.23839

Mörs, K., Braun, O., Wagner, N., Auner, B., Voth, M., Störmann, P., Wutzler, S. Marzi, I., & Relja, B. (2016). Influence of gender on systemic IL-6 levels, complication rates and outcome after major trauma. *Immunobiology*, *221*(8), 904-910. https://doi.org/10.1016/j.imbio.2016.03.005

Muthén, B., & Muthén, L. (2017). Mplus. In *Handbook of item response theory* (pp. 507-518). Chapman and Hall/CRC.

Neurath, M. F., & Finotto, S. (2011). IL-6 signaling in autoimmunity, chronic inflammation and inflammation-associated cancer. *Cytokine & Growth Factor Reviews*, *22*(2), 83-89. https://doi.org/10.1016/j.cytogfr.2011.02.003

Newton, T. L., Fernandez-Botran, R., Miller, J. J., & Burns, V. E. (2014). Interleukin-6 and soluble interleukin-6 receptor levels in post-traumatic stress disorder: Associations with lifetime diagnostic status and psychological context. *Biological Psychology*, *99*, 150-159. https://doi.org/10.1016/j.biopsycho.2014.03.009

O'Donovan, A., Hughes, B. M., Slavich, G. M., Lynch, L., Cronin, M. T., O'Farrelly, C., & Malone, K. M. (2010). Clinical anxiety, cortisol and interleukin-6: Evidence for specificity in emotion–biology relationships. *Brain, Behavior, and Immunity*, *24*(7), 1074-1077. https://doi.org/10.1016/j.bbi.2010.03.003

Owens, G. P., Held, P., Hamrick, L., & Keller, E. (2018). The indirect effects of emotion regulation on the association between attachment style, depression, and meaning made among undergraduates who experienced stressful events. *Motivation and Emotion*, *42*(3), 429-437. https://doi.org/10.1007/s11031-018-9688-0

Porges, S. W. (1995). Orienting in a defensive world: Mammalian modifications of our evolutionary heritage. A polyvagal theory. *Psychophysiology*, *32*(4), 301- 318. https://doi.org/10.1111/j.1469-8986.1995.tb01213.x

Porges, S. W. (2001). The polyvagal theory: phylogenetic substrates of a social nervous system. *International Journal of Psychophysiology*, *42*(2), 123-146. https://doi.org/10.1016/S0167-8760(01)00162-3

Porges, S. W. (2007). The polyvagal perspective. *Biological Psychology*, *74*(2), 116-143. https://doi.org/10.1016/j.biopsycho.2006.06.009

Priest, J. B., Woods, S. B., Maier, C. A., Parker, E. O., Benoit, J. A., & Roush, T. R. (2015). The Biobehavioral Family Model: Close relationships and allostatic load. *Social Science & Medicine*, *142*, 232-240. https://doi.org/10.1016/j.socscimed.2015.08.026

Puig, J., Englund, M. M., Simpson, J. A., & Collins, W. A. (2013). Predicting adult physical illness from infant attachment: a prospective longitudinal study. *Health Psychology*, *32*(4), 409. https://doi.org/10.1037/a0028889

Quidé, Y., Bortolasci, C. C., Spolding, B., Kidnapillai, S., Watkeys, O. J., Cohen-Woods, S. Berk, M., Carr, V.J., Walder, K., & Green, M. J. (2019). Association between childhood trauma exposure and pro-inflammatory cytokines in schizophrenia and bipolar-I disorder. *Psychological Medicine*, *49*(16), 2736-2744. https://doi.org/10.1017/S0033291718003690

Quirin, M., Pruessner, J. C., & Kuhl, J. (2008). HPA system regulation and adult attachment anxiety: Individual differences in reactive and awakening cortisol. *Psychoneuroendocrinology*, *33*(5), 581-590. https://doi.org/10.1016/j.psyneuen.2008.01.013

Raby, K. L., Labella, M. H., Martin, J., Carlson, E. A., & Roisman, G. I. (2017). Childhood abuse and neglect and insecure attachment states of mind in adulthood: Prospective,

longitudinal evidence from a high-risk sample. *Development and Psychopathology, 29*(2), 347-363. https://doi.org/10.1017/S0954579417000037

Radler, B. T., & Ryff, C. D. (2010). Who participates? Accounting for longitudinal retention in the MIDUS national study of health and well-being. *Journal of aging and health, 22*(3), 307-331. https://doi.org/10.1177/0898264309358617

Ramsay, D. S., & Woods, S. C. (2014). Clarifying the roles of homeostasis and allostasis in physiological regulation. *Psychological Review*, *121*(2), 225. https://doi.org/10.1037/a0035942

Refisch, A., Chung, H. Y., Komatsuzaki, S., Schumann, A., Mühleisen, T. W., Nöthen, M. M., Hubner, C.A. & Bär, K. J. (2021). A common variation in HCN1 is associated with heart rate variability in schizophrenia. *Schizophrenia Research, 229*, 73-79. 429-437. https://doi.org/10.1016/j.schres.2020.11.017

Reiner, S. R., Anderson, T. L., Hall, M. E. L., & Hall, T. W. (2010). Adult attachment, God attachment and gender in relation to perceived stress. *Journal of Psychology and Theology*, *38*(3), 175-185. https://doi.org/10.1177/009164711003800302

Reed, R. G., Mauss, I. B., Ram, N., & Segerstrom, S. C. (2021). Daily Stressors, Emotion Dynamics, and Inflammation in the MIDUS Cohort. *International Journal of Behavioral Medicine*, 1-12. https://doi.org/10.1007/s12529-021-10035-9

Robles, T. F., & Kiecolt-Glaser, J. K. (2003). The physiology of marriage: Pathways to health. *Physiology & Behavior*, *79*(3), 409-416. https://doi.org/10.1016/S0031-9384(03)00160-4

Robles, T. F., Slatcher, R. B., Trombello, J. M., & McGinn, M. M. (2014). Marital quality and health: A meta-analytic review. *Psychological Bulletin, 140*(1), 140. https://doi.org/10.1037/a0031859

Rubin, K. H. (2002). Brokering" emotion dysregulation: the moderating role of parenting in the relation between child temperament and children's peer interactions. *Emotional regulation and developmental health: Infancy and early childhood*, 81-99.

Ryff, C. D., Almeida, D. M., Ayanian, J. S., Carr, D. S., Cleary, P. D., Coe, C., Davison, R. J., Krueger, R.F., Lachman, M.E., Marks, N. F., Mroczek, D.K., Seeman, T.E., Seltzer, M.M., Singer, B. H., Sloan, R.P., Tu, P. A., Weinstein, M., & Williams, D. (2019). National Survey of Midlife Development in the United States (MIDUS II), 2004 - 2006. ICPSR04652-v6. Ann Arbor, MI: Inter- University Consortium for Political and Social Research [distributor], 2012-04- 18. http://www.icpsr.umich.edu/cgi-bin/file?comp=none&study=4652&ds=1&file_id=1047483&path=ICPSR

Ryff, C. D., Seeman, T., & Weinstein, M., (2013) National Survey of Midlife Development in the United States (MIDUS II): Biomarker Project, 2004-2009. ICPSR29282-v6. Ann Arbor, MI: Inter-University Consortium for Political and Social Research [distributor], 2013-12-20. http://www.icpsr.umich.edu/cgi-bin/file?comp=none&study=29282&ds=1&file_id=1109794&path=ICPSR

Sandberg, J. G., Bradford, A. B., & Brown, A. P. (2017). Differentiating between attachment styles and behaviors and their association with marital quality. *Family Process, 56*(2), 518-531. https://doi.org/10.1111/famp.12186

Santacroce, S. J., & Crandell, J. B. (2014). Feasibility and preliminary findings from a pilot study of allostatic load in adolescent–young adult childhood cancer survivors and their

siblings. *Journal of Pediatric Oncology Nursing*, *31*(3), 122-134. https://doi.org/10.1177/1043454213520190

Schmidt, M. R., Narayan, A. J., Atzl, V. M., Rivera, L. M., & Lieberman, A. F. (2020). Childhood maltreatment on the Adverse Childhood Experiences (ACEs) Scale versus the Childhood Trauma Questionnaire (CTQ) in a perinatal sample. *Journal of Aggression, Maltreatment & Trauma*, *29*(1), 38-56. https://doi.org/10.1080/10926771.2018.1524806

Schrepf, A., Markon, K., & Lutgendorf, S. K. (2014). From childhood trauma to elevated C-reactive protein in adulthood: The role of anxiety and emotional rating. *Psychosomatic Medicine*, *76*(5), 327. https://doi.org/10.1097/PSY.0000000000000072

Seeman, T. E., Singer, B. H., Rowe, J. W., Horwitz, R. I., & McEwen, B. S. (1997). Price of adaptation—allostatic load and its health consequences: MacArthur studies of successful aging. *Archives of internal medicine*, *157*(19), 2259-2268. https://doi.org/10.1001/archinte.1997.00440400111013

Shah, P., Bihari, S., & Munshi, C. (2018). Adult attachment style and marital satisfaction. *Indian Journal of Mental Health*, *5*(2).

Shapiro, F. (1989). Eye movement desensitization: a new treatment for post-traumatic stress disorder. *Journal of Behavioral Therapy Experimental Psychiatry*, *20,* 211–217.

Shin, L. M., & Liberzon, I. (2010). The neurocircuitry of fear, stress, and anxiety disorders. *Neuropsychopharmacology*, *35*(1), 169-191.

Siegel, D. J. (2001). Toward an interpersonal neurobiology of the developing mind: Attachment relationships, "mindsight," and neural integration. *Infant Mental Health Journal: Official Publication of The World Association for Infant Mental Health, 22*(1-2), 67-94.

Siegel, D. J. (2020). *The developing mind: How relationships and the brain interact to shape who we are*. Guilford Publications. Chapter 3, Attachment, New York, NY

Simpson, J. A., & Rholes, W. S. (2017). Adult attachment, stress, and romantic relationships. *Current opinion in psychology*, *13*, 19-24. https://doi.org/10.1016/j.copsyc.2016.04.006

Skinner, E. A., Edge, K., Altman, J., & Sherwood, H. (2003). Searching for the structure of coping: a review and critique of category systems for classifying ways of coping. *Psychological Bulletin*, *129*(2), 216. https://doi.org/10.1037/0033-2909.129.2.216

Solomon, Z., Mikulincer, M., & Avitzur, E. (1988). Coping, locus of control, social support, and combat-related posttraumatic stress disorder: a prospective study. *Journal of Personality and Social Psychology*, *55*(2), 279.

Sperry, J., Friese, R., Frankel, L., West, M., Cuschieri, J., Moore, E., Harbrecht, B., Peitzman, A., Billiar, T., Maier, R., Remick, D., Minei, J. (2008). Male gender is associated with excessive IL-6 expression following severe injury. *Journal of Trauma and Acute Care Surgery*, *64*(3), 572-579. https://doi.org/10.1097/TA.0b013e3181650fdf

Stefano, G. B., Stefano, J. M., & Esch, T. (2008). Anticipatory stress response: A significant commonality in stress, relaxation, pleasure and love responses. *Medical Science Monitor*, *14*(2), RA17.

Stone, L. B., Marlissa C. Amole, J. M. Cyranowski, and Holly A. S. (2018) History of childhood emotional abuse predicts lower resting-state high-frequency heart rate variability in depressed women. *Psychiatry Research, 269*, 681-687. https://doi.org/10.1016/j.psychres.2018.08.106

Sutin, A. R., Terracciano, A., Deiana, B., Naitza, S., Ferrucci, L., Uda, M., Schlessinger, D., & Costa, P. T. (2010). High neuroticism and low conscientiousness are associated with interleukin-6. *Psychological medicine*, *40*(9), 1485-1493. https://doi.org/:10.1017/S0033291709992029

Szepsenwol, O., & Simpson, J. A. (2019). Attachment within life history theory: An evolutionary perspective on individual differences in attachment. *Current Opinion in Psychology*, *25*, 65-70. https://doi.org/10.1016/j.copsyc.2018.03.005

Tateishi, Y., Oda, S., Nakamura, M., Watanabe, K., Kuwaki, T., Moriguchi, T., & Hirasawa, H. (2007). Depressed heart rate variability is associated with high IL-6 blood level and decline in the blood pressure in septic patients. *Shock*, *28*(5), 549-553. https://doi.org/10.1097/shk.0b013e318063e8d1

Teicher M.H., Andersen S.L., Polcari A., Anderson C.M., Navalta C.P., and Kim D.M. (2003). The neurobiological consequences of early stress and childhood maltreatment. *Neurosci Biobehavioral Rev* 27:33–44. https://doi.org/10.1016/S0149-7634(03)00007-1

Tonhajzerova, I., & Mestanik, M. (2017). New perspectives in the model of stress response. *Physiological Research*, *66*, S173. https://doi.org/10.33549/physiolres.933674

Valkanova, V., Ebmeier, K. P., & Allan, C. L. (2013). CRP, IL-6 and depression: A systematic review and meta-analysis of longitudinal studies. *Journal of Affective Disorders*, *150*(3), 736-744. https://doi.org/10.1016/j.jad.2013.06.004

Vig, K., D., Michelle M. P., and Gordon JG Asmundson. (2020). ACEs and physical health outcomes. In *Adverse Childhood Experiences*, pp. 71-90. https://doi.org/10.1016/B978-0-12-816065-7.00005-7

Vilagut, G., Forero, C. G., Barbaglia, G., & Alonso, J. (2016). Screening for depression in the general population with the Center for Epidemiologic Studies Depression (CES-D): A systematic review with meta-analysis. *PloS one*, *11*(5), e0155431.

Waheed, M. (2021). The Efficacy of Somatic Therapies in Trauma Recovery.

Watson, D., & Clark, L. A. (1991). The mood and anxiety symptom questionnaire. *Unpublished manuscript, University of Iowa, department of psychology, Iowa City*.

Widom, C. S., Czaja, S. J., Kozakowski, S. S., & Chauhan, P. (2018). Does adult attachment style mediate the relationship between childhood maltreatment and mental and physical health outcomes?. *Child abuse & neglect*, *76*, 533-545. https://doi.org/10.1177/1079063209340142

Wheelock, M. D., Harnett, N. G., Wood, K. H., Orem, T. R., Granger, D. A., Mrug, S., & Knight, D. C. (2016). Prefrontal cortex activity is associated with biobehavioral components of the stress response. *Frontiers in Human Neuroscience*, *10*, 583. https://doi.org/10.3389/fnhum.2016.00583

Whisman, M. A. (2006). Childhood trauma and marital outcomes in adulthood. *Personal Relationships*, *13*(4), 375-386. https://doi.org/10.1111/j.1475-6811.2006.00124.x

Wood, E., & Riggs, S. (2009). Adult attachment, cognitive distortions, and views of self, others, and the future among child molesters. *Sexual Abuse*, *21*(3), 375-390. https://doi.org/10.1177/1079063209340142

Young, D. G., Skibinski, G., Mason, J. I., & James, K. (1999). The influence of age and gender on serum dehydroepiandrosterone sulphate (DHEA-S), IL-6, IL-6 soluble receptor (IL-6 sR) and transforming growth factor beta 1 (TGF-β1) levels in normal healthy blood

donors. *Clinical & Experimental Immunology*, *117*(3), 476-481. https://doi.org/10.1046/j.1365-2249.1999.01003.x

Zobel, A., Barkow, K., Schulze-Rauschenbach, S., Von Widdern, O., Metten, M., Pfeiffer, U., Schnell, S., Wagner, M., & Maier, W. (2004). High neuroticism and depressive temperament are associated with dysfunctional regulation of the hypothalamic–pituitary–adrenocortical system in healthy volunteers. *Acta Psychiatrica Scandinavica*, *109*(5), 392-399. https://doi.org//10.1111/j.1600-0447.2004.00313.x