

2013

Childhood maltreatment, limbic dysfunction, resilience and psychiatric symptoms

<https://hdl.handle.net/2144/12251>

"Downloaded from OpenBU. Boston University's institutional repository."

BOSTON UNIVERSITY
SCHOOL OF MEDICINE

Thesis

**CHILDHOOD MALTREATMENT, LIMBIC DYSFUNCTION, RESILIENCE
AND PSYCHIATRIC SYMPTOMS**

by

BRIAN YU

B.S., Tulane University, 2011

Submitted in partial fulfillment of the
requirements for the degree of

Master of Arts

2013

Approved by

First Reader

Janet Osterman, M.D.
Professor of Psychiatry

Second Reader

Majed Ashy, Ph.D.
Professor of Psychology
(Bay State College)

ACKNOWLEDGEMENTS

Janet Osterman, M.D., Professor of Psychiatry, Boston University School of Medicine

Kathleen Malley-Morrison, Ed.D., Professor of Psychology, Boston University

Majed Ashy, Ph.D., Professor of Psychology, Bay State College

**CHILDHOOD MALTREATMENT, LIMBIC DYSFUNCTION, RESILIENCE
AND PSYCHIATRIC SYMPTOMS**

BRIAN YU

Boston University School of Medicine, 2013

Major Professor: Janet Osterman, M.D., Professor of Psychiatry

ABSTRACT

Objective: Resilience is a multidimensional phenomenon encompassing both internal traits and external protective factors that allow individuals to thrive in circumstances of chronic stress. Childhood experiences of physical or psychological maltreatment are chronic stressors and represent major risk factors for the development of psychiatric disorders later in life. Teaching of emotional coping strategies is an integral part of treatments for many of these disorders, such as anxiety and depression. The association between traumatic experiences and emotional regulation is thought to be mediated in part by the limbic system, and emotional regulation may be represented positively by trait resilience or negatively by feelings of guilt or shame. We sought to investigate the value of resilience in predicting psychiatric symptoms in victims of childhood maltreatment, as well as examine the association between the resilience and limbic emotional regulation. We hypothesized that trait resilience would be a protective mediator in the relationship between childhood maltreatment and psychiatric symptoms, while limbic dysfunction, guilt and shame would be negative mediators of this relationship.

Method: A total of 439 adult participants completed measures of childhood exposure to psychological and physical maltreatment. The participants' current limbic health was assessed using the Limbic System Checklist, trait resilience was assessed using the Resilience Scale, emotional regulation was assessed using the Personal Feelings Questionnaire, and psychiatric symptoms were assessed using the Symptoms Questionnaire.

Results: Limbic dysfunction and trait resilience predicted the severity of psychiatric symptoms above and beyond exposure to various forms of childhood maltreatment. Feelings of shame contributed significantly to the prediction of psychiatric symptoms in female participants, while feelings of guilt contributed significantly to the prediction of psychiatric symptoms in male participants. Positive associations between limbic dysfunction and feelings of guilt and shame were found in all participants, while negative association between limbic dysfunction and trait resilience was found in female participants only.

Conclusions: Resilience was found to be a protective mediator in the relationship between psychological and physical childhood maltreatment and later psychiatric symptoms, and such mediation was found to be associated with limbic health and emotional regulation. Gender differences were found in the presentation of psychiatric symptoms and negative emotions. Future research should expand assessments to examine a wide range of childhood traumatic experiences and limbic structural pathologies.

TABLE OF CONTENTS

Title	i
Reader's Approval Page	ii
Acknowledgements	iii
Abstract	iv
Table of Contents	vi
List of Tables	viii
List of Abbreviations	ix
Introduction	1
Childhood Maltreatment	1
Types and Prevalence	1
Mental Health Consequences	3
Neurobiological Consequences	5
Resilience	7
Definition	7
Resilience and Neurobiology	9
Social Hostility and Neurobiology	10
Specific Aims	11
Methods	12
Participants	12
Procedure	15

Measures	15
Data Analysis	18
Results	19
Discussion	38
References	45
Vita	54

LIST OF TABLES

Table	Title	Page
1	Demographic Statistics of Participants	13
2	Descriptive Statistics for All Variables for Whole Sample	20
3	Descriptive Statistics for All Variables for Females	21
4	Descriptive Statistics for All Variables for Males	22
5	T Test Results for All Variables, with Gender as the Independent Variable	23
6	Correlations Between Childhood Experiences of Aggression and Major Study Variables	25
7	Correlations Between Childhood Experiences of Aggression and Major Study Variables in Females	27
8	Correlations Between Childhood Experiences of Aggression and Major Study Variables in Males	28
9	ANOVA Results of All Variables by Parental Sources of Maltreatment	30
10	ANOVA Results of All Variables by Parental Sources of Maltreatment in Males	31
11	ANOVA Results of All Variables by Parental Sources of Maltreatment in Females	32
12	Correlations Between Limbic Dysfunction and Major Study Variables	33
13	Correlations Between Limbic Dysfunction and Major Study Variables in Females	34
14	Correlations Between Limbic Dysfunction and Major Study Variables in Males	35
15	Linear Multiple Regression Model for the Prediction of Total Psychiatric Symptoms in Females	37
16	Linear Multiple Regression Model for the Prediction of Total Psychiatric Symptoms in Males	38

ABBREVIATIONS

CTSPC	Conflict Tactics Scales-Parent-Child
HPA	Hypothalamic-Pituitary-Adrenal
LSCL	Limbic System Checklist
PFQ	Personal Feelings Questionnaire
PTSD	Post-Traumatic Stress Disorder
RS	Resilience Scale
SQ	Symptoms Questionnaire

Despite the accumulating evidence linking stress to neurobiological dysfunction in the limbic system and other parts of the brain (Teicher et al., 2003; Nemeroff, 2004; Lanius, 2007; McFarlane, 2010; Pitman et al., 2012), little research has been done to investigate the moderating effect of resiliency on limbic dysfunction (Hoge, Austin and Pollack, 2007; Maier, 2010; Daniels, 2012). This study was designed to examine the association of resiliency with limbic dysfunction in individuals with experiences of childhood psychological or physical maltreatment within the ecological model (Bronfenbrenner, 1979; Belsky, 1993). The ecological model describes multiple levels of interaction that affect human behavior. Within the individual level, there are biological factors, gender, cognition, and emotional characteristics. These individual characteristics exist within the microsystem level, which consists of the social environment of the family. Broader exosystem and macrosystem variables take into account the surrounding neighborhood and school environment, as well as cultural attitudes. To understand the interaction between childhood maltreatment, resilience, and psychiatric outcomes, we examined variables at the microsystem level and then at the individual level.

Childhood Maltreatment

Types and Prevalence

Childhood maltreatment encompasses four major categories: a) physical abuse, defined as non-accidental bodily injury; b) sexual abuse, defined as unwanted sexual contact or attempted contact; c) emotional abuse, defined as persistent opposition to basic emotional needs; d) neglect, defined as failure to provide minimum care or supervision

(Barnett et al., 1993; Cicchetti & Toth, 2005). According to the U.S. Department of Health and Human Services (2010), an estimated 688,251 children experienced maltreatment in 2010, a rate of 9.2 per 1,000 children. Among such individuals, 78.3% experienced parental or caretaker neglect, 17.6% experienced physical abuse, 9.2% experienced sexual abuse, 8.1% experienced emotional abuse, and 2.4% experienced medical neglect; Girls comprised 51.2% of the maltreated children (U.S. Department of Health and Human Services, 2010).

Across high-income nations, annual rates for childhood abuse range from 4 - 16% for physical abuse and 4 - 9% for emotional abuse (Gilbert et al., 2009). Variations in abuse reporting can be partly attributed to differences in abuse definitions, methods of analysis and characteristics of the sample population (Andrews et al., 2004). In addition, studies have shown that government agencies often underestimate the true prevalence of abuse (Cicchetti & Toth, 2005; Gilbert et al., 2009). A study of self-reported childhood maltreatment in Eastern and Southeastern United States found 4 to 6 times greater prevalence of abuse as compared to Child Protection Services' records (Everson et al., 2008). A study of childhood experiences in Ontario, Canada reported that only 5% of physically abused and 8% of sexually abused children had interactions with Child Protection Services in the area (MacMillan, Jamieson and Walsh, 2003).

Racial and gender disparities in experiences of childhood maltreatment have also been reported. Analysis of a national child abuse database found greater prevalence of physical abuse in African American, Asian/Pacific Islander, and multiracial children, and greater mortality rates due to physical abuse in Native American, African American,

Asian/Pacific Islander, and Latino children than Caucasian children (Dakil, Cox and Flores, 2011). The study also found that Native Americans were less likely to report physical abuse, and Latino children were less likely to receive support services in response to physical abuse in comparison to other racial groups (Dakil, Cox and Flores, 2011). Analysis of 16,000 participants of the National Violence Against Women Survey found that females who experienced childhood physical abuse were significantly more likely to develop physical and mental health conditions in adulthood compared to their male counterparts; in addition, females who experienced such abuse were more likely to have used antidepressants in the recent past, while males who experienced such abuse were more likely to have used illicit drugs in the recent past (Thompson, Kingree and Desai, 2004).

Mental Health Consequences

Clinical epidemiology of childhood abuse has been demonstrated in many patient samples. Compared to the general population, patients with the following conditions have reported greater prevalence of childhood abuse: major depression (Kendler, Karkowski and Prescott, 1999; Weiss, Longhurst and Mazure, 1999), post-traumatic stress disorder (Breslau et al., 1998; McQuaid et al., 2001; Alim et al., 2006), somatization disorder (Morrison, 1989; Pribor et al., 1993; Saxe et al., 1994), schizophrenia (Shearer et al., 1990; Norman & Malla, 1993; Zanarini et al., 2002) and bipolar disorder (Hyun, Friedman and Dunner, 2000). Abused children are also at greater risk for adjustment difficulties that manifest through substance abuse (Windle et al., 1995; Moncrieff et al.,

1996; Langeland & Hartgers, 1998), cognitive delay and learning difficulties (Koenen et al., 2003) and aggression and juvenile offending (Fergusson & Lynskey, 1997; Schuck & Wisdom, 2001).

MacMillan et al. (2001) studied a sample of 7,016 adult men and women in Ontario, Canada and found that individuals with history of childhood physical or sexual abuse exhibited greater symptoms of anxiety and depression. Teicher et al. (2006) found greater anxiety, depression and anger-hostility symptoms in individuals who had reported childhood emotional or physical abuse compared to those who had not reported such abuse. Individuals who had reported combined childhood emotional and physical abuses exhibited higher symptom scores compared to individuals who had reported a single type of abuse.

Comorbidity between psychiatric disorders and alcohol and substance abuse have been consistently demonstrated (Kessler et al., 1997). Sociobehaviorally, children who have experienced maltreatment tend to have earlier exposure to alcohol and heavier use of alcohol than non-abused children (Young-Wolff, Kendler, Prescott, 2012). In addition, studies have shown that behavioral effects extend cross-generationally, as individuals with history of childhood maltreatment are more likely to demonstrate antisocial behavior, poor parenting, child maltreatment towards their own children (Schury & Kolassa, 2012).

Neurobiological Consequences

The neurodevelopmental impact of childhood maltreatment has been investigated in animal and human studies (Sapolsky, McEwen and Rainbow, 1983; Sapolsky et al., 1990; Bremner et al., 1997; Teicher et al., 2003). Grassi-Oliveira, Ashy and Stein (2008) reviewed human neurodevelopmental consequences that include limbic irritability, frontal lobe and cerebellar vermis dysfunction, and reduced hippocampal volume. This study found neurohumoral consequences in the stress response and hypersensitivity of the Hypothalamic-Pituitary-Adrenal (HPA) axis. Repeated exposure to childhood trauma has been associated with the kindling phenomenon of over-sensitizing the limbic system (Van der Kolk and Saporta, 1991). In animals, repeated stimulation of limbic neurons leads to lower thresholds for neuron firing (Wasterlain, Morin and Jonec, 1982). This kindling phenomenon has been implicated in lowering the threshold for psychological vulnerability to subsequent traumas (Van der Kolk, McFarlane and Weisaeth, 1996).

The limbic system, whose major structures consist of the hippocampus and the amygdala, has been associated with various consequences of childhood maltreatment pertaining to emotional expression and cognition (Grassi-Oliveira, Ashy and Stein, 2008). Teicher and colleagues (1993) developed a paper-and-pencil scale for the diagnosis of limbic dysfunction and used the scale to demonstrate positive associations between childhood maltreatment and symptoms of limbic abnormality. In one study, adults with a history of childhood emotional or physical abuse exhibited greater limbic irritability than those with no abuse. Adults with combined childhood emotional and physical abuses exhibited higher rates of limbic symptoms compared to individuals who

had reported a single type of abuse (Teicher et al., 2006). Limbic irritability has been positively correlated with psychiatric symptoms of anxiety, depression, and anger-hostility (Anderson et al., 2002).

Studies of hippocampal volume in adults with a history of childhood abuse have found 18% reductions in hippocampal volume for adults with major depression (Vythilingam et al., 2002), 16% reductions in hippocampal volume for adults with borderline personality disorder (Driessen et al., 2000), and 12% reductions in hippocampal volume for adults with post-traumatic stress disorder (Bremner et al., 1997).

Pitman et al. (2006) conducted a study of hippocampal volume in identical twin veterans, one combat exposed and one non-combat exposed to explore the previously noted smaller hippocampal volume in people with PTSD. He found that while veterans with PTSD had smaller hippocampal volume, their identical, non-combat exposed twin without PTSD also had smaller hippocampal volume. Thus, he concluded that small hippocampal volume may represent an antecedent risk factor for PTSD rather than a development that occurs subsequent to trauma.

A variety of explanations have been proposed as mediating factors for the findings in hippocampal morphology in traumatized individuals, which include substance abuse (De Bellis et al., 1999), HPA axis overload (Grassi-Oliveira, Ashy and Stein, 2008), and genetic susceptibility (Caspi et al., 2002).

Multiple studies have examined the limbic system's role in projecting diverse afferent inputs to regulate the HPA axis, which leads to the release of glucocorticoids. Children who have been maltreated have elevated salivary, plasma, and urinary cortisol

levels (Grassi-Oliveira, Ashy and Stein, 2008). These increases in glucocorticoids have been correlated with a maladaptive hippocampus (Teicher et al., 2006).

The amygdala, a major limbic structure, has been implicated in regulating the emotional response to stressful stimuli. In rats, damage to the central, lateral or basal nuclei of the amygdala led to the inability to cope with a conditioned fear stimulus (Amorapanth et al., 2000). In humans, exposure to images of fearful stimuli, as well as neutral stimuli that became acquired triggers of fear, were associated with increased activation of the amygdala (Ochsner et al., 2002; Ochsner et al., 2004). Such studies provide evidence for the amygdala's involvement in both real and perceived fears (Phelps and LeDoux, 2005). Active coping strategies related to emotional regulation of amygdala responses are an integral part of treatment for psychological disorders such as anxiety and depression (Phelps and LeDoux, 2005).

Resilience

Definition

Rutter (1985) described resilience as “the positive pole” in the spectrum of human responses to adversity. Resilience refers to descriptive characteristics, such as positive self-esteem and self-control and external, environmental factors, such as family and educational support, which allow the individual to successfully adapt to stressful situations (Werner, 1984; Rutter, 1985; Luthar, Cicchetti and Becker, 2000). Rutter (1987), Werner and Smith (1992) and Garmezy (1991) identified a core set of protective factors that have guided resilience measurements and interventions. Broadly, these

factors fall under the categories of individual temperament, family cohesion, and external support (Hoge, Austin and Pollack, 2007). Temperamental factors include intelligence (Zimrin, 1986) and sociability (Luthar, 1991). Factors pertaining to family cohesion include parental attentiveness and feelings of warmth (Garmezy, 1993). Factors pertaining to external support include guidance from teachers and adult relatives (Werner, 1989). As a result of increased emphasis on developmental interventions, researchers of resilience theory have sought to align more closely with neurobiology in order to study the epigenetics and neurology underlying the individual's resilience and to help determine the course of society's interventions (Hoge, Austin and Pollack, 2007). According to Ungar (2011), this new wave of resilience research facilitates discussions where "neurophysiologists are arguing for the better design of neighborhoods" (p. 3).

Several studies investigated children growing up with risk factors and found that resilience plays an important role in predicting social and mental health outcomes. Garmezy (1973) studied children of schizophrenic mothers in Minnesota and found that a significant proportion of the study sample had achieved academic and social successes despite exposure to the genetic and environmental risk factors of having a parent with schizophrenia. A decade later, Garmezy and colleagues found that the majority of children in the at-risk sample had grown to become well-adjusted adults (Garmezy, Masten and Tellegen, 1984). Examination of social risk factors was conducted by Rutter (1979), who studied children on the rural Isle of Wight, England who reported chronic stressors including poverty, parental discord, parental criminality and parental psychopathologies. Rutter found that a quarter of the children demonstrated qualities,

such as good temperament, self-mastery, and self-efficacy despite living in the presence of multiple stressors (Rutter 1979). Werner (1982) conducted a 30-year epidemiological study of individuals in the working-class community of Kauai, Hawaii that followed their developments from birth to adulthood. Werner found that among the group who spent their childhoods in adverse family conditions, such as witnessing domestic violence or having a parent with mental illness, over one-third grew to be competent and well-adjusted adults (Werner, 1982; Werner & Smith, 1992).

Resilience and Neurobiology

Evidence suggests that there is a malleable relationship between the brain and resiliency, which can be altered by experience and neuroplasticity. Experiencing control over a stressful situation may lead to inhibition of the limbic stress response, providing greater resilience in future situations (Maier, 2010). In addition, accumulating evidence has linked early stress exposure to hippocampal remodeling (Teicher et al., 2006). The hippocampus, which contributes to the formation of episodic memory, contains a high concentration of glucocorticoid receptors and is highly plastic during childhood, leading to its association with flashbacks, anxiety and PTSD (Breslau et al., 1998; McQuaid et al., 2001; Alim et al., 2006).

In a study of 132 college students, Campbell-Sills, Cohan and Stein (2005) identified trait resilience as a protective factor in the relationship between childhood emotional neglect and present psychiatric symptoms. In a study of 70 DSMV-IV PTSD

patients, Daniels et al. (2012) found trait resilience to be a significant negative predictor of PTSD symptoms for patients who had reported severe childhood trauma.

Social Hostility and Neurobiology

Two prior studies have examined resilience in the context of shame and guilt. Ginzburg et al. (2006) applied the Abuse-Related Beliefs Questionnaire, a measure of negative self-perception with subscales of guilt and shame, to individuals with experiences of childhood sexual abuse and found psychiatric symptoms to be positively correlated with the variables of guilt, shame, resilience and negatively correlated with psychiatric symptoms. Uji, Kitamura and Nagata (2011) used the Resilience Scale and the Test of Self-Conscious Affect, a measure of guilt and shame, in a study of 447 Japanese university students and found resilience to be negatively correlated with shame and positively correlated with emotional detachment.

Other studies have associated trauma with various descriptions of detrimental self-perception. The prevalence of self-blame has been studied within populations of battered women (Clements, Sabourin and Spiby, 2004) and women with childhood sexual abuse (Liem and Bowdewyn, 1999). Campbell-Sills, Cohan and Stein (2005) investigated a model of trait resilience, personality dimensions and psychiatric symptoms in a sample of college students; they found trait resilience to be negatively correlated with neuroticism, a personality dimension that has been correlated with negative emotions, as well as, psychiatric symptoms of anxiety and depression (Brown, Chorpita and Barlow, 1998; Bienvenu & Stein, 2003). Kling, Ryff and Essex (2003) found that high scores in

neuroticism were correlated with negative self-perception. Neurologically, the amygdala has been implicated in the processing of hostile social stimuli. Recently, Michl et al. (2012) conducted a pilot fMRI study of brain activations, finding specific areas of activation mainly in the amygdala and the temporal lobe in response to feelings of guilt and shame. In addition, female participants demonstrated activations solely in the temporal lobe in response to guilt, while male participants demonstrated additional activations in the frontal and occipital lobes (Michl et al., 2012).

Prior fMRI studies used facial expressions of contempt and disgust as representations of interpersonal hostility. Sambataro et al. (2006) found greater activation of the amygdala in response to contemptuous expressions compared to expressions of disgust or neutral expressions. Aleman and Swart (2008) studied sex differences in such activations and found that women displayed stronger frontal and temporal lobe activation in response to contemptuous expressions by the opposite sex rather than by the same sex; however, overall, men responded more strongly than women towards contemptuous expressions.

Specific Aims

The present study used the ecological model of psychosocial resilience and neurological development to investigate psychiatric outcomes in people who experienced childhood psychological or physical maltreatment. Using survey data from a broad, non-clinical population (n = 439), potential interactions between limbic health, resiliency, and mental health symptoms were investigated. The goals of the project were to determine

the consequences of childhood maltreatment on limbic dysfunction and emotional regulation and to evaluate the potential use of trait resilience as a protective factor in the relationship between childhood maltreatment and adult mental health.

The investigation was guided by the following hypotheses:

- 1) Reports of childhood maltreatment will be negatively correlated with resilience and positively correlated with limbic dysfunction, guilt, shame and psychiatric symptoms.
- 2) Participants reporting maltreatment from both parents will have significantly more limbic dysfunction, guilt, shame and psychiatric symptoms than participants reporting only maternal or paternal maltreatment.
- 3) Limbic dysfunction will be negatively correlated with resilience and positively correlated with guilt, shame and psychiatric symptoms.
- 4) The relationship between childhood maltreatment and young adult psychiatric symptoms will be mediated by limbic dysfunction, trait resilience, guilt and shame.

Methods

Participants

As shown in Table 1, the sample consisted of 439 participants (239 females, 200 males), ranging in age from 18 to 69 years old with a mean age of 27 years old. The average participant was a non-Hispanic White, unmarried college student at a large, urban university in the Northeastern United States, whose self-reported socioeconomic status was middle or upper-middle class.

Table 1

Demographic Statistics of Participants

	Frequency	Percent
<i>Gender</i>		
Female	239	54.4
Male	200	45.6
Total	439	100.0
<i>Class</i>		
Lower	8	1.8
Working	44	10.0
Middle	187	42.6
Upper Middle	166	37.8
Upper	30	6.8
Unknown	4	.9
Total	439	100.0
<i>Education</i>		
High school grad	73	16.6
Trade/technical school	1	.2
Some college	206	46.9
Associates degree	6	1.4
Bachelor's degree	85	19.4
Some graduate training (no degree)	16	3.6
Master's Degree	29	6.6
Professional or doctoral degree	20	4.6
Unknown	3	.7
Total	439	100.0

Table 1 (Cont.)

	Frequency	Percent
<i>Ethnicity</i>		
Non-Hispanic White	264	60.1
African, Black, or African-American	16	3.6
Asian or Asian-American	53	12.1
Latin, Hispanic, Central American	24	5.5
Other {Pacific Islands, Multiethnic}	23	5.2
Indian Peninsula	42	9.6
Native/Aboriginal American	7	1.6
Middle Eastern	8	1.8
Unknown	2	.5
Total	439	100.0
<i>Marital status</i>		
Married	74	16.9
Divorced	23	5.2
Separated	2	.5
Single	337	76.8
Unknown	3	.7
Total	439	100.0
<i>Age</i>		
Minimum	18	
Maximum	69	
Mean	27.22	
Std. Deviation	12.63	

Procedure

Recruitment of participants was undertaken by students in an undergraduate research methods psychology course in a large urban university in the Northeast. Protocols of the project were reviewed and approved by the university's Institutional Review Board. Participants signed two copies of the informed consent form, kept one copy and submitted the other. Participants were informed that they could skip any questions that they felt uncomfortable answering, and that they could stop answering the questionnaire at any time. In addition, participants were provided with telephone numbers for counseling resources they might contact if they wished to speak about any of the sensitive topics that they were asked to recall as part of their participation. After their participation, participants were given a debriefing form that detailed the purpose of the questionnaire, as well as provided with information about the study and how to obtain their results.

All surveys were collected anonymously. Participants' data were entered into the computer using the assigned study numbers. The research was conducted in compliance with all American Psychological Association Guidelines and state and federal laws.

Measures

Participants were asked to provide answers to the following sets of questions:

Demographic Questionnaire. Information regarding sex, age, ethnicity, marital status, socioeconomic status, and education level were obtained.

Conflict Tactics Scales-Parent-Child (CTSPC, Straus & Hamby, 1997). The CTSPC is a 44-item questionnaire that measures the frequency of conflict tactics that fall under the broad subscales of negotiation tactics, psychological aggression, and physical aggression employed by the participant's parents during the self-described "worst year" of the participant's childhood. For each tactic witnessed or reported by the participant, participants reported frequencies ranging from 0 ("never happened") to 6 ("more than 20 times"). These numbers were summed to obtain the overall scores for each conflict subscale. The CTSPC has shown good construct and discriminant validity and good reliability, with internal consistencies ranging from .79 to .95 (Straus & Hamby, 1996; Ashy, 2003).

Resilience Scale (RS, Wagnild & Young, 1993). The RS is a self-reported questionnaire dealing with self-acceptance and personal competence (e.g. "I usually take things in stride"; "I am friends with myself"; "I feel that I can handle many things at a time"). Originally consisting of 25 items, the version employed in this study is a shortened, 10-item questionnaire derived from a factor analysis performed by Neill and Dias (2001). Participants respond to each question on a scale of 1-7, with 1 being "Strongly Disagree," 4 being "Neutral," and 7 being "Strongly Agree." The RS has demonstrated good construct validity with adaptation outcomes such as morale and life satisfaction along with high reliability, with $r = .91$ for the whole scale (Wagnild & Young, 1993). A review of resilience instruments by Ahern and colleagues (2006) found RS to be the most suitable instrument to study resilience in young adults due to its confirmation in multiple studies.

Limbic System Function Questionnaire (LSCL-33, Teicher, Glod, Surrey and Swett, 1993). The LSCL is a 33-item, self-reported scale that asks participants to rate how frequently they experience various forms of limbic irritability, consisting of visual disturbances, somatic disturbances, dissociative disturbances, hallucinatory events, and automatisms. The LSCL is a non-invasive method of measuring temporolimbic functioning and has been correlated with the Dissociative Experiences Scale and the Hopkins Symptoms Checklist (Teicher, Glod, Surrey and Swett, 1993). Participants are asked to describe the lifetime frequency of limbic events as occurring “never,” “rarely,” “sometimes,” or “often.” A score of 0, 1, 2, or 4 is assigned for each item (0 = never; 4 = often). A total score for all 33 items is calculated, along with factor scores for sensory, somatic, behavioral, and mnemonic disturbances. In prior studies, normal adults have exhibited total LSCL-33 scores lower than 10, while patients diagnosed with Temporal Lobe Epilepsy have exhibited total LSCL-33 scores in the range of 23 to 60 (Anderson et al., 2002). The LSCL-33 has shown high test-retest reliability, with $r = .92$ for the whole scale and $.78$ to $.86$ for subscales (Teicher, Glod, Surrey and Swett, 1993; Ashy, 2003).

Symptom Questionnaire (SQ; Kellner, 1987). The SQ is a 92-item true/false scale measuring four symptom subscales (depression, anxiety, anger, somatic) and four well-being subscales (content, relaxed, friendly, somatic well-being). The SQ has been validated in crossover drug trials, where it discriminated between the effects of antianxiety drugs and placebos (Kellner et al, 1974; Kellner et al, 1979), and in a normal population, where the various symptoms were found to correlate with a life events scale (Kellner et al, 1983). The test-retest reliability of the subscales in various studies was $r =$

0.71 for anxiety, $r = 0.95$ for depression, $r = 0.77$ for somatic, and $r = 0.82$ for hostility (Kellner, 1987; Ashy, 2003).

Personal Feelings Questionnaire (PFQ; Harder, 1997). The PFQ is a 22-item measure that assesses expressions of shame and guilt by presenting several feelings associated with negative self-perception. Responses range from a scale of 1 (“you never experience the feeling”) to 4 (“you almost continuously feel the feeling”). Two scales, one for shame and one for guilt, are produced from the questionnaire. The PFQ has shown good internal consistency and construct validity with convergent and discriminant personality dimensions (Harder & Zalma, 1990).

Data Analysis

T tests were performed to determine whether differences in demographic variables (sex, age, ethnicity, marital status, social class, and education level) were present in any of the main variables to be studied (childhood maltreatment history, psychiatric symptoms, resilience score, guilt and shame assessments, limbic rating).

Pearson correlations were performed to test Hypotheses 1 and 3. Several ANOVAs were performed to test Hypothesis 2. Based on the bivariate Pearson correlations, regressions were used to determine the relative contributions of the predictor factor (childhood maltreatment) and mediating factors (resilience score, limbic rating, guilt and shame assessments) to psychiatric outcomes for the whole sample, as well as separately by gender. The final decision regarding the input of predictor variables into

regression analysis was guided by prior literature as well as preliminary correlational analyses.

Results

Table 2 provides descriptive statistics for the major variables studied in the sample. Tables 3 and 4 provide descriptive statistics for the major variables for female and male participants, respectively. These analyses show that participants reported incidences of parental psychiatric and physical aggression comparable to samples in previous studies (Polcari & Teicher, 2000). Furthermore, limbic ratings are comparable to previous non-clinical samples (Teicher, Glod, Surrey & Swett, 1993), and reports of anxiety, depression, somatization and hostility are comparable with levels previously reported in non-clinical samples (Kellner, 1987).

Table 2

Descriptive Statistics for All Variables for Whole Sample

	Mean	Std. Deviation
ctsmcpsy	7.11	6.47
ctsfcpsy	6.90	5.81
ctsmcphy	5.58	8.83
ctsfcpby	4.41	7.29
LSCL	53.08	13.27
rs_sum	55.18	11.21
PFQ	2.58	0.65
shame total		
PFQ guilt total	2.60	0.68
tsymptoms	86.31	17.51
sqanx	22.02	4.74
sqdep	23.01	5.48
sqhostil	21.24	4.93
sqsuma	20.10	4.45

Note: ctsmcpsy = maternal psychological aggression; ctsfcpsy = paternal psychological aggression; ctsmcpby = maternal physical aggression; ctsfcby = paternal physical aggression; LSCL = limbic dysfunction; rs_sum = trait resilience; PFQ shame total = shame index; PFQ guilt total = guilt index; tsymptoms = total psychiatric symptoms; sqanx = anxiety; sqdep = depression; sqhostil = hostility; sqsuma = somatization.

Table 3

Descriptive Statistics for All Variables for Females

	Mean	Std. Deviation
ctsmcpsy	7.39	6.49
ctsfcpsy	6.31	5.42
ctsmcphy	5.40	8.69
ctsfcpby	3.49	5.97
LSCL	53.74	11.83
rs_sum	55.83	9.81
PFQ	2.70	0.63
shame total		
PFQ guilt total	2.68	0.68
tsymptoms	87.96	16.41
sqanx	22.57	4.49
sqdep	23.56	5.32
sqhostil	21.26	4.47
sqsuma	20.56	4.39

Note: ctsmcpsy = maternal psychological aggression; ctsfcpsy = paternal psychological aggression; ctsmcphy = maternal physical aggression; ctsfcphy = paternal physical aggression; LSCL = limbic dysfunction; rs_sum = trait resilience; PFQ shame total = shame index; PFQ guilt total = guilt index; tsymptoms = total psychiatric symptoms; sqanx = anxiety; sqdep = depression; sqhostil = hostility; sqsuma = somatization.

Table 4

Descriptive Statistics for All Variables for Males

	Mean	Std. Deviation
ctsmcpsy	6.74	6.46
ctsfcpsy	7.66	6.22
ctsmcphy	5.81	9.02
ctsfcpby	5.59	8.58
LSCL	52.25	14.88
rs_sum	54.36	12.74
PFQ	2.43	0.64
shame total		
PFQ guilt total	2.51	0.66
tsymptoms	84.24	18.65
sqanx	21.32	4.96
sqdep	22.32	5.62
sqhostil	21.20	5.48
sqsuma	19.51	4.47

Note: ctsmcpsy = maternal psychological aggression; ctsfcpsy = paternal psychological aggression; ctsmcphy = maternal physical aggression; ctsfcphy = paternal physical aggression; LSCL = limbic dysfunction; rs_sum = trait resilience; PFQ shame total = shame index; PFQ guilt total = guilt index; tsymptoms = total psychiatric symptoms; sqanx = anxiety; sqdep = depression; sqhostil = hostility; sqsuma = somatization.

As shown in table 5, t-tests revealed significant gender differences in several study variables. Male participants reported greater incidences of paternal psychological aggression and paternal physical aggression. Female participants reported greater levels of guilt and shame. In addition, female participants reported greater levels of anxiety, depression, somatization and total psychiatric symptoms. No significant gender differences were found on other variables.

Table 5

T Test Results for All Variables, with Gender as the Independent Variable

	t	P
ctsmcpsy	0.92	0.36
ctsfpsy	-2.09	0.04
ctsmcphy	-0.42	0.67
ctsfphy	-2.65	0.01
LSCL	1.04	0.30
rs_sum	1.22	0.23
PFQ shame total	4.03	0.00
PFQ guilt total	2.36	0.02
tsymptoms	1.97	0.05
sqanx	2.45	0.02
sqdep	2.10	0.04
sqhostil	0.11	0.91
sqsuma	2.22	0.03

Note: ctsmcpsy = maternal psychological aggression; ctsfcpsy = paternal psychological aggression; ctsmcphy = maternal physical aggression; ctsfphy = paternal physical aggression; LSCL = limbic dysfunction; rs_sum = trait resilience; PFQ shame total = shame index; PFQ guilt total = guilt index; tsymptoms = total psychiatric symptoms; sqanx = anxiety; sqdep = depression; sqhostil = hostility; sqsuma = somatization.

To test Hypothesis 1 (that exposure to childhood maltreatment will be negatively correlated with resilience and positively correlated with limbic dysfunction, guilt, shame and psychiatric symptoms), several correlations were performed. Tables 6, 7 and 8 provide correlation matrices for the entire sample as well as separately by gender.

As shown in Table 6, psychological and physical aggressions from either parent were significantly positively correlated with all psychiatric symptoms in the overall sample. In addition, psychological and physical aggressions from either parent were significantly positively correlated with limbic dysfunction and negatively correlated with resilience. Paternal and maternal psychological aggressions, as well as maternal physical aggression, were significantly positively correlated with the shame and guilt indices.

Table 6

Correlations Between Childhood Experiences of Aggression and Major Study Variables

	ctsmcpsy	Ctsfcpsy	ctsmcphy	ctsfcpy
LSCL	.28**	.21**	.31**	.23**
rs_sum	-.11*	-.15*	-.16**	-.21**
PFQ shame total	.24**	.13*	.14*	.07
PFQ guilt total	.19**	.12*	.14*	.06
tsymptoms	.25**	.21**	.19**	.18**
sqanx	.20**	.19**	.13*	.16**
sqdep	.25**	.21**	.19**	.14*
sqhostil	.24**	.18**	.13*	.16**
sqsoma	.20**	.15*	.22**	.18**

*p<0.05; **p<0.01

Note: ctsmcpsy = maternal psychological aggression; ctsfcpsy = paternal psychological aggression; ctsmcphy = maternal physical aggression; ctsfcphy = paternal physical aggression; LSCL = limbic dysfunction; rs_sum = trait resilience; PFQ shame total = shame index; PFQ guilt total = guilt index; tsymptoms = total psychiatric symptoms; sqanx = anxiety; sqdep = depression; sqhostil = hostility; sqsoma = somatization.

In females, as shown in Table 7, psychological and physical aggressions from either parent were significantly positively correlated with all psychiatric symptoms and to limbic dysfunction. Paternal and maternal psychological aggression, as well as paternal physical aggression, were significantly negatively correlated with resilience and positively correlated with the shame index. Paternal and maternal psychological aggressions, as well as maternal physical aggression, were significantly positively correlated with the guilt index.

Table 7

Correlations Between Childhood Experiences of Aggression and Major Study Variables in Females

	ctsmcpsy	Ctsfcpsy	ctsmcphy	ctsfcpy
LSCL	.31**	.25**	.24**	.17*
rs_sum	-.14*	-.22**	-.12	-.21**
PFQ shame total	.28**	.19*	.10	.03
PFQ guilt total	.27**	.19*	.17*	.06
tsymptoms	.33**	.29**	.24**	.22**
sqanx	.27**	.24**	.17*	.19*
sqdep	.32**	.28**	.24**	.18*
sqhostil	.31**	.25**	.18*	.22**
sqsuma	.25**	.23**	.22**	.18*

*p<0.05; **p<0.01

Note: ctsmcpsy = maternal psychological aggression; ctsfcpsy = paternal psychological aggression; ctsmcpy = maternal physical aggression; ctsfcphy = paternal physical aggression; LSCL = limbic dysfunction; rs_sum = trait resilience; PFQ shame total = shame index; PFQ guilt total = guilt index; tsymptoms = total psychiatric symptoms; sqanx = anxiety; sqdep = depression; sqhostil = hostility; sqsuma = somatization.

In males, as shown in Table 8, paternal and maternal physical aggressions were significantly positively correlated with somatization but uncorrelated with other psychiatric symptoms. Paternal and maternal psychological aggressions were uncorrelated with any psychiatric symptoms. Psychological and physical aggressions from either parent were significantly positively correlated with limbic dysfunction. Only paternal and maternal physical aggressions were significantly negatively correlated with

resilience. Paternal and maternal physical aggressions, as well as maternal psychological aggression, were significantly positively correlated with the shame index. No forms of aggression were correlated with the guilt index in male participants.

Table 8

Correlations Between Childhood Experiences of Aggression and Major Study Variables in Males

	ctsmcpsy	Ctsfcpsy	ctsmcphy	ctsfcpy
LSCL	.24**	.19*	.38**	.30**
rs_sum	-.08	-.07	-.19*	-.20*
PFQ shame total	.18*	.12	.21*	.17*
PFQ guilt total	.06	.06	.11	.09
tsymptoms	.15*	.15*	.15*	.19*
sqanx	.10	.16*	.09	.18*
sqdep	.15*	.16*	.15*	.15*
sqhostil	.16*	.10	.08	.13
sqsoma	.12	.08	.23*	.24*

*p<0.05; **p<0.01

Note: ctsmcpsy = maternal psychological aggression; ctsfcpsy = paternal psychological aggression; ctsmcpy = maternal physical aggression; ctsfcphy = paternal physical aggression; LSCL = limbic dysfunction; rs_sum = trait resilience; PFQ shame total = shame index; PFQ guilt total = guilt index; tsymptoms = total psychiatric symptoms; sqanx = anxiety; sqdep = depression; sqhostil = hostility; sqsoma = somatization.

To test Hypothesis 2 (that participants exposed to maltreatment from both parents will have significantly more limbic dysfunction, guilt, shame and psychiatric symptoms compared to participants exposed to a single category of maltreatment), several one-way ANOVAs were performed to test for differences among participants who had reported maternal aggression only, paternal aggression only, or aggression from both parents. Tables 9, 10 and 11 provide ANOVA analyses for the whole sample, male participants and female participants, respectively. No significant differences in the study variables were found for female participants when comparing maternal maltreatment, paternal maltreatment, or maltreatment by both parents.

As shown in Table 9, analysis of the whole sample revealed significant differences in limbic dysfunction ($F = 5.966$, $df = 2,307$ $p = .003$), shame ($F = 4.395$, $df = 2$, $p = .013$) and guilt ($F = 3.382$, $df = 2$, $p = .035$). Tukey post-hoc comparisons revealed significantly greater limbic dysfunction in participants who had reported maltreatment from both parental figures ($M = 54.1$, $sd = 12.51$, $p = .002$) compared to those who had reported only paternal maltreatment ($M = 44.05$, $sd = 8.81$). In addition, participants who had reported maltreatment from both parental figures scored higher in shame ($M = 2.62$, $sd = .63$, $p = .010$) and guilt ($M = 2.63$, $sd = .66$, $p = .031$) than participants who had reported only paternal maltreatment ($M = 2.19$, $sd = .52$; $M = 2.24$, $sd = .54$).

Table 9

ANOVA Results of All Variables by Parental Sources of Maltreatment

	F	p	Group Differences
LSCL	5.97	0.00	3 > 2
rs_sum	0.67	0.51	
PFQ shame total	4.40	0.01	3 > 2
PFQ guilt total	3.38	0.04	3 > 2
tsymptoms	2.96	0.05	
sqanx	2.20	0.11	
sqdep	2.72	0.07	
sqhostil	1.80	0.17	
sqsuma	3.04	0.05	

Note: LSCL = limbic dysfunction; rs_sum = trait resilience; PFQ shame total = shame index; PFQ guilt total = guilt index; tsymptoms = total psychiatric symptoms; sqanx = anxiety; sqdep = depression; sqhostil = hostility; sqsuma = somatization.

In males, as shown in Table 10, analyses revealed significant differences in limbic dysfunction ($F = 4.356$, $df = 2$, $p = .015$) and guilt ($F = 5.128$, $df = 2$, $p = .007$). Tukey post-hoc comparisons revealed that limbic dysfunction was significantly higher in participants who had reported maltreatment from both parents ($M = 53.32$, $sd = 13.49$, $p = .012$) compared to participants who had reported only paternal maltreatment ($M = 40.7$, $sd = 7.78$). In addition, male participants who had reported maltreatment from both parents scored higher in guilt ($M = 2.55$, $sd = .62$, $p = .016$) compared to male participants who had reported only paternal maltreatment ($M = 1.98$, $sd = .57$).

Table 10

ANOVA Results of All Variables by Parental Sources of Maltreatment in Males

	F	p	Group Differences
LSCL	4.36	0.02	3 > 2
rs_sum	.48	0.62	
PFQ shame total	3.58	0.03	
PFQ guilt total	5.13	0.01	3 > 2
tsymptoms	1.79	0.17	
sqanx	.86	0.43	
sqdep	2.15	0.12	
sqhostil	1.00	0.37	
sqsuma	1.65	0.20	

Note: LSCL = limbic dysfunction; rs_sum = trait resilience; PFQ shame total = shame index; PFQ guilt total = guilt index; tsymptoms = total psychiatric symptoms; sqanx = anxiety; sqdep = depression; sqhostil = hostility; sqsuma = somatization.

Table 11

ANOVA Results of All Variables by Parental Sources of Maltreatment in Females

	F	Sig.	Group Differences
LSCL	1.58	0.21	
rs_sum	0.87	0.42	
PFQ shame total	1.57	0.21	
PFQ guilt total	0.32	0.73	
tsymptoms	1.53	0.22	
sqanx	1.79	0.17	
sqdep	1.15	0.32	
sqhostil	0.92	0.40	
sqsuma	1.61	0.20	

Note: LSCL = limbic dysfunction; rs_sum = trait resilience; PFQ shame total = shame index; PFQ guilt total = guilt index; tsymptoms = total psychiatric symptoms; sqanx = anxiety; sqdep = depression; sqhostil = hostility; sqsuma = somatization.

To test Hypothesis 3 (that limbic dysfunction will be negatively correlated with resilience and positively correlated with guilt, shame and psychiatric symptoms), Tables 12, 13 and 14 provide correlation matrices for the entire sample as well as separately by gender. As shown in Table 12, limbic dysfunction was significantly positively correlated with shame, guilt and all psychiatric symptoms in the overall sample. In females, as shown in Table 13, limbic dysfunction was significantly negatively correlated with resilience and positively correlated with shame, guilt and all psychiatric symptoms. In males, as shown in Table 14, limbic dysfunction was significantly positively correlated with shame, guilt and all psychiatric symptoms.

Table 12

Correlations Between Limbic Dysfunction and Major Study Variables

	LSCL	rs_sum	PFQ shame total	PFQ guilt total	tsymptoms	sqanx	sqdep	sqhostil	sqsuma
LSCL	—	-0.05	0.43**	0.33**	0.50**	0.45**	0.43**	0.37**	0.50**
rs_sum		—	-0.21**	-0.12*	-0.24**	-0.18**	-0.33**	-0.17**	-0.22**
PFQ shame total			—	0.65**	0.39**	0.37**	0.40**	0.26**	0.32**
PFQ guilt total				—	0.32**	0.32**	0.36**	0.23**	0.22**
tsympto ms					—	0.92**	0.91**	0.87**	0.84**
sqanx						—	0.80**	0.74**	0.72**
sqdep							—	0.71**	0.69**
sqhostil								—	0.61**
sqsuma									—

*p<0.05; **p<0.01

Note: LSCL = limbic dysfunction; rs_sum = trait resilience; PFQ shame total = shame index; PFQ guilt total = guilt index; tsymptoms = total psychiatric symptoms; sqanx = anxiety; sqdep = depression; sqhostil = hostility; sqsuma = somatization.

Table 13

Correlations Between Limbic Dysfunction and Major Study Variables in Females

	LSCL	rs_sum	PFQ shame total	PFQ guilt total	tsymptoms	sqanx	sqdep	sqhostil	sqsuma
LSCL	—	-.16*	.41**	.30**	.53**	.48**	.43**	.38**	.54**
rs_sum		—	-.27**	-.15*	-.36**	-.30**	-.44**	-.28**	-.22**
PFQ shame total			—	.64**	.46**	.46**	.44**	.35**	.37**
PFQ guilt total				—	.36**	.37**	.38**	.30**	.20**
tsymptoms					—	.92**	.91**	.85**	.83**
sqanx						—	.79**	.72**	.71**
sqdep							—	.70**	.66**
sqhostil								—	.58**
sqsuma									—

*p<0.05; **p<0.01

Note: LSCL = limbic dysfunction; rs_sum = trait resilience; PFQ shame total = shame index; PFQ guilt total = guilt index; tsymptoms = total psychiatric symptoms; sqanx = anxiety; sqdep = depression; sqhostil = hostility; sqsuma = somatization.

Table 14

Correlations Between Limbic Dysfunction and Major Study Variables in Males

	LSCL	rs_sum	PFQ shame total	PFQ guilt total	tsymptoms	sqanx	sqdep	sqhostil	sqsuma
LSCL	—	0.02	0.46**	0.37**	0.48**	0.43**	0.43**	0.36**	0.45**
rs_sum		—	-0.18*	-0.10	-0.16*	-0.11	-0.25**	-0.09	-0.25**
PFQ shame total			—	0.64**	0.27**	0.22*	0.32**	0.19*	0.23*
PFQ guilt total				—	0.26**	0.23**	0.32**	0.15*	0.21*
tsymptoms					—	0.92**	0.91**	0.89**	0.86**
sqanx						—	0.79**	0.76**	0.72**
sqdep							—	0.74**	0.71**
sqhostil								—	0.65**
sqsuma									—

*p<0.05; **p<0.01

Note: LSCL = limbic dysfunction; rs_sum = trait resilience; PFQ shame total = shame index; PFQ guilt total = guilt index; tsymptoms = total psychiatric symptoms; sqanx = anxiety; sqdep = depression; sqhostil = hostility; sqsuma = somatization.

Based on the bivariate Pearson correlations calculated for Hypotheses 1 and 4, several multiple regressions were performed to test Hypothesis 5 (that the relationship between childhood maltreatment and young adult psychiatric symptoms will be moderated by limbic dysfunction, trait resilience, guilt and shame). Tables 15 and 16 display the linear multiple regression analyses used to determine the relative contributions of the predictor variables (forms of childhood maltreatment) and mediator variables (limbic dysfunction, trait resilience, guilt and shame) to the outcome variables (psychiatric symptoms).

In females, as seen in Table 15, total scores for psychiatric symptoms were regressed on all forms of parental aggression in the first step, limbic dysfunction in the second step and trait resilience, shame and guilt in the third step. These variables accounted for 43.1% of the variance in total psychiatric symptoms ($R^2 = .431$, $p = .000$). Maternal psychiatric aggression demonstrated significant effects on psychiatric symptoms in the first step ($B = .539$, $p = .024$) but no longer contributed significantly once limbic dysfunction was added in the second step ($B = .677$, $p = .000$). Shame ($B = 6.006$, $p = .003$) and resilience ($B = -.334$, $p = .001$) contributed significantly to the third step.

Table 15

Linear Multiple Regression Model for the Prediction of Total Psychiatric Symptoms in Females

Variable	B	p	.	F	p
Step 1	—	—			
			0.14	7.22	.00
Maternal psychological aggression	0.54	0.02			
Paternal psychological aggression	0.37	0.22			
Maternal physical aggression	0.11	0.52			
Paternal physical aggression	0.14	0.59			
Step 2	—	—			
			0.31	16.87	.00
Limbic dysfunction	0.61	0.00			
Step 3	—	—			
			0.43	17.17	.00
Trait resilience	-0.33	0.00			
Shame index	6.01	0.00			
Guilt index	1.09	0.53			

In males, as seen in Table 16, total scores for psychiatric symptoms were regressed on paternal physical aggression in the first step, limbic dysfunction in the second step and trait resilience, shame and guilt in the third step. These variables account for 32.1% of the variance in total psychiatric symptoms ($R^2 = .321$, $p = .000$). Paternal physical aggression demonstrated significant effects on psychiatric symptoms in the first step ($B = .393$, $p = .011$) but no longer contributed significantly once limbic dysfunction was added in the second step ($B = .398$, $p = .000$). Resilience ($B = -.510$, $p = .000$) and guilt ($B = 5.475$, $p = .018$) contributed significantly in the third step.

Table 16

Linear Multiple Regression Model for the Prediction of Total Psychiatric Symptoms in Males

Variable	B	p	R ²	F	p
Step 1	—	—	0.04	6.60	.01
Paternal physical aggression	0.39	0.01			
Step 2	—	—	0.14	12.04	.00
Limbic dysfunction	0.40	0.00			
Step 3	—	—	0.32	13.24	.00
Trait resilience	-0.51	0.00			
Shame index	0.93	0.71			
Guilt index	5.48	0.02			

Discussion

The goal of this study was to examine the relationships between childhood maltreatment, limbic dysfunction, trait resilience, shame and guilt, and psychiatric symptoms within the ecological model. We predicted that limbic dysfunction and its consequences in emotional regulation will mediate between childhood experiences of maltreatment and resilience and later psychiatric symptoms. The findings of this investigation suggest that trait resilience plays a significant role in mediating the relationship between childhood maltreatment and psychiatric symptoms and that such mediation is related to emotional regulation by the limbic system.

The ecological model examines variables at the individual and social levels. On the individual level, female participants scored higher than males in anxiety, depression, somatization, guilt, shame and total psychiatric symptoms. Higher scores on somatization

among females are consistent with previous studies (Ashy, 2003; Teicher et al., 1993). However, higher scores on anxiety, depression and total psychiatric symptoms had not been reported among females in previous samples that used the same scales (Ashy, 2003). A possible explanation is that stress responses in males may not be expressed in ways that are detectable by the current measures used. For example, while women are more likely to be diagnosed with depressive disorders, men prevail in diagnoses of alcohol dependence (Kessler et al., 1994). Furthermore, positive correlation between guilt and psychiatric symptoms was found in females but not in males, which supports a finding in the literature that guilt is a stronger predictor of psychiatric symptoms compared to shame (Ginzburg and colleagues, 2006). Males reported more paternal psychological and physical aggression compared to females, which is consistent with previous research findings (Ashy, 2003; Ashy & Malley-Morrison, 2000).

The first hypothesis, that exposure to childhood maltreatment would be negatively correlated with resilience and positively correlated with limbic dysfunction, guilt, shame and psychiatric symptoms, was fully supported in the overall sample. This is consistent with previous research on childhood maltreatment and resilience in adulthood (Werner, 1989; Rutter, 1985; Luthar, Cicchetti and Becker, 2000), as well as research on childhood maltreatment and limbic dysfunction in adulthood (Teicher et al., 1993; Anderson et al., 2002; Ashy, 2003; Teicher et al., 2006). The positive association between childhood maltreatment and guilt and shame is consistent with research showing high scores for negative self-perception and neuroticism in studies of individuals with traumatic experiences (Campbell-Sills, Cohan and Stein, 2005; Kling, Ryff and Essex, 2003).

A possible explanation for the link between childhood abuse and limbic dysfunction can be found at the biological level, as enhanced activity of stress response systems may cause the brain to follow alternative developmental pathways to manage an environment of heightened stressors (Teicher et al., 2006). Therefore, the negative association between maltreatment and resilience can be examined in light of the altered environment experienced by maltreated children, in that what may constitute resilience in an abnormally stressful environment may not characterize resilience in the normal environment as measured by the Resilience Scale. Furthermore, childhood maltreatment's contribution to feelings of guilt and shame may be explained through limbic dysfunction or through behavioral and cognitive mechanisms, such as negative self-concept, behavioral inhibition or through internalization of blame for the experienced abuse (Swanell et al., 2012). In addition, there were several gender-specific findings related to the first hypothesis. Exposure to maltreatment was associated with all psychiatric symptoms in females; however, in males, exposure to maltreatment was only associated with somatization. One possible explanation for this finding is that the connection between abuse and psychiatric symptoms is direct in females but may be indirect in males through other variables such as alcohol and substance abuse (Kessler et al., 1994).

The second hypothesis predicted that participants exposed to maltreatment from both parents would have significantly more limbic dysfunction, guilt, shame and psychiatric symptoms compared to participants exposed to maltreatment by a single parent. This hypothesis was partially supported by the results. Overall, maltreatment by

both parents was associated with greater limbic dysfunction, shame and guilt compared to paternal maltreatment alone. Among male participants, maltreatment by both parents was associated with greater limbic dysfunction and guilt compared to paternal maltreatment alone. The co-occurrence of different forms of abuse is known to have a positive correlation with the severity of mental health and behavioral consequences (Edwards et al., 2003). This finding suggests that family dynamics may have effects on the consequences of maltreatment. Within this sample, the apparently higher levels of aggression from mothers than from fathers may account for the stronger impact due to maternal maltreatment. One possible explanation is that mothers are often the major care providers, which may contribute to increased levels of stress and greater incidences of aggressive behavior.

Furthermore, the differences in males and females may be linked to attachment theory, which states that interactions between infants and caregivers can have lasting impact on the child's biological and social functioning (Bowlby, 1969; Tavecchio and Van-Ijzendoorn, 1987; Harwood, Miller and Irizarry, 1995). In a study of peer relationships during childhood, boys with insecure attachment were found to be more attention-seeking compared to girls with insecure attachment (Turner, 1991). Disorganized attachment may result when the child is subjected to maltreatment by the caregiver; disorganized attachment may manifest as contradictory behaviors such as alternately approaching and turning away from the caregiver (Lyons-Ruth, Bronfman and Parsons, 1999). Disorganized attachment and attention seeking may explain the exacerbated symptoms in males when both parents are abusive, as the child cannot seek

comfort from either caregiver. However, the lack of influence of this variable on females suggests that the modulating effect of maternal influence may be different on sons and daughters. The findings in girls may suggest a greater vulnerability to maltreatment overall, as maltreatment from either parent resulted in greater limbic dysfunction, shame, and psychiatric symptoms, or differences in attachment prevented amelioration of the distress by the non-abusive parent.

The fourth hypothesis predicted that limbic dysfunction would be negatively correlated with resilience and positively correlated with guilt, shame and psychiatric symptoms was fully supported. The negative association between limbic dysfunction and resilience was supported only in females but not males, but this association was not robust and may require further study. Resilience has been shown to be a moderator of psychiatric symptoms and PTSD in both male and female individuals with histories of childhood trauma (Campbell-Sills, Cohan and Stein, 2005; Daniels et al., 2012), and the amygdala has been implicated in the ability to regulate emotions in response to fearful stimuli (Amorapanth et al., 2002). Since limbic system is involved in emotional regulation, and resilience is defined as the ability to regulate emotions, then limbic dysfunctions might be affecting the core of resilience.

The positive relationships between limbic dysfunction, guilt and shame are consistent with fMRI studies showing activation of the amygdala in response to hostile stimuli (Sambataro et al., 2006; Aleman and Swart, 2008; Michl et al., 2012). The association between limbic dysfunction and psychiatric symptoms is consistent with Teicher et al. (2006), who found comparatively larger effect sizes for anxiety, depression

and hostility in individuals exposed to childhood traumas compared to individuals not exposed.

The fifth hypothesis, that limbic dysfunction, trait resilience, guilt and shame are mediators between childhood maltreatment and adult psychiatric symptoms, has been supported by the results of the linear regression analysis. In females, maternal and paternal psychological aggression, limbic dysfunction, resilient and shame contributed significantly to the variance in psychiatric symptoms ($R^2 = .43$, $p = .00$). In contrast, in males, paternal physical aggression, limbic dysfunction, resilience and guilt contributed significantly to the variance in psychiatric symptoms ($R^2 = .32$, $p = .00$). These findings are consistent with the ecological model that examines variables contributing to psychiatric symptoms on the biological, psychological and social levels. Based on the regression analysis, limbic dysfunction, guilt and shame can be seen as risk factors for psychiatric symptoms, while resilience can be seen as a protective factor, as consistent with previous research (Campbell-Sills, Cohan and Stein, 2005).

Limitations

There are several limitations in the present study. First, the study sample consisted mainly of participants who are college-educated and of middle or upper-middle socioeconomic status. These demographics indicate that participants had access to environmental protective factors that are not typically available to severely maltreated children (Garmezy, 1991). Future studies should seek to examine populations at higher risk for the consequences of severe childhood aggression in order to provide more

evidence for the ecological pathways between severe maltreatment and emotional regulation. Second, the present study included only physical and psychological maltreatment from parents to child. Other forms of childhood maltreatment, including neglect, sexual trauma, witnessed violence between parents, sibling and peer aggressions, and abuses by authority figures outside the home are potential areas for future research. Third, the study did not have the means to specify dysfunctions in particular limbic areas. Future research should use imaging techniques and physiological instruments to confirm limbic dysfunction through direct assessments of the brain. Fourth, resilience is a relatively new area of research, and multilevel analysis may be needed to understand the complex phenomena that determine individual levels of resilience and their relevance to various psychiatric disorders. Furthermore, the findings of this study may have implications for healthcare professionals. The mediating role of resilience suggests that treatment of individuals who have experienced childhood traumas should focus on the psychological resources available to the individual in addition to his or her vulnerabilities.

REFERENCES

- Aleman, A., & Swart, M. (2008). Sex differences in neural activation to facial expressions denoting contempt and disgust. *PloS one*, 3(11), e3622. doi:10.1371/journal.pone.0003622
- Alim, T. N., Graves, E., Mellman, T. A., Aigbogun, N., Gray, E., Lawson, W., & Charney, D. S. (2006). Trauma exposure, posttraumatic stress disorder and depression in an African-American primary care population. *Journal of the National Medical Association*, 98(10), 1630–1636.
- Amorapanth, P., LeDoux, J. E., & Nader, K. (2000). Different lateral amygdala outputs mediate reactions and actions elicited by a fear-arousing stimulus. *Nature neuroscience*, 3(1), 74–79. doi:10.1038/71145
- Anderson, C. M., Teicher, M. H., Polcari, A., & Renshaw, P. F. (2002). Abnormal T2 relaxation time in the cerebellar vermis of adults sexually abused in childhood: potential role of the vermis in stress-enhanced risk for drug abuse. *Psychoneuroendocrinology*, 27(1-2), 231–244.
- Ashy, M. & Malley-Morrison, K. (2000). The relationship of childhood experiences of abuse and physical health. Paper presented at the annual meeting of the American Psychological Association, Washington, D.C.
- Ashy, M. (2003). Childhood experiences, social interactions, and physical health. (Unpublished doctoral dissertation). Boston University, Massachusetts.
- Belsky, J. (1993). Etiology of child maltreatment: A developmental-ecological analysis. *Psychological Bulletin*, 114 (3), 413-434.
- Bienvenu, O. J., & Stein, M. B. (2003). Personality and anxiety disorders: a review. *Journal of personality disorders*, 17(2), 139–151.
- Bowlby, J. (1969). *Attachment and loss*. New York Basic Books.
- Bremner, J. D., Randall, P., Vermetten, E., Staib, L., Bronen, R. A., Mazure, C., ... Charney, D. S. (1997). Magnetic resonance imaging-based measurement of hippocampal volume in posttraumatic stress disorder related to childhood physical and sexual abuse--a preliminary report. *Biological psychiatry*, 41(1), 23–32.
- Breslau, N., Kessler, R. C., Chilcoat, H. D., Schultz, L. R., Davis, G. C., & Andreski, P. (1998). Trauma and posttraumatic stress disorder in the community: the 1996 Detroit Area Survey of Trauma. *Archives of general psychiatry*, 55(7), 626–632.
- Bronfenbrenner, U. (1979). *Ecology of human development*. Harvard Up.

- Brown, T. A., Chorpita, B. F., & Barlow, D. H. (1998). Structural relationships among dimensions of the DSM-IV anxiety and mood disorders and dimensions of negative affect, positive affect, and autonomic arousal. *Journal of abnormal psychology, 107*(2), 179–192.
- Campbell-Sills, L., Cohan, S. L., & Stein, M. B. (2006). Relationship of resilience to personality, coping, and psychiatric symptoms in young adults. *Behaviour research and therapy, 44*(4), 585–599. doi:10.1016/j.brat.2005.05.001
- Carlson, V., Cicchetti, D., Barnett, D., & Braunwald, K. (1989). Disorganized/disoriented attachment relationships in maltreated infants. *Developmental Psychology, 25*(4), 525–531. doi:10.1037/0012-1649.25.4.525
- Caspi, A., McClay, J., Moffitt, T. E., Mill, J., Martin, J., Craig, I. W., ... Poulton, R. (2002). Role of genotype in the cycle of violence in maltreated children. *Science (New York, N.Y.), 297*(5582), 851–854. doi:10.1126/science.1072290
- Clements, C. M., Sabourin, C. M., & Spiby, L. (2004). Dysphoria and Hopelessness Following Battering: The Role of Perceived Control, Coping, and Self-Esteem. *Journal of Family Violence, 19*(1), 25–36. doi:10.1023/B:JOFV.0000011580.63593.96
- Dakil, S. R., Cox, M., Lin, H., & Flores, G. (2011). Racial and ethnic disparities in physical abuse reporting and child protective services interventions in the United States. *Journal of the National Medical Association, 103*(9-10), 926–931.
- Daniels, J. K., Hegadoren, K. M., Coupland, N. J., Rowe, B. H., Densmore, M., Neufeld, R. W. J., & Lanius, R. A. (2012). Neural correlates and predictive power of trait resilience in an acutely traumatized sample: a pilot investigation. *The Journal of clinical psychiatry, 73*(3), 327–332. doi:10.4088/JCP.10m06293
- De Bellis, M. D., Keshavan, M. S., Clark, D. B., Casey, B. J., Giedd, J. N., Boring, A. M., ... Ryan, N. D. (1999). A.E. Bennett Research Award. Developmental traumatology. Part II: Brain development. *Biological psychiatry, 45*(10), 1271–1284.
- Driessen, M., Herrmann, J., Stahl, K., Zwaan, M., Meier, S., Hill, A., ... Petersen, D. (2000). Magnetic resonance imaging volumes of the hippocampus and the amygdala in women with borderline personality disorder and early traumatization. *Archives of general psychiatry, 57*(12), 1115–1122.
- Edwards, V. J., Holden, G. W., Felitti, V. J., & Anda, R. F. (2003). Relationship between multiple forms of childhood maltreatment and adult mental health in community respondents: results from the adverse childhood experiences study. *The American journal of psychiatry, 160*(8), 1453–1460.
- Fergusson, D. M., Horwood, L. J., & Lynskey, M. T. (1996). Childhood sexual abuse and psychiatric disorder in young adulthood: II. Psychiatric outcomes of childhood sexual

- abuse. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35(10), 1365–1374. doi:10.1097/00004583-199610000-00024
- Garnezy, N. (1973). Competence and adaptation in adult schizophrenic patients and children at risk. In S. R. Dean (Ed.), *Schizophrenia: The first ten Dean Award lectures*(pp. 163–204). New York: MSS Information.
- Garnezy N, Masten AS, Tellegen A. 1984. The study of stress and competence in children: A building block for developmental psychopathology. *Child Development* 55:97–111.
- Garnezy, N. (1991). Resiliency and Vulnerability to Adverse Developmental Outcomes Associated with Poverty. *American Behavioral Scientist* 34: 416-430.
- Gilbert R, Widom CS, Browne K, Fergusson D, Webb E, Janson S. Burden and consequences of child maltreatment in high-income countries. 2009. *Lancet* 373: 68–81.
- Ginzburg, K., Arnow, B., Hart, S., Gardner, W., Koopman, C., Classen, C. C., ... Spiegel, D. (2006). The abuse-related beliefs questionnaire for survivors of childhood sexual abuse. *Child abuse & neglect*, 30(8), 929–943. doi:10.1016/j.chiabu.2006.01.004
- Grassi-Oliveira R, Ashy M, Stein LM. Psychobiology of childhood maltreatment: effects of allostatic load? *Revista Brasileira de Psiquiatria*. 2008 Mar;30(1):60-8.
- Greenberg, M. T. (2006). Promoting resilience in children and youth: preventive interventions and their interface with neuroscience. *Annals of the New York Academy of Sciences*, 1094, 139–150. doi:10.1196/annals.1376.013
- Harder, D. H., & Zalma, A. (1990). Two promising shame and guilt scales: a construct validity comparison. *Journal of personality assessment*, 55(3-4), 729–745. doi:10.1080/00223891.1990.9674108
- Harwood, R., Miller, G., & Irizarry, N. (1995). *Culture and attachment: Perceptions of the child in context*. New York, NY, USA: The Guilford Press.
- Helliwell, J. F., & Putnam, R. D. (2004). The social context of well-being. *Philosophical transactions of the Royal Society of London. Series B, Biological sciences*, 359(1449), 1435–1446. doi:10.1098/rstb.2004.1522
- Hoge, E. A., Austin, E. D., & Pollack, M. H. (2007). Resilience: research evidence and conceptual considerations for posttraumatic stress disorder. *Depression and anxiety*, 24(2), 139–152. doi:10.1002/da.20175
- Hyun, M., Friedman, S. D., & Dunner, D. L. (2000). Relationship of childhood physical and sexual abuse to adult bipolar disorder. *Bipolar disorders*, 2(2), 131–135.
- Kellner R. (1987). A symptom questionnaire. *Journal of Clinical Psychiatry*, 48, 268-274.

- Kessler, K. S., Karkowski, L. M., & Prescott, C. A. (1999). Causal relationship between stressful life events and the onset of major depression. *The American journal of psychiatry*, *156*(6), 837–841.
- Kessler, R. C., Crum, R. M., Warner, L. A., Nelson, C. B., Schulenberg, J., & Anthony, J. C. (1997). Lifetime co-occurrence of DSM-III-R alcohol abuse and dependence with other psychiatric disorders in the National Comorbidity Survey. *Archives of general psychiatry*, *54*(4), 313–321.
- Kessler, R. C., McGonagle, K. A., Zhao, S., Nelson, C. B., Hughes, M., Eshleman, S., ... Kessler, K. S. (1994). Lifetime and 12-month prevalence of DSM-III-R psychiatric disorders in the United States. Results from the National Comorbidity Survey. *Archives of general psychiatry*, *51*(1), 8–19.
- Kling, K. C., Ryff, C. D., Love, G., & Essex, M. (2003). Exploring the influence of personality on depressive symptoms and self-esteem across a significant life transition. *Journal of personality and social psychology*, *85*(5), 922–932. doi:10.1037/0022-3514.85.5.922
- Koenen, K. C., Moffitt, T. E., Caspi, A., Taylor, A., & Purcell, S. (2003). Domestic violence is associated with environmental suppression of IQ in young children. *Development and psychopathology*, *15*(2), 297–311.
- Langeland, W., & Hartgers, C. (1998). Child sexual and physical abuse and alcoholism: a review. *Journal of studies on alcohol*, *59*(3), 336–348.
- Lanius, R. (2007). Complex adaptations to traumatic stress: from neurobiological to social and cultural aspects. *The American journal of psychiatry*, *164*(11), 1628–1630. doi:10.1176/appi.ajp.2007.07081352
- Layard, R. (2010). Economics. Measuring subjective well-being. *Science (New York, N.Y.)*, *327*(5965), 534–535. doi:10.1126/science.1186315
- Leserman, J., Li, Z., Drossman, D. A., Toomey, T. C., Nachman, G., & Glogau, L. (1997). Impact of sexual and physical abuse dimensions on health status: development of an abuse severity measure. *Psychosomatic medicine*, *59*(2), 152–160.
- Liem, J. H., & Boudewyn, A. C. (1999). Contextualizing the effects of childhood sexual abuse on adult self- and social functioning: an attachment theory perspective. *Child abuse & neglect*, *23*(11), 1141–1157.
- Luthar SS. 1991. Vulnerability and resilience: A study of high-risk adolescents. *Child Development* *62*:600–616.
- Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The construct of resilience: a critical evaluation and guidelines for future work. *Child Development*, *71*(3), 543–562.

- Lyons-Ruth, K., Bronfman, E., & Parsons, E. (1999). Chapter IV. Maternal Frightened, Frightening, or Atypical Behavior and Disorganized Infant Attachment Patterns. *Monographs of the Society for Research in Child Development*, 64(3), 67–96. doi:10.1111/1540-5834.00034
- MacMillan, H L, Fleming, J. E., Streiner, D. L., Lin, E., Boyle, M. H., Jamieson, E., ... Beardslee, W. R. (2001). Childhood abuse and lifetime psychopathology in a community sample. *The American journal of psychiatry*, 158(11), 1878–1883.
- MacMillan, Harriet L, Jamieson, E., & Walsh, C. A. (2003). Reported contact with child protection services among those reporting child physical and sexual abuse: results from a community survey. *Child abuse & neglect*, 27(12), 1397–1408.
- Maier, S. F., & Watkins, L. R. (2010). Role of the medial prefrontal cortex in coping and resilience. *Brain research*, 1355, 52–60. doi:10.1016/j.brainres.2010.08.039
- McFarlane, A. C. (2010). The long-term costs of traumatic stress: intertwined physical and psychological consequences. *World psychiatry: official journal of the World Psychiatric Association (WPA)*, 9(1), 3–10.
- Mcquaid, J. R., Pedrelli, P., McCahill, M. E., & Stein, M. B. (2001). Reported trauma, post-traumatic stress disorder and major depression among primary care patients. *Psychological medicine*, 31(7), 1249–1257.
- Michl, P., Meindl, T., Meister, F., Born, C., Engel, R. R., Reiser, M., & Hennig-Fast, K. (2012). Neurobiological underpinnings of shame and guilt: a pilot fMRI study. *Social cognitive and affective neuroscience*. doi:10.1093/scan/nss114
- Morrison, J. (1989). Childhood sexual histories of women with somatization disorder. *The American journal of psychiatry*, 146(2), 239–241.
- Nemeroff, C. B. (2004). Neurobiological consequences of childhood trauma. *The Journal of clinical psychiatry*, 65 Suppl 1, 18–28.
- Ochsner, K. N., Bunge, S. A., Gross, J. J., & Gabrieli, J. D. E. (2002). Rethinking feelings: an fMRI study of the cognitive regulation of emotion. *Journal of cognitive neuroscience*, 14(8), 1215–1229. doi:10.1162/089892902760807212
- Ochsner, K. N., Ray, R. D., Cooper, J. C., Robertson, E. R., Chopra, S., Gabrieli, J. D. E., & Gross, J. J. (2004). For better or for worse: neural systems supporting the cognitive down- and up-regulation of negative emotion. *NeuroImage*, 23(2), 483–499. doi:10.1016/j.neuroimage.2004.06.030
- Phelps, E. A., & LeDoux, J. E. (2005). Contributions of the amygdala to emotion processing: from animal models to human behavior. *Neuron*, 48(2), 175–187. doi:10.1016/j.neuron.2005.09.025

- Pitman, R. K., Gilbertson, M. W., Gurvits, T. V., May, F. S., Lasko, N. B., Metzger, L. J., ... Orr, S. P. (2006). Clarifying the origin of biological abnormalities in PTSD through the study of identical twins discordant for combat exposure. *Annals of the New York Academy of Sciences*, 1071, 242–254. doi:10.1196/annals.1364.019
- Pitman, R. K., Rasmusson, A. M., Koenen, K. C., Shin, L. M., Orr, S. P., Gilbertson, M. W., Liberzon, I. (2012). Biological studies of post-traumatic stress disorder. *Nature reviews. Neuroscience*, 13(11), 769–787. doi:10.1038/nrn3339
- Pribor, E. F., Yutzy, S. H., Dean, J. T., & Wetzel, R. D. (1993). Briquet's syndrome, dissociation, and abuse. *The American journal of psychiatry*, 150(10), 1507–1511.
- Quaife, R. A., Gilbert, E. M., Christian, P. E., Datz, F. L., Mealey, P. C., Volkman, K., ... Bristow, M. R. (1996). Effects of carvedilol on systolic and diastolic left ventricular performance in idiopathic dilated cardiomyopathy or ischemic cardiomyopathy. *The American journal of cardiology*, 78(7), 779–784.
- Rutter, M. (1979). Protective factors in children's responses to stress and disadvantage. In M. W. Kent & J. E. Rolf (Eds.), *Primary prevention in psychopathology: Social competence in children* (pp.49–74). Hanover, NH: University Press of New England.
- Rutter, M. (1985). Resilience in the face of adversity. Protective factors and resistance to psychiatric disorder. *The British journal of psychiatry: the journal of mental science*, 147, 598–611.
- Sambataro, F., Dimalta, S., Di Giorgio, A., Taurisano, P., Blasi, G., Scarabino, T., ... Bertolino, A. (2006). Preferential responses in amygdala and insula during presentation of facial contempt and disgust. *The European journal of neuroscience*, 24(8), 2355–2362. doi:10.1111/j.1460-9568.2006.05120.x
- Sapolsky, R. M., McEwen, B. S., & Rainbow, T. C. (1983). Quantitative autoradiography of [3H]corticosterone receptors in rat brain. *Brain research*, 271(2), 331–334.
- Sapolsky, R. M., Uno, H., Rebert, C. S., & Finch, C. E. (1990). Hippocampal damage associated with prolonged glucocorticoid exposure in primates. *The Journal of neuroscience: the official journal of the Society for Neuroscience*, 10(9), 2897–2902.
- Saxe, G. N., Chinman, G., Berkowitz, R., Hall, K., Lieberg, G., Schwartz, J., & Van der Kolk, B. A. (1994). Somatization in patients with dissociative disorders. *The American journal of psychiatry*, 151(9), 1329–1334.
- Schuck, A. M., & Widom, C. S. (2001). Childhood victimization and alcohol symptoms in females: causal inferences and hypothesized mediators. *Child abuse & neglect*, 25(8), 1069–1092.

- Schury, K., & Kolassa, I.-T. (2012). Biological memory of childhood maltreatment: current knowledge and recommendations for future research. *Annals of the New York Academy of Sciences*, 1262, 93–100. doi:10.1111/j.1749-6632.2012.06617.x
- Shearer, S. L., Peters, C. P., Quaytman, M. S., & Ogden, R. L. (1990). Frequency and correlates of childhood sexual and physical abuse histories in adult female borderline inpatients. *The American journal of psychiatry*, 147(2), 214–216.
- Straus, M. A. & Hamby, S. L., (1997). Measuring physical and psychological maltreatment of children with the conflict tactics scale. In *Out of Darkness: Contemporary Perspectives on Family Violence*. Kantor, G.K. & Jasinski, J.L. Thousand Oaks, CA: Sage, 119-135.
- Swannell, S., Martin, G., Page, A., Hasking, P., Hazell, P., Taylor, A., & Protani, M. (2012). Child maltreatment, subsequent non-suicidal self-injury and the mediating roles of dissociation, alexithymia and self-blame. *Child abuse & neglect*, 36(7-8), 572–584. doi:10.1016/j.chiabu.2012.05.005
- Tavecchio, L., & Van-IJzendoorn, M. (1987). Attachment in social networks: Contributions to the Bowlby-Ainsworth attachment theory. Amsterdam, Netherlands: North-Holland.
- Teicher, M H, Glod, C. A., Surrey, J., & Swett, C., Jr. (1993). Early childhood abuse and limbic system ratings in adult psychiatric outpatients. *The Journal of neuropsychiatry and clinical neurosciences*, 5(3), 301–306.
- Teicher, Martin H, Andersen, S. L., Polcari, A., Anderson, C. M., Navalta, C. P., & Kim, D. M. (2003). The neurobiological consequences of early stress and childhood maltreatment. *Neuroscience and biobehavioral reviews*, 27(1-2), 33–44.
- Teicher, Martin H, Samson, J. A., Polcari, A., & McGreenery, C. E. (2006). Sticks, stones, and hurtful words: relative effects of various forms of childhood maltreatment. *The American journal of psychiatry*, 163(6), 993–1000. doi:10.1176/appi.ajp.163.6.993
- Thompson, M. P., Kingree, J. B., & Desai, S. (2004). Gender differences in long-term health consequences of physical abuse of children: data from a nationally representative survey. *American journal of public health*, 94(4), 599–604.
- Turner, P. J. (1991). Relations between attachment, gender, and behavior with peers in preschool. *Child development*, 62(6), 1475–1488.
- Uji, M., Kitamura, T., & Nagata, T. (2011). Self-conscious affects: their adaptive Functions and relationship to depressive mood. *American journal of psychotherapy*, 65(1), 27–46.
- Ungar, M. (2011). The social ecology of resilience: addressing contextual and cultural ambiguity of a nascent construct. *The American journal of orthopsychiatry*, 81(1), 1–17. doi:10.1111/j.1939-0025.2010.01067.x

- U.S. Department of Health and Human Services, Administration for Children and Families, Administration on Children, Youth and Families, Children's Bureau. (2011). Child Maltreatment 2010.
- Van der Kolk, B., McFarlane, A., & Weisaeth, L. (1996). Traumatic stress: the effects of overwhelming experience on mind, body, and society. (2007) (Pbk. ed.). New York: Guilford Press.
- Van der Kolk, B. & Saporta, J. (1991) The biological mechanisms and treatment of intrusion and numbing. *Anxiety Research*; 4:199-212.
- Vythilingam, M., Heim, C., Newport, J., Miller, A. H., Anderson, E., Bronen, R., ... Bremner, J. D. (2002). Childhood trauma associated with smaller hippocampal volume in women with major depression. *The American journal of psychiatry*, 159(12), 2072–2080.
- Wagnild, G. M., & Young, H. M. (1993). Development and psychometric evaluation of the Resilience Scale. *Journal of nursing measurement*, 1(2), 165–178.
- Wasterlain, C. G., Morin, A. M., & Jonec, V. (1982). Kindling: a pharmacological approach. *Electroencephalography and clinical neurophysiology. Supplement*, 36, 264–273.
- Weiss, E. L., Longhurst, J. G., & Mazure, C. M. (1999). Childhood sexual abuse as a risk factor for depression in women: psychosocial and neurobiological correlates. *The American journal of psychiatry*, 156(6), 816–828.
- Werner, E.E. (1982). *Vulnerable but invincible: A longitudinal study of resilient children and youth*. New York: McGraw-Hill.
- Werner EE. (1989). High-risk children in young adulthood: A longitudinal study from birth to 32 years. *Am J Orthopsychiatry* 59: 72–81.
- Werner, EE, and Smith, R. (1992). *Overcoming the Odds: High-Risk Children from Birth to Adulthood*. New York: Cornell University Press, 1992.
- Windle, M., Windle, R. C., Scheidt, D. M., & Miller, G. B. (1995). Physical and sexual abuse and associated mental disorders among alcoholic inpatients. *The American journal of psychiatry*, 152(9), 1322–1328.
- Wong, M. C. S., Lee, A., Sun, J., Stewart, D., Cheng, F. F. K., Kan, W., & Ho, M. (2009). A comparative study on resilience level between WHO health promoting schools and other schools among a Chinese population. *Health promotion international*, 24(2), 149–155. doi:10.1093/heapro/dap010
- Young-Wolff, K. C., Kendler, K. S., & Prescott, C. A. (2012). Interactive effects of childhood maltreatment and recent stressful life events on alcohol consumption in adulthood. *Journal of studies on alcohol and drugs*, 73(4), 559–569.

- Zanarini, M. C., Yong, L., Frankenburg, F. R., Hennen, J., Reich, D. B., Marino, M. F., & Vujanovic, A. A. (2002). Severity of reported childhood sexual abuse and its relationship to severity of borderline psychopathology and psychosocial impairment among borderline inpatients. *The Journal of nervous and mental disease*, *190*(6), 381–387.
- Zimmerman, M., McGlinchey, J. B., Posternak, M. A., Friedman, M., Attiullah, N., & Boerescu, D. (2006). How should remission from depression be defined? The depressed patient's perspective. *The American journal of psychiatry*, *163*(1), 148–150.
doi:10.1176/appi.ajp.163.1.148
- Zimrin H. 1986. A profile of survival. *Child Abuse and Neglect* 10:339–349.

VITA

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

- [REDACTED]
- [REDACTED]

[REDACTED]

[REDACTED]

- [REDACTED]
- [REDACTED]

[REDACTED]

[REDACTED]

- [REDACTED]
- [REDACTED]

[REDACTED]

[REDACTED]