

Post-Traumatic Stress Syndrome and Child Development: A Meta-Synthesis

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**Abstract**

Exposure to acute stress and maltreatment during the first forty-eight months of life may result in a chain reaction of chemical and biological changes negatively impacting the growth and development of the brain. Especially affected is the neurohormonal structure of the hypothalamic pituitary adrenal or HPA axis, which regulates stress hormones. Corpus callosum, the left neocortex, hippocampus, and amygdala are major brain structures which are adversely affected by chronic acute stress. Psychiatric disorders such as post-traumatic stress disorder (PTSD) may result from severe stress, neglect and maltreatment especially when acute stress comes about during critical periods of developmental.

## **1. Introduction**

### *1.1 Background*

Historically, children have been considered to be resilient in the face of trauma. Researchers have learned over the past 20 years that children are not as resilient to stress as once believed. In fact, they are more negatively affected by stress than their adult counterparts. Children's brains are very malleable and they are growing and adapting to the environment around them. If that environment is acutely stressful the developing brain having no prior knowledge may fail to thrive. A child who is subject to acute stress or maltreatment without positive intervention may suffer brain development damage and develop maladaptive thought processes.

The American Psychiatric Association has updated the criteria for diagnosis of Post-Traumatic Stress Disorder (PTSD) in the fifth edition of its *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) published in 2013 (American Psychiatric Association, 2013). This update includes an introduction of a preschool subtype of PTSD for children ages 6 years and younger. The new criteria in the DSM-5 recognized that there are developmental differences between age groups and those persons of different age groups express symptoms in different ways. Young children are not able to verbally express themselves after experiencing a traumatic experience. In order to better understand Post Traumatic Stress Syndrome (PTSD) in young children, I have included the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5) (Psychiatric Association, 2013) criteria for diagnosing PTSD in children under the age of six in Appendix A.

Traumatic events which can result in PTSD young children include but are not limited to physical abuse, car or plane accident, natural disaster, animal attack, violent crime, acts of

war, or terrorist attacks. According to Kessler (2012) predictors of PTSD in young children include gender, social economic status, parental support, pre-existing medical conditions, duration of exposure to traumatic situations. Advances in medical research have increased the information available about how acute trauma effects young children, predictors of PTSD, and diagnostic markers.

### *1.2. Author's beliefs and experiences*

When I began teaching a year and half ago I had my first encounter with a student who exhibited symptoms of Post-Traumatic Stress Disorder, commonly referred to as PTSD. This child was violent towards other children and adults. I had believed PTSD was a soldier's illness after being exposed to the trauma of war. During those first six months of teaching, I really didn't know what to do to help this student. She had no official diagnosis yet, but a community mental health organization had been brought in by the family to assist the child with her behavior. Little by little, I found out that the child had been witness to violent domestic abuse for most of her life. Unfortunately, the parent, a single mother, communicated very little with me. Eventually the child was given the diagnosis of Attention Deficit Hyperactivity disorder (ADHD).

During my second year of teaching, I again had a student with behavior issues which included acting out in class and urinary incontinence. The mother in this second case was very forthcoming about tell me about the child's history. The child now lived with her adopted family. Before being taken away from her biological family at age 3, she had been subjected to physical abuse and witnessed domestic violence. This child also had been given the diagnosis of ADHD and PTSD.

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Now in my third year of teaching, I again have a child who is suffering from the after effect of maltreatment prenatally (drug abuse) to the age of two, when he was taken into state custody. This child has a tremendous support system, which probably accounts for his positive development. He suffers from behavioral issues, but not cognitive delays.

### *1.3 Purpose of this meta-synthesis*

The purpose of this meta-synthesis is to investigate and distill information pertaining to Post Traumatic Stress Syndrome in children ages 6 and under. The goal of this meta-synthesis is to investigate and provide an overview of information about PTSD to educational school staff. In this meta-synthesis I hope to answer the question of how does trauma affect a child's developing brain? What are the symptoms of PTSD in children ages 6 years and younger? Are there strategies school staff can use to assist young children ages 6 years and younger who demonstrate PTSD symptoms?

## **2. Methods**

### *2.1. Selection criteria*

The 47 journal articles included in this meta-synthesis met the following selection criteria.

1. The articles explored issues related to the effect trauma has on children and their development.
2. The articles explored issues related to symptoms of childhood Post Traumatic Stress Disorder (PTSD).
3. The articles explored issues related to strategies for educators to use in helping teach students who exhibit PTSD.
4. The articles were published in peer-reviewed journals related to the field of education,

psychiatry, and psychology.

5. The articles were full text.
6. The articles were published between 2000 and 2013.

## *2.2 Search procedures*

In fall of 2013, I conducted systematic searches of 7 databases that index articles related to the disciplines of education, psychology, and psychiatry. I also conducted ancestral searches and hand searches of three books that examined the issues related to children with Post Traumatic Stress Disorder.

### *2.2.1 Database searches*

I conducted Boolean searches within the education resources available through Egan Library's online. I systematically conducted searches for articles related to Post Traumatic Stress Disorder, child development, and recovery strategies. I searched 7 data sources, which included Education Full Text (Wilson) (EBSCOhost), Educational Resource Information Center (ERIC, EBSCOhost), Education Journals (ProQuest), ProQuest Psychology Journals (ProQuest), Social Sciences Full Text (Wilson) (EBSCOhost), PsycINFO (EBSCOhost), PsycARTICLES (EBSCOhost). I used search term combinations to conduct Boolean searches of each database:

1. ("trauma") and ("children") and ("recovery")
2. ("posttraumatic stress disorder") and ("children") and ("recovery")
3. ("children") and ("stress")
4. ("posttraumatic stress disorder") and ("students") and ("recovery")
5. ("trauma") and ("children") and ("education")

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6. (“post-traumatic stress disorder and children“) and (“trauma and children“) and (“therapy and school“)
7. (“post-traumatic stress disorder and children“) and (“trauma and children“) and (“therapy and school“)
8. (“post-traumatic stress disorder“) and (“children“) and (“treatment“)

The data base search yielded 28 articles that met my search criteria (Adami, Konig, Vetter, Hausmann & Conca, 2006, Alat, 2002, Brown, McQuaid, Farina, Ali & Winnick-Gelles, 2006, Conley, K., 2013, Copping, Warling, Benner & Woodside, 2002, Dawson, D. M., 2009, De Young, Kenardy, Cobbham & Kimble, 2011, Dyregrove & Regel, 2012, Foran, 2009, Grasso, Boonsiri, Lipschitz, Guyer, Houshyar, Douglas-Palumberi, Massey & Kaufman, 2009, Kenemore, Lynch, Mann, Steinhaus & Thompson, 2010, Kuban & Steele, 2011, Little, Akin-Little, Gutierrez, 2009, Margolin, G., & Vickerman, K. A., 2007, Noble, Tottenham & Casey, 2005, Ogawa, 2004, Perrin, Smith & Yule, 2000, Pfefferbaum, Houston, North & Regens, 2008, Putman, 2009, Ronan, 2002, Shepherd & Freado, 2012, Smilan, 2012, Strati, 2010, Szente, Hoot & Taylor, 2006, Uguak, 2010, Vickerman & Margolin, 2007, Webber, 2009).

### *2.2.2 Ancestral searches*

An ancestral search involves reviewing the reference lists of previously published works to locate literature relevant to one’s topic of interest (Welch, Brownell, & Sheridan, 1999). I conducted ancestral searches using the reference lists found in the previously retrieved articles and the three books titled The Boy Who Was Raised as a Dog, (Perry & Szalavitz, 2008), Scared Sick (Karr-Morse & Wiley, 2012) and Ghosts from the Nursery (Karr-Morse & Wiley, 1997)

these searches yielded 16 additional articles that met my selection criteria (Abram, K.M., Teplin, L.A., Charles, D.R., Longworth, S.L., McClelland, G.M., Dulcan, M.K., (2004); Abram, K.M., Washburn, J.J., Teplin, L.A., Emanuel, K.M., Romero, E.G., McClelland, G.M. (2007); Bremner, J. D.,1999, Carrion, V. G., Haas, B. W., Garrett, A., Song, S., & Reiss, A. L.,2010, Carrion, V. G., Haas, B. W., Garrett, A., Song, S., & Reiss, A. L., 2002, De Bellis, M. D., Baum, A. S., Birmaher, B., Keshavan, M. S., Eccard, C. H., Boring, A. M., et al., 1999, De Bellis, M. D., Keshavan, M. S., Clark, D. B., Casey, B. J., Giedd, J. N., Boring, A. M., et al., 1999, Karl, A., Schaefer, M., Malta, L. S., Dörfel, D., Rohleder, N., & Werner, A., 2006, MacMillan, H. L., Georgiades, K., Duku, E. K., Shea, A., Steiner, M., Niec, A., et al., 2009, Perry, B. D., 2001, Perry, B. D., 2005, Teicher, M. H., Andersen, S. L., Polcari, A., Anderson, C. M., & Navalta, C. P., 2002, Teicher, M. H., Andersen, S. L., Polcari, A., Anderson, C. M., Navalta, C. P., & Kim, D. M., 2003, Teicher, M. H., Dumont, N. L., Ito, Y., Vaituzis, C., Giedd, J. N., & Andersen, S. L., 2004).

### *2.3 Coding procedures*

I categorized the forty-seven articles I found by code. This code form was based on; (a) publication type; (b) research design; (c) participants; (d) data sources; and (e) findings of the studies.

#### *2.3.1. Publication types*

Each journal article was evaluated and classified according to publication type (e.g., research study, theoretical work, descriptive work, opinion piece/position paper, guide, annotated bibliography, and review of the literature). Research studies use a formal research design to

gather and/or analyze quantitative and/or qualitative data. Theoretical works use existing literature to analyze, expand, or further define a specific philosophical and/or theoretical assumption. Descriptive works describe phenomena and experiences, but do not disclose particular methods for attaining data. Opinion pieces/position papers explain, justify, or recommend a particular course of action based on the author's opinions and/or beliefs. Guides give instructions or advice explaining how practitioners might implement a particular agenda. An annotated bibliography is a list of cited works on a particular topic, followed by a descriptive paragraph describing, evaluating, or critiquing the source. Reviews of the literature critically analyze the published literature on a topic through summary, classification, and comparison.

### *2.3.2. Research design*

Each empirical study was further classified by research design (i.e., quantitative, qualitative, qualitative phenomenological research, mixed methods research). Quantitative research utilizes numbers to convey information. Qualitative research uses language to explore issues and phenomenon. Mixed methods research involves the use of both quantitative and qualitative methods to present information within a single study. Qualitative phenomenological research approach describes an experience as it is actually lived by the person.

### *2.3.3. Participants, data sources, and findings*

I identified the participants in each study (e.g., children with Post Traumatic Stress Disorder, teachers of children Post Traumatic Stress Disorder, caregivers of children Post Traumatic Stress Disorder). I also identified the data sources used in each study (e.g., observations, surveys, questionnaires). Lastly, I summarized the findings of each study (Table 2).

#### *2.4. Data analysis*

I used a modified version of the Stevick-Colaizzi-Keen method previously employed by Duke (2011) and Duke and Ward (2009) to analyze the 47 articles included in this metasynthesis. Significant statements were first identified within each article. For the purpose of this metasynthesis, significant statements were identified as statements that addressed issues related to: (a) severity of PTSD symptoms may be affected by duration of trauma and occurrence during critical developmental.; (b) PTSD is often misdiagnosed (c) PTSD is often accompanied by comorbid psychiatric disorders; (d) exposure to acute stress in early childhood may result in altered biological and chemical brain structure; (e) there are gender differences in the way that acute trauma affects boys and girls; (f) acute stress in early childhood affects cognitive functioning and memory; and/or (g) children affected by PTSD symptoms may display maladaptive. I then generated a list of non-repetitive, verbatim significant statements with paraphrased formulated meanings. These paraphrased formulated meanings represented my interpretation of each significant statement. Lastly, the formulated meanings from all 47 articles were grouped into theme clusters, represented as emergent themes. These emergent themes represented the fundamental elements of the entire body of literature.

### **3. Results**

#### *3.1. Publication type*

I located 47 articles that met my selection criteria. The publication type of each article is located in table 1. Nineteen (40%) of the 47 articles included in this meta-synthesis were research studies (Abram, K.M., Teplin, L.A., Charles, D.R., Longworth, S.L., McClelland, G.M., Dulcan, M.K., (2004); Abram, K.M., Washburn, J.J., Teplin, L.A., Emanuel, K.M.,

Romero, E.G., McClelland, G.M. (2007); Brown, McQuaid, Farina, Ali & Winnick-Gelles, 2006; Carrion, V. G., Haas, B. W., Garrett, A., Song, S., & Reiss, A. L., 2010; Carrion, V. G., Haas, B. W., Garrett, A., Song, S., & Reiss, A. L., 2002; Copping, Warling, Benner & Woodside, 2002; De Bellis, M. D., Baum, A. S., Birmaher, B., Keshavan, M. S., Eccard, C. H., Boring, A. M., et al., 1999; De Bellis, M. D., Keshavan, M. S., Clark, D. B., Casey, B. J., Giedd, J. N., Boring, A. M., et al., 1999; De Young, Kenardy, Cobbham & Kimble, 2011; Grasso, Boonsiri, Lipschitz, Guyer, Houshyar, Douglas-Palumberi, Massey & Kaufman, 2009; Kenemore, Lynch, Mann, Steinhaus & Thompson, 2010; MacMillan, H. L., Georgiades, K., Duku, E. K., Shea, A., Steiner, M., Niec, A., et al., 2009; Perry, B. D., 2001; Perry, B. D., 2005; Perry & Szalavitz, 2006; Teicher, M. H., Andersen, S. L., Polcari, A., Anderson, C. M., Navalta, C. P., & Kim, D. M., 2003; Teicher, M. H., Dumont, N. L., Ito, Y., Vaituzis, C., Giedd, J. N., & Andersen, S. L., 2004; Uguak, 2010). Six (13%) of the 47 articles included in this meta-synthesis were guides (Little, Akin-Little, Gutierrez, 2009; Margolin, G., & Vickerman, K. A., 2007; Pfefferbaum, Houston, North & Regens, 2008; Ronan, 2002; Smilan, 2012; Webber, 2009). Four (9%) of the 42 articles included in this meta-synthesis were literature reviews (Karl, A., Schaefer, M., Malta, L. S., Dörfel, D., Rohleder, N., & Werner, A., 2006; Ogawa, 2004; Perrin, Smith & Yule, 2000; Teicher, M. H., Andersen, S. L., Polcari, A., Anderson, C. M., & Navalta, C. P., 2002). Six (13%) of the 47 articles included in this meta-synthesis were descriptive works (Adami, Konig, Vetter, Hausmann & Conca, 2006; Bremner, J. D., 1999; Foran, 2009; Karr-Morse, R., & Wiley, M. S., 1997; Karr-Morse, R., & Wiley, M. S., 2012; Kuban & Steele, 2011). Three (6%) of the 47 articles included in this meta-synthesis were narrative guide (Dawson, D. M., 2009; Putman, 2009; Shepherd & Freado, 2012). Six (13%) of the 47 articles included in this meta-synthesis

were descriptive work/guide (Alat, 2002; Conley, K., 2013; Dyregrove & Regel, 2012; Strati, 2010; Szente, Hoot & Taylor, 2006; Vickerman & Margolin, 2007). One (2%) of the 47 articles included in this meta-synthesis were review of research (Noble, Tottenham & Casey, 2005).

**Table 1**

<b>Author(s) &amp; Year of Publication</b>	<b>Publication Type</b>
Abram, K.M., Teplin, L.A., Charles, D.R., Longworth, S.L., McClelland, G.M., Dulcan, M.K., 2004	Research Study
Abram, K.M., Washburn, J.J., Teplin, L.A., Emanuel, K.M., Romero, E.G., & McClelland, G.M. 2007	Research Study
Adami, Konig, Vetter, Hausmann & Conca, 2006	Descriptive Work
Alat, 2002	Descriptive Work\Guide
Bremner, J. D., 1999	Descriptive Work
Brown, McQuaid, Farina, Ali & Winnick-Gelles, 2006	Research Study
Carrion, V. G., Haas, B. W., Garrett, A., Song, S., & Reiss, A. L., 2010	Research Study

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Carrion, V. G., Haas, B. W., Garrett, A., Song, S., & Reiss, A. L., 2002	Research Study
Conley, K., 2013	Descriptive Work\Guide
Copping, Warling, Benner & Woodside, 2002	Research Study
Dawson, D. M., 2009	Narrative
De Bellis, Keshavan, Clark, Casey, Giedd, Boring, et al, 1999	Research Study
De Bellis, Keshavan, Clark, Casey, Giedd, Boring, et al, 1999	Research Study
De Young, Kenardy, Cobbham & Kimble, 2011	Research Study
Dyregrove & Regel, 2012	Descriptive Work\Guide
Foran, 2009	Descriptive Work
Grasso, Boonsiri, Lipschitz, Guyer, Houshyar, Douglas-Palumberi, Massey & Kaufman, 2009	Research Study
Karl, A., Schaefer, M., Malta, L. S., Dörfel, D., Rohleder, N., & Werner, A., 2006	Literature Review
Karr-Morse, R., & Wiley, M. S., 1997	Descriptive Work
Karr-Morse, R., & Wiley, M. S., 2012	Descriptive Work
Kenemore, Lynch, Mann, Steinhaus & Thompson, 2010	Research Study
Kuban & Steele, 2011	Descriptive Work
Little, Akin-Little, Gutierrez, 2009	Guide
MacMillan, H. L., Georgiades, K., Duku, E. K., Shea, A., Steiner, M., Niec, A., et al., 2009	Research Study
Margolin, G., & Vickerman, K. A., 2007	Guide

Noble, Tottenham & Casey, 2005	Review of Research
Ogawa, 2004	Review of Literature
Perrin, Smith & Yule, 2000	Review of Literature
Perry, B. D., 2001	Research Study
Perry, B. D., 2005	Research Study
Perry & Szalavitz, 2006	Research Study
Pfefferbaum, Houston, North & Regens, 2008	Guide
Putman, 2009	Narrative / Guide
Ronan, 2002	Guide
Shepherd & Freado, 2012	Narrative\Guide
Smilan, 2012	Guide
Strati, 2010	Descriptive Work\Guide
Szente, Hoot & Taylor, 2006	Descriptive Work\Guide
Teicher, M. H., Andersen, S. L., Polcari, A., Anderson, C. M., & Navalta, C. P., 2002	Literature Review
Teicher, M. H., Andersen, S. L., Polcari, A., Anderson, C. M., Navalta, C. P., & Kim, D. M., 2003	Research Study
Teicher, M. H., Dumont, N. L., Ito, Y., Vaituzis, C., Giedd, J. N., & Andersen, S. L., 2004	Research Study
Uguak, 2010	Research Study
Vickerman & Margolin, 2007	Descriptive Work\Guide
Webber, 2009	Guide

*3.2. Research design, participants, data sources, and findings of the studies*

As previously stated, I located 19 research studies that met my selection criteria studies (Abram, K.M., Teplin, L.A., Charles, D.R., Longworth, S.L., McClelland, G.M., Dulcan, M.K., (2004); Brown, McQuaid, Farina, Ali & Winnick-Gelles, 2006; Carrion, V. G., Haas, B. W., Garrett, A., Song, S., & Reiss, A. L.,2010; Carrion, V. G., Haas, B. W., Garrett, A., Song, S., & Reiss, A. L., 2002; Copping, Warling, Benner & Woodside, 2002; De Bellis, M. D., Baum, A. S., Birmaher, B., Keshavan, M. S., Eccard, C. H., Boring, A. M., et al., 1999; De Bellis, M. D., Keshavan, M. S., Clark, D. B., Casey, B. J., Giedd, J. N., Boring, A. M., et al., 1999; De Young, Kenardy, Cobbham & Kimble, 2011; Grasso, Boonsiri, Lipschitz, Guyer, Houshyar, Douglas-Palumberi, Massey & Kaufman, 2009; Kenemore, Lynch, Mann, Steinhaus & Thompson, 2010; MacMillan, H. L., Georgiades, K., Duku, E. K., Shea, A., Steiner, M., Niec, A., et al., 2009; Perry, B. D., 2001; Perry, B. D., 2005; Perry & Szalavitz, 2006; Teicher, M. H., Andersen, S. L., Polcari, A., Anderson, C. M., Navalta, C. P., & Kim, D. M., 2003; Teicher, M. H., Dumont, N. L., Ito, Y., Vaituzis, C., Giedd, J. N., & Andersen, S. L., 2004; Uguak, 2010). The research design, participants, data sources, and findings of each of the studies identified Table 2.

**Table 2**

<b>Authors</b>	<b>Research Design</b>	<b>Participants</b>	<b>Data Sources</b>	<b>Findings</b>
Abram, Teplin, Charles, Longworth, McClelland, Dulcan, 2004	Quantitative	898 randomly chosen juvenile detainees. Participants included 532 boys and 366 girls ages 10 to 18 years old	Interviews, standardized questionnaires	Study focused on the prevalence of posttraumatic stress disorder in juvenile detainees. 90% of sample had been exposed to at least one traumatic event, 56% of sample had been exposed to six or more

				<p>traumatic events. Study revealed prevalence for PTSD was 10% of boys and 14% of girls. Findings are consistent with research connecting exposure to acute trauma with psychosocial problems. Researchers found children exposed to chronic violence are at high risk for developing PTSD and continued research is warranted.</p>
<p>Abram, Washburn, Teplin, Emanuel, Romero, McClelland, 2007</p>	<p>Quantitative</p>	<p>898 randomly chosen juvenile detainees. Participants included 532 boys and 366 girls ages 10 to 18 years old</p>	<p>Interviews, standardized questionnaires</p>	<p>Study focused on PTSD and comorbidity in juvenile detainees. Study concluded that there was a high rate of PTSD and comorbid disorders among participants. Boys were more likely to comorbid disorders than females. PTSD was often misdiagnosed because standardized screening did not include PTSD.</p>

<p>Brown, McQuaid, Farina, Ali, Winnick-Gelles, 2006</p>	<p>Quantitative</p>	<p>63 students, ages 13 years old who were recruited from inner city mental health programs. Students had been exposed to the 911 Trade Center attacks.</p>	<p>Pre and post questionnaires completed by participants and caregivers</p>	<p>Participants attended 10 cognitive behavioral therapy (CBT) sessions at school in a group setting, following 10 sessions, individual who still displayed PTSD symptoms were invited to attend 6 individual CBT sessions. Participants reported a significant reduction in symptoms. Positive feedback indicates a need for further investigation into school based intervention programs.</p>
<p>Carrion, Haas, Garrett, Song, Reiss, 2002</p>	<p>Quantitative</p>	<p>Participants ranged in age from 7-14 years old. 30 boys and 21 girls who had demonstrated PTSD symptoms were compared to a control group of 31 similar healthy children.</p>	<p>Questionnaires Salivary cortisol samples</p>	<p>Boys with PTSD symptoms had lower levels of cortisol than girls with PTSD symptoms  Children with history of neglect and or abuse were observed to have higher levels of cortisol</p>

<p>Copping, Warling, Benner, Woodside, 2002</p>	<p>Quantitative</p>	<p>27 families which included 13 girls and 14 boys ages 3 to 17 years old. Participants had experienced one or more traumatic events.</p>	<p>Pre and post questionnaire, observations</p>	<p>Caregivers and children attended a 21 week Integrated Trauma Treatment Model (ITTM) program. Pilot study indicates significant decreases in PTSD symptoms in children and increase in social functioning. Caregiver reported a significant reduction in depression and feelings of hopelessness. Cognitive behavioral intervention for trauma in combination with parent training show positive results and warrants further discussion.</p>
<p>De Bellis, Baum, Birmaher, Keshavan, Eccard, Boring, et al, 1999</p>	<p>Quantitative</p>	<p>Pre-pubescent children ranging in age from 8 to 13 years old; 18 diagnosed with PTSD; 10 diagnosed with overanxious disorder; 24 healthy control group</p>	<p>Psychiatric and clinical assessment 24 hour urine collection</p>	<p>PTSD subjects excreted greater concentrations urinary catecholamine (stress hormones) and urinary free cortisol (UFC). Study concluded prepubescent PTSD participants differed PTSD adults in that children showed higher cortisol secretion while adults showed more concentration. Data suggest that abused children manifest long-term if not</p>

				<p>permanent adaptations to the stress response (catecholamine) systems, sympathetic nervous system (SNS) and hypothalamic-pituitary-adrenal axis (HPA) thus negatively affecting developing the brain structures. The catecholamine system is responsible for regulating the developmental process.</p>
<p>De Bellis, Keshavan, Clark, Casey, Giedd, Boring, et al, 1999</p>	<p>Quantitative</p>	<p>44 abused children diagnosed with PTSD and 61 matched controls. Children were approximately 12 years old</p>	<p>Subjects were evaluated psychiatric and psychological assessment questionnaires and by anatomical magnetic resonance imaging (MRI) brain scans</p>	<p>PTSD subjects had smaller intracranial cerebral volumes than matched controls. Mid-and posterior regions of the corpus callosum remained smaller; right left and pool lateral ventricles proportionately larger than controls. Evidence indicates male children may show more evidence of adverse brain development than female children. The predicted decrease in</p>

				<p>hippocampal volume seen in adults with PTSD was not seen in the subjects.                  Conclusion: data suggest that acute stress experienced during childhood abuse is associated with adverse brain development.</p>
De Young, Kenardy, Cobbham, Kimble, 2011	Quantitative	130 children between the ages of one and six years old who were accidentally burned.	Family members were contacted at one and six months after accident to complete diagnostic questionnaire	<p>Young burn victims are at risk for developing PTSD and comorbid emotional and behavioral difficulties. It is recommended that early intervention resources are available in pediatric burn units to minimize psychological damage following entry. Further research is needed to identify factors that may predict how a young child will</p>

				react following in medical trauma
Grasso, Boonsiri, Lipschitz, Guyer, Houshyar, Douglas-Palumberi, Massey & Kaufman, 2009	Quantitative	116 abuse children removed from their homes within the prior months and 83 control children with no history of abuse; children ranged in age from 6 to 14 years old	Participants and guardian completed baseline interview at place of residence; one month later participants attended one week summer camp where they were observed and interviewed. PTSD symptomology	When completing interviews and questionnaires parents and children failed to report approximately 50% of physical and sexual abuse documented by protective services. 55% of the abused children met the criteria for PTSD, diagnosis missed without child protective service records. The chances for meeting PTSD criteria increase

			<p>was assessed at six month follow-up visit. Review child protective services records.</p>	<p>exponentially with the number of abuse events. Trauma histories are required in assessing the need to further survey children who exhibit PTSD symptoms</p>
<p>Kenemore, Lynch, Mann, Steinhaus, Thompson, 2010</p>	<p>Qualitative</p>	<p>31 school personnel, including administrators, teachers, counselors, social workers, and psychologist.</p>	<p>Interviews</p>	<p>Teamwork emerged as the theme of the how to appropriately and effectively responds to children exposed to violence. Given the prevalence of violence in today's schools, school personnel education in the areas of the effects of exposure to violence, screening and assessment, family support, interventions that decrease the effects of long-term exposure</p>

				to violence specifically designed for schools are crucial. The school personnel have the opportunity to identify and assist students who display PTSD symptoms.
MacMillan, H. L., Georgiades, K., Duku, E. K., Shea, A., Steiner, Niec, et al, 2009	Quantitative	67 girls ages 12 to 16 with no history of depression but who had been subjected to maltreatment and a control group consisting of 25 girls of similar age	Questionnaires, Trier Social Stress Test, saliva samples, heart rate monitor	Maltreated test subjects showed a blunted cortisol response to stress test. Findings support HPA axis dysregulation amongst youth who have experienced acute stress.
Perry, B. D., 2001	Qualitative phenomenological	Dr. Perry's work with high-risk children, adolescents, and adults has been instrumental in describing how negative childhood experiences change the biology of the brain and body	For over 30 years Dr. Perry has conducted clinical research on the biology of the brain and the body. His work examines how chemicals, drugs, neglect, exposure to acute stress, impact the development, the brain and	Exposure to violence activates the threat response system in a child's developing brain (even prenatally). Excess activation of the neural systems in the threat response system can alter the developing brain (hippocampus, amygdala, and hypothalamic-pituitary-adrenal axis (HPA)); creating alterations in emotional, behavioral

			cognitive functioning	and cognitive functioning.
Perry, B. D., 2005	Qualitative phenomenological	Dr. Perry's work with high-risk children, adolescents, and adults has been instrumental in describing how negative childhood experiences change the biology of the brain and body	For over 30 years Dr. Perry has conducted clinical research on the biology of the brain and the body. His work examines how chemicals, drugs, neglect, exposure to acute stress, impact the development, the brain and cognitive functioning	When hyperarousal repeatedly occurs in the first months of life while a young child's brain is still malleable the brain organizes around the overactive system to allow for survival.  Children suffering from acute stress will have trouble sleeping, anxiety, impulsivity, over-sensitivity, hyper-arousal, high blood pressure, rapid heart rate, irregular heart rate
Perry & Szalavitz, 2006	Qualitative phenomenological	Dr. Perry's work with high-risk children, adolescents, and adults has been instrumental in describing how negative childhood experiences change the biology of the brain and body	For over 30 years Dr. Perry has conducted clinical research on the biology of the brain and the body. His work examines how chemicals, drugs, neglect, exposure to acute stress, impact the development, the brain and	MRI scans from children who suffered significant neglect early in life have overall smaller brains.  90 % of the brain is developed in the first 48 months. It is in these first four years the brain is the most malleable.  Brain development is state dependent.  PTSD children suffer from underdeveloped

			cognitive functioning	and poor functioning elements of the brain. Their brains do not react and process information the way a healthy child's brain does.
Simeon, D., Knutelska, M., Yehuda, R., Putnam, F., Schmeidler, J., & Smith, L. M., 2007	Quantitative	46 subjects with dissociative disorder, 35 subjects PTSD, and 58 healthy subjects; participants between the ages of 18 and 16 years old	Questionnaires, interviews, stress test blood test and urine analysis	Results indicate participants in the PTSD group showed a blunted stress reactivity and a lower base urinary cortisol level
Teicher, M. H., Dumont, N. L., Ito, Y., Vaituzis, C., Giedd, J. N., & Andersen, S. L., 2004	Quantitative	26 maltreated boys and 25 maltreated girls compared to 115 healthy control subjects. Children approximately 12 years old	Medical records, including medical history and MRIs, were blindly reviewed by two independent raters	Medical records indicate that the corpus callosum (CC) of the abused or neglected patients with 17% smaller than the control subjects. Neglect was the strongest factor associated reduction in size of the corpus callosum (CC) boys; while in contrast sexual abuse seem to the strongest factor associated with the

				reduction of CC size and girls
Uguak, 2010	Quantitative	235 children ages 8-14 years who were exposed to war.	Interviews	Trauma in child victims can result low self-esteem, the inability to focus, aggressiveness and poor academic performance. Therapeutic remedies that were found to help trauma victims include but are not limited to talk, play, music, storytelling, art and movement.

*3.2.1. Research design*

Three (16%) of the 19 studies use a qualitative phenomenological research design (Perry, B. D., 2001; Perry, B. D., 2005; Perry & Szalavitz, 2006). Thirteen (68%) of the 19 studies used quantitative research design (Abram, K.M., Teplin, L.A., Charles, D.R., Longworth, S.L., McClelland, G.M., Dulcan, M.K., (2004); Brown, McQuaid, Farina, Ali & Winnick-Gelles, 2006; Carrion, V. G., Haas, B. W., Garrett, A., Song, S., & Reiss, A. L., 2010; Carrion, V. G., Haas, B. W., Garrett, A., Song, S., & Reiss, A. L., 2002; Copping, Warling, Benner & Woodside, 2002; De Bellis, M. D., Baum, A. S., Birmaher, B., Keshavan, M. S., Eccard, C. H., Boring, A.

M., et al., 1999; De Bellis, M. D., Keshavan, M. S., Clark, D. B., Casey, B. J., Giedd, J. N., Boring, A. M., et al., 1999; De Young, Kenardy, Cobbham & Kimble, 2011; Grasso, Boonsiri, Lipschitz, Guyer, Houshyar, Douglas-Palumberi, Massey & Kaufman, 2009; Kenemore, Lynch, Mann, Steinhaus & Thompson, 2010; MacMillan, H. L., Georgiades, K., Duku, E. K., Shea, A., Steiner, M., Niec, A., et al., 2009; Teicher, M. H., Andersen, S. L., Polcari, A., Anderson, C. M., Navalta, C. P., & Kim, D. M., 2003; Teicher, M. H., Dumont, N. L., Ito, Y., Vaituzis, C., Giedd, J. N., & Andersen, S. L., 2004; Uguak, 2010).

### *3.2.2. Participants and data sources*

All of the 19 research studies included in this meta-synthesis analyzed data from children who have been exposed to acute trauma and young age and who exhibit PTSD symptoms. Three (16%) of the studies examined findings from Dr. Bruce Perry who is an expert in the field of children and posttraumatic stress disorder design (Perry, B. D., 2001; Perry, B. D., 2005; Perry & Szalavitz, 2006). All of the 16 (84%) research studies utilized medical records, Child protective services records, interviews and standardized questionnaires for interviewing caregivers and children who had been exposed to one or more acute traumatic episodes. Of the 19 research studies, one (5%) used saliva (Carrion, V. G., Haas, B. W., Garrett, A., Song, S., & Reiss, A. L., 2002) to determine cortisol levels; one (5%) used blood, urine and stress tests in determining cortisol levels (Simeon, D., Knutelska, M., Yehuda, R., Putnam, F., Schmeidler, J., & Smith, L. M., 2007); one (5%) used saliva, stress test and heart rate in determining cortisol levels (MacMillan, H. L., Georgiades, K., Duku, E. K., Shea, A., Steiner, M., Niec, A., et al., 2009); one (5%) used 24 hour urine collection in determining stress hormone levels (De Bellis, M. D., Baum, A. S., Birmaher, B., Keshavan, M. S., Eccard, C. H., Boring, A. M., et al., 1999); three

(16%) utilized MRI scans in analyzing brain structure (Carrion, V. G., Haas, B. W., Garrett, A., Song, S., & Reiss, A. L., 2010; De Bellis, M. D., Keshavan, M. S., Clark, D. B., Casey, B. J., Giedd, J. N., Boring, A. M., et al., 1999; Teicher, M. H., Dumont, N. L., Ito, Y., Vaituzis, C., Giedd, J. N., & Andersen, S. L., 2004).

### *3.2.3. Findings of the studies*

The findings of the 19 research studies included in this meta-synthesis can be summarized as follows.

1. PTSD is often misdiagnosed due to common symptomology with other psychiatric disorders. PTSD is often misdiagnosed because it is accompanied by other comorbid psychiatric disorders. PTSD often goes undiagnosed due to incomplete trauma history provided by caregivers.
2. Holistic response to trauma is most effective when utilizing a holistic treatment plan for the family and child. Trauma may be experienced by child, but does not just impact the child, everyone around the child is affected. An increase in research and information is needed to educate the public, parents and educators about the detrimental effects of maltreatment on children's developing brain.
3. Research studies have shown alterations in the biological stress systems of the brain may be a consequence of exposure to chronic stress during the developmental period. Dysregulation in the HPA axis has a detrimental effect brain structure growth. Excess activation of the neural systems in the threat response system can alter the developing

brain; creating alterations in emotional, behavioral and cognitive functioning. Exposure to traumatic events creates two distinct response states; hyperarousal and dissociative.

4. Boys and girls respond differently to chronic stress. Boys are more affected by neglect while girls are more affected by sexual abuse. The corpus callosum was smaller in neglected boys, while the corpus callosum was smaller in sexually abused girls. The cortisol level in boys with PTSD are lower than girls with PTSD.
5. Children and adults respond differently to chronic stress. Chronic stress severely impacts children whose malleable brain is still developing. Adults can rely upon prior knowledge to help them cope with chronic stress while children have no prior knowledge to reference.
6. Children who have been exposed to chronic violence or maltreatment may display symptoms of hypervigilance or dissociative and commonly transients between the two.

### *3.3. Emergent themes*

Six themes emerged from analysis of the 47 articles included in this meta-synthesis.

These emergent themes theme clusters include: (a) PTSD is often misdiagnosed and is accompanied by comorbid psychiatric disorders; (b) there is a need for appropriate response to victims of acute trauma.; (c) exposure to acute stress during development may alter biological and chemical brain structures; (d) there are gender differences in how boys and girls are react to maltreatment; (e) the age of exposure to maltreatment and duration of trauma may impact severity of PTSD symptoms; (f) children who have been exposed to chronic violence and or

maltreatment display similar PTSD systems. These six theme clusters and their formulated meanings are represented in Table 3.

**Table 3**

<b>Theme Clusters</b>	<b>Formulated Meanings</b>
<p>Misdiagnosis and Comorbidity</p>	<ul style="list-style-type: none"> <li>● Burn studies have shown that comorbidity with PTSD is common</li> <li>● PTSD, major depressive disorder (MAD) attention deficit hyperactivity disorder (ADHD) oppositional defiant disorder (ODD) separation anxiety disorder (SAD) all have symptoms in common</li> <li>● PTSD often goes undiagnosed due to lack of trauma history</li> <li>● Accuracy is increased when case workers, mental health workers, school personnel and caregivers collaborate in disclosing and assessing trauma histories to determine appropriate diagnostic survey.</li> <li>● Out of the 18 participants diagnosed with PTSD; 14 were diagnosed with morbid psychiatric disorders which included major depressive disorder, dysthymic disorder, oppositional defiant disorder, and attention deficit hyperactivity disorder.</li> <li>● A substantial percentage of participants had comorbid mood disorders.</li> <li>● In school age children hypervigilance is perceived as ADHD or ODD, because student lacks focus and is impulsive.</li> <li>● 93% of juvenile detainees interviewed had at least one comorbid psychiatric disorder.</li> <li>● It is not uncommon for PTSD to be misdiagnosed</li> <li>● PTSD is often accompanied by comorbid psychiatric disorders</li> </ul>
<p><b>Need for appropriate response to victims of acute trauma.</b></p>	<ul style="list-style-type: none"> <li>● Team approach-students, and school personnel, families and counselors</li> <li>● Increase teacher education about the effects of violence exposure, screening and assessment, and family support</li> <li>● Use evidence-based interventions to reduce the effects of exposure to trauma</li> <li>● Make all school personnel aware of triggers for negative behavior</li> <li>● School based trauma programs offer a way to reach a large number of children in a setting that is familiar and comfortable.</li> <li>● Holistic response to trauma is most effective when utilizing holistic treatment for the family and child. Trauma experienced by child does not just impact the child, but everyone around the child.</li> <li>● The neuralsequential approach to helping children who suffer from PTSD assess the poorly functioning structures of the brain and provides repeated positive stimulation to encourage healthy growth</li> <li>● Stress response systems must be taken into account when helping PTSD children. Optimal conditions require the child to be in a calm state and feel safe in order for high cognitive function to take place</li> </ul>
	<ul style="list-style-type: none"> <li>● Acute trauma may results in a reduction of hippocampus activity severely impacting memory.</li> </ul>

<p><b>Developmental impact on brain structure</b></p>	<ul style="list-style-type: none"> <li>● Maladaptive thinking occurs when learned response to traumatic events becomes conditioned response to traumatic cues.</li> <li>● Individuals suffering from PTSD have difficulty placing traumatic information in historical context, this may be related to the functional abnormalities in their hippocampus during retrieval of information.</li> <li>● Dysregulation of the biological stress systems may occur as a result of childhood exposure to acute stress. PTSD in abuse children is associated with an increase in physical and psychological deterioration.</li> <li>● Enduring exposure to stressful events may be linked to reduced physical response to stressors over time.</li> <li>● The ability to respond to acute stress is important for health, blunted cortisol response supports findings for dysregulation in HPA axis may assist in understanding physical and mental problems experienced by youth who have experienced trauma.</li> <li>● A reduction in size of the corpus callosum has been connected to a decrease in the amount of information transferred between the right and left hemispheres of the brain.</li> <li>● Children who are exposed chronic hyper-arousal can be identified by high levels of noradrenaline and resting rapid heart beat</li> <li>● Exposure to acute stress during development may alter biological and chemical brain structure</li> </ul>
<p><b>Acute stress effects boys and girls differently</b></p>	<ul style="list-style-type: none"> <li>● During the developmental stages of life, under the age of three, it has been shown that boys were more severely impacted by neglect while girls are more severely impacted by sexual abuse.</li> <li>● A reduced corpus callosum size in girls who had been sexually abused was observed</li> <li>● boys who have been neglected were observed to have smaller corpus callosum</li> <li>● Maltreated girls are more likely to suffer major depression</li> <li>● Girls are more likely to ruminate about negative thoughts</li> <li>● A greater percentage of boys were observed having comorbid mental disorders with PTSD.</li> <li>● The cortisol level in boys with PTSD was lower than girls with PTSD</li> </ul>
<p><b>Age of exposure to trauma and</b></p>	<ul style="list-style-type: none"> <li>● Research is discovering that there is difference between adult and childhood exposure to trauma. It has been found adult exposure to have less long term detrimental effect than childhood trauma. This could be</li> </ul>

<p><b>duration may impact severity of PTSD symptoms</b></p>	<p>due to the interaction between the developmental period and exposure to trauma.</p> <ul style="list-style-type: none"> <li>● The difference between child and adult PTSD may be explained by the long-term adaptations of the HPA axis after trauma experience</li> <li>● Exposure to chronic trauma while the brain is malleable cause the brain system to become maladapted for survival. A child may become hypervigilant or dissociative depending on the age and circumstances</li> <li>● The first thirty-three months are a critical development period</li> <li>● The brain develops in sequence from the bottom to the top, beginning with the brain stem and the most basic functioning. In order for the brain to develop positively it requires timed repetitive patterns.</li> <li>● During the first four years of life a child’s brain grows to 90% of its adult size.</li> <li>● Onset and duration of neglect or abuse can be directly correlated to the severity of malfunctioning.</li> </ul>
<p><b>Symptomology of children who have been exposed to chronic violence and or maltreatment</b></p>	<ul style="list-style-type: none"> <li>● Hypervigilance, hypersensitive to surrounding living in a state of alarm</li> <li>● Aggressive to any perceived threat</li> <li>● Have difficulty in perceiving the future or consequences</li> <li>● Dissociative state, unable to focus</li> <li>● Have maladapted thinking</li> <li>● Nightmares, flashbacks</li> <li>● Anxiety</li> <li>● Depression</li> <li>● Have difficulties with cognitive abilities and memory recall</li> <li>● Longitudinal studies indicate a relationship between developing PTSD and exposure to chronic community violence, one in 10 juvenile detainees were diagnosed with PTSD.</li> </ul>

*4. Discussion*

In this section, I summarize emergent themes from my analysis of the 47 articles included in this meta-synthesis. These emergent themes were then connected to my own practices general education teacher.

*4.1. PTSD is often misdiagnosed and is accompanied by comorbid psychiatric disorders*

PTSD is often misdiagnosed for multiple reasons. Physicians are often unaware of trauma history. Without a complete trauma history doctors could easily misdiagnose post-traumatic stress disorder for attention deficit/hyperactivity disorder, both disorders have similar it is symptoms, but very different treatment. PTSD cannot be treated with medication. It is critical for professionals who work with children and in schools to be educated on trauma, what to look for, and how to intervene. Too often, children are not evaluated for PTSD. In addition to common symptomology, it is very prevalent for children who have been diagnosed with PTSD to be accompanied by comorbid psychiatric disorders, such as depression, oppositional defiance disorder, substance abuse and dysthymic disorder. It has been observed by researchers psychiatric disorders multiply in cases where children are chronically exposed to maltreatment and trauma.

Sometimes I feel more like a social worker than a teacher. In the past, I have had classes where one quarter of the population was from a dysfunctional home environment. It is critical for educators to be aware of a child's life outside of school. Educators don't teach in a vacuum. A child's behavior and cognitive abilities are a reflection of his or hers environment and genetic makeup (Perry, 2001; Perry, 2005). This is a good reason for getting to know the child's history and their family. It is also important to know the symptomology of the common mental illnesses that affect children. As noted above PTSD and many common symptom with disorders such as ADHD. When I first began teaching, I had a very challenging student who had been diagnosed

with ADHD. I now know after completing my research on PTSD and discussing the matter with my professor that this child is more than likely afflicted with posttraumatic stress disorder.

#### *4.2 There is a need for appropriate response to victims of acute trauma*

Response to trauma is most effective when treating the family and child as a whole. Trauma experienced by child does not just impact the child, but everyone around the child. Research studies have concluded children exposed to acute trauma are less likely to develop PTSD when they have a supportive family. Early intervention to stop and reverse the effects of maltreatment are key. A correlation has been found between the severity of PTSD symptoms and duration of the maltreatment. In case of accidents and natural disasters it has been found that a wait-and-see approach may not be best practice. According to Dyregrov (2011) how trauma is responded to can severely impact the development PTSD. Following an event impressions are formed and undergo several processes to become part of our long-term memory. Memory consists of acquisition, consolidation, storage, and retrieval. Holmes, James, Coode-Bate, and Deepröse (2009) suggest there is a six-hour window when memories are malleable. In a review of research conducted by Holmes, James, Coode-Bate, and Deepröse (2009), Dyregrov and Regel (2012) found positive images and tasks can be introduced during the first six hours to displace memory of negative experience before it becomes part of long-term memory. They also reported on findings by Field (2006) and Seligman (1996) of the importance during crisis intervention to reduce arousal; therefore it is advised to refrain from formal question for the first 72 hours to 14 days after the event; focusing on facts and allow a child and parent to stay together. Children who are the least affected by natural disasters, burns, and accidents received physical and emotional support from their families. In order to minimize psychological impact of

traumatic events it is recommended to implement effective team management and be aware that young traumatized children are at high risk for adverse outcomes and need to be screened for a range of emotional and behavioral difficulties (Dyregrov & Regel, 2012).

Many of the evidence-based interventions to reduce the effects of exposure to trauma are conducted individually in a licensed counselor's office, but there are things that teachers and school staff can do to help. Teachers and school staff can help children recover by providing a sense of continuity and safety in their classrooms and school. Teachers and school staff have the unique opportunity to recognize and support children exhibiting PTSD symptoms. Children must feel safe in order for higher cognitive functioning to take place. The poorly functioning structures of the brain must be provided with repeated positive stimulation to encourage healthy brain development. Uguak (2010) found therapeutic remedies to help trauma victims of war to include talk, play, music, storytelling, art and movement (2010). Teachers and families must work together to recognize and communicate triggers for negative behavior. Each child suffering from PTSD is unique and their behaviors. Children with PTSD have difficulty regulating and expressing their feelings. School staff need to be made aware that children suffering from PTSD do not always process information in the same way as unaffected. They also commonly have limited working memory. Smells, facial expressions and voice tone are just a few of the possible triggers. Children suffering from PTSD do not generally do well with change or transitions. When dysregulation occurs, a child becomes anxious, distressed, resulting in increased aggression or does dissociation. A school wide system of support must be put in place to plan for a safe place for children and distress.

*4.3 Exposure to acute stress during development may alter biological and chemical brain structures*

In order to better understand how acute trauma affects the brain I will give you a brief overview of how a child's brain develops. The brain develops sequentially from the bottom to the top. Beginning with the brain stem which includes the most primitive structures in charge of survival functions like heart rate, temperature, and blood pressure. Above the brain stem is located the midbrain. The midbrain controls appetite, sleep, and arousal. Next comes the limbic area; the home of memories and emotions. Last is the cortex, the outside layer of the brain which is divided into two halves called the right and left hemisphere. The right and left hemisphere is connected by corpus callosum; which allows for communication between the two hemispheres. The frontal cortex is divided into four distinct areas; frontal, parietal, temporal, and occipital. It is in these four areas that higher functioning processes occur; abstract and concrete thought, language, motor functions, and impulse control.

Researchers now know that proper development of each area requires repeated, timed, patterned experiences. The hippocampus, amygdala, and hypothalamic-pituitary-adrenal axis (HPA) controls reactions to stress. Researchers have discovered a connection between chronic acute trauma and alterations in brain development. The developing brain is extremely sensitive to stress. When the stress response system is activated cortisol is released. Minor to moderate

exposure to stress can develop resilience. Chronic exposure to stress over-activates the stress response system in a child's developing brain resulting in an imbalance in stress hormones (Carrion, Haas, Garrett, Song, Reiss, 2002; De Bellis, et al., 1999; MacMillan, et al., 2009; Perry, 2001; Perry, 2005; Perry, Szalavitz, 2006; Simeon, Knutelska, Yehuda, Putnam, Schmeidler, Smith, 2007). Exposure to traumatic events creates two distinct response states; hyperarousal and dissociative, commonly referred to as the fight, flight, or freeze response (Karr-Morse and Wiley, 2012). Most individuals affected by PTSD shift between the two states during development. According to Karr-Morse and Wiley, excessive over activation of the neurochemical response to threat in the central nervous system, particularly during the developing years of life can result in chronic state of dissociation or hyperarousal (1997, p.168). When a child feels stressed, adrenal and pituitary glands release chemicals the adrenaline, cortisol, and dopamine. Excess activation of the stress response system can alter the HPA axis; creating alterations in emotional, behavioral and cognitive functioning (Carrion, Haas, Garrett, Song, Reiss, 2002). Continued research is needed to confirm finding that elevated noradrenaline levels, resting rapid heartbeat and blunted cortisol response are key indicators in diagnosing PTSD.

Advancements in medical research tools like the Magnetic resonance imaging machine (MRI) now allow researchers to scans and analyzing brain structures. Preliminary results indicate the corpus callosum and hippocampus are smaller in size (Carrion, Haas, Garrett., Song, Reiss., 2010; De Bellis, et al., 1999; Teicher, Dumont, Ito, Vaituzis Giedd, Andersen, 2004). Reduction of hippocampus activity severely impacts memory. The corpus callosum allows for communication between the left and right hemispheres. Acute stress experiences in childhood are associated with alterations biological stress systems. PTSD in abuse children is associated

with an increase in physical and psychological deterioration. Continued research with a larger population is needed to confirm findings.

Alteration in the chemical and biological structure due to exposure to acute stress may result in developmental delays in cognitive functioning, memory, and social skills. In the classroom it is important to remember to respond and instruct students with PTSD at their developmental level, not their chronological age. Dr. Perry's (2006) work has shown that underdeveloped brain structures that function poorly can be rehabilitated through positive repetitive patterns. Diagrams of the HPA axis and stress can be found in Appendix B.

#### *4.4 Gender differences have been observed in how boys and girls are affected by maltreatment*

The difference between boys and girls in the research studies were small but notable. During the developmental stages of life, under the age of three, it has been shown that boys were more severely impacted by neglect while girls are more severely impacted by sexual abuse. Cortisol testing conducted by Carrion, Haas, Garrett, Song and Reiss found the cortisol level in boys with PTSD was lower than girls with PTSD (2007). A reduced corpus callosum size in girls who had been sexually abused was observed, while boys who had been neglected were observed to have smaller corpus callosum (De Bellis, et al., 1999; Teicher, Dumont, Ito, Vaituzis, Giedd, Andersen, 2004). Girls are more likely to ruminate about negative thoughts which may lead to major depression. Girls were more likely to talk about their experiences. Boys reported more exposure to community violence and were observed exhibiting more hyperarousal symptoms (Perry, 2005). A study by Abram, Washburn, Teplin, Emanuel, Romero and McClelland indicated boys were at a higher risk for developing comorbid mental disorders with PTSD

(2007).

All students are individuals with their own unique learning styles. Teachers who take in account gender differences into account when planning lessons and activities ensure that all their students have equal opportunities. Knowing what students have or have not been exposed to can help classroom teachers respond appropriately to their behavior. Knowing how trauma effects boys and girls differently can help educators understand and proactively respond to symptoms of PTSD such as aggression in boys or depression in girls.

#### *4.5 Reaction to acute trauma is effected by duration and developmental period*

Researchers agree that conception to forty-eight months contain critical development periods. It is during this period the brain is the most malleable. The brain develops in sequence from the bottom to the top, beginning with the brain stem and the most basic functions. In order for the brain to develop positively it requires timed repetitive patterns. Children need to be exposed to positive emotions, touch, smells, sounds and sights to develop healthy brain structures for language, cognition and emotional connections. It is during this time a child's brain grows to 90% of its adult size. Karr-Morse and Wiley (1995) express that "there is a general agreement in the scientific community that even before birth the brain is shaped by stimulation from the environment. After birth, development is an interactive process between the baby's physiology and his or her environment" (p. 24). Exposure to chronic trauma while the brain is malleable may cause the brain system to become maladapted for survival (Karr-Morse, Wiley, 1997; Karr-Morse, Wiley, 2012; Perry, 2001; Perry, 2005; Perry, Szalavitz, 2006).

Maladaptive thinking occurs when learned response to traumatic events becomes

conditioned response to traumatic cues. The child may develop become hypervigilant or dissociative depending on the age, trauma and duration of exposure. Onset and duration of neglect or abuse can be directly correlated to the severity of malfunctioning (De Bellis, 1999; Teicher, Dumont, Ito, Vaituzis, Giedd, Andersen, 2004).

Trauma in childhood may be more detrimental than trauma experienced in adulthood due to the interaction between traumas to the developmental process. The difference between child and adult PTSD may be explained by the long-term adaptations of the HPA axis after trauma experience (De Bellis, 1999; MacMillan, et al., 2009; Perry, 2001). Another explanation for the difference between adult and child response to trauma is a healthy adult exposed to acute trauma has prior know to refer to in a stressful situation. A child has no prior knowledge as a reference point. Their brain develops according to the environment they are exposed to and the nurturing they receive.

#### *4.6 Symptomology of children who have been exposed to chronic violence and or maltreatment*

Researchers agree the follow are indicators of the possible presence of post-traumatic stress syndrome. Children may be live in a state of alarm; being hypervigilance and or hypersensitive to their surroundings. Hypervigilant anxious babies are unable to be soothed or comforted. Child may be observed tuning the world out in a dissociative state. They lack the ability to focus and concentrate due to anxiety, depression, or flashbacks. Children with PTSD have difficulty perceiving the future or consequences. They may react aggressively to any perceived threat or impulsively unable to wait or delay gratification. Longitudinal studies indicate a relationship between developing PTSD and exposure to chronic community violence, one in 10 juvenile detainees were diagnosed with PTSD. They may have difficulties with

cognitive abilities and memory recall making learning difficult.

In retrospect, I wish I had learned the symptoms of PTSD before I began teaching. I personally know that there are incidents where I could have responded more effectively to students' inappropriate and disruptive behaviors. Students with PTSD don't think the same as unaffected students, nor do they react to their environment in the same way. They may have developed maladaptive thinking which skews their world views and reactions. Simple things like direct eye contact, tone of voice, smells, or touches can be triggers for students. Students need a calm environment to learn in. If their brains are busy in survival mode they will be unable to practice and develop higher order thinking skill, emotions and behaviors. I believe it was best said by Dr. Perry when he articulated the learning process as state dependent. The brain structure and processing has been altered in destructive ways by trauma and neglect, but may be repaired with adequate repetition of developmentally appropriate experiences (2005, 2006).

Rehabilitation requires patience and teamwork.

### *5. Conclusion*

I began this meta-synthesis project with the goals of investigating and providing an overview of information about PTSD to educational staff. Answering the questions of how does trauma affect a child's developing brain? What are the symptoms of PTSD in children ages 6 years and younger? Are there strategies school staff can use to assist young children ages 6 years and younger who demonstrate PTSD symptoms? I believe I have answered all of those questions and discovered a need for information about PTSD to support classroom teachers. I had a difficult time finding information on how teachers can assist students with PTSD in the classroom. In addition, I learned that children at risk for developing PTSD come from low social

economic status; are exposed to multiple experiences of violence or witness violence; are maltreated, physical and or sexually abused; are neglected and lack nurturing human interactions.

Humans are a reflection of the environment they develop in. In order for a child to grow and thrive developmentally they must be exposed to a rich, safe, and supportive emotional environment on a routine basis. When a child develops in a chaotic, unpredictable environment that is emotionally barren, that child may have developed learning disabilities, have difficulty with social cues and self-control. This child may require the service of special educational, mental health services and/or become part of the juvenile criminal justice system. The ultimate goal for educators is to assist each child in reaching his or her potential as a functional member of human society. There is a need for an increase in research and education on the effects of neglect, exposure to acute trauma, screening tools, assessment tools and interventions, and appropriate responses to victims of violence and families.

I would like to conclude with a few additional findings about the impact of childhood trauma. The Adverse Childhood Experience (ACE) Study looked at the correlation between the number of adverse childhood experiences and risk factors associated with death and poor health. According to Dr. Felitti, co-author ACE, as the number of adverse experiences increases so did the risk for developing health problems. Two-thirds of participants reported experiencing one or more traumatic event in childhood. Findings indicate a link between adverse experiences and an increase in risk for addictive behavior and drug use, heart disease, anger, depression, anxiety, and eating disorders (Karr-Morse, Wiley, 2012 p. 8-15). The overwhelming cost of childhood trauma can be seen throughout our society (Karr-Morse, Wiley, 2012; Abram, et al, 2004). Research concludes chronic stress negatively affects the immune system. Resources need to be dedicated

to further research, intervention, and promote the elimination of preventable trauma in childhood.

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Appendix A

*Diagnostic and Statistical Manual of Mental Disorders (DSM-5)* (Psychiatric Association, 2013)

criteria for diagnosing PTSD in children under the age of six is as follows:

A. Children under the age 6 have been exposed to an event involving real or threatened death, serious injury, or sexual violence in at least one of the following ways:

1. The child directly experience the event.
2. The child witnessed the event (this does not include events that were seen on the television, in movies, or some other form of media).
3. The child learned about a traumatic event that happened to a caregiver.

B. The presence of at least one of the following intrusive symptoms that are associated with the traumatic event and began after the event occurred:

1. Recurring, spontaneous, and intrusive upsetting memories of the traumatic event.
2. Recurring and upsetting dreams about the event.
3. Flashbacks or some other dissociative response where the child feels or acts as if the event were happening again.
4. Strong and long-lasting emotional distress after being reminded of the event or after encountering trauma-related cues.
5. Strong physical reactions (e.g., increased heart rate, sweating) to trauma-related reminders.

C. The child exhibits at least one of the following avoidance symptoms or changes in his or her thoughts and mood. These symptoms must begin or worsen after the experience of the traumatic event.

1. Avoidance of or the attempted avoidance of activities, places, or reminders that bring up thoughts about the traumatic event.
2. Avoidance of or the attempted avoidance of people, conversations, or interpersonal situations that serve as reminders of the traumatic event.
3. More frequent negative emotional states, such as fear, shame, or sadness.
4. Increased lack of interest in activities that used to be meaningful or pleasurable.
5. Social withdrawal.
6. Long-standing reduction in the expression of positive emotions.

D. The child experiences at least one of the below changes in his or her arousal or reactivity, and these changes began or worsened after the traumatic event:

1. Increased irritable behavior or angry outbursts. This may include extreme temper tantrums.
2. Hypervigilance
3. Exaggerated startle response.
4. Difficulties concentrating
5. Problems with sleeping

Criterion E: alterations in arousal and reactivity

Trauma-related alterations in arousal and reactivity that began or worsened after the traumatic event: (2 required)

1. Irritable or aggressive behavior.
2. Self-destructive or reckless behavior.
3. Hypervigilance.
4. Exaggerated startle response.
5. Problems in concentration.
6. Sleep disturbance.

Criterion F: duration

Persistence of symptoms (in Criteria B, C, D and E) for more than one month.

Criterion G: functional significance

Significant symptom-related distress or functional impairment (e.g., social, occupational).

Criterion H: exclusion

Disturbance is not due to medication, substance use, or other illness.

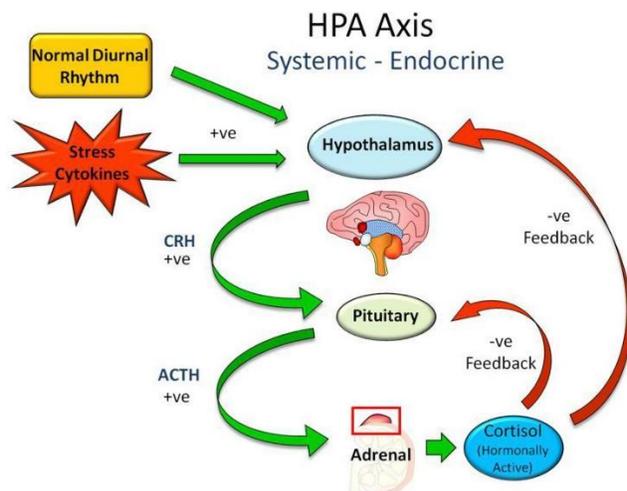
Specify if: With dissociative symptoms.

In addition to meeting criteria for diagnosis, an individual experiences high levels of either of the following in reaction to trauma-related stimuli:

1. Depersonalization: experience of being an outside observer of or detached from oneself (e.g., feeling as if "this is not happening to me" or one were in a dream).
2. Derealization: experience of unreality, distance, or distortion (e.g., "things are not real").

Appendix B

Figure 1. Hardy, R., Raza, K., & Cooper, M. (2012). Circulating cortisol levels are regulated by the HPA axis. Retrieved April 8, 2014 from <http://www.smw.ch/content/smw-2012-13650/>



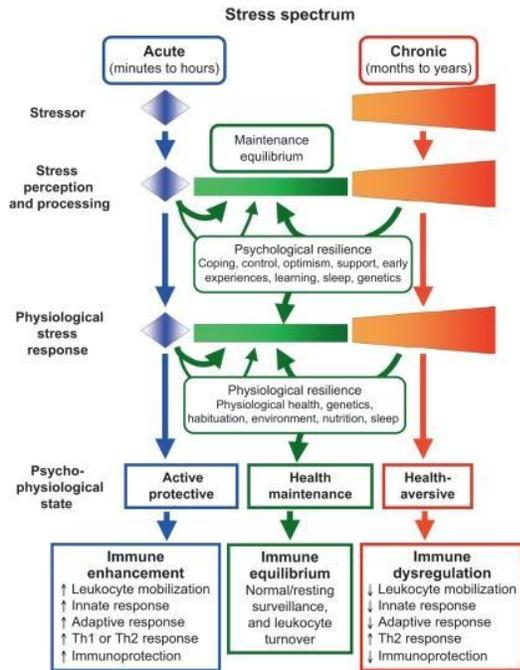


Figure 2. Dhabhar, F. (2009). The relationship between stress immune system. Retrieved April 8, 2014 from <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2790771/?tool=pmcentrez>