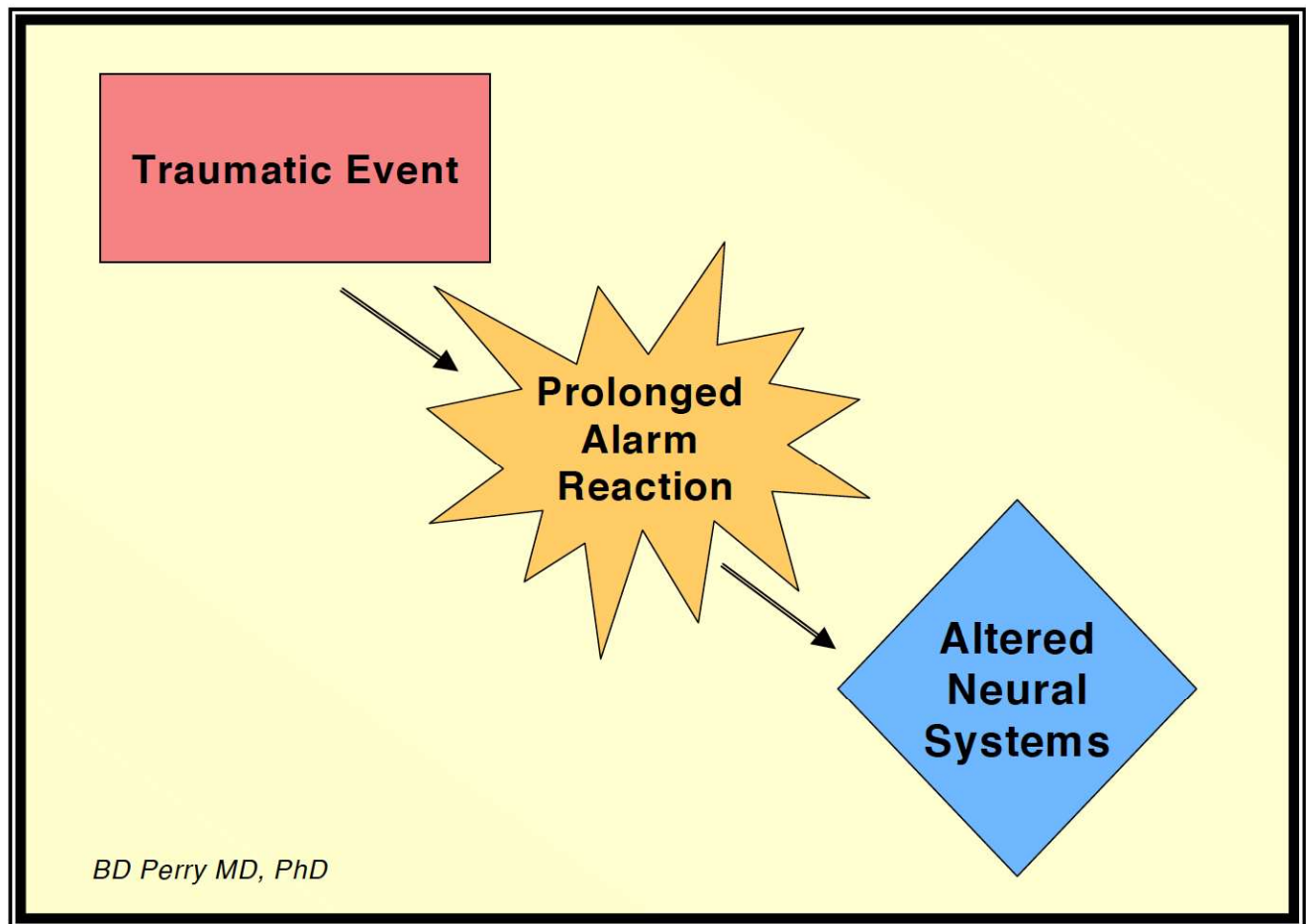


EFFECTS OF TRAUMATIC EVENTS ON CHILDREN: AN INTRODUCTION

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This booklet is one in a series developed by the ChildTrauma Academy to assist parents, caregivers, teachers and various professionals working with maltreated and traumatized children.

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Introduction

Each year in the United States approximately five million children experience some form of traumatic experience. More than two million of these are victims of physical and /or sexual abuse. Millions more are living in the terrorizing atmosphere of domestic violence. Natural disasters, car accidents, life-threatening medical conditions, painful procedures, exposure to community violence - all can have traumatic impact on

the child. By the time a child reaches the age of eighteen, the probability that any child will have been touched directly by interpersonal or community violence is approximately one in four. Traumatic experiences can have a devastating impact on the child, altering their physical, emotional, cognitive and social development. In turn, the impact on the child has profound implications for their family, community and, ultimately, us all.

Traumatic events in childhood increase risk for a host of social (e.g., teenage pregnancy, adolescent drug abuse, school failure, victimization, anti-social behavior), neuropsychiatric (e.g., post-traumatic stress disorder, dissociative disorders, conduct disorders) and other medical problems (e.g., heart disease, asthma). The deterioration of public education, urban violence and the alarming social disintegration seen in some of our urban and rural communities can be traced back to the escalating cycles of abuse and neglect of our children.

This introductory booklet is written for an interdisciplinary audience. Caregivers, childcare providers, teachers, law enforcement, child protection workers, social workers, judges, nurses, pediatricians and mental health service providers all are will work with traumatized or maltreated children. The more we can understand these children and the impact of traumatic experiences, the more compassionate and wise we can be in our interactions and in our problem solving. To date, few of the systems designed to care for, protect, educate, evaluate or heal our children have solved the multiple problems posed by the maltreated or traumatized children. A first step in solving these problems is learning about the roots of trauma-related problems: the *adaptive responses to threat* present during the traumatic experiences.

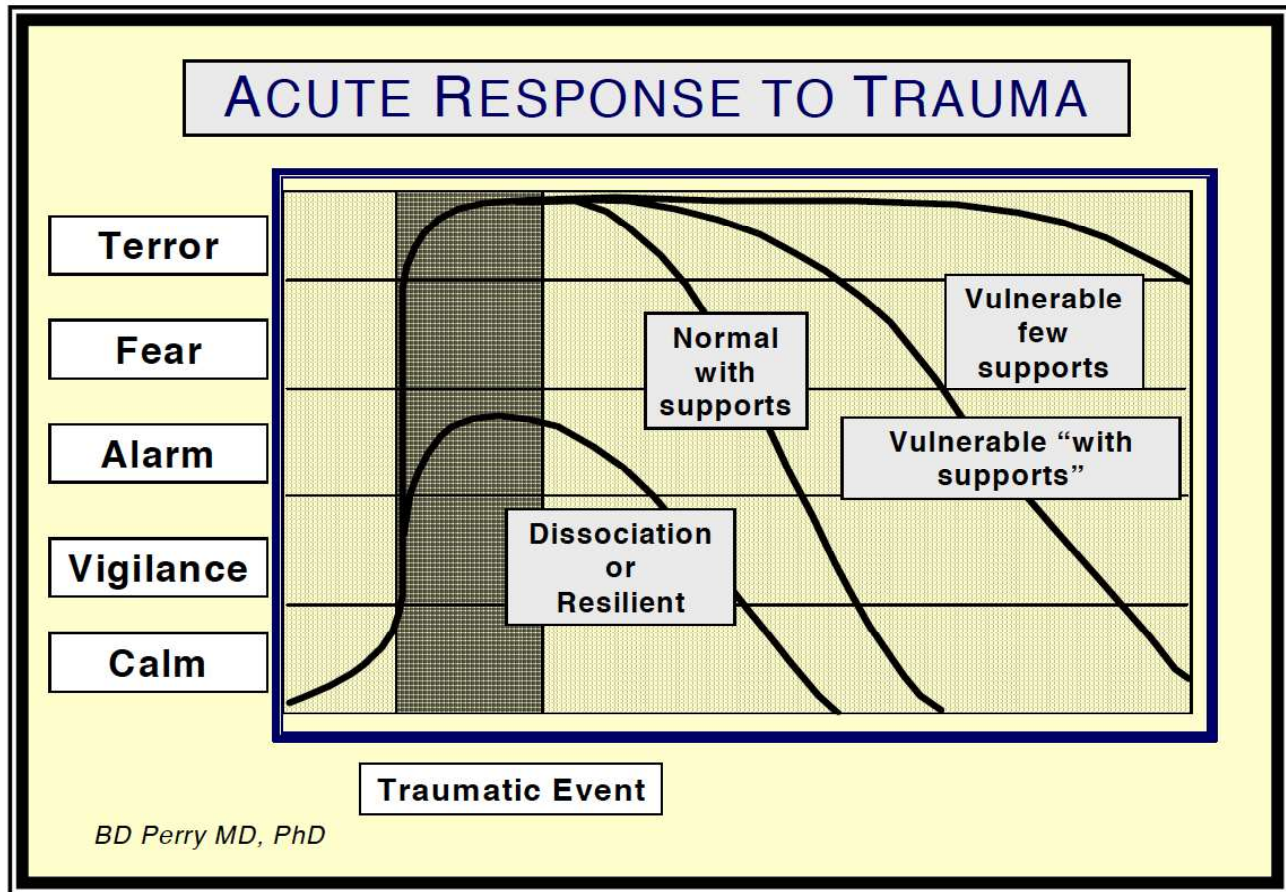
Response to Trauma

Heterogeneity of response patterns:

- Adaptive changes in *cognition*
- Adaptive changes in *affects*
- Adaptive changes in *behavior*
- Adaptive changes in *neurophysiology*
- Adaptive changes in *physiology*

The Alarm State

The human body and human mind have a set of very important and very predictable responses to threat. Threat may come from an internal (e.g., pain) or external (e.g., an assailant) source. One common reaction to danger or threat has been labeled the ‘fight or flight’ reaction. In the initial stages of this reaction there is a response called the alarm reaction.



The Acute Response to Trauma: Each traumatic event has a beginning and an end. As the traumatic event begins, the individual will move along the arousal continuum. Their internal state will shift from calm to vigilance, alarm, fear and then terror. The descriptive labels – calm, vigilance, alarm, fear, terror – merely designate various points along this continuum and are common descriptive terms for the emotional state corresponding to various stages of the response to threat.

As the individual begins to feel threatened, the initial stages of a complex, total-body response will begin. The brain orchestrates, directs and controls this response. If the individual feels more threatened, their brain and body will be shifted further along an arousal continuum in an attempt to ensure appropriate mental and physical responses to the challenges of the threat. The cognitive, emotional and behavioral functioning of the individual will reflect this shift along the arousal continuum. During the traumatic event, all aspects of functioning of the individual change - feeling, thinking, behaving all change. Someone being assaulted doesn't spend a lot of time thinking about the future or making an abstract plan for survival. At that moment, their thinking, behaving and feeling is being directed by more 'primitive' parts of the brain (see Table in Appendix). A frightened child doesn't focus on the words; they attend to the threat related signals in their environment - the non-verbal signs of communication such as eye contact, facial expression, body posture or proximity to the threat. The internal state of the child shifts with the level of perceived threat. With increased threat a child moves along the arousal continuum from vigilance through to terror.

The alarm continuum is characterized by a graded increase in sympathetic nervous system activity, in turn, causing increased heart rate, blood pressure, and respiration, a release of glucose stored in muscle and increased muscle tone. Changes in the central nervous system cause hypervigilance; the child tunes out all non-critical information. These actions prepare the child to fight with, or run away from, the potential threat. This total body mobilization, the “fight or flight” response, has been well characterized and described in great detail for adults. These responses are highly adaptive and involve many coordinated and integrated neurophysiological responses across multiple brain areas such as the locus coeruleus, the amygdala, the hypothalamus and the brainstem nuclei responsible for autonomic nervous system regulation.

HETEROGENEITY OF RESPONSE TO THREAT: DISSOCIATION

Differential Response to Threat	
Dissociation	Hyperarousal
<ul style="list-style-type: none"> • Detached • Numb • Compliant • Decrease HR • Suspension of time • De-realization • ‘Mini-psychoses’ • Fainting 	<ul style="list-style-type: none"> • Hypervigilance • Anxious • Reactive • Alarm response • Increase HR • Freeze: Fear • Flight: Panic • Fight: Terror

The most well characterized response to threat is the fight or flight response. However, it is increasingly clear that individual responses to threat can vary tremendously. Another of the major adaptations to threat involves a different set of physiological and mental changes. Sometimes, when fighting or fleeing is not possible, the child will use avoidant and psychological fleeing mechanisms that are dissociative. Dissociation is basically a mental mechanism by which one withdraws attention from the outside world and focuses on the inner world. Dissociation may involve a distorted sense of time, a detached feeling that are “observing” something happen to you as if it is unreal, the sense that you may be watching a movie of your life. In extreme cases, children may withdraw into an elaborate fantasy world where they may assume special powers or strengths. Like the alarm response, this “defeat” or dissociative response is graded. The intensity of the dissociation varies with the intensity and duration of the traumatic event. Even when we are not threatened, we use dissociative mental mechanisms all of the time. Daydreaming is an example of a dissociative event. The period between wakefulness and sleep is another example of dissociating from the present to your inner thoughts, ideas, fears, fantasies and, then, ultimately moving into the state of sleep. All children and most adults use some degree of dissociation during a traumatic event. Some individuals will use, and some kinds of trauma induced, dissociation as a primary adaptive response.

For most children and adults, however, the adaptive response to an acute trauma involves a mixture of hyperarousal and dissociation. During the actual trauma, a child will feel threatened and the arousal systems

will activate. With increased threat, the child moves along the arousal continuum. At some point along this continuum, the dissociative response is activated. This results in the host of protective mental (e.g., decreases in the perception of anxiety and pain) and physiological responses (decreased heart rate) that characterize the dissociative response (see *Differential Response to Trauma* Figure, above).

The Acute Post Traumatic Period

As the traumatic event ends, the mind and body slowly move back down the arousal or dissociative continuum. The child moves from the brink of terror, through fear, alarm and, with time and support, back to calm (see *The Acute Response to Trauma* figure above). Heart rate, blood pressure and other physiological adaptations normalize. If a child can move back down the arousal continuum, their brain will resume baseline (pre-trauma) styles of thinking, feeling and behaving. Hypervigilance decreases and the mental mechanisms related to attention begin to normalize as well. The child that has dissociated will begin to pay attention to external stimuli. While the child that has been completely focused on external cues related to threat will actually pay attention to internal stimuli (e.g., feelings, thoughts, sensing their pounding heart or noticing the cut on their leg from diving under a desk during the shooting).

This means, for example, that the child will now perceive the sense of fear and anxiety. This is when they will actually feel the fear associated with the trauma. The individual will begin to process and think about what happened, attempting to make sense out of what has just happened. Because the traumatic event is so far out of the normal range of experience, there will be a variety of mental attempts to process and “master” this event.

The event will play itself out in the mind of the child again and again. A host of intrusive images related to the trauma may swamp the child’s thinking. This set of re-living and re experiencing phenomenon may include telling the story over and over again to friends. The child may act this event out in their play and drawings (see below) or have intrusive dreams. In essence, these children have created memories of the traumatic memory. But these memories are complex and multi domain. Traumatic memory involves the storage and recall of traditional cognitive information (who, what, when, where), emotional information (fear, dread, sadness), motor-vestibular information (e.g., the body position during the rape) and state memory (vigilance, physiological hyperarousal).

The normal and predictable mental mechanisms that are used to process all experiences will, at times, fail in the attempts to master and understand a traumatic event. Because traumatic events have features that are so outside the range of normal experience, there are very few internal experiences with which to judge or make sense out of the event. *The more outside the range of the normal experience and the more life-threatening the experience, the more difficult it will be for the normal mental mechanisms to work efficiently to process and master that experience.* The inability to control elements of the traumatic event or the intrusive thoughts that follow leads to a set of predictable, mental and physiological responses.

DISSOCIATION

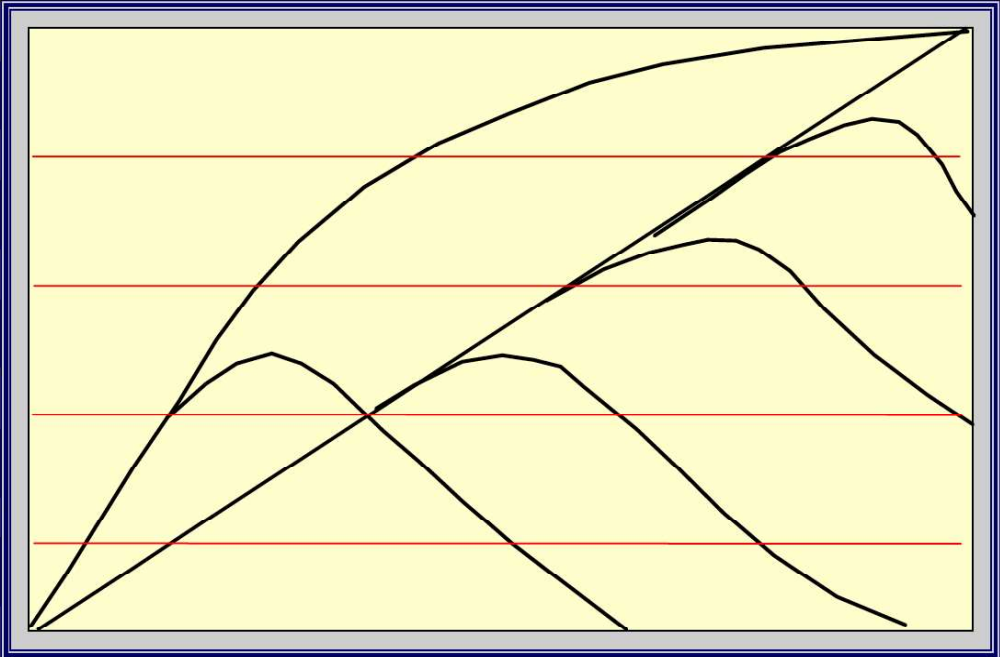
Terror

Fear

Alarm

Vigilance

Calm

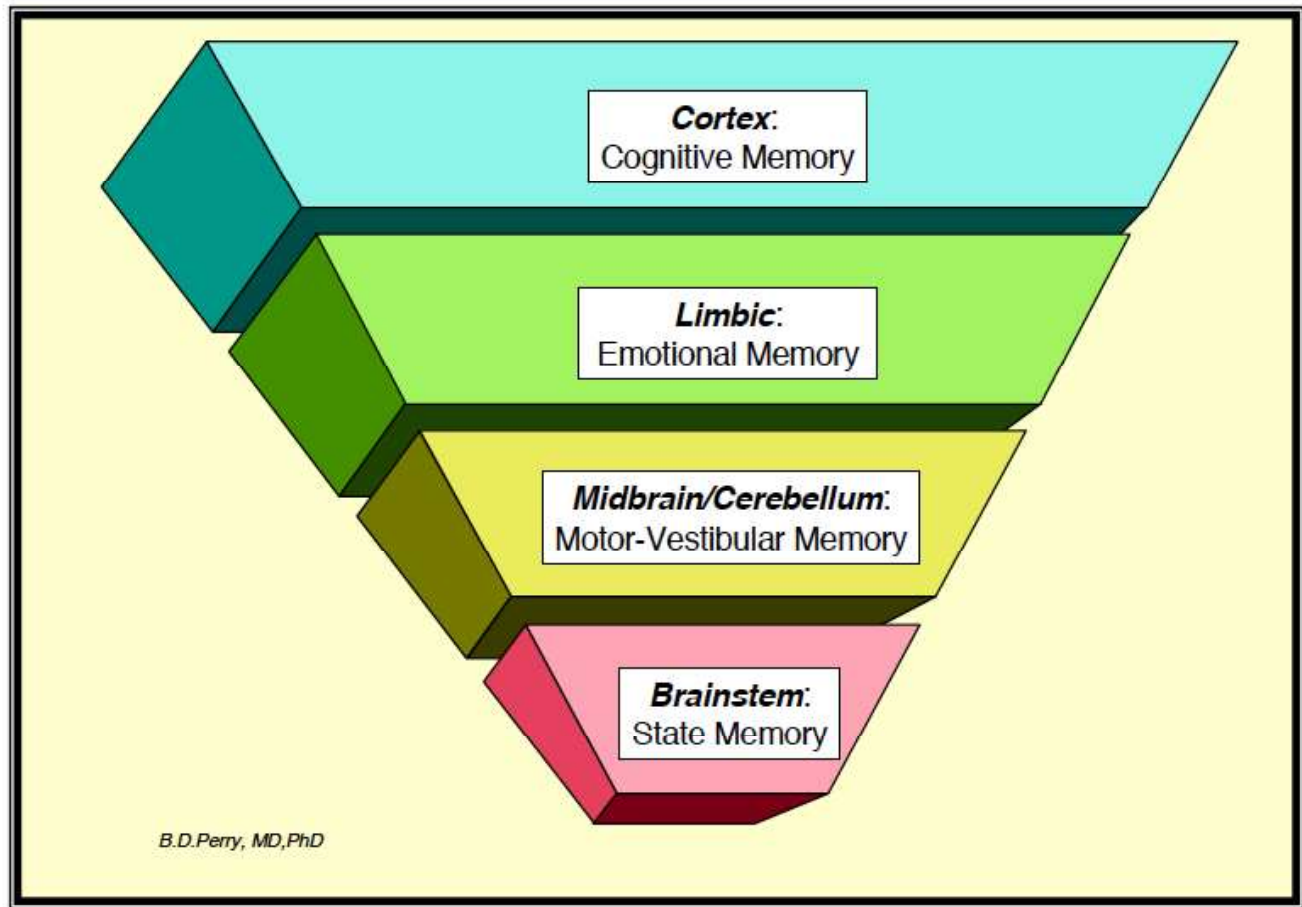


Stress

Trauma

BD Perry MD, PhD

EMOTIONAL MEMORY AND PHYSIOLOGICAL HYPERAROUSAL



Trauma and Memory: One of the key functions of nervous tissue is to store information. All areas of the brain store information related to the functions they mediate. The cortex stores cognitive information – names, faces, facts. The limbic system can store emotional information – fear, pleasure, sadness. Motor-vestibular memories such as typing, playing the piano or riding a bike are stored in other parts of the brain. In the brainstem, the anxiety or arousal states associated with a traumatic event can be stored. The symptoms of PTSD are stored throughout the brain in these various systems and areas. Re-exposure to cues associated with the trauma (e.g., sights, sounds, and smells) can elicit these stored “memories” and result in the signs and symptoms of PTSD.

Unfortunately, as this event plays itself out again and again in the mind of the child, not only will the thoughts of the event be recalled, the emotions and feelings (fear, anxiety, pain) of being out of control and threatened will be re-experienced as well. Each intrusive thought, nightmare and re-enactment in play also re-evokes the emotional or affective memory of being in the midst of the threatening event.

A classic set of predictable symptoms and physical changes seen in the acute post-traumatic period is related to the ability to re-evolve the emotional and physiological memories of being in the traumatic event. This means very simply that in addition to having cognitive remembrances of the facts and narrative details of their thoughts during the event, the child has the capacity for recollection and reliving of the physiological changes that were present in the alarm reaction. *In effect, the child has emotional and state*

memories from the traumatic event. This means that the children will be hypervigilant, and may have an increased startle response, increased muscle tone, a fast heart rate (tachycardia) and blood pressure. Indeed, even at rest in the weeks following a traumatic event, children and adolescents often exhibit signs of physiological hyperarousal - including tachycardia or a fast heart rate. Despite normal behaviors in most situations, children exposed to trauma are internally agitated. They have not truly been able to move back down the arousal continuum to the state of calm. This has profound implications for the child's long term functioning (see Post-traumatic Stress Disorders below).

Persisting physiological and emotional distress is physically exhausting and emotionally painful. Because of the pain, energy and discomfort associated with the recurrent intrusive thoughts and the physiological and emotional 'memories' associated with these thoughts, a variety of protective avoidance mechanisms are used to escape reminders of the original trauma. These include active *avoidance* of any reminders of the trauma and the mental mechanisms of numbing and dissociation.

State and affect memories elicited in a non-conscious state: *David is a 9 year-old boy. From age 2 through 6, he was sexually abused by his father. This abuse induced severe physical injuries. At age 6 he was removed from the family.*

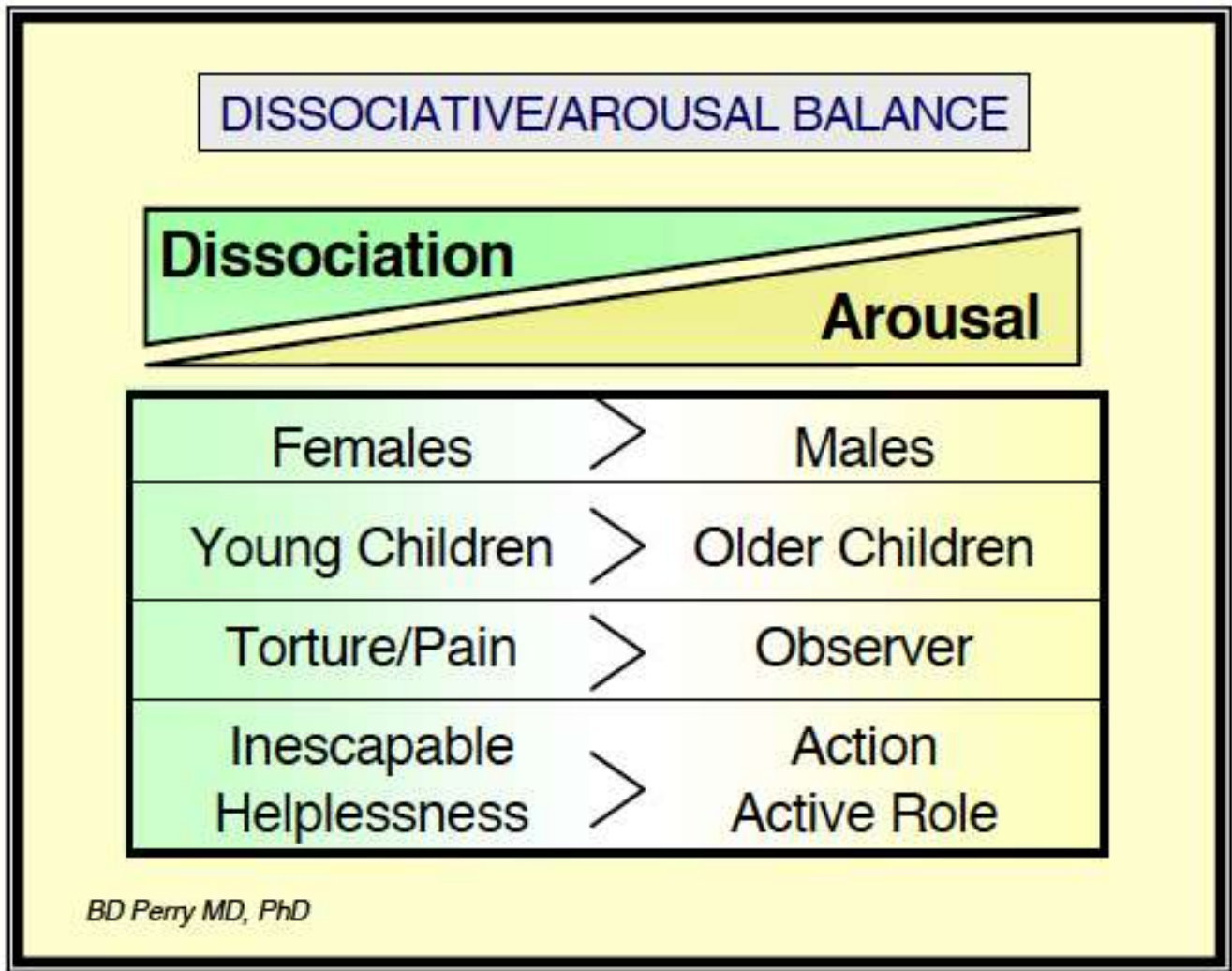
At age 8, he was seriously injured in a fall. He suffered from serious brain injury resulting in a coma state for 8 months following the injury. He continues to be difficult to arouse and is nonverbal. He exhibits no form of meaningful communication. In the presence of his biological father, he began to scream, moan, and his heart rate increased dramatically. Audiotapes of his biological father elicit a similar response. The scent of his father (one of the father's shirts) resulted in similar agitated behavior and physiological hyperarousal. These "memories" are stored in lower parts of the brain and do not require cognitive memory or consciousness to be expressed.

AVOIDANCE, EMOTIONAL NUMBING AND DISSOCIATION

Traumatized children, when faced with reminders of the original traumatic event, may experience so much pain and anxiety that they become overwhelmed. In these situations - when they cannot physically withdraw from those reminders — they may dissociate. Following a traumatic experience, children may act stunned or numb. Dissociating children often appear to be gazing off into nowhere. They will not readily respond to questions by adults. Their answers to questions will seem unclear, unfocused or evasive. This is understandable if we remember that while these children are present in body, their minds may be 'off in another place' — dissociated, trying to avoid the painful reminders of the original trauma.

Avoiding direct reminders of the trauma sometimes is extremely difficult. In that case, children will withdraw into themselves in a variety of ways. This inward focused withdrawal basically means that they will have fewer opportunities to be provoked into having more intrusive thoughts about the event, and therefore, they can thereby avoid pain.

In the first days and weeks following the traumatic event, the symptoms listed above, 1) re-experiencing phenomena, 2) attempts to avoid reminders of the original event and 3) physiological hyper-reactivity are all relatively predictable, and indeed, highly adaptive physiological and mental responses to a trauma. *Unfortunately, the more prolonged the trauma and the more pronounced the symptoms during the immediate post-traumatic period, the more likely there will be long term chronic and potentially permanent changes in the emotional, behavioral, cognitive and physiological functioning of the child. It is this abnormal persistence of the originally adaptive responses that result in trauma-related neuropsychiatric disorders such as Post-traumatic Stress Disorder (PTSD).*



The Adaptive Balance: The primary adaptive response to threat appears to vary according to several factors. Dissociation is more common in younger children, females and during traumatic events that are characterized by pain or an inability to escape. A hyperarousal response is more common in older children, males and when the trauma involves witnessing or playing an active role in the event. In most traumatic events, the individual will use a combination of these two primary adaptive response patterns.

POST-TRAUMATIC STRESS DISORDERS

Recurring intrusive recollection of the traumatic event

Persistent avoidance of stimuli associated with the trauma or numbing of general responsiveness

Persistent symptoms of increased arousal --physiological hyper-reactivity

Persisting 'fear' in a traumatized child: Rachel is a 10-year-old girl. She lives in a foster home after being removed from her family following the severe physical assault of a sibling by her stepfather. She was exposed to chronic violence in the home as her stepfather battered her mother and her older male sibling. She was referred to the ChildTrauma Clinic with presenting problems of sleep difficulties, increased startle response, difficulty concentrating (hypervigilance), academic failure and pervasive anxiety. Her resting heart rate was 120 beats per minute (bpm).

Following a multidisciplinary evaluation, she was diagnosed with post-traumatic stress disorder. Her symptoms were interpreted as being the persistence of the fear-related emotions and behaviors that were non native and adaptive during the violence but now were maladaptive. Treatment included: a) psychoeducation for the foster family and school regarding the impact of exposure to trauma on the emotional, behavioral and cognitive functioning of children, b) small group therapy with a focus on social skills and c) pharmacotherapy with clonidine, medication that specifically decreases the activity of fear-related neurobiological systems in the brain. Dramatic improvement in sleep, impulsivity, anxiety and concentration were noted following the clonidine. Temporary discontinuation of the medication resulted in partial return of symptoms.

Children and adults surviving traumatic events very frequently will have persistence of the acute post-traumatic stress response beyond six months. When this occurs, the child or adult is then considered to be suffering from post-traumatic stress disorder (PTSD). Post-traumatic stress disorder is a diagnostic label that has been traditionally associated with combat veterans. More recently however, it has been very well described in children who have been survivors of physical abuse, sexual abuse, exposure to community or domestic violence, natural disasters, motor vehicle accidents and a host of other traumatic events. The three major clusters of symptoms as described above are observed in a variety of forms of post-traumatic stress disorder.

In brief however, children who survive a traumatic event and have persistence of this low level fear state, may be behaviorally impulsive, hypervigilant, hyperactive, withdrawn or depressed, have sleep difficulties (including insomnia, restless sleep and nightmares) and anxiety. In general, these children may show some loss of previous functioning or a slow rate of acquiring new developmental tasks. Children may act in a regressed fashion. In addition, many of these children have persistent physiological hyper-reactivity with resulting fast heart rate or borderline high blood pressure.

Whether or not someone develops post- traumatic disorder following a traumatic event is related to a variety of factors. The more life-threatening the event, the more likely someone is to develop PTSD. The more the event disrupts their normal family or social experience the more likely someone is to develop PTSD. Having an intact, supportive and nurturing family appears to be a relative protective factor.

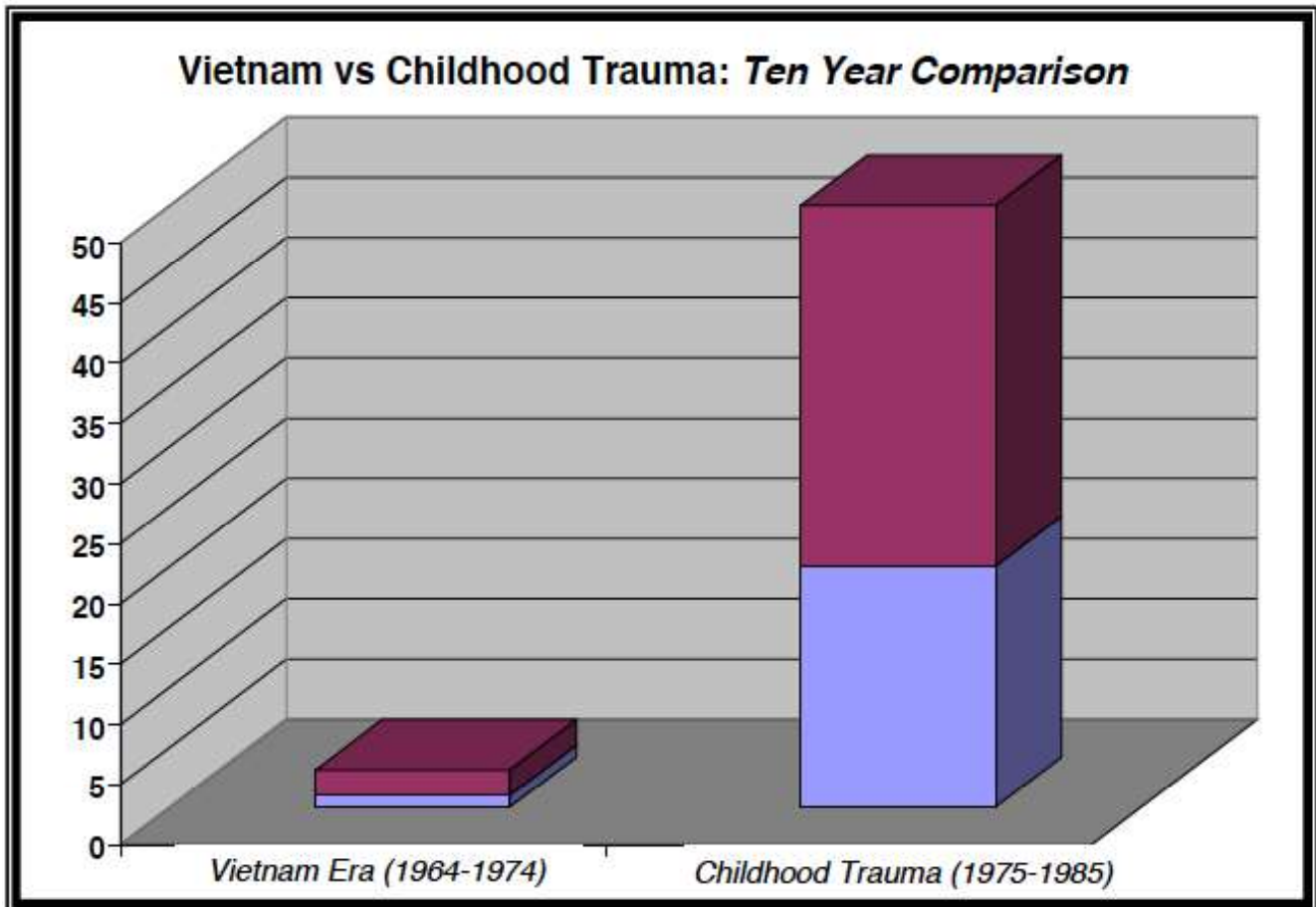
Unfortunately, a great majority of children who survive traumatic experiences also have a concomitant major disruption in their way of life, their sense of community, their family structure, and will be exposed to a variety of ongoing provocative reminders of the original event (e.g., ongoing legal actions, high press visibility). The frequency with which children develop post-traumatic stress disorders following comparable traumatic events is relatively high (45-60%).



The Firing Squad. Extract from of a drawing by a 12 year old Kosovar child witnessing the violence, chaos and destruction of war. Drawings by children exposed to traumatic events frequently include elements from the original trauma and are often re-enactment efforts. From the collection of Dr. Shoab (Psychiatry resident trainee at the ChildTrauma program in 1998) obtained during his work in Kosovar refugee camps in Albania in 1999.

Children who survive traumatic events and exhibit this diverse set of symptoms and physical signs are frequently also able to meet diagnostic criteria for attention-deficit hyperactivity disorder, anxiety disorder NOS, major depressive disorder, conduct disorder, and a variety of Axis I DSM IV diagnoses. Keeping in mind, however, that these children have been traumatized and that the symptoms of anxiety, depression and behavioral impulsivity are reflective of core changes related to the traumatic event helps one provide better diagnostic, prognostic and the therapeutic services for these children.

APPENDIX I: The Scope of Childhood Trauma



The Wars of Childhood: During the ten years of the Vietnam war, over 3 million young men and women served in Vietnam. Of these 3.14 million (left column above) young adults, over 1 million (blue in left column above) developed PTSD at some point over the next 20 years. In response, we have established the National Centers for PTSD; thousands of specialized clinical services, research programs and educational initiatives focused on combat-related PTSD. Billions of dollars have dedicated to treating and understanding combat-related trauma.

In contrast, each year in the United States, five million children are exposed to abuse, violence and other traumatic events. Unlike the veterans from Vietnam, most of these children don't rotate out of the war zone after a year. Millions of these children live year after year in the violent and terrorizing world of domestic or community violence, physical and sexual abuse. They are chronically exposed to pervasive trauma at ages when they are most vulnerable. During the ten years following the Vietnam era, more than 50 million children were exposed to traumatic events (right column above). If only thirty percent (a conservative estimate) of these children developed PTSD (blue in right column), thirty million children developed severe and chronic neuropsychiatric problems during this ten-year period. Despite the pervasive and devastating nature of childhood trauma, our society has dedicated few focused resources for research, clinical or educational programs for traumatized or maltreated children.

APPENDIX II: Key Points - The Adaptive Response to Trauma

The brain mediates threat with a set of predictable neurobiological, neuroendocrine and neuropsychological responses.

These responses may include different ‘survival’ strategies — ranging from fighting or fleeing to ‘giving up’ or a ‘surrender’ reaction.

There are multiple sets of neurobiological and mental responses to stress. These vary with the nature, intensity and frequency of the event. Different children may have unique and individualized ‘response’ sets to the same trauma.

Two primary adaptive response patterns in the face of extreme threat are the hyperarousal continuum (defense -- fight or flight) and the dissociation continuum (freeze and surrender response). Each of these response ‘sets’ activates a unique combination of neural ‘systems’.

These response patterns are somewhat different in infants, children and adults — though they share many similarities. Adult males are more likely to use hyperarousal (fight or flight) response — young children are more likely to use a dissociative pattern (freeze and surrender) response.

As with all experience — when the brain ‘activates’ the neurophysiological systems associated with alarm or with dissociation, there will be use-dependent neurobiological changes (or in young children, use-dependent organization) which reflects this activation.

It is these use-dependent changes in the brain development and organization which underlie the observed emotional, behavioral, cognitive, social and physiological alterations following childhood trauma.

In general, the predominant adaptive style of an individual in the acute traumatic situation will determine which post-traumatic symptoms will develop — hyperarousal or dissociative.

APPENDIX III: The Threatened Child

How Fear Changes Thinking, Feeling and Behaving

Hyperarousal continuum	REST	VIGILANCE	RESISTANCE Crying	DEFIANCE Tantrum	AGGRESSION
Dissociative continuum	REST	AVOIDANCE	COMPLIANCE Robotic/detached	DISSOCIATION Fetal rocking	FAINING
Regulating brain region	NEOCORTEX Cortex	CORTEX Limbic	Limbic Midbrain	MIDBRAIN Brainstem	BRAINSTEM Autonomic
Cognitive style	Abstract	Concrete	Emotional	Reactive	Reflexive
Internal state	CALM	AROUSAL	ALARM	FEAR	TERROR

Different children have different styles of adaptation to threat. Some children use a primary hyperarousal response some a primary dissociative response. Most use some combination of these two adaptive styles. In the fearful child, a defiant stance is often seen. This is typically interpreted as a willful and controlling child. Rather than understanding the behavior as related to fear, adults often respond to the ‘oppositional’ behavior by becoming more angry, more demanding. The child, over-reading the non-verbal cues of the frustrated and angry adult, feels more threatened and moves from alarm to fear to terror. These children may end up in a primitive “mini-psychotic” regression or in a very combative state. The behavior of the child reflects their attempts to adapt and respond to a perceived (or misperceived) threat.