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Sasha Kellogg

Western Michigan University, mrscornflake@gmail.com

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The Effects of Trauma on Brain Development in Infancy

Sasha Kellogg

Western Michigan University

Abstract

This thesis explains how trauma, which can be defined for this study as traumatic experiences, affects brain development in infants. For the purpose of this report, infants are defined as being fifteen months or younger. As gathered from the book and articles researched, typical infant brain development, including the eight processes of neurodevelopment and the four main parts of the brain, will be explained in this report, along with how the brain grows and matures. This thesis shows how maturation of the brain in infancy is dependent upon the bonds and connections infants form with others and explains how trauma can impact attachment. The different types of trauma such as: war and military trauma, child maltreatment (abuse, neglect, substance abuse, domestic violence) and complex trauma will be discussed. What happens to the infant's brain when trauma is experienced and how the brain development of infants is impacted by trauma, including what happens when each type of trauma occurs, will be examined as well. When trauma is experienced, there are other developmental concerns that arise due to the trauma and will be addressed. Ways to support infants who have experienced trauma will be discussed, along with what Family Life Educators or Social Workers can do to provide guidance to the families of these infants who experience trauma resulting in neurodevelopmental issues.

Keywords: infant brain development, neurodevelopment, brain maturation, trauma, complex trauma, attachment, Family Life Educators, Social Workers,

The Effects of Trauma on Brain Development in Infancy

Numerous studies have shown the correlation between trauma, also defined as traumatic experiences, and brain development in all ages. In 2012, the Report of the Attorney General's National Task Force on Children Exposed to Violence stated that 46 million children will have their lives affected by violence, crime, abuse, or psychological trauma. According to Perry & Szalavitz (2006), 40 % of American children will experience a traumatic event by the time they are eighteen, having a lasting effect on them. Children are the most vulnerable to trauma within the first five years of living (Osofsky & Lieberman, 2011). Coates & Gaensbauer (2009) state that when dealing with a child younger than four years of age, the neurodevelopment and neurophysiologic regulatory systems, including the stress management system, are in the process of development and stabilization. The development of a child during infancy is intertwined and dependent on the attachments they form (Coates & Gaensbauer, 2009). This thesis provides knowledge about normal brain development, how brain development is affected by trauma, different types of trauma including how that trauma can affect development and what can be done to support families and their infants who have experienced trauma.

Normal Brain Development in Infancy

To recognize how trauma can affect brain development, normal brain development in infancy needs to be understood first. A mature brain has 100 billion neurons and ten times as many glial cells, which are linked together by trillions of synapses (Perry & Szalavitz, 2006). Neurodevelopment is a continuous process and very complex. There are eight major processes of neurodevelopment: neurogenesis, migration, differentiation, apoptosis, arborization, synaptogenesis, synaptic sculpting, and myelination (Perry, 2002).

The first process of neurodevelopment is neurogenesis takes place in utero. There are billions of neurons that exist at birth; these neurons need to specialize and bond with other neurons in order to create the working neural systems of the brain (Perry, 2002). The second process, called migration can be described as the way neurons move into their final resting place, guided by glial cells and other chemical markers (Perry, 2002). In neurodevelopment, the third process is the differentiation; this is how neurons become specialized. Even though each neuron has the same set of genes, a unique combination of those genes creates a distinctive neurochemistry, neuroarchitecture, and function for that neuron. Each neuron, in the process of differentiation, undergoes a series of choices determined by environmental factors and genetics that decide the final resting place and specification of that particular neuron (Perry, 2002). An example of differentiation happens in the brainstem when the infant is younger than six weeks while the differentiation of the cortex happens between six months and eight months (Johnson, 2001). The fourth process in neurodevelopment is called apoptosis. Neurons must make a connection with other neurons and also must have enough stimulation to activate that link, otherwise the neuron will not be used. As a consequence of not being used, the neurons will die off or get absorbed, which is a normal. In brain development, this is where the use it or lose it mentality comes into play (Perry, 2002).

The fifth process of neurodevelopment is arborization, which takes place as neurons differentiate. During arborization, dendrites are formed which eventually become the receptive area that connects neurons. Hundreds of neurons are able to connect to one neuron because of the dendrite, which looks like a tree (Perry, 2002). One more process, the sixth of neurodevelopment, is synaptogenesis, which is the creation of synapses. Dr. Bruce Perry (2002, p. 84) said that, "Synapses are the most experience-sensitive feature of neuron." During the

process of differentiation, neurons send growth cones, to other neurons seeking a connection with them. These growth cones that grow into axons, which are the electronic pulses of the neuron (Mosby Dictionary of Medicine, 2012) and the axon then connects with dendrites of other cells thus creating synapses (Perry, 2002). Synapses are how neurons communicate with each other (Perry, 2002). The neurons that are developing in the brain are searching for the right neural connection (Perry, 2002). Synaptogenesis happens rapidly at birth with different areas of the brain completing this process at different times (Johnson, 2001). Perry (2002) states that by the time an infant turns eight months old, the synaptic density is increased greatly. The creation of synapses allows the brain to have the plasticity it needs to organize and function with a large scope of potential.

During synaptic sculpting, the seventh process of neurodevelopment, the synapse is constantly changing. The synapse is sending out neurotransmitters; when this happens, synaptic networks within the brain will strengthen (Perry, 2002). This is a very vulnerable time in brain development: if these connections are not made, the synapses are lost. These synaptic connections create chains of neuron-to-neuron-to neuron networks that allow the brain to function properly, thus creating the building blocks for thought, feeling, motion, sensation, and perceptions (Perry, 2002; Perry & Szalavitz, 2006). If an infants' brain does not have all the connections needed, possible delays in developmental milestones may occur. The process of synaptic sculpting is the building blocks of knowledge and memory (Perry, 2002). The eighth and last process of neurodevelopmental is myelination; this is a process that places a protective sheath around axons. During myelination specialized glial cells wrap around axons, creating a more efficient and faster way for neurons to communicate with each other (Perry & Szalavitz, 2006). Without myelination, the complex functioning that takes place within the brain would not

happen. Myelination takes place within the first year of being born but is a continuous process, happening throughout childhood and adolescence (Perry, 2002).

There are four major parts of the brain: the brainstem, the diencephalon, the limbic system, and the cortex (MacKinnon, 2012). The brainstem and diencephalon are the simplest parts of the brain thus they mature before the other parts of the brain (Perry & Szalavitz, 2006). The limbic system is more complicated than the simplest parts of the brain with the cortex being even more intricate (Perry & Szalavitz, 2006). The four parts of the brain work in a tiered fashion: developing from bottom to top, inside to outside (Perry & Szalavitz, 2006), which are interconnected with each part having its own purpose (Perry, 2002). The further up and out from the brain you go, the more complex the neurological process is (MacKinnon, 2012). The brainstem is in charge of core regulatory functions like body temperature and heart rate. The diencephalon and limbic system are responsible for handling the emotional responses that regulates behavior. The cortex, the very top of the brain, controls the more difficult human tasks such as speech, decision making, along with abstract thought (Perry & Szalavitz, 2006).

There are four core factors of neurodevelopment that play a role in how the brain may develop: genetic and environmental influences, sequential development of the brain, user-dependency of the brain and windows of opportunity along with windows of vulnerability. The first factor, genetic and environmental influences, is the thought that genes can be impacted by environmental signals that are affected by the experiences of each individual (Perry, 2002). The second factor has to do with the sequential development of the regions of the brain that develops in a hierarchal fashion (Perry & Szalavitz, 2006). These areas mature and become fully functional during different stages in childhood, which means that each part of the brain develops on its own timetable (Perry, 2002). The third factor is that the brain is activity-dependent on the

processes of neurodevelopment which has already been discussed as organized in a user-dependent fashion (Johnson, 2001). The brain being user-dependent changes how power within the brain is distributed, which affects human behavior and responses (Perry & Szalavitz, 2006). The last factor of neurodevelopment is that there are windows of opportunity along with windows of vulnerability. Each part of the brain has critical or sensitive time periods. There are times during the neurodevelopment where a neural system may be more sensitive to experiences than others (Perry, 2002). The brain is most receptive to environmental input during infancy so the experiences that an infant has provides the way that the brain will organize itself. Putting together the four core factors of development, it is understandable that the sensitive and intricate brain of an infant is more easily affected by experiences of trauma than that of a mature brain (Perry, 2002).

What Happens When Trauma is Experienced During Infancy

When traumatic experiences happen within the first year of life, there are definite consequences. The severity of those consequences will depend on the severity of the traumatic experience and how early the trauma takes place (Perry, 2002). Social stressors that cause trauma are much more damaging than non-social stressors, particularly in infancy (Schoore, 2001). According to Perry & Szalavitz (2006), since the brain develops in a chronological fashion, these changes happen very rapidly. It is because of how the brain develops during infancy that there is such a risk involved when infants experience trauma, their brains are still developing. Thus, the lasting effects of trauma during infancy are numerous.

As a result of these lasting effects of trauma, there are often abnormalities that develop in different parts of the brain (Perry & Szalavitz, 2006). Since each part of the brain has its own job, the abnormalities that affect the brain will depend on when the experience occurred and

what neural activity was taking place during that time (Perry, 2002). Many studies have shown that trauma affects a key set of neural systems, the system that helps the individual manage risk and stress (Perry & Szalavitz, 2006).

Trauma can be difficult to detect, especially in infancy, because the infant does not communicate with words. Yet, there can be signs of trauma in infancy that are detectable and should be looked for. According to the National Child Traumatic Stress Network (NCTSN), trauma can affect an infant cognitively, behaviorally and physiologically (Zero to Six Collaborative Group, 2010). Some cognitive problems due to trauma seen in infancy include issues with memory and language skills. Behavioral issues may include: extreme anger and aggression later in infancy, excessive crying or screaming, regression, and fear of loud noises and of certain people. The physiological problems seen in infancy as a result of trauma may be loss of appetite, weight loss, digestive issues, and poor sleeping habits (Zero to Six Collaborative Group, National Child Traumatic Stress Network, 2010). According to Schore (2001), changes often take place in the automatic nervous system for infants. These could include an increased heart rate, increased blood pressure, respiratory issues, and changes in muscle tone (Schore, 2001).

Traumatic experiences affect the senses. With trauma comes a shattered sense of safety, as a result, certain stimuli will trigger a response (Perry, 2006). That stimuli could be loud noises, sudden movements, and other sensations that may be associated with the frightening event that took place (Zero to Six Collaborative Group, National Child Traumatic Stress Network, 2010). Often infants will become dissociative when stimuli makes them afraid; they may have a blank stare or look out into space (Schore, 2001). The brain is built from millions of tiny choices, many of those choices are conscious but most are not. Choices made will result in

diverse consequences, good or bad, later in life. With stimuli, timing is everything; it can either hamper or assist in brain development (Perry, 2006).

Stable attachment bonds aid in the neurodevelopment of infants: without these bonds, infants are unable to build the coping capacities needed to survive the trauma (Schoore, 2001). Traumatic experiences often affect the bond the infant has with his or her primary caregiver, which ultimately affects the attachment that infant experiences. According to Perry (2002), when an infant feels safe and secure in their attachment to their primary caregiver, a lasting emotional relationship takes place. However, when that attachment bond does not occur or is severed, distress occurs for the infant (Perry, 2002). Infants depend on caregivers for survival and safety, therefore relying on them to provide a shield from any physical and emotional harm (Zero to Six Collaborative Group, National Child Traumatic Stress Network, 2010). In the growth of infants, early nurturing plays a significant role in how the brain will develop (Perry, 2002). Traumatic events can interrupt early nurturing between caregivers and infants, consequently interrupting the neurological processes taking place in the brain (Perry, 2002).

Types of Trauma

There are many types of traumatic experiences that can have long lasting effects on the development of an infant. These traumatic experiences play a vital role in the brain development of infants, as already discussed, so having some knowledge about the types of trauma is crucial to the success of being able to help families care for their infants. Many infants experience military deployments, war, natural disasters, domestic violence, early death of a loved one, or maltreatment (Zero to Six Collaborative Group, National Child Traumatic Stress Network, 2010).

Deployment/War

An infant may be affected by war in different ways. Some infants are the children of military veterans who have experienced war or they have a parent who is actively serving in the military, which causes its own stressors for both infants and parents. Other infants may live in countries that are stricken by civil unrest and constant war. For infants, who are the children of deployed military caregiver, it can be especially difficult since infancy is when the child is forming attachments (Perry & Szalavitz, 2006). This separation of infants and parents can disrupt the attachment relationship that contributes to anxiety and behavior issues for infants (Osofsky & Chartrand, 2013). Consistent relationships are vital to the infant's social and emotional growth (Osofsky & Chartrand, 2013). Osofsky & Chartrand (2013) state that the process of attachment is also interrupted when the parents are exposed to trauma or are depressed, which can then affect the infant. The ability of an infant to be able to cope with the deployment of a parent is dependent upon the present parent's stress levels and their ability to cope with the changes (Osofsky & Chartrand, 2013).

An additional risk associated with prolonged deployment is the risk of child maltreatment, especially in infancy. Osofsky & Chartrand (2013) reported that multiple studies have been conducted since the tragic events of 9/11, which have shown an increase of maltreatment during the deployment of a parent. A stressor for the present parent is separation from their spouse, possibly for the first time, along with the added responsibilities that come with being the significant other of someone who is deployed (Osofsky & Chartrand, 2013). Other factors, such as being away from a support system or having to relocate frequently can affect the present parent negatively. Being a single parent due to deployment and possibly the only caregiver of an infant, can be overwhelming which can lead to extra frustrations being taken out

on the infant (Osofsky & Chartrand, 2013). According to Osofsky & Chartrand (2013), the most important thing that can be done for infants during deployment is to be responsive to their needs and to react accordingly.

There are some things that can be done to support infants and families who are experiencing the type of trauma associated with deployment. Osofsky & Chartrand (2013) suggest that finding a way to help the parent caring for the infant with benefit both of them. Also, infants thrive on consistency, so routines should be kept the same and predictable. Routines are events that are repeated and are the foundations of how infants learn in everyday life (Gillespie & Petersen, 2012). Having a routine helps infants to learn what to expect and provides stability for the infant. Rituals can be beneficial for infants as well. A ritual for an infant could be explained as a way to navigate the emotional transitions they may be experiencing (Gillespie & Petersen, 2012). An example of a ritual for an infant could be the same story being read to them before bedtime. Finding ways to stay connected to the deployed parent is essential as well, which may entail the parents being creative. A suggested way, which could be defined as a ritual between the family members, is for the family to stay in contact through audio and video recordings. By doing so, the infant can hear and see the deployed parent (Osofsky & Chartrand, 2013) and by sending audio and video recordings of the infant to the deployed parent goes a long way to help them feel included in the parenting and connection to the infant.

In the 1990's alone, over two million children have been killed in conflict from war, six million children have been wounded while one million have been orphaned and twenty-five million have been uprooted from their homes (United Nations High Commission for Refugees, 2001). Infants who have faced the violent conditions of war suffer the consequences of those traumatic stress reactions for years after they occur (Refugee Trauma Working Group &

Children of War Production Committee, National Child Traumatic Stress Network, 2005).

Sensory impressions of the traumatic event, as an infant, can make the child later in life relive that experience later in life. According to Feldman and Vengrober (2011), 37% of young children growing up in war zones will be affected by the traumatic events or experiences causing a regression in the social, emotional, and daily life domains. They often display signs of sleep deprivation, which can be a result of insomnia or night terrors and children many times avoid talking about the time they lived in conflict (Refugee Trauma Working Group & Children of War Production Committee, National Child Traumatic Stress Network, 2005).

Another issue that may be unique to infants who have lived in a war stricken environment is that they have experienced the loss of family members. In many cases, that family member could be the infant's primary caregiver (Refugee Trauma Working Group & Children of War Production Committee, National Child Traumatic Stress Network, 2005) which interrupts the bonds of attachment. As discussed earlier, there can be severe consequences for the infant if attachment issues arise. This causes distress for the infant, possibly evoking changes in the processes of neurodevelopment (Perry, 2002).

The death of a primary caregiver can be detrimental to the development of infants. Infants are not able to conceptualize when, all of sudden, the person who has been taking care of them is taken away (Perry, 2006) and the reactions from others around them may frighten the infant (Perry & Rubenstein, n.d.). As a result of this sudden loss, they are less able to adjust (Perry, 2006). The more traumatic the death, the more confused and fearful the infant may be (Perry & Rubenstein, n.d.). Perry & Rubenstein (n.d.) state that young children, including infants, who experience a traumatic death (war, accident, shooting, or fire) have two emotions: the first one is fear and the next is intense sadness. Young children do not have the skills needed

to cope with the loss of loved ones. (Perry & Rubenstein, n.d.). According to Perry (2006), the sudden loss of that love and separation from the caregiver affects the infant's capacity to thrive and learn. The closer the infant may be to the caregiver will also affect how deeply the infant will feel the hurt of that loss (Perry, 2006). The ability to recover from the loss of a loved one will depend on if there is a history of trauma, the support system available, and how dependent the infant was on the person who died (Perry & Rubenstein, n.d.).

Feldman & Vengrober (2011) state that when working with infants exposed to traumatic experiences such as war or death, they should be observed for emotional reactions to the things that remind them of the tragedy. As an infant, the child may show signs of hyper-vigilance, which includes anxiety or nervousness; always being alert to the danger that may surround them (Perry & Szalavitz, 2006). Perry (2006) states that other signs of distress for infants may include: fear and anxiety, confusion, sleeping issues, regression of behaviors and loss of appetite. An infant will often express nonverbal cues of distress such as numbness or withdrawing (Feldman & Vengrober, 2011). According to a study conducted by Feldman & Vengrober (2011), over 60% of young children experienced many nonverbal re-experiences of the trauma with gestures, frequent crying, mood swings, and symptoms of social withdrawal. This includes a preference for being alone while playing and being more interested in objects than people (Feldman & Vengrober, 2011).

Infants are known to feed off the emotions of others, so it is important to watch the family's posttraumatic stress symptoms such as depression and anxiety. Often when the primary caregiver is affected by the periods of unrest, conflict, or war, the infant will be impacted as well (Feldman & Vengrober, 2011). The best way for parents or caregivers to provide support to infants who have experienced trauma as a result of deployment, war, or loss is to be assertive,

sympathetic, and sensitive. By doing this, it can provide an emotional bridge that is essential to healing (Perry & Rubenstein, n.d.).

Maltreatment/Domestic Violence/Substance Abuse

Maltreatment is another form of trauma that infants may experience. Maltreatment can include various forms of abuse and neglect. In 2012, a report done by the United States Department of Human Services found that over 678,000 children were maltreated in the United States; 85,000 or 12.8% of these children were under the age one. The types of maltreatment and perpetrator of the abuse vary. In this report, the types of maltreatment noted were medical neglect, neglect, psychological abuse, sexual abuse, and physical abuse (United States Department of Human Services, 2012). There is one more category of maltreatment called 'other,' which is defined individually by all the states that are reporting (United States Department of Human Services, 2012). To fit into the category of other, the maltreatment must not fit into any of the different types of maltreatment. Examples within the other category could include: threatened abuse, parent's substance abuse issues, or the relinquishment of an infant to a safe sanctuary. Many families are at risk for maltreatment if there is an alcohol or drug abuse problem (United States Department of Human Services, 2012) by either parent or if domestic violence is prevalent in the home (Osofsky, 2003).

In 2012, there were an estimate of 1,640 children who died from child abuse or neglect and over 44% of the reported deaths were during infancy (Department of Human Services, 2012). The rate of fatalities of infants due to maltreatment in 2012 according to the Department of Human Services was 18.83 out of every 100,000 children which is three times the rate of children who are between the age of one and two. According to Lieberman & Van Horn (2009), infants are particularly vulnerable during the time period when mothers are affected by

postpartum depression. Maltreatment of any kind can cause trauma which can affect how the brain develops.

There are many documented studies about how child abuse and neglect affect infants and their development. There are classes of nerve cells in the brain called mirror neurons. These neurons respond in synchrony with the behavior of others (Perry & Szalavitz, 2006). If an infant's smile goes unnoticed or their cries for attention or food is ignored or if the baby is not handled with tenderness, the positive connection between human contact and safety, predictability, and pleasure may not develop (Perry & Szalavitz, 2006). There is a strong correlation between decreased stimuli and a decrease in brain growth (Perry, 2002).

When an infant is sexually abused, an interruption of normal caregiving behaviors happens and there is often an extreme and prolonged stress response (Perry, 2000). Learning during infancy is related to the infant's primary caregivers and the relationships they form. The distortions of attachment that occur during infancy due to sexual trauma can be toxic to future relationships (Perry, 2000).

One of the most harmful things that can be done to infants is for them to be shaken. Shaken baby syndrome is characterized by a traumatic brain injury caused by violent shaking of the infant and can be extremely detrimental to their well-being (Gutierrez, Clements, & Averill, 2004). Shaking baby syndrome happens most often between three and eight months of age and frequently will cause severe issues for the infant. Shaken baby syndrome happens up to 1,400 times a year and one in four of the infants will die due to injuries sustained (American Association of Neurological Surgeons, 2005). These are only estimates due to the lack of ability to actually track this kind of data (American Association of Neurological Surgeons, 2005). When this type of abuse takes place, it can cause damage that is mild and temporary to

permanent and severe (Gutierrez, Clements, & Averill, 2004). The brain injury caused by the shaking of an infant often causes retinal tearing and bleeding on the brain (American Association of Neurological Surgeons, 2005). Frequently infants have skull fractures from their head being slammed against something hard and often other fractures of the arms and legs occur (American Association of Neurological Surgeons, 2005). The range of injuries sustained may result in permanent brain development, paralysis, blindness, seizures, cerebral palsy, delays in development, cognitive difficulties, and behavior issues (Gutierrez, Clements, & Averill, 2004).

Infants who experience maltreatment are frequently removed from their caregivers, which is traumatic in itself and placed into relative care or foster care. When the trauma experienced is not treated within the foster care system, it can have disastrous effects, in many cases later in life (Klain & White, 2013). Although being taken away from their parents and placed in foster care may expose infants to more trauma, this does not mean that staying with parent is always the best option. Continuing to stay with their parents or caregivers may increase the infant's exposure to domestic violence or neglect.

Osofsky & Lieberman (2011) stated that children in the first five years of life are the most susceptible to traumatic death and injury due to interpersonal violence and neglect experienced. Several studies have shown that exposure to domestic violence, within the first six months of life, is a predictor of child neglect through age five (Lieberman & Van Horn, 2009). Osofsky (2003) discussed that how an infant develops is affected by how often an infant is exposed to domestic violence. A risk associated with domestic violence and infants has to do with the parents' availability to the child emotionally. Infants look to parents to provide nurturance and protection. Parents may not be available to provide this because they are victims or perpetrators of the abuse (Osofsky, 2003). Infant attachment bonds are not able to form

properly when infants do not have someone reliable, emotionally available, and responsive to their needs. These attachment bonds play a huge role in how the infant's brain will mature (Osofsky, 2007; Perry, 2002). It is possible, even likely, that early exposure to violence is linked to violent adolescent and adult behaviors (Osofsky, 2007). A study conducted in the early 1990's by Shakoor and Chalmers (1991) found that children who witnessed violence at a young age were more likely to use violence themselves than those who were not exposed. Children learn by modeling behavior, even as infants, whether that behavior is good or bad (Shakoor & Chalmers, 1991).

Sometimes parental maltreatment of infants is not directed at the child such as abuse or neglect, but rather a side effect of poor parental decisions which in turn affect children. These things include parents choosing to use drugs or abusing alcohol. Studies that have shown the correlation between drug or alcohol abuse and maltreatment of infants. One particular study conducted by Sun, Freese & Fitzgerald (2007) showed that younger mothers (aged 19-25) were more apt to abuse or neglect their infants due to drug abuse. Additionally, another risk associated with the maltreatment of infants who were drug exposed was the parents' prior history with alcohol abuse (Sun, Freese & Fitzgerald, 2007). According to Henry, Sloane, & Black-Pond (2007), studies conducted have shown that infants who are exposed prenatally to alcohol and experienced postnatal trauma experience problems within neurodevelopment and as a result, their intelligence scores are severely impacted. Many times alcohol abuse gets overlooked, as it is thought of as less damaging to the infant, but it is important that those working with these families understand the secondary impact alcohol abuse can have on families (Sun, Freese & Fitzgerald, 2007).

An additional category of neglect that is often overlooked is the neglect in which infants in orphanages in third world countries experience. Frequently children born in third world countries, for various reasons, go to an orphanage but are often adopted later in life. Many children who are institutionalized as infants have issues, no matter how loving their adoptive families are. Those infants who spend their first years institutionalized, such as in an orphanage, often have a smaller sized brain due to brain shrinkage in the limbic regions of the brain and may have other functional brain issues (Perry & Szalavitz, 2006). In many cases, these infants were raised where they did not receive attention, cognitive stimulation, or affection (Perry, 2002). Later in life they also had reduced IQ scores (Perry, 2002) and many social-emotional delays that affected their ability to have meaningful relationships with peers and family members (Perry & Szalavitz, 2006).

Complex Trauma

In the last couple of decades, there has been an explosion of studies conducted to not only see what happens when infants experience trauma, but to look at multiple instances of different types of trauma within a child's life. This new type of trauma, with multiple traumatic experiences, is called complex trauma. Complex trauma is defined as exposure to chronic trauma (Henry, Richardson, Black-Pond, Atchinson, & Yetter, 2011). According to the National Child Traumatic Stress Network (n.d.), complex trauma does not focus on the number of times a type of trauma occurred but the number of trauma types that child is exposed to. Repetitive and significant exposure to trauma and stress causes severe issues and is very complex (Klain & White, 2013). It is important to understand that the effects of complex trauma may not present themselves during the time the in which the trauma occurred but will manifest into negative consequences for the child later in life (Perry & Szalavitz, 2006). Many times infants will not

show signs of distress when they experience complex trauma as an infant but will show signs as the child ages. Complex trauma results in an injury of core abilities needed for self-regulation and interpersonal relatedness (Cook et al., 2005). Cook et al. (2005) state that there are seven domains that cause impairment for children who have experienced complex trauma early in life. These domains are: attachment, biological, affect regulation, dissociation, behavior control, cognition, and self-concept. Trauma can affect any of these domains at any given time.

According to the National Child Traumatic Stress Network (n.d.), the effects of complex trauma can be staggering. Complex trauma can cause a host of problems which may include: the formation of self, emotions, the ability to think, learn and concentrate, along with impulse control, self-image, and relationships with others (National Child Traumatic Stress Network, n.d.). Attachment issues are always prevalent with complex trauma. Having a healthy attachment to a caregiver is vital to the success of the infant being able to trust others, regulate their emotions, and interact with the world. Stress appears to have a negative effect on the immune system and body stress response (National Child Traumatic Stress Network, n.d.). Research indicates that infants will react to this stress later on in life by appearing to overreact or be detached because their body is reacting like there is a vast threat in that moment. Infants who have experienced trauma are at a heightened risk of being alarmed by stimuli that typically would not alarm the same infant who has not experienced trauma (National Child Traumatic Stress Network, n.d.). Later on in life, children who have experienced complex trauma as an infant may have issues labeling their emotions and feelings (National Child Traumatic Stress Network, n.d.). Complex trauma can be so disturbing for infants, as they age and become adults, they do not understand why they are acting out or unable to control their feelings. Often times, when complex trauma occurs, the caregiver is so busy trying to deal with their own emotions and

many times infants are left to deal with the trauma on their own. Having no other option but to deal with their trauma alone causes a host of issues because young children do not instinctively know who to turn to for help regarding their own stress (Cook et al., 2005). Children who have experienced trauma at a young age are often unable to see when a relationship is actually safe. This interferes with their capacity to live, love, and be loved (National Child Traumatic Stress Network, n.d.). Children often do not understand why they have the issues they do with relationships (Klain & White, 2013).

Attachment in infancy is vital as already discussed. A type of attachment seen often when complex trauma is experienced is called disorganized attachment (Cook et al., 2005). The feelings experienced may include helplessness and feelings of abandonment, failure, betrayal, and rejections. Attachment issues can cause lifelong risks to physical disease and psychosocial dysfunctions. There is an increased susceptibility to stress along with problems regulating emotions (Cook et al., 2005). If healthy attachments are not formed, infants may experience problems with boundaries, social isolation, learn to not trust others, and difficulty being aware of other people's emotions (Cook et al., 2005). Early caregiving is essential to the psychological development of self, others and self in relation to others (Cook et al., 2005). This forms the foundation of the infant's developmental capacities, which includes the development of distress, tolerance, curiosity, sense of self, and communication (Cook et al., 2005). Healthy attachment to caregivers provide the infant with the security needed to feel safe to explore the world around them. The attachment relationship between the primary caregiver and infant is compromised when trauma occurs because of the primary caregiver (Cook et al., 2005) which leads to mistrust for infants (Perry & Szalavitz, 2006). According to Cook et al. (2005), these attachment issues

cause the infant to have problems with boundaries, social isolation among peers (Perry & Szalavitz, 2006), and difficulty distinguishing other people's emotions (Cook et al., 2005).

Not only can trauma compromise the attachment between the caregiver and infant, trauma also can affect the infant's biological processes and affect regulation of emotions. The biological problems associated with complex trauma at a young age includes: sensory issues, problems with balance, coordination, and body tone (Cook et al., 2005). Infants who experience complex trauma are at definite risk for non-development of brain capacities that are needed later in life (Henry, Slone and Black-Pond, 2007). The effects of trauma are certainly not limited to biological processes because trauma also hinders affect regulation. The affect regulation connected with complex trauma includes being able to self-regulate emotions (Cook et al., 2005).

Dissociation is yet another harmful side effect of complex trauma. Dissociation is a detachment from immediate surroundings. Van der Kolk (2005) stated that exposure to trauma on a repeated basis tends to cause the child to have alterations in states of consciousness. These may include disorientation of space and sensorimotor developmental disorders (van der Kolk, 2005). Dissociation places children at risk for victimization later in life even if it is a way for children to cope with what their traumatic experiences (Cook et al., 2005).

Complex trauma in infancy correlates with various behavior control issues, including both over controlled and under controlled behaviors (Cook et al., 2005). The under controlled behaviors may include: impulsivity, self-destruction, aggression, and oppositional behavior, difficulty with complying and understanding rules, and reenacting the trauma in inappropriate ways. The over controlled behaviors include excessive compliance and other self-soothing behaviors (Cook et al., 2005). According to Cook et al., (2005) infants who have experienced complex trauma may actually demonstrate rigid controlled behaviors by age two including

excessive compliance. Infants who have experienced trauma frequently show problems in language development as well as other learning difficulties (Cook et al., 2005). Infants who experience complex trauma are more likely to respond to self-recognition with neutral or negative emotions than those who have not experienced any trauma (Cook et al., 2005).

Way to Support Children and Families

The 2012's Attorney General's National Task Force on Children Exposed to Violence, recommends that every professional or advocate serving traumatized children should learn and provide trauma informed care and services meant to help these children. The amount of children exposed to trauma is astounding, 46 billion every year (Klein & White, 2013), so being able to work with these families and children is crucial. These families need to feel supported and know that they are not alone.

According to Bath (2008), there are three pillars of trauma informed care. These pillars provide the tools needed for infants who have experienced trauma to be able cope with what has taken place. The first pillar is about the infant's safety. Getting an infant out of a dangerous situation can be the first steps towards healing (Bath, 2008). The second pillar of trauma informed care is all about connections. Infants crave and desperately need attention. These connections are crucial to the child being able to heal from their situation. The last pillar of trauma informed care involve the ability to help infants regulate their emotions and impulse control (Bath, 2008). The good news is that the part of the brain that develops last is the one that has the most plasticity (Bath, 2008) so the ability to learn new ways of coping with the trauma is possible; it just takes time.

It is crucial for those who work with these infants to realize that the healing that takes place will depend on the risk and vulnerability, development when trauma occurs, and the

structure of the environment they are in (Osofsky, 2003). Osofsky (2009) stated that traumatic play is a good option, letting the infant act out the trauma, which typically happens through nonverbal behavior and play. Although controversial, it is important to let the infant use traumatic play in the appropriate setting. This type of play allows the social worker or family life educator to observe from the child's eyes what they saw or heard and be able to provide the intervention that is needed (Osofsky, 2009; Perry & Szalavitz, 2006).

It is absolutely vital that everyone on the team of people who are assisting to help the child and family, are on the same team. Everyone should be sharing ideas and collaborating with each other to help children who have experienced trauma as infants (Henry et al., 2011). A lack of collaboration inhibits the potential integration of trauma into guiding planning, getting services in place, and decision making (Henry et al., 2011). Those working with the family should understand the symptoms of trauma and how it can be assessed. To assess trauma it is important to get a careful history of the child and what has taken place (Perry & Szalavitz, 2006; Coates & Gaensbauer, 2009).

The best way to help infants who have experienced trauma is to promote healthy relationships (Osofsky & Lieberman, 2011). Perry & Szalavitz (2006) shared an anecdotal account of an infant who experience trauma in a Russian orphanage due to not having any interaction with adults. Relationships were what this little boy needed to learn to regulate his emotions. The relationship with his adoptive parents were crucial but what made the biggest difference was little Peter's peers. They provided support and role models Peter needed. After a short amount of time, Peter was able advance his social-emotional development and regulation of emotions to match those in his class, due to the kindness his peers shown him. They also offer

Peter appropriate role models that showed Peter what kind of behavior was appropriate in different situations (Perry & Szalavitz, 2006).

There are so many negative effects of stress on infants in regards to their relationships and self-control. As with muscles, the more a brain system, such as the stress response network, gets exercised the more it changes and the more risk there is of altered functioning (Perry & Szalavitz, 2006). It is crucial to understand how the brain is dependent on stimuli and user-activity within the brain. By understanding this, it allows those who work with this population to support infants and their families in a better way (Perry & Szalavitz, 2006). With those who have experienced trauma at a young age, there is a high likelihood of poor organization and functioning in the brainstem and diencephalon which we know affects the stress-response (Perry, 2002).

There are clues of post-traumatic stress in infants. The first clue experienced is re-experiencing the trauma which typically will not happen until the child is a toddler. Repetitive play is typically how it is manifested and it will look very automatic, repetition of the activity, and will lack creativeness or even fun (Coates & Gaensbauer, 2009). The next clue is avoidance; subtle aversion of the gaze or turning of the head is common avoidance behavior response to trauma in infancy. Avoidance in young children often manifests itself in extreme generalization, which is due to limitations in learning capabilities (Coates & Gaensbauer, 2009). Hyperarousal is the last clue. Hyperarousal happens because of the self-regulation issues that infants have due to the traumatic experiences they have gone through. These infants are typically on edge and startle easily (Coates & Gaensbauer, 2009).

As research has shown there are severe consequences to infants who have experienced trauma. The type of trauma does not matter because once it takes place, it is detrimental to

neurodevelopment and attachment in infancy. When assisting families who have infants who have been traumatized, it is important to understand how the brain develops and what can occur when the infant experiences trauma. Different types of trauma affects infants in different ways, so being trauma informed and understanding the effects of that trauma is vital to the healing of infants. Infant children are the future of the world, so it is important that those working with these infants are able to provide the support they need to not only succeed in life but to provide the tools and support infants need to mend their little hearts, who have been through so much at such an young age.

Resources

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