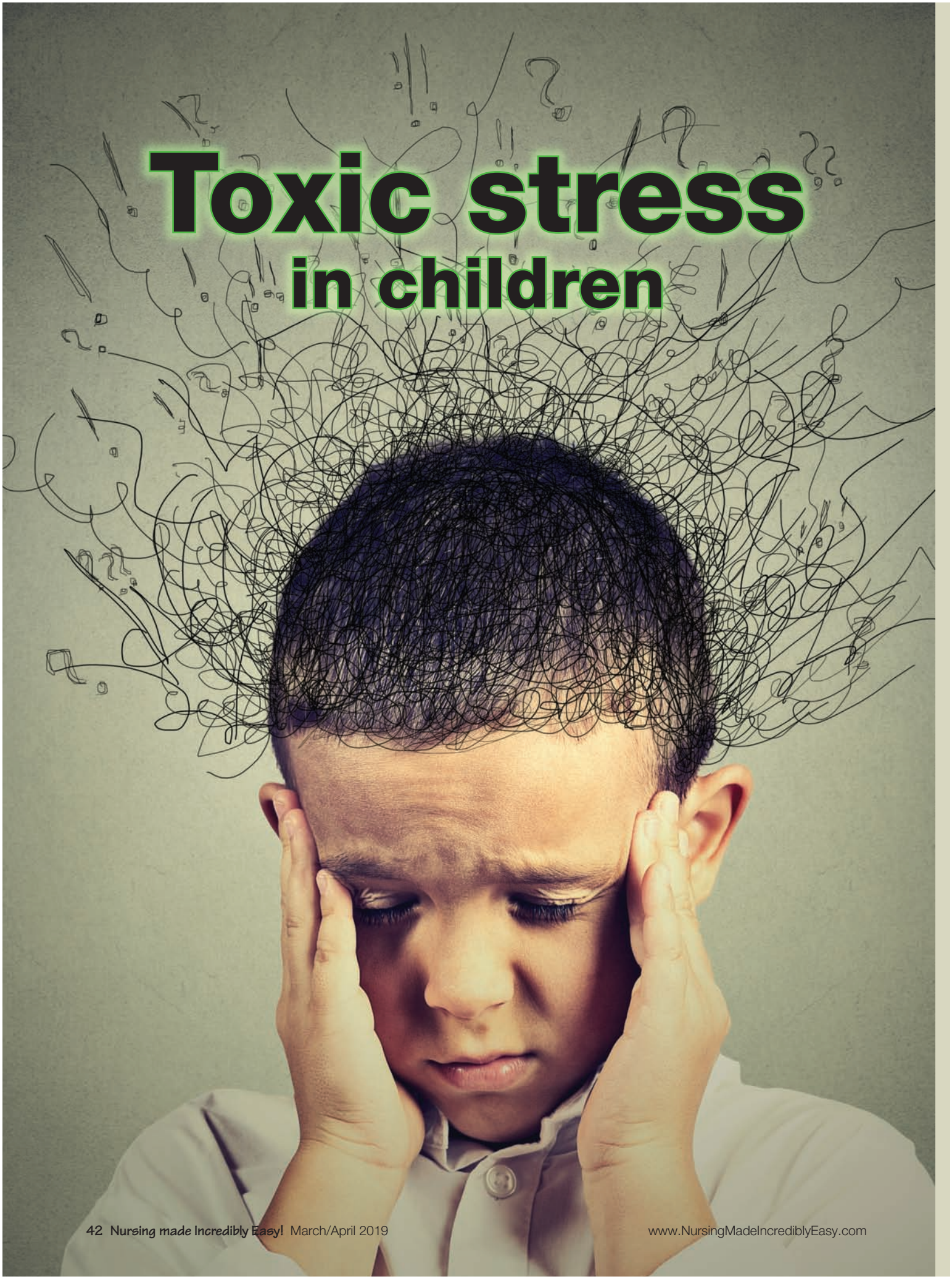
# Toxic stress in children



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# Impact over a lifetime

Healthy development can be impeded by stressful or traumatic events, known as adverse childhood experiences.

By Amanda Perkins, DNP, RN

Up to 90% of children will experience at least one traumatic event, which can lead to toxic stress. According to Harvard University's Center on the Developing Child, toxic stress is the "excessive or prolonged activation of stress response systems in the body and brain." Examples of stressful childhood situations include the death of loved ones, illness, divorce, an unstable home environment, crime, natural disasters, mass shootings, terrorism, and war. Many of these situations are becoming a daily and normal occurrence for children around the world. Toxic stress can lead to problems with learning, behavior, and health—all of which can last a lifetime.

This article provides an overview of toxic stress, including how the brain develops, the impact of stress on the body, the long-term effects of stress, resilience, and how to prevent toxic stress.

## The developing brain

The brain isn't fully developed until age 25. When a child is born, his or her brain only weighs 25% of what it weighs in adulthood. In the first year of life, the child's brain more than doubles in weight and by age 5, his or her brain will triple in size. Early childhood experiences play an important role in brain development. For example, early physical and psychological stressors shape the neuroendocrine system, functional maturation of the hippocampus, and behavioral responses to stress. Healthy child development relies, in part, on effective coping skills.

In children who experience toxic stress, brain architecture, also known as brain development, can be negatively affected. This is important to understand because brain architecture affects learning, behavior, and health; begins before a child is born; and continues into adulthood. When thinking about brain development, we must understand the role of both genes and the environment. Research has shown that genes guide the initial steps in brain development, including neural connections, whereas environmental factors, such as stress, influence development in a variety of different ways.

Early in life, millions of new neural connections form every second and will continue to be formed throughout the child's life. These neural connections are important for healthy brain development and can lead to strong or weak foundations for neural connection development later in life. They'll eventually be reduced through a process known as pruning, which increases the efficiency of connections by keeping connections that are useful and removing those that aren't.

Plasticity—the ability of the developing brain to be molded—is necessary for healthy brain development, as well as the potential for changes in connectivity. Brain plasticity is present for an individual's entire life but is most prominent

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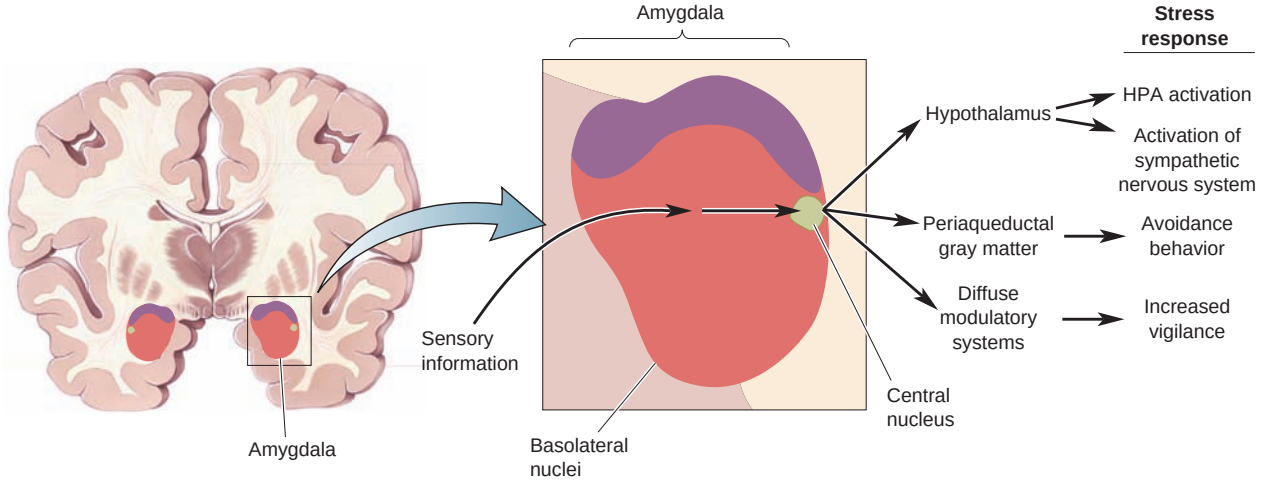
## The stress response

The amygdala regulates the stress response. Incoming sensory information is integrated in the basolateral nuclei of the amygdala and relayed to the central nucleus of the amygdala. The central nucleus activates a series of brain regions to drive the body's stress response.




Source: Bear MF, Connors BW, Paradiso MA. *Neuroscience: Exploring the Brain.* 4th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2015.

during early life. Adverse events that occur in childhood can impair plasticity, negatively affecting brain development. These experiences, combined with the child's support system, can lead to the development of either resilience or vulnerability.

### Physiologic responses

Physiologic reactions occur when a person is exposed to stress (see *Physical changes with stress*). Stress-related changes that happen in the body can include an elevated heart rate and BP, as well as elevated stress hormones such as cortisol. Toxic stress can cause changes to stress response regulation. It can also negatively affect endocrine system regulation and the immune response.

The hypothalamic-pituitary-adrenal (HPA) axis regulates slower responses to stress. The sympathetic nervous system regulates acute responses to stress, commonly known as the fight-or-flight response (see *The stress response*). When a person is experiencing stress, the sympathetic nervous system is most active, especially when a person is fearful, angry, and/or anxious, preparing us for activity. Think "s" for stress.

Toxic stress leads to the HPA axis staying activated, which can have negative effects on the developing brain. This prolonged activation causes increased pituitary sensitivity and spikes in cortisol levels. These changes can lead to the following:

- decreased brain weight
- decreased DNA content
- problems with myelination
- decreased dendritic spines
- increased risk of infection due to elevated cortisol levels suppressing the immune system, as well as the inflammatory response.

The development of healthy relationships is important for children because when the stress response system is active, and a child is in a healthy environment with healthy relationships with adults, the physiologic effects of stress aren't as significant and will be brought back to the

child's baseline. These children are more likely to develop successful coping skills, leading to a more effective stress response. On the other hand, if the stress response is activated, extreme, and/or long lasting, in the absence of a healthy environment, the child may develop a damaged brain architecture, leading to difficulties lasting a lifetime.

## Types of stress

Stressful or traumatic events that occur during childhood or adolescence are called adverse childhood experiences (ACEs). There are three types of responses to stress or ACEs: positive, tolerable, and toxic.

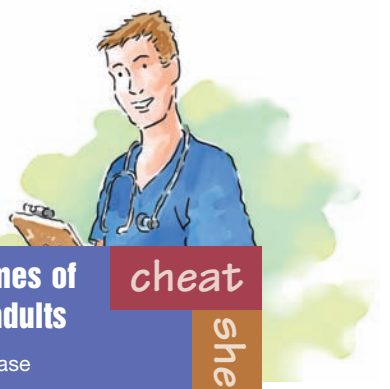
A positive stress response is normal, necessary for healthy brain development, and doesn't lead to toxic stress. During a positive stress response, the heart rate is elevated, and stress hormones are mildly elevated for a brief time. Examples of positive stress for children are the first day of school, receiving immunizations, and taking a test.

During a tolerable stress response, vital signs changes occur to a higher degree than with a positive stress response. If a child doesn't stay in this stressed state for too long, and if healthy relationships with adults help manage the stress, the brain and other organs will recover. Examples of tolerable stress are the death of someone close, a traumatic event, and a natural disaster.

A toxic stress response happens when a child experiences severe, prolonged, and/or frequent stress. The activated stress response seen in toxic stress can lead to a disruption in brain architecture development and other organs, and increases the risk of stress-related disease and cognitive impairment. Examples of toxic stress include child abuse, caregiver substance abuse, emotional and physical neglect, caregiver mental illness, violence, and living in poverty. Toxic stress is so detrimental to children that many believe it should be treated as a public health problem.

### Physical changes with stress

- Increased heart rate supplies the body with more blood.
- Vasodilation to muscles allows for increased oxygen and glucose, which are needed for activity.
- Vasoconstriction to skin allows more blood to be sent to the muscles and vital organs.
- Dilation of bronchioles allows more oxygen to enter the body.
- The liver converts glycogen to glucose to provide more energy to the body.
- The pupils dilate to improve vision.
- Urinary output is decreased to prevent an individual from having to go to the bathroom during a potentially dangerous situation.
- Peristalsis decreases so blood flow is diverted to muscles and vital organs.



### Negative outcomes of toxic stress in adults

cheat sheet

- Cardiovascular disease
- COPD
- Cancer
- Diabetes
- Asthma
- Autoimmune disease
- Depression
- Anxiety
- Substance use disorders
- Mental health disorders
- Premature death

## Negative outcomes

ACEs are associated with physical and psychological problems, both of which can persist long after the traumatic event, sometimes well into adulthood. Stress experienced by children has been associated with psychopathologies, cognitive deficits, and anxiety disorders. The following negative outcomes can be seen in adults who were exposed to toxic stress as children:

## consider this

**Immigrant children**

Many children in the US are either immigrants or have at least one parent who's an undocumented immigrant. Additionally, over 1 million children living in the US have had at least one parent deported. These children are at high risk for toxic stress and the complications associated with it. Children with a parent or parents who've been deported have an increased risk of anxiety, depression, attention deficits, withdrawal, and rule-breaking behaviors.

Children who are immigrants or have parents who are immigrants experience ACEs for a variety of reasons, including, but not limited to, separation from parents, housing instability, prejudice, discrimination, and interrupted schooling. Additionally, toxic stress increases the risk that they'll experience poor physical and mental health, cognitive impairments, and difficulty with social and emotional skills.

When these children are exposed to toxic stress, they may start to display symptoms of abandonment, trauma, and fear. They may also begin to display changes in eating and sleeping, outbursts of anger and aggression, crying, and clinginess. Some of them are placed in foster care after their parents are deported or detained, and some may never see their parents again. The fear and anxiety associated with being taken away and separated from a parent or parents who are loving and supportive causes negative effects on mental health that can last a lifetime, even if the child is able to be reunited with his or her parents.

Children who are immigrants face numerous difficulties and hurdles, all of which can increase stress. They may experience stress due to the current political environment in the US or they may face discrimination when they're at school, creating a negative, and sometimes unsafe, learning environment. A healthy school environment is important and necessary for children to grow and develop into healthy adults. These children often have limited access to resources that can help them with stressors, further increasing the risk of toxic stress and its negative outcomes.

When caring for children who are immigrants, ensure that supportive relationships with adults are in place. You can develop relationships with these children and assist others, such as teachers, to develop healthy relationships as well.

- cardiovascular disease
- chronic obstructive pulmonary disease (COPD)
- cancer
- diabetes
- asthma
- autoimmune disease
- depression
- anxiety
- substance use disorders
- mental health disorders
- premature death.

Toxic stress in children can lead to lifelong immune hyperactivity, increasing the risk of developing allergies and asthma. It can also lead to elevated inflammatory markers and an increased inflammatory response to stress, which will ultimately increase the risk of inflammatory and autoimmune diseases. Additionally, individuals who were exposed to trauma as children are more likely to engage in risky behaviors, have financial difficulties, be in violent relationships, and have difficulty maintaining relationships once they reach adulthood.

## Resilience

When stress is present without appropriate coping strategies or healthy and appropriate relationships with adults, we can see disparities in learning and behavior. But not all children who are exposed to stress or trauma will develop negative outcomes. Resilience—the process of adapting effectively to stressful situations—plays an important role in mitigating the effects of stress. It's believed that some children have a genetic predisposition for resilience, decreasing the likelihood they'll develop negative outcomes related to stress. However, resilience can be taught and

learned. When we help children become resilient, we provide them with the necessary tools to appropriately respond to and manage stress.

Effective coping strategies serve as protective mechanisms for children and adults. When it comes to resilience, cognitive flexibility is important, as well as the ability to redefine a traumatic event. Resilient individuals tend to place blame where it belongs, determine that problems are short term and solvable, and view problems as affecting only portions of their lives.

Caring and supportive relationships have been shown to improve resilience. Other factors related to resilience include a positive self-image, confidence in strengths and abilities, strong communication skills, problem-solving skills, and the ability to manage feelings and impulses.

Pediatrician Kenneth Ginsburg identified the seven Cs of resilience:

- competence
- confidence
- connection
- character
- contribution
- coping
- control.

A child with competence feels like he or she can handle situations as they arise. We can help children develop competence by helping them identify strengths, empowering them to make decisions, and allowing them to handle things independently when appropriate.

A child with confidence believes in his or her abilities. We can help children develop confidence by focusing on strengths, not weaknesses; recognizing when they've done a good job; praising them for a job well done, but not offering praise lacking authenticity; and not pushing them to take on more responsibility than they're able to handle.

A child with connection has developed close relationships with family, friends, and those in the community. Connection creates a sense of safety and security. We can help children feel connected by building a sense of safety and security in the home, allowing them to show emotions, addressing conflict when it arises, creating a space and time for family to be together, and fostering healthy relationships.

### memory jogger

To remember the components of resilience, think of the seven **C**s.

**C**ompetence
**C**onfidence
**C**onnection
**C**haracter
**C**ontribution
**C**oping
**C**ontrol

A child with character has developed morals and values and knows how to demonstrate a caring attitude toward others. We can help children develop character by showing them how behaviors affect others, helping them view themselves as caring, showing them the importance of community, and avoiding hateful statements and actions.

Many families want to have strong relationships, but don't know how to effectively develop these relationships without assistance.

Resilient children have developed an understanding of the importance of contribution. We can help children understand the importance of contribution by stressing the value of helping others and finding ways for them to contribute.

Children with effective coping strategies have learned how to deal with stress. We can help children learn how to cope

## consider this

**Disasters, school crises, and emergencies**

Children may be exposed to myriad stressful situations, which can include disasters; school crises, such as mass shootings; emergencies; violence among peers; or simply watching the news. After a child has been exposed to a traumatic event, such as a mass shooting, he or she will often report difficulty sleeping, problems at school, problems with peer relationships, and difficulty concentrating. Children also report that they feel irritable, sad, angry, and/or worried.

When caring for these children, it's important to listen, pay attention, and monitor for nonverbal cues associated with stress. Be aware of changes in behavior, mood, school performance, interactions, and participation in activities. Children are naturally curious and when they ask questions, we should answer them. Guide the child to set attainable goals, educate about positive and effective coping strategies, and monitor for anything that could retraumatize him or her. Helping these children succeed is a key step in the healing process.

effectively by modeling positive coping strategies and not condemning them for negative behaviors.

Resilient children realize that they can't control everything, and change will happen. We can help children develop control by helping them see that choices and actions have consequences. Lastly, it's important for children to know that they have an adult in their corner, someone who loves them unconditionally. As stated previously, these relationships are one of the most important factors when it comes to resilience.

## Prevention

To the best of our abilities, we need to eliminate or greatly reduce the trauma that children experience. Children rely on adults for survival and, because of this, a key prevention strategy is the development of healthy adult-child relationships. In fact, research has shown that the most important environmental factor during early childhood development is the infant-caregiver relationship.

You can support children and families by helping them develop resilience through making connections, building strong relationships, learning about stress, accepting change, developing a positive self-image, and maintaining a hopeful outlook. Many children and families want to have strong relationships, but don't know how to effectively develop these relationships without assistance. You can also identify children who are at risk for being exposed to stressful situations that may develop into toxic stress.

Be knowledgeable about community resources because it may be beneficial to recommend self-help and support groups, books, other publications, and online resources. In some instances, children and their families may need the help of a licensed mental health professional. Be aware that nutrition influences brain development; a poor diet increases the vulnerability of the stress response system, emotional functions, and cognitive development. Provide basic nutritional education to families, highlighting the importance of a healthy diet. When necessary, referrals can be made to a nutritionist.

## A healthy future

As nurses, we can work to prevent toxic stress in children and positively impact our pediatric patients who've been affected by toxic stress. The immature brain is shaped by experiences, both positive and negative. Children who are exposed to stress may need extra support, especially from caregivers. Remember that early care and intervention are necessary to prevent problems into adulthood. You can play an important role in child development for a long and healthy future. ■

## on the web

**Harvard University Center on the Developing Child:** https://developingchild.harvard.edu

**National Association of School Psychologists:** www.nasponline.org

**National Child Traumatic Stress Network:** www.nctsn.org

**Ready.gov:** www.ready.gov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