

# Neurobiology and Neurodevelopmental Impact of Childhood Traumatic Stress and Prenatal Alcohol Exposure

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**KEYWORDS:** *child trauma, developmental delays, language delays, prenatal alcohol exposure*

## SUMMARY

Harmful effects of both prenatal alcohol and childhood trauma (i.e., abuse, neglect, sexual abuse) have been well documented individually in research. However, this study examined the effects of both prenatal alcohol exposure and postnatal trauma on child development across multiple arenas. Results indicated that those children with both prenatal alcohol exposure as well as postnatal trauma had lower intelligence scores, hyperactivity, impulsivity, greater oppositional/defiant behavior and social problems, and more severe neurodevelopmental deficits in attention, memory, visual processing, language, and motor skills than did those traumatized children without prenatal alcohol exposure. Clinical implications for teachers and caregivers are discussed. These interventions consider a child's limitations.

## MAIN POINTS

- Results show that children exposed to prenatal alcohol combined with childhood trauma have significantly greater severe neurodevelopmental deficits in attention, language, and memory than those children with trauma only.
- Results show that children exposed to prenatal alcohol in conjunction with postnatal traumatic experience have greater oppositional/defiant behavior, inattention, hyperactivity, impulsivity, and social problems when compared to children exposed to trauma only.
- Findings also illustrate that children exposed to both trauma and prenatal alcohol have lower intelligence scores when compared to those children with only trauma.
- Authors strongly advocate for a shift in intervention paradigms to recognize the extreme neurodevelopmental deficits in children with coexisting prenatal alcohol exposure and trauma. This shift would move from a traditional discipline paradigm in which the caregiver/teacher views the child as being “willfully disobedient,” toward a brain-behavior-based paradigm that recognizes the prenatal alcohol exposed/trauma child's limitations and their primitive and instinctive “survival behavior” such as fight, flight, or freeze, as their only means of continued existence.
- From this research, children with prenatal alcohol exposure combined with childhood trauma encompass multiple challenges are best served by multidisciplinary treatment that takes into consideration their overall development. “Such multiple challenges demand that multiple systems collaborate closely with school personnel to provide intense resource support if these children are to be academically and socially successful.”

## REFERENCE

Henry, J., Sloane, M., & Black-Pond, C. (2007). Neurobiology and neurodevelopmental impact of childhood traumatic stress and prenatal alcohol exposure. *Language, Speech, and Hearing Services in Schools, 38*, 99-108.

Figure 1. Intervention Framework

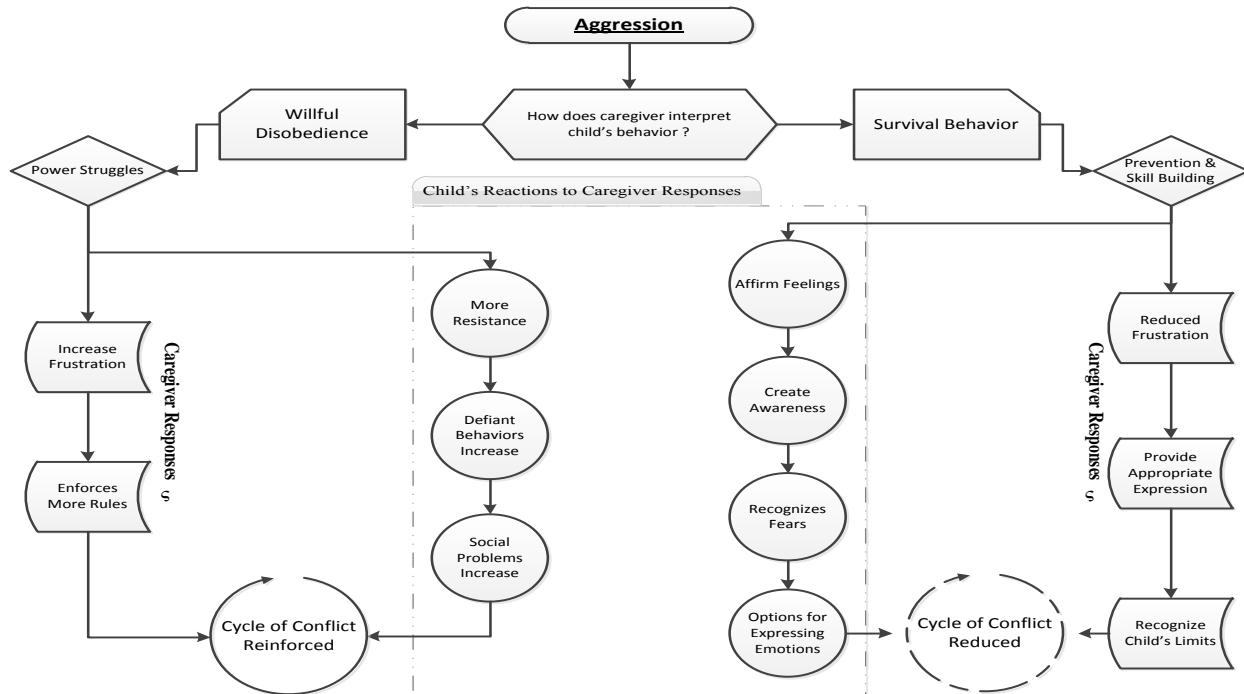


Table 1. Brain systems affected by trauma and prenatal alcohol exposure

| Structure/Region/System       | Purpose  |
|-------------------------------|--|
| <b>Attachment</b>             |  |
| Neurotransmitters             | Oxytocin, vasopressin, estrogen, norepinephrine, dopamine  |
| HPA axis                      | Multi-organ system allows organism to respond quickly and perceive threat  |
| Amygdala                      | Primary role in threat detection---extensively connected to other brain structures                                       |
| Hippocampus                   | Involved in new memory acquisition and learning  |
| Corpus callosum               | Structure between two hemispheres involved in emotion regulation   |
| Fusiform face area (FFA)      | Necessary for face recognition; critical for infant recognition of caregiver   |
| <b>Affect regulation</b>      |  |
| Locus ceruleus                | Vital area in brainstem (pons) involved in alertness and arousal   |
| Thalamus                      | Central relay station in the middle of the brain where sensory input is screened and distributed to other parts of brain |
| Corpus callosum               | (See above)  |
| Striatum, nucleus accumbens   | Reward center of the brain   |
| Orbitofrontal cortex          | Regulates emotion, social behavior, and conscious decision making  |
| <b>Information processing</b> |  |
| Amygdala & hippocampus        | Involved in new memory formation   |
| Anterior cingulate            | Associated with conflict monitoring, resolution, and executive functioning   |
| Orbitofrontal cortex          | Essential for conscious decision making  |

**Note:** Figure & Table were adapted from Henry, Sloane, & Black-Pond, 2007