

Neurodevelopmental Consequences of Child Abuse and Witnessing Domestic Violence

Neuropsychological and Developmental Consequences of Trauma

C. Chyrelle Martin, PsyD

- The question is:
- What impact does experiencing abuse or witnessing DV have on a child's neurological development?
- The answer is: A lot.
- However, there are a lot of mitigating and exacerbating factors that make a big difference.
- For example, stressful environments are harmful and impact the development of the child's brain.

- Other things that hurt a child tend to also be present in home in which there is DV
- For example, a caregiver who is depressed, unavailable to the child, unpredictable or even frightening.
- Or a tense and stressful environment.
- Or poor parent-child verbal interactions.
- Which of these is the most damaging?
- How do we apportion relative responsibility to these factors, especially as so often several are present?

For example,
Is it worse to be abused?
Or to witness one's parent be abused?

Research says *both* are harmful
Particularly if the abuse is carried out by the other biological parent.

DSM-III-R:

- PTSD is more severe and longer-lasting when the stressor is of human design
- When the aggressor is a *parent*, children develop PTSD at *three times* the numbers of those who witness DV by a trusted, but nonparental figure

Is it worse to witness the abuse of one's mother?
Or to have a depressed mother?

Research shows that *both* are harmful.
The mental health of the mother is an important factor in the development of the child
And is also important an buffer against the trauma of witnessing DV.

Neurodevelopmental Consequences of Child Abuse and Witnessing Domestic Violence

Is it worse to be abused?
Or to grow up in a very stressful home?

Research shows that *both* are harmful.
Stress is toxic for the developing brain.

So, although I will address research on
the effects of being abused or
witnessing abuse,

This research also applies to children
who grow up in homes in which there is
chronic stress.

Effects of Witnessing Domestic Violence

- 3.3 million children and adolescents per year witness severe emotional and physical abuse directed at parent
- Violence is highest earlier in marriage, when kids are younger and are home more so if there is abuse in the home, the children are likely to see it or be aware of it.

These kids experience:

- Anxiety
- Depression
- Lower self-esteem
- Aggression
- Cognitive distortions
- Impaired social competence
- School-related problems
- Somatic problems
- PTSD symptoms

- Some studies indicate that children who are abused and witness DV have worse outcomes than do those who only witness DV.
- But other studies indicate that the outcomes are similar (Ketzmann, Gaylord, Holt & Kenny, 2003).

Meta analysis:

Ketzmann, Gaylord, Holt, & Kenny, 2003

- Abused children and child witnesses had similar levels of adjustment problems
- 63% of child witnesses had poorer outcomes than children without violence in the family
- They experience both internalizing and externalizing behaviors in equal measure

Children who witness DV:

- Witness status strongly associated with level of PTSD
- The majority scored within the moderate to severe range (PTSRI)
- *Thus, witnessing DV is a stressor comparable in impact to the direct experience of a violent or abusive act.*

Neurodevelopmental Consequences of Child Abuse and Witnessing Domestic Violence

Children who witness DV:

- However, those who did not develop PTSD had higher anxiety, depression, externalizing behaviors and problems in general (Kiser et al., 1991).
- Which indicates that PTSD may not capture children's outcomes as well as it does adult outcomes
- And may not identify children most adversely impacted by trauma.

- Battered mothers' self-esteem, depression, parenting abilities and stress mediate the impact of DV
- Researchers believe these are more pervasive and continuously present factors
- Child witnesses performed similarly to homeless kids and kids from one-parent families on reading, attention, memory tests

- Huth-Bocks et al. found *no differences* between kids who were witnesses only and witnesses who were also abused
- Maternal depression predicted a more negative and impoverished environment.
- Child witnesses had lower verbal scores than nonwitnesses (PPVT-R)
- There were no differences on a visuospatial measure (BD)

Huth-Bocks, Levendosky, & Semel, 2001

Brain Development Paradigms

The "Optimal Brain Development" Perspective
vs.

The Alternate Paths of Development Perspective

The effects of abuse and stress in childhood

- "Having controllable stress reactions seems to be essential for the development of CNS connections that promote neural inhibitory mechanisms and long-range planning (executive functioning)...to coordinate cognition, emotion regulation, and behavior" (van der Kolk, 2003).

The Cascade Model

Teicher, Anderson, Polcari, Anderson & Navalta (2002)

- 1) Early exposure to stress activates stress response systems and alters their molecular organization.
 - a) This modifies their sensitivity.
- 2) Stress hormones affect myelination, neural structure, neurogenesis, and synaptogenesis.

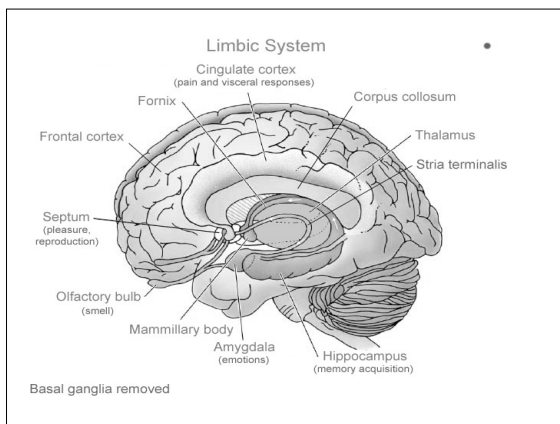
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The Cascade Model:

- 3) Different brain regions differ in sensitivity to the stress hormones.
 - a) This depends on gender,
 - b) timing,
 - c) rate of development,
 - d) and density of glucocorticoids.

The Cascade Model:

- 4) Left hemisphere development, decreased R-L hemisphere integration, increased irritability of the limbic system, and lower activity of the cerebellar vermis occur.
- 5) Due to these developmental changes, these children are at greater risk for developing PTSD, depression, borderline personality disorder, dissociative identity disorder, and substance abuse.



Stress Response System: The Hippocampus

- Limbic system; learning and memory.
- Necessary to put danger in context and to identify the nature of the threat.
- Early abuse makes individuals more likely to misinterpret information in direction of a sense of threat.
- This area is particularly vulnerable to stress due to the high numbers of GC neurons and late development (20s).

Stress Response System: The Hippocampus

- **Bremner et al. (1997), Stein (1997):** Adults with childhood trauma and PTSD showed left hippocampal reduction in volume (12%, 5% respectively). Stein showed a “dose response relationship.”
- This is not a consistent finding.
- Navalta (2000) found no differences in teens who had very traumatic experiences but generally no PTSD diagnosis.

Stress Response System: The Hippocampus

- One possibility for the discrepancies: PTSD exerts a gradual effect on hippocampal structure.
- Another possibility: Its reduced size may be due to alcohol/drug abuse that often co-occurs with PTSD.
- Or: Reduced hippocampal size may not result from PTSD but may be a risk factor for its development or persistence into adulthood.

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Problems with the Hippocampus Impact:

- Learning and Memory
- Emotion regulation through feedback re: cortisol
- Processing of emotional information
- Behavioral inhibitory system which inhibits behavior that is inappropriate
- Psychological health: GAD, Panic
- Tendency toward dissociative states.

Stress Response System: The Amygdala

- Part of limbic system.
- The amygdala deals with fear and aggression as well as sexual and oral behaviors
- Very important in fight-or-flight response.
- Implicated in depression, irritability, self-destructive, aggressive, and oversexualized behaviors.

Amygdala

- Nuclei in the amygdala are among most sensitive in the brain to *kindling*:
repeated stimulation produces ever greater excitability.
- Kindling has a major impact on behavioral control through neuronal irritability and seizure susceptibility.
- Amygdala overactivation may be a critical factor in PTSD.

Stress Response System: Temporolimbic Seizures

- Cause hippocampal sclerosis and loss of neurons
- Cause damage to amygdala
- EEG abnormalities in temporal lobe linked to episodic violence and suicidal ideation or attempts

Stress Response System: The Amygdala

- Ito, Teicher, Glod, et al. (1993): Psychiatrically hospitalized kids with abuse history had twofold increase in EEG abnormalities (L FT).
- The abnormalities were strongly associated with self-destructive or violent behaviors.

Stress Response System: The Corpus Callosum

- Connects the two hemispheres.
- The *myelination* of this area is the critical factor. Myelination is affected by early exposure to stress hormones.
- Smaller CC size was the most prominent finding in kids, especially boys, with abuse and PTSD (De Bellis, Keshavan, Clark et al., 1999).
- Smaller CC was found in girls with sex abuse history (Teicher, Anderson, Dumont, 2000).

Neurodevelopmental Consequences of Child Abuse and Witnessing Domestic Violence

Stress Response System: The Corpus Callosum

- Reduced size is associated with less communication between the hemispheres (Yazgan, Wexler, Kinsbourne, et al., 1995).
- It is also associated with increased laterality and decreased hemispheric integration (Schiffer, Teicher, Papanicolaou, 1995).
- CBCL Dissociation score increases as the CC size decreases.

Problems with abnormalities in the CC:

- Language problems
- Difficulties with complex reasoning and problem solving
- Limited insight into own/others' behavior
- Limited insight into others' feelings
- Difficulty reading social cues
- Difficulty understanding the consequences of their own behavior

Stress Response System: Cerebellar Vermis

- Vulnerable to stress hormones due to the high numbers of GC neurons and late development (20s).
- "Striking" correlation between activity here and level of limbic irritability (Anderson, Maas, Renshaw, et al., 2000).
- Helps modulate limbic irritability and seizures (Cooper & Upton, 1985).
- Young adults with PTSD showed a marked functional impairment here.

Cerebellar Vermis Functions:

- Damage here is primarily related to linguistic and emotional disruptions.
- Abnormalities may be involved in depression, bipolar DO, schizophrenia, autism, ADHD.
- Is likely critical in modulating stress response via regulating glucocorticoids.
- *May thus maintain psychological health and alleviate consequences of neglect or stress.*

Stress Response System: Prefrontal Cortex

- Most delayed development of any area and high numbers GC receptors.
- Exerts inhibitory control on subcortical regions and HPA axis (via monoamines).
- Pediatric psych inpatients with abuse history had significantly less developed left hemispheres, which "appeared to be arrested in their development" (Teicher, Ito, Glod, et al., 1997).

Stress Response System: Prefrontal Cortex

- Abuse in very early childhood is associated with ADHD; abuse later in life is associated with depression.
- Children and adolescents with abuse had chemical markers indicating neuronal loss and dysfunction in the anterior cingulate cortex (De Bellis et al., 2000).
- Anterior cingulate works with DLPFC to integrate attention, working memory, motivation, and affective networks.

Neurodevelopmental Consequences of Child Abuse and Witnessing Domestic Violence

Due to prefrontal dysfunction, individuals have problems with:

- Attention.
- Abstract reasoning and problem solving.
- Semantic organization.
- Impulsivity.
- LT verbal memory (Beers & De Bellis, 2002).
- Processing trauma relevant stimuli (Golier & Yehuda, 2002).
- Antisocial and aggressive behavior.

Subcortical ↑, Prefrontal Cortex ↓

- To threat, fast tracks of limbic act before PFC can evaluate the information.
- Too much arousal interferes with OF functioning (discrimination, learning, problem solving).
- Difficulty with learning from experience results (incoming information is less likely to be compared with previous learning and evaluated for the appropriate response).

Prefrontal Cortex

- Theory: Early stress activates the developing PFC.
 - Which may cause premature development of this area ("parentified child")
 - And may also arrest its development.
- Poor development of PFC impacts development of executive functions, and inhibits ability to modulate stress and fear reactions.*

In Sum:

- Childhood stress/abuse is linked with:
- Excess neuronal irritability
- EEG abnormalities
- Symptoms suggestive of temporal lobe epilepsy
- Reduced development of the left hemisphere and corpus callosum, and lower activity in vermis.

Conclusions

As a result, individuals with traumatic backgrounds struggle with

- Learning and memory
- Impulse control and aggression
- Problem-solving and flexible thinking
- Complex reasoning
- Emotional regulation

Conclusions

- Insight into their own actions and motivations
- Understanding the behavior of others
- Understanding social cues
- And understanding the consequences of their own behavior

Neurodevelopmental Consequences of Child Abuse and Witnessing Domestic Violence

Conclusions

- Thus, they need patience, practice, stress regulation and emotional regulation techniques (mindfulness, DBT), written information, calm and slow presentation, simple vocabulary, social skills training, training in how to read their own and others' emotions.
- They may benefit from ADHD medication.
- Perhaps most of all, they need safe environments.

Conclusions

- I view this information as helping me to understand why so many individuals are dependent upon others - because they need them to help them regulate their emotions.
- "Children are unlikely to give up their primitive self-protective behaviors until they learn how to feel physically competent and secure" (van der Kolk, 2003)