

APSAC Research to Practice Brief

Study Title: Atypical Prefrontal-Amygdala Circuitry Following Childhood Exposure to Abuse: Links with Adolescent Psychopathology

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Introduction:

The ventromedial prefrontal cortex (vmPFC) and amygdala constitute a functional brain network that has been shown to play a role in threat appraisal and emotion regulation. Research has shown that this functional network develops differently in children who have experienced adversity compared to those who have not; however, it is unknown how the specific adverse experience of child abuse alters this brain network. In this study, the associations between child abuse, vmPFC-amygdala connectivity, and later psychopathology (i.e., internalizing and externalizing symptoms) were examined. The vmPFC-amygdala connection is explored as a potential mediating mechanism of the connection between child abuse and later psychopathology.

Research Questions & Hypotheses:

1. Does exposure to child abuse influence functional connectivity between the vmPFC and amygdala during a passive emotional processing task among adolescents?

Hypothesis: Adolescents who were exposed to abuse would have greater negative connectivity.

2. Are patterns of task-related vmPFC-amygdala functional connectivity associated with internalizing and externalizing psychopathology two years later?

Hypothesis: Greater negative functional connectivity would be associated with higher levels of internalizing and externalizing.

3. Does vmPFC-amygdala functional connectivity mediate the association between child abuse and later psychopathology?

Hypothesis: Negative functional connectivity would mediate the association between child abuse and later psychopathology.

Study Sample:

Participants were part of a longitudinal study of child maltreatment and included a total of 57 adolescents (24 with previous exposure to child abuse and 33 control). Neuroimaging data were collected at Wave 2 of the study, and clinical interviews were conducted to assess internalizing and externalizing psychopathology at Wave 2 and two years later at Wave 3. The mean age of adolescents at Wave 2 was 16.9 years, and all participants were recruited from neighborhoods with high rates of community violence and poverty.

Student Measures and Task:

Child abuse was measured as a composite variable including exposure to physical, sexual, or emotional abuse using the Childhood Experiences of Care and Abuse interview and the Childhood

Trauma Questionnaire (CTQ); abuse was measured both as a dichotomous (abuse did or did not occur) and continuous variable (measuring abuse severity). Psychopathology was reported as internalizing and externalizing scores from the Diagnostic Interview Schedule for Children, Version IV (DISC-IV). vmPFC-amygdala functional connectivity was measured via fMRI while participants viewed positive, negative, and neutral images from the International Affective Picture System.

Findings:

While all adolescents rated the negative images during the viewing task as more emotionally intense than the neutral images, those who had been exposed to abuse reported higher emotional intensity in both conditions compared to control participants. The authors also found that vmPFC-amygdala functional connectivity while viewing the emotionally negative images was negative for all adolescents (i.e., when one system is activated, the other is inhibited), and the connectivity was positive while viewing the neutral images (i.e., both systems are activated or inhibited simultaneously).

Specific to Research Question 1, the authors found that adolescents who were exposed to abuse showed more negative task-related vmPFC-amygdala functional connectivity during the negative viewing condition compared to control adolescents with no abuse history; additionally adolescents with abuse history showed more positive functional connectivity compared to controls during the neutral viewing condition. Further, greater severity of abuse was associated with more negative functional connectivity during the negative viewing condition. The researchers also investigated whether violence exposure and socioeconomic status were associated with vmPFC-amygdala functional connectivity, and neither showed a significant relationship.

Regarding Research Question 2, more negative functional connectivity was associated with greater concurrent internalizing and externalizing psychopathology, while 2 years after the connectivity scan, more negative functional connectivity predicted greater externalizing only. The authors reported an additional finding whereby exposure to abuse and greater abuse severity were both associated with increased internalizing and externalizing concurrently and 2 years after neuroimaging data were collected.

Research Question 3 examined whether vmPFC-amygdala task-related functional connectivity mediated the relationship between abuse severity and psychopathology two years after the connectivity scan. Only the relationship between abuse and externalizing psychopathology was considered since the relationship between connectivity and internalizing two years later was not significant; no mediating effect of connectivity on the relationship between abuse and externalizing psychopathology two years later was found.

Recommendations:

A physiological or neurocognitive difference among those with adverse experiences that develops following those adverse experiences is often adaptive for the individual given their circumstances. The concern, however, lies in whether that "adaptation" will still be adaptive in the long-term, or whether it might result in harmful physical or mental health effects. The results of this study suggest that while the greater negative vmPFC-amygdala functional connectivity of those adolescents who have experienced abuse might be adaptive for a time and even help that individual survive extreme threat, externalizing psychopathology might follow long after the threat has passed.

This study has shown evidence of one more biological system that is affected by child abuse; therefore, the findings contribute to the ever-expanding evidence base that necessitates the prevention of abuse before it occurs. For those who have experienced abuse, this study also supports the need for emotion processing and regulation interventions as soon as possible following abuse.

Bottom Line:

While child abuse predicted vmPFC-amygdala functional connectivity, and vmPFC-amygdala functional connectivity predicted concurrent internalizing and externalizing and later externalizing psychopathology, vmPFC-amygdala functional connectivity did not mediate the relationship between child abuse and later psychopathology. This means that while the vmPFC-amygdala network functions differently in adolescents who have experienced child abuse compared to those who have not, it is only one component of a larger complex threat appraisal and emotion regulation system that might contribute to later psychopathology. Future studies might consider whether and how vmPFC-amygdala connectivity, or the larger emotional regulatory system of which this is one part, might be altered after abuse has occurred, in an effort to address later externalizing psychopathology.

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About the Research to Practice Author:

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