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EFFECTS OF CHILDHOOD TRAUMA ON BRAIN FUNCTIONING

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ABSTRACT

The study aims to discover the effect of childhood trauma on brain functioning. It was demonstrated that childhood trauma alters the arousal level of amygdala and the fear response leading to hypervigilance, enhanced emotional responses and problems on regulating emotions. It even leads to changes in the hippocampus region of the brain responsible for memories. Higher order functioning of prefrontal cortex such as problem solving, planning, impulse control, decision making is hampered by the trauma experienced by individuals in their early or late childhood. Overall, childhood trauma has far-reaching impacts on cognitive functioning by impairing neural connectivity and the size of the brain, making a person more prone to depressive disorders. However, it is important to note that such impairments can be overcome by therapy and supporting relations in mitigating such adverse effects by promoting healing and resilience.

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Introduction

Trauma experienced as a child has a significant impact on brain development, altering cognitive, emotional, and behavioural processes. Certain experiences, such being abused, neglected, or seeing violent acts, might alter certain brain regions. The hippocampus may have decreased volume, which affects memory and emotional regulation, while the amygdala may become hyperactive, intensifying reactions to dangers. Executive functioning and emotional regulation issues can result from damage to the prefrontal cortex, which is in charge of impulse control and decision-making. Developing successful interventions to support people who have experienced childhood trauma requires an understanding of these impacts.

Trauma experienced as a child alters the structure and function of the brain permanently. The emotional processing centre of the brain, the amygdala, frequently experiences hyperactivity, which heightens reactions to perceived threats. Simultaneously, the hippocampus, which is important for memory and emotional control, would show diminished activity, which would hinder coping strategies. In addition, abnormalities in the prefrontal cortex, which is crucial for impulse control and decision-making, can cause problems with executive functioning and emotional regulation. These brain alterations highlight the value of focused therapies and encouraging surroundings in promoting resilience and reducing the long-term effects of childhood trauma on people's functioning and general well-being. Comprehensive methods to healing and recovery are informed by an understanding of these complex brain pathways.

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Leeb et al. (2008) defines child maltreatment or abuse as “the physical, sexual, emotional mistreatment or neglect of children.” It is defined as “any act or series of acts by a parent or caregiver that results in harm, potential for harm, or threat of harm to a child.” Abuse, whether physical, sexual, or emotional, is the primary classification for childhood trauma. Any physical injury that a child is subjected to, including shaking, kicking, or hitting, is referred to as physical abuse. Physical abuse includes an injury inflicted on a child by the caregiver. These injuries are through non accidental means, i.e., hitting with a hand , stick, strap or other objects such as kicking, throwing, burning, stabbing (Sedlak & Broadhurst, 1996).

Along with this any type of sexual interaction between an adult and a child is considered sexual abuse, whereas a caregiver's failure to provide emotional support or attention is referred to as emotional abuse. Emotional abuse can include verbal abuse, penalizing a child for normal behaviour, additionally, the child witnessing domestic violence could also be termed as emotional abuse (Garbarino & Garbarino, 1994).

Bullying, violence, neglect, sexual assault, unexpected loss of a loved one, serious accidents, and illnesses that pose a serious risk to life are few instances of these abuses. However, bullying is considered when a child or group of children (bullies) repeatedly acts aggressively towards another child (victim). Further, it can also be observed that child abuse has been associated with series of cognitive issues such as poor academic performance, as well as problems in language, memory, inhibition and attention deficits (Pechtel & Pizzagalli, 2010).

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Review of Literature

Huang et al. (2021) conducted a study on 53 young healthy adults whose childhood trauma histories were assessed by the Childhood Trauma Questionnaire (CTQ) and Network Switching Rate, at both global and local levels for each participant. The results found that 19 (35.8%) participants at global level showed higher level switching rates than those without trauma and positive correlation was found between network switching rate and CTQ in the entire sample.

According to Cassiers et al. (2018), a survey was conducted to study the structural and functional brain abnormalities associated with exposure to different childhood trauma subtypes such as sexual abuse, physical abuse, emotional maltreatment and neglect. The results found out that sexual abuse was associated with structural deficits in the reward circuit and Genito sensory cortex and amygdala hyper reactivity during sad autobiographic memory recall. Further it was found out that emotional maltreatment correlated with abnormalities in frontal limbic socio-emotional networks. It was also found out that in neglected individuals, the white matter integrity and connectivity were disturbed in several brain networks involved in a variety of functions. Other abnormalities, such as reduced frontal cortical volume were common to all maltreatment types.

An investigation was done on 201 adolescent girls to understand the vulnerability of mood disorders and volumetric changes in hippocampus as an effect of childhood trauma. In this study, a comparison was done on hippocampal subfield volumes between those who were exposed to minimal emotional trauma at three points of adolescent development- a) early, b) middle, and c) late. The results found out that the mid-adolescent girls had smaller left CA-3 volumes than the

girls in the minimal emotional trauma group. Also, the early adolescents had larger left CA-3 volumes than late adolescents (Malhi et al., 2019).

Beilharz et al. (2020) conducted a study on the impact of childhood trauma on psychosocial functioning and physical health in a non-clinical community centre of young adults in which questionnaires were provided for the participants to solve, with addition to overnight autonomic and sleep monitors. In the results 22 childhood trauma cases and 89 non-childhood trauma cases were identified among the sample. It was also revealed that some individuals had experienced significant levels of trauma in one or more of the childhood trauma subtypes. Moreover, the sample who has been through childhood trauma depicted elevated psychological distress, sleep disturbances, reduced emotional well-being, and lower perceived social support. Autonomic dysregulation was found in those with severe of childhood trauma. Notably, the experience of physical abuse in childhood was significantly associated with alterations in nocturnal heart rate and heart rate variability.

Moreira et al. (2018) conducted a study on childhood trauma and increased peripheral cytokines in young adults with major depressive disorder. It was a population-based study with 166 young adults aged 18-35 years in which the Mini International Neuropsychiatric Interview (M.I.N.I.) was used to measure the current Major Depressive Disorder (MDD). Also, Childhood Trauma Questionnaire (CTQ) was used in addition to Serum TNF-a, IL-6, and IL-10 levels were measured by ELISA using a commercial kit. The results found that 40.4% of samples were subjects with MDD and childhood trauma, and 59.6% were diagnosed with MDD without childhood trauma. Notably, subjects with childhood trauma showed a significantly higher Serum IL-6 ($p=0.013$) and IL-10 levels ($p=0.022$) when compared with those with history of no childhood

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trauma. It was also observed that subjects with childhood trauma showed positive correlations among Serum IL-6, emotional abuse, and physical abuse. Moreover Serum IL-10 was seen to be positively correlated with physical abuse, however, no significant correlation was seen in TNF-a and childhood trauma.

Majer et al. (2010) conducted a study on association of childhood trauma with cognitive function in 47 healthy adults, who were identified as a part of a larger study from the general population in Wichita, KS. The tests used to examine cognitive function and individual achievement were namely Cambridge Neuropsychological Test Automated Battery (CANTAB) and the Wide-Range-Achievement-Test (WRAT-3). Type and severity of childhood trauma was assessed by Childhood Trauma Questionnaire (CTQ). Data were analyzed by using multiple linear regression on CANTAB measures with primary predictors (CTQ) and potential confounders (age, sex, education and income). Results suggested that emotional abuse was associated with impaired spatial working memory performance. Likewise, physical abuse was associated with impaired pattern recognition memory. Along with this, sexual abuse and physical neglect were negatively related to WRAT-3 scores. However, the association did not reach the significance level of $p < 0.01$.

In another study of Quide et al. (2021) on Schizotypy, Childhood Trauma and Brain Morphometry on 160 healthy individuals. Childhood trauma exposure was assessed using the Childhood Adversity Questionnaire, and schizotypy was assessed using the Schizotypal Personality Questionnaire. Univariate voxel-based morphometry and multivariate analysis of grey matter volume covariation (GMC) were performed to determine the main effects of schizotypy, trauma exposure and their interaction on these indices of grey matter volume. Levels of schizotypy, in particular, cognitive-perceptual and interpersonal dimensions were negatively associated with

GMC in striatum, hippocampus, thalamus and insulae. Moreover, trauma exposure was negatively associated with GMC of the middle frontal lobe, parietal lobe, and cerebellum. But levels of schizotypy were not negatively associated with striatal GMC among those who were exposed to trauma.

Likewise, Aas et al. (2017) conducted a study on association of childhood trauma with increased brain responses to emotionally negative as compared to positive faces in 101 patients with psychotic disorders. Childhood Trauma Questionnaire (CTQ) was used to obtain history of childhood trauma. Brain activations were measured by Functional Magnetic Resonance Imaging (fMRI) during presentation of faces with negative or positive emotional expressions. After the scanner session, patients performed emotional ratings of the same faces. The results stated that severity levels of total childhood trauma were associated with stronger differentiation in brain responses to negative compared with positive faces in clusters comprising the right angular gyrus, supramarginal gyrus, middle temporal gyrus, and the lateral occipital cortex. In patients with schizophrenia, childhood trauma was associated with reporting negative faces as more negative and positive faces as less positive.

Moreover, Lu et al. (2017) conducted a study on Intrinsic brain abnormalities in young healthy adults with childhood trauma, in which 24 healthy individuals with childhood trauma and 24 age and sex-matched adults without childhood trauma were recruited. Each participant underwent resting state functional magnetic resonance imaging (fMRI). Intra-regional brain activity was evaluated by a regional homogeneity method and compared between groups. Areas with altered regional homogeneity were further selected as seeds in subsequent functional connectivity analysis. Statistical analyses were performed by setting current depression and anxiety as covariates. As results depicted that the adults with childhood trauma showed decreased

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regional homogeneity in bilateral superior temporal lobe and insula, and the right inferior parietal lobe, as well as an increased regional homogeneity in the right cerebellum and left middle temporal lobe. All these regions correlated with childhood trauma severity. In addition, individuals with childhood trauma also exhibited altered default mode network, cerebellum-default mode network, and insula-default mode network connectivity when the left middle temporal lobe, right cerebellum, and right insula were selected as seed area, respectively.

Queiroz et al. (2016) conducted a study on childhood trauma and the limbic network of the brain on 79 subjects: 47 healthy, controlled and 32 patients with bipolar disorder. Correlational analyses between Childhood Trauma Questionnaire (CTQ) subscores and anatomo-functional measurements of limbic network were performed. The results stated that CTQ total scores were negatively correlated with amygdala volume, prefrontal-limbic functional connectivity (FC) and uncinate fractional anisotropy in the sample. Considering subscores, physical and emotional neglects were the only to affect neural parameters. The patients with bipolar disorder drove most of the results.

Conclusion

Childhood trauma can have its impact on the brain functioning in several ways. One of the major impacts that is observed is in the amygdala region of the brain which is responsible for processing emotions, especially fear. It is seen that individuals with childhood trauma depict increased activity in the amygdala which further leads to dysregulation of emotions and elevated emotional responses. Along with this, another region of the brain that is significantly affected is the hippocampus which results in impaired memories and past experiences of childhood trauma. In

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many studies it is also observed that the prefrontal cortex is profoundly affected by childhood trauma leading to poor decision making, decreased problem solving behaviour, and problems in controlling impulsive thoughts and actions. Childhood trauma severely impacts one's brain functioning by altering the neural connections and size of the brain. Individuals with childhood trauma are more prone to mood disorders as compared to others. To sum up, it is evident that childhood trauma significantly impairs one's cognitive functioning and even leads to generational trauma by altering gene expression patterns via epigenetic modifications.

Some recommendations to overcome the effects of childhood trauma are to create a safe, stable and nurturing environment for children to flourish. However, different interventions like trauma-focused cognitive-behaviour therapy (TF-CBT) and eye movement desensitization and reprocessing (EMDR) can help in mitigating the effects. Along with this, developing resilience and nurturing relations among family can help a victim to promote self-esteem, problem solving behaviour and self-efficacy.

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References

Aas, M., Kauppi, K., Brandt, C. L., Tesli, M., Kaufmann, T., Steen, N. E., ... & Melle, I. (2017). Childhood trauma is associated with increased brain responses to emotionally negative as compared with positive faces in patients with psychotic disorders. *Psychological medicine*, *47*(4), 669-679.

Beilharz, J. E., Paterson, M., Fatt, S., Wilson, C., Burton, A., Cvejic, E., ... & Vollmer-Conna, U. (2020). The impact of childhood trauma on psychosocial functioning and physical health in a non-clinical community sample of young adults. *Australian & New Zealand Journal of Psychiatry*, *54*(2), 185-194.

Cassiers, L. L., Sabbe, B. G., Schmaal, L., Veltman, D. J., Penninx, B. W., & Van Den Eede, F. (2018). Structural and functional brain abnormalities associated with exposure to different childhood trauma subtypes: A systematic review of neuroimaging findings. *Frontiers in psychiatry*, *9*, 370528.

Garbarino, J., & Garbarino, A. C. (1980). *Emotional maltreatment of children*. National Committree for Prevention of Child Abuse.

Huang, D., Liu, Z., Cao, H., Yang, J., Wu, Z., & Long, Y. (2021). Childhood trauma is linked to decreased temporal stability of functional brain networks in young adults. *Journal of affective disorders*, *290*, 23-30.

Leeb, R. T. (2008). *Child maltreatment surveillance: Uniform definitions for public health and recommended data elements*. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control.

Lu, S., Gao, W., Wei, Z., Wang, D., Hu, S., Huang, M., ... & Li, L. (2017). Intrinsic brain abnormalities in young healthy adults with childhood trauma: A resting-state functional

magnetic resonance imaging study of regional homogeneity and functional connectivity. *Australian & New Zealand Journal of Psychiatry*, *51*(6), 614-623.

Majer, M., Nater, U. M., Lin, J. M. S., Capuron, L., & Reeves, W. C. (2010). Association of childhood trauma with cognitive function in healthy adults: a pilot study. *BMC neurology*, *10*, 1-10.

Malhi, G. S., Das, P., Outhred, T., Irwin, L., Gessler, D., Bwabi, Z., ... & Mannie, Z. (2019). The effects of childhood trauma on adolescent hippocampal subfields. *Australian & New Zealand Journal of Psychiatry*, *53*(5), 447-457.

Moreira, F. P., Wiener, C. D., Jansen, K., Portela, L. V., Lara, D. R., de Mattos Souza, L. D., ... & Oses, J. P. (2018). Childhood trauma and increased peripheral cytokines in young adults with major depressive: Population-based study. *Journal of neuroimmunology*, *319*, 112-116.

Pechtel, P., & Pizzagalli, D. A. (2011). Effects of early life stress on cognitive and affective function: an integrated review of human literature. *Psychopharmacology*, *214*, 55-70.

Quide, Y., Tonini, E., Watkeys, O. J., Carr, V. J., & Green, M. J. (2021). Schizotypy, childhood trauma and brain morphometry. *Schizophrenia Research*, *238*, 73-81.

Sedlak, A. J., Schultz, D., Wells, S. J., Lyons, P., Doueck, H. J., & Gragg, F. (2006). Child protection and justice systems processing of serious child abuse and neglect cases. *Child abuse & neglect*, *30*(6), 657-677.

Souza-Queiroz, J., Boisgontier, J., Etain, B., Poupon, C., Duclap, D., d'Albis, M. A., ... & Houenou, J. (2016). Childhood trauma and the limbic network: a multimodal MRI study in patients with bipolar disorder and controls. *Journal of Affective Disorders*, *200*, 159-164.