Journal of Mental Health Issues and Behavior
Vol: 03, No. 01, Jan-June 2023
ISSN: 2799-1261, DOI: 10.55529/jmhib.31.8.15

Research Paper

Anxiety impact on the children brain: consequences for children emotional capacities

Muzamil Hussain Al Hussaini[1*], Muhammad Khizir Abbas[2], Rehmat Fatima[3], Asma Noureen[4]
[1*,2,3]PhD Scholar, Qurtuba University Dera Ismail Khan.
[4]M. Phil Researcher, Qurtuba University Dera Ismail Khan.

Article Info

Article History:
Received: 20 September 2022
Revised: 26 November 2022
Accepted: 04 December 2022
Published: 19 January 2023

Keywords:
Brain Maturation Structure
Factors of Cortex
Puberty
Tension Factor
Adolescence

ABSTRACT

Background: Adolescence is characterized by substantial structural and functional brain maturation alongside a rise in stress-related psychiatric conditions such as anxiety and depression. Most evidence on adolescent-specific neural stress effects derives from human neuroimaging, with comparatively less known from non-human/animal models.
Objective: To review evidence on the effects of chronic stress exposure on brain regions that continue to mature structurally during adolescence, focusing on the amygdala, hippocampus, and prefrontal cortex.
Methods: Narrative literature review synthesizing human neuroimaging studies and animal (rodent) models of adolescent stress-related neurodevelopment.
Results: Chronic stress exposure during adolescence was found to differentially affect structural maturation of the amygdala, hippocampus, and cortex compared with adulthood. Adolescent rodent models showed corticosteroid-related gene expression remaining elevated relative to adult hippocampus, suggesting heightened adolescent sensitivity to stress hormones that may underlie increased vulnerability to anxiety and mood disturbance emerging during this period.
Conclusion: Adolescence represents a sensitive developmental window in which stress exposure can alter structural maturation of emotion-related brain regions, with implications for later psychiatric risk. Further translational research is needed to clarify the underlying mechanisms linking adolescent stress to altered brain development and emotional functioning.

Corresponding Author:
Muzamil Hussain Al Hussaini
PhD Scholar, Qurtuba University Dera Ismail Khan.
Email: muzamilqurtuba@gmail.com

Copyright © 2023 The Author(s). This is an open access article distributed under the Creative Commons Attribution License, (http://creativecommons.org/licenses/by/4.0/) which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

1. INTRODUCTION

Operational mellowing of the adolescent head has drawn more attention subsequently the formative rumors on longitudinal compelling reverberation imaging investigations [1]. The major changes in cerebral capacities and demonstrative regulation seen during adolescence have been attributed to the morphological changes brought on by puberty in the cortical and limbic brain regions [2].

Researchers have started looking into elements that might interfere with the teenage brain's normal development as well as the short- and long-term effects of these disturbances in tandemwith the increased interest in this development [3]. Due to the enhanced experimental control and cellular clarity of animal studies, these disruptions of teenage brain maturation have been viewed from a more mechanistic perspective. This succinctreview aims to highlight studies that looked at the neuroanatomical effects of stress on the developing teenage brain. This review will pay particular attention to the belongings of tension of neurons besides indicators of mechanical pliability in areas of brains: the amygdala, hippocampus, and prefrontal cortex. These domains are particularly delicate to pressure which have distinctive evolving patterns throughout youth.

Increasing evidence suggests that adolescent exposure to prolonged stress has detrimental impacts on a variety of neurobehavioral outcomes, [4], [5], [6]. It ought to be mentioned while this stage would probably last between 10 and 18 years in humans, teen-age advance in mice and vermin spans ages that range much days [7].

Adolescence may bring about an exceptional susceptibility intellect stress-related adrenal chemicals, like all as a result of the confluence of a number of elements The average-teenage (142 days) and adult rats pickled with equal amounts of corticosterone display distinct gene expression profiles, suggesting that the teenage brain may be more responsive. This homework, in particular, demonstrated that corticosterone subunit expression stayed higher in the middle-youthful hippocampus equated to grownup hippocampus.

1.1 The Adolescent Amygdala and Stress

Central, and medial cores are among the sub nuclei that make up the amygdala, which also productions significant part in facilitating anxiety erudition, repayment, hostility, and voluptuous comportment [8]. According to human MRI studies, both boys' and girls' overall amygdala volumes rise from childhood to the beginning of adolescence, peakingat between 12 and 14 years.

Its significant toward memo that after mountaintops in development, schoolboys endure to demonstration inconsequential rises in amygdalar volume until while teen-agers display minorvolumetric diminutions. Although trajectories stand more fashioned by the teenage standing ofthe distinct differences, it is important to note that these peaks in expansion occur in the maleand female [9], [10]. Animal studies in rodents, including rats and hamsters, demonstrate pubertal-related volumetric increases in sub nuclei of the amygdala,such as the basolateral and medial nuclei, in addition to these human findings [11], [12], [13]. Changes in the number of circulating gonadotropins may control these changes in part [14], [15].

1.2 Adolescent Hippocampal Formation and Stress

The hippocampus and dentate gyrus make up the hippocampal formation, an important part ofthe brain that mediates a variety of education and remembrance processes expressive functionsand pressure response [16]. Neuroimaging studies demonstrate that males and girls' hippocampal volumes expand linearly early in adolescence, similar to the amygdala, and thenbegin to lose volume in females while continuing to grow in males throughout late youth [17].

Studies human animals similarly document structural changes in the hippocampus formation that are associated to adolescence, with womanlike cockroaches exhibiting bigger dendritic diverging amongst days 44 and 51, followed [18]. Additionally, althoughthe density of dendritic spines remainders moderately relentless throughout these years,incidence of spines with a more stable, mature appearance (such as those with a mushroom shape) rises during these ages [19]. On the other hand, research on prepubescent male mice reveals increased spine densities on the dendrites of hippocampal pyramidal and granular cells.

However, these changes are curvilinear, so that spine densities increase during the early stages of adolescence and then diminution through the changeover into undeveloped maturity [20].

Research on effects of stress chemicals linked to stress hippocampus size development besidesthe of neurons has been quite extensive in adults [21]. Hippocampal volumespecifically linked negatively with reported stress levels in postmenopausal women [22]. It is important to note that patients with Cushing's syndrome, a condition characterized by hypercortisolemia, similarly show lower hippocampus sizes [23].

Research on grown-up vermin has revealed considerable after prolonged exposure to relatively high amounts of glucocorticoids or chronic restraint stress [24]. And within tendays after the stressor's cessation, neuronal branching patterns tin improve their pre -stress levels [25]. Accordingly, after successfully treating patients with Cushing's syndrome, the abnormally high levels of cortisol are reduced, and hippocampus sizes return tonormal [26]. These studies collectively show that the development is vulnerable long-term pressure hormone exposure, but that these belongings can be reversed with adequate time.

Prefrontal cortex undergoes striking anatomical changes during adolescence. From childhoodto the commencement of puberty, the volume of the prefrontal cortex was seen to rise. Periodof cortical thinking associated with adolescence is thought to be partially caused by synapticthe prefrontal cortex is crucial for controlling demonstrative actions, managerial role, andanxiety annihilation. As a result, these organizational changes have been proposed to moderatesome of the psychological function changes associated with adolescence. [27] Adult medial prefrontal cortex exhibits considerable structural changes after prolongedexperience to moreover pressure, just as the amygdala and hippocampal formation [28]. In particular, dendritic branching and spine density in pyramidal cells in layerII/III of the prefrontal cortex are reduced [29], [30], [31]. As attention set-shifting is a cognitive function that is hampered by prefrontal cortex lesions [32] indicating a connection changes and modifications activities. Many concerns remain unresolved, despite the fact that it is nowevident how chronic stress exposure affects the development of the teenage brain [33]. To gain adeeper knowledge connection among strain besides teenage intelligence, it crucial pursue at least three areas of research as the field develops [34]. The first step will be to conduct tests that directly contrast how persistent stress affects the adult brains. Trainings that take looked at howstress affects the neuronal building in the prefrontal cortex [35], and adolescent amygdala suggest that these effects are similar to those seen in adults. The amount of these structural changes brought on by stress the teenage and adult brains, however, is still unknown [36].

Table 1. Anxiety Factor Analysis

Factor	Anxiety Level (%)	Students Mental Level (%)	Effected Level (%)
Domestic Issues	34	70	40
Financial Nature	35	76	39
Environmental	31	90	30
Financial Stress	45	87	32
Non-Environmental Tension	43	88	28
Depression	47	90	27
Community Problems	49	100	20
Cultural	31	105	18
Developmental	36	90	22
Emotional	37	85	27

Above Table 1 show that students effected by differ level of anxiety which are many different factors such as financial condition, domestic situation, environmental and community base. These factor learner level on educational performance and other practices.

Due to these stress and anxiety level arises and learner performance is affected. Higher level of stress has a great higher impact on learner educational performance and in case of low-level students learn more and more.

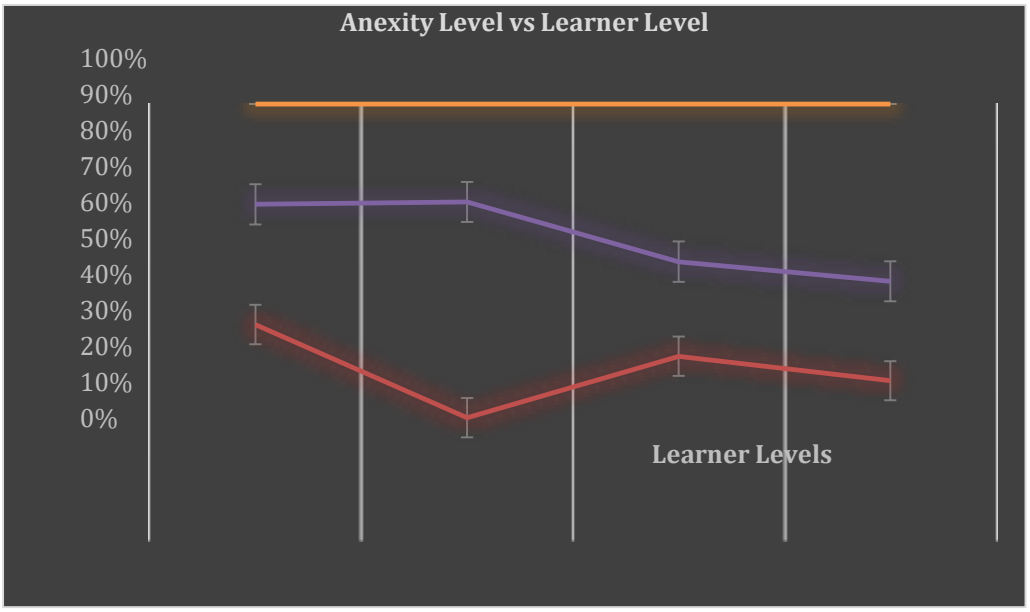


Figure 1. Anxiety Levels Among Learners

Figure 1 show results of level of anxiety and learner level in two lines. At the point of anxietylevel between 70% and 80% where level of learner on 50% and moreover anxiety level between60% & 80% than learner level between 30% & 40%.

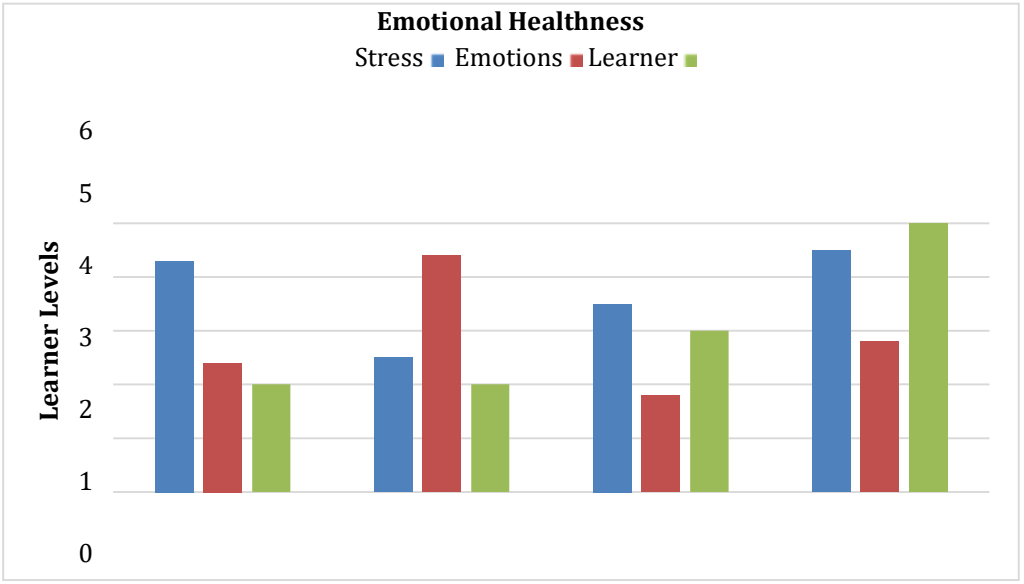


Figure 2. Comparative Levels of Stress, Emotions, and Learner Emotional Health

In this Figure *2* there is detail description of emotional healthiness which is comprised on three differ levels called stress, emotions and learner. All these factors have differed effects on leaner performance with time to time and in this Figure *2*, you can see first stress level is higher than learner level and in second graph emotion level is high than the both its means emotion is also affected by stress.

In next phase there is stress level and learner performance level is higher than the emotion levelits means if the level of level of stress or anxiety is high than it will effect on learner performance.

2. CONCLUSION

According to the research review above, exposure to chronic stress has a considerable impact on

the structural elements of the youthful amygdala, hippocampal development, then prefrontal cortex. Although many of these morphological changes brought on by stress seem to be parallelto persons seen in grownups, no through assessments between the teenage and mature associates have been conducted. Therefore, it is not yet known whether exposure to prolonged stress throughout adolescence may be especially harmful to the growing brain. Forthcoming outlines of study will need to look at both the tiny- and enduring effects of trauma on youthful intellect edifice due to the rise in stress-related emotional liabilities throughout this critical step of expansion (Dahl and Gunnar, 2021; Eil and Romeo, 2019). Establishing the precise impactof stress-induced structural variations in adolescent people's mental health and wellbeing as they enter young adulthood and beyond will also be crucial.

Acknowledgments

The authors have no specific acknowledgments to make for this research.

Funding Information

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Muzamil Hussain Al Hussaini	✓	✓	✓	✓		✓		✓	✓	✓	✓		✓	✓
Muhammad Khizir Abbas	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Rehmat Fatima	✓	✓	✓	✓	✓	✓		✓	✓	✓		✓	✓	✓
Asma Noureen	✓		✓	✓	✓		✓	✓	✓		✓	✓	✓	✓

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

Conflict of Interest Statement

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Informed Consent

All participants were informed about the purpose of the study, and their voluntary consent was obtained prior to data collection.

Ethical Approval

Not Applicable.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

REFERENCES

[1] Allen Norm, P.B., Ouimet, C.C., Greengard, P., 2019. Spinophilin, a novel protein phosphatase 1 binding protein localized to dendritic spines. Proc. Natl. Acad. Sci.94, 9956-9961. doi.org/10.1073/pnas.94.18.9956

[2] S. L. Andersen Kolon, 'Trajectories of brain development: point of vulnerability or window of opportunity', Neurosci. Biobehav. Rev, vol. 27, pp. 3-18, 2018. doi.org/10.1016/S0149-

7634(03)00005-8

[3] D. A. Bangasser Donnet and R. J. Valentino, 'Sex differences in molecular and cellular substrates of stress', Cell. Mol. Neurobiol, vol. 32, pp. 709-723, 2018. doi.org/10.1007/s10571-012-9824-4

[4] J. M. Berry and V. J. Brown, 'Medial frontal cortex mediates perceptual attentional set shifting in the rat', J. Neurosci, vol. 20, pp. 4320-4324, 2018. doi.org/10.1523/JNEUROSCI.20-11-04320.2000

[5] S. Choudhury, 'Development of the adolescent brain: implications for executive function and social cognition', J. Child Psychol. Psychiatr, vol. 47, pp. 296-312, 2020. doi.org/10.1111/j.1469-7610.2006.01611.x

[6] Carrion, V.G., Wong, S.S., 2018. Can traumatic stress alter the brain? Understanding the implications of early trauma on brain develpoment and learning. J. Adolesc. Health. 51, S23-S28. doi.org/10.1016/j.jadohealth.2012.04.010

[7] Casey, B.J., Duhoux, S., Cohen, M.M., 2018. Adolescence: what do transmission, transition, and translation have to do with it? Neuron. 67, 749-760. doi.org/10.1016/j.neuron.2010.08.033

[8] Chowdhury, T.G., Rios, M.B., Chan, T.E., Cassataro, D.S., Barnarich-Marsteller, N.C., Aoki, C., 2018. Activity-based anorexia during adolescence disrupts normal development of the CA1 pyramidal cells in the ventral hippocampus of female rats. Hippocampus. 24, 1421-1429. doi.org/10.1002/hipo.22320

[9] Conrad, C.D., Magarinos, A.M., LeDoux, J.E., McEwen, B.S., 2019. Repeated restraint stress facilitates fear conditioning independently of causing hippocampal CA3 dendritic atrophy. Behav. Neurosci. 113, 902-913. doi.org/10.1037/0735-7044.113.5.902

[10] Cook, S.C., Wellman, C.L., 2018. Chronic stress alters dendritic morphology in ratmedial prefrontal cortex. J. Neurobiol. 60, 263-248. doi.org/10.1002/neu.20025

[11] Cooke, B.M., 2018. Synaptic reorganization of the medial amygdala during puberty. JNeuroendocrinol. 23, 65-73. doi.org/10.1111/j.1365-2826.2010.02075.x

[12] Dahl, R.E., Gunnar, M.R., 2021. Heightened stress responsiveness and emotional reactivity during pubertal maturation: implications for psychopathology. Dev. Psychopathol. 21, 1-6. doi.org/10.1017/S0954579409000017

[13] Dziedzic, N., Ho, A., Adabi, B., Foilb, A.R., Romeo, R.D., 2018. Shifts in hormonalstress reactivity during adolescence are not associated with changes in glucocortcoid receptor levels in the brain and pituitary of male rats. Dev. Neurosci. 36, 261-268. doi.org/10.1159/000362873

[14] Eiland, L., Ramroop, J., Hill, M.N., Manely, J., McEwen, B.S., 2018. Chronic juvenile stress produces corticolimbic dendritic architectural remodeling and modulates emotional behavior in male and female rats. Psychoneuroendocrinology. 37, 39-47. doi.org/10.1016/j.psyneuen.2011.04.015

[15] Eiland, L., Romeo, R.D., 2019. Stress and the developing adolescent brain. Neuroscience. 249, 162-171. doi.org/10.1016/j.neuroscience.2012.10.048

[16] Ernst, M., Mueller, S.C., 2020. The adolescent brain: insights from functional neuroimaging research. Dev. Neurobiol. 68, 729-743. doi.org/10.1002/dneu.20615

[17] Fanselow, M.S., Dong, H.-W., 2018. Are the dorsal and ventral hippocampusfunctionally distinct structures? Neuron.

[18] Farrell, M.R., Gruene, T.M., Shansky, R.M., 2018. The influence of stress and gonadal hormones on neuronal structure and function. Horm. Behav. 76, 118-124. doi.org/10.1016/j.yhbeh.2015.03.003

[19] Galea, L.A.M., McEwen, B.S., Tanapat, P., Deak, T., Spencer, R.L., Dhabhar, F.S., 2019. Sex differences in dendritic atrophy of CA3 pyramidal neurons in responseto chronic restraint stress. Neuroscience. 81, 689-697. doi.org/10.1016/S0306-4522(97)00233-9

[20] Gianaros, P.J., Jennings, J.R., Sheu, L.K., Greer, P.J., Kuller, L.H., Matthews, K.A., 2020. Prospective reports of chronic life stress predict decreased grey mattervolume in the hippocampus. NeuroImage. 35, 795-803. doi.org/10.1016/j.neuroimage.2006.10.045

[21] Giedd, J.N., Blumenthal, J., Jeffries, N.O., Castellanos, F.X., Liu, H., Zijdenbos, A., Paus, T., Evans, A.C., Rapoport, J.L., 2019. Brain development during childhood and adolescence: a longitudinal MRI study. Nat. Neurosci. 2, 861-863. doi.org/10.1038/13158

[22] Giedd, J.N., Rapoport, J.L., 2018. Structural MRI of pediatric brain development: what have we

learned and where are we going? Neuron. 67, 728-734. doi.org/10.1016/j.neuron.2010.08.040

[23] Giedd, J.N., Raznahan, A., Alexander-Bloch, A., Schmitt, E., Gogtay, N., Rapoport, J.L., 2018. Child psychiatry branch of the National Institute of Mental Health longitudinal structural magnetic resonance imaging study of human brain development. Neuropsychopharmacology. 40, 43-49. doi.org/10.1038/npp.2014.236

[24] Goddings, A.-L., Mills, K.L., Clasen, L.S., Giedd, J.N., Viner, R.M., Blakemore, S.-J., 2018. The influence of puberty on subcortical brain development. NeuroImage.88, 242- 251. doi.org/10.1016/j.neuroimage.2013.09.073

[25] Gogtay, N., Giedd, J.N., Lusk, L., Hayashi, K.M., Greenstein, D., Vaituzis, A.C., Nugent, T.F., Herman, D.H., Clasen, L.S., Toga, A.W., Rappoport, J.L., Thompson, P.M., 2018. Dynamic mapping of human cortical development during childhood through early adulthood. Proc. Natl. Acad. Sci. 101, 8174-8179. doi.org/10.1073/pnas.0402680101

[26] Hollis, F., Isgor, C., Kabbaj, M., 2019. The consequences of adolescent chronic unpredictable stress exposure on brain and behavior. Neuroscience. 249, 232-241. doi.org/10.1016/j.neuroscience.2012.09.018

[27] Hu, S., Pruessner, J.C., Coupe, P., Collins, D.L., 2019. Volumetric analysis of medial temporal lobe structures in brain development from childhood to adolesence. NeuroImage. 74, 276-287. doi.org/10.1016/j.neuroimage.2013.02.032

[28] Huttenlocher, P.R., 1979. Synaptic density in human frontal cortex- developmental changes and effects of aging. Brain Res. 163, 195-205. doi.org/10.1016/0006-8993(79)90349-4

[29] Isgor, C., Kabbaj, M., Akil, H., Watson, S.J., 2018. Delayed effects of chronic variable stress during peripubertal-juvenile period on hippocampal morphology and on cognitive and stress axis functions in rats. Hippocampus. 14, 636-648. doi.org/10.1002/hipo.10207

[30] Juraska, J.M., Markham, J.A., 2018. The cellular basis for volume changes in the rat cortex during puberty: white and gray matter. Ann. NY Acad. Sci. 1021, 431-435. doi.org/10.1196/annals.1308.058

[31] Koss, W.A., Belden, C.E., Hristov, A.D., Juraska, J.M., 2018. Dendrtitic remodeling in the adolsecent medial prefrontal cortex and the basolateral amygdala of male and female rats. Synapse. 68, 61-72. doi.org/10.1002/syn.21716

[32] LeDoux, J.E., 2020. The amygdala. Curr. Biol. 17, R868-R874. doi.org/10.1016/j.cub.2007.08.005

[33] Lee, P.R., Brandy, D., Koenig, J.I., 2018. Corticosterone alters N-methyl-D-aspartate receptor subunit mRNA expression before puberty. Mol. Brain Res. 115, 55-62. doi.org/10.1016/S0169-328X(03)00180-3

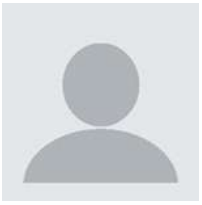
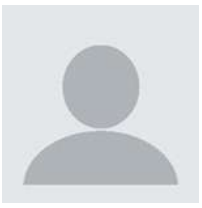
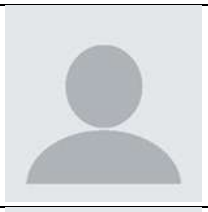
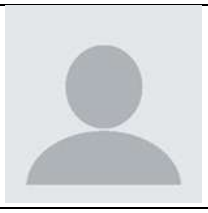
[34] Leussis, M.P., Andersen, S.L., 2020. Is adolescence a sensitive period for depression? behavioral and neuroanatomical findings form a social stress model. Synapse. 62, 22-30. doi.org/10.1002/syn.20462

[35] Leussis, M.P., Lawson, K., Stone, K., Andersen, S.L., 2020. The enduring effects of an adolescent social stressor on synaptic density, part II: poststress reversal of synaptic loss in the cortex by adinazolam and MK-801. Synapse. 62, 185-192. doi.org/10.1002/syn.20483

[36] Liston, C., Miller, M.M., Goldwater, D.S., Radley, J.J., Rocher, A.B., Hof, P.R., Morrison, J.H., McEwen, B.S., 2020. Stress-induced alterations in frontal cortical dendritic morphology predict selective impairments in perceptual attentional set-shifting. J.Neurosci. 26, 7870-7874. doi.org/10.1523/JNEUROSCI.1184-06.2006

How to Cite: Muzamil Hussain Al Hussaini, Muhammad Khizir Abbas, Rehmat Fatima, Asma Noureen. (2023). Anxiety impact on the children brain: consequences for children emotional capacities. Journal of Mental Health Issues and Behavior (JMHIB), 3(1), 8-15. https://doi.org/10.55529/jmhib.31.8.15

BIOGRAPHIES OF AUTHORS

	**Muzamil Hussain Al Hussaini,** is of a PhD Scholar at Qurtuba University in Dera Ismail Khan Pakistan, and he is also affiliated with the Institute of Education and Research in Bhakkar Pakistan. He serves as a visiting researcher at Qurtuba University's Dera Ismail Khan campus. His main interests are education management, public policy and also the more day to day issues tied to primary education, which to be honest he keeps returning to. He has published quite a lot across educational journals, especially around student anxiety, tension, academic performance, and child development, in a very consistent manner over time. Email: muzamilqurtuba@gmail.com
	**Muhammad Khizir Abbas,** is a PhD Scholar at Qurtuba University in Dera Ismail Khan, Pakistan. He has co-authored research around how anxiety affects children's emotional and cognitive growth and also worked on educational policy plus modernization training for Pakistani institutions.
	**Rehmat Fatima,** is a PhD scholar over at Qurtuba University, Dera Ismail Khan Pakistan. She is also listed as a co-author on research that looks at how anxiety may affect children's brain growth and their emotional capacities or if you prefer, temperament.
	**Asma Noureen,** is an M.Phil researcher at Qurtuba University in Dera Ismail Khan Pakistan. She has co-authored work, about how anxiety effects children brain function and their emotional development, kinda indirectly related.