

Research Paper



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

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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.

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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 tandem with 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 succinct review 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, peaking at 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 minor volumetric diminutions. Although trajectories stand more fashioned by the teenage standing of the distinct differences, it is important to note that these peaks in expansion occur in the male and 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 of the brain that mediates a variety of education and remembrance processes expressive functions and pressure response [16]. Neuroimaging studies demonstrate that males and girls' hippocampal volumes expand linearly early in adolescence, similar to the amygdala, and then begin 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, although the density of dendritic spines remains 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 besides the of neurons has been quite extensive in adults [21]. Hippocampal volume specifically 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 ten days after the stressor's cessation, neuronal branching patterns 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 to normal [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 childhood to the commencement of puberty, the volume of the prefrontal cortex was seen to rise. Period of cortical thinking associated with adolescence is thought to be partially caused by synaptic changes in the prefrontal cortex is crucial for controlling demonstrative actions, managerial role, and anxiety annihilation. As a result, these organizational changes have been proposed to moderate some of the psychological function changes associated with adolescence. [27] Adult medial prefrontal cortex exhibits considerable structural changes after prolonged experience to moreover pressure, just as the amygdala and hippocampal formation [28]. In particular, dendritic branching and spine density in pyramidal cells in layer II/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 now evident how chronic stress exposure affects the development of the teenage brain [33]. To gain a deeper knowledge connection among strain besides teenage intelligence, it is crucial to 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 how stress 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 (%)	Effect 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.

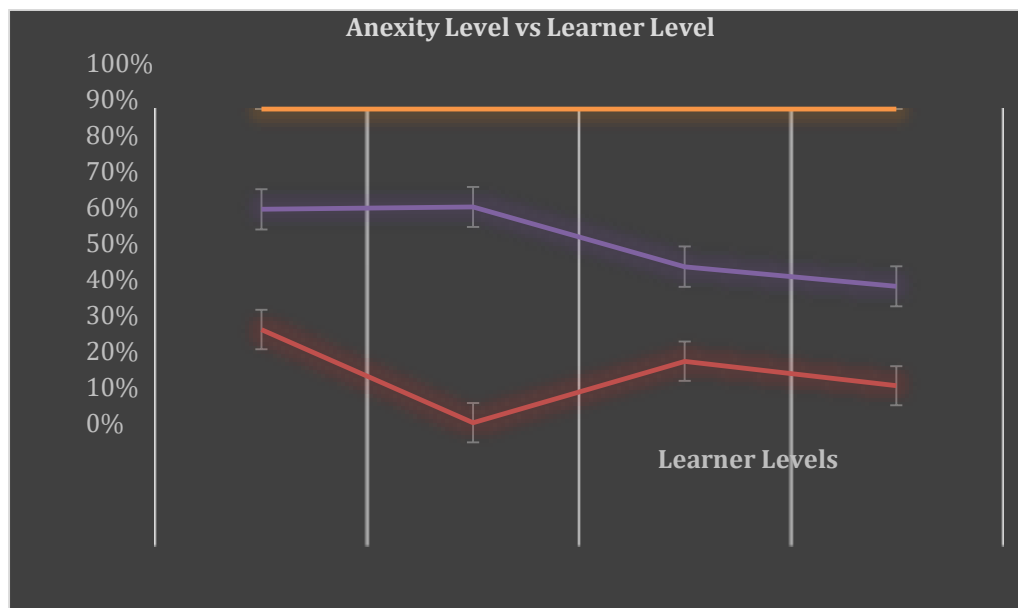


Figure 1. Anxiety Levels Among Learners

Figure 1 show results of level of anxiety and learner level in two lines. At the point of anxiety level between 70% and 80% where level of learner on 50% and moreover anxiety level between 60% & 80% than learner level between 30% & 40%.

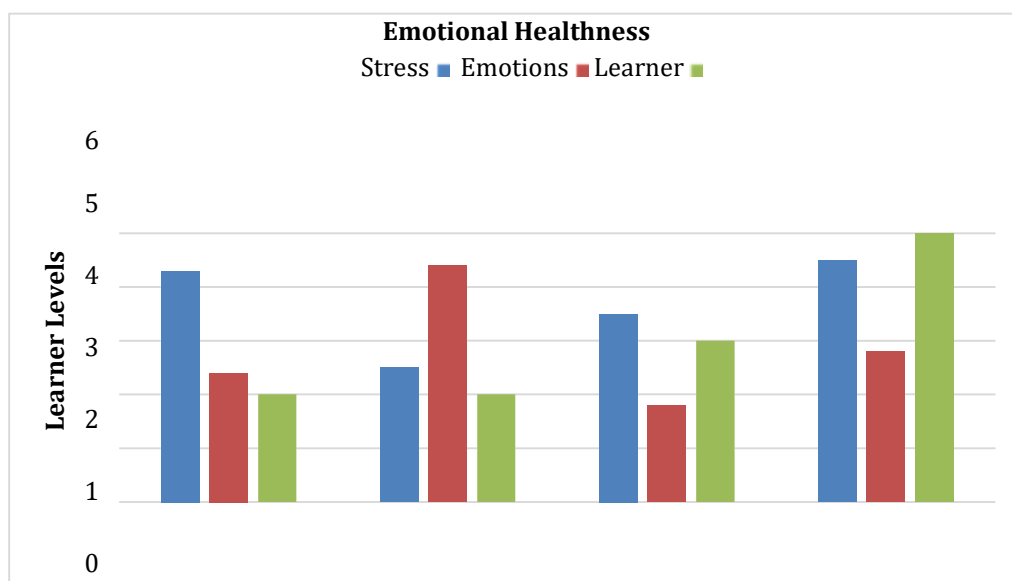


Figure 2. Comparative Levels of Stress, Emotions, and Learner Emotional Health

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 learner 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 levels 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 parallel to 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 impact of stress-induced structural variations in adolescent people's mental health and wellbeing as they enter young adulthood and beyond will also be crucial.

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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 : Conceptualization

M : Methodology

So : Software

Va : Validation

Fo : Formal analysis

I : Investigation

R : Resources

D : Data Curation

O : Writing - Original Draft

E : Writing - Review & Editing

Vi : Visualization

Su : Supervision

P : Project administration

Fu : Funding 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.

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