HIGH SCHOOL EDITION
Journal of Student Research
Volume 14 Issue 1 (2025)

The Effects of Childhood Trauma on Brain Development and Implications on Career Success

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ABSTRACT

Childhood trauma(CT), whether from physical abuse, neglect, emotional mistreatment, or exposure to violence, can have a lasting effect on an individual's brain and well-being. These early experiences shape how the brain develops, often leading to emotional and mental health challenges that last into adulthood. Childhood trauma affects the hippocampus, amygdala, prefrontal cortex, and HPA axis which are responsible for managing emotions and controlling impulses as well as regulating stress. As a result, people with a history of CT may find it difficult to succeed in school, build relationships, or thrive in their careers. Socio-economic factors like living in poverty or being exposed to violence increase the likelihood of trauma, making its effects even more damaging to specific populations. As adults, those who experienced CT may face higher risks of substance abuse, depression, or even conditions like Alzheimer's. This paper examines the underlying mechanisms behind how trauma affects the brain and the long-term consequences for mental health and quality of life. It also highlights therapeutic methods like Eye Movement Desensitization and Reprocessing (EMDR) and Cognitive Behavioral Therapy (CBT), which have shown promise in helping people heal from trauma. Due to the negative impacts of childhood trauma on the development of the brain and career success, it is imperative that prevention methods and awareness for the issue are advanced quickly.

Introduction

So many people experience trauma in their childhood, from injuries, stress, emotional hurt, and other external factors. All these experiences have an effect on the brain, speeding up problems such as depression and anxiety. Along with this, the future success of someone who has experienced trauma can be compromised. All the effects caused by these experiences stay with us after childhood, but we tend to shut out trauma and forget about it, however this does not mean the negative effects go away. This is why awareness needs to be raised about the trauma experienced by everyone during childhood. By finding the specific negative effects that stress and trauma have on individuals, I hope to find a way to prevent them. This research aims to find a way to prevent the negative effects of stress and trauma on the brain, which will help people avoid neurological conditions and pursue their dreams while staying healthy.

There are different types of CT with the most common ones being physical abuse, neglect, exposure to violence, and emotional abuse. All these examples of trauma have different effects on the brain causing various problems associated with brain function. A few factors that go into CT and the chance that it will be experienced are the wealth and income of a family, and the region they live in. Low income families have been shown to have a much larger chance to experience CT while regions close to wars or other conflicts also show an increase in CT. This is because these socio-economic factors cause children to be exposed to violence and other behavior that will cause Trauma (Mladen Cimeša et al., 2023). These examples of CT mainly affect the emotional functioning of the brain and may cause behavioral changes later in life. This results in a hindrance of educational opportunities, career paths, and social connections, which can be devastating for the success of an individual/

Neurological diseases and conditions are widespread amongst the older generation and account for a large portion of deaths in old age. With over one billion children around the world facing problematic conditions, the

prevalence of CT has only been increasing. CT is closely related to developing these diseases in adulthood according to the national library of medicine(Jian Jian Cai et al., 2023). In fact, a study in 2021 showed 24% of adults in a group of patients receiving therapy for neurological conditions experienced some type of CT. Along with this study, many brain imaging studies were done and they all showed a correlation between CT and neurological conditions.

The effects of Childhood Trauma add up over time becoming more devastating with more traumatic experiences. Although the effects of childhood trauma are known by some people, the awareness in the general public for CT is lacking. Therefore, there was a "call-to-action" at the University of North Carolina Chapel Hill in April 2023 to address the issue of CT (Fishbein et al., 2023). This "call-to-action" shows that people are starting to realize the effects of CT and realizing it is a major problem in today's society.

The effects of CT are prevalent amongst a large portion of the population in the form of neurological problems such as substance abuse, depression, anxiety, and other neurological conditions. These problems can be prevented and it is important to do so because the conditions caused by CT are a major factor in the deaths of the older generations. Along with these conditions that may be developed earlier on in life, there are problems caused later in life such as Alzheimer's Disease. Along with these potentially fatal diseases and conditions, childhood trauma hinders many aspects of career success as well as the potential for having a good quality of life. Therefore, it is essential that childhood trauma be both treated and prevented in the future.

Methodology

The goal of this paper is to provide an insight as to how childhood trauma can affect brain development in children as well as its implications on future neurological diseases. This research is gathered from various online sources such as databases and journals. The database most used was National Library of Medicine as it has a variety of resources for the topic of childhood trauma and provides easy access to the specific articles as well as their citations. Another prevalent database used in this paper was Researchgate due to its reliability and credibility. The design for this study did not include any in-person experiments as it is mainly a literature review, however this paper utilizes insightful research methods to analyze the effects of childhood trauma that have been studied and make connections between them, leading to new information and discoveries. Each source was analyzed individually to source out necessary information to create new connections. This was done to allow information from the original sources to be retained in the new findings and create a basis for which new conclusions were made.

Childhood Trauma

Childhood trauma is prevalent amongst humans and it is a serious issue. In fact, with almost two thirds of kids under 16 experiencing a traumatic event in their life, CT is one of the largest issues in the present. Childhood trauma can be defined as any traumatic experiences in childhood that alter the brain or behavior of a child. There are many types of childhood trauma with some of the most common being physical abuse, neglect, emotional abuse, and exposure to violence. These experiences have a significant effect on the brain development in children and cause behavioral changes that last for a lifetime (Gooden, 2021).

According to Substance Abuse and Mental Health Administration, 1 in 7 children have experienced trauma in the past year. The effects of the trauma are proven to be significant as over 1,000 children have had to receive emergency treatments due to injuries caused by violence. These children will live their life with trauma from that experience that caused injuries to them and will cause significant changes in their reactions to violence. A prime example of trauma from violence would be children from war zones. The violence they experience throughout childhood may cause a condition known as PTSD(Post Traumatic Stress Disorder) which causes a negative reaction to whatever the trauma was caused by. This disorder is common as around 6% of adults in the US have had PTSD from

a traumatic childhood event, and the National Center for PTSD states that veterans or people from war zones are more likely to experience PTSD (National Center for PTSD, 2023).

Signs and Diagnosis

While childhood trauma is prevalent, many people don't fully acknowledge it. This is because denying trauma is a defense mechanism that helps hide and shut out pain caused by the trauma (Lebow, 2021). Shutting out pain is only a short term solution and it is best to get help for trauma due to the conditions it can cause. Since childhood trauma can lead to depression, anxiety, and even suicidal thoughts, it is important to know when someone has it and how they can deal with it. Various behaviors are associated with trauma in children with excessive crying, acting out trauma during play, fearing safety when away from parents, and bed-wetting being common signs. Some other important signs to look for are increased frustration, increased sadness, actions indicating self-harm, and difficulty sleeping (Gooden, 2021).

The diagnosis for trauma is not fully developed and is reliant on the symptoms and experiences the patient has faced. Because various symptoms of childhood trauma could also be caused by physiological factors, the accuracy of diagnosis is not always perfect. While there is no clear diagnosis method, it is important to go to a psychologist when signs of trauma are present, especially if a child has faced multiple traumatic events. A psychologist will be able to determine with the highest possible accuracy if the child has been affected by trauma.

Effects on College and Career

For many career fields, completing college is important and usually required. With college being one of the best ways to build success and wealth, it is crucial that everyone has an opportunity to complete it and build their future. From two-year degrees to full pathways like medical school and residency, childhood trauma plays a significant role in the completion of college. CT can compromise one's ability to finish college and thus affect their success. The development of the brain during early stages of life is altered by trauma and causes the one who experienced trauma to be affected. For example, a study in 2022 showed a negative correlation between trauma in childhood and acceptance rate to colleges (Quan et al., 2022). Many students who are not accepted into college are set back in their goals or even worse, demoralized enough to give up on their dreams, proving why CT can have detrimental effects on success.

A possible cause of this negative correlation between trauma and acceptance rate is due to the emotional and behavioral changes caused by CT. When the brain is altered by trauma, people can react to situations differently, often with stronger emotions or attitude. This is because of an increased emotional intake caused by all the traumatic experiences in childhood (Quan et al., 2022). This could include violence or verbal abuse where the child who experienced this becomes more sensitive to related subjects. These reactions can affect specific tasks surrounding college applications such as volunteer work, interviews, or teacher recommendations. Teacher recommendations are a vital part of college applications and they come with hard work and good emotional connections with teachers. Trauma may cause someone to be afraid of socializing with others due to negative experiences and not talk to their teacher as much as they should. This may also be the case in interviews with colleges. Good social skills are important and when subjects that are difficult to discuss are brought up, one needs to have emotional intelligence while talking. This ability is affected by trauma and victims of CT could have unreliable answers or strong emotional responses that would jeopardize their chances of acceptance.

Effects on Self-Expectations

The expectations one has on themselves is affected in various ways, determined by factors such as past behavior and experiences. Childhood Trauma plays a large role in this because the abuse, physical or emotional, causes people to

look down upon themselves. This was proven in a study of high schoolers done by the International Journal of Psychology and Educational Studies (Savci and Gülbahçe, 2023). The study including 408 high schoolers revealed about 18% of the students having lower expectations for themselves due to abuse or neglect. This is a significant number because the expectations one has on themselves affects their plan for the future.

During adolescence, children are especially vulnerable to changes in their state of mind and their beliefs. They undergo rapid development in their brains and events they experience during this time influence their future plans. For example, a low-income family near a war zone may have less access to educational resources and have more violence prevalent among the area they live in. This can cause the children to experience trauma from being in the middle of all the violence. This combined with not being educated about careers and the lack of basic education can cause children to have incomplete views of their future or negatively reflect on what they think they can achieve. This is crucial to address because our expectations of ourselves are the basis of how we go about life and without goals that we set out to achieve, many people can become unmotivated.

Effect on Brain Development and Implications on Adulthood

Childhood trauma can also significantly impact brain development in children. During the childhood years, the brain is rapidly growing and developing in a process called neurogenesis, and trauma experienced during this time is especially harmful. The main areas of the brain that are negatively impacted are the Hippocampus, Amygdala, Prefrontal Cortex, and the Corpus callosum(Cimeša et al., 2023). While it may seem insignificant that only four parts of the brain are affected, these four parts are essential for emotional control, learning, memory, and decision-making, which are all fundamental aspects of childhood. When the development of these aspects is slowed, the overall growth of the brain is also slowed, resulting in severely underdeveloped brains in children who have experienced neglect or abuse.

The temporal lobes, which are responsible for storing memories, controlling and processing emotions, understanding speech(language), and processing information, are severely affected by childhood trauma. The amygdala, located on both temporal lobes, connects fear to past memories which initiates the fight or flight response. Traumatic experiences in childhood leave lasting memories that affect how the amygdala responds to situations. The development of the amygdala is altered, resulting in more activity in the area of the brain. Because of this, countless people with traumatic experiences have trouble controlling their emotions leading to behavioral and social issues.

The hippocampus, a part of the hippocampal formation extending from the amygdala just above the ear, is where memories are stored and processed. Early trauma can disrupt the formation of the hippocampus, resulting in smaller size and less activity(Cimeša et al., 2023). The disruption in growth creates a significant deficiency in memory and learning,causing children to fall behind in school and other aspects of life. While this deficiency alone shows how detrimental trauma can be for children, it is only the start of the problem. Adverse interactions in early childhood can develop emotional impulses and lose control of their own decision-making. This is due to the amygdala and prefrontal cortex also being affected by trauma. The amygdala is responsible for regulating emotions, and the prefrontal cortex is essential for decision-making and control of impulses. Traumatic experiences induce greater activity in the amygdala and reduced activity in the prefrontal cortex which results in difficulty making decisions and controlling emotions. Studies have shown that the right amygdala grows at a much larger rate than the left side during pre-adolescent years when exposed to stressful or traumatic situations. This difference is linked to greater cortisol(stress related hormone) levels in later years(Pybis et al., 2017), which in turn leads to higher blood sugar levels and metabolic instability, as well as difficulty controlling impulses.

The effects of childhood trauma also reach to the hypothalamic-pituitary adrenal(HPA) Axis, where it can cause it to be dysfunctional in several ways. The HPA includes the adrenal glands which are responsible for releasing cortisol in times of stress. This cortisol continues to trigger a reaction leading to increased energy, a suppressed immune response, and increased blood sugar. This can be particularly dangerous in already sick patients or those who have diabetes due to the irregular blood sugar levels. When children are exposed to stressful and traumatic situations the HPA axis will be negatively affected in a crucial time of development, resulting in irregular control of the adrenal

glands which help deal with stress. As discussed earlier, students may go to interviews or be in situations where stress may be put on them, and when the HPA axis' functions are impaired, the release of cortisol is also altered. This results in many people having trouble controlling themselves in situations where a stressful reaction is triggered, especially when it is connected to a disorder such as PTSD(Wu et al., 2010).

The effects of childhood trauma are devastating on the brain and while this is important, it is essential that the implications for adulthood also be reviewed. The effects of childhood trauma in childhood like HPA Axis dysfunction and a decrease in the activity of the Hippocampus lead to diseases or disorders later in life. Some notable problems correlating with childhood trauma are PTSD(post-traumatic stress disorder), Alzheimer's Disease, and addiction to harmful substances. In fact, there is a 20%-50% increased risk of developing PTSD in adulthood when exposed to traumatic childhood events such as neglect, physical abuse, and emotional abuse(Wu et al., 2010). Significant correlation has also been found between the disruption of the HPA axis caused by childhood trauma and the development of Alzheimer's Disease. This is linked to an increased secretion of glucocorticoids that can toxify the hippocampus and prefrontal cortex, leading to the disrupted cognitive abilities seen in Alzheimer's(Canet et al., 2019). Both PTSD and Alzheimer's Disease are usually seen in people later in life, however substance abuse is a prevalent issue in all ages. The increased risk of substance abuse due to childhood trauma as well as the depression related to it are in cohesion with the risk of PTSD as both are a 20%-50% increased chance(Wu et al., 2010).

Treatments for Childhood Trauma

Trauma in children is widespread and for this reason, it is important to know how to deal with it. Children's brains are still developing and growing rapidly so it is essential to use a safe and caring approach in treating trauma. Bibliotherapy, or in other words, therapeutic storytelling, is a great way to self-treat trauma in both children and adults. Therapeutic books are especially created to help people solve problems related to trauma so this source of help must be utilized. Another significant treatment method, especially for children, is play therapy. This method involves helping children express feelings related to traumatic experiences through play and grow from it (Gooden, 2021).x

While simple methods of treatment like play therapy and bibliography are useful in treating acute trauma(trauma from a single event), treatments for chronic trauma(trauma from prolonged or repeated events) require more medical involvement. Eye movement desensitization and reprocessing(EMDR) is a method used for patients with PTSD where a traumatic event is reenacted in the patient's brain while the doctor administers eye movements. This helps patients advance through traumatic experiences and move past their memories (Gooden, 2021). EMD was first thought of when Psychologist Francine Shapiro noticed that specific eye movements can decrease the severity of disturbing thoughts. Shapiro conducted a study with 22 patients after this discovery and this study along with a follow-up study found that EMD worked with results similar to other methods. In order to further increase effectiveness of the treatment, EMD evolved into EMDR which added an 8 phase process of treatment. The process starts with assessments and plan creation in order to target treatment specifically towards the current patient. After this, there are sets of bilateral stimulation in which the patient is directed to make certain eye movements while thinking about their traumatic experience. While doing this, the psychologist records data to be used in the next phases. Phases 5-7 involve strengthening the mind and replacing negative thoughts relating to the trauma with positive thoughts. The body is also relaxed and movements are reprocessed to establish emotional stability. The final phase of treatment involves analyzing data collected from previous phases and using it to determine whether to move on to a different traumatic experience or continue treatment with the current one (Landin-Romero et al., 2018).

CBT (Cognitive Behavioral Therapy) is also an essential method of treatment for trauma. CBT is a method of therapy that involves changing one's negative thoughts associated with a traumatic event to positive thoughts. This is done by altering an individual's thought processes and habits. Many times, people who have experienced childhood trauma will have a worse reaction than is normal in negative situations, so by building new habits and new ways of thinking about situations, patients will be able to have more positive thoughts to replace previous negative ones. Cognitive Behavioral Therapy has proven to be impactful as research has shown recovery rates of 62.2% with 18 sessions

or more(Pybis et al., 2017). While the recovery rate for patients with over 18 sessions is promising, CBT treatments often only occur every 2 weeks(may vary based on counselor's choice), making CBT a more long-term choice form of treatment (Davis, 2018).

Results

The results of this study provide a significant insight into how childhood trauma negatively impacts the brain in areas especially important for emotional control and intelligence as well as the implications of this on self-expectations and career success. Due to the decreased self-expectations in children who have experienced traumatic events, their educational and career goals are often not as expected of success(Savci and Gülbahçe, 2023). This leads to reduced educational prowess and motivation in children, limiting their future opportunities, especially for secondary education. This also relates to difficulty creating meaningful relationships with teachers, mentors, or even friends, further impacting the ability of those who have childhood trauma to have a good-quality of life. After this is considered, it is not surprising to see many individuals who have experienced trauma have trouble even after entering college or the workforce.

The emotional control that is seen in many successful individuals is significantly more difficult to achieve for traumatized individuals, not only due to the impacts of trauma in relationships, but also because of the impact it has on brain functions(Quan et al., 2022). The hippocampus, amygdala, and prefrontal cortex are essential to the regulation and expression of emotions including the control of emotional impulses. When exposed to trauma at an early age, individuals experience hindered development in these areas of the brain, especially the hippocampus, which leads to problems in expressing emotions as well as controlling impulses. This creates problems later in life in college due to difficulty in communication, relationship-creating, and motivation. If one has low expectations of themselves, less emotional control, and poor communication skills, it can be extremely difficult for them to have a successful career, as shown in a 2022 study that provided a negative correlation between students with childhood trauma and college completion rates(Cimeša et al., 2023).

In this study, the specific effects of childhood trauma on the parts of the brain were also researched. The hippocampus, amygdala, prefrontal cortex, and HPA axis are among those most affected. The main function these have in common is that they regulate either emotions or feelings. The amygdala's development can be disrupted early on resulting in trouble controlling emotions, especially when the electrical activity in the prefrontal cortex is increased. This leads to impulses in stressful situations and when exposed to triggers of trauma. These impulses, paired with the altered cortisol production caused by an impaired HPA axis have devastating effects on the quality of life of individuals as well as their risk of developing neurological conditions later in life. The risk of developing problems like Alzheimer's Disease, PTSD, and substance abuse are increased by 20-50% which is a significant amount considering the massive impacts these issues can have on individuals.

Conclusion

The negative impacts of childhood trauma reach far and wide across the brain's neurological pathways as well as the pathways of connection between people. From reduced communication abilities to a dysfunctioning HPA axis, childhood trauma has significant effects on one's health in the long-term. Studies have shown negative correlation between students that have trauma and college completion rates as well as an increased risk of developing neurological conditions in later years. Combined with the fact that early brain development is also greatly impacted, it is imperative that childhood trauma be acted upon as soon as possible. Novel treatment methods have already been created, however the awareness and prevention methods for childhood trauma must be advanced for the psychological health as well as career success of future generations.

Limitations

This study applies to the topic of childhood trauma and childhood traumatic events(CTEs) and the effects these have on the brain, however it does not discuss new treatments or ways to prevent trauma. This is due to the limited materials and resources available as a high school student. The results of the study were particularly insightful as to how the effects of childhood trauma can hinder career success, but more in-person studies should be done on the topic before making concrete conclusions.

Acknowledgments

I would like to thank the professors and the administration team at Gifted Gabber for helping me develop research skills as well as walking me through the process for creating my own research paper.

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