

Examining the relationship between early adversity and mental health outcomes

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SUMMARY

According to the World Health Organization, 1 in 7 adolescents between 10 and 19 years old experience a mental health disorder. Accordingly, adolescent mental health is a pressing concern. The concept of adverse childhood experiences (ACEs) is a widely recognized framework for how early life stress impacts future mental health. In the present study, we conducted a secondary data analysis to explore the relationship between early adversity and adolescents' mental health outcomes. Specifically, we examined the relationship between abuse and externalizing symptoms, neglect and depression symptoms, adversity and externalizing symptoms, and adversity and depression symptoms. We hypothesized that there would be strong positive correlations between childhood neglect and depression symptoms, abuse and externalizing symptoms, adversity and externalizing symptoms, and adversity and depression symptoms. Additionally, we hypothesized there would be a statistically significant difference in mental health symptoms between those individuals with and without childhood adversity. We used t-tests to determine the significance of the means between the variables, as well as correlation to determine the strength and direction of the relationships. We found that there was a significant statistical difference between the means of all variables compared. We also found a positive correlation between abuse and neglect, and between depression and externalizing symptoms; however, the strength of these relationships varied. Our findings revealed that early adversity impacts later mental health outcomes, which aligns with previous research conducted on ACEs. Future research can explore further how benevolent childhood experiences can function as protective factors.

INTRODUCTION

Adolescent mental health issues are a pressing concern around the world. About 14.3% of young people (10 to 19 years old) will experience a mental health disorder (1). Depression, anxiety, and behavioral disorders among youth are among the foremost causes of illness and disability in childhood, often having a profound impact on young people's daily functioning, relationships, and development (1). Mental health disorders can drive adolescents to have suicidal thoughts, and in severe cases, lead to suicidal behaviors. In 2024, suicide was the most common cause of death in adolescents and young adults between the ages of 15–29 years old (1). Adolescence is a critical period for mental health because it is a time of rapid physical, emotional, and cognitive development (3). During this stage, adolescents are particularly vulnerable to

mental health challenges because of internal developmental shifts (e.g., brain chemistry) and external changes (e.g., academic pressures and social relationships) (3). It is also a time when adolescents begin to develop abstract thinking and a stronger sense of identity, making it an especially important time to intervene against the potential emergence of mental health disorders (3). Additionally, adolescents also face external stressors from their family, peers, and school environment. These pressures can add strain to relationships and leave many adolescents without a support system, often contributing to the development of mental health disorders later on in life (3). Identifying the factors in childhood that contribute to mental health disorders is crucial for timely and effective treatment. Early access to treatment can significantly improve overall mental health turnouts and the well-being of children (4).

One of the most widely recognized frameworks for understanding how early life stress impacts adolescent mental health is the concept of adverse childhood experiences (ACEs). ACEs are events during childhood that are either stressful or traumatic to the child. ACEs can be divided into two categories: 1) maltreatment (which includes physical/emotional neglect or abuse) and 2) household dysfunction (which includes incarceration of caregivers, witnessing intimate partner violence, and parental substance abuse) (4). There is a ten-question survey that is typically used to assess ACEs, and each question relates to a different ACE (5). The greater number of traumatic experiences that a child goes through during adolescence, the greater the risk that they will face mental health issues or psychological distress. Specifically, one study showed that compared to a child with no ACEs, a child with one or more ACE was more likely to have ADHD, behavior/conduct issues, anxiety, depression, and substance use disorder (5). In particular, adolescents who indicated experiencing childhood maltreatment were shown to be more likely to experience anxiety, depression, trauma, and externalizing behaviors (e.g., aggression, defiance, impulsivity, and conduct problems) (4). Additionally, depression is one of the most prominent mental health outcomes resulting from ACEs. Adults with four or more ACEs were shown to be 4.6 times more likely to experience depression compared to those without ACEs (6).

ACEs also lead to long-term physiological consequences (7). The trauma adolescents face may cause issues with emotional regulation, impulse control, and stress response (7). Furthermore, trauma can alter pathways in the brain, ultimately leaving adolescents more vulnerable to mental health challenges (7). For instance, experiences like physical and emotional abuse can disrupt the hypothalamic-pituitary-adrenal (HPA) axis, which is extremely important to the

body's stress response (7). Chronic activation of the HPA axis due to early trauma can lead to long-term dysregulation, resulting in heightened physiological reactivity to stress and difficulty distinguishing between safe and unsafe situations (7). Additionally, trauma exposure can also disrupt reward processing, making it hard for adolescents to experience pleasure or motivation, which can contribute to symptoms of anhedonia and disengagement (7). This can increase the chances of a variety of mental health issues, such as anxiety, depression, and post-traumatic stress disorder (7).

We aimed to analyze the relationship between early childhood trauma and mental health in adolescents by performing a secondary analysis of the data from the Child Maltreatment and Neural Networks Underlying Emotion Regulation, a research project funded by the National Institutes of Mental Health (8). One factor we used to determine mental health was "externalizing" symptoms, which we defined as difficulties with self-regulation, impulse control, and social interactions. We hypothesized that there would be 1) a strong positive correlation between childhood neglect and depression symptoms, 2) a strong positive correlation between abuse and externalizing symptoms, and 3) a statistically significant difference in reported mental health symptoms between those individuals with and without early life adversity (i.e., those with early life adversity would report higher levels of depression and behavioral issues). To analyze the data, we assessed the strength of correlations between adverse experiences (physical, emotional, and sexual abuse, as well as neglect) and mental health symptoms (i.e., depression and anxiety), as well as mean symptoms differences between individuals with and without reported adverse life experiences. In the current study, we explored: 1) the relationship between abuse and externalizing symptoms; 2) the relationship between neglect and depression symptoms; 3) the relationship between any adversity (abuse/neglect) and externalizing symptoms; and 4) the relationship between any adversity (abuse/neglect) and depression symptoms. Applying a secondary data analysis to investigate new constructs and how they interact is important because our understanding of childhood adversity and its mental health consequences continues to evolve, based on the influence of new theoretical models, shifts in diagnostic criteria, and emerging social and cultural factors.

RESULTS

To understand the mental health adversity faced by adolescents, we analyzed the Child Maltreatment and Neural Networks Underlying Emotion Regulation for varying factors. The sample we used included 68 females and 64 males, of which 51.15% percent reported experiencing some type of abuse, 24.24% reported neglect, and 54.54% reported any adversity (8). We found the average externalizing behavior score was $M = 56.49 (\pm 10.63)$. Adolescents scoring between 65 and 69 are considered borderline for externalizing behavior, and those who score greater than 70 are recommended for clinical intervention. The average depression score was $M = 8.61 (\pm 6.89)$, with normal scores ranging from 10 to 12. Those who score higher than 13 are considered to be showing depression symptoms (8). Analyses examined the relationships between abuse, neglect, adversity, externalizing symptoms, and depression.

We defined abuse as any experience of physical, sexual, or emotional abuse, neglect as any experience of emotional

or material deprivation (physical needs, food insecurity, etc.), and adversity as any experience of abuse or neglect. Depression symptoms were collected based on participants' answers to the Child Depression Inventory, where responses indicated the severity of the symptoms. Finally, we defined externalizing symptoms as outwardly directed behaviors (difficulties with self-regulation, impulse control, social interactions, etc.) (8).

To analyze the data, we started by performing independent sample t-tests (Welch's). The first two variables compared were the relationship between abuse experience and severity externalizing symptoms. The test revealed that children who experienced abuse had significantly higher externalizing symptoms than those who did not ($t(161) = 1.97, p < 0.001$, independent sample t-test) (**Figure 1**). Next, we compared neglect experience and severity of depression symptoms. The test revealed that children who experienced neglect had slightly higher depression symptoms than those who did not ($t(44) = 2.02, p = 0.01$, independent sample t-test) (**Figure 2**). Furthermore, we compared the relationship between adversity experience and severity of externalizing symptoms. The test revealed that children who experienced adversity had significantly higher externalizing symptoms than those who did not ($t(126) = 1.97, p < 0.001$, independent sample t-test) (**Figure 3**). The last relationship we analyzed was between adversity experience and severity of depression symptoms. The test revealed that children who experienced adversity had significantly higher depression symptoms than those who did not ($t(116) = 1.98, p < 0.001$, independent sample t-test) (**Figure 4**).

Additionally, we performed point-biserial correlations to discover the strength of the association between the factors. The strongest positive association was between abuse experience and severity of externalizing symptoms ($r = 0.61, p < 0.001$, point-biserial correlation) (**Figure 5**). We found a moderately positive association between adversity experience and severity externalizing symptoms ($r = 0.59, p < 0.001$, point-biserial correlation) (**Figure 6**). We discovered a weak positive association between adversity experience and severity of depression symptoms ($r = 0.39, p < 0.001$, point-biserial correlation) (**Figure 7**). We found the weakest positive association between neglect experience and severity of depression symptoms ($r = 0.25, p < 0.001$, point-biserial correlation) (**Figure 8**).

DISCUSSION

We explored the relationship between early adversity and adolescent mental health through a secondary analysis of a publicly available dataset containing information about childhood abuse and neglect, as well as subsequent adolescent depression and anxiety (8). Our analyses revealed significant differences in mental health symptoms among adolescents who experienced early childhood adversity and those who did not. Specifically, adolescents who experienced neglect and/or physical, emotional, and/or sexual abuse reported more severe externalizing and depression symptoms compared to those who did not experience early adversity. The strongest correlation was the relationship between abuse experience and externalizing symptoms. The weakest correlation was the relationship between neglect and depression symptoms. Our findings suggest that certain types of adversity can have a different degree of impact on specific mental health

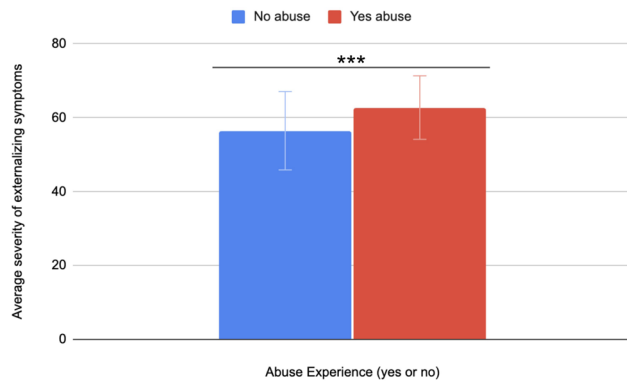


Figure 1. Mean differences of abuse experience versus severity of externalizing symptoms. There was a significant difference in mean severity of externalizing symptoms based on abuse history among adolescents aged 13–18 receiving outpatient mental health services. An independent sample t-test assuming unequal variances revealed a statistically significant difference between groups, $t(161) = 1.97$, $***p < 0.001$.

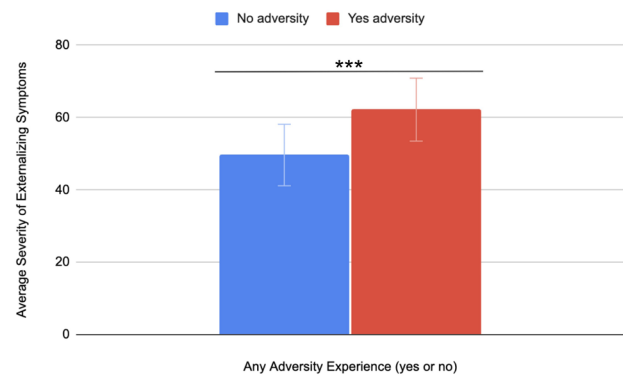


Figure 3. Mean differences of any adversity experience versus severity of externalizing symptoms. The difference in severity of externalizing symptoms between adolescents with and without reported adversity experiences, based on data from individuals aged 13–18 receiving outpatient mental health services. An independent sample t-test revealed a statistically significant difference between groups, $t(126) = 1.97$, $***p < 0.001$.

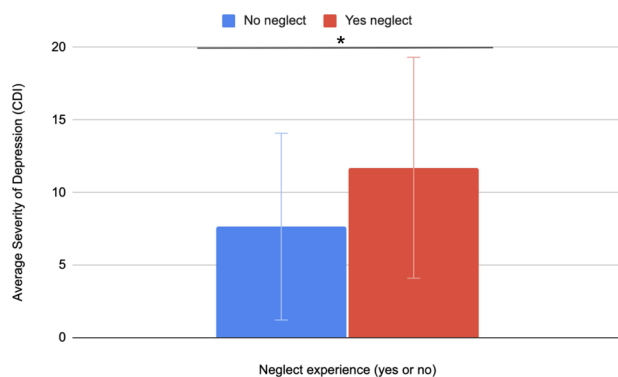


Figure 2. Mean differences of neglect experience versus severity of depression symptoms. The difference in severity of depressive symptoms based on reported experiences of neglect among adolescents aged 13–18 receiving outpatient mental health services. An independent sample t-test assuming unequal variances indicated a statistically significant difference between groups, $t(44) = 2.02$, $*p = 0.01$.

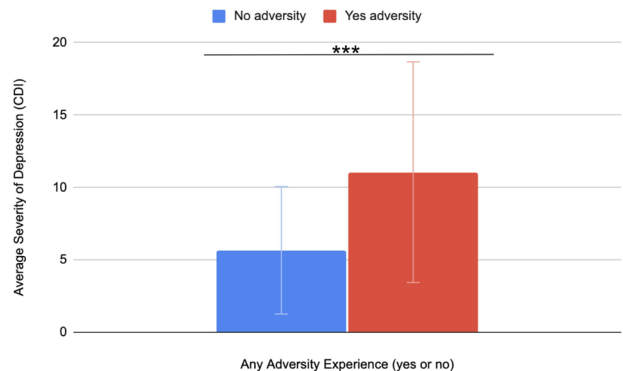


Figure 4. Mean differences of any adversity experience versus severity of depression symptoms. Differences in mean depressive symptom severity between adolescents with and without reported adversity, based on data from individuals aged 13–18 receiving outpatient mental health services. An independent sample t-test demonstrated a statistically significant difference between groups, $t(116) = 1.98$, $***p < 0.001$.

outcomes. Overall, the results of our study supported the hypotheses and prior research conducted on this topic. Our hypotheses were that there would be a strong positive correlation between childhood neglect and depression symptoms, abuse and externalizing symptoms, adversity and externalizing symptoms, and adversity and depression symptoms, and a statistically significant difference in mental health symptoms between those individuals with and without childhood adversity. We found that there were ranging positive correlations between ACEs and mental health outcomes. Our overall conclusion is that there was a statistically significant difference in mental health symptoms between those with and without childhood adversity.

There were a number of limitations to note in our study. For instance, the variables included in the data analysis were binary. Using binary variables, such as asking “yes/no” to record experiences, limits the study because it prevents us from knowing the severity of the abuse, neglect, or adversity experience. The severity and duration of the experience

could significantly impact the mental health outcome of an adolescent.

Our study paves the way for future research aimed at preventing and treating mental health disorders in adolescents with ACEs. We found varying correlations between different types of adversity. Therefore, our research encourages future studies to understand the complexities of adversity and its connection to mental health. For instance, researchers should look at each specific type of adversity in isolation and in combination, as well as account for the severity, amount of exposure, and when the exposure took place. Factoring specific types of adversity into the analyses would provide more robust insights into what aspects of adversity affect future mental health. Furthermore, this study contained both caregiver-reported and child-reported data. Future researchers could examine differences when adversity exposure and mental health are reported by the parent versus the child. The results may vary depending on the reporter, and a valuable next step could be looking at

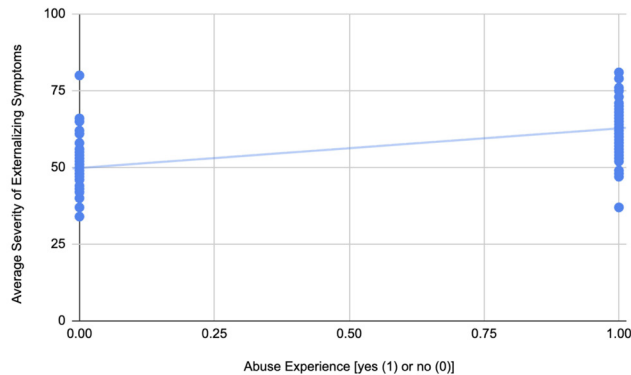


Figure 5. Correlation between abuse experience versus severity of externalizing symptoms. The relationship between abuse history and the severity of externalizing symptoms among adolescents aged 13–18 receiving outpatient mental health services. A point-biserial correlation revealed a strong positive association, $r = 0.61$, $***p < 0.001$.

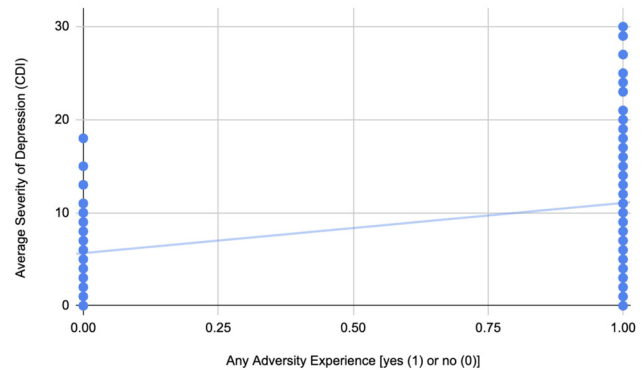


Figure 7. Correlation between any adversity experience versus severity of depression symptoms. The relationship between reported adversity and depressive symptom severity among adolescents aged 13–18 receiving outpatient mental health services. Point-biserial correlation analysis revealed a positive association, $r = 0.39$, $***p < 0.001$.

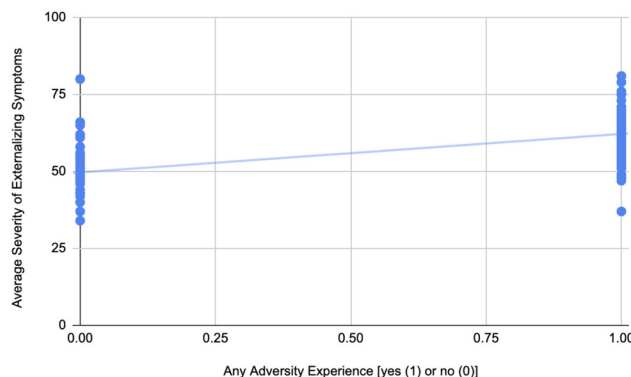


Figure 6. Correlation between any adversity experience versus severity of externalizing symptoms. The relationship between adversity exposure and externalizing symptom severity among adolescents aged 13–18 receiving outpatient mental health services. Point-biserial correlation analysis revealed a positive association between reported adversity and the severity of externalizing symptoms, $r = 0.59$, $***p < 0.001$.

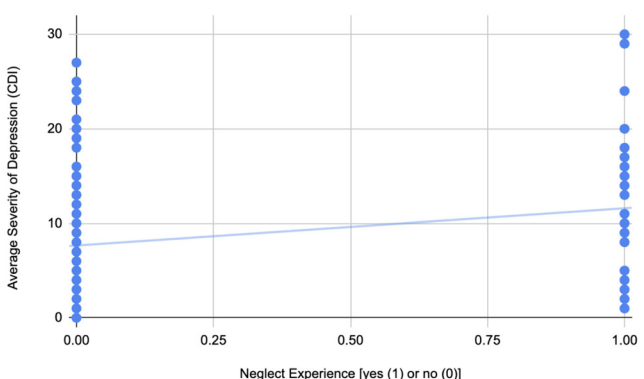


Figure 8. Correlation between neglect experience versus severity of depression symptoms. The relationship between reported neglect and severity of depressive symptoms among adolescents aged 13–18 receiving outpatient mental health services. A point-biserial correlation analysis revealed positive association, $r = 0.25$, $***p < 0.001$.

which results align with previously established trends. Finally, researchers should also consider protective factors, such as benevolent childhood experiences, that may help a child develop resilience in the face of adversity. These may include experiences such as having a dependable caregiver, positive social relationships, and a constant routine. By developing a greater understanding of how and when protective factors can act as a form of prevention against the negative impact of childhood adversity, treatment providers and researchers can move from theoretical understanding of these constructs towards prevention and intervention efforts supporting child and adolescent mental health.

MATERIALS AND METHODS

Study design and data source

In this study, we conducted a secondary analysis of data from the Child Maltreatment and Neural Networks Underlying Emotion Regulation, a research project funded by a National Institutes of Mental Health R01 (R01-MH103291) grant (8).

The original project aimed to investigate emotion regulation processes and treatment outcomes in adolescents who experienced childhood adversity and have a diagnosed mood disorder (8). The data is publicly available online and is able to be downloaded from the website Open Science Framework (8).

Participants

Participants were adolescents aged 13–18 ($M=16.57 \pm 1.41$; 61.9% female) who were recruited from outpatient mental health clinics as part of the original study grant (8). The study took data from the adolescents through three sessions: 1) evaluation of the inclusion/exclusion criteria, surveying and interviewing measures of trauma, psychopathology surveys, IQ evaluation, and behavioral assignments; 2) clinical interviews for psychopathology; and 3) collection of magnetic resonance imaging (MRI) data. The original study's sample consisted of 150 children who met the inclusion criteria, completed MRI scans, and had good-quality data.

However, our analysis included 132 participants as this was the sample for which data was accessible and uploaded to the open access website Open Science Framework. Per the original authors, all participants and caregivers gave informed consent to the study, adhering to ethical guidelines approved (8).

Procedure

In the original study, children and caregivers completed a series of questionnaires about the child's adversity experiences and the mental health symptoms. Our secondary analysis utilized this dataset to examine the relationship between abuse experiences and externalizing symptoms, neglect experiences and depression symptoms, adversity experiences and externalizing symptoms, and adversity experiences and externalizing symptoms.

Measures

The following variables are defined based on the original grant proposal and publication of this dataset (8).

"Depression symptoms" were quantified using the Child Depression Inventory (CDI-II), which is widely used to measure depression in adolescents (10). It consists of 28 items, each with three response options reflecting increasing severity on a scale from 0 to 2. The final CDI-II score is calculated by adding up the responses, and a higher score indicates greater severity of depression symptoms. The total raw scores were utilized, ranging from 0-56 (10). A score between 10 and 12 was considered "normal" for this metric. A score of 13 or above was considered to be showing depression symptoms.

"Externalizing symptoms" were defined following the original dataset authors as outwardly directed behaviors indicating difficulties with self-regulation, impulse control, and social interactions (8,9). These include aggression (e.g., verbal or physical hostility, bullying), oppositional behaviors (e.g., defiance, rule-breaking), hyperactivity and impulsivity (e.g., excessive movement, acting without thinking), and conduct problems (e.g., lying, stealing, truancy). In the original study, participants and their caregivers completed the Youth Self-Report (YSR) and Child Behavioral Checklist (CBCL), and the highest composite T-score from either reporter was used to capture externalizing symptoms (8). A score between 65 and 69 was considered "normal" for this metric. Those who had a score of 70 or higher were recommended for clinical intervention.

"Neglect" in this secondary analysis was defined based on the original study's composite measure of cognitive, emotional, and material deprivation. Cognitive deprivation reflects a lack of cognitive stimulation in the home. Emotional deprivation was assessed through standardized scores from emotional neglect measures, while material deprivation included physical needs, food insecurity, and physical neglect. These standardized scores were averaged to form a composite deprivation score, which was used to find out if there was an existence or absence of neglect.

"Any abuse" was defined following the original study as a binary composite variable indicating exposure to physical, sexual, or emotional abuse. Physical or sexual abuse was classified if described by either the child (using the Childhood Experience of Care and Abuse [CECA] interview, Post-Traumatic Stress Disorder Reaction Index [PTSD-RI] trauma

screen, or the Childhood Trauma Questionnaire [CTQ] threshold) or the parent (using the Conflict Tactics Scale [CTS], Juvenile Victimization Questionnaire [JVQ], or PTSD-RI trauma screen). Emotional abuse and domestic violence exposure were determined based on child reports only, using validated measures such as the CECA, CTQ, Violence Exposure Scale for Children-Revised [VEX-R] interview, or PTSD-RI trauma screen. The variable was coded as 1 for abuse exposure and 0 for no abuse.

"Any adversity" was defined in the original study as a binary variable indicating whether a child experienced neglect and/or any form of abuse based on their reported experiences from the questionnaires and interviews described above. A score of 1 represents exposure to abuse or neglect, while 0 indicates no exposure.

Statistical analyses

We performed a secondary data analysis using XLMiner Analysis ToolPak in Excel. T-tests and correlations were conducted to explore the relationships between early adversity and mental health outcomes. In the point-biserial correlations, we determined a correlation as strong if $r > 0.8$ and weak if $r < 0.2$.

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