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The mediating role of internalizing and externalizing symptoms in the association between child neglect and suicide attempt in adulthood

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Abstract

To examine the association between child neglect and adult suicide risk as well as the underlying mechanism. Adults aged 18 or older from the National Epidemiological Survey on Alcohol and Related Conditions Wave 3 who did not have suicide attempts before 18 were included (N = 35,275). Child neglect was categorized into emotional and physical neglect. Suicide risk was captured by suicide attempt. Mediators included internalizing and externalizing symptoms. Natural effect models along with regression analyses were used to estimate the mediated models. Respondents who reported child emotional neglect had greater odds of attempting suicide than those who did not report child emotional neglect. This association was partially mediated by internalizing symptoms. Child emotional neglect is associated with greater odds of suicide attempt and internalizing symptoms partially mediate this association. These results highlight the importance of a comprehensive approach to suicide prevention which includes providing safe, stable, nurturing relationships and environments to prevent child neglect.

Keywords

Child neglect; suicide; internalizing; externalizing; mediation; adverse childhood experience

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1. Introduction

Suicide is the 10th leading cause of death in the United States (48,334 people died from suicide in 2018) (Xu et al., 2020) and has become a serious public health issue. From 1999 to 2018, the age-adjusted suicide rate increased by 35.5%, from 10.54 to 14.2 per 100,000 population (Hedegaard et al., 2018a; 2018b; Xu et al., 2020). The rates of emergency department visits for nonfatal self-harm increased by 39%, from 112.8 per 100,000 in 2001 to 158.2 in 2018 (Centers for Disease Control & Prevention. National Center for Injury Prevention & Control, 2020). The economic burden of suicide is substantial; the direct medical and work loss costs are approximately $70 billion per year (Stone et al., 2018).

Research shows that adverse childhood experiences (ACEs)—a collection of potentially traumatic experiences that occur during childhood—are associated with a variety of negative outcomes in adulthood, including suicide risk (Afifi et al., 2008; Brockie et al., 2015; Dube et al., 2001, 2003; Duprey et al., 2019; Felitti et al., 1998; Merrick et al., 2019; Tang et al., 2020). Chronic or repeated exposure to toxic stress from ACEs can disrupt the architecture of the developing brain and important regulatory systems, which influence health (Garner et al., 2012; Shonkoff & Garner, 2012). ACEs include a variety of negative childhood experiences, including family violence, substance abuse in the household, and parental divorce (Bethell et al., 2017; Felitti et al., 1998). However, research consistently finds that among those experiences, exposure to child maltreatment often has the greatest impact on negative outcomes (Merrick et al., 2017). Child neglect is one type of ACE and is consistently the most prevalent type of child maltreatment according to the child protective services (CPS) reports: about 411,969 children in the United States suffered from neglect alone in 2018 and they account for 60.8% of child maltreatment victims (Children's Bureau, 2020). The rate is underestimated as less severe incidents of neglect are often not reported to CPS (DePanFilis, 2006; Dubowitz et al., 2004). Although investigated child neglect cases have declined by 11 percent from 1992 to 2018, the decline is much smaller than that of sexual and physical abuse, which have declined more than 50% during the same time period (Finkelhor et al., 2020). Given the prevalence and potential impact, it is imperative to study exposure to neglect so that prevention and response practitioners can have a better understanding of the association of child neglect with adult suicide risk.

Although neglect and abuse comprise child maltreatment, neglect is different from abuse in notable ways. Child abuse is defined as acts of commission by a caregiver that result in harm, potential for harm or threat of harm to a child. Child neglect is defined as acts of omission or the failure by a caregiver to meet a child's basic physical, emotional, medical/dental or educational needs, or combination thereof (Leeb et al., 2008). Unlike abuse, neglect is not as easily identifiable (Hildyard & Wolfe, 2002), because it contains acts of omission, which are often less visible (Hecker et al., 2019; Mennen et al., 2010). In addition, child neglect usually presents as chronic exposures (Hecker et al., 2019; Korbin & Krugman, 2014) (recur persistently over time) and has an accumulating effect on subsequent developmental abilities and limitations (Hildyard & Wolfe, 2002). Compared with abused children, neglected children interact less with peers (Erickson et al., 1989), have fewer positive social interactions and have poorer coping abilities (Hildyard & Wolfe, 2002). For instance, it is more difficult for neglected children to distinguish others' emotional

expression such as happiness and sadness, which could negatively impact social and emotional well-being (Pollak et al., 2000). Neglected children also show different patterns of response to stress than abused children; abused children tend to become angry under stress, while neglected children are more likely to be passive and tend toward helplessness (Erickson et al., 1989). In addition, neglected children are more likely than abused children to have internalizing symptoms but are less likely to have externalizing symptoms (Hildyard & Wolfe, 2002). Research also supports that different types of child neglect such as emotional neglect (i.e., caregiver ignores the child, or denies emotional responsiveness or adequate access to mental health care) and physical neglect (i.e., caregiver fails to provide adequate nutrition, hygiene, or shelter; or, caregiver fails to provide clothing that is adequately clean, appropriate size, or adequate for the weather) (Leeb et al., 2008) have different influences on child development (Dubowitz et al., 2002, 2004; Egeland et al., 1983). Therefore, it is essential to examine the detrimental impacts of different types of child neglect separately.

Although child neglect usually co-occurs with other ACEs (Dong et al., 2004), it may influence child physical and emotional development in a unique way, and may in turn increase suicide risk for those children in their adulthood. Limited research (Thompson et al., 2019; Wang et al., 2019) has examined the association between child neglect or specific type of neglect and suicide risk in adulthood. One study found that neglect was not associated with higher odds of suicide ideation and attempt (Thompson et al., 2019); whereas another study using a college-student sample, child emotional neglect but not physical neglect was found to be associated with suicide ideation (Wang et al., 2019). In addition, the mechanism through which child neglect is associated with suicide risk remains understudied. It is well documented that internalizing symptoms (e.g., hopelessness, depression, anxiety) and externalizing symptoms (e.g., antisocial behaviors, aggression) are associated with both child neglect and suicide risk (Apter et al., 1988; Beck et al., 1975, 1985; Bolger & Patterson, 2001; Dubowitz et al., 2002; Hecker et al., 2019; Minkoff et al., 1973; Sareen et al., 2005; Soto-Sanz et al., 2019; Verona et al., 2004; Verona & Patrick, 2002; Wetzel, 1976). For instance, child neglect was positively associated with child internalizing symptoms (Bolger & Patterson, 2001). In a young sample (aged 6–9 years), child neglect was found to be associated with both internalizing and externalizing symptoms (Hecker et al., 2019). Further, prior studies examined the relationship between the sub-types of child neglect and internalizing/externalizing symptoms, indicating that emotional neglect (but not physical neglect) was associated with both internalizing and externalizing symptoms at age 3 (Dubowitz et al., 2002). Mounting evidence shows that internalizing symptoms (Beck et al., 1975, 1985; Minkoff et al., 1973; Sareen et al., 2005; Soto-Sanz et al., 2019; Wetzel, 1976) and externalizing symptoms (Apter et al., 1988; Verona et al., 2004; Verona & Patrick, 2002) may be associated with attempted suicide and suicide intent. However, it is not clear whether internalizing and externalizing symptoms mediate the association of child neglect and adult suicide risk.

In the present study, we investigated the association of child neglect (including emotional and physical) with suicide attempt in adulthood and whether internalizing and externalizing symptoms mediate this association. In order to understand the long-term association of child neglect with suicide risk in adulthood, we focused on adult suicide attempt. We

hypothesize that 1) child neglect is associated with suicide attempt in adulthood; and 2) both internalizing and externalizing symptom mediate the association of child neglect and adult suicide attempts.

2. Materials & methods

2.1. Data and study sample

We used data from Wave 3 of the National Epidemiological Survey on Alcohol and Related Conditions (NESARC-III) conducted in 2012–2013 by the National Institute on Alcohol Abuse and Alcoholism. The NESARC-III is a nationally representative sample of the non-institutionalized adult population in the United States (N = 36,309). A total of 837 respondents were excluded because they attempted suicide before 18 years old. Additionally, 197 respondents did not answer the questions regarding either lifetime suicide attempt or the age at first suicide attempt, and therefore they were excluded from the analysis sample. After applying these exclusions, the final sample size is N = 35,275. This study utilized the existing deidentified data and was deemed exempt from review by the Institutional Review Board of Indiana University.

2.2. Measures

2.2.1. Outcome variables—Suicide attempt in adulthood served as the outcome variable. This variable was created based on two variables: lifetime suicide attempt and the age at first suicide attempt. It is a binary variable coded as “1” for attempted suicide at or after 18 years old and “0” otherwise. We excluded the respondents who attempted suicide before 18 years old for three reasons: 1) We wanted to understand the long-term association of child neglect with suicide risk in adulthood; 2) people who attempted suicide before 18 years old may have incomparably higher risk of attempting suicide in adulthood than those who did not as previous research has shown that previous suicide attempt is a risk factor for current suicide attempt (Borowsky et al., 2001; Christiansen & Jensen, 2007); and 3) excluding them ensures neglect happens before the first suicide attempt.

2.2.2. Primary independent variables—Child physical and emotional neglect variables are the primary independent variables. Respondents were asked about both their child emotional neglect and physical neglect experiences (detailed items in Appendix A). Respondents were coded as “1” if they were exposed to child emotional neglect, as specified in a previous study (Dong et al., 2004). The same coding rule was used for the creation of the physical neglect variable.

2.2.3. Mediator variables—The hypothesized mediator variables are internalizing and externalizing symptoms, as identified in the Global Appraisal of Individual Needs – Shorter Screener (GAIN-SS). The reliability of GAIN-SS has been validated (Dennis et al., 2006). Items from NESARC-III based on the GAIN-SS manual were selected. Since the outcome examined is suicide attempt, we excluded suicide related items from the internalizing symptoms variable. Eleven items measuring internalizing symptoms and fourteen items measuring externalizing symptoms (see Appendix B) were included. Cronbach’s alphas suggest that our scales for internalizing ($\alpha = 0.78$) and externalizing ($\alpha = 0.74$) symptoms

are reliable. Reports of yes to each question are coded as 1 and or 0 otherwise, and then summed. Each respondent received a total score for lifetime internalizing symptoms (ranged from 0 to 11) and externalizing symptoms (ranged from 0 to 14).

2.2.4. Control variable: ACE score—A composite ACE score excluding emotional/physical neglect was created based on nineteen questions regarding the following ACEs categories: emotional abuse, physical abuse, sexual abuse, household physical violence, household substance abuse, incarcerated household member, household mental illness, and parental separation or divorce (see Appendix C). Following the same method as a previous study (Dong et al., 2004), questions were collapsed for each ACEs category, and exposure was determined. Respondents were coded as a "1" if they were exposed to that category of ACE. Our data show 32% of emotionally neglected respondents were physically neglected; 39% of physically neglected respondents were emotionally neglected. To control for overlap, if the primary independent variable is emotional neglect, then the ACE score variable excludes emotional neglect and retains physical neglect. The same rule applies for the creation of the physical neglect variable. We summed the number of ACE categories each respondent was exposed to and yielded an ACE score (ranged from 0 to 9).

2.2.5. Control variable: sociodemographic and alcohol use disorder variables—Sociodemographic and alcohol use disorder were included as control variables, including: self-reported sex (male/female), age, race/ethnicity (non-Hispanic white, non-Hispanic black, Non-Hispanic American Indian, Non-Hispanic Asian, Hispanic), education (less than high school, high school, some college, college, or graduate school), marital status (married or not), region (Northeast, Midwest, South, or West), and employment status (employed or not). We also included lifetime alcohol use disorder (yes/no) as a control variable because literature indicates that alcohol dependence is a risk factor for suicide (Hufford, 2001).

2.3. Statistical analyses

Descriptive statistical analysis among respondents not attempting suicide in adulthood and respondents attempting suicide in adulthood was conducted using Chi-square tests and t tests for between-group differences. A two-step approach was then used to conduct the remaining statistical analysis whereby the association between emotional/physical neglect and suicide attempt controlling for ACE score, sociodemographic, and alcohol use disorder variables but leaving out the mediator was first analyzed. If a significant association was found, mediation analyses were conducted. The mediation models are provided in Figure 1. Path *c* represents the direct effects of child neglect on suicide attempt in adulthood. Path *a* and path *b* together represent indirect effects of child neglect on suicide attempt in adulthood that are associated with mediators. The natural effect model (NEM) (Valeri & VanderWeele, 2013) was used to examine the association of child physical or emotional neglect with suicide attempt in adulthood and the mediating roles of internalizing and externalizing symptoms, while other ACEs, socioeconomic variables, and alcohol use disorder were controlled. Because there are two mediators, one mediator was controlled for while the mediation effect of the other was estimated. Observations with missing values on variables used in the NEM were excluded from the regression analysis. All statistical analyses were conducted using Stata

SE 15 (College Station, TX). The Stata package “paramed” was used to conduct mediation analyses. This package does not allow the use of survey weights from complex surveys; thus, the survey weights provided by NESARC to generate national estimates were not used in the analysis.

3. Results

Comparison of respondents who attempted suicide in adulthood with those who did not attempt suicide in adulthood demonstrated that respondents who attempted suicide in adulthood have higher prevalence of emotional neglect and physical neglect, higher ACE scores, and more internalizing symptoms and externalizing symptoms than those who did not (Table 1).

A significant association was found between emotional neglect and suicide attempt while leaving out the mediator, but not for physical neglect (see Appendices D and E for the two-step approach). Only mediation analyses for emotional neglect was conducted. The estimates of the direct effect of child emotional neglect with suicide attempt in adulthood, while controlling for internalizing symptoms, externalizing symptoms, ACE score, sociodemographic and alcohol use disorder are provided in Table 2. The adjusted odds ratios (AORs) were reported. Respondents reporting child emotional neglect had greater odds of attempting suicide (direct AOR = 1.45, 95% CI: 1.23, 1.72) than those who did not experience child emotional neglect.

NEM demonstrated that the association between emotional neglect and suicide attempt is not mediated by externalizing symptoms, whereas internalizing symptoms partially mediates the association between emotional neglect and suicide attempt (Table 3). The estimate of the total effect is reported in the first column of Table 3. When both the direct and indirect effect through internalizing symptoms are included, being exposed to child emotional neglect is associated with greater odds of suicide attempt in adulthood (AOR = 1.55, 95% CI: 1.31, 1.84). The third column of Table 3 presents the estimates of the indirect effect. Internalizing symptoms partially mediate the association between child emotional neglect and suicide attempt in adulthood (indirect AOR = 1.07, 95% CI: 1.04, 1.10; proportion mediated = 18%).

4. Discussion

This study examined the association of child physical and emotional neglect with suicide attempt in adulthood and whether internalizing/externalizing symptoms mediate this association. Child emotional neglect and physical neglect were studied separately as the different types of neglect may influence child development and later suicide risk in different ways. To our knowledge, this is the first study that focuses on how internalizing and externalizing symptoms mediate the associations between different types of child neglect and suicide attempts in adulthood.

Child emotional neglect is associated with suicide attempt in adulthood, which is consistent with prior research indicating that child neglect impacts health and wellbeing later in life (Johnson et al., 2000; Wang et al., 2019). There was no significant association between

child physical neglect and suicide attempt in adulthood after controlling for internalizing symptoms or externalizing symptoms, ACE score, sociodemographic and alcohol use disorder. Further examination of the mediating roles of internalizing/externalizing symptoms demonstrated that internalizing symptoms partially mediates this association whereas externalizing symptoms does not. As such, individuals who experienced childhood emotional neglect have higher suicide risk in adulthood. This is not surprising given that exposure to emotional neglect has been associated with harmful impacts on child development (Hildyard & Wolfe, 2002), adult psychological functioning (Wark et al., 2003) and adult mental health (Pederson & Wilson, 2009). Interestingly, physical neglect was not associated with adult suicide attempt, which is consistent with previous findings that physical neglect was not associated with adult suicide attempts (Thompson et al., 2019) and lifetime suicide ideation (Wang et al., 2019). It could be that physical neglect does not cause as much emotional trauma as emotional neglect, or it might be easier for individuals to rationalize their experience of physical neglect if they come from families with fewer resources but harder to rationalize their experience of emotional neglect. Future research is needed to understand what underlies this relationship. Our findings also suggest that different types of child neglect may have differential impacts on adult suicide risk, though both types of neglect could co-occur. Child emotional neglect may not be as easily detected as physical neglect because it is less visible, nevertheless it has a chronic and detrimental impact on child development and adult mental health. These findings suggest that type of child neglect should be considered when designing suicide prevention interventions.

Although child neglect is the most prevalent type of child maltreatment, its potential long-term detrimental impact is understudied. Our study provides further evidence that child neglect may be associated with serious outcomes and highlight the importance of community-based comprehensive prevention that addresses both ACEs and suicide. Such approaches include primary prevention of child neglect including interventions such as parenting programs (Chen & Chan, 2016; Fortson et al., 2016; Ports et al., 2017) and home visiting (Fortson et al., 2016; Howard & Brooks-Gunn, 2009), and macro-level policies such as tax credits (e.g., the Earned Income Tax Credit and Child Tax Credit) and family friendly work policies (e.g., paid family leave, flexible work schedule) that increase economic stability (Bullinger et al., 2020;; Centers for Disease Control & Prevention, 2019; Fortson et al., 2016). Comprehensive approaches also support people already at risk through training to identify, respond, and effectively care for people at risk of suicide or who have internalizing symptoms (Stone et al., 2017). For example, the finding that internalizing symptoms partially mediate the relationship between emotional neglect and suicide attempt suggests that interventions to treat internalizing symptoms such as depression, anxiety, loneliness when they occur may prevent suicide in adulthood. For instance, a parent-adolescent relationship intervention program, Attention-Based Family Therapy, was designed to treat depression and found to be effective in reducing suicide ideation (Diamond et al., 2010). Additionally, Dialectical Behavior Therapy, another intervention program to treat distress, demonstrated protective effects for suicide attempt (Linehan et al., 2006; Stone et al., 2017).

In preventing ACEs and promoting healthy outcomes across the lifespan, health care providers and prevention practitioners, such as pediatric medical providers, mental health providers, and other prevention specialists, are uniquely qualified to treat and prevent

ACEs and other sources of toxic stress to ensure that children reach their full health and life potential (Garner et al., 2012). For primary prevention of ACEs and subsequently suicide, health care providers and prevention practitioners can provide consistent messaging about positive parenting techniques, encourage multi-generational activities that promote safe, stable, nurturing relationships and environments (Chen & Chan, 2016; Fortson et al., 2016; Howard & Brooks-Gunn, 2009; Ports et al., 2017), and support policies and programs that strengthen the capacity of the medical home and benefit children and families (Bullinger et al., 2020;; Centers for Disease Control & Prevention, 2019; Fortson et al., 2016). Because health care providers interact directly with patients and their families, they are often the first to identify and address ACEs. As such, health care providers can screen patients and their families for social determinants of health (e.g., poverty, parental educational level, employment status, and zip code), measures of family dysfunction (e.g., maternal depression, substance abuse, food or housing insecurity) and known risk factors for ACEs, and provide referrals to programs (e.g., parent education, substance use treatment) and resources (e.g., job training, economic supports) to help alleviate risk. When patients have already been exposed to ACEs or are exhibiting symptoms, including mental health concerns, health care providers can collaborate with local service providers who offer evidence-based treatments and trauma informed services that help children and families cope with stress and change unhealthy behaviors (Diamond et al., 2010; Linehan et al., 2006; Stone et al., 2017). Collectively, these strategies can prevent ACEs and mitigate the impact of toxic stress on young children to ensure a bright and healthy future.

There are limitations of this study. First, we were unable to determine the temporal sequence of internalizing and externalizing symptoms because the survey asked about lifetime symptoms. It is possible that individuals experienced neglect and internalizing and externalizing symptoms simultaneously. It is also possible that internalizing or externalizing symptoms developed after an individual attempted suicide. Future longitudinal research is needed to disentangle the temporal relationships between child neglect, and internalizing/externalizing symptoms as well as between internalizing/externalizing symptoms and suicide attempt in adulthood. Second, child neglect beginning at earlier stages in life might have different effects at later stages, so we may not capture the heterogeneity of the effects. Since the ACE questions in NESARC-III did not provide details regarding when neglect happened, we were not able to analyze the potential age effect. Third, survey weights were not used in the present study due to the complex statistical analyses. As such, our estimates are not nationally representative and may have limited generalizability. In addition, as multiple adults within the same household were interviewed in NESARC-III, the sample clustering may result in potential imprecision of our estimates. Fourth, as NESARC-III was conducted in 2012–2013, the findings may not fully reflect factors that are contributing to recent increases in U.S. suicide rates. Despite these limitations, this study provides important findings for upstream suicide prevention strategies.

5. Conclusion

In conclusion, child emotional neglect is associated with suicide attempt in adulthood and this association is partially mediated by internalizing symptoms. Child neglect, a common ACE, and suicide are preventable public health problems. States and communities are

encouraged to make use of the best available evidence for preventing child neglect, other ACEs, and suicide to develop a comprehensive prevention approach, including providing children with safe, stable, and nurturing relationships and environments and implementation of other community-based strategies (Fortson et al., 2016; Stone et al., 2017).

Appendix A.: Neglect Items Included in NESARC-III

Item	Content	Neglect category
	Before you were 18 years old:	
1	How often did a parent/other adult living in your home make you go hungry or not prepare regular meals?[a]	Physical neglect
2	How often did you go without things you needed like clothes, shoes or school supplies because a parent/other adult living in your home spent the money on themselves?[a]	Physical neglect
3	How often did a parent/other adult living in your home ignore or fail to get you medical treatment when you were sick or hurt?[a]	Physical neglect
4	How often were you made to do chores that were too difficult or dangerous for someone your age?[a]	Physical neglect
5	How often were you left alone or unsupervised when you were too young to be alone, that is, before you were 10 years old?[a]	Physical neglect
6	Felt there was someone in family who wanted me to be a success?[b]	Emotional neglect
7	Felt there was someone in family who helped me feel I was important or special?[b]	Emotional neglect
8	My family was a source of strength and support?[b]	Emotional neglect
9	Felt I was part of a close knit family?[b]	Emotional neglect
10	Someone in my family believed in me?[b]	Emotional neglect

[a]Likert scale – never, almost never, sometimes, fairly often, very often.

[b]Likert scale – never true, rarely true, sometimes true, often true, very often true; the question was reverse-scored.

Appendix B: Internalizing/Externalizing Symptom Items Included in NESARC-III

GAIN-SS subscale	Item	Content	Reliability
Internalizing symptoms		*In your entire life, have you (items 1–2)*	Cronbach's $\alpha = 0.78$
	1	Ever had 2 week period when felt sad, hopeless, depressed, or down nearly every day?[a]	
	2	Ever had 2 week period when other people noticed that you were sad, hopeless, depressed, or down nearly every day?[a]	
		In your entire life, did you (items 3–4)	
	3	Have trouble falling asleep nearly every day for 2+ weeks?[a]	
	4	Wake up too early nearly every day for 2+ weeks?[a]	
	5	When your mood was at its lowest for at least 2 years, did you often have trouble falling asleep, staying asleep, or waking up too early?[a]	
		When you were the most worried or anxious for at least 3 months, did you (items 6–7)	
	6	Often have trouble falling/staying asleep?[a]	
	7	Often have such restless sleep that you woke up tired?[a]	

GAIN-SS subscale	Item	Content	Reliability
		When your mood was at its lowest, did you (items 8–11)	
	8	Feel keyed up or tense for at least 2 weeks?[a]	
	9	Spend a lot of time worrying about unpleasant things for at least 2 weeks?[a]	
	10	Fear something awful may happen for at least 2 weeks?[a]	
	11	Have you ever had a time lasting at least 3 months when you felt extremely worried or anxious about many different things?[a]	
Externalizing symptoms[a]		*In your entire life, did you (items 15–28)*	Cronbach's $\alpha = 0.74$
	12	Have a time when you lied a lot, other than to avoid being hurt?[a]	
	13	Use a false and made-up name or alias?[a]	
	14	Scam or con someone for money, to avoid responsibility or just for fun?[a]	
	15	Often bully or push people around or try to make them afraid of you?[a]	
	16	Often get people to do what you wanted by making them afraid not to?[a]	
	17	Get into a lot of fights that you started?[a]	
	18	Physically hurt another person in any other way on purpose?[a]	
	19	Get into a fight that came to swapping blows with someone like a husband, wife, girlfriend or boyfriend?[a]	
	20	Use a weapon like a stick, knife, or gun in a fight?[a]	
	21	Hit someone so hard that you injured them or they had to see a doctor?[a]	
	22	Harass, threaten or blackmail someone?[a]	
	23	Often cut class, not go to class or go to school and then leave without permission?[a]	
	24	Run away from home overnight at least twice or run away and stay away for a longer time?[a]	
	25	Stay out late at night even though your parents or caregivers told you to stay home[a]	

[a]Dichotomous scale – yes/no.

Appendix C: Other ACE Items Included in NESARC-III

Item	Content	Other ACEs category
	Before you were 18 years old:	
1	How often did a parent/other adult living in your home swear at or insult you or say hurtful things?[a]	Emotional abuse
2	How often did a parent/other adult living in your home act in any other way that made you afraid you would be physically hurt?[a]	Emotional abuse
3	How often did a parent/other adult living in your home push, grab, shove, slap or hit you?[a]	Physical abuse
4	How often did a parent/other adult living in your home hit you so hard that you had marks or bruises or were injured?[a]	Physical abuse
5	How often did an adult/other person touch or fondle you in a sexual way when you didn't want them to or were too young to know what was happening?[a]	Sexual abuse
6	How often did an adult/other person have you touch their body in a sexual way when you didn't want to or were too young to know what was happening?[a]	Sexual abuse
7	How often did an adult/other person attempt to have sexual intercourse with you when you didn't want them to or were too young to know what was happening?[a]	Sexual abuse

Item	Content	Other ACEs category
8	How often did an adult/other person actually have sexual intercourse with you when you didn't want them to or were too young to know what was happening?[a]	Sexual abuse
9	How often did your father/other adult male push, grab, slap or throw something at your mother/other adult female?[a]	Household physical violence
10	How often did your father/other adult male kick, bite, hit your mother/other adult female with a fist or something hard?[a]	Household physical violence
11	How often did your father/other adult male repeatedly hit your mother/other adult female for at least a few minutes?[a]	Household physical violence
12	How often did your father/other adult male threaten your mother/other adult female with a knife/gun or use a knife/gun to hurt her?[a]	Household physical violence
13	Parent/other adult living in home was a problem drinker/alcoholic?[b]	Household substance abuse
14	Parent/other adult living in home had similar problems with drugs?[b]	Household substance abuse
15	Parent/other adult living in home went to jail or prison?[b]	Incarcerated household member
16	Parent/other adult living in home was treated/hospitalized for a mental illness?[b]	Household mental illness
17	Parent/other adult living in home attempted suicide?[b]	Household mental illness
18	Parent/other adult living in home actually committed suicide?[b]	Household mental illness
19	Did biological or adoptive parents get divorced or permanently stop living together before respondent was 18?[b]	Parental separation/ divorce

[a] Likert scale – never, almost never, sometimes, fairly often, very often.

[b] Dichotomous scale – yes/no.

Appendix D: Testing the Association of Child Emotional Neglect with Adult Suicide Attempt Leaving out Mediator: National Epidemiological Survey on Alcohol and Related Conditions, 2012–2013

	Attempted suicide in adulthood (excluding internalizing symptoms)		Attempted suicide in adulthood (excluding externalizing symptoms)	
Variables	AOR[a]	(95% CI)	AOR[a]	(95% CI)
Emotional neglect: yes	1.53**	(1.31, 1.80)	1.44**	(1.22, 1.72)
ACE score	1.29**	(1.25, 1.33)	1.22**	(1.18, 1.26)
Internalizing symptom score	–	–	1.32**	(1.29, 1.34)
Externalizing symptom score	1.19**	(1.15, 1.22)	–	–
Sex: Female	1.72**	(1.50, 1.97)	1.14	(0.99, 1.30)
Age	1.01**	(1.01, 1.02)	1.01**	(1.00, 1.01)
Race/ethnicity				
Non-Hispanic white	(Ref.)		(Ref.)	
Non-Hispanic black	0.62**	(0.52, 0.74)	0.78**	(0.66, 0.94)
American Indian	1.09	(0.72, 1.65)	1.14	(0.74, 1.75)
Non-Hispanic Asian	0.54*	(0.33, 0.87)	0.63	(0.39, 1.03)

	Attempted suicide in adulthood (excluding internalizing symptoms)		Attempted suicide in adulthood (excluding externalizing symptoms)	
Variables	**AOR[a]**	**(95% CI)**	**AOR[a]**	**(95% CI)**
Hispanic	0.88	(0.73, 1.05)	1.00	(0.83, 1.20)
Education				
Less than high school	(Ref.)		(Ref.)	
High school	0.99	(0.82, 1.20)	0.96	(0.79, 1.17)
Some college	0.98	(0.81, 1.18)	0.90	(0.74, 1.08)
College	0.69**	(0.54, 0.89)	0.59**	(0.46, 0.76)
Graduate school	0.59**	(0.42, 0.82)	0.46**	(0.32, 0.64)
Married: yes	0.65**	(0.57, 0.75)	0.69**	(0.60, 0.80)
Region				
Northeast	(Ref.)		(Ref.)	
Midwest	0.99	(0.80, 1.23)	1.06	(0.85, 1.32)
South	1.13	(0.93, 1.38)	1.19	(0.97, 1.46)
West	0.96	(0.78, 1.19)	1.01	(0.81, 1.26)
Unemployed: yes	0.91	(0.72, 1.16)	0.94	(0.74, 1.20)
Alcohol use disorder: yes	2.04**	(1.78, 2.35)	1.77**	(1.54, 2.03)
n	35,229		35,229	

* $p < .05$;
** $p < .01$.

AOR = adjusted odds ratio; CI = confidence interval.

[a]Models were adjusted for internalizing/externalizing symptoms, ACE score, sex, race/ethnicity, education, marital status, region, employment status, and alcohol use disorder when appropriate.

Appendix E: Testing the Association of Child Physical Neglect with Adult Suicide Attempt Leaving out Mediator: National Epidemiological Survey on Alcohol and Related Conditions, 2012–2013

	Attempted suicide in adulthood (excluding internalizing symptoms)		Attempted suicide in adulthood (excluding externalizing symptoms)	
Variables	**AOR[a]**	**(95% CI)**	**AOR[a]**	**(95% CI)**
Physical neglect: yes	1.02	(0.85, 1.22)	0.93	(0.77, 1.12)
ACE score	1.35**	(1.30, 1.40)	1.28**	(1.24, 1.33)
Internalizing symptom score	–	–	1.32**	(1.29, 1.34)
Externalizing symptom score	1.18**	(1.15, 1.22)	–	–
Sex: Female	1.70**	(1.49, 1.95)	1.12	(0.98, 1.29)
Age	1.01**	(1.01, 1.02)	1.01**	(1.006, 1.014)
Race/ethnicity				
Non-Hispanic white	(Ref.)		(Ref.)	
Non-Hispanic black	0.62**	(0.52, 0.74)	0.77**	(0.65, 0.93)
American Indian	1.09	(0.72, 1.65)	1.13	(0.74, 1.73)

	Attempted suicide in adulthood (excluding internalizing symptoms)		Attempted suicide in adulthood (excluding externalizing symptoms)	
Variables	**AOR[a]**	**(95% CI)**	**AOR[a]**	**(95% CI)**
Non-Hispanic Asian	0.55 *	(0.34, 0.89)	0.64	(0.39, 1.04)
Hispanic	0.89	(0.74, 1.06)	1.01	(0.84, 1.21)
Education				
Less than high school	(Ref.)		(Ref.)	
High school	0.97	(0.81, 1.18)	0.94	(0.78, 1.15)
Some college	0.97	(0.80, 1.16)	0.88	(0.73, 1.07)
College	0.69 **	(0.54, 0.88)	0.58 **	(0.45, 0.75)
Graduate school	0.58 **	(0.42, 0.81)	0.45 **	(0.32, 0.63)
Married: yes	0.65 **	(0.57, 0.75)	0.69 **	(0.60, 0.80)
Region				
Northeast	(Ref.)		(Ref.)	
Midwest	1.00	(0.80, 1.24)	1.06	(0.85, 1.33)
South	1.15	(0.94, 1.40)	1.21	(0.99, 1.47)
West	0.97	(0.78, 1.20)	1.03	(0.82, 1.28)
Unemployed: yes	0.91	(0.72, 1.16)	0.94	(0.74, 1.19)
Alcohol use disorder: yes	2.02 **	(1.75, 2.31)	1.74 **	(1.52, 2.01)
n	35,243		35,243	

* $p < .05$;

** $p < .01$.

AOR = adjusted odds ratio; CI = confidence interval.

[a]Models were adjusted for internalizing/externalizing symptoms, ACE score, sex, race/ethnicity, education, marital status, region, employment status, and alcohol use disorder when appropriate.

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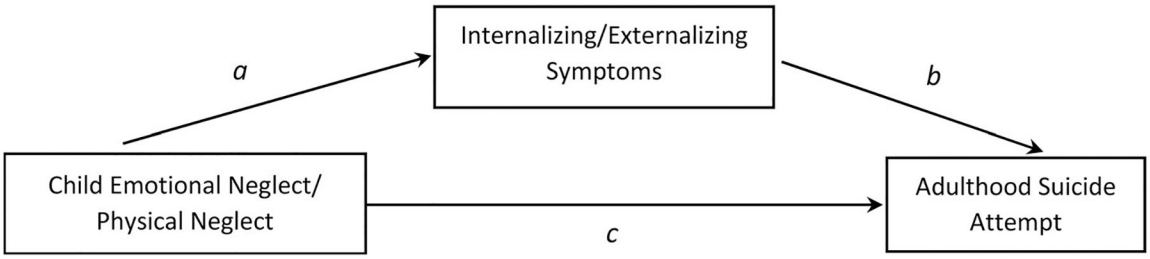

Figure 1.
The concept model of the mediation relationship.

Table 1.

Descriptive overview of the study sample by adult suicide attempt status: National Epidemiological Survey on Alcohol and Related Conditions, 2012–2013.[a]

	n (%) or mean (SD)[b]		*p*-value
Variables	**Did not attempt suicide in adulthood (n = 34,176)**	**Attempted suicide in adulthood (n = 1,099)**	
Emotional neglect			< 0.001[c]
Yes	3,333 (9.8%)	285 (26.0%)	
No	30,799 (90.2%)	812 (74.0%)	
Physical neglect			< 0.001[c]
Yes	2,750 (8.1%)	245 (22.4%)	
No	31,397 (91.9%)	851 (77.6%)	
ACE score (excluding emotional neglect)[d]	1.05 (1.50)[b]	2.58 (2.20)[b]	< 0.001[e]
ACE score (excluding physical neglect)[d]	1.06 (1.48)[b]	2.62 (2.16)[b]	< 0.001[e]
Internalizing symptom score	1.73 (2.76)[b]	5.81 (3.40)[b]	< 0.001[e]
Externalizing symptom score	0.99 (1.63)[b]	2.37 (2.52)[b]	< 0.001[e]
Sex			< 0.001[c]
Female	19,000 (55.6%)	716 (65.2%)	
Male	15,176 (44.4 %)	383 (34.8%)	
Age	45.80 (17.67)[b]	46.86 (13.9)[b]	0.050[e]
Race/ethnicity			< 0.001[c]
Non-Hispanic whitev	17,957 (52.5%)	661 (60.2%)	
Non-Hispanic black	7,381 (21.6%)	190 (17.3%)	
American Indian	438 (1.3%)	29 (2.6%)	
Non-Hispanic Asian	1,755 (5.1%)	18 (1.6%)	
Hispanic	6,645 (19.5%)	201 (18.3%)	
Education			< 0.001[c]
Less than high school	5,105 (14.9%)	198 (18.0%)	
High school	9,203 (26.9%)	333 (30.3%)	

Variables	n (%) or mean (SD)[b]		*p*-value
	Did not attempt suicide in adulthood (n = 34,176)	Attempted suicide in adulthood (n = 1,099)	
Some college	11,265 (33.0%)	408 (37.1%)	
College	5,670 (16.6%)	112 (10.2%)	
Graduate school	2,933 (8.6%)	48 (4.4%)	
Marital status			< 0.001[c]
Married	13,871 (40.6%)	303 (27.6%)	
Not married	20,305 (59.4%)	796 (72.4%)	
Region			< 0.931[c]
Northeast	4,879 (14.3%)	150 (13.6%)	
Midwest	7,133 (20.9%)	233 (21.2%)	
South	13,691 (40.0%)	446 (40.6%)	
West	8,473 (24.8%)	270 (24.6%)	
Employment			0.091[c]
Employed	31,827 (93.1%)	1,009 (91.8%)	
Unemployed	2,349 (6.9%)	90 (8.2%)	
Alcohol use disorder			< 0.001[c]
Yes	8,939 (26.2%)	554 (50.4%)	
No	25,237 (73.8%)	545 (49.6%)	

[a] The descriptive statistics are not weighted.

[b] Mean (standard deviation) are calculated for continuous variables.

[c] Chi-square test.

[d] ACE score excludes emotional neglect if emotional neglect is the variable of interest and excludes physical neglect if physical neglect is the variable of interest.

[e] t-test.

Table 2.

Direct effect of child emotional neglect on suicide attempt in adulthood: National Epidemiological Survey on Alcohol and Related Conditions, 2012–2013.

	Attempted suicide in adulthood	
Variables	**AOR[a]**	**(95% CI)**
Emotional neglect: yes	1.45**	(1.23, 1.72)
ACE score	1.17**	(1.13, 1.21)
Internalizing symptom score	1.31**	(1.28, 1.33)
Externalizing symptom score	1.13**	(1.10, 1.16)
Sex: Female	1.26**	(1.09, 1.45)
Age	1.01**	(1.006, 1.015)
Race/ethnicity		
Non-Hispanic white	(Ref.)	
Non-Hispanic black	0.73**	(0.61, 0.88)
American Indian	1.07	(0.70, 1.65)
Non-Hispanic Asian	0.62	(0.38, 1.00)
Hispanic	1.01	(0.84, 1.21)
Education		
Less than high school	(Ref.)	
High school	0.98	(0.81, 1.20)
Some college	0.93	(0.77, 1.13)
College	0.64**	(0.50, 0.83)
Graduate school	0.50**	(0.36, 0.71)
Married: yes	0.71**	(0.62, 0.82)
Region		
Northeast	(Ref.)	
Midwest	1.07	(0.85, 1.33)
South	1.21	(0.99, 1.48)
West	1.02	(0.82, 1.27)

	Attempted suicide in adulthood	
Variables	**AOR[a]**	**(95% CI)**
Unemployed: yes	0.89	(0.70, 1.13)
Alcohol use disorder: yes	1.56**	(1.36, 1.80)
n	35,229	

*$p < .05$;

**$p < .01$.

AOR = adjusted odds ratio; CI = confidence interval,.

[a]Models were adjusted for internalizing and externalizing symptoms, ACE score, sex, race/ethnicity, education, marital status, region, employment status, and alcohol use disorder when appropriate.

Table 3.

Mediation effect of internalizing symptoms on the association between child emotional neglect and suicide attempt in adulthood: National Epidemiological Survey on Alcohol and Related Conditions, 2012–2013.

	Total effect		Natural indirect effect		
Primary independent variable	**AOR[a]**	**(95% CI)**	**AOR[a]**	**(95% CI)**	**Proportion mediated**
Mediator: Internalizing symptom score					
Emotional neglect	1.55**	(1.31, 1.84)	1.07**	(1.04, 1.10)	18%

** $p < .01$.

AOR = adjusted odds ratio; CI = confidence interval.

[a]Models were adjusted for internalizing and externalizing symptoms, ACE score, sex, race/ethnicity, education, marital status, region, employment status, and alcohol use disorder when appropriate.