Journal of Affective Disorders 365 (2024) 542–552

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Research paper

Self-esteem mediates child abuse predicting adulthood anxiety, depression, and substance use symptoms 18 years later

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ARTICLE INFO

Keywords:
Childhood parental abuse
Anxiety disorders
Major depressive disorder
Alcohol use disorders
Substance use disorders
Structural equation modeling analyses

ABSTRACT

According to biopsychosocial models, experiencing parental child abuse increases susceptibility to adulthood psychopathology. However, there is a paucity of studies examining potential mechanisms of the parental child abuse and adulthood psychopathology relationship. The purpose of the current study was to determine if Time 2 (T2) trait self-esteem mediated levels of Time 1 (T1) retrospectively recalled parental child abuse predicting (T3) past-year major depressive disorder (MDD), generalized anxiety disorder (GAD), panic disorder (PD), alcohol use disorder (AUD), and substance use disorder (SUD) symptoms. The 18-year Midlife Development in the United States (MIDUS) study included participants ($N = 3294$; T1 average age of 45.62 years) assessed at three different time points, each spaced about nine years apart. We performed structural equation mediation modeling analyses to determine how maternal and paternal child abuse at T1 would independently predict T3 MDD, GAD, PD, AUD, and SUD symptoms. We also examined whether T2 self-esteem mediated these relations while controlling for adulthood T1 psychopathology symptoms, demographics, socioeconomic status, somatic symptoms, and parental psychopathology. Consistent with our hypotheses, higher T1 maternal and paternal abuse predicted increased T3 GAD, PD, AUD, and SUD symptoms via diminished T2 self-esteem as the mediator (% proportion mediated = 33.0–100). However, childhood paternal, but not maternal, abuse predicted adulthood MDD symptoms via reduced self-esteem. Findings remained after adjusting for covariates. Our research highlights the importance of understanding retrospectively recalled parental child abuse–adulthood psychopathology relations, their potential mechanisms, and self-esteem as a malleable treatment target for adults with heightened child abuse.

Abuse and neglect of children under the age of 18 constitute child maltreatment. It includes all forms of physical or emotional maltreatment, sexual abuse, negligence, carelessness, and commercial or other exploitation that can harm children's health, survival, development, or dignity (World Health Organization, 2022). Over 3.1 million child abuse or neglect cases were investigated in the United States alone (U.S. Department of Health and Human Services, 2020). Childhood adversity accounts for 29.8% of all psychopathologies in several countries (Kessler et al., 2010). These include generalized anxiety disorder (GAD), major depressive disorder (MDD), panic disorder (PD), alcohol use disorder (AUD), and substance use disorder (SUD; Carlson et al., 1997; Hagborg et al., 2020; Hovens et al., 2012; Moretti and Craig, 2013). Child abuse could reduce mental and physical health-related quality of life, increase somatic symptoms, and decrease overall well-being over long durations (Afifi et al., 2007; Bell and Belicki, 1998; Newman et al., 2000). Hence, it is essential to understand and study the potential mechanisms between child abuse and adulthood psychopathology.

Trait self-esteem is a plausible mechanism for child abuse predicting adulthood psychopathology. Self-esteem, defined as confidence in oneself and one's abilities (Carlson et al., 1997), should be studied as a focal mediator because it represents an essential human need. Based on the self-determination theory, humans need a sense of competence, autonomy, and relatedness (Ryan et al., 2022). Self-esteem offers feelings of competency by raising effectiveness in implementing skills and tasks. It develops autonomy by conferring a sense of agency and builds relatedness by encouraging feelings of being accepted and valued by others (Heppner et al., 2008). Child abuse might thwart and undermine these core needs, dampen self-esteem, and promote psychopathology long term (Ravn, 2024). Excessive negative feedback or lack of support, disruption of healthy relationship formation, and the imposition of

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https://doi.org/10.1016/j.jad.2024.08.107
Received 18 April 2024; Received in revised form 19 August 2024; Accepted 20 August 2024
Available online 22 August 2024

control by abusive parental figures could diminish feelings of self-worth (Islam et al., 2022; Kim and Cicchetti, 2004; Toth and Cicchetti, 1996). Given its importance, self-esteem should be studied as a viable mechanism via which greater child abuse predicts more severe adulthood mental health symptoms.

Although not examined in the current manuscript, a number of theories suggest pathways by which child abuse might predict more adulthood psychopathology via lower trait self-esteem. For example, frequent child abuse could harm self-esteem in the short and long term through exposure to ongoing criticism, harm, or insults from maternal or paternal figures – typical encounters of abused children (Teicher et al., 2006; Trickett and McBride-Chang, 1995). Persistent avoidance, such as social isolation or withdrawal, related to low self-esteem linked to child abuse might culminate in adulthood GAD, MDD, and PD symptoms (Ihme et al., 2022; Shahab et al., 2021). Other self-esteem-depleting behavioral repertoires, such as using alcohol or drugs to numb the psychological pain induced by child abuse, might lead to adulthood AUD and SUD (Lawrence et al., 2023; Oshri et al., 2017).

Seven studies have determined the longitudinal relations among retrospectively recalled child abuse, self-esteem, and common mental health symptoms across all developmental stages. Three studies found that the linkages between childhood trauma and symptoms of anxiety and depression in adulthood were mediated by reduced self-esteem among community-dwelling adolescents (Kim et al., 2022; Reid-Russell et al., 2022) and adults (Li et al., 2023). Child abuse also exhibited a greater magnitude of adverse consequences among older adults with diminished self-esteem than those with elevated self-esteem (Sachs-Ericsson et al., 2010). Likewise, lower self-esteem was associated with higher childhood trauma and higher severity of anxiety, borderline personality disorder (BPD), and depression symptoms among adult community individuals and patients (Li et al., 2023; Pohl et al., 2021). Another short-term longitudinal study focusing on adolescents in China found that childhood maltreatment was positively correlated with adolescent psychopathology and was negatively correlated with self-esteem. Furthermore, self-esteem significantly mediated the effect of child abuse on adolescent psychopathology (Wang et al., 2020). Additionally, a meta-analysis of 95 longitudinal studies showed that low self-esteem was a robust risk factor for anxiety and depression symptoms (Sowislo and Orth, 2013). A related systematic review highlighted the links between low self-esteem and more frequent alcohol and substance use (Arsandaux et al., 2020).

Despite the progress made on this topic, these prior studies had several shortcomings the present study aimed to remedy. First, previous studies did not measure the varying effects of maternal and paternal abuse separately and instead focused on childhood maltreatment in general. Our study thus individually assessed paternal and maternal abuse as predictors, given that each parent's distinct caregiving styles and roles within the family may exert varying influences on a child (Cox and Paley, 1997; Cui et al., 2018). Drawing from attachment theories (Bowlby, 1973, 1980), maternal abuse might predispose youth more to adulthood psychopathology than paternal abuse, potentially due to higher interactional frequency with maternal figures. In fact, child abuse by mothers rather than fathers predicted reduced psychological well-being, and led to higher mental disorder risk, and more distress (Kong and Martire, 2019; VanMeter et al., 2021). Studies also showed distinct mediators between maternal and paternal abuse. For example, although both maternal and paternal abuse were a direct predictor of adulthood depression, emotion dysregulation was a mediator of this pathway only when maternal abuse was the predictor (Moretti and Craig, 2013). Similarly, the mediational contribution of everyday stress responses on the effect of child abuse on anxiety and depression was stronger for maternal than paternal figures (Zainal et al., 2024). Thus, the present study tested the effect of child abuse by each parental figure independently.

Further, prior studies on this topic had design limitations. Adulthood psychopathology might include debilitating disorders such as AUD and SUD, which typically have an adult onset (Connor et al., 2019; Kelly et al., 2019), but most previous studies focused on adult anxiety and depression symptoms. One of these studies had a small sample size (Pohl et al., 2021), limiting precision in model parameter estimates. Another study was cross-sectional (Li et al., 2023), and a meta-analysis of cross-sectional studies indicated that the negative impact of child abuse on self-esteem lessened with increasing age (Zhang et al., 2023). However, cross-sectional designs preclude causal inferences (Granger, 1969). Existing longitudinal studies (e.g., Reid-Russell et al., 2022; Wang et al., 2020) also tended to examine short-term outcomes, preventing an understanding of how processes of interest might unfold across long periods in adulthood. Studying how child abuse diminishes self-esteem in ways that perpetuate mental health symptoms into adulthood is essential for advancing developmental psychopathology and informing effective population-level prevention efforts (Harter, 2015; Pluess, 2024).

Accordingly, studying how trait self-esteem might mediate the relationship between retrospectively recalled parental child abuse and adulthood psychopathology could help fill some gaps in the literature and better understand the long-term effects of maternal and paternal child abuse. Based on theory and research, we hypothesized that low self-esteem would mediate the relationship between higher maternal child abuse and more adulthood MDD, GAD, PD, AUD, and SUD symptoms (Hypothesis 1). We also predicted that low self-esteem would significantly mediate the association between higher paternal child abuse and more adulthood MDD, GAD, PD, AUD, and SUD symptoms (Hypothesis 2).

1. Methods

1.1. Study design

The Midlife Development in the United States (MIDUS) dataset, accessible through a publicly available repository (https://www.icpsr.umich.edu/web/ICPSR/series/203), was used in the current study. Three rounds of assessment were conducted in MIDUS: Time 1 (T1): 1995–1996; Time 2 (T2): 2004–2005; and Time 3 (T3): 2012–2013. Telephone interviews and self-administered questionnaires (SAQs) were used to gather data at all measurement time points (refer to codebooks for more information; Brim et al., 2020; Ryff et al., 2019; Ryff et al., 2017).

1.2. Participants

Table 1 provides details of participants' demographic and socio-economic (SES) variables. At T1, participants averaged 45.616 years (SD = 11.408, range = 20 to 74; T2 mean age = 54.420, SD = 9.797, range = 34–83; T3 mean age = 63.641, SD = 11.350, range = 39–93). More than half were women (54.948%), 45.052 % were men, and the rest (3.916%) declined to disclose. Most racially identified as White (89.010%), 46.843% had a college degree, and 72.313% were married. Regarding T1 parental psychopathology variables, 19.915% reported that their parents had past-year emotional struggles, and 3.461% stated that their parents had past-year alcohol/substance use problems.

1.3. Procedures

At T1 and T3, MDD, GAD, PD, AUD, and SUD symptoms of 3294 participants were assessed using telephone interviews and/or SAQs. At T1, participants retrospectively reported on the frequency of emotional, physical, and severe physical abuse they experienced in childhood. At T2, their self-esteem levels were measured.

Table 1
Demographic and socioeconomic variables of participants (N = 3294).

Ordinal variables	*M*	(*SD*)
T1 Age (years)	45.616	(11.408)
T2 Age (years)	54.420	(9.797)
T3 Age (years)	63.641	(11.350)
T1 Household income ($)	82,369.723	(66,229.439)
T1 Number of chronic conditions	2.260	(2.274)

Nominal variables	*n*	(%)
Sex		
Men	1484	(45.052)
Women	1810	(54.948)
Declined to answer	129	(3.916)
Race		
Non-white	233	(7.073)
White	2932	(89.010)
T1 Education level		
College degree or higher	1543	(46.843)
Declined to answer	4	(0.121)
No college degree	1747	(53.036)
T1 Marital status		
Married	2382	(72.313)
Separated, divorced, widowed, and never married	912	(27.687)
T1 Parental emotional issues in the past year		
No	2638	(80.085)
Yes	656	(19.915)
T1 Parental substance use issues in the past year		
No	3180	(96.539)
Yes	114	(3.461)

Note. T1, time 1; T2, time 2; T3, time 3. T1 age ranged from 20 to 74. T2 age ranged from 34 to 83. T3 age ranged from 39 to 93. T1 household income ranged from 0 to 300,000. T1 number of chronic conditions ranged from 0 to 21.

1.4. Measures

1.4.1. T1 Retrospectively-recalled child abuse

The 3-item Revised Conflict Tactics Scale (CTS2) was used to report retrospective incidents of maternal or paternal abuse during childhood (Straus et al., 1996). The CTS2 examined three forms of child abuse: emotional, physical, and severe physical abuse (each measured on a single item). Respondents used a 4-point Likert scale (1 = *often* to 4 = *never*) to rate their experiences. All items were reverse scored so that higher CTS2 scores indicated greater retrospective child abuse. The abuse perpetrated by their mother, or the woman who raised them, and their father, or the man who raised them, was examined separately for each category. Participants indicated whether perpetrators engaged in any emotionally abusive behaviors: "insulted you or swore at you; sulked or refused to talk to you; stomped out of the room; did or said something to spite you; threatened to hit you; smashed or kicked something in anger." For physical abuse, respondents endorsed whether the perpetrators behaved in these ways: "pushed, grabbed, or shoved you; slapped you; threw something at you." Finally, participants indicated if the perpetrators engaged in severe physical abuse: "kicked, bit, or hit you with a fist; hit or tried to hit you with something; beat you up; choked you; burned or scalded you." Total scores for each parental figure were used. Internal consistencies (αs) of the CTS2 ratings were good for both maternal abuse (.80) and paternal abuse (.72). CTS2 scores also showed strong validity and reliability in various samples (Chapman and Gillespie, 2018).

1.4.2. T1 and T3 GAD, MDD, and PD symptoms

The Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition (DSM-III-R; American Psychiatric Association, 1987) criteria were used to determine the symptoms of GAD, MDD, and PD using the World Health Organization's (WHO) Composite International Diagnostic Interview - Short Form (CIDI-SF; Kessler et al., 1998a). MDD symptoms were measured on a 7-point integer scale (0 = *absence of all assessed MDD symptoms* and 7 = *presence of all assessed MDD symptoms*). It assessed past-year MDD symptoms associated with depressed affect and anhedonia nearly every day for at least two weeks (7 items: loss of interest in most things; fatigue; appetite changes; sleep difficulties; concentration problems; low self-worth; thoughts about death). Each response was binary (1 = *present*, 0 = *absent*). GAD symptoms were assessed on a 10-point integer scale (0 = *absence of all assessed GAD symptoms* and 10 = *presence of all assessed GAD symptoms*). To meet GAD criteria, past-year GAD symptoms were required to be present for at least 6 months most of the day nearly every day. This included symptoms associated with excessive and uncontrollable worries (10 items: restlessness; feeling keyed up, on edge, or had a lot of nervous energy; irritability; trouble falling asleep; trouble staying asleep; trouble keeping your mind on the task at hand;trouble remembering things; low on energy; easily tired; sore, or aching muscles). PD symptoms were measured using the CIDI-SF scale that evaluated ten symptoms associated with past-year panic attacks/spells (0 = *absence of all assessed PD symptoms* and 10 = *presence of all assessed PD symptoms*). These symptoms were trembling/shaking, tightness/discomfort, pain in the chest/stomach, heart palpitations, hot flashes/chills, presence of spell/attack when frightened, at least one attack in the previous year, spell/attack without reason, the attack occurred when not in danger or during social situations, and a sense of unreality. Internal consistencies (Cronbach αs) of CIDI-SF were good for all symptom scales: MDD (T1: .94; T3: .88), GAD (T1: .87; T3: .88), and PD (T1: .86; T3: .85). For MDD, GAD, and PD symptoms, the CIDI-SF demonstrated strong psychometric validity and reliability (Kessler et al., 1997; Kessler et al., 1998b; Ng et al., 2024; Wang et al., 2000).

1.4.3. T1 and T3 AUD and SUD symptoms

The 5-item Alcoholism Screening Test (AST; Selzer, 1971) measured AUD symptoms (0 = *absence of all assessed AUD symptoms* and 5 = *presence of all assessed AUD symptoms*). An intense urge to consume alcohol, emotional problems resulting from alcohol use, excessive drinking duration, and increased tolerance to the effects of alcohol consumption were issues participants self-reported. To meet AUD criteria, symptoms were required to have been present every day in the past year. Also, a MIDUS-specific 7-item scale (Turiano et al., 2012) measured SUD symptoms (0 = *absence of all assessed SUD symptoms* and 7 = *presence of all assessed SUD symptoms*). Participants reported experiencing issues in the past year related to SUD (cocaine/crack; heroin; inhalants; LSD/other hallucinogens; marijuana/hashish; nerve pills; prescription painkillers; sedatives; stimulants). These problems included using more than intended, negative effects of using at work/school, increased risk of injury, strong desire to use, use taking excessive time, and increased tolerance to its effects. The αs of the AST (T1: .74; T3: .72) and SUD measures (T1 and T3: .75) were acceptable.

1.4.4. T2 Self-esteem

A shortened 7-item Rosenberg self-esteem (RSE) scale was used to measure self-esteem (Rosenberg, 1965). Participants rated their agreement with positive self-evaluation statements. Higher scores indicated better self-esteem. The RSE evidenced good retest reliability and construct validity (Rosenberg, 1979; Wongpakaran and Wongpakaran, 2012). The internal consistency of the RSE was also good in the present study (α = .78).

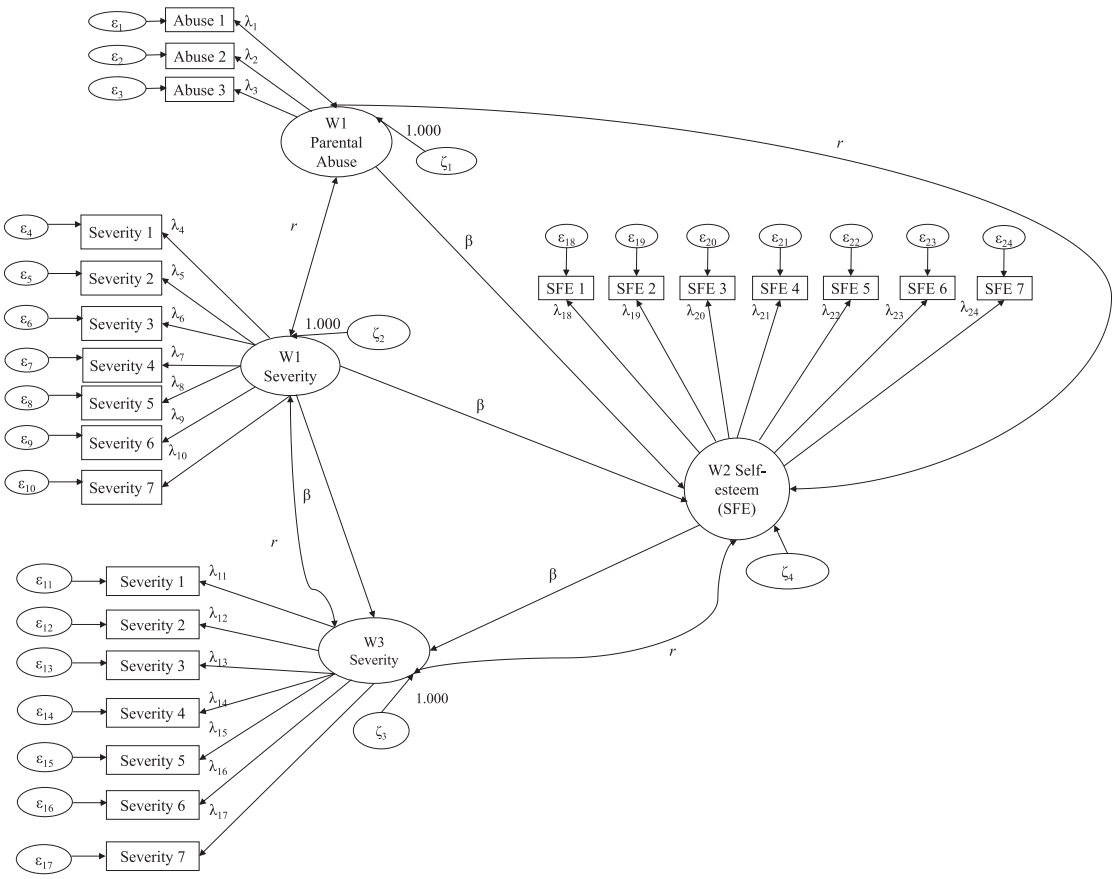

Fig. 1. General structural equation mediation model.
Note. β, regression estimate; ε, item residual variance; λ, item factor loadings; ζ, factor residual variance; SFE, self-esteem; W1, wave 1; W2, wave 2; W3, wave 3.

1.5. Data analyses

Fig. 1 presents a generic schematic mediation model. Given the small-to-moderate correlations among disorder constructs at T1 to T3 (online supplemental materials [OSM] Table S1), each disorder outcome was examined separately. The *lavaan R* package (Rosseel, 2012) was used in the RStudio software (Version 1.3.1093) to perform longitudinal structural equation modeling (SEM) latent mediation analyses. We used the chi-square (χ^2; Hu and Bentler, 1999), model degrees of freedom and its probability (*p*) value, confirmatory fit index (CFI; Bentler, 1990), Tucker-Lewis index (TLI; Tucker and Lewis, 1973), root mean square error of approximation (RMSEA; Steiger, 1990), and standardized root mean square residual (SRMR; Byrne, 1998; Hu and Bentler, 1999) to evaluate the fit of the SEM model. For regression coefficients of the CTS2-derived latent composite scores (maternal and paternal child abuse) predicting self-esteem latent composite score (a path) and self-esteem predicting adulthood MDD, GAD, PD, AUD, and SUD symptoms (b path), mediation analyses were performed using the product-of-coefficients method of indirect effect (a * b). We presented the unstandardized (*b*) and standardized (β) regression coefficients, standard error (SE), *t*-value, and *p*, and we employed bootstrapping with 10,000 resampling draws (Cheung and Lau, 2008). The mediation effect size is the proportion of indirect effect (a * b) relative to the total effect, $c = a * b + c'$ (Cheung and Lau, 2008; Cole and Maxwell, 2003; Preacher and Kelley, 2011). It was indicated as the proportion of variance in the degree to which self-esteem explained the distinct relationships between T1 maternal or paternal child abuse and T3 adulthood MDD, GAD, PD, AUD, and SUD symptoms. All models adjusted for the T1 outcome variable (e.g., including T1 MDD symptoms in predicting T3 MDD symptoms) and included the direct effect of retrospective child abuse predicting T3 symptoms. Missing data (a total of 0.535% of observations) were addressed using full information maximum likelihood (Lee and Shi, 2021).[1] Cohen's *d* effect sizes were also computed to facilitate interpretation (Rosenthal, 1991).

To provide a more robust set of inferences, we tested if similar results were obtained if each covariate was adjusted for in all mediation models. This was done by regressing the outcome on the covariate and allowing it to covary with all latent factors in the model. Such covariates included demographic (Orth et al., 2018; Zuckerman et al., 2016) and SES indicators that have been correlated with self-esteem (Twenge and Campbell, 2002; Twenge and Crocker, 2002): age, sex, race, education, household income (pension, salary, social security, etc.), and marital status. Proxy T1 parental psychopathology indicators were also included as covariates. These included past-year parental emotional issues (Krug et al., 2016; Ranoyen et al., 2015) and alcohol/substance use problems (Williams and Corrigan, 1992). Number of chronic health conditions

[1] For all SEM mediation models, error terms were not allowed to correlate except for the models that examined T3 PD symptoms as the outcome. In those models, item 1 ("anxiety attack") and item 2 ("heart race or felt faint") for PD symptoms at both T1 and T3 were permitted to correlate based on modification fit indices to improve the model fit substantially. Relatedly, as detailed in Fig. 1, the latent factors between T1 and T3 symptom constructs were allowed to autocorrelate. Also, parceling was not used as it could obscure a potentially multidimensional factor structure (including abuse constructs assessed herein), falsely generating acceptable fit index values for an incorrectly specified model (Bandalos, 2002). Parceling would also bias SEM regression estimates in this context, leading us to use an item-level solution approach.

was also included in the models since frequent child abuse likely impacted physiological and somatic health. These conditions included issues with AIDS/HIV, asthma/bronchitis/emphysema, autoimmune disorders, bone/joint, constipation, diabetes, gall bladder, gums/mouth, hay fever, hernia/rupture, hypertension, integumentary system, lungs, migraine, neurology, piles/hemorrhoids, podiatry, psychiatry, sciatica/lumbago/backache, sleep, stomach, stroke, teeth, thyroid, tuberculosis, ulcer, urination/bladder, and varicose veins.

2. Results

2.1. T1 Retrospectively recalled childhood maternal abuse predicting T3 adulthood psychopathology via T2 self-esteem

Table 2 summarizes the series of mediation models. The mediation model for T3 GAD symptoms as the outcome showed acceptable fit ($\chi^2(df = 400) = 1716.413$, $p < .001$, CFI = .932, RMSEA = .032, SRMR = .052). Higher T1 maternal child abuse significantly predicted lower T2 self-esteem ($b = -.056$, 95% CI [−0.088, −0.025], $p < .001$, $d = -0.406$), and lower T2 self-esteem significantly predicted higher T3 GAD symptoms ($b = -.134$, 95% CI [−0.217, −0.051], $p = .001$, $d = -0.271$). The indirect effect of reduced T2 self-esteem mediating the T1 maternal child abuse–T3 GAD symptoms was also significant ($b = 0.008$, 95% CI [0.005, 0.010], $p < .001$, $d = 0.318$; % mediated = 79.1).

The mediation model for T3 MDD symptoms as the outcome displayed good fit ($\chi^2(df = 247) = 1670.975$, $p < .001$, CFI = .951, RMSEA = .042, SRMR = .057). Greater T1 maternal child abuse significantly predicted decreased T2 self-esteem ($b = -.169$, 95% CI [−0.297, −0.040], $p = .010$, $d = -0.326$), but decreased T2 self-esteem did not significantly predict higher T3 MDD symptoms ($b = -.097$, 95% CI [−0.259, −0.066], $p = .245$, $d = -0.148$). The indirect effect of reduced T2 self-esteem mediating the T1 maternal child abuse–T3 MDD symptoms was not significant ($b = .016$, 95% CI [−0.006, 0.039], $p = .159$, $d = 0.179$; % mediated = 33.0%).

The mediation model for T3 PD symptoms as the outcome showed good fit ($\chi^2(df = 399) = 2223.109$, $p < .001$, CFI = .924, RMSEA = .037, SRMR = .057). Greater T1 maternal child abuse significantly predicted lower T2 self-esteem ($b = -.054$, 95% CI [−0.084, −0.023], $p = .001$, $d = -0.347$), and lower T2 self-esteem significantly predicted higher T3 PD symptoms ($b = -.375$, 95% CI [−0.597, −0.153], $p = .001$, $d = -0.332$). The indirect effect of reduced T2 self-esteem mediating the T1 maternal child abuse–T3 PD symptoms was also significant ($b = .020$, 95% CI [0.013, 0.027], $p < .001$, $d = 0.592$; % mediated = 100).

The mediation model for T3 AUD symptoms as the outcome showed good fit ($\chi^2(df = 225) = 1097.729$, $p < .001$, CFI = .931, RMSEA = .032, SRMR = .060). Higher T1 maternal child abuse significantly predicted

Table 2
T1 Childhood maternal abuse predicting T3 mental disorder symptom severity via T2 self-esteem.

	GAD model		MDD model		PD model		AUD model		SUD model	
	β	(*SE*)	β	(*SE*)	β	(*SE*)	β	(*SE*)	β	(*SE*)
Factor loadings										
T1 Emotional abuse	–	–	–	–	–	–	–	–	–	–
T1 Physical abuse	.744	(0.045)	.311	(0.053)	.654	(0.042)	.751	(0.036)	.771	(0.036)
T1 Severe physical abuse	.688	(0.036)	.277	(0.049)	.562	(0.034)	.644	(0.027)	.663	(0.027)
T2 Self-esteem item 1	–	–	–	–	–	–	–	–	–	–
T2 Self-esteem item 2	.764	(1.711)	.769	(3.179)	.753	(1.801)	.747	(2.279)	.748	(2.170)
T2 Self-esteem item 3	.756	(2.128)	.768	(4.017)	.753	(2.272)	.758	(2.931)	.754	(2.767)
T2 Self-esteem item 4	.441	(1.045)	.428	(1.818)	.458	(1.124)	.444	(1.386)	.451	(1.337)
T2 Self-esteem item 5	.680	(2.400)	.677	(4.406)	.687	(2.569)	.697	(3.345)	.693	(3.156)
T2 Self-esteem item 6	.743	(1.840)	.734	(3.355)	.736	(1.938)	.737	(2.479)	.734	(2.347)
T2 Self-esteem item 7	.728	(2.209)	.734	(4.156)	.726	(2.368)	.725	(3.043)	.730	(2.908)
T3 symptom severity item 1	–	–	–	–	–	–	–	–	–	–
T3 symptom severity item 2	.619	(0.194)	.853	(0.012)	.755	(0.007)	.676	(0.126)	.878	(0.074)
T3 symptom severity item 3	.666	(0.251)	.814	(0.027)	.222	(0.024)	.522	(0.097)	.290	(0.024)
T3 symptom severity item 4	.670	(0.250)	.912	(0.018)	.487	(0.039)	.570	(0.102)	.198	(0.017)
T3 symptom severity item 5	.668	(0.224)	.843	(0.026)	.823	(0.048)	.577	(0.106)	.130	(0.013)
T3 symptom severity item 6	.630	(0.191)	.790	(0.028)	.736	(0.047)	.510	(0.100)	.117	(0.013)
T3 symptom severity item 7	.757	(0.308)	.808	(0.057)	.740	(0.048)	–	–	.170	(0.016)
T3 symptom severity item 8	.713	(0.276)	–	–	.604	(0.041)	–	–	–	–
T3 symptom severity item 9	.668	(0.236)	–	–	.714	(0.048)	–	–	–	–
T3 symptom severity item 10	.644	(0.217)	–	–	.541	(0.039)	–	–	–	–
T1 symptom severity item 1	–	–	–	–	–	–	–	–	–	–
T1 symptom severity item 2	.660	(0.144)	.857	(0.012)	.769	(0.011)	.395	(0.044)	.754	(0.095)
T1 symptom severity item 3	.632	(0.151)	.768	(0.031)	.283	(0.028)	.368	(0.040)	.412	(0.044)
T1 symptom severity item 4	.588	(0.136)	.920	(0.021)	.444	(0.034)	.381	(0.040)	.284	(0.033)
T1 symptom severity item 5	.614	(0.125)	.847	(0.027)	.823	(0.044)	.398	(0.042)	.162	(0.020)
T1 symptom severity item 6	.631	(0.121)	.764	(0.030)	.746	(0.043)	.725	(0.137)	.167	(0.019)
T1 symptom severity item 7	.630	(0.158)	.880	(0.050)	.701	(0.043)	.669	(0.098)	.214	(0.026)
T1 symptom severity item 8	.701	(0.161)	–	–	.684	(0.042)	–	–	–	–
T1 symptom severity item 9	.579	(0.133)	–	–	.753	(0.043)	–	–	–	–
T1 symptom severity item 10	.620	(0.130)	–	–	.535	(0.035)	–	–	–	–
Regression estimates										
T1 abuse → T2 self-esteem	−.275*	(0.016)	−.239*	(0.066)	−.277*	(0.015)	−.177*	(0.009)	−.166*	(0.008)
T2 self-esteem → T3 severity	−.277*	(0.042)	−.281*	(0.083)	−.238*	(0.114)	−.062*	(0.026)	−.098*	(0.069)
DE: T1 abuse → T3 severity	.004	(0.003)	.000	(0.044)	.037	(0.009)	−.081	(0.003)	.005	(0.006)
T1 severity → T3 severity	.347*	(0.047)	.349*	(0.040)	.326	(0.030)	.450*	(0.034)	.368*	(0.054)
Mediation effect	.076*	(0.001)	.067*	(0.012)	.066*	(0.003)	.011*	(0.001)	.016*	(0.001)
Total effect	.080	(0.003)	.067*	(0.035)	.103*	(0.009)	−.070*	(0.003)	.022*	(0.006)

T1, time 1; T3, time 3; T2, time 2; GAD, generalized anxiety disorder; MDD, major depressive disorder; PD, panic disorder AUD, alcohol use disorder; SUD, substance use disorder; *b*, regression parameter estimate; *SE*, standard error of *b*; DE, direct effect. Standardized estimates of factor loadings and regression estimates were shown. Refer to the online supplemental materials (OSM) for more information about sensitivity analyses.

* Significant at the $p < .05$ alpha level (two-tailed test).

lower T2 self-esteem ($b = -.026$, 95% CI [−0.043, −0.009], $p = .002$, $d = -0.406$), and lower T2 self-esteem significantly predicted higher T3 AUD symptoms ($b = -.052$, 95% CI [−0.103, −0.002], $p = .042$, $d = -0.271$). The indirect effect of reduced T2 self-esteem mediating the T1 maternal child abuse–T3 AUD symptoms was also significant ($b = .001$, 95% CI [0.000, 0.002], $p = .017$, $d = 0.318$; % mediated = 79.1).

The mediation model for T3 SUD symptoms as the outcome showed good fit ($\chi^2(df = 247) = 949.872$, $p < .001$, CFI = .935, RMSEA = .022, SRMR = .110). Greater T1 maternal child abuse significantly predicted lower T2 self-esteem ($b = -.026$, 95% CI [−0.042, −0.009], $p = .002$, $d = -0.395$), and decreased T2 self-esteem significantly predicted higher T3 SUD symptoms ($b = -.187$, 95% CI [−0.321, −0.052], $p = .006$, $d = -0.347$). The indirect effect of decreased T2 self-esteem mediating the T1 maternal child abuse–T3 SUD symptoms was also significant ($b = .005$, 95% CI [0.002, 0.007], $p < .001$, $d = 0.463$; % mediated = 100).

2.2. T1 Retrospectively recalled childhood paternal abuse predicting T3 adulthood psychopathology via T2 self-esteem

Table 3 summarizes this series of mediation models. The mediation model for T3 GAD symptoms as the outcome showed acceptable fit ($\chi^2(df = 400) = 1744.480$, $p < .001$, CFI = .932, RMSEA = .031, SRMR = .053). Higher T1 paternal child abuse significantly predicted lower T2 self-esteem ($b = -.035$, 95% CI [−0.055, −0.015], $p = .001$, $d = -0.345$), and lower T2 self-esteem significantly predicted higher T3 GAD symptoms ($b = -.140$, 95% CI [−0.227, −0.054], $p = .002$, $d = -0.317$). The indirect effect of reduced T2 self-esteem mediating the T1 paternal child abuse–T3 GAD symptoms was also significant ($b = .005$, 95% CI [0.003, 0.007], $p < .001$, $d = 0.503$; % mediated = 100).

The mediation model for T3 MDD symptoms as the outcome showed good fit ($\chi^2(df = 247) = 2047.144$, $p < .001$, CFI = .937, RMSEA = .042, SRMR = .058). Greater T1 paternal child abuse significantly predicted decreased T2 self-esteem ($b = -.031$, 95% CI [−0.051, −0.011], $p = .002$, $d = -0.392$), and decreased T2 self-esteem significantly predicted higher T3 MDD symptoms ($b = -.300$, 95% CI [−0.497, −0.103], $p = .003$, $d = -0.379$). The indirect effect of reduced T2 self-esteem mediating the T1 paternal child abuse–T3 MDD symptoms was also significant ($b = .009$, 95% CI [0.006, 0.012], $p < .001$, $d = 0.784$; % mediated = 100).

The mediation model for T3 PD symptoms as the outcome showed good fit ($\chi^2(df = 399) = 2369.094$, $p < .001$, CFI = .918, RMSEA = .039, SRMR = .058). Higher T1 paternal child abuse significantly predicted lower T2 self-esteem ($b = -.028$, 95% CI [−0.044, −0.012], $p = .001$, $d = -0.336$), and lower T2 self-esteem significantly predicted higher T3 PD symptoms ($b = -.409$, 95% CI [−0.653, −0.166], $p = .001$, $d = -0.330$). The indirect effect of reduced T2 self-esteem mediating the T1

Table 3
T1 Childhood paternal abuse predicting T3 mental disorder symptom severity via T2 self-esteem.

	GAD model		MDD model		PD model		AUD model		SUD model	
	β	(*SE*)	β	(*SE*)	β	(*SE*)	β	(*SE*)	β	(*SE*)
Factor loadings										
T1 Emotional abuse	–	–	–	–	–	–	–	–	–	–
T1 Physical abuse	.744	(0.029)	.731	(0.032)	.767	(0.030)	.820	(0.022)	.835	(0.022)
T1 Severe physical abuse	.688	(0.028)	.664	(0.030)	.684	(0.026)	.755	(0.021)	.763	(0.019)
T2 Self-esteem item 1	–	–	–	–	–	–	–	–	–	–
T2 Self-esteem item 2	.764	(1.736)	.761	(2.321)	.755	(1.857)	.748	(2.302)	.750	(2.203)
T2 Self-esteem item 3	.756	(2.161)	.770	(2.960)	.755	(2.342)	.761	(2.966)	.756	(2.808)
T2 Self-esteem item 4	.441	(1.034)	.426	(1.341)	.448	(1.130)	.435	(1.370)	.444	(1.333)
T2 Self-esteem item 5	.680	(2.417)	.680	(3.249)	.683	(2.629)	.694	(3.361)	.690	(3.185)
T2 Self-esteem item 6	.743	(1.870)	.730	(2.464)	.739	(2.000)	.739	(2.508)	.736	(2.386)
T2 Self-esteem item 7	.728	(2.253)	.739	(3.084)	.731	(2.453)	.730	(3.092)	.734	(2.965)
T3 symptom severity item 1	–	–	–	–	–	–	–	–	–	–
T3 symptom severity item 2	.619	(0.185)	.849	(0.012)	.754	(0.007)	.674	(0.126)	.882	(0.075)
T3 symptom severity item 3	.666	(0.242)	.812	(0.027)	.222	(0.024)	.524	(0.097)	.284	(0.024)
T3 symptom severity item 4	.670	(0.238)	.919	(0.017)	.487	(0.038)	.567	(0.101)	.193	(0.016)
T3 symptom severity item 5	.668	(0.217)	.848	(0.026)	.822	(0.048)	.579	(0.105)	.129	(0.013)
T3 symptom severity item 6	.630	(0.185)	.784	(0.029)	.738	(0.047)	.513	(0.101)	.112	(0.013)
T3 symptom severity item 7	.757	(0.297)	.805	(0.057)	.739	(0.048)	–	–	.171	(0.016)
T3 symptom severity item 8	.713	(0.267)	–	–	.607	(0.041)	–	–	–	–
T3 symptom severity item 9	.668	(0.230)	–	–	.714	(0.049)	–	–	–	–
T3 symptom severity item 10	.644	(0.209)	–	–	.542	(0.039)	–	–	–	–
T1 symptom severity item 1	–	–	–	–	–	–	–	–	–	–
T1 symptom severity item 2	.660	(0.136)	.865	(0.012)	.775	(0.010)	.336	(0.045)	.764	(0.096)
T1 symptom severity item 3	.632	(0.143)	.779	(0.030)	.285	(0.027)	.331	(0.042)	.408	(0.041)
T1 symptom severity item 4	.588	(0.130)	.923	(0.020)	.455	(0.034)	.343	(0.043)	.264	(0.030)
T1 symptom severity item 5	.614	(0.118)	.824	(0.027)	.820	(0.042)	.361	(0.046)	.157	(0.019)
T1 symptom severity item 6	.631	(0.116)	.769	(0.029)	.739	(0.042)	.786	(0.197)	.158	(0.018)
T1 symptom severity item 7	.630	(0.148)	.870	(0.049)	.700	(0.041)	.717	(0.136)	.205	(0.024)
T1 symptom severity item 8	.701	(0.151)	–	–	.689	(0.040)	–	–	–	–
T1 symptom severity item 9	.579	(0.124)	–	–	.751	(0.041)	–	–	–	–
T1 symptom severity item 10	.620	(0.125)	–	–	.535	(0.034)	–	–	–	–
Regression estimates										
T1 abuse → T2 self-esteem	−.035*	(0.010)	−.247*	(0.010)	−.213*	(0.008)	−.164*	(0.006)	−.213*	(0.006)
T2 self-esteem → T3 severity	−.140*	(0.044)	−.262*	(0.101)	−.255*	(0.124)	−.058*	(0.026)	−.255*	(0.072)
DE: T1 abuse → T3 severity	.000	(0.002)	.032	(0.004)	.014	(0.006)	−.100	(0.003)	.014	(0.005)
T1 severity → T3 severity	.252*	(0.047)	.272*	(0.027)	.339*	(0.030)	.444*	(0.039)	.339*	(0.051)
Mediation effect	.005*	(0.001)	.065*	(0.002)	.054*	(0.002)	.010*	(0.000)	.054*	(0.001)
Total effect	.005*	(0.002)	.097*	(0.004)	.068*	(0.006)	−.091*	(0.003)	.068*	(0.005)

T1, time 1; T3, time 3; T2, time 2; GAD, generalized anxiety disorder; MDD, major depressive disorder; PD, panic disorder AUD, alcohol use disorder; SUD, substance use disorder; *b*, regression parameter estimate; *SE*, standard error of *b*; DE, direct effect. Standardized estimates of factor loadings and regression estimates were shown. Refer to the online supplemental materials (OSM) for more information about sensitivity analyses.

* Significant at the $p < .05$ alpha level (two-tailed test).

paternal child abuse–T3 PD symptoms was also significant (b = .011, 95% CI [0.008, 0.015], p < .001, d = 0.579; % mediated = 100).

The mediation model for T3 AUD symptoms as the outcome showed good fit ($\chi^2(df = 225) = 1215.013$, $p < .001$, CFI = .926, RMSEA = .034, SRMR = .066). Greater T1 paternal child abuse significantly predicted decreased T2 self-esteem (b = −.018, 95% CI [−0.031, −0.006], p = .003, d = −0.396), and decreased T2 self-esteem marginally significantly predicted higher T3 AUD symptoms (b = −.050, 95% CI [−0.100, −0.001], p = .054, d = −0.257). The indirect effect of reduced T2 self-esteem mediating the T1 paternal child abuse–T3 AUD symptoms was also significant (b = .001, 95% CI [0.000, 0.002], p = .029, d = 0.291; % mediated = 68.3).

The mediation model for T3 SUD symptoms as the outcome showed acceptable fit ($\chi^2(df = 247) = 967.211$, $p < .001$, CFI = .935, RMSEA = .022, SRMR = .111). Higher T1 paternal child abuse significantly predicted lower T2 self-esteem (b = −.017, 95% CI [−0.028, −0.006], p = .003, d = −0.382), and lower T2 self-esteem significantly predicted higher T3 SUD symptoms (b = −.198, 95% CI [−0.338, −0.057], p = .006, d = −0.351). The indirect effect of reduced T2 self-esteem mediating the T1 paternal child abuse–T3 SUD symptoms was also significant (b = .003, 95% CI [0.002, 0.005], p < .001, d = 0.473; % mediated = 100).[2]

2.3. Sensitivity analyses by adjusting for various covariates

As shown in the OSM, findings remained similar after adjusting for diverse demographic variables, including age (Table S2), sex (Table S3), race (Table S4), and marital status (Table S5). A similar pattern emerged after controlling for socioeconomic indicators, including education (Table S6) and household income (Table S7). Neither past-year parental emotional problems (Table S8) nor alcohol/substance use issues (Table S9) altered the results. Regarding somatic/physiological factors, the number of chronic health conditions did not change the present study outcomes (Table S10).

3. Discussion

Our 18-year study aimed to understand better how retrospectively recalled maternal and paternal child abuse might impact the development of MDD, GAD, PD, AUD, and SUD symptoms in adulthood. We found that self-esteem significantly mediated the pathway of childhood maternal and paternal abuse predicting adulthood GAD, PD, AUD, and SUD symptoms. For MDD symptoms, self-esteem significantly mediated paternal abuse, but not maternal abuse, as a predictor. The findings mostly supported our hypotheses and extended prior evidence that low self-esteem could lead to future psychopathology (Arsandaux et al., 2020; Sowislo and Orth, 2013). Our study improved on most prior research by employing a longitudinal design (Blackwell and Glynn, 2018) and by examining risk factors and potential mechanisms of long-term psychopathology outcomes of child abuse. Prior studies were either cross-sectional (e.g., Li et al., 2023) or had a longitudinal design that focused on short-term outcomes (e.g., Wang et al., 2020). Our study also extended previous research by stringently determining that the pattern of findings remained even after adjusting for demographics, SES, symptoms, and somatic variables (potential confounds). We offer potential accounts to explain observed findings.

Why did higher levels of retrospectively recalled maternal and paternal child abuse predict increased GAD, PD, AUD, and SUD symptoms via diminished self-esteem? Consistent with models proposing that increased childhood maltreatment contributes to poorer psychological outcomes over extended durations (cf. triple vulnerability theory; Barlow et al., 2014), more child abuse predicted higher levels of suboptimal self-regulation repertoires and negative self-evaluation, which would likely predict future low self-esteem (Hymowitz et al., 2017; Ng et al., 2024). Another potential account is that maltreated children were less likely to receive adequate parental care, which probably increased their risk of developing a distorted self-concept and self-acceptance (Harter, 1998; Sanghvi et al., 2023) and, in turn, decreased self-esteem across long durations. Relatedly, more frequent childhood trauma and subsequent decreased self-esteem might thereby heighten the risk for rejection sensitivity and negative emotional states that could dovetail and predict adulthood psychopathology over time (Blackhart et al., 2009; Bungert et al., 2015; Gao et al., 2024). More prospective studies are needed to test these conjectures for why youth who have faced more frequent parental abuse were at risk of developing mental health issues in adulthood through reduced self-esteem.

Other social and biological factors could account for why retrospectively recalled maternal and paternal abuse during childhood consistently predicted adulthood GAD, PD, AUD, and SUD symptoms via lowered self-esteem. Those exposed to child abuse and neglect might have a high risk of interpersonal problems with peers and partners through behavioral modeling (e.g., learning unhelpful interaction styles), which could create persistently conflictual environments that deflate self-esteem in adulthood (Bartek et al., 2021). Such environments could heighten the risk of psychopathology over time in adulthood by hindering the optimal development of social support systems to reduce the odds of developing psychopathology (Gariepy et al., 2016).

Relatedly, the associations among biomarkers, child abuse, self-esteem, and psychopathology symptoms are probably reciprocal and non-linear in ways that might partly account for the present findings. Anxiety, depression, and AUD/SUD symptoms have been bidirectionally associated with both higher *and* lower levels of neuroendocrine cortisol response to stress among persons exposed to child abuse (Alink et al., 2012; Dziurkowska and Wesolowski, 2021), psychiatric patients (Bremmer et al., 2007; Stephens and Wand, 2012), and community samples (Chaplin et al., 2018; Yehuda and Seckl, 2011). Such suboptimal cortisol levels have been linked to low self-esteem (Pruessner et al., 2005), which became more pronounced as age increased (Pruessner et al., 2004). Child abuse has also been correlated with reduced cortisol levels upon waking, and self-esteem both contributed to and mediated this connection (Zilioli et al., 2016). The hypothalamic-pituitary-adrenal (HPA) axis might thus be a critical biological mediator of the long-term mental health effects of child abuse (Gunnar and Vazquez, 2001; Negriff et al., 2020). By lowering self-esteem, child abuse might heighten sensitivity to social evaluative threats that notably trigger HPA axis-mediated stress responses over time (Dickerson and Kemeny, 2004; Miller et al., 2007). Future longitudinal studies should investigate these ideas to optimize prevention and treatment efforts to mitigate the risk of adulthood psychopathology.

Contrary to expectations, the path between retrospectively recalled child paternal but not maternal abuse and adulthood MDD symptoms was mediated by reduced self-esteem. Such findings highlight the importance of examining child maternal and paternal abuse separately (Zainal et al., 2024). Moreover, a notable portion of current research on parental roles in childhood predominantly emphasize maternal figures, frequently neglecting the contributions of paternal figures (Brumariu and Kerns, 2010; Ding and He, 2022). Several factors might contribute to differences in the effects of these parental figures. Distressed parent-adolescent relationships could often lead to psychosocial adjustment issues (including a tendency to internalize problems) in young adulthood, particularly when the identified parent is a father instead of a mother (Summers et al., 1998). Relatedly, another account might involve how fathers tended to play more of a pivotal role than mothers in

[2] The effect of maternal and paternal child abuse was examined separately to determine its independent effects. Nonetheless, the pattern of findings remained similar even if we included both maternal and paternal child abuse within the same models, i.e., formal comparison tests showed neither differential predictive nor mediation effects of maternal vs. paternal abuse emerged except in the special case of examining the pathway of T1 child abuse predicting T3 MDD symptoms.

providing economic stability and other factors that nurtured self-esteem within the family environment in formative years (Krauss et al., 2020). These propositions await empirical testing.

The present results should also be understood within their developmental context. At midlife, the interplay among recalled childhood trauma, self-esteem, and psychopathology could become especially pronounced. Midlife adults who remember high levels of parental abuse might still experience unresolved emotional issues from their past ties to fractured parent-child relationships (Mayer et al., 2021; VanMeter et al., 2021). These factors could have eroded self-esteem in ways that exacerbated psychopathological symptoms over time. Together, how parental abuse was recalled and interpreted could substantially alter mental health outcomes in midlife and beyond (Herrenkohl et al., 2021; Latham et al., 2021).

There were several limitations to the study that should be noted. First, we used DSM-III-R criteria (American Psychiatric Association, 1987) to assess MDD, GAD, PD, AUD, and SUD symptoms. As a result, the findings may not be generalizable to DSM-5-TR (American Psychiatric Association, 2022). DSM-5-TR-compliant assessments could be included in future replication efforts. Second, data on abuse incidents were collected retrospectively, which could have resulted in recall bias. Retrospective self-reports of child abuse might be swayed by individuals' subsequent experiences, possibly introducing bias, given the modest concordance between prospective and retrospective evaluations of child abuse (Baldwin et al., 2019). Third, the retrospective parental abuse measure was not administered at T2 or T3. This could have provided more information on how participants' retrospective self-report ratings varied and possibly contributed to the pattern of outcomes over time. Also, given our sample's average age (45 years) at baseline, anxiety, and mood disorders were assessed 18 years or more after the abuse happened, considerably after the average age of onset for these disorders (Solmi et al., 2022). Such shortcomings in design could be addressed in future prospective studies. Finally, mediation tests and temporal precedence imply potential causality but do not confirm it; experimental designs are required for strong causal inferences (Shadish et al., 2002).

Despite its limitations, the current study had several merits. First, we employed an 18-year longitudinal design with three assessment waves, following the recommendations of sound mediation analyses (Maxwell and Cole, 2007). Second, all measures used produced psychometrically reliable and valid scores. Third, we comprehensively addressed how self-esteem might be a potential mechanism of the pathway between maternal and paternal child abuse and adulthood GAD, MDD, PD, AUD, and SUD symptoms. Our research adds to the literature on the psychosocial consequences of parental abuse by emphasizing the need to assess mediators for the association between parental child abuse and adulthood psychopathology to enhance our comprehension of prevention and treatment targets.

In summary, our study found that self-esteem significantly mediated the association between retrospectively recalled childhood maternal and paternal abuse and adulthood GAD, PD, AUD, and SUD symptoms. Only paternal abuse predicted the mediation between T1 maternal child abuse and T3 MDD symptoms. If these prospective findings are replicated, some clinical implications merit consideration. Our findings suggest enhancing self-esteem, addressing core beliefs informed by child abuse experiences, and incorporating self-esteem measures as part of measurement-based care when working with adult survivors of child abuse is essential (Cruz et al., 2020; Zack et al., 2015). Such approaches are likely best used in conjunction with evidence-based trauma-focused treatments, including trauma-focused cognitive behavioral therapy (CBT), prolonged exposure therapy, and dialectical behavior therapy (DBT; Coates, 2010). Moreover, CBT and its offshoots, such as mindfulness-based cognitive therapy (MBCT), are often considered a first-line treatment for anxiety, depression, and related disorders (Curtiss et al., 2021; Lee and Cho, 2021). However, longitudinal preventative work is required to determine how such treatments could help *prevent* downstream MDD, GAD, PD, AUD, and SUD symptoms among adults who encountered high levels of child maternal and paternal abuse.

Funding source

The data used in this publication were made available by the Data Archive on the University of Wisconsin at Madison Institute on Aging, 1300 University Avenue, 2245 MSC, Madison, Wisconsin 53706-1532. Since 1995, the MIDUS study has been funded by the following: John D. and Catherine T. MacArthur Foundation Research Network; National Institute on Aging (P01-AG020166); National Institute on Aging (U19-AG051426). Dr. Zainal received funding support from the National University of Singapore (NUS) Presidential Young Professorship Start-Up Grant. Dr. Newman was supported by the National Institute of Mental Health (NIMH) (R01 MH115128). The original investigators and funding agency are not responsible for the analyses or interpretations presented here.

Author contributions statement

My research team, Nilakshi Sarkar and Dr. Michelle G. Newman, and I take full responsibility for the data, the accuracy of analyses and interpretation, as well as conduct of the research. This study was conducted in compliance with the American Psychological Association (APA) and Declaration of Helsinki, ethical standards in the treatment of human participants, and approved by the Institutional Review Board (IRB). Informed consent was obtained from participants per IRB requirements at the University of Michigan at Ann Arbor, the University of Wisconsin at Madison, and Harvard Medical School. Further, since this study used a publicly available dataset, it was exempt from additional IRB approval. All authors have (1) made substantial contributions to the analysis and interpretation of the study and its findings, (2) drafted and revised the article for intellectual content, and (3) given their final approval of the version to be submitted. The manuscript has been read and approved by all authors. I was involved in the conceptualization, formal analysis, and coding with the R software for the data analysis, visualization, and writing (original draft, reviewing, editing) of this work. Dr. Newman and I assisted with the data curation, validation, supervision, and writing (original draft, reviewing, editing) of the manuscript.

Scientific interdisciplinarity and/or collaboration

Our endeavor can guide personalized approaches to education, diagnosis, prevention, and intervention (Hayes and Andrews, 2020; Reber et al., 2018; van Os et al., 2013).

Diversity and representation in clinical science

Our sample used a predominantly White Caucasian, non-Hispanic sample. Nonetheless, we acknowledged this as a limitation in the discussion of the paper.

Open and transparent practices and methodological rigor

Data can be accessed via the Inter-university Consortium for Political and Social Research (ICPSR), which hosts the Midlife Development in the United States (MIDUS) Series (https://www.icpsr.umich.edu/web/ICPSR/series/203). Analytic scripts in R can be made available upon reasonable request.

CRediT authorship contribution statement

Nilakshi Sarkar: Writing – review & editing, Writing – original draft, Investigation, Conceptualization. **Nur Hani Zainal:** Writing –

review & editing, Writing – original draft, Visualization, Validation, Supervision, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Michelle G. Newman:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Data curation, Conceptualization.

Declaration of competing interest

None of the authors have any conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jad.2024.08.107.

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