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The relationship between childhood trauma and adult neuroticism: a systematic review and meta-analysis

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Rosenek, N., Wake, S. ORCID: https://orcid.org/0000-0001-6202-7645, Runton, R., Davies, A., Albaroudi, N., Pollen, A., Ellett, L. and Morriss, J. (2026) The relationship between childhood trauma and adult neuroticism: a systematic review and meta-analysis. Clinical Psychology Review, 124. 102700. ISSN 0272-7358 doi: 10.1016/j.cpr.2026.102700 Available at https://centaur.reading.ac.uk/128410/

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To link to this article DOI: http://dx.doi.org/10.1016/j.cpr.2026.102700

Publisher: Elsevier

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Clinical Psychology Review 124 (2026) 102700

Contents lists available at ScienceDirect

Clinical Psychology Review

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

Review

The relationship between childhood trauma and adult neuroticism: A systematic review and meta-analysis

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ARTICLE INFO

Keywords:
Childhood trauma
Neuroticism
Meta-analysis
Emotional abuse
Trauma-informed care

ABSTRACT

Childhood trauma has been consistently associated with elevated levels of neuroticism in adulthood, a transdiagnostic trait marked by emotional instability, heightened negative affect, and stress sensitivity. This systematic review and meta-analysis aimed to synthesise evidence examining the association between childhood trauma and adult neuroticism, both overall and by specific trauma subtypes. A comprehensive search of four electronic databases identified 136 eligible studies, encompassing a total of 526,371 individuals. Using a random-effects meta-analysis, results revealed a significant positive association between childhood trauma and adult neuroticism ($g = 0.46$). The strength of the association between neuroticism and the different trauma subtype varied. The strongest association was observed for emotional neglect ($g = 0.40$), followed by emotional abuse ($g = 0.33$). In addition, there were associations between neuroticism and physical abuse ($g = 0.18$), physical neglect ($g = 0.15$), sexual abuse ($g = 0.22$), unspecified abuse ($g = 0.13$), and victimisation ($g = 0.21$), with the exception of unspecified neglect, which showed no significant association. These findings demonstrate a robust relationship between early adversity and neuroticism. Childhood trauma may lead to adaptions that give rise to neuroticism through several psychological mechanisms such as disruptions in attachment and the formation of negative self-beliefs, and neurobiological alterations in stress regulation systems. These results underscore the importance of systemic preventative measures and early intervention strategies that may alleviate the psychological and neurobiological consequences of trauma, with the potential to increase awareness of adaptions such as neuroticism in trauma-exposed populations.

1. Introduction

Childhood trauma is the exposure to adverse experiences during formative years and has been widely recognised as a critical factor influencing psychological development (Crede et al., 2023; Fletcher & Schurer, 2017; van der Kolk et al., 2009). These adverse experiences, which include emotional abuse, emotional neglect, physical abuse, physical neglect, and sexual abuse, have been consistently linked to long-term consequences for mental health and well-being (Teicher, Samson, Anderson, & Ohashi, 2016). A growing body of research suggests that such early-life adversities may be associated with the development of transdiagnostic traits, particularly in relation to neuroticism (also known as negative emotionality), which is associated with increased risk for mental health disorders (Lahey, 2009; McLaughlin, Colich, Rodman, & Weissman, 2020; Ogle, Rubin, & Siegler, 2014; Ormel et al., 2013; Rossiter et al., 2015).

Given the potentially lasting effects of early adversity, understanding its influence on transdiagnostic traits is crucial. Transdiagnostic traits are shaped by a complex interplay of genetic and environmental factors, including early childhood experiences (Costa & McCrae, 2008). Among the Big Five personality traits, neuroticism has been extensively studied in relation to adverse childhood experiences. Neuroticism is characterised by heightened emotional instability, susceptibility to stress, and a tendency toward negative emotional states such as anxiety and negative mood such as depression (Widiger & Mullins-Sweatt, 2009). Research indicates that individuals with higher levels of childhood trauma often exhibit elevated neuroticism in adulthood, suggesting that early adversity may lead to trait-like adaptions in emotional reactivity and regulation tendencies (Shackman et al., 2016).

The connection between childhood trauma and neuroticism may be

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https://doi.org/10.1016/j.cpr.2026.102700
Received 19 May 2025; Received in revised form 16 December 2025; Accepted 9 January 2026
Available online 10 January 2026
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understood through multiple psychological and neurobiological mechanisms. For instance, early adverse experiences are thought to shape the development of a person's sense of self and core beliefs about the world. Attachment theory posits that early caregiving experiences play a fundamental role in shaping self-concept and emotional regulation (Bowlby, 1998). Children who experience trauma may develop schemas that result in negative self-perceptions and shame, which persist into adulthood and contribute to increased neuroticism (Pilkington, Bishop, & Younan, 2021). These negative self-appraisals may increase tendencies toward rumination, emotional lability, and a pervasive sense of threat, all of which are hallmarks of high neuroticism (Bowlby, 1998; Ormel et al., 2013; Pilkington et al., 2021). Moreover, exposure to early-life stress has been shown to alter stress response systems, including the hypothalamic-pituitary-adrenal (HPA) axis, leading to greater emotional reactivity and sensitivity to stress (Heim & Nemeroff, 2001). Additionally, childhood trauma is associated with structural and functional changes in brain regions involved in emotion regulation, such as the amygdala, hippocampus, and prefrontal cortex (Teicher et al., 2016). Since these brain regions undergo critical periods of development during childhood, exposure to trauma at an early age may lead to longer-term changes to the neural circuitry supporting emotion regulation and impulse control (Cremers et al., 2010; Forbes et al., 2014; Silverman et al., 2019; Yang et al., 2020). In particular, such adaptions may result in heightened susceptibility to stress and negative emotionality in adulthood (Chia & Tan, 2024; Kolassa & Elbert, 2007). Given the established literature showing that childhood trauma increases the risk of developing mental health disorders (Arango et al., 2021; Hogg et al., 2023), it is plausible that heightened negative emotionality following such trauma may serve as a pathway through which these disorders emerge.

Since trauma can influence self-concept and neurobiological systems in different ways, it follows that different subtypes of childhood trauma may impact specific mechanisms that support the development of neuroticism. Emotional abuse and neglect may influence a child's self-worth and emotional security (Glaser, 2002). In contrast, physical and sexual abuse may contribute to the development of heightened stress sensitivity and altered emotion regulation tendencies (Infurna et al., 2016). A recent meta-analysis examined the relationship between adverse childhood experiences ($r = 0.20$) and adult neuroticism (Crede et al., 2023). These findings also highlighted a robust, positive relationship between exposure to subtypes childhood trauma and higher levels of neuroticism in adulthood, with emotional abuse emerging as the most strongly associated subtype ($r = 0.25$), whereas physical abuse ($r = 0.14$) and physical neglect ($r = 0.14$) showed weaker, though still significant, associations, whereas sexual abuse had the weakest association ($r = 0.10$). While these findings represent an important contribution, several limitations highlight the need for a more comprehensive synthesis. Specifically, Crede et al. did not specify the full extent of their search period, with the most recent study included published in 2021. Given the likely growth of literature in the intervening years, a more up-to-date synthesis is warranted. Furthermore, the current review aims to expand the scope by applying broader search terms across a wider range of databases, allowing for the inclusion of additional relevant studies that may have been missed in previous reviews.

This systematic review and meta-analysis aimed to synthesise the literature on childhood trauma and neuroticism in adulthood. Specifically, we examined whether.

(1) there is an association between childhood trauma and neuroticism in adult life and.

(2) different subtypes of childhood trauma (emotional abuse, emotional neglect, physical abuse, physical neglect, and sexual abuse) are associated with adult neuroticism.

2. Methods

This systematic review was conducted following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). The study was registered in the International Prospective Register of Systematic Reviews (PROSPERO) in August 2024 (CRD42024580278).

2.1. Eligibility criteria and study selection

Studies included in this review met specific eligibility criteria designed to ensure methodological rigor and relevance to the research question. Inclusion criteria were as follows: studies had to be published in English in peer-reviewed journals, with no restrictions on publication date. Eligible studies were required to report a statistical association between childhood trauma and neuroticism (or negative emotionality) using quantitative methods, including correlation or regression analyses, group comparisons, structural equation modelling, or path analyses. To ensure measurement quality, included studies had to assess both constructs using well-validated instruments, defined as questionnaires or indices that demonstrated at least adequate psychometric properties (e.g., Cronbach's alpha $\geq$0.70) and reported evidence of reliability and validity in line with established standards. Neuroticism had to be measured in adulthood (18 years or older) to ensure that personality traits were assessed post-developmentally. Exclusion criteria included qualitative studies, case studies, reviews, book chapters, conference abstracts, theses and dissertations, and other forms of grey literature. Studies that used proxy indicators without psychometric validation or that measured neuroticism during adolescence or childhood were also excluded.

Study selection adhered to PRISMA guidelines (Liberati et al., 2009, see Fig. 1). First, a literature search was conducted across six digital databases (EBSCO, Web of Science, PsycINFO and Scopus) using the following search terms: "("childhood trauma" OR "early life stress" OR "early trauma" OR "childhood adversity" OR "childhood maltreatment" OR "childhood abuse" OR "childhood neglect" OR "adverse childhood experience*" OR 'ACEs') AND ('neurotic*' OR 'neurotic traits' OR 'emotional instability' OR 'negative affectivity' OR 'negative emotionality') AND ('childhood trauma' OR 'early life stress' OR 'early trauma' OR 'childhood advers*' OR 'childhood maltreatment' OR 'childhood abuse' OR 'childhood neglect' OR 'adverse childhood experience*' OR 'ACEs') AND ('neurotic*' OR 'neurotic traits' OR 'emotional instability' OR 'negative affectivity' OR 'negative emotionality') AND ('impact' OR 'effect' OR 'consequences' OR 'relationship')". Searches were conducted between July 25, 2024, and August 4, 2024. An updated search was completed in April 2025. Search results were uploaded to the software 'Rayyan' (Ouzzani, Hammady, Fedorowicz, & Elmagarmid, 2016) where authors screened them. After removing duplicate results, abstracts from all sources were screened against the eligibility criteria. Full-text review was conducted by at least two members of the research team (NR plus at least one other researcher). Any discrepancies were resolved through discussion; however, there were no disagreements in the final inclusion decisions, resulting in 100% agreement.

2.2. Risk of bias assessment

The risk of bias in the included studies was assessed using the Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for Quantitative Studies (EPPHP, 2009). This tool evaluates studies across eight key domains: selection bias, study design, confounders, blinding, data collection methods, withdrawals and dropouts, intervention integrity, and analyses. Each component is rated as strong, moderate, or weak, allowing for an overall assessment of study quality. The EPHPP tool has been widely used in systematic reviews due to its applicability across different study designs and its comprehensive evaluation criteria. Assessments were conducted by the lead researcher (NR) and spot-checked by the senior author (JM) to ensure reliability and consistency. JM independently reviewed 20% of the included studies, and there was complete agreement between raters, yielding a

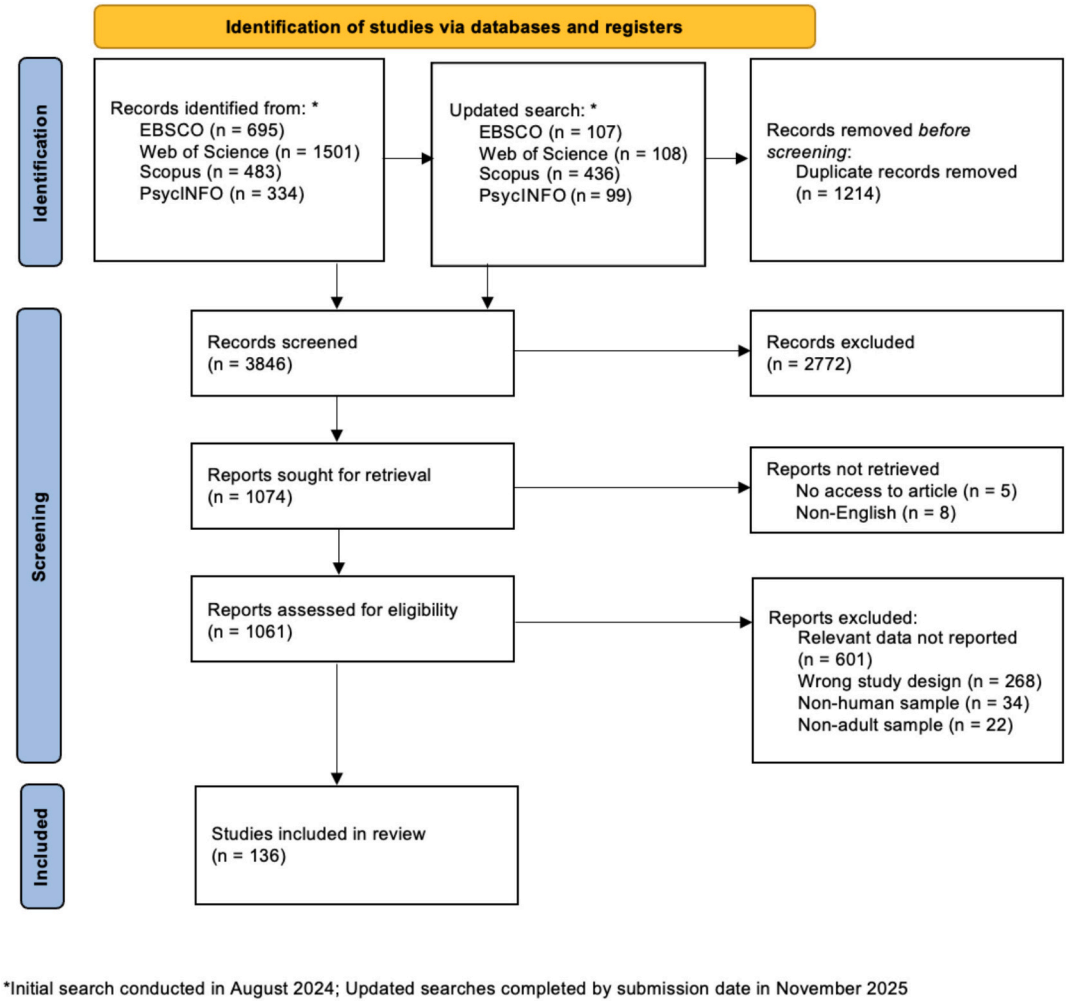

Fig. 1. Flowchart to show the process of inclusion eligibility for meta-analysis.

Cohen's kappa of $\kappa = 1.00$ The results of the risk of bias assessment provide insight into the methodological rigor of the included studies and inform the interpretation of the findings in this review.

To tailor the tool to the specific aims and characteristics of the included studies, a selective approach was adopted regarding the EPHPP domains. From Section A (Selection Bias), both questions were retained. In Section B (Study Design), all questions were kept, although questions three and four, which pertain specifically to randomised controlled trials, were not relevant, as none of the included studies employed a randomised design. Sections C (Confounders) and D (Blinding) were excluded entirely, as they were not applicable to the predominantly observational study designs in this review. Section E (Data Collection Methods) was fully included, given its relevance to assessing the validity and reliability of measurement tools used across studies. In Section F (Withdrawals and Dropouts), both questions were retained to capture issues related to participant attrition. Section G (Intervention Integrity) was excluded, as it pertains to the consistency and delivery of interventions, which was not relevant to the studies assessed. For Section H (Analyses), questions two and three were retained. As part of the screening process, it was ensured that all studies were conducted at the individual level, as studies not meeting this criterion would have automatically been assigned a weak rating in this section.

Following the domain-level assessments, a global quality rating was assigned to each study: strong (no weak ratings across included domains), moderate (one weak rating), or weak (two or more weak ratings). Overall, of the 136 papers included, 91 received a strong rating, 41 received a moderate rating, and 4 were rated as weak. After screening all full texts, data extraction included (1) sample characteristics, (2) methodology, (3) statistical analyses performed, (4) outcome measures pertinent to the review's objectives, (5) resulting effect sizes, and (6) a brief description of study outcome. This information was then used to conduct a narrative synthesis of the findings of the included experiments in alignment with the study's aims.

2.3. Data/meta-analysis model

Effect sizes that were extracted included *r,* beta and *d* and were transformed to Hedges' g effect size values. Thus, the only effect size index used to quantity effects for the relationship between trauma (and its subtypes) and neuroticism was Hedges' *g*. A positive Hedges' *g* value represents a positive relationship between trauma and neuroticism. In line with conventional guidelines, Hedges' *g* values of 0.20, 0.50, and 0.80 were interpreted as small, medium, and large effects, respectively (Cohen, 1988; Hedges & Olkin, 2014).

Hedges' *g* was the preferred effect size metric, over Odds Ratios for several reasons. Firstly, Hedges' *g* is primarily used for continuous data and when sample sizes vary (Borenstein, 2009), whereas Odds Ratios are used for categorical data (Deeks, 1998). Given that most of the data for the meta-analysis were continuous versus categorical, and that the sample sizes varied substantially between studies, Hedges' *g* was a more appropriate effect size metric. Secondly, it was more appropriate to convert the effect sizes to Hedge's *g* rather than Odds Ratios because continuous data, compared to categorical data are less susceptible to effect size inflation (MacCallum, Zhang, Preacher, & Rucker, 2002;

Maxwell & Delaney, 1993; Morriss, Biagi, & Wake, 2024). Thirdly, Hedges *g* versus Odds Ratios criteria for the effect size magnitude are more readily interpretable (Altman, Deeks, & Sackett, 1998; Deeks, 1998).

Random-effect meta-analyses were carried out in RStudio (RStudio, Inc., Boston, MA). Effect size outcomes were modelled for overall trauma and the subtypes with a random-effects model due to its tolerance of heterogeneous effect sizes and conservative nature of estimation (Schmidt, Oh, & Hayes, 2009). Heterogeneity across effects sizes were measured by I^2 statistic. To evaluate the presence of publication bias, funnel plots were visually examined and Egger's test was performed (Egger, Smith, Schneider, & Minder, 1997). Given the small number of studies included in the meta-analysis, which can limit the ability to detect asymmetry in funnel plots and presents as a more lenient significance threshold of 0.10 was applied instead of the standard 0.05 (Fleiss, 1993). When relevant, the Duval and Tweedie 'Trim and Fill' procedure was utilised to adjust for the potential influence of such bias (Duval & Tweedie, 2000). We reported Egger's test for all outcomes but did not conduct trim-and-fill analyses in cases of significant Egger's outcomes when fewer than 10 studies were included, as the test lacks reliability in such cases and follow-up adjustments like trim-and-fill are not recommended with small *k* (Mavridis & Salanti, 2014).

3. Results

3.1. Study characteristics

A total of 136 studies were included in the meta-analysis, comprising a combined sample of 526,371 participants (see Table 1 in supplementary material due to size). Analyses were conducted for overall childhood trauma and separately for different trauma subtypes. We extracted 106 effect sizes for overall trauma ($k = 99$; $n = 526{,}371$). For emotional abuse, we extracted 48 effect sizes ($k = 47$; $n = 144{,}249$), and for emotional neglect, 37 effect sizes ($k = 36$; $n = 130{,}096$). Unspecified neglect was examined in 3 effect sizes ($k = 3$; $n = 326$). Physical abuse yielded 40 effect sizes ($k = 39$; $n = 134{,}205$), while physical neglect yielded 28 effect sizes ($k = 27$; $n = 126{,}622$). Unspecified abuse was represented by 4 effect sizes ($k = 3$; $n = 1265$), and sexual abuse by 45 effect sizes ($k = 43$; $n = 131{,}561$). Three effect sizes were extracted for victimisation experiences ($k = 3$; $n = 1441$).

3.2. Childhood trauma measures

Childhood trauma was assessed using a variety of retrospective measures across the included studies. The most frequently used instrument was the Childhood Trauma Questionnaire – Short Form (CTQ-SF; $k = 63$), which included translated versions in Korean, Thai, and Chinese. The full version of the CTQ was also used in a smaller subset ($k = 10$). Other widely employed measures included the Adverse Childhood Experiences scale (ACEs) or adaptations thereof ($k = 21$), incorporating both Thai and Portuguese versions, as well as the Child Abuse and Trauma Scale (CATS; $k = 6$). Less commonly used tools were the Early Trauma Inventory Self Report – Short Form (ETISR-SF; $k = 4$), the Childhood Trauma Screener (CTS; $k = 4$), the Childhood Psychological Maltreatment Scale (CPMS; $k = 2$), and the NEMESIS Childhood Trauma Interview ($k = 2$), which included a Dutch adaptation. A wide range of other trauma instruments were used only once each across the studies. These included: the Conflict Tactics Scale (CTS); Juvenile Victimisation Questionnaire – Adults Retrospective Version; Childhood Sexual Trauma Questionnaire (CSTQ); adaptations of the Childhood Trauma Interview from ACE-IQ and national mental health surveys (e.g., MHQ); Childhood Adversity score from the Christchurch Health and Development Study (CHDS); Abuse-Perpetration Inventory (API); Assessment Scale of Victimisation in Childhood; Childhood Experiences of Violence Questionnaire (CEVQ); Family and Sexual History Questionnaire; Childhood Victimisation Rating Scale; Traumatic Life Events Questionnaire (TLEQ); Childhood Threat Inventory (PTI); Early Life Stress (ELS) scale; the Daily Inventory of Stressful Events (DISE) with trauma-relevant adaptations; short mistreatment and abuse scales (e.g., Almeida et al., 2002); trauma subscales from the Health and Retirement Study (HRS); the Traumatic Events Screening Inventory – Youth/Self-Report (TESI-Y/SR); the MIDUS childhood trauma subscale; and data from the Violent Experiences Questionnaire (VEQ-R) and LONGSCAN consortium (Table 2 Supplementary for an overview).

3.3. Neuroticism measures

Neuroticism was measured using a range of validated personality instruments across the included studies. The most commonly used measure was the NEO Five-Factor Inventory (NEO-FFI/NEO-FFI-3; $k = 50$), which included translated versions such as Dutch. The Eysenck Personality Questionnaire and its variants (EPQ, EPQ-R, EPQ-RSC, EPQR-AF, EPQR-N, EPQR-S) were also widely used ($k = 20$). Other frequently applied instruments included the Revised NEO Personality Inventory (NEO PI-R; $k = 9$), the Big Five Inventory and short forms (BFI, BFI-S; $k = 16$), which included Chinese and Thai versions, the International Personality Item Pool (IPIP; $k = 8$), and the Ten-Item Personality Inventory (TIPI; $k = 5$), including a Korean version. Less frequently used measures were the PANAS or its international short form (e.g., I-PANAS-SF; $k = 4$) Multidimensional Personality Questionnaire (MPQ, MPQ-BF; $k = 3$), the Emotionality Personality Inventory (EPI; $k = 3$), and the Personality Inventory for DSM-5 (PID-5; $k = 2$). A variety of instruments were used only once across studies, including the Temperament and Character Inventory short forms (TSDI, S5), the Minnesota Multiphasic Personality Inventory – 2 (MMPI-2; Korean version), the Affective Intensity Measure (AIM), Defense Style Questionnaire (DSQ-40), the Five-Factor Narcissism Inventory – Short Form (FFNI-SF), a six-item negative affect scale, the HADS neuroticism/worry subscale, the Type D personality scale (DS14), the 16 Personality Factor Questionnaire (16PF), the Psychological Distress Scale from the Mental Health Index, and the trait version of the State–Trait Anxiety Inventory (STAI-T). For full details, see Table 3 in Supplementary Material.

3.4. Meta-analytic results

3.4.1. The relationship between overall trauma and neuroticism.[1]

Effect sizes for the relationship between an overall measure of trauma and neuroticism were taken from 106 samples ($k = 99$; $n = 526{,}371$). The random-effects model was significant and estimated a moderate positive effect, Hedges' $g = 0.46$ (95% CI = 0.40; 0.52), $p < .001$ (Fig. 2). There was considerable heterogeneity across studies, $I^2 = 98.7\%$. An examination of the funnel plots and the outcome of Egger's test ($p = .24$) indicated no evidence of publication or other selection bias.

3.5. The relationship between distinct subtypes of trauma and neuroticism

3.5.1. Emotional abuse

Effect sizes for the relationship between emotional abuse and

[1] For transparency, we additionally report an analysis that excludes studies drawing on biobank databases with potential participant overlap. Because it is not possible to definitively determine whether datapoints are unique across these cohorts, the main analysis retains all eligible studies to remain as inclusive as possible. The alternative analysis includes only the single UK biobank study with the largest sample size; results from this analysis are reported here: Effect sizes for the relationship between an overall measure of trauma and neuroticism were taken from 103 samples ($k = 96$; $n = 242{,}039$). The random-effects model was significant and estimated a moderate positive effect, Hedges' $g = 0.47$ (95% CI = 0.40; 0.53), $p < .001$. There was considerable heterogeneity across studies, $I^2 = 97.5\%$.

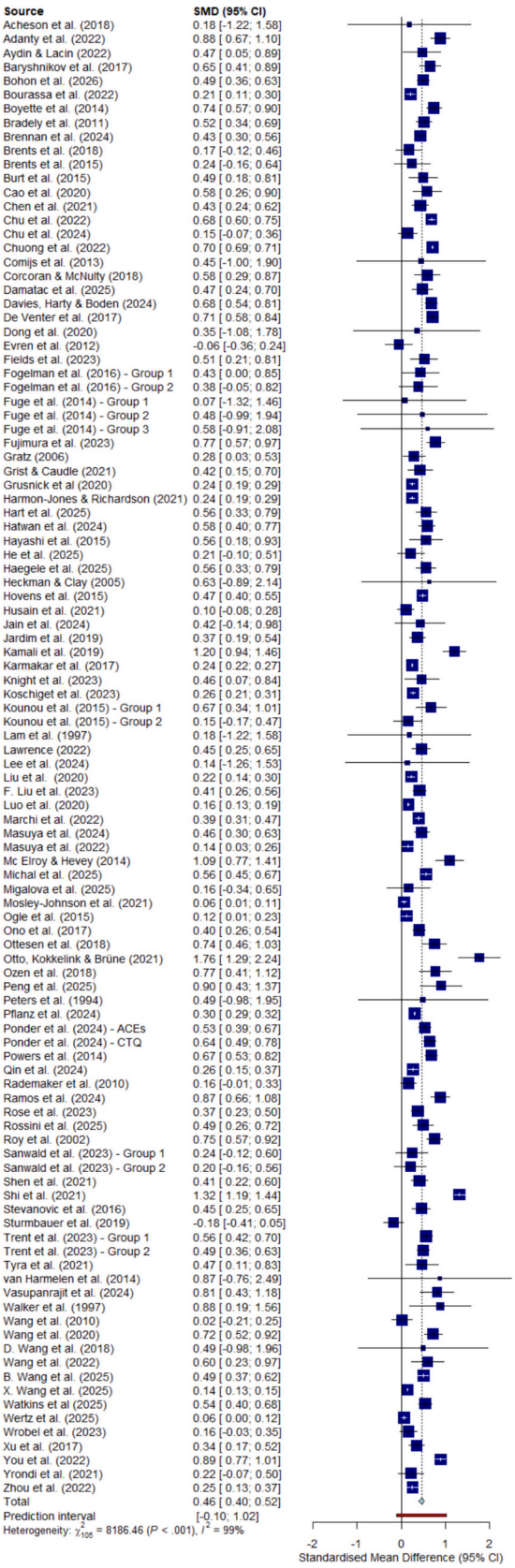

Fig. 2. Forest plot demonstrating a small effect size across studies for the relationship between neuroticism and overall childhood trauma.

neuroticism were taken from 48 samples ($k = 47$; $n = 142{,}249$). The random-effects model was significant and estimated a moderate positive effect, Hedges' $g = 0.49$ (95% CI = 0.43; 0.55), $p < .001$ (Fig. 3). There was considerable heterogeneity across studies, $I^2 = 93.1\%$. An examination of the funnel plots and the outcome of Egger's test ($p < .01$) indicated evidence of publication or other selection bias. The Trim and Fill procedure suggested an adjusted effect size of $g = 0.33$ (95% CI = 0.27; 0.39; Fig. 7A).

3.5.2. *Emotional neglect*

Effect sizes for the relationship between emotional neglect and neuroticism were taken from 37 ($k = 36$; $n = 130{,}096$). The random-effects model was significant and estimated a moderate positive effect, Hedges' $g = 0.40$ (95% CI = 0.35; 0.45), $p < .001$ (Fig. 4). There was considerable heterogeneity across studies, $I^2 = 80.2\%$. An examination of the funnel plots and the outcome of Egger's test ($p = .27$) indicated no evidence of publication or other selection bias.

3.5.3. *Unspecified neglect*

Effect sizes for the relationship between unspecified neglect and neuroticism were taken from 3 samples ($k = 3$; $n = 326$). The random-effects model estimated a moderate but not statistically significant positive effect, Hedges' $g = 0.39$ (95% CI = −0.04; 0.83), $p = .08$ (Fig. 6D). There was considerable heterogeneity across studies, $I^2 = 71.2\%$. An examination of the funnel plots and the outcome of Egger's test ($p = .42$) indicated no evidence of publication or other selection bias.

3.5.4. *Physical abuse*

Effect sizes for the relationship between physical abuse and neuroticism were taken from 36 studies. These studies contributed 40 effect sizes ($k = 39$; $n = 134{,}205$). The random-effects model estimated a small but statistically significant positive effect, Hedges' $g = 0.26$ (95% CI = 0.21; 0.31), $p < .001$ (Fig. 5A). There was considerable heterogeneity across studies, $I^2 = 80.9\%$. An examination of the funnel plots and the outcome of Egger's test ($p = .01$) indicated evidence of publication or other selection bias. The Trim and Fill procedure suggested an adjusted effect size of $g = 0.18$ (95% CI = 0.13; 0.22; Fig. 7B).

3.5.5. *Physical neglect*

Effect sizes for the relationship between physical neglect and neuroticism were taken from 28 samples ($k = 27$; $n = 122{,}622$). These studies contributed 25 samples, which comprised of 12,285 individuals. The random-effects model was significant and estimated a moderate positive effect, Hedges' $g = 0.31$ (95% CI = 0.24; 0.38), $p < .001$ (Fig. 6A). There was heterogeneity across studies, $I^2 = 87.0\%$. An examination of the funnel plots and the outcome of Egger's test ($p < .001$) indicated evidence of publication or other selection bias. The Trim and Fill procedure suggested an adjusted effect size of $g = 0.15$ (95% CI = 0.08; 0.22; Fig. 7C).

3.5.6. *Unspecified abuse*

Effect sizes for the relationship between unspecified abuse and neuroticism were taken from 4 samples ($k = 3$; $n = 1265$). The random-effects model estimated a small but statistically significant positive effect, Hedges' $g = 0.13$ (95% CI = 0.02; 0.24), $p = .02$ (Fig. 3B). There was low heterogeneity across studies, $I^2 = 26.1\%$. An examination of the funnel plots and the outcome of Egger's test ($p = .04$) indicated evidence of publication or other selection bias. However, due to small number of studies included in this analysis, use of the Trim and Fill method was unnecessary in this instance (Mavridis & Salanti, 2014).

3.5.7. *Sexual abuse*

Effect sizes for the relationship between sexual abuse and neuroticism were taken from 45 samples ($k = 43$; $n = 131{,}561$). The random-effects model estimated a small but statistically significant positive

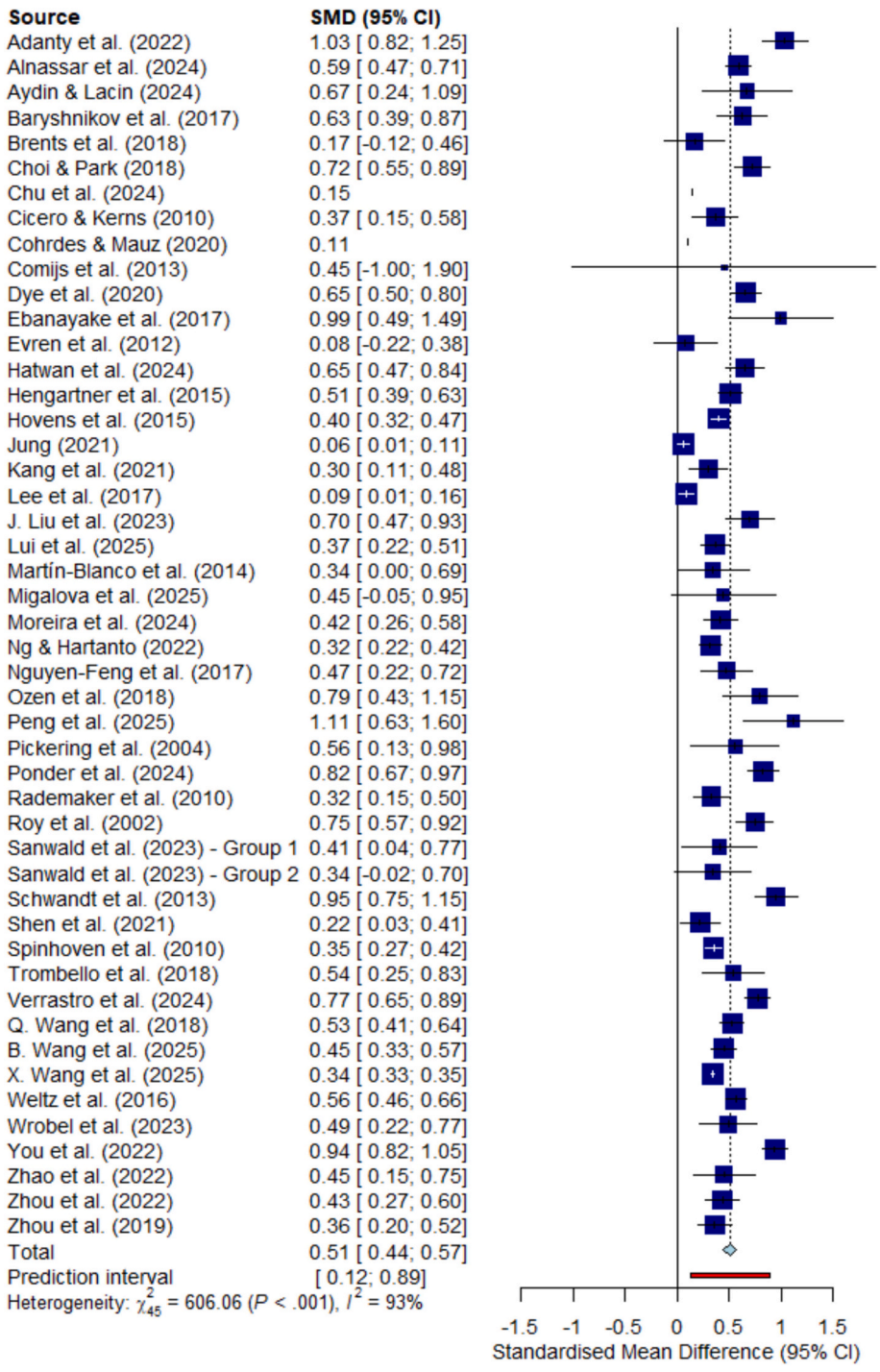

Fig. 3. Forest plot demonstrating a medium effect size across studies for the relationship between neuroticism and emotional abuse.

effect, Hedges' $g = 0.22$ (95% CI = 0.18; 0.27), $p < .001$ (Fig. 5B). There was considerable heterogeneity across studies, $I^2 = 74.3\%$. An examination of the funnel plots and the outcome of Egger's test ($p = .13$) indicated no evidence of publication or other selection bias.

3.5.8. *Victimisation*

Effect sizes for the relationship between victimisation and neuroticism were taken from 3 samples ($k = 3$; $n = 1441$). These studies contributed 3 samples, which comprised of 1441 individuals. The random-effects model estimated a small but statistically significant positive effect, Hedges' $g = 0.21$ (95% CI = 0.14; 0.29), $p < .001$ (Fig. 6B). There was extremely low heterogeneity across studies, $I^2 = 0.0\%$. An examination of the funnel plots and the outcome of Egger's test ($p = .56$) indicated no evidence of publication or other selection bias.

4. Discussion

The present meta-analysis is the largest and most comprehensive synthesis of the literature examining the association between childhood trauma (including its subtypes) and adult neuroticism to date. The findings provide robust evidence for an association between early-life adversity and the development of neuroticism in adulthood, underscoring the potential long-term influence of childhood trauma on neuroticism. Overall, childhood trauma was associated with a small-

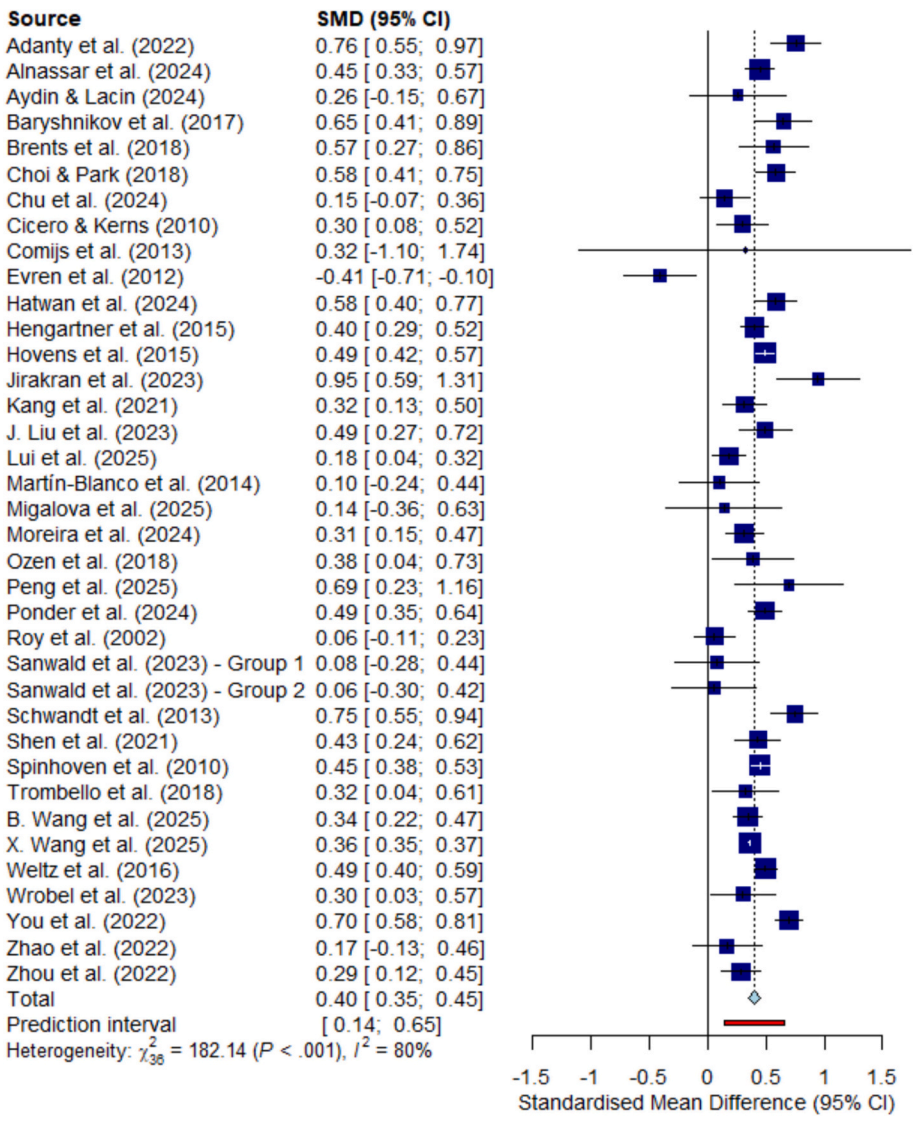

Fig. 4. Forest plot demonstrating a small effect size across studies for the relationship between neuroticism and emotional neglect.

medium effect size, indicating a modest but consistent relationship with adult neuroticism. The relationship between the different trauma subtype and neuroticism varied. A small-medium effect size was observed for the association between neuroticism and emotional neglect, and emotional abuse. In addition, small effect sizes were observed for the relationship between neuroticism and physical abuse, physical neglect, sexual abuse, unspecified abuse, and victimisation. These findings suggest that childhood trauma may lead to adaptions that give rise to neuroticism through several psychological mechanisms such as disruptions in attachment and the formation of negative self-beliefs, and neurobiological alterations in stress regulation systems. These results underscore the importance of systemic preventative measures and early intervention strategies that may alleviate the psychological and neurobiological consequences of trauma, with the potential to increase awareness of adaptions such as neuroticism in trauma-exposed populations.

Building on a growing body of evidence, the present meta-analysis offers robust support for a small-medium effect of a positive association between overall childhood trauma and adult neuroticism. These findings align with foundational theories in developmental psychology, particularly attachment theory, which emphasises the importance of secure early relationships on emotional reactivity and regulation tendencies (Bowlby, 1969, 1998; Bowlby & Solomon, 1989; Mikulincer & Shaver, 2019). Disruptions in caregiving, such as neglect, inconsistency, or maltreatment, can impair the formation of internal working models that foster emotional security. This impairment may heighten susceptibility to psychological processes that are often associated with neuroticism, including emotional reactivity, persistent worry, and stress. In addition to these psychological pathways, early exposure to trauma can lead to dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, the body's central stress response system. Chronic activation of the HPA axis in response to early adversity has been linked to long-term alterations in cortisol secretion and heightened stress sensitivity, both of which are implicated in the development of neurotic traits (Lupien, McEwen, Gunnar, & Heim, 2009; McEwen, 2017). By synthesising data from a large and diverse sample, this meta-analysis extends previous findings (Anda et al., 2007; McLaughlin, 2018) and suggests that childhood trauma, irrespective of its specific form, likely constitutes a generalised risk factor for adaptions such as neurotic traits across the lifespan.

Notably, emotional abuse emerged as having one of the strongest associations with neuroticism, showing a small-medium effect size and suggesting a particularly potent impact on long-term emotional functioning. Theoretical models, particularly those grounded in attachment theory, may offer valuable insights into these patterns (Bowlby, 1969, 1998; Bowlby & Solomon, 1989; Mikulincer & Shaver, 2019).

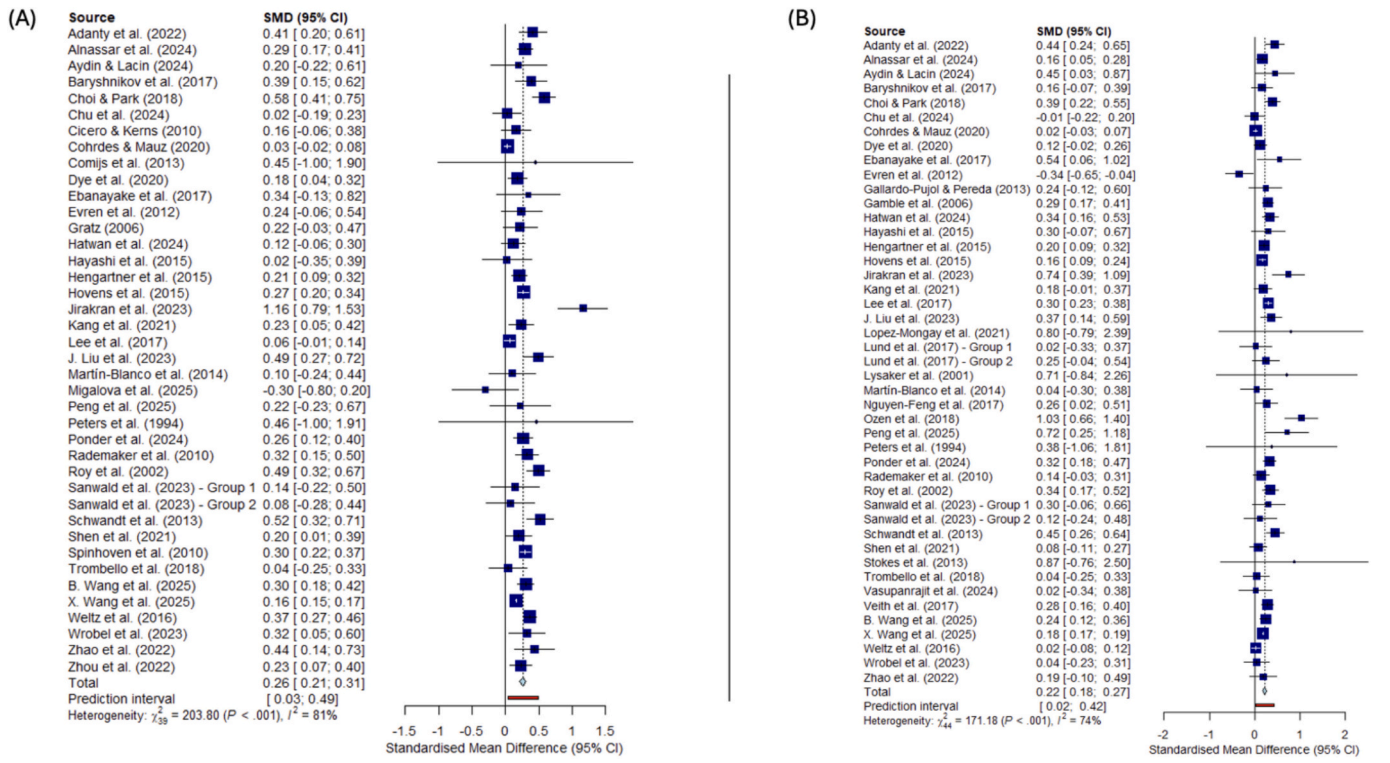

Fig. 5. Forest plot demonstrating a small effect size across studies for the relationship between neuroticism and (A) physical abuse and (B) sexual abuse.

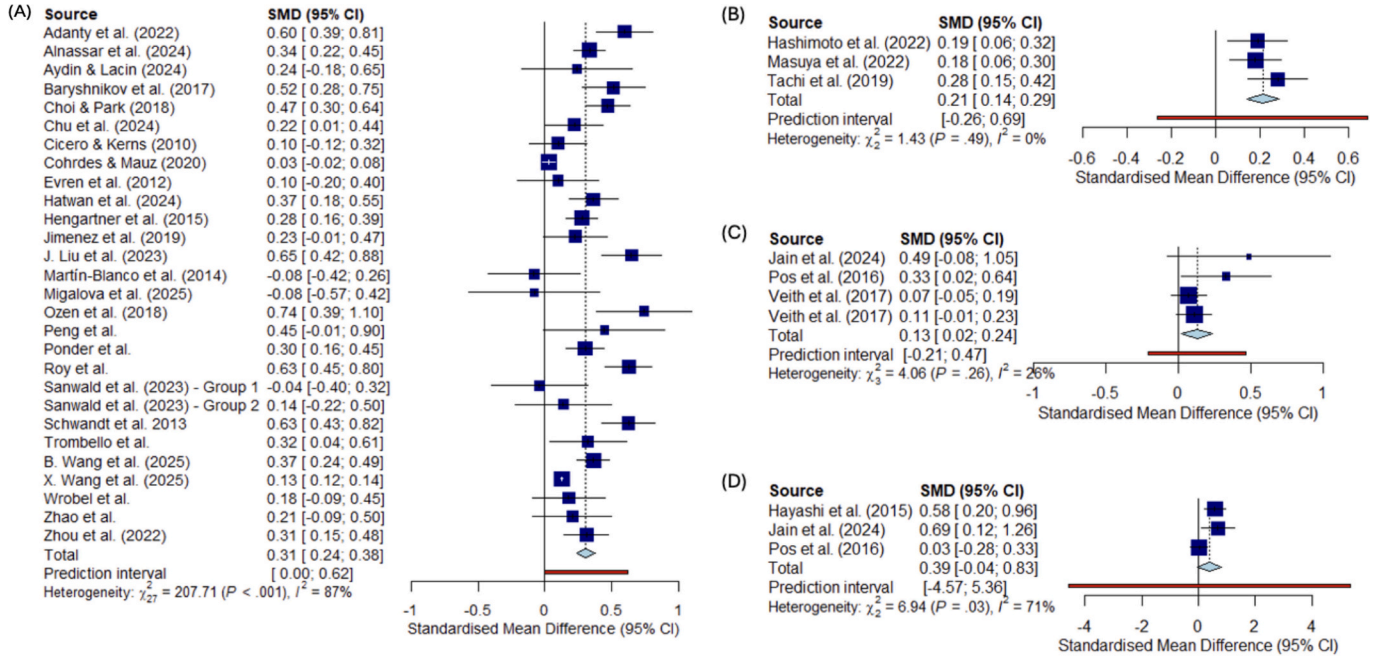

Fig. 6. Forest plot demonstrating a small effect size across studies for the relationship between neuroticism and (A) physical neglect, (B) victimisation, (C) unspecified abuse and (D) unspecified neglect.

Attachment theory (Bowlby, 1969; Bowlby & Solomon, 1989) posits that early interactions with caregivers are critical for the development of emotional regulation. Experiences of trauma, especially emotional abuse or neglect, can disrupt the formation of secure attachment bonds (Bifulco et al., 2006; Finzi, Cohen, Sapir, & Weizman, 2000), which are essential for fostering a stable sense of self and trust in others. The absence of these secure bonds may leave individuals with fewer social resources for safety-seeking and emotion regulation, both in childhood and later life (Hengartner et al., 2015; Hovens et al., 2010; Ponder, Cole, Jensen, & Vrshek-Schallhorn, 2024). This may increase susceptibility to internalising negative self-beliefs, heighten perceived threat in social contexts, and ultimately contribute to elevated neuroticism (Mikulincer, 1998; Mikulincer & Shaver, 2019). Future research is needed to directly test these pathways, ideally using longitudinal or prospective designs that can examine whether disruptions in attachment-related processes mediate the link between specific types of childhood trauma,

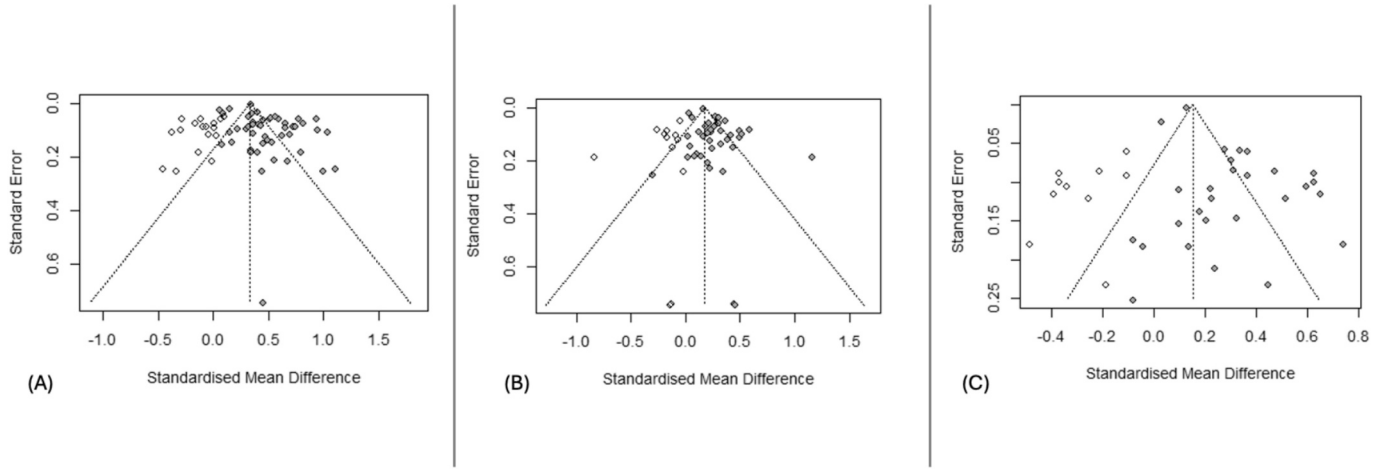

Fig. 7. Funnel plots assessing publication bias for studies included that were examining the relationship between neuroticism and (A) emotional abuse, (B) physical abuse and (C) physical neglect.

particularly emotional abuse, and the development of neurotic traits over time.

Given the observed strength of the association for emotional abuse in particular, it is important to consider the neurobiological mechanisms that may underlie this link. For example, early exposure to adversity has been shown to alter the functioning of the HPA axis and shape the development of brain regions involved in emotional regulation, such as the amygdala and prefrontal cortex (McEwen, 2017; Teicher et al., 2016). These changes are often associated with heightened and prolonged physiological responses to stress (Juster, McEwen, & Lupien, 2010; Lupien et al., 2009; McEwen, 2017). Neurobiological adaptations of this kind align closely with core features of neuroticism and negative emotionality (Faravelli et al., 2012; Laird et al., 2019; Teicher et al., 2016; Twardosz & Lutzker, 2010), supporting the idea that trauma-related physiological changes may play a key role in both the emergence and persistence of adaptions such as neuroticism. Individuals high in neuroticism also tend to exhibit altered cortisol reactivity, including blunted responses to acute stress (e.g., during the Trier Social Stress Test; (Kirschbaum, Pirke, & Hellhammer, 1993)) and disrupted diurnal patterns, with elevated cortisol levels in the morning and evening (Montoliu, Hidalgo, & Salvador, 2020; Xin et al., 2017). The particularly strong association observed for emotional abuse in our findings may reflect the chronic, interpersonal nature of this trauma subtype, which could exert disruptive effects on stress-regulatory systems and emotional processing circuits in the brain. Future research should aim to examine these neurobiological pathways directly, using longitudinal designs that integrate biological measures (e.g., cortisol reactivity, neuroimaging biomarkers) with detailed assessments of trauma exposure and personality development. Additionally, experimental studies employing psychophysiological methods, such as stress reactivity paradigms, salivary cortisol sampling, or heart rate variability, could offer valuable insights into how trauma-related disruptions in stress physiology and emotional regulation unfold in real time and underscore neurotic traits. Collectively, these approaches are essential for identifying causal mechanisms, sensitive developmental windows, and trauma subtypes associated with elevated risk, ultimately providing empirical evidence to further refine psychological models of early adversity and informing the development of early interventions.

While previous meta-analytic work (e.g., Crede et al., 2023) examined a range of trauma subtypes, their review was limited to studies published up to 2021 and relied on a more restricted set of databases, potentially omitting relevant research. In contrast, the present review extended the search window to November 2025 and employed broader search terms across a wider selection of databases. By addressing these limitations, we were able to identify a larger and more diverse dataset, building on the foundation laid by Crede et al. and offering a more comprehensive and statistically robust synthesis. Although our findings were broadly consistent with theirs in demonstrating positive associations between childhood trauma and neuroticism, we observed stronger effects across all trauma types. Although associations with sexual abuse and other forms of maltreatment were smaller in magnitude compared to emotional abuse and neglect, they remained statistically significant, reinforcing the broader literature on the pervasive influence of multiple forms of early adversity on personality development (Boillat et al., 2017; Gamble et al., 2006; Lee & Song, 2017; Pickering, Farmer, & McGuffin, 2004; Talbot, Duberstein, King, Cox, & Gile, 2000). These findings align with and further substantiate existing psychological theories of early relational development (e.g., attachment theory, as well as neurobiological research on the lasting effects of early stress exposure and HPA axis dysregulation). They also contribute to a growing body of evidence linking childhood trauma to mental health disorders later in life (Arango et al., 2021; Hogg et al., 2023), including anxiety (De Venter et al., 2017; He et al., 2024) and mood disorders (Hayashi et al., 2015; Heim, Newport, Mletzko, Miller, & Nemeroff, 2008), alcohol dependency (Cloninger, Sigvardsson, & Bohman, 1988; Davies, Harty, & Boden, 2024; Schwandt, Heilig, Hommer, George, & Ramchandani, 2013), and higher rates of suicidality (Jirakran, Vasupanrajit, Tunvirachaisakul, & Maes, 2023; Roy, 2002; Zhou et al., 2022). Taken together, these findings emphasise that experiences of interpersonal trauma, particularly those involving betrayal, violation, or neglect by caregivers or other trusted figures during sensitive developmental periods continue to confer meaningful risk for the development of neuroticism in adulthood (D'Andrea, Ford, Stolbach, Spinazzola, & Van der Kolk, 2012; Huh, Kim, Yu, & Chae, 2014; Van Assche, Van de Ven, Vandenbulcke, & Luyten, 2020).

When recognising the potentially enduring influence of childhood trauma on the development of neuroticism, it becomes essential to consider how targeted interventions at the micro level, as well as policy change at the *meso* and macro levels, can help prevent and mitigate these long-term effects (Bronfenbrenner, 1979). From both clinical and public health perspectives, our findings highlight the long-term psychological consequences of childhood trauma and the need for preventive strategies that target early-life risk factors. Interventions such as parenting programmes (Chang et al., 2024; Chen & Chan, 2016; Coore Desai, Reece, & Shakespeare-Pellington, 2017), family-based support services (Goodrum & Prinz, 2022; Kimber et al., 2019), and larger scale policy-level efforts (Bowen & Murshid, 2016; Murphey & Bartlett, 2019) to ensure safe, stable, and nurturing environments for children are essential not only to prevent immediate psychosocial harm but also to reduce the likelihood of neuroticism becoming a longer-term adaption. These

approaches have the potential to confer significant downstream benefits in mental health, given the well-established evidence bases for the links between childhood adversity and increased risk for mental health disorders (Arango et al., 2021; Hogg et al., 2023), and neuroticism increased risk for anxiety, mood disorders, suicidality, and physical health problems (Heim et al., 2008; Lahey, 2009; Roy, 2002; Zhou et al., 2022). Clinically, the findings underscore the relevance of trauma-informed assessment and treatment strategies, particularly for individuals high in neuroticism, who may experience heightened emotional reactivity and stress (Barlow, Sauer-Zavala, Carl, Bullis, & Ellard, 2014; Widiger & Mullins-Sweatt, 2009). Although neuroticism has been viewed as a stable transdiagnostic trait, growing evidence suggests it can be meaningfully altered through psychological intervention. Evidence supports the use of therapies, such as trauma-focused Cognitive Behavioural Therapy (tf-CBT), Dialectical Behaviour Therapy (DBT), Compassion Focused Therapy (CFT), and Eye Movement Desensitisation and Reprocessing (EMDR) in helping individuals build more adaptive emotion regulation strategies, reshape core beliefs, and cultivate secure relational patterns (Amari & Mahoney, 2022; Bohus et al., 2019; Chen et al., 2018; Ford, 2021; Herman & van der Kolk, 2020; Lewey et al., 2018; Rolling et al., 2024; Sachser, Keller, & Goldbeck, 2017; Smith et al., 2024; Whalley & Lee, 2019). Additionally, interventions explicitly targeting neuroticism, such as mindfulness-based cognitive therapy (MBCT; Armstrong & Rimes, 2016; Sauer-Zavala, Wilner, & Barlow, 2017) and neuroticism-focused CBT have shown promise in addressing cognitive and emotional processes linked to high neuroticism, including rumination, emotional avoidance, and internalised self-criticism (Kolesnichenko, Muzychko, Savchenko, Kolesnichenko, & Lovegrove, 2021; Sauer-Zavala et al., 2021). Emerging research also supports the value of Acceptance and Commitment Therapy (ACT) which enhances psychological flexibility and has shown promising outcomes in reducing neurotic perfectionism and internalised self-criticism, core features often aligned with high neuroticism (Khadem Dezfuli, Alavi, & Shahbazi, 2023). These findings collectively suggest that various therapeutic approaches can modify neurotic traits, offering meaningful clinical benefits and underscore the value of integrating trauma-informed and personality-focused approaches in both prevention and intervention efforts. The evidence provided by this meta-analysis offers a robust empirical foundation for informing clinical practice and shaping public health strategies aimed at reducing the psychological effects of early adversity and promoting compassion and empowerment for those who have experienced childhood trauma.

There are several limitations of the review to acknowledge. Significant heterogeneity across studies suggests that contextual factors, such as differences in the assessment methods for trauma and neuroticism, study design features such as continuous versus categorical data that impact effect size conversion and comparability, and population demographics may influence the observed effect sizes. The predominance of self-report measures, while common and often necessary in trauma research, presents challenges related to shared method variance and the complexities of recalling early adverse experiences (Boskovic et al., 2024; Merckelbach & Muris, 2001). Memory for traumatic events can be shaped by time, context, and emotional salience, and while retrospective accounts are invaluable for understanding lived experience, they may also reflect the influence of current psychological states. Future research would benefit from integrating multimethod assessment approaches, including clinical interviews, informant reports, and biological markers to enhance construct validity and triangulate findings. Another potential limitation is that four of the included studies may have reused data from the UK Biobank database. However, because the number of participants differed across these studies, it is not possible to determine how many participants were unique or overlapping. Notably, when the largest of the four studies was retained and the other three were excluded, the results remained significant and demonstrated a similar effect size for the relationship between overall trauma experience and neuroticism. Additionally, many of the included studies employed cross-sectional designs, limiting the ability to draw conclusions about causality or developmental pathways. Longitudinal studies are needed to clarify the temporal dynamics between early trauma and the emergence and consolidation of neurotic traits. Experimental work, such as studies using psychophysiological stress paradigms could also help identify causal mechanisms linking trauma exposure to neurotic outcomes. Furthermore, smaller sample sizes in certain trauma subtype analyses, particularly for less commonly studied forms of adversity, may have reduced statistical power and attenuated effect sizes. Lastly, these meta-analytic results of the association between childhood trauma and neuroticism could not address the impact of genetic confounds or gene by environment interactions that contribute to personality development (Briley & Tucker-Drob, 2014; Gupta et al., 2024).

In conclusion, this meta-analysis offers robust evidence for a consistent association between overall childhood trauma and adult neuroticism, reinforcing the notion that early adversity may exert a lasting influence on the development of neurotic traits. Importantly, the strength of this association varied by trauma subtype, with emotional abuse showing the strongest link to neuroticism, followed by emotional and physical neglect. These findings underscore the particularly detrimental impact of relational forms of trauma, those involving violations or absences of care from trusted figures, on the development of emotional regulation and self-concept. While associations with sexual abuse and other trauma types were smaller, they remained statistically significant, supporting the view that a wide range of early adverse experiences can increase risk for heightened emotional reactivity and stress sensitivity in adulthood (Alnassar, Juruena, Macare, Perkins, & Young, 2024; Schwandt, Ramchandani, Diazgranados, & Goldman, 2018). By integrating a large and diverse body of research, this review not only extends prior meta-analytic work but also provides a clearer, more differentiated understanding of how specific forms of childhood trauma contribute to the development of adaptions such as neuroticism. Promisingly, there are ample opportunities to further research how early adversity leads to adaptions such as neuroticism via longitudinal and multi-method approaches within diverse populations. Such research has the potential to support and inform initiatives at all levels (e.g. micro, *meso* and macro) that aim to prevent and mitigate the effects of early adversity.

Ethical approval

This study is a meta-analysis of published studies and does not involve human participants or original data collection; therefore, ethical approval was not required.

Funding information

Norma Rosenek conducted this research as a trainee clinical psychologist funded by Health Education England (HEE). This research was conducted as part of the Doctorate in Clinical Psychology (DClinPsy) at the University of Southampton.

Declaration of competing interest

The authors declare that they have no conflicts of interest to disclose.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.cpr.2026.102700.

Data availability

Data available upon request from first author.

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