Navigating the Paradox: The role of Thought Suppression in PTSD Symptom Severity in Youth Post-Trauma

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Thesis Portfolio Abstract

Overview: Traumatic exposure is common among children and adolescents, with many going on to develop post-traumatic stress disorder (PTSD). PTSD profoundly affects emotional, cognitive, and social development in youth. However, debate continues regarding the mechanisms of PTSD and related disorders in child and adolescent populations, as well as the specific symptom profiles that trauma exposed youth present with.

Methods: This thesis portfolio comprises two papers. First, a systematic review and meta-analyses were conducted to examine associations between five subtypes of childhood maltreatment - emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect – and PTSD, depression, and anxiety in children and adolescent populations. Second, an empirical paper analysed pre-existing data to investigate thought suppression's predictive influence on PTSD symptom trajectory over time, whilst accounting for cognitive moderators.

Results: The systematic review found that all maltreatment subtypes showed mild to moderate positive associations with all mental health outcomes. Emotional abuse had the strongest and most consistent association with adverse mental health outcomes, while physical neglect had the weakest, with cultural factors moderating observed associations. The empirical paper revealed that early thought suppression may function as a benign short-term coping strategy, yet prolonged reliance on suppression strategies predicted greater PTSD severity over time. Notably, *mild* to *moderate* thought suppression at both time points was not linked to elevated PTSD symptoms, suggesting a more nuanced relationship. Trauma-related appraisals and data-driven processing moderated this relationship, suggesting that cognitive biases shape PTSD symptom trajectories.

Conclusion: Together, these papers advance the understanding of how childhood trauma affects mental health and the cognitive mechanisms that sustain post-traumatic stress. The findings have both theoretical and clinical implications, emphasising the need for targeted interventions that address maladaptive cognitive processes to improve outcomes for trauma-exposed youth.

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Chapter 1.
Thesis Introduction

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General Introduction

Childhood trauma is a global issue which causes long-standing and chronic consequences for individuals mental health. Adverse childhood experiences, including abuse and neglect, have been consistently linked to increased risks of depression, anxiety, and post-traumatic stress disorder (PTSD) (Ackerman et al., 1998; Gardner et al., 2019). Research has demonstrated that early-life trauma not only disrupts emotional and cognitive development but also alters neural pathways associated with stress regulation, emotion processing, and memory consolidation (Cross et al., 2017; van Harmelen et al., 2010).

From a biological perspective, PTSD has been linked to significant changes in brain function, particularly within the amygdala, hippocampus and medial frontal cortex. Research suggests that hyperactivity in the amygdala heightens sensitivity to trauma-related stimuli, while dysfunction in the hippocampus and medial frontal cortex reduces the traumatised brain's ability to regulate fear responses (Bremner, 2006; Henigsberg et al., 2019; Iqbal et al., 2023). These neurobiological alterations may contribute to PTSD symptoms, including intrusive memories, hyperarousal and difficulties in emotion regulation (Bremner et al., 2007; Nutt & Malizia, 2004). In youth populations, the impact of neural disruption is profound, with paediatric PTSD associated with reduced hippocampal volume, increased amygdala reactivity and a progressive decline in amygdala-prefrontal connectivity over time (Herringa, 2017). The cost for affected youth includes compromises in the ability to regulate fear responses, leading to persistent hypervigilance, which negatively impacts youths core identity and ability to relate to others (Lubit et al., 2003). While such findings provide valuable insights into the neurobiology of PTSD, they do not fully explain why some children develop chronic symptoms while others

recover. Interestingly, research has turned toward specific cognitive mechanisms that may sustain PTSD symptoms such as maladaptive thought processes and avoidance strategies.

While trauma exposure is a well-established risk factor for PTSD, not all types of trauma exert the same psychological effects. Childhood maltreatment—encompassing emotional, physical, and sexual abuse, as well as childhood neglect—has been consistently linked to increased vulnerability to PTSD, depression, and anxiety (Gardner et al., 2019). However, research has often treated maltreatment as a single risk factor, rather than examining how different forms of abuse may uniquely contribute to mental health outcomes (Teicher et al., 2012). Recent findings suggest that emotional abuse may have particularly severe effects on long-term psychological functioning, while physical neglect may be less strongly associated with PTSD symptoms (Berzenski, 2019). Another important but often overlooked factor is the role of cultural context in shaping trauma responses. The impact of maltreatment may vary based on societal norms, parenting practices, and attitudes toward mental health. For example, studies suggest that emotional neglect may be more strongly associated with anxiety in Eastern cultures, where emotional restraint is often encouraged, whereas physical discipline is allegedly more widely accepted in some regions, potentially influencing the perception and reporting of abuse (Cheah et al., 2015; Wang et al., 2018). Despite these findings, few meta-analyses have systematically explored the differential effects of maltreatment subtypes on PTSD, depression, and anxiety, while considering cultural variations.

PTSD is not solely a disorder of fear conditioning; cognitive and emotional factors play a crucial role in its persistence (Ehlers & Clark, 2000). Among these, thought suppression – the conscious attempt to avoid or push away distressing thoughts- has been widely implicated in PTSD symptom maintenance (Purdon, 1999; Wegner, 1994). While suppression may offer short-

term relief, paradoxically, it has been found to increase the frequency of intrusive thoughts, leading to greater distress over time (Abramowitz et al., 2001). However, a key debate remains around the early stages of thought suppression, with some research indicating it may serve as an adaptive coping mechanism when the emotional intensity of distressing memories becomes overwhelming, reducing anxiety and negative affect without rebound effects (Mamat & Anderson, 2023). It is evident the relationship between thought suppression and PTSD is complex. Despite increasing recognition towards the role of avoidant coping strategies in PTSD development, there is limited longitudinal research examining how suppression evolves over time in youth following trauma. Additionally, few studies have explored how *early* suppression attempts interact with other cognitive factors, such as trauma related appraisals and memory processing, in shaping *later* PTSD symptoms. This is crucial as understanding such interactions could inform effective intervention targeting confounding factors in the development of PTSD in youth.

The first component of this thesis is a systematic review and meta-analysis, which examines the associations between five subtypes of childhood maltreatment—emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect—and three common mental health outcomes: depression, anxiety, and PTSD. By synthesising findings from 62 studies, this review aims to provide a clearer picture of the relative impact of different maltreatment types on psychological distress in youth populations and highlight the importance of considering these subtypes independently rather than as a cumulative risk factor. Additionally, this review explores potential cultural differences in the relationship between maltreatment and mental health outcomes, highlighting the role of contextual factors in shaping trauma responses. Given the growing body of literature emphasising the need for improved trauma-informed care

(Bargeman et al., 2021; Berliner & Kolko, 2016; Yatchmenoff et al., 2017), this review helps bridge existing knowledge gaps by clarifying the distinct psychological consequences of different maltreatment experiences.

Building on the findings of the systematic review, the second component of this thesis is an empirical study investigating thought suppression as a key cognitive mechanism in the development of PTSD symptoms in youth. While avoidance strategies, including thought suppression, may initially serve as protective coping mechanisms, research suggests that prolonged suppression can paradoxically increase intrusive thoughts and distress (Purdon, 1999; Wegner, 1994). Existing trauma research has increasingly focused on various thought control strategies as significant predictors of PTSD persistence (Ehlers & Clark, 2000), yet limited longitudinal studies have explored how these strategies evolve over time in youth. This study employs both traditional regression analyses and machine learning techniques to examine how thought suppression, as a specific thought control strategy employed post-trauma, predicts PTSD symptom severity over time. Additionally, it explores how cognitive factors, such as trauma-related appraisals, trauma memory quality, rumination and data-driven processing, moderate the suppression-PTSD relationship, offering insights into potential intervention for trauma-exposed youth. By incorporating advanced predictive modelling approaches, this study extends current methodological frameworks in trauma research and contributes to the broader discussion on risk and resilience factors.

Recent advancements in trauma-focused interventions have increasingly emphasised the importance of targeting maladaptive cognitive responses to trauma. Emerging research suggests that interventions such as cognitive restructuring, trauma-focused cognitive behavioural therapy (TF-CBT), and exposure-based approaches may be more effective when tailored to address

specific cognitive processes that sustain PTSD symptoms (Meiser-Stedman et al., 2014). By integrating findings from the systematic review and empirical study, this thesis contributes to the broader understanding of how childhood maltreatment impacts mental health and the cognitive mechanisms that maintain post-traumatic symptoms.

Together, these studies contribute to a more refined understanding of the mechanisms linking childhood trauma to adverse mental health outcomes. By integrating the systematic review findings with empirical data, this thesis aims to inform both theoretical models and clinical interventions, emphasising the importance of targeted, trauma-informed approaches in supporting youth exposed to adversity.

Chapter 2.

Systematic Review and Meta-Analysis

Prepared for submission to the Journal of Affective Disorders.

Author guidelines are outlined in Appendix A.

Examining the Impact of Childhood Maltreatment on PTSD, Depression, and Anxiety in Children and Adolescents: A Systematic Review and Meta-Analysis

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Abstract

Objective: Childhood maltreatment is a well-established risk factor for mental health difficulties, including depression, anxiety, and post-traumatic stress disorder (PTSD). However, the extent to which different maltreatment subtypes independently predict these outcomes remains largely disputed in literature. This systematic review and meta-analyses examined associations between five maltreatment subtypes—emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect—and youth mental health outcomes, while exploring cultural moderators. **Methods:** A systematic search across PsycINFO, PubMed, and PTSD Pubs was conducted assessing childhood maltreatment in community youth samples. Meta-analyses were conducted using a random-effects model, with sensitivity analyses implemented to check reliability of results. Moderation analyses were performed to examine the influence of geographical regions on effect sizes. **Results:** Sixty-two studies (N > 128,000 youth) were included. All maltreatment subtypes indicated mild to moderate positive associations with depression, anxiety and PTSD. Emotional abuse demonstrated the strongest and most consistent associations across all mental health outcomes, particularly with depression and anxiety. Physical and sexual abuse were also significantly associated with adverse outcomes, but with weaker effect sizes. Emotional neglect and physical neglect exhibited moderate associations with depression and anxiety. Moderation analyses revealed that cultural factors influenced some observed associations. **Conclusions:** Findings highlight the importance of distinguishing between maltreatment subtypes when assessing mental health risks in youth. The results underscore the need for culturally sensitive assessments and interventions, emphasising the profound impact of emotional abuse on psychological well-being.

Introduction

Childhood maltreatment is a pervasive global issue with profound and lasting effects on mental health in child and adolescent populations. Defined as acts of physical, sexual, or emotional abuse, neglect, or exposure to domestic violence, maltreatment occurs within relationships of trust and responsibility, affecting individuals aged 0-17 (WHO, 2022). Childhood maltreatment is a significant predictor of adverse developmental outcomes, with substantial evidence linking it to disruptions in brain development, impaired cognitive functioning, academic underachievement, behaviour difficulties and an elevated risk of developing poor mental health (Font & Berger, 2015; Romano et al., 2015; Whittle et al., 2013).

Recent global estimates indicate that nearly 400 million children under five – approximately 60% of this age group – experience physical punishment or psychological maltreatment in the home (Unicef, 2024). While childhood maltreatment is a worldwide concern, prevalence varies across regions. For instance, in the United Kingdom, one in five adults reported experiencing abuse before the age of 16 (Office for National Statistics, 2016).

The consequences of childhood maltreatment are profound, contributing to cognitive, emotional and social disruptions to development that increase vulnerability to mental health disorders, including depression, anxiety and post-traumatic stress disorder (PTSD) (Bomysoad & Francis, 2020; Hagele, 2005; Scully et al., 2020). Maltreatment also hinders young people's ability to form healthy interpersonal relationships (Wekerle & Wolfe, 1998) and compromises the ability to manage stress (Badr et al., 2018). Given its widespread prevalence and lasting impact, a deeper understanding of how maltreatment influences youth mental health is crucial for informing prevention and intervention efforts. This issue has received significant attention in recent research, suggesting profound effects on youths development and well-being.

The Mental Health Impact of Childhood Maltreatment

The mental health impact of childhood maltreatment varies by abuse type, with physical, emotional, and sexual abuse and neglect reportedly leading to psychosomatic and psychological outcomes. Emotional abuse has shown strong associations with depression and attachment issues (Riggs, 2011; Zhou & Zhen, 2022), while physical abuse is linked with heightened anxiety and trauma symptoms (Shackman et al., 2007; Springer et al., 2007), and increased risk of aggression and impulsivity (Connor et al., 2003; Liu, 2019). Sexual abuse is strongly correlated with PTSD (Boumpa et al., 2024), dissociation (Kisiel & Lyons, 2001), and maladaptive coping strategies, such as self-harm or high-risk behaviours, leading to increase suicidal ideation (Mossige et al., 2016). These responses often persist into adulthood, exacerbating long-term mental health difficulties (Bradley et al., 2019).

The Childhood Trauma Questionnaire

To better understand the multifaceted impacts of childhood maltreatment, the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994) has become a widely utilised tool for assessing maltreatment across five subtypes: emotional abuse, physical abuse, sexual abuse, emotional neglect, and physical neglect. The CTQ provides a robust framework for examining different forms of maltreatment in youth populations, offering reliable and valid outcomes for evaluating maltreatment in youth as young as twelve (Spinhoven et al., 2014; Wang et al., 2022). Research has consistently linked CTQ subscale scores to adverse mental health outcomes, such as depression, anxiety, and PTSD. For instance, Humphreys et al. (2020) found higher total CTQ scores correlated with increased depression scores, while Guo et al. (2021) identified similar associations with anxiety. Pham et al. (2021) highlighted subtype-specific effects, suggesting emotional abuse is more strongly linked to depression and suicidal ideation, whereas physical

abuse is more closely associated with anxiety and suicide attempts. Higher scores on the emotional and sexual abuse subscales have also been linked to increased PTSD symptomology (Cecil et al., 2017). The CTQ's subscales provide a vital framework for understanding how different maltreatment types impact mental health outcomes across populations (Cruz, 2023).

Current difficulties

Despite extensive research, inconsistencies persist in identifying the magnitude of each maltreatment subtype on mental health outcomes. Some studies highlight emotional abuse as the most impactful on mental health, linking it to depression, anxiety, self-esteem and emotion regulation difficulties (Berzenski, 2019; Mwakanyamale & Yu, 2019). Conversely, others emphasise the impairment of physical abuse, particularly its connection to externalising behaviours like aggression and conduct disorders (Ford et al., 2009; Kim & Cicchetti, 2010). Sexual abuse is often cited as holding the most profound impact on mental health, with strong associations with anxiety, depression, PTSD, dissociation and maladaptive coping skills (Allen et al., 2014; Khadr et al., 2018). Others argue that emotional neglect may be equally, if not more, detrimental as its chronic and insidious nature disrupts emotion regulation and self-concept (Berzenski, 2019; Young et al., 2011). Physical neglect has also been associated with severe psychological distress, particularly internalising symptoms and long-term health risks (Cohen et al., 2017).

The extent to which these subtypes independently predict mental health symptoms remains debated, with some evidence suggesting that the cumulative maltreatment may be more predictive than any single subtype alone (Warmingham et al., 2020). These inconsistencies highlight the ongoing debate in maltreatment research, underscoring the need for greater clarity on how difference abuse subtypes shape mental health outcomes. Such discrepancies may stem

from methodological variations, including differences in how maltreatment is defined and measured, as well as differences in sample characteristics, such as age, geographical region, and recruitment source, such as clinical or community populations (Fallon et al., 2010; Jackson, 2023). These challenges further complicate efforts to determine the unique impacts of maltreatment subtypes on psychological distress.

Geographical Influences

The relationship between childhood maltreatment and mental health is not universally consistent, as cultural, and regional factors are suggested to shape both its prevalence and impact. For instance, research suggests lower estimates of maltreatment in Europe and Asia, while South America and Africa report some of the highest global rates (Akmatov, 2011; Viola et al., 2016). These regional variations are closely tied to cultural, social, and systemic influences that shape parenting practices and the perception of maltreatment. In Western cultures, parenting often emphasises warmth and emotional expression, encouraging children to share their feelings (Cheah et al., 2015). In contrast, it has been argued that many Asian cultures prioritise academic success and emotional restraint as signs of maturity (Cheah et al., 2015; Chen et al., 2001). Research from China suggests a greater societal acceptance of physical discipline as an expression of parental authority, whereas in the United States, such practices are more widely classified as abusive (Wang et al., 2018; Wang & Kenny, 2014). These cultural differences can blur the boundaries between discipline and abuse, influencing reporting rates and shaping how maltreatment is both experienced and understood.

Sampling Difficulties

Research on childhood maltreatment faces significant challenges in obtaining representative samples. Much of the literature relies on highly specific groups, such as clinical

populations or retrospective accounts from adults, limiting the ability to establish clear patterns or draw generalisable conclusions (Jackson, 2023). In contrast, community samples will include youth with severe difficulties as well as individuals whose experiences, while not meeting diagnostic thresholds, still contribute to considerable psychological distress. Subthreshold conditions, such as anxiety and depression, have been shown to predict the onset of full syndrome disorders (Shankman et al., 2009). Moreover, underreporting remains a concern, as fear of retaliation, worsening the child's situation, or intruding on privacy can often deter intervention (Bensley et al., 2004). Prioritising community samples provides a more comprehensive picture of maltreatments prevalence and impact, offering insights that are more applicable to the general population.

Gap in Literature and Scope of Paper

Understanding childhood maltreatment is hindered by methodological variability and challenges in obtaining representative samples, particularly in youth populations. Differences in sample populations, maltreatment assessment, and outcome measures, further complicates cross-study comparisons (Chae et al., 2011). While meta-analyses have examined associations between childhood trauma and specific mental health outcomes (Gardner et al., 2019; Humphreys et al., 2020; Norman et al., 2012), no large-scale study has systematically explored the differential effects of childhood maltreatment, as measured by the CTQ, on depression, anxiety, and PTSD in community samples of youths. Furthermore, the potential moderating role of geographical regions on such associations remains unexplored.

This systematic review and meta-analyses aim to address these gaps by synthesising evidence on the associations between childhood maltreatment (as measured by the CTQ subscales) and mental health outcomes (depression, anxiety and PTSD) in children and

adolescents. By focusing on community samples, this review aims to clarify the differential impacts of maltreatment types across a range of types of exposure and the full range of mental health disturbances and reduce sources of methodological heterogeneity.

Method

Registration and Protocol

This review was registered with the International Prospective Register of Systematic Reviews (PROSPERO) under ID code CRD42024520931 on 21st March 2024. It adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009; Page et al., 2021), to promote transparency, reproducibility and applicability of findings.

Search Strategy

Searches were completed by the first author (DP) to identify all relevant studies examining the impact of childhood trauma using the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994) on common mental health outcomes (depression, anxiety and PTSD symptoms) in children and adolescents. The CTQ was chosen as it is a widely used, validated and reliable measure for assessing childhood abuse and neglect (Bernstein et al., 2003; Hagborg et al., 2022; Liebschutz et al., 2018). Additionally, the CTQ has been successfully translated into multiple languages whilst maintaining psychometric consistency (Delhalle et al., 2024; Grassi-Oliveira et al., 2014; Peng et al., 2023a).

Searches were completed in the electronic databases PsycInfo, PubMed, and PTSD pubs, using a combination of free-text terms and controlled vocabulary (e.g., Medical Subject

Headings or “MeSH “terms) to ensure comprehensive and sensitive retrieval of articles. The following search terms and Boolean operators were used:

(PTSD OR “post-traumatic stress” OR “posttraumatic stress” OR depress* OR anxi*) AND ("Childhood Trauma Questionnaire") AND (child* OR adolesc* OR pupil OR boy* OR girl* OR teenage*).

The search strategy was not restricted to specific fields (e.g., title and abstract) to increase sensitivity. Studies published in any language were included, with foreign language articles (*n* = 4) translated using Google Translate. Whilst this approach enabled full-text screening, potential limitations in translation accuracy were acknowledged; however, none of the four studies ultimately met inclusion criteria. The search encompassed all articles published prior to the review start date (March 2024).

Study Selection

Data from the initial database searches were imported to Zotero referencing software and subsequently uploaded to Rayyan systematic review software for screening. After removing duplicates, titles and abstracts were screened by the primary reviewer (DP) for relevance against predefined inclusion and exclusion criteria. Full-text reviews were conducted for studies deemed potentially eligible based on title and abstracts.

Studies were included in the review if they met the following criteria: (1) published as academic journal articles, doctoral theses, or master’s dissertations, (2) focused on children and adolescent populations (mean age of < 18, with no participant older than 21, (3) drawn from non-clinical, community samples, (4) utilised the CTQ to measure abuse exposure, (5) assessed

common mental health outcomes (depression, anxiety & PTSD symptoms) using validated assessment tools, and (6) provided correlational statistics between CTQ subscales and mental health outcomes or data convertible to coefficients (e.g. Cohen's d). Studies were excluded from the review if: (1) focused on high-risk populations (e.g. foster children, natural disasters, child soldiers), (2) used adapted CTQ subscales, (3) relied on parent-completed measures over child-reported data for any included measure, (4) included participants who were treatment seeking, and (4) used inappropriate study design (e.g. scoping review or protocol paper).

Only studies published in peer-reviewed journals were included to ensure methodological rigour and quality control; grey literature, such as conference abstracts and unpublished reports were excluded. The upper age limit was set at 21 to capture late adolescence, recognising that the definition of adolescences varies across cultural and geographical contexts (Sawyer et al., 2018). This decision also helped to mitigate the inclusion of adult populations, to control for studies that featured a small number of adult participants despite maintaining a mean sample ages of below 18.

To ensure rigor, a second reviewer (AP) independently rescreened a random 20% of both the initial title and abstract screenings and the secondary full-text screenings. Agreement rates were 98% for the title and abstract screening and 96.4% for the full-text screening. Discrepancies regarding eligibility were resolved through discussion with a third independent reviewer (RMS).

Data Extraction

Data were extracted from included studies by the primary reviewer (DP). The following data points were extracted: (1) article metadata (e.g., author, country and year of publication), (2) population demographics (e.g., mean age, age range, gender split, number of participants), (3) core outcome measures (CTQ subscales, anxiety, depression and PTSD metrics) and (4) effect

sizes (e.g., correlation, Cohens d, odd's ratios and standardised regression coefficients, i.e. betas). Although some articles included longitudinal comparisons, cross-sectional data were prioritised for inclusion in this review to maintain consistency across analyses, as longitudinal data were less available across studies. As a result, the findings presented in this study are based solely on observational, cross-sectional data.

Effect Size Calculation

Pearson's correlation coefficient (*r*) was used as the primary measure of effect size due to its versatility in quantifying the strength and direction of relationships between variables and its widespread use in psychological research, allowing for comparability across studies. Correlation coefficients were primarily extracted from correlation matrices in the included studies, which provided clear evidence of association between variables. For studies that reported odds ratios, prevalence ratios, and standardised regression coefficients (betas), these values were converted into Pearson's correlation coefficient using established conversion formulas (Borenstein et al., 2011; Cohen, 1988; Peterson & Brown, 2005). This conversion ensured consistency in effect size metrics across studies in data synthesis.

Quality Assessment

A risk of bias assessment was conducted for each study in accordance with the PRISMA 2020 guidelines (Page et al., 2021). A custom quality assessment tool (Appendix B) was developed specifically for this review, drawing from existing checklists, to ensure increased relevance. These included the CASP Checklist For Descriptive/Cross-Sectional studies (Critical Appraisal Skills Programme, 2024), Quality Appraisal Checklist for Studies Reporting Correlations and Associations (NICE, 2012) and the Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (National Heart Lung and Blood Institute, 2014).

The tool consisted of seven items, and included studies were rated on a points-based system with responses of "Yes" (1) and "No" (0). Studies were classified into two categories: "High Quality" (i.e. low risk of bias; ≥ 4 points) and "Low Quality" (i.e. high risk of bias: < 4 points). The quality assessment was initially completed by the first author, with 20% of the included studies subsequently re-rated by the second reviewer (AP) to ensure. Cohen's Kappa indicated a strong level of inter-rater reliability between reviewers ($K = 0.83$)

Data Synthesis

Random effects meta-analyses were conducted using the "metafor" package (Viechtbauer, 2010) in R. To calculate an effect size, correlation coefficients (r) were transformed using Fisher's z transformation. This transformation stabilises variance and improves normality, enabling more reliable pooling of effect sizes across studies (López-Ibáñez et al., 2024). The pooled effect sizes were then back-transformed to r values for interpretability. Heterogeneity of effect sizes was assessed using the Q statistic and the I^2 statistic. A significant Q statistic ($p < .05$) indicates variability in effect size beyond chance (Higgins & Thompson, 2002), while the I^2 statistic quantifies the degree of heterogeneity, with values classified as low (25%), moderate (50%) and high (75%) according to established thresholds (Higgins et al., 2003) Prediction intervals are also reported to aid with interpretation of heterogeneity (IntHout et al., 2016). The full R code is provided in the appendices section (Appendix C).

Sensitivity & Subgroup Analyses

Additional sensitivity analyses were conducted to examine the impact of low-quality studies on the robustness of the findings, as such studies may include bias or reduce precision in overall effect size estimates, thereby compromising the validity of the conclusions (De Cassai et al., 2023). The transformation of coefficients and beta-estimation procedures has been criticised,

with concerns that such transformation may introduce substantial bias when estimating population correlations (Linakis et al., 2024; P. L. Roth et al., 2018). To address these concerns, a second series of sensitivity analyses were conducted to examine the impact of excluding transformed values on the overall results, assessing whether the use of converted *r* values substantially influenced observed effect sizes.

Moderation analyses were also conducted to explore whether geographical regions (North America vs. Rest of World, China vs. Rest of World) influenced the associations between CTQ subscales and mental health outcomes (depression, anxiety, PTSD). Given that cultural and systemic differences across regions may affect the prevalence or impact of childhood maltreatment (Sebre et al., 2004; Stoltenborgh et al., 2013; Viola et al., 2016), the analyses aimed to determine whether effect size significantly varied by region. Subgroup meta-analyses were performed to compare pooled effect sizes and heterogeneity statistics between regions, assessing potential regional moderation of the relationships between childhood maltreatment and mental health outcomes.

Results

Search Results

The initial database search identified 2,282 articles. After removing duplicates, 2,013 articles remained eligible for review. Following the initial title and abstract screening, 1,476 articles (73.32%) were excluded due to irrelevance, leaving 537 articles for full-text review. Of these, 62 studies met inclusion criteria and were included for the review (see Figure 1).

Figure 1

PRISMA Flow Chart outlining study selection

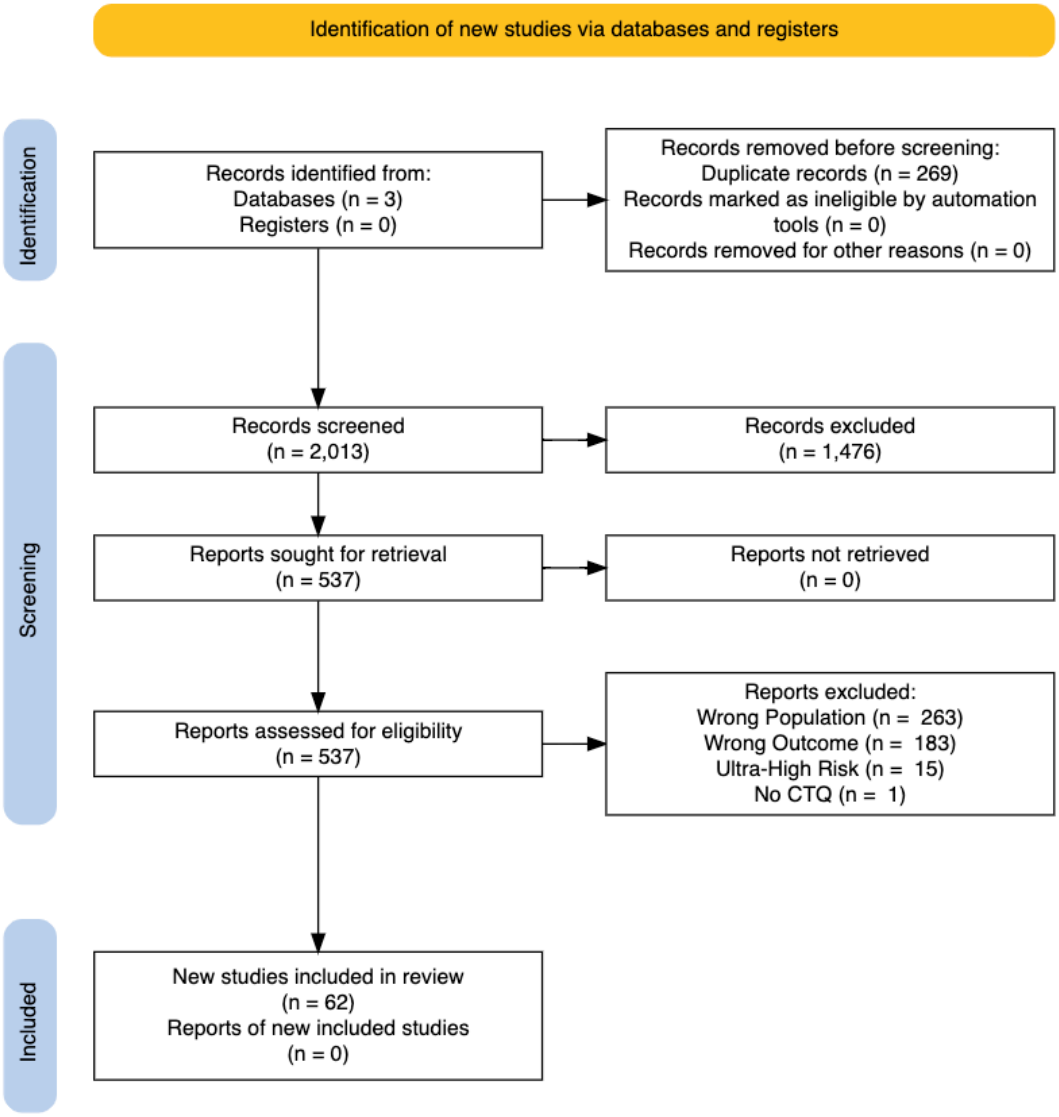

Table 1 summarises the key characteristics of the 62 included studies, while Supplementary Table 1 presents the correlation coefficients (reported as *r* values, including transformed *r* values) for each study (See Table S1). Together, these studies provided participant data totalling 128,318 individuals.

Table 1

Descriptive Characteristics of Included Studies

Article	Sample Size	*Age, M*	*Age, SD*	Age Range	Female (%)	Country	Recruitment Method	Depression Measure	Anxiety Measure	PTSD Measure
Aloba et al. (2020)	1337	15.2	NA	13 - 18	54.7	Nigeria	School	HADS-D	HADS-A	NA
Arata et al. (2007)	1452	15.6	NA	13 - 18	53.3	USA	School	CES-D	NA	NA
Banducci et al (2017)	244	12.1	0.91	10 - 14	45	USA	CR	NA	RCADS	NA
Banducci et al. (2018)	206	14.1	0.55	11 - 13	41	USA	School	RCADS	NA	NA
Bounoua et al. (2015)	229	14	0.89	NA	44.3	USA	CR	NA	CASI	NA
Brockie et al. (2015)	86	NA	NA	15 - 18	51	USA	School	BDI	NA	B-SSS
Cao et al (2024)	827	16.5	1.37	NA	50.2	China	School	CDI	SCAS	NA
Chango et al (2012)	173	16.4	0.87	16 - 18	53.1	USA	School	CDI	NA	NA
Chen & Cao, (2023)	370	16.3	1.28	NA	50.4	China	School	CDI	NA	NA
Chen & Qin (2020)	569	11.7	0.83	10 - 15	49.4	China	School	NA	SCAS	NA
Cohen et al (2019)	673	14.8	0.66	NA	57.1	USA	School	CESD-10	NA	NA
de Oliveira et al. (2018)	347	13.3	1.52	11 - 17	48	Brazil	School	CDI	SCARED	NA
de Vasconcelos et al. (2020)	342	13.3	2.52	11 - 17	47.1	Brazil	School	BDI	NA	NA
Fu et al. (2022)	4313	10.9	0.49	NA	45.5	China	School	CES-D	NA	NA
Gratz et al. (2011)	225	12.2	0.82	11 - 14	45	USA	CR	RCADS	RCADS	NA
Gustafsson et al. (2017)	626	17.8	1.29	14 - 19	100	USA	CR	RADS	NA	NA
Hamilton et al (2014)	225	12.8	0.61	12 - 13	59	USA	School	CDI	MASC	NA
Hamilton et al (2015)	259	12.9	0.6	12 - 13	54	USA	CR	CDI	NA	NA
Hamilton et al (2016)	410	12.8	0.61	12 - 13	53	USA	School	CDI	MASC	NA
Hodson et al. (2006)	361	17.2	1.4	NA	100	USA	CR	DC+SI	NA	NA
Holt (2002)	450	16	1.4	NA	56	USA	School	YSR	NA	NA
Hou et al (2023)	1337	13	0.98	11 - 16	50.2	China	School	NA	SAS	NA
Hu et al. (2022)	3357	13.7	2.06	NA	49.4	China	School	SDS	SAS	NA
Jessar et al (2017)	204	12.9	0.6	12 - 13	54	USA	School	CDI	NA	NA
Kang et al. (2020)	942	13.5	NA	11 - 16	52.4	China	School	CES-D	NA	NA
Li et al. (2021)	4273	9.9	0.73	NA	45.2	China	School	YSR	NA	NA
Li et al. (2022)	1610	13.1	0.95	11 - 16	52.6	China	School	DASS-21	DASS-21	NA
Lu et al (2019)	864	17.1	0.78	16 - 21	58.1	USA	School	CES-D	GAD-7	PC-PTSD
Menon et al (2018)	1042	15.1	0.79	NA	56	USA	School	CES-D	NA	PC-PTSD
Mikaeili et al. (2013)	893	13.2	1.06	12 - 14	0	Iran	School	SCL90-R	SCL90-R	NA
Miller et al (2018)	682	11.8	2.42	7 - 18	NA	USA	School	CDI	NA	NA
Peng et al. (2023)	18980	15	1.64	12 - 18	50.1	China	School	PHQ-9	GAD-7	NA

Perry et al (2014)	207	16	1	14 - 17	0	USA	Online/CR	PHQ-9 + GAD-7	NA	NA
Qu et al (2022)	6300	12.3	1.83	8 - 18	45.4	China	School	CES-DC	SCARED	NA
Qu et al. (2022)	23853	13.8	1.02	NA	42.8	China	School	PHQ-9	NA	NA
Reis et al. (2024)	654	14.3	1.89	11 - 17	52.9	Brazil	School	RCADS	RCADS	NA
Ribero et al. (2018)	869	NA	NA	12 - 19	100	Brazil	School	BDI	NA	NA
Sapkota et al (2020)	384	NA	NA	11 - 18	95.3	Canada	School	DSRS	NA	CPSS
Sapkota et al. (2019)	314	14.6	0.99	11 - 18	59.6	Canada	School	DSRS	NA	CPSS
Shao et al. (2021)	718	11.5	0.95	9 - 14	51.1	China	School	CES-D	NA	NA
Shapero et al. (2013)	216	14	0.87	12 - 13	58	USA	School	CDI	MASC	NA
Soar et al (2023)	96	12.3	2.2	9 - 16	68.8	USA	CR	CES-D	NA	NA
Strange et al (2013)	174	12.3	0.58	12 - 13	57.9	USA	CR	CDI	NA	NA
Strange et al (2014)	256	12.3	0.61	12 - 13	54	USA	School	CDI	MASC	NA
Tian et al. (2022)	395	17.5	0.61	NA	55.5	China	School	NA	NA	ITQ
Tong et al. (2022)	426	17	0.85	15 - 19	57.5	China	School	SDS	SAS	NA
Wang et al. (2022)	1507	16.1	0.84	15 - 17	54.8	China	School	BDI	STAI	NA
Wang et al. (2022)	890	9.55	0.74	7 - 12	34.2	China	School	CES-D	NA	NA
Wei et al. (2021)	6510	12.6	1.7	10 - 17	47.7	China	School	CES-D	NA	NA
Weierich & Nock (2008)	86	17	1.88	12 - 19	77.9	USA	CR	NA	NA	K-SADS
Williamson et al (2018)	151	16.7	0.89	NA	50	Cambodia	School	NA	NA	PCL-C
Xiao et al. (2022)	756	13.5	1.71	10 - 18	74.1	China	School	K-SADS-PL	NA	NA
Xu et al (2023)	1570	13.1	0.95	11 - 16	46.9	China	School	DASS-21	NA	NA
Yearwood et al. (2020)	218	14.2	1.54	11 - 18	47.7	Peru	School	YSR	NA	NA
Yigit et al. (2021)	132	15.1	1.07	13 - 18	71	Turkey	School	CDI	STAI	NA
Zeller et al (2015)	222	16.6	1.44	13 - 18	80.6	USA	CR	BDI	NA	NA
Zhang et al. (2022)	9071	14.5	1.7	NA	47.4	China	School	SDS	SAS	NA
Zhang et al. (2022)	2011	15.3	2.48	9 - 20	49	China	School	PHQ-9	GAD-7	NA
Zhao et al. (2021)	1802	14.3	0.89	NA	47.6	China	School	CDI	NA	NA
Zheng et al (2024)	14059	13.9	1.08	NA	49.9	China	School	PHQ-9	NA	NA
Zhong et al (2024)	4576	13.4	1.21	9 - 17	49.2	China	School	CDI	NA	NA
Zhou & Zhen (2022)	1987	14	1.6	14 - 17	52.1	China	School	CES-D	NA	NA

Note. CR = Community Recruitment; HADS-D = Hospital Anxiety & Depression Scale - Depression Subscale; HADS-A = Hospital Anxiety & Depression Scale - Anxiety Subscale; CES-D Center for Epidemiologic Studies Depression Scale; PHQ-9 = Patient Health Questionnaire 9; GAD-7 = General Anxiety Disorder-7; SCL-90-R = Symptom Checklist-90; SDS = Self-Rating Depression Scale; SAS = Self-Rating Anxiety Scale; CDI = Children's Depression Inventory; BDI = Beck's Depression Inventory; STAI = State-Trait Anxiety Inventory; SCAS = Spence Children's Anxiety Scale; DASS-21 = The Depression, Anxiety and Stress Scale - 21 Item; RCADS = Revised Child Anxiety and Depression Scale; DSRS = Depression Self-Rating Scale; PC-PTSD = Primary Care PTSD Screen; CPSS = Child PTSD Symptom Scale; B-SSS = Breslau's Short Screening Scale; YSR = Youth Self Report (Internalising Subscale); PCL-C = PTSD Checklist - Civilian Version; SCARED = Screen for Child Anxiety Related Disorders; CES-DC = Center for Epidemiological Studies Depression Subscale for Children; K-SADS-PL = Kiddie Schedule for Affective Disorders and Schizophrenia - Present and Lifetime Version; MASC - Multidimensional Anxiety Scale for Children; CESD-10 = Center for Epidemiologic Studies Depression Scale - 10 item; DC+SI = Depressive Cognitions + Suicidal Ideations Scales; ITQ = International Trauma Questionnaire.

Primary meta-analyses

Fifteen meta-analyses were conducted to examine the association between the five CTQ subscales - Emotional Abuse (EA), Physical Abuse (PA), Sexual Abuse (SA), Emotional Neglect (EA) and Physical Neglect (PN) - and three common mental health outcomes; depression, anxiety, and PTSD. Table 2 summaries the results, including pooled effect sizes, confidence intervals, prediction intervals, and heterogeneity statistics.

Table 2

Meta-analyses of the Associations Between CTQ Subscales and Mental Health Outcomes

Meta-Analyses	*k*	*n*	Pooled effect size, *r*	95% CI		95% PI		Q test	I^2
				LB	UB	LB	UB		
Depression									
Emotional Abuse	51	121,189	0.40	0.36	0.43	0.13	0.61	1647.09***	97.86
Physical Abuse	37	112,577	0.23	0.19	0.27	0.004	0.43	1187.64***	97.43
Sexual Abuse	32	101,864	0.18	0.15	0.21	0.009	0.34	286.31***	95.51
Emotional Neglect	39	113,320	0.29	0.24	0.33	0.02	0.52	2635.37***	98.14
Physical Neglect	32	109,576	0.24	0.20	0.28	0.005	0.45	1288.24***	97.85
Anxiety									
Emotional Abuse	23	73,013	0.35	0.29	0.40	0.06	0.58	762.60***	98.39
Physical Abuse	17	72,072	0.26	0.20	0.32	0.01	0.48	405.50***	98.30
Sexual Abuse	13	68,573	0.15	0.11	0.19	0.03	0.27	97.69***	94.02
Emotional Neglect	19	75,001	0.22	0.16	0.28	-0.05	0.46	977.22***	98.38
Physical Neglect	15	72,773	0.19	0.15	0.24	0.03	0.35	284.98***	96.59
PTSD									
Emotional Abuse	4	1,016	0.31	0.04	0.53	-0.27	0.72	72.33***	94.31
Physical Abuse	6	2,922	0.20	0.07	0.33	-0.13	0.49	50.69***	91.54
Sexual Abuse	5	1,102	0.21	0.09	0.34	-0.07	0.46	18.99***	76.81
Emotional Neglect	3	865	0.07	0.01	0.14	0.01	0.14	1.58	0
Physical Neglect	3	865	0.18	-0.01	0.35	-0.17	0.48	16.02***	84.77

Note. *** $p < .001$; *k* = number of studies; *n* = number of participants

All effect sizes were positive and statistically significant except for physical neglect and PTSD (which only comprised three studies). Emotional abuse demonstrated the strongest associations with all mental health outcomes; depression ($r = 40$) and anxiety ($r = 0.35$) and PTSD ($r = 0.31$). Results from the PTSD analyses warrant caution due to a limited number of studies ($k < 7$) and participants. Physical abuse and physical neglect were consistently associated with small effect sizes across all outcomes. In contrast, sexual abuse exhibited weaker associations with depression and anxiety, with emotional neglect demonstrating the lowest pooled effect size for PTSD ($r = 0.07$).

The non-overlapping 95% confidence intervals between physical abuse and emotional abuse in relation to depression further highlighted the distinct and robust effects of these abuse subtypes, with physical abuse consistently exhibiting lower associations across outcomes. This suggested the importance of considering these variables separately in clinical and research settings.

Heterogeneity estimates were high across all analyses ($I^2 > 75\%$), reflecting considerable variability in study populations and methodologies. Prediction intervals largely supported the robustness of observed associations, with most intervals excluding zero in analyses with sufficient studies ($k > 7$), indicating robustness of observed associations whilst acknowledging study variability. Forest plots visualising the pooled effect sizes are included in the Supplementary Materials (See Figure S1-15).

Publication bias detection tests for emotional neglect and anxiety revealed significant asymmetry (Egger's test: $z = -2.83$, $p = 0.005$), suggesting small-study effects or publication bias. Duval and Tweedie's (2000) trim-and-fill method imputed one missing study on the right side of the funnel plot (see Figure S16). The adjusted pooled effect size remained robust (pooled

effect size = 0.36, 95% CI [0.25, 0.47]). No evidence of publication bias was identified for the remaining meta-analyses ($p > 0.05$).

Sensitivity analyses – removing low quality studies

The first series of sensitivity analyses assessed the robustness of findings by evaluating the influence of study quality on the pooled effect sizes. Studies identified as having low-quality (i.e. high risk of bias) during the risk of bias assessment were excluded from the meta-analyses, reducing the total number of studies to $k = 52$. The recalculated effect sizes for each CTQ subscale across all mental health outcomes are presented in Table 3.

Table 3

Sensitivity Analysis by Removing Low Quality Studies

Meta-Analyses	*k*	*n*	Pooled effect size	95% CI		95% PI		Q test	I^2
				LB	UB	LB	UB		
Depression									
Emotional Abuse	44	112,271	0.39	0.36	0.43	0.13	0.61	1601.56***	98.04
Physical Abuse	30	103,659	0.21	0.17	0.25	-0.01	0.42	1110.80***	97.53
Sexual Abuse	24	92,585	0.16	0.13	0.20	0.02	0.30	180.36***	94.53
Emotional Neglect	32	104,402	0.30	0.26	0.35	0.03	0.54	2431.58***	98.37
Physical Neglect	25	100,658	0.25	0.20	0.30	-0.01	0.48	1250.33***	98.46
Anxiety									
Emotional Abuse	21	66,366	0.34	0.28	0.40	0.04	0.59	695.54***	98.49
Physical Abuse	15	65,425	0.26	0.19	0.33	-0.01	0.50	402.60***	98.53
Sexual Abuse	11	61,926	0.14	0.10	0.19	0.12	0.27	91.06***	94.97
Emotional Neglect	17	68,354	0.24	0.18	0.30	-0.001	0.46	480.91***	98.03
Physical Neglect	13	66,126	0.21	0.17	0.25	0.06	0.35	151.45***	95.78
PTSD									
Emotional Abuse	1	-	-	-	-	-	-	-	-
Physical Abuse	3	2,290	0.28	0.09	0.45	-0.10	0.59	30.69***	95.34
Sexual Abuse	2	470	0.29	0.18	0.39	0.15	0.42	1.29	22.35
Emotional Neglect	1	-	-	-	-	-	-	-	-
Physical Neglect	1	-	-	-	-	-	-	-	-

Note. *** $p < .001$; *k* = number of studies; *n* = number of participants

Exclusion of low-quality studies resulted in slight reductions in pooled effect sizes across most analyses, but the overall patterns of association remained consistent. Despite these reductions, all associations remained statistically significant. Heterogeneity (I^2) remained high across analyses, suggesting that methodological variability alone did not account for the observed heterogeneity.

Sensitivity Analyses – Converted r values

A second series of sensitivity analyses was conducted to assess the impact of excluding studies that reported effect sizes requiring conversion to *r* values (e.g., from odds ratios or beta regression coefficients). The re-calculated meta-analyses for each CTQ subscale and associated mental health outcomes (depression, anxiety, and PTSD) were based on $k = 53$ studies. The results are presented in Table 4.

Table 4.

Sensitivity Analyses by Removing Converted R Values

Meta-Analyses	*k*	*N*	Pooled effect size	95% CI		95% PI		Q test	I^2
				UB	LB	UB	LB		
Depression									
Emotional Abuse	44	94,085	0.40	0.36	0.44	0.13	0.62	1301.25***	97.67
Physical Abuse	30	85,473	0.25	0.21	0.29	0.03	0.44	443.07***	96.75
Sexual Abuse	24	74,553	0.19	0.15	0.23	0.01	0.35	190.22***	95.37
Emotional Neglect	32	86,216	0.31	0.27	0.36	0.06	0.53	1138.69***	97.65
Physical Neglect	26	83,145	0.26	0.22	0.31	0.04	0.46	382.98***	97.33
Anxiety									
Emotional Abuse	21	66,059	0.34	0.28	0.40	0.04	0.59	696.50***	98.46
Physical Abuse	15	65,118	0.26	0.20	0.33	-0.01	0.50	402.38***	98.52
Sexual Abuse	11	61,619	0.14	0.10	0.18	0.01	0.27	90.36***	94.91
Emotional Neglect	17	68,047	0.23	0.17	0.29	-0.03	0.47	498.75***	98.28
Physical Neglect	13	65,819	0.20	0.16	0.25	0.04	0.36	159.68***	96.52
PTSD									
Emotional Abuse	2	535	0.51	0.42	0.59	0.39	0.61	1.52	34.26

Physical Abuse	4	2,441	0.26	0.11	0.39	-0.07	0.53	31.59***	92.34
Sexual Abuse	3	621	0.28	0.21	0.36	0.21	0.36	1.29	0
Emotional Neglect	1	-	-	-	-	-	-	-	-
Physical Neglect	1	-	-	-	-	-	-	-	-

Note. *** $p < .001$; k = number of studies; N = number of participants

Following the exclusion studies that required converted *r* values, pooled effect sizes showed minimal changes, with most associations remaining consistent in both direction and statistical significance. However, there were too few studies to consider CTQ correlates of PTSD.

Moderation Analyses by Region

To investigate the potential moderating effects of geographical regions (North America vs Rest of World and China vs. Rest of World) on the association between CTQ subscales and mental health outcomes, meta-analyses were conducted with stratification by region. Due to the limited number of studies on PTSD, only depression and anxiety were included in the analyses. The corresponding tables are provided in the Supplementary Materials Section (see Tables S2 & S3).

Overall, no moderating effect was observed when comparing North America with the rest of the world. However, when comparing China to the rest of the world, some moderation effect was found. The relationship between sexual abuse and depression were weaker in Chinese studies ($r = 0.14$) compared to studies from other regions ($r = 0.23$). Conversely, the association between anxiety and emotional neglect was stronger in Chinese studies ($r = 0.26$) than those from the rest of the world ($r = 0.13$).

Discussion

This systematic review examined the associations between childhood maltreatment (as measured by the CTQ) and common mental health outcomes, including depression, anxiety, and

PTSD. Findings revealed significant positive associations across five CTQ subscales, with emotional abuse consistently showing the strongest associations. Sensitivity analyses confirmed the robustness of the results, indicating that study-level factors (i.e. risk of bias, statistics used) did not disproportionately influence the observed relationships, enhancing reliability of the observed associations. The results emphasise the profound impact of childhood maltreatment on mental health, with implications for clinical practice and future research discussed.

The meta-analyses results revealed significant moderate associations between emotional abuse and all three mental health outcomes: depression ($r = 0.40$), anxiety ($r = 0.35$), and PTSD ($r = 0.31$). These findings align with prior research emphasising the pervasive impact of emotional abuse on psychological well-being, supporting theories that identify emotional abuse as a key risk factor for persistent and enduring mental health difficulties in youth (Higgins et al., 2003; López-Ibáñez et al., 2024). Moreover, the consistent associations across various mental health outcomes suggest that emotional abuse may disrupt broad psychological processes, increasing vulnerability to long term difficulties such as emotion regulation deficits, attachment disturbances, and maladaptive coping strategies (Duprey et al., 2023; Dvir et al., 2014; Sousa et al., 2011).

Physical abuse was also significantly associated with depression, anxiety and PTSD, though its effect sizes were consistently smaller than those for emotional abuse. This weaker association is particularly notable given the extensive literature on the long-term psychological consequences of physical maltreatment (Éthier et al., 2004; Ford et al., 2009; Kim & Cicchetti, 2010; Lansford et al., 2002). While physical abuse undoubtedly contributes to significant psychological distress, its impact may be more domain-specific, particularly influencing externalising behaviours, such as aggression, as highlighted in earlier findings (Ford et al., 2009;

Kim & Cicchetti, 2010), in contrast to the broader, more pervasive effects of emotional abuse on long-term mental health. The relatively weaker association between physical abuse and mental health outcomes may also reflect distinct underlying mechanisms; while physical abuse may be more immediately disruptive (Al Odhayani et al., 2013), emotional abuse may exert a more prolonged and cumulative impact on psychological well-being (Dye, 2020).

Sexual abuse, emotional neglect, and physical neglect were also significantly associated with depression, anxiety, and PTSD, though with varying magnitudes. Sexual abuse showed a stronger association with PTSD than with depression and anxiety, consistent with trauma models that emphasise the role of sexual victimisation in post-traumatic symptomatology (Feiring et al., 2007; Trickett et al., 2011). However, its effects were less pronounced than those of emotional abuse, which is particularly striking given the traditionally assumed severity of sexual trauma. This finding suggests that the pervasive nature of emotional abuse may have broader psychological repercussions, potentially due to its chronic and underreported nature (Cohen et al., 2013). Contextual factors such as social support, self-efficacy and disclosure may also shape the long-term impact from different maltreatment types (Carranza & Bueno-Guerra, 2025; Hirsh, 2022).

Emotional neglect was moderately associated with depression and anxiety, though the association was weaker than that observed for emotional abuse. This is consistent with the literature suggesting that neglect is a subtle but equally harmful form of maltreatment, causing severe cognitive deficits, social withdrawal and internalising problems (Hildyard & Wolfe, 2002b). Physical neglect showed the weakest associations, suggesting its impact may be weaker on mental health than on social development and self-esteem (Ayhan & Beyazit, 2021). Neglect often appears to be a precursor to abuse in many cases (Ney et al., 1994), implying that its effects

may be compounded when occurring alongside other forms of maltreatment. This aligns with developmental theories that emphasise the cumulative risk of early adversity, where neglect can create a foundation of emotional and physical deprivation that heightens vulnerability to later abuse and psychological distress (Cicchetti & Toth, 2005). Future research should explore protective factors that may mitigate its effects, such as early recognition, prevention programs and timely intervention to encourage supporting caregiving environments.

These findings highlight the complex interplay between different forms of maltreatment, each contributing uniquely to mental health outcomes while often co-occurring. As Warmingham et al. (2020) suggested, the cumulative burden of multiple maltreatment types may be more detrimental on mental health than any single form alone. Since most children who experience maltreatment are exposed to multiple forms of abuse or neglect, identifying which combinations have the most significant impact is crucial (Ney et al., 1994). However, the particularly strong and pervasive impact of emotional abuse – evidenced by its non-overlapping confidence intervals with physical abuse – suggests it may play a more central role in shaping long-term psychopathology. This challenges traditional assumptions that prioritise physical and sexual abuse in clinical and research settings, emphasising the need for targeted interventions that address the distinct psychological harm of emotional abuse. Future research should further examine the mechanisms through which emotional abuse impacts youth, particularly in the context of polyvictimisation, where individuals experience multiple forms of maltreatment simultaneously, to inform more nuanced prevention and treatment strategies in clinical practice.

Interestingly, all the associations observed in our analyses displayed small to moderate effects. This pattern suggests that while childhood maltreatment is a significant risk factor for poor mental health outcomes, it is not a sole determinant, and in some cases, may have a

negligible effect on mental health outcomes. Individual differences, such as resilience, the presence of protective factors, such as social support, and access to early intervention may diminish the severity of these associations (Reynolds & Robertson, 2003; Sattler & Font, 2018; Su et al., 2020). Additionally, methodological differences, such as variations in sample characteristics, retrospective self-report biases, and differences in how maltreatment is conceptualised across studies, may have contributed to the observed effect sizes. Finally, the impact of maltreatment is not static and evolves over time, with youth experiencing delayed effects that are not immediately apparent in childhood or adolescence. Longitudinal research has highlighted the enduring consequences of childhood maltreatment, extending well into adulthood, including difficulties in emotion regulation, heightened vulnerability to physical health problems, and increased risk for psychiatric disorders (Springer et al., 2007; Strathearn et al., 2020; Young & Widom, 2014). These long-term effects may manifest differently depending on developmental stage, life circumstances and the availability of protective factors, such as a supportive relationship. The cross-sectional nature of studies included might have limited the ability to fully capture such complex developmental trajectories of youth. Future research could prioritise multi-wave designs that track individuals over time, allowing for greater understanding into how maltreatment-related risks evolve into adulthood.

The present review found some evidence that regional and cultural factors moderate the relationship between childhood maltreatment and mental health outcomes. While no moderating effect was found for North America and the rest of the world, for Chinese studies, the relationship between sexual abuse and depression were weaker compared to other regions. This supports prior research highlighting cultural differences in the perception and reporting of maltreatment (Cheah et al., 2015; Wang et al., 2018). Research indicates that Chinese youth may

truly experience lower rates of sexual abuse due to closer supervision, a less overtly sexualised culture, and social norms that discourage predatory behaviour (Finkelhor et al., 2013; Ji et al., 2013). In contrast, the association between anxiety and emotional neglect was stronger in Chinese studies, which may be linked to the cultural emphasis on parental authority and privacy sounding family matters (Qiao & Chan, 2005; Zhai & Gao, 2009).These findings align with literature highlighting the role of regional differences in how maltreatment is experienced, reported and impacts upon mental health (Akmatov, 2011; Viola et al., 2016).

Limitations

A key limitation of this review is the difficulty in isolating the "most harmful" form of maltreatment, as it is rare for children to experience only one form of abuse (Higgins et al., 2025; Scher et al., 2004). Polyvictimisation complicates the identification of the single most harmful factor and may confound the results. Future research should adopt methodological approaches that account for the co-occurrence of different maltreatment types, such as latent class analysis or network modelling, to better capture the complex interactions between abuse types and their impact on mental health.

Another important limitation relates to variability in how different forms of maltreatment are measured by the CTQ. Subscales differ in intensity and specificity of the experiences captured, for example, emotional neglect assess more subtle, ongoing experiences that may be harder to recall or quantify, while others, such a sexual abuse, focuses on more discrete and explicit trauma events. Such discrepancies could lead to differences in observed effect sizes, as subtler experiences may be underreported, or their psychological impact underestimated when compared to more explicit questioning in abuse subscales. Future studies could explore

alternative assessment tools which may enable more consistent comparisons across maltreatment types.

A limitation of this study is the reliance on self-reported trauma symptoms, particularly within a youth sample. Children and adolescents may struggle with accurately identifying and articulating trauma-related thoughts and emotions due to ongoing cognitive and emotional development (Khan & Jaffee, 2022). Additionally, self-report is subject to well-established biases, including recall error, social desirability, and minimisation (Negriff et al., 2017; Schulz et al., 2014; Wente et al., 2023), particularly in relation to more covert or internal experiences such as emotional abuse, neglect, or cognitive strategies (Krayem et al., 2021). Individuals may lack meta-awareness of their trauma-related thoughts, raising concerns around the validity of relying solely on self-reported intrusions (Takarangi et al., 2014). Future research may benefit from incorporating multi-informant approaches or clinician-administered assessments to improve measurement accuracy and reduce potential biases in the reporting of trauma symptomatology.

Finally, many of the included studies were cross-sectional in nature, which restricts our ability to draw conclusions about the long-term impact of maltreatment on mental health. Future research should consider longitudinal designs to better understand the lasting effects of maltreatment over time and to clarify the causal relationships between different forms of abuse and mental health outcomes.

Conclusion

This review highlights the significant implications of maltreatment, particularly emotional abuse, on youth mental health. While causality cannot be established, the associations observed suggest that maltreatment is consistently linked to poorer mental health outcomes in youth. These findings emphasise the need to recognise emotional abuse as a potent, often

overlooked factor, on poor mental health outcomes, as recent literature has shown (Dye, 2020; Scher et al., 2004). Differentiating maltreatment subtypes rather than treating them as a singular construct in clinical assessment would add clarity and lead to more targeted interventions (Warmingham et al., 2019). Clinicians can better support recovery and resilience in emotionally abused youth by integrating trauma-informed and attachment-based approaches, ensuring their needs are not overshadowed by more visible forms of maltreatment (Iwaniec, 2006).

Clinically, these results underscore the importance of comprehensive assessments that integrate emotional abuse more prominently alongside physical and sexual abuse. Historically, greater emphasis has been placed on physical and sexual maltreatment in child protection efforts, due to the limited reports of emotional abuse in child populations (Leeb et al., 2011). Yet, as this review and the global literature suggest, emotional abuse can have deeply detrimental effects on mental health, manifesting in ways that are just as impactful, if not more so, than physical or sexual maltreatment and neglect (Arata et al., 2007; de Vasconcelos et al., 2020; Gardner et al., 2019; Peng et al., 2023). Severe and prolonged emotional abuse can undermine self-esteem, leaving invisible scars like self-doubt and worthlessness (Radell et al., 2021). Clinicians working with youth, particularly those with mood and anxiety disorders, should remain vigilant for histories of maltreatment, particularly emotional abuse, to improve long-term outcomes for these young people.

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Supplementary Materials: Systematic Review

Table S1.

Coefficients (r) for each included study for primary analysis

Article	Pearson correlation coefficient (r)														
	EN x Dep	PN x Dep	SA x Dep	EA x Dep	PA x Dep	EN x Anx	PN x Anx	SA x Anx	EA x Anx	PA x Anx	EN x PTSD	PN x PTSD	SA x PTSD	EA x PTSD	PA x PTSD
Aloba et al. (2020)	0.36	0.24	0.25	0.23	0.19	0.25	0.21	0.29	0.29	0.21	NA	NA	NA	NA	NA
Arata et al. (2007)	0.50	0.42	0.32	0.56	0.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Banducci et al (2017)	NA	NA	NA	NA	NA	NA	NA	NA	0.53	NA	NA	NA	NA	NA	NA
Banducci et al. (2018)	NA	NA	NA	0.34	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bounoua et al. (2015)	NA	NA	NA	NA	NA	NA	NA	NA	0.26	NA	NA	NA	NA	NA	NA
Brockie et al. (2015)	0.15	0.14	0.16	0.21	0.34	NA	NA	NA	NA	NA	0.16	0.26	0.16	0.15	0.16
Cao et al (2024)	0.4	0.36	0.15	0.45	0.28	0.13	0.13	0.03	0.31	0.16	NA	NA	NA	NA	NA
Chango et al (2012)	NA	NA	NA	0.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chen & Cao, (2023)	0.56	0.5	0.2	0.54	0.42	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chen & Qin (2020)	NA	NA	NA	0.36	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cohen et al (2019)	0.24	NA	0.14	0.27	0.13	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
de Oliveira et al. (2018)	0.34	0.19	0.37	0.57	0.43	0.04	0.05	0.18	0.38	0.28	NA	NA	NA	NA	NA
de Vasconcelos et al. (2020)	0.32	0.18	0.38	0.56	0.43	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fu et al. (2022)	0.19	0.2	NA	0.36	0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Gratz et al. (2011)	NA	NA	NA	0.59	NA	NA	NA	NA	0.52	NA	NA	NA	NA	NA	NA
Gustafsson et al. (2017)	NA	NA	NA	0.53	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hamilton et al (2014)	0.23	NA	NA	0.38	NA	0.04	NA	NA	0.08	NA	NA	NA	NA	NA	NA
Hamilton et al (2015)	NA	NA	NA	0.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hamilton et al (2016)	0.31	NA	NA	0.32	NA	0.13	NA	NA	0.15	NA	NA	NA	NA	NA	NA
Hodson et al. (2006)	NA	NA	0.23	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Holt (2002)	NA	NA	0.34	0.35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hou et al (2023)	NA	NA	NA	NA	NA	0.212	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hu et al. (2022)	0.49	0.41	0.13	0.45	0.26	0.35	0.32	0.117	0.27	0.44	NA	NA	NA	NA	NA
Jessar et al (2017)	0.33	NA	NA	0.42	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Kang et al. (2020)	0.22	0.15	0.2	0.46	0.25	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Li et al. (2021)	NA	NA	NA	0.41	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Li et al. (2022)	0.28	0.21	NA	0.55	0.35	0.19	0.12	NA	0.54	0.35	NA	NA	NA	NA	NA
Lu et al (2019)	NA	NA	NA	NA	0.13	NA	NA	NA	NA	0.1	NA	NA	NA	NA	0.21
Menon et al (2018)	NA	NA	NA	NA	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.17
Mikaeili et al. (2013)	0.05	0.03	NA	0.05	0.07	0.17	0.05	NA	0.19	0.21	NA	NA	NA	NA	NA
Miller et al (2018)	NA	NA	NA	0.36	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Peng et al. (2023)	0.32	0.24	0.16	0.41	0.21	0.28	0.2	0.15	0.39	0.20	NA	NA	NA	NA	NA
Perry et al (2014)	NA	NA	0.27	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Qu et al (2022)	0.14	0.14	0.23	0.43	0.28	0.03	0.09	0.19	0.33	0.28	NA	NA	NA	NA	NA
Qu et al. (2022)	0.33	0.28	0.14	0.52	0.31	0.3	0.26	0.14	0.48	0.29	NA	NA	NA	NA	NA
Reis et al. (2024)	0.36	0.25	0.18	0.56	0.31	0.2	0.16	0.19	0.43	0.24	NA	NA	NA	NA	NA
Ribero et al. (2018)	0.23	0.23	0.18	0.34	0.28	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Sapkota et al (2020)	0.31	0.37	0.13	0.32	0.23	NA	NA	NA	NA	NA	0.1	0.28	0.26	0.54	0.46
Sapkota et al. (2019)	NA	NA	0.06	0.10	0.12	NA	NA	0.12	0.56	0.60	NA	NA	NA	NA	NA
Shao et al. (2021)	0.11	0.09	0.01	0.11	0.04	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Shapero et al. (2013)	NA	NA	NA	0.64	NA	NA	NA	NA	0.24	NA	NA	NA	NA	NA	NA
Soar et al (2023)	0.26	0.23	0.3	0.38	0.16	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strange et al (2013)	0.29	NA	NA	0.38	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Strange et al (2014)	0.26	NA	NA	0.28	NA	-0.03	NA	NA	0.121	NA	NA	NA	NA	NA	NA
Tian et al. (2022)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.03	0.01	0.02	0.02	0
Tong et al. (2022)	0.48	0.43	0.07	0.39	0.25	0.35	0.25	0.09	0.34	0.21	NA	NA	NA	NA	NA
Wang et al. (2022)	0.33	0.26	0.17	0.39	0.23	0.36	0.28	0.11	0.30	0.18	NA	NA	NA	NA	NA
Wang et al. (2022)	0.14	0.39	NA	0.42	0.41	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wei et al. (2021)	0.24	0.23	0.11	0.34	0.20	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Weierich & Nock (2008)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.38	NA	NA
Williamson et al (2018)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.29	0.45	0.16
Xiao et al. (2022)	0.07	0.19	0.01	0.351	0.11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Xu et al (2023)	NA	NA	NA	0.55	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yearwood et al. (2020)	0.18	0.26	0.25	0.34	0.32	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Yigit et al. (2021)	NA	NA	NA	0.22	0.06	NA	NA	NA	0.21	0.19	NA	NA	NA	NA	NA
Zeller et al (2015)	0.27	0.14	0.09	0.38	0.22	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zhang et al. (2022)	0.52	0.23	0.2	0.55	0.3	0.45	0.22	0.21	0.5	0.29	NA	NA	NA	NA	NA
Zhang et al. (2022)	0.2	0.23	NA	NA	NA	0.2	0.21	NA	NA	NA	NA	NA	NA	NA	NA
Zhao et al. (2021)	0.41	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zheng et al (2024)	0.03	0.01	0.14	0.33	0.07	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zhong et al (2024)	0.19	0.09	0.08	0.32	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Zhou & Zhen (2022)	NA	NA	NA	0.28	0.18	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Note. Dep = Depression Subscale; Anx = Anxiety Subscale; PTSD = Post-traumatic Stress Disorder Subscale; EN = CTQ Emotional Neglect; PN = CTQ Physical Neglect; SA = CTQ Sexual Abuse; EA = CTQ Emotional Abuse; PA = CTQ Physical Abuse.

Table S2

Moderation Analysis Results North America vs Rest of World

Meta-Analyses	Region	*k*	*n*	Pooled effect size	95% CI		95% PI		Q test	I^2	Moderation p value
					LB	UB	LB	UB			
Depression											
Emotional Abuse	North America	20	7,333	0.39	0.33	0.44	0.11	0.61	187.24^{***}	88.19	0.66
	Rest of World	30	112,256	0.40	0.36	0.45	0.13	0.62	1454.42^{***}	98.7	
Physical Abuse	North America	9	5,133	0.20	0.12	0.27	-0.03	0.40	93.10^{***}	86.07	0.34
	Rest of World	27	105,844	0.24	0.20	0.29	0.004	0.45	1093.01^{***}	98.14	
Sexual Abuse	North America	10	4,245	0.20	0.14	0.27	0.01	0.39	45.19^{***}	77.29	0.28
	Rest of World	21	96,019	0.17	0.13	0.21	0.001	0.33	210.85^{***}	96.7	
Emotional Neglect	North America	11	4,182	0.30	0.24	0.36	0.11	0.47	74.16^{***}	75.74	0.79
	Rest of World	27	107,538	0.28	0.23	0.34	-0.02	0.54	2525.86^{***}	98.91	
Physical Neglect	North America	5	2,240	0.28	0.16	0.40	-0.002	0.52	26.10^{***}	83.99	0.42
	Rest of World	26	105,736	0.23	0.19	0.28	-0.005	0.45	1190.48^{***}	98.2	
Anxiety											
Emotional Abuse	North America	8	2,119	0.32	0.17	0.46	-0.13	0.66	100.28^{***}	92.83	0.55
	Rest of World	14	69,294	0.36	0.31	0.42	0.14	0.55	602.34^{***}	98.32	
Physical Abuse	North America	2	1,178	0.37	-0.18	0.74	-0.54	0.88	79.45^{***}	98.74	NA
	Rest of World	14	69,294	0.26	0.21	0.3	0.09	0.41	312.26^{***}	96.60	
Sexual Abuse	North America	1	314	0.12	0.01	0.23	0.01	0.23	0	0	NA
	Rest of World	11	66,659	0.16	0.12	0.2	0.03	0.28	95.30^{***}	95.3	
Emotional Neglect	North America	3	891	0.06	-0.04	0.15	-0.09	0.20	3.94	49.42	NA
	Rest of World	15	72,510	0.24	0.18	0.3	-0.01	0.46	915.76^{***}	98.43	
Physical Neglect	North America	0	-	-	-	-	-	-	-	-	NA
	Rest of World	14	71,173	0.19	0.14	0.23	0.02	0.34	277.28^{***}	96.67	

PTSD											
Emotional Abuse	North America	2	470	0.37	-0.06	0.68	-0.36	0.82	14.30***	93.01	NA
	Rest of World	2	546	0.24	-0.2	0.61	-0.48	0.77	23.1	95.67	
Physical Abuse	North America	4	2,376	0.25	0.12	0.40	-0.07	0.54	31.25***	92.07	NA
	Rest of World	2	546	0.07	-0.09	0.22	-0.17	0.30	2.80	64.26	
Sexual Abuse	North America	3	556	0.26	0.18	0.34	0.18	0.34	2.56	0.09	NA
	Rest of World	2	546	0.15	-0.12	0.4	-0.29	0.54	8.28***	87.92	
Emotional Neglect	North America	2	470	0.11	0.02	0.20	0.02	0.20	0.23	0	NA
	Rest of World	1	395	0.03	-0.07	0.13	-0.07	0.13	0	0	
Physical Neglect	North America	2	470	0.28	0.19	0.36	0.19	0.36	0.23	0	NA
	Rest of World	1	395	0.01	-0.09	0.11	-0.09	0.11	0	0	

Note. *** $p < .001$; k = number of studies; N = number of participants

Table S3

Moderation Analysis Results China vs Rest of World

Meta-Analyses	Region	*k*	*n*	Pooled effect size, *r*	95% CI		95% PI		Q test	I^2	Moderation p value
					LB	UB	LB	UB			
Depression											
Emotional Abuse	China	22	107,464	0.41	0.37	0.45	0.20	0.59	1175.28^{***}	98.47	0.39
	Rest of World	28	12,125	0.38	0.32	0.44	0.07	0.63	425.17^{***}	92.19	
Physical Abuse	China	19	101,052	0.23	0.18	0.28	0.003	0.44	1017.58^{***}	98.50	0.98
	Rest of World	17	9,925	0.23	0.17	0.29	-0.02	0.46	169.92^{***}	89.95	
Sexual Abuse	China	15	92,252	0.14	0.1	0.17	0.02	0.25	152.22^{***}	95.1	**< .001**
	Rest of World	16	8,012	0.23	0.18	0.28	0.05	0.40	67.13^{***}	79.44	
Emotional Neglect	China	20	102,878	0.29	0.22	0.36	-0.05	0.56	2452.40^{***}	99.28	0.91
	Rest of World	18	8,842	0.29	0.23	0.34	0.08	0.47	169.37^{***}	83.72	
Physical Neglect	China	19	101,076	0.25	0.19	0.30	-0.02	0.48	1156.80^{***}	98.85	0.73
	Rest of World	12	6,900	0.23	0.16	0.30	0.010	0.43	114.68^{***}	86.50	
Anxiety											
Emotional Abuse	China	9	65,931	0.39	0.32	0.45	0.17	0.57	500.40^{***}	98.85	0.22
	Rest of World	13	5,482	0.32	0.22	0.40	-0.04	0.60	131.99^{***}	92.68	
Physical Abuse	China	9	65,931	0.27	0.21	0.33	0.08	0.45	302.77^{***}	98.33	0.97
	Rest of World	7	4,541	0.27	0.14	0.39	-0.11	0.58	82.31^{***}	95.25	
Sexual Abuse	China	8	64,321	0.14	0.10	0.17	0.03	0.24	65.04^{***}	94.31	0.06
	Rest of World	4	2,652	0.21	0.13	0.28	0.06	0.34	11.39^{**}	70.64	
Emotional Neglect	China	11	69,279	0.26	0.19	0.33	0.01	0.49	873.10^{***}	98.9	**0.02**
	Rest of World	7	4,122	0.13	0.05	0.20	-0.06	0.31	30.24^{***}	81.18	
Physical Neglect	China	10	67,942	0.21	0.16	0.26	0.05	0.35	238.56^{***}	97.13	0.07
	Rest of World	4	3,231	0.12	0.04	0.20	-0.05	0.28	17.42^{***}	80.80	

PTSD										
Emotional Abuse	China	1	395	0.02	-0.08	0.12	-0.08	0.12	0	0	NA
	Rest of World	3	621	0.40	0.16	0.60	-0.07	0.73	14.46***	88.36	
Physical Abuse	China	1	395	0.00	-0.10	0.10	-0.10	0.10	0	0	NA
	Rest of World	5	2,527	0.24	0.11	0.36	-0.05	0.50	32.80***	88.94	
Sexual Abuse	China	1	395	0.02	-0.08	0.12	-0.08	0.12	0	0	NA
	Rest of World	4	707	0.27	0.20	0.34	0.20	0.34	2.65*	0.03	
Emotional Neglect	China	1	395	0.03	-0.07	0.13	-0.07	0.13	0	0	NA
	Rest of World	2	470	0.11	0.02	0.20	0.02	0.20	0.23	0	
Physical Neglect	China	1	395	0.01	-0.09	0.11	-0.09	0.11	0	0	NA
	Rest of World	2	470	0.28	0.19	0.36	0.19	0.36	0.02	0	

Note. *** = $p > .001$, ** $p > .01$, * $p > .05$; k = number of studies; n = number of participants

Figure S1

Emotional Abuse vs Depression Forest Plot

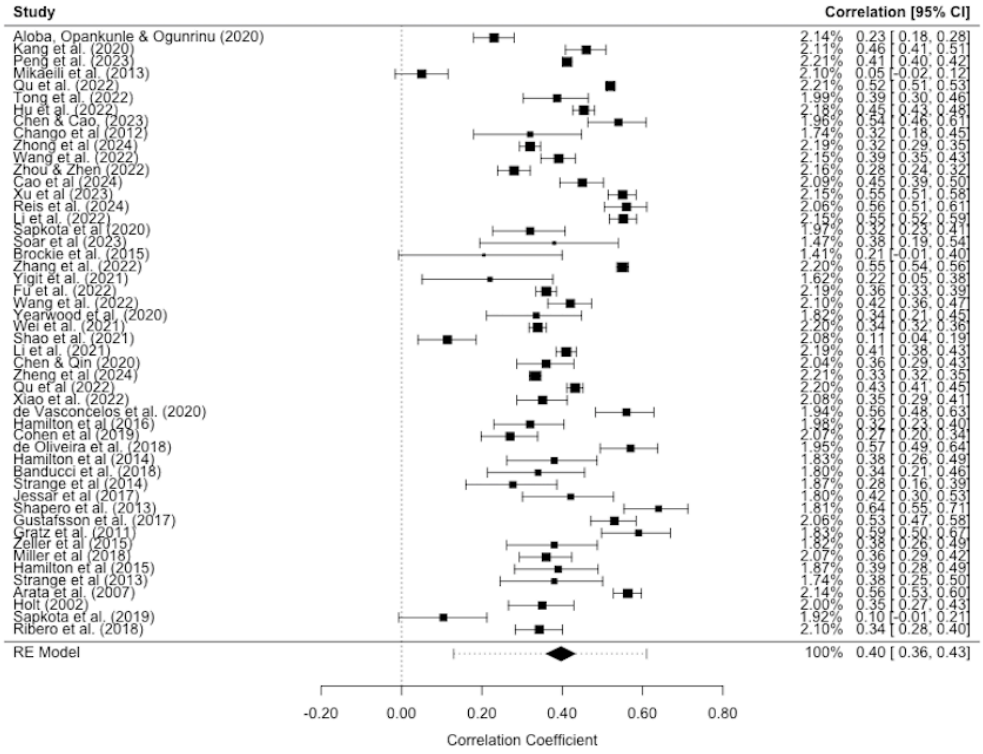


Figure S2

Emotional Neglect vs Depression Forest Plot

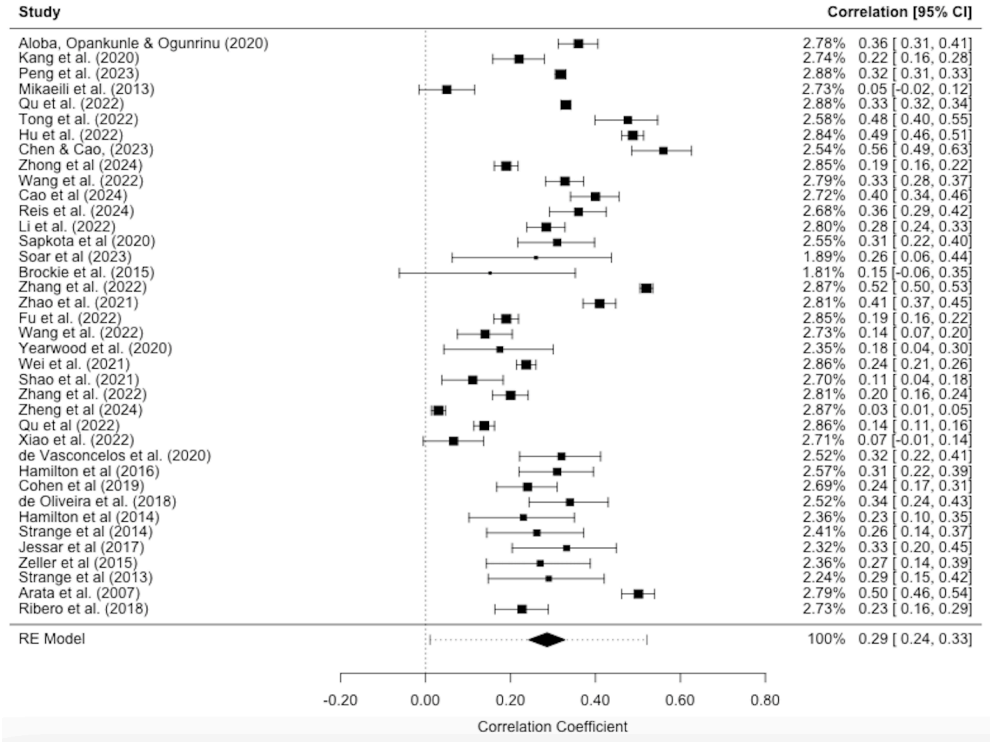


Figure S3

Physical Abuse vs Depression Forest Plot

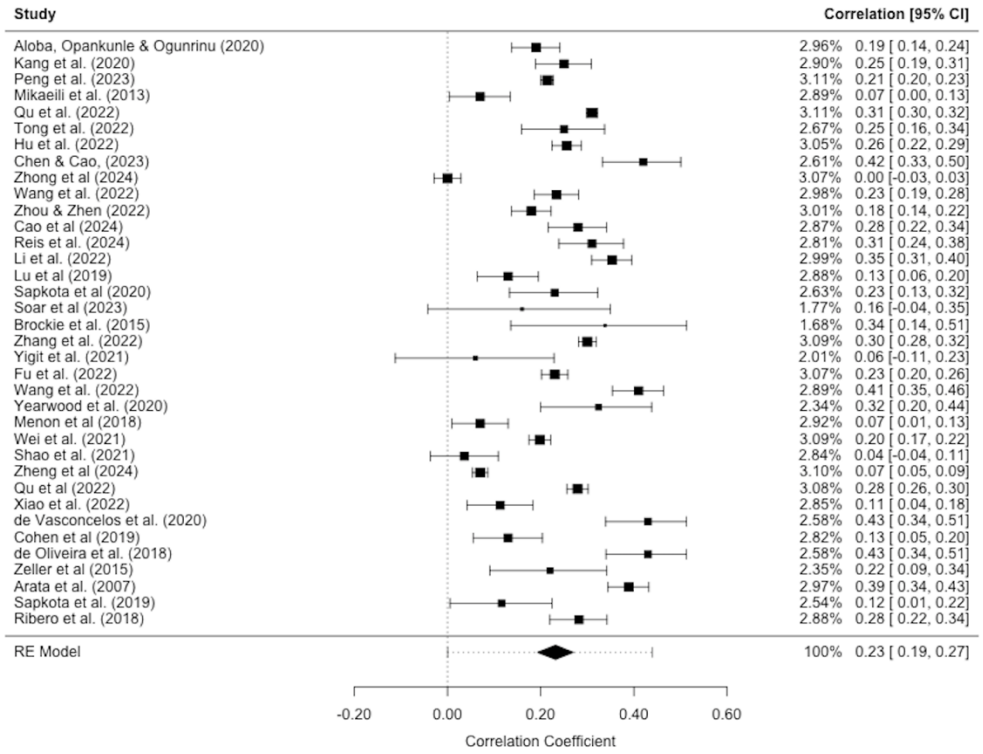


Figure S4

Physical Neglect vs Depression Forest Plot

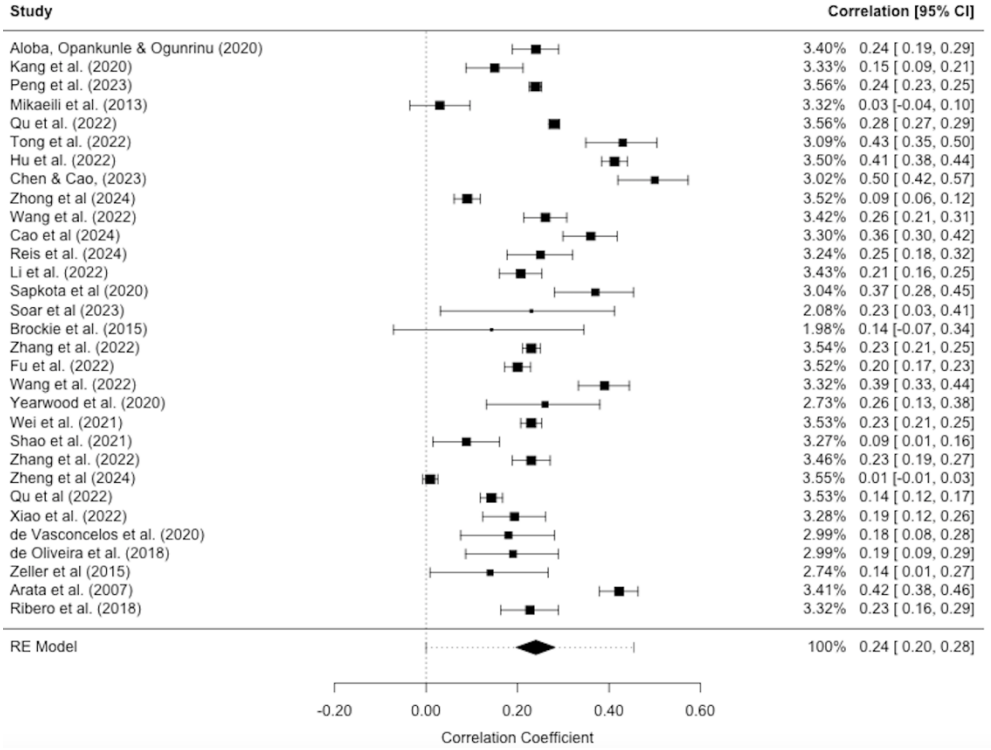


Figure S5

Sexual Abuse vs Depression Forest Plot

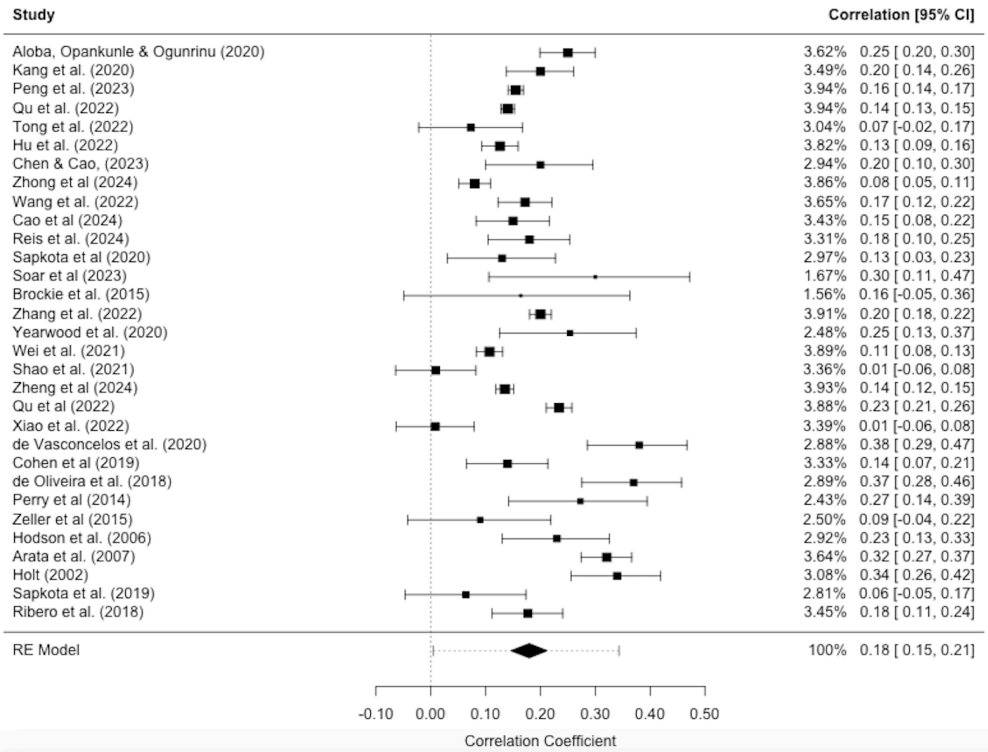


Figure S6

Emotional Abuse vs Anxiety Forest Plot

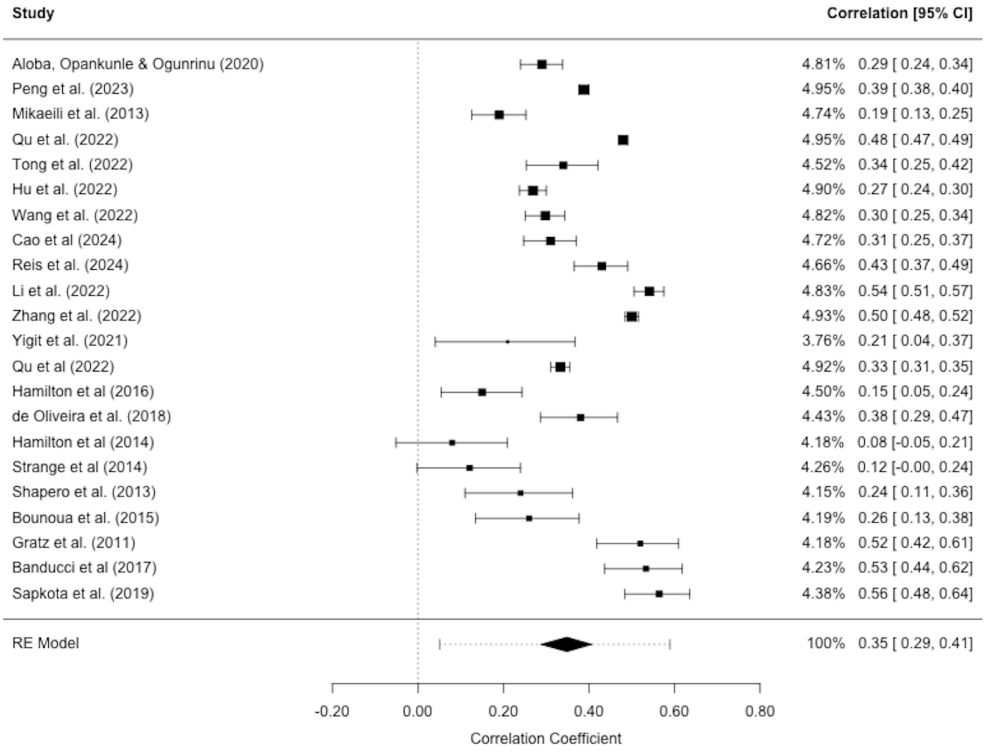


Figure S7

Emotional Neglect vs Anxiety Forest Plot

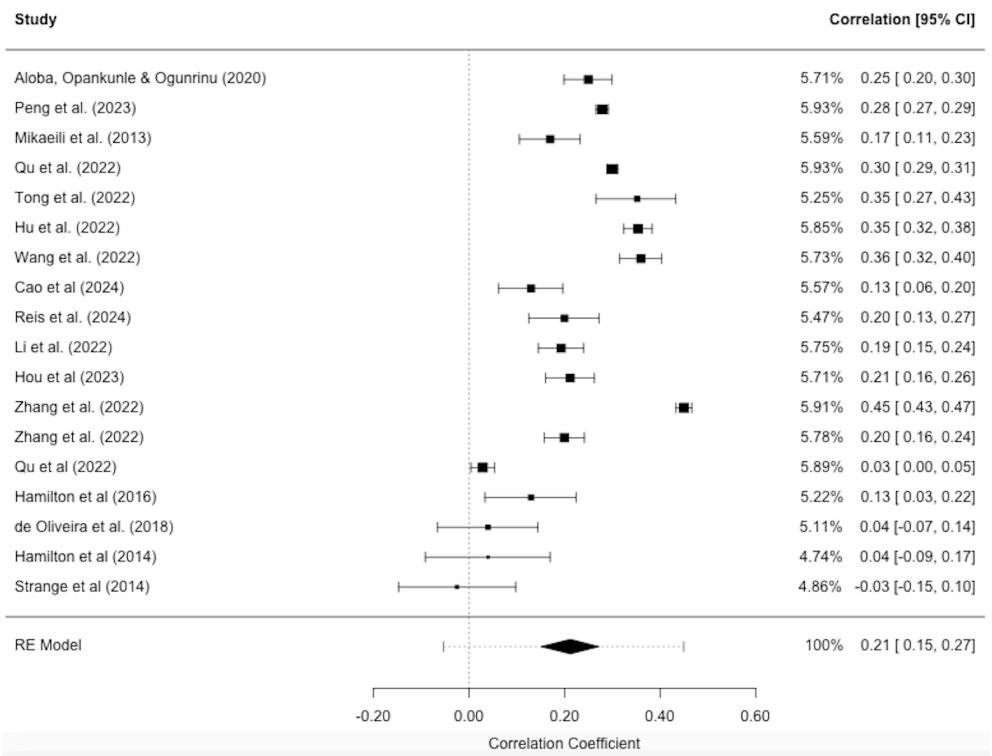


Figure S8

Physical Abuse vs Anxiety Forest Plot

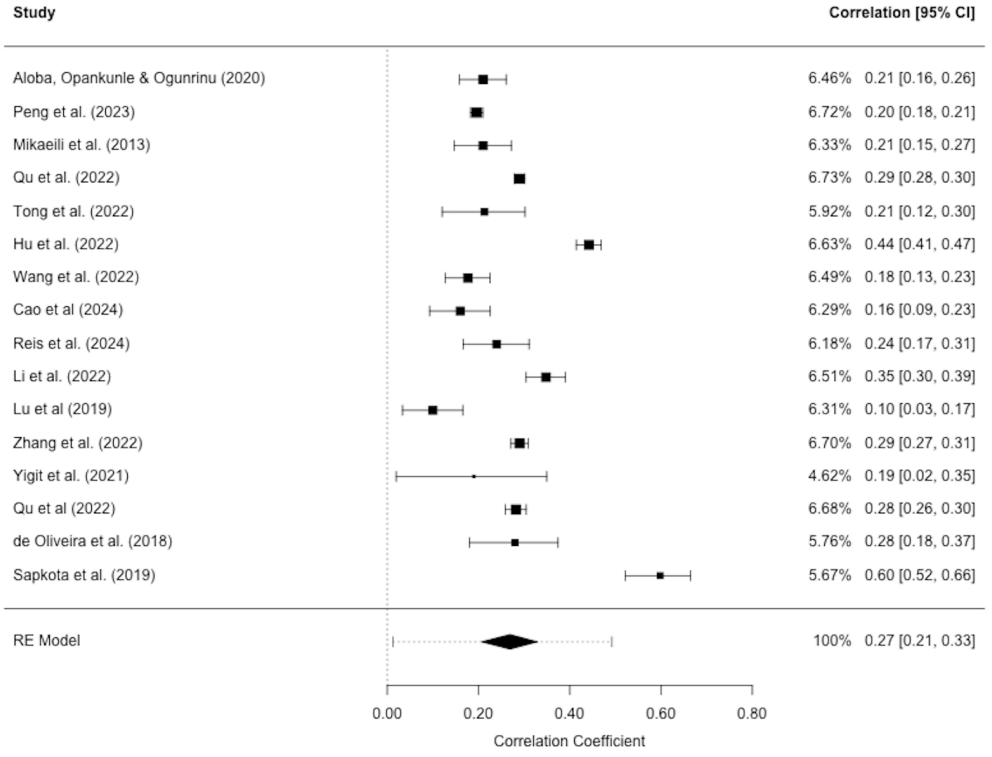


Figure S9

Physical Neglect vs Anxiety Forest Plot

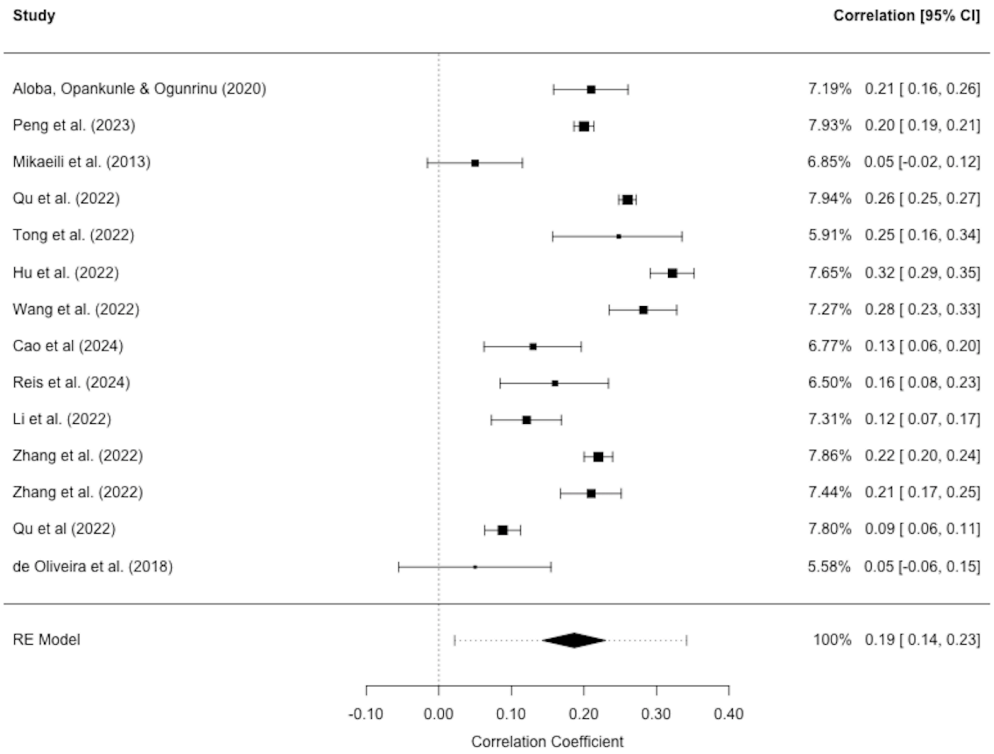


Figure S10

Sexual Abuse vs Anxiety Forest Plot

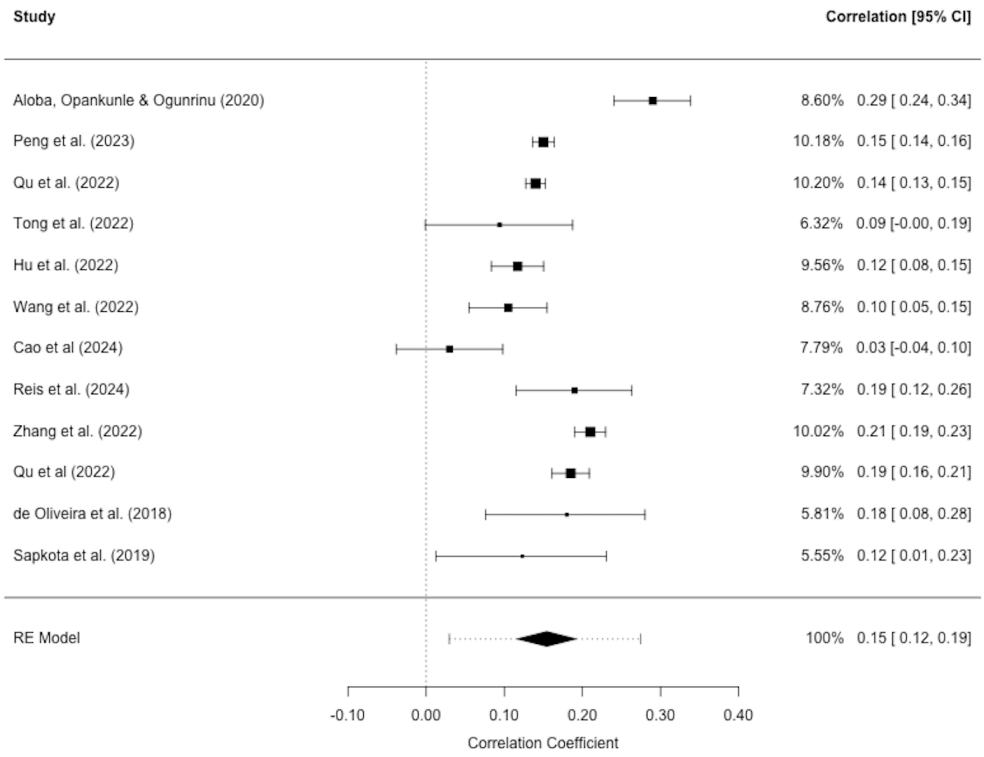


Figure S11

Emotional Abuse vs PTSD Forest Plot

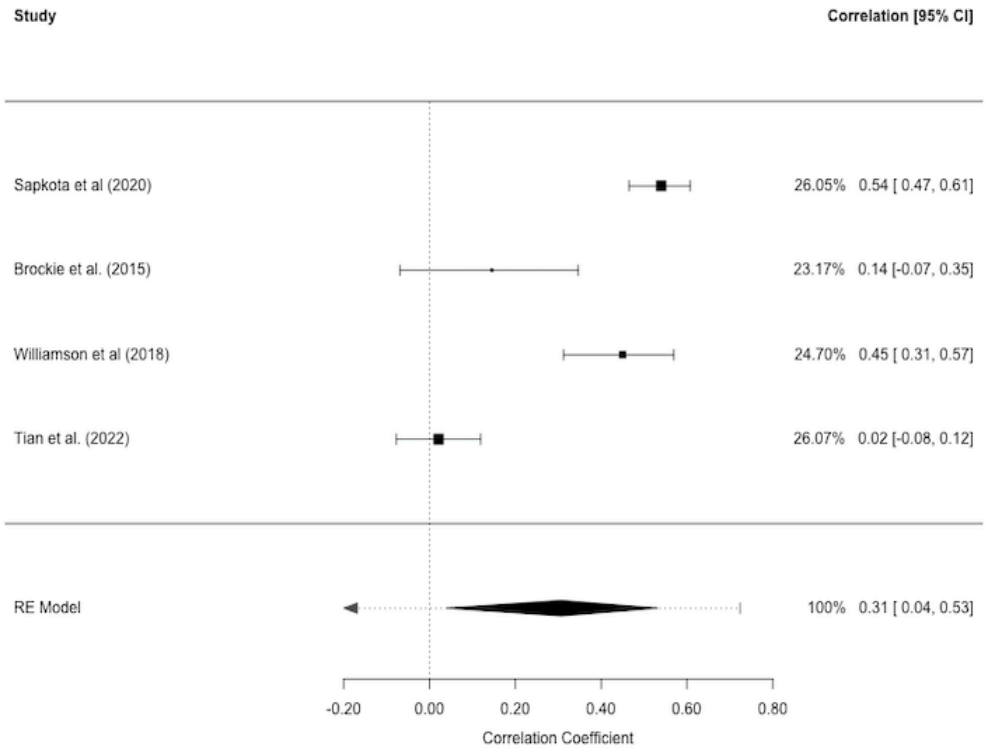


Figure S12

Emotional Neglect vs PTSD Forest Plot

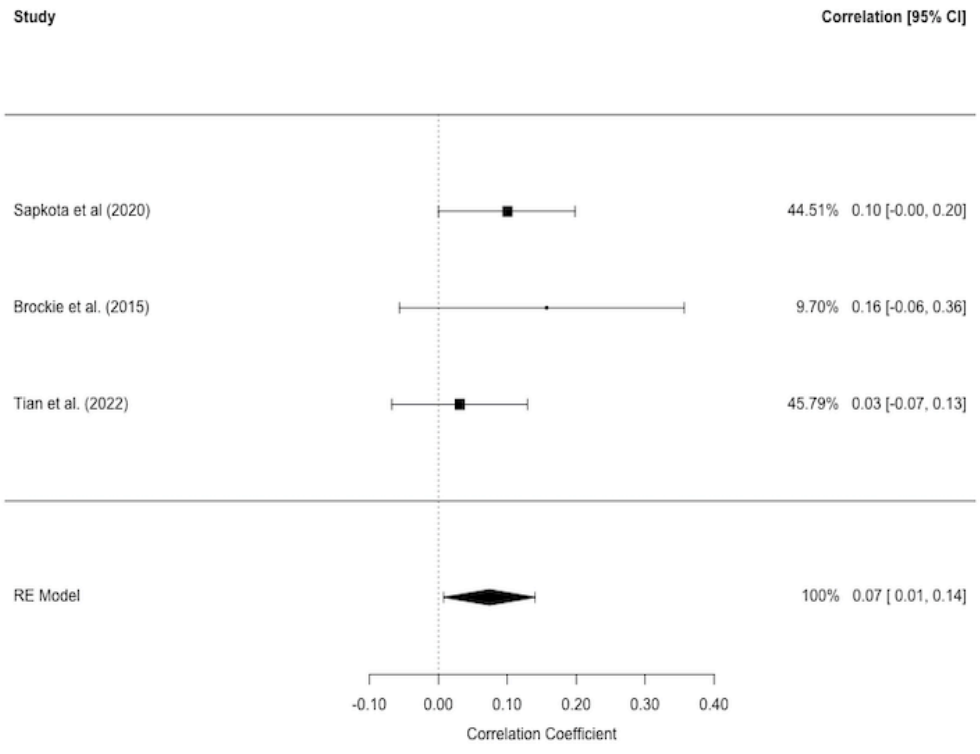


Figure S13

Physical Abuse vs PTSD Forest Plot

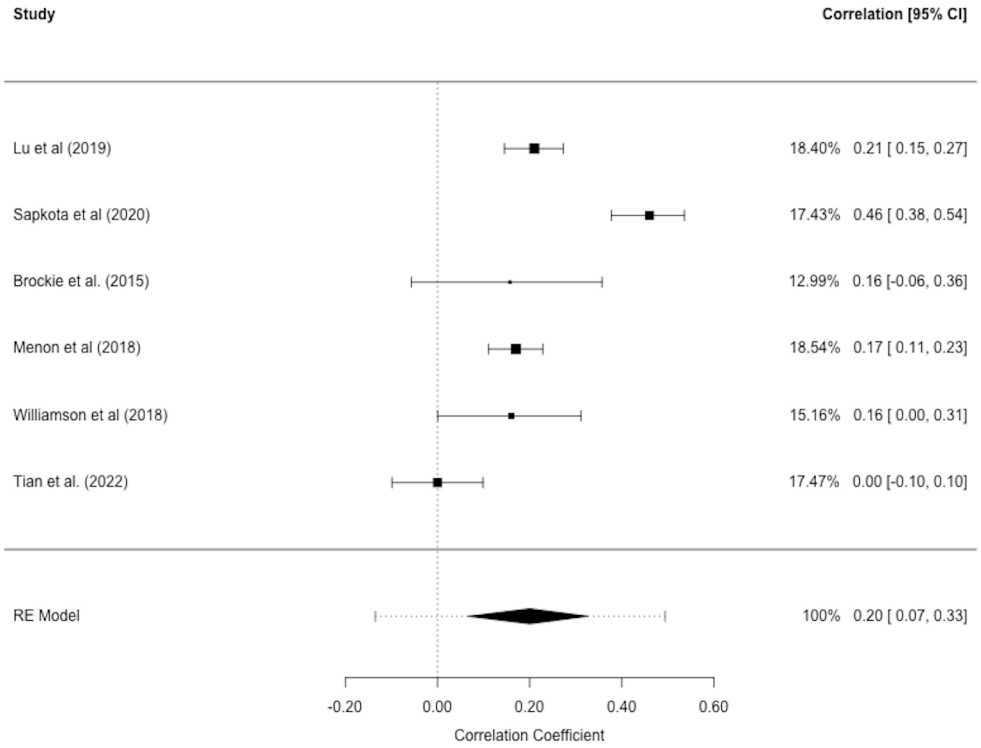


Figure S14

Physical Neglect vs PTSD Forest Plot

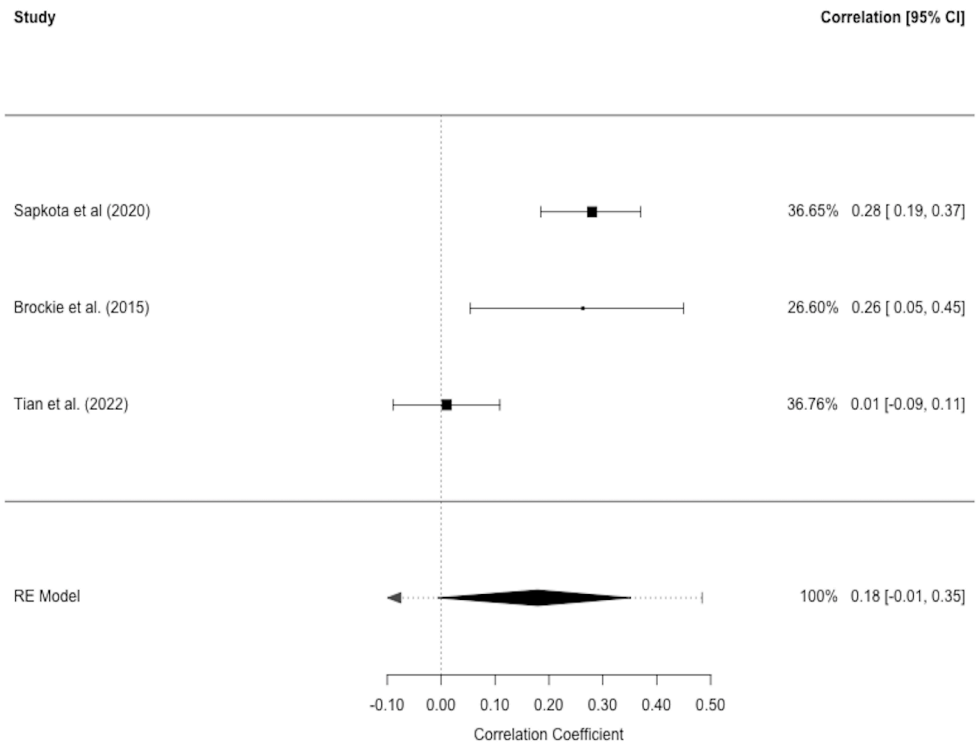


Figure S15

Sexual Abuse vs PTSD Forest Plot

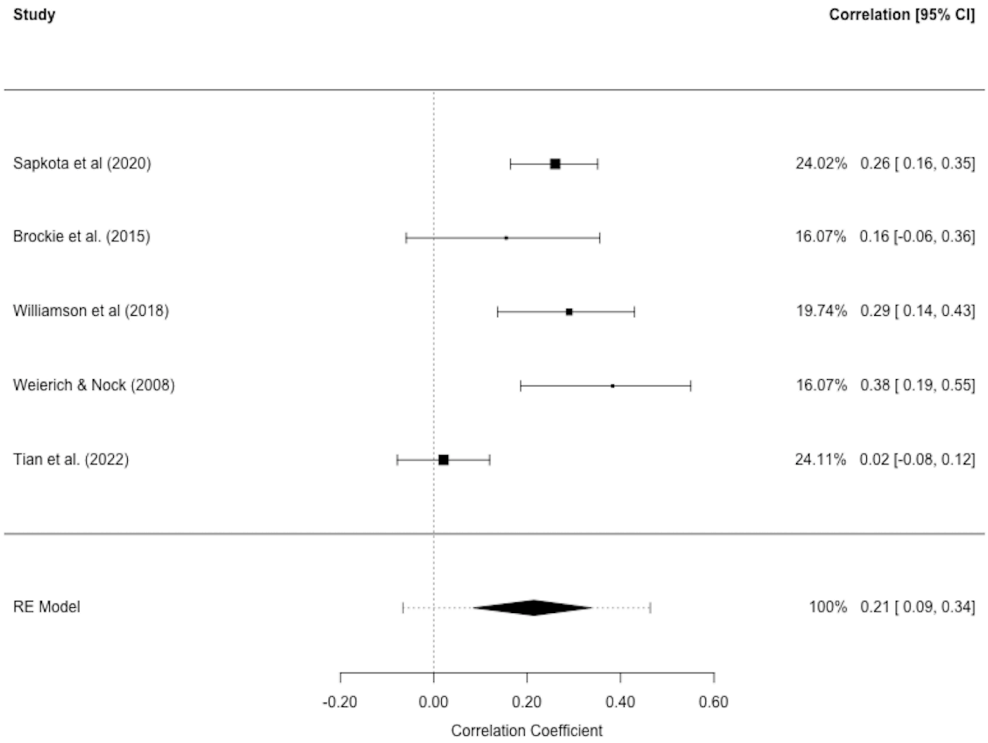
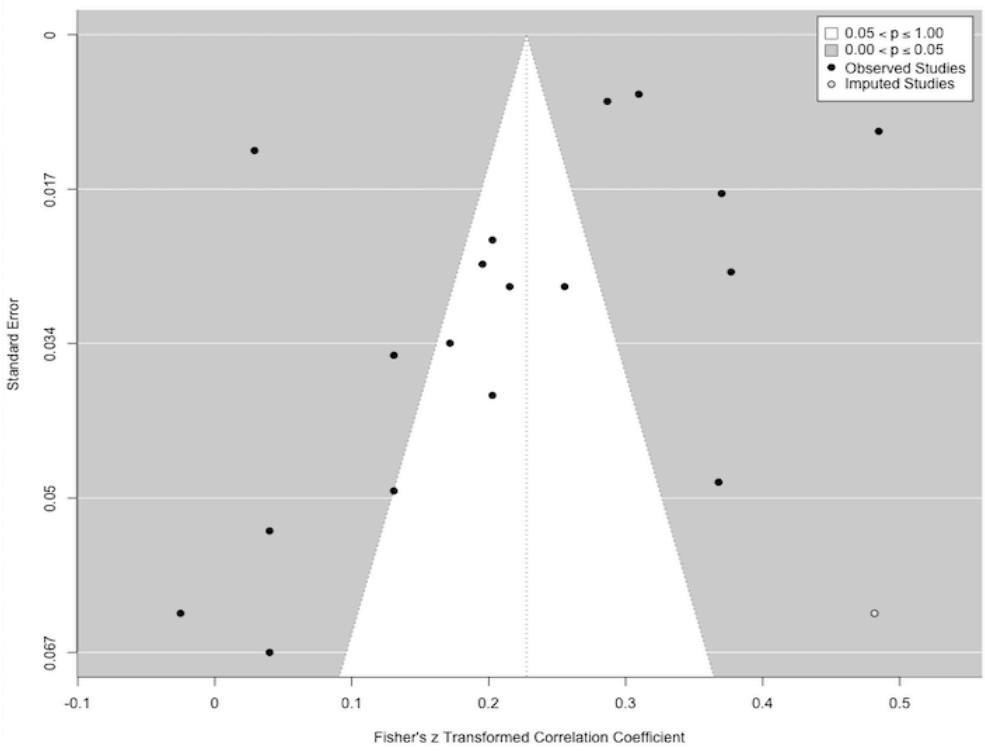


Figure S16

Emotional Neglect vs Anxiety - Trim and Fill Plot



Chapter 3.

Bridging Chapter

Word Count: 245

Bridging chapter

The preceding systematic review and meta-analysis provided a comprehensive examination of the association between childhood maltreatment subtypes and common mental health outcomes, including depression, anxiety, and PTSD. By synthesising data from 62 studies, it was evident that childhood emotional abuse had the most profound impact on psychological distress, while physical neglect demonstrated the weakest association with PTSD symptoms. This review underscored the necessity of assessing maltreatment subtypes independently rather than as a cumulative risk factor, highlighting the nuanced ways in which different forms of adversity contribute to mental health difficulties.

Building on these findings, the empirical study shifts focus toward a key cognitive avoidance process implicated in post-traumatic symptomatology: thought suppression. While the systematic review established that all childhood maltreatment was a significant predictor of PTSD, the specific mechanisms through which trauma exposure translates into persistent symptoms remains widely debated. Understanding further the role of cognitive thought control strategies, particularly thought suppression, offers valuable insights into the maintenance and potential exacerbation of PTSD in youth.

The empirical study thus serves as a natural progression from the systematic review, moving beyond broad associations to examine individual cognitive responses to trauma. By employing longitudinal data and advanced statistical modelling, the study investigates how thought suppression evolves as a coping strategy and whether its effects on PTSD symptoms change over time. This shift in focus enables a deeper exploration of how maladaptive cognitive strategies may mediate the relationship between early adverse experiences and long-term psychological distress.

Chapter 4.

Empirical Paper

Prepared for submission to the Journal of Clinical Child & Adolescent Psychology.

Author guidelines available in Appendix D.

Navigating the Paradox: The Role of Thought Suppression in PTSD Symptom Severity in Youth Post-Trauma

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Abstract

Objective: Thought suppression, a form of cognitive avoidance, has been linked to the development and maintenance of post-traumatic stress disorder (PTSD). Trauma theory suggests avoidant coping strategies are maladaptive yet thought suppression's role in early trauma recovery among youth remains underexplored. This study examined thought suppression's impact on PTSD symptom trajectories in trauma-exposed youth, examining its predictive value over time and its interaction with key cognitive factors. **Methods:** Using ASPECTS study data on cognitive predictors of PTSD in youth following single-event trauma, 194 youth (aged 8–17) completed assessments at week two and week eight post-trauma. Regression and machine learning techniques examined the longitudinal relationship between thought suppression and PTSD severity, with moderation analyses assessing the influence of cognitive processes. **Results:** Early thought suppression at week two significantly predicted PTSD symptoms at week eight. Increased variability in early thought suppressions indicated a non-linear relationship influenced by unseen moderators. Notably, *mild* to *moderate* thought suppression at both week two and week eight post-trauma displayed benign effects on PTSD symptoms. Rumination and data-driven processing significantly moderated the relationship between thought suppression and PTSD symptoms, while other cognitive factors, such as social support and trauma memory quality, did not. **Conclusions:** Thought suppression may serve as a short-term coping strategy but could exacerbate PTSD symptoms long term in youth populations, particularly when excessive or when coupled with rumination and fragmented trauma processing. These findings suggest a threshold in which suppression transitions from innocuous to harmful in the context of PTSD symptom development, with implication for future research discussed.

Introduction

Post-traumatic stress disorder (PTSD) is a debilitating psychiatric condition triggered by exposure to traumatic events. The condition is characterised by a range of symptoms such as intrusive thoughts, experiential avoidance, negative alterations in cognition and mood, and heightened arousal and reactivity (American Psychiatric Association, 2022). PTSD affects individuals across all age groups, often leading to profound and long-lasting impairments in well-being and daily functioning. Youth populations exhibit concerning rates of PTSD; a UK study of over 2,000 children found that 31.8% had experienced trauma, with 7.8% developing PTSD by age 18 (Lewis et al., 2019). Among trauma-exposed youth in this sample, 29.3% displayed significant psychopathology, 15.9% had alcohol dependency, 48.8% engaged in risk behaviours, 20.1% self-harmed, and 11.9% attempted suicide.

Early identification and diagnosis of PTSD are critical for effective intervention and improved long-term outcomes. Prompt detection can prevent the disorder from becoming chronic or worsening (Rothbaum et al., 2012). However, early diagnosis remains challenging, as individuals can display distinct symptom presentations despite sharing the same diagnosis (Galatzer-Levy & Bryant, 2013). Furthermore, current risk factors for predicting PTSD onset lack sensitivity and specificity, particularly in youth (Brewin et al., 2000; Scheeringa et al., 2005). Research indicates alarmingly low support rates for severe PTSD, with only approximately 20% of affected youth receiving any specialised mental health treatment (Goger et al., 2022; Koenen et al., 2017). Addressing these challenges by improving early detection, refining risk assessment methods, and expanding access to treatment is crucial for mitigating PTSD's long-term impact on youth, families, and communities.

PTSD, thought control strategies and thought suppression.

Ehlers and Clark (2000) propose that PTSD emerges when a traumatic event fails to integrate into an individual's cognitive framework. Traumatic experiences disrupt fundamental beliefs about the self, others, and the world. Their model highlights how maladaptive cognitive appraisals and the nature of trauma memory play key roles in both the development and maintenance of PTSD. Beyond cognitive appraisal, the model emphasises the significance of maladaptive emotion regulation strategies, including thought control strategies, in maintaining PTSD symptoms. Individuals with PTSD often attempt to suppress or avoid trauma-related thoughts to reduce distress, however, avoidance can hinder trauma processing and prevent symptom resolution. Research across various trauma-exposed populations supports this hypothesis, including studies on assault survivors (Dunmore et al., 1999) veterans (Bonn-Miller et al., 2012) and motor vehicle accidents (Beck & Coffey, 2007).

In recent years, thought control strategies, particularly thought suppression, have gained increasing attention in trauma research. Thought suppression, a form of cognitive avoidance, involves the deliberate attempt to push distressing thoughts from awareness and is often used to regulate emotions following trauma (Rassin, 2005). While commonly employed as a coping strategy, research suggests that suppressing unwanted thoughts can backfire, making thoughts increasingly persistent and intrusive over time (Najmi, 2013). This paradox was first demonstrated in Wegner et al.'s (1987) seminal "white bear experiment", where participants instructed to avoid thinking about a white bear found themselves thinking about it more frequently, both during suppression attempts and afterward. This 'rebound effect' suggests that efforts to control distressing thoughts may inadvertently increase their accessibility rather than eliminate them.

In the context of PTSD, individuals who engage in thought suppression often experience more frequent and intense intrusive memories, reinforcing distress through the rebound effect (Shipherd & Beck, 2005). Moreover, evidence suggests that thought suppression plays a critical role in maintaining PTSD symptoms. Individuals with PTSD report greater reliance on suppression compared to those without trauma-related difficulties, yet this strategy is largely ineffective in reducing distressing thoughts (Ehlers & Clark, 2000; Purdon, 1999).

In youth populations, the impact of thought suppression on early PTSD symptom development remains poorly understood (Kaminer et al., 2005). Emerging research suggests that youth may be particularly vulnerable to its negative effects, given their developing cognitive and emotional regulation skills (Meiser-Stedman et al., 2014; Yapan et al., 2022). This highlights the need for further research to explore how thought suppression influences PTSD trajectories in youth, as well as the potential for early interventions targeting avoidant coping behaviours.

While thought suppression and avoidance are generally considered dysfunctional, some theoretical perspectives suggest they may serve as adaptive aspects in certain contexts. Approach-Avoidance Theory of stress (S. Roth & Cohen, 1986) proposes that temporary avoidance can help individuals manage the initial overwhelm related to trauma-related stimuli; similar views have been proposed by several others (Folkman & Moskowitz, 2004; Hofmann & Hay, 2018; Mary et al., 2020; Milosevic & Radomsky, 2008). However, persistent avoidance can hinder the processing and integration of traumatic memories, ultimately impeding recovery. Similarly, Wegner (1994) argues that thought suppression, as a form of mental control, may provide short-term relief by regulating distressing thoughts; nevertheless, prolonged reliance on suppression often leads to a paradoxical rebound effect, where suppressed thoughts become more frequent and intrusive, reinforcing PTSD symptoms. Understanding when and how these coping

mechanisms shift from adaptive to maladaptive in the development and maintenance of PTSD is therefore an important question.

Thought suppression in trauma-exposed children and adolescence

Like adults, youth also display strong associations between thought suppression and PTSD symptom clusters, particularly re-experiencing, emotional numbing and dysphoria, which contribute to ongoing impairment (Kassam-Adams et al., 2010). Despite growing research, longitudinal studies in youth populations remain scarce (Meiser-Stedman, 2002), and many young people miss out on trauma-focused interventions due to undetected symptoms (Smith et al., 2019). Further research is necessary to clarify the role of thought suppression in PTSD development, which could enhance screening efforts, inform early intervention strategies and reform treatment pathways (Feeny et al., 2004).

Summation of relevant gaps in literature

Understanding how thought suppression affects PTSD severity in youth is essential for developing targeted interventions, such as psychoeducation, guided self-help, individual psychotherapies, that address suppressive behaviours and reduce the long-term psychological consequences of trauma. The literature remains divided on the contribution of *mild* thought suppression to early coping processes following trauma. Clarifying whether thought suppression initially serves as an adaptive function and identifying the threshold at which it transitions into maladaptive avoidance is critical for both clinical practice and research. This study aims to further understand the developmental trajectory of thought suppression and its impact on developing PTSD symptoms in youth.

Recent advancements in machine learning, particularly Random Forest (RF) regression models, offer significant advantages for analysing complex, non-linear relationships in

psychological data (Auret & Aldrich, 2012). Unlike traditional linear models, RF regression does not assume linearity, making it well suited for exploring intricate interactions within psychological constructs such as cognitive avoidance and PTSD. Therefore, we sought to use such methods in the present study.

Additionally, factors such as cognitive appraisal, memory quality and data driven processing significantly influence PTSD maintenance in youth (Meiser-Stedman et al., 2019). While some research has explored the influence of thought control strategies on PTSD symptoms (Bennett et al., 2009; Meiser-Stedman et al., 2014; Wisco et al., 2013), a broader range of potential moderators on the specific relationship between thought suppression and PTSD remains understudied. In particular, i.e. are there cognitive psychological states where thought suppression becomes particularly disadvantageous for recovery? This study aims to address this gap by examining how key trauma-related variables - perceived social support, rumination, trauma memory quality, data-driven processing, and misappraisal - moderate the relationship between thought suppression and PTSD symptoms. We, therefore, proposed the following research questions:

RQ1 - Is thought suppression associated with core PTSD symptom clusters (re-experiencing and hyperarousal) at different time points following a single-event trauma in youth?

RQ2 - At what threshold does thought suppression transition from being a benign/harmless coping strategy to a maladaptive mechanism in trauma recovery?

RQ3 – To what extent do cognitive and social factors (misappraisal, trauma memory quality, rumination, perceived social support and data driven processing) moderate the longitudinal relationship between thought suppression and PTSD symptoms?

Method

Participants

Participants were youth (aged 8–17 years) recruited from four emergency departments in the East of England between 2010 and 2013. Trauma was defined as attendances involving the threat of death or serious injury, consistent with the DSM-V PTSD criteria (American Psychiatric Association, 2013). Single event trauma was defined as "one-off" incidents unrelated to maltreatment and abuse. Exclusion criteria included intellectual disability, deliberate self-harm, social services involvement, moderate to severe traumatic brain injury, or inability to speak English. No psychological interventions were provided by hospital staff or the study team.

Of the initial 773 eligible youth, 605 could be contacted (78.3%), 315 (52%) opted out, 30 (5.0%) were excluded based on the study's criteria, and 260 (43.0%) consented to participate. There were no significant demographic or clinical differences between participants and the eligible nonparticipants in terms age, sex, ethnicity, or injury type (all *ps* >.05).

For the present study, data from both two-week and eight-week assessments were used. These timepoints were selected in the original study to capture both the acute post-trauma phase (two to four weeks), and the early post-acute phase (two months), when persistent PTSD symptoms are more reliably identified. This design allowed for the examination of cognitive mechanisms involved in both the onset and maintenance of post-traumatic stress (Meiser-Stedman et al., 2019). After removing participants with missing data, the final sample size was *N*=194. The mean age of participants was 14.1 (*SD*=0.2), with 87 girls (44.8%), and 11 participants from ethnic minority groups (5.7%). The trauma types included road traffic accidents (*N*=86; 44.3%), assault (*N*=31; 16.0%), accidental injury (*N*=65; 33.5%), acute medical emergencies (*N*=2; 1.0%) and dog attacks (*N*=10; 5.2%).

Design

This study utilised data from the ASPECTS dataset (Meiser-Stedman et al., 2019), a prospective longitudinal study of youth following a single-incident trauma, which explored the relationship between trauma exposure, cognitive processes, and the development of psychopathology at two timepoints (two-weeks and eight-weeks post-trauma). Since power analysis for machine learning models does not align with traditional hypothesis testing, model stability and generalisability were assessed through cross-validation (see Additional Methods), which suggested a reliable model performance across folds with similar scores (Supplementary Table S4).

The original study by Meiser-Stedman et al. (2019) was approved by the UK National Research Ethics Service under the Cambridgeshire 1 Research Ethics Committee. Consent was obtained from all participants along with information sheets containing study details in accordance with British Psychological Society (BPS, 2021) and the Health and Care Professionals Council (HCPC, 2016) guidelines.

Measures

A summary of key measures for the present study outlined below:

The Child Cognitive Avoidance Questionnaire (CCAQ; Meiser-Stedman et al., 2017) is a five-item Likert scale designed to assess thought suppression, including the suppression of distressing thoughts, memories, and emotions. The CCAQ demonstrated strong internal consistency at weeks two & eight (Cronbach's $\alpha = 0.90$ & 0.93), consistent with previous research findings (Meiser-Stedman et al., 2019).

The Child PTSD Symptom Scale (CPSS; Foa et al., 1997) is a widely used self-report questionnaire assessing PTSD symptom severity in youth aged 8 to 18 years. It consists of a 24-

item scale measuring PTSD symptoms severity (17 items) and impairment in daily functioning (seven items). It produces subscale scores for intrusion (five items), avoidance (seven items), and hyperarousal (six items). The CPSS exhibits good internal consistency (Cronbach α = 0.80 to 0.92 in this sample), strong convergent/discriminant validity, and sensitivity to change over time (Foa et al., 2001). In this study, PTSD symptoms were assessed using a composite that focused on the re-experiencing and hyperarousal subscales, excluding avoidance items to reduce overlap with cognitive avoidance. This composite, referred to as PTSD symptoms Re-Experiencing + Hyperarousal (PTSD-RH), was calculated at both week two and week eight. A threshold of three to four re-experiencing and hyperarousal symptoms is predictive of PTSD outcomes with 90% efficiency (Brewin et al., 2002). Therefore, excluding cognitive avoidance allowed for a clear examination of the relationships between thought suppression and PTSD symptoms.

The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 1988) is a 12-item scale used to measure youths' perceived social support across from family, friends and significant others (Cronbach α = 0.93 in this sample), aligning with prior research across diverse populations and ages (Bruwer et al., 2008; Dahlem et al., 1991).

The Trauma-Related Rumination Scale (Rumination; Meiser-Steadman et al., 2014) is a three-item youth measure, assessing repetitive thoughts that sustain distress (Cronbach's α = 0.76 in this sample), consistent with findings from prior research (Meiser-Stedman et al., 2014).

The Child Data Driven Processing Questionnaire (CDDPQ; McKinnon et al., 2008) is a seven-item scale used to measure data-driven processing, in which individuals focus on fragmented details rather than context-driven information. The internal consistency for week two was respectable (Cronbach α = 0.89 in this sample), and has widely demonstrated strong reliability in prior research (Memarzia et al., 2024)

The Trauma Memory Quality Questionnaire Measure (TMQQ; Meiser-Stedman et al., 2007) is an 11-item self-reported measure used to assess trauma memory characteristics including sensory content, based on cognitive theories of PTSD (Brewin et al., 1996; Ehlers & Clark, 2000). It demonstrated respectable internal consistency (Cronbach $\alpha = 0.81$ in this sample), consistent with previous findings (R. McGuire et al., 2021; Meiser-Stedman et al., 2007).

The Child's Post-Traumatic Cognitions Inventory (CPTCI; Meiser-Stedman et al., 2009) is a 25-item self-reported scale measuring post traumatic appraisals in youth following a traumatic episode (Cronbach $\alpha = 0.95$ in this sample). It has demonstrated excellent test-retest reliability and construct validity (Lee et al., 2018; Mckinnon et al., 2016; Meiser-Stedman et al., 2009).

Procedure

Parents/caregivers of eligible participants were contacted by letter, followed by a telephone call to schedule a two week post trauma assessment. Written informed consent and assent were obtained from both the child and their parent/caregiver. Graduate-level psychologists conducted the assessments via telephone, and questionnaires were completed online. At the two week assessment, parents/caregivers provided additional information regarding their child's emergency department visit, and injury severity information was obtained from the hospitals. A follow-up assessment was conducted eight weeks post-trauma to gather longitudinal data.

Analysis Plan

Statistical analyses were conducted using R and SPSS. The primary objective was to examine the predictive relationship between thought suppression at week-two and PTSD-RH symptoms at week-eight.

To consider RQ1 (does early thought suppression predict later PTSD), a linear regression model was conducted with week two thought suppression as the predictor and week eight PTSD-RH as the outcome. A *post hoc* power analysis, conducted using G*Power (Faul et al., 2007), indicated that 186 participants would be needed to detect a small effect size ($f^2 = 0.06$) with sufficient power and significance ($b = 0.08$; $p < .05$) for regression analyses with three predictors, i.e. our regression models had adequate power. Descriptive statistics were computed for all demographic variables, alongside Person's correlation coefficients used to examine bivariate correlations between thought suppression, PTSD-RH and moderating variables at each timepoint.

Prior to conducting the regression analysis, assumptions of linearity, independence of errors, normality of residuals, homoscedasticity, and multicollinearity were assessed. Several violations were detected (see Table S5), therefore, bootstrapping (5000 iterations) was applied to improve the robustness of the regression coefficients.

RQ2 employed a Random Forest (RF) regression model to explore how thought suppression at week two and week eight predict PTSD-RH symptoms at week eight. The primary aim was to assess the relative contribution of earlier versus later thought suppression while acknowledging that week eight suppression, being concurrent with the outcome, may show stronger associations. RF regression is an ensemble machine-learning method that constructs multiple decision trees, each trained on a random subset of the data. A final prediction is made by averaging the predictions from all the trees, which helps improve accuracy and reduce overfitting. A full explanation of RF Regression techniques is included in the Additional Methods section, with a summary of key values provided below.

The model was trained with 500 trees, using the default setting of two predictor variables per split. No further hyperparameter tuning was conducted, as the model used a limited number of predictors. Model performance was evaluated using three key metrics. The R-squared indicated how much variance in PTSD-RH scores was explained by thought suppression across both timepoints, with higher R-squared values suggesting a stronger predictive relationship. The Root Square Mean Error (RMSE) measures the average magnitude of predicted errors. A lower RMSE indicates better predictive accuracy of the model without excessive error. Mean Absolute Error (MAE) provides an interpretable measure of prediction error by averaging the absolute differences between predicted and actual PTSD-RH scores, with lower scores indicating better predictive modelling. To improve generalisability, a ten fold cross-validation approach was applied, ensuring that performance metrics reflect consistency across different training and testing splits. Feature importance scores were extracted to determine which predictor—week two or week eight thought suppression—was most influential in explaining PTSD-RH variance.

To better understand model behaviour, Partial Dependence Plots (PDP) and Individual Conditional Expectation (ICE) plots were generated. PDPs illustrate the overall impact of changes in thought suppression on PTSD-RH predictions, while ICE plots provide a more granular view by showing how individual cases respond to variations in suppression levels. These visualisations help determine whether thought suppression exhibits linearity in its relationship with PTSD-RH symptoms.

Further performance checks were conducted using residual analysis to ensure that model errors were randomly distributed, indicating an absence of systematic bias. Additionally, Shapley Additive Explanations (SHAP) were used to quantify the contribution of each predictor to individual PTSD-RH predictions. This analysis clarifies whether early (week two) thought

suppression exerts a meaningful influence beyond concurrent (week eight) suppression, offering insight into whether early intervention targeting thought suppression may be beneficial.

RQ3 conducted further moderation analyses to examine whether CPTCI**,** TMQQ**,** Rumination**,** MSPSS**,** and CDDPQ at week two moderated the relationship between thought suppression at week two and PTSD-RH symptoms at week eight. Each model was bootstrapped (5000 iterations) to ensure robust estimates, confidence intervals, and *p*-values for main effects and interactions terms.

Results

Descriptive Statistics

Table 5 provides descriptive statistics for the total sample (N = 194).

Table 5

Descriptive statistics for total sample.

	N	*Mean (SD) or Frequency (%)*
Age (Years)	194	14.08 (0.21)
Gender		
Male	107	55.2
Female	87	44.8
Ethnicity		
White British	183	94.3
Asian	6	3.1
Black African	2	1.0
Pakistani	1	0.5
White & Black African	1	0.5
Other	1	0.5
Trauma Type		
RTA	86	44.3
Assault	31	16.0
Accidental Injury	65	33.5
Acute Medical Emergency	2	1.0
Dog Attack	10	5.2

Week two Variables		
PTSD-RH	194	7.54 (7.33)
Thought Suppression	194	11.44 (4.91)
CPTCI	194	37.91 (14.63)
TMQQ	194	21.82 (6.89)
Rumination	194	7.49 (2.84)
MSPSS	194	69.39 (13.04)
CDDPQ	194	15.70 (6.02)
Week eight Variables		
PTSD-RH	194	5.14 (6.31)
Thought Suppression	194	10.36 (5.19)
CPTCI	194	37.20 (15.35)
TMQQ	194	21.05 (6.52)
Rumination	194	6.68 (2.98)
MSPSS	194	67.57 (15.87)
CDDPQ	194	14.40 (5.90)

Note. Total Sample; N = 194. Data cleaning performed for missing data from the original sample (N = 260). RTA = Road Traffic Accident; PTSD-RH = Post-traumatic Stress Disorder Symptoms –Re-Experiencing + Hyperarousal. CPTCI = Child Post-Traumatic Cognitions Inventory; TMQQ = Trauma Memory Quality Questionnaire; Rumination = Trauma-Related Rumination; MSPSS = Multidimensional Scale of Perceived Social Support; CDDPQ = Child Data Driven Processing Questionnaire.

Psychological measures showed slight reductions over time, particularly in PTSD-RH symptoms, which decreased from a mean of 7.54 (*SD* = 7.33) at week two to 5.14 (*SD* = 6.31) by week eight. Thought suppression scores also declined from week two (*M* = 11.44, *SD* = 4.91) to week eight (*M* = 10.36, *SD* = 5.19). Other measures, including the CPTCI, TMQQ, Rumination, MSPSS, and CDDPQ, demonstrated minimal change. Overall, the data suggests a general trend of symptom reduction, particularly in PTSD-RH, over the study period.

Correlations Table

To examine associations between thought suppression and the various PTSD-related constructs, a correlation analysis was performed. Table 6 illustrates the intercorrelations among variables assessed at week two and week eight

.

Week two thought suppression showed a large positive correlation with week two PTSD-RH (r = .591, p <.001), week eight PTSD-RH (r = 0.511, p < .001), week two appraisals (CPTCI: r = 0.545, p < .001) and week two rumination (r = 0.602, p < .001). While social support (MSPSS) at both time points showed mostly nonsignificant correlations with other variables, it demonstrated a strong positive association between week two and week eight (r = 0.535, p < .0001).

Table 6

Correlation matrix of all study variables

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. w2_ThoughtSuppression	—													
2. w2_PTSD-RH	.591***	—												
3. w2_CPTCI	.545***	.748***	—											
4. w2_TMQQ	.602***	.718***	.682***	—										
5. w2_Rumination	.602***	.631***	.650***	.620***	—									
6. w2_MSPSS	-0.036	-0.07	-0.14	-0.075	-0.096	—								
7. w2_CDDPQ	.432***	.522****	.475***	.441***	.459***	0.029	—							
8. w8_ThoughtSuppression	.733***	.585***	.555***	.590***	.595***	-0.017	.416***	—						
9. w8_PTSD-RH	.511***	.719***	.686***	.655***	.571***	-0.031	.471***	.616***	—					
10. w8_CPTCI	.447***	.654***	.781***	.625***	.580***	-.148*	.424***	.538***	.734***	—				
11. w8_TMQQ	.551***	.622***	.610***	.744***	.566***	-0.021	.436***	.642***	.752***	.647***	—			
12. w8_Rumination	.507***	.561***	.549***	.573***	.750***	-0.009	.438***	.636***	.666***	.594***	.654***	—		
13. w8_MSPSS	0.04	0.01	-0.02	0.064	0.041	.535***	0.089	0.104	0.079	0.018	0.087	0.093	—	
14. w8_CDDPQ	.445***	.582***	.495***	.488***	.482***	0.047	.666***	.500***	.567***	.531***	.554***	.523***	.184*	—

Note. Total N = 194 following data cleaning of missing data from the original sample (N = 260). w2 = Week two, w8 = Week eight, PTSD-RH = Post-traumatic Stress Symptoms – Re-Experiencing + Hyperarousal. CPTCI = Child Post-Traumatic Cognitions Inventory; TMQQ = Trauma Memory Quality Questionnaire; Rumination = Trauma-Related Rumination; MSPSS = Multidimensional Scale of Perceived Social Support; CDDPQ = Child Data Driven Processing Questionnaire.

*** $p < .001$

** $p < .01$

* $p < .05$

Research Question 1 – Linear Regression

A simple linear regression model examined whether week two thought suppression predicted PTSD-RH symptoms at week eight (Table 7). The model was significant, explaining approximately 26.1% of variance in PTSD-RH, F (1,192) = 67.86, $p < .001$, $R^2 = 0.26$. Thought suppression at week two was a positive predictor of PTSD-RH symptoms at week eight (b = 0.657*, SE* = 0.080, t = 8.238, $p < .001$), indicating that for each one-point increase in thought suppression at week two, corresponded to a 0.657-point rise in week eight PTSD-RH symptoms.

Bootstrapping (5000 iterations) was performed to address residual assumptions violations. The bootstrapped 95% confidence intervals for the intercept [-3.847, -0.837] and the thought suppression coefficient [0.496, 0.820] excluded zero, confirming significance.

Table 7

Regression Output for Week two Thought Suppression as a Predictor of Week eight PTSD-RH

					95% CI	
Predictor	*b*	*SE*	*t*	*p*	*LL*	*UL*
(Intercept)	-2.372	0.992	2.392	0.018 *	-3.847	-0.837
Thought Suppression	0.657	0.08	8.238	< .001 ***	0.496	0.820
R^2	0.261					
Adjusted R^2	0.257					

Note. N = 194. Bootstrapping with 5,000 iterations was used to obtain 95% confidence intervals for the coefficients.
*** $p < .001$.
** $p < .01$.
* $p < .05$

Research Question 2 – Machine Learning RF Regression

A Random Forest (RF) Regression Model was trained to predict week eight PTSD-RH symptoms based on week two and week eight thought suppression scores as predictors. The model was trained using 500 trees, and used default values (2) for the number of predictor variables considered at each split (mtry = 2).

The final model indicated a RMSE of 5.23, indicating a moderate prediction error (PTSD-RH range: 1-33). The Mean Absolute Error (MAE) was 2.77, suggesting an average level of deviation between predicted and actual values. The model explained approximately 30.84% of the variance in week eight PTSD-RH, suggesting a moderate level of predictive performance, but also highlighting the influence of other unaccounted-for factors. Feature performance was evaluated for each predictor. Week two thought suppression yielded an IncMSE of 16.02 and an IncNodePurity of 2208.46, while week eight thought suppression produced an IncMSE of 31.31 and an IncNodePurity of 2970.32. These results suggested that week eight thought suppression is a stronger predictor of week eight PTSD-RH symptoms than week two thought suppression.

10-fold cross validation was used to account for potential overfitting and to provide a more reliable estimate of the model's generalisability on 'unseen' data. The mean cross-fold RMSE was 5.48 (*SD* = 0.60). The mean cross-fold MAE was 3.94 (*SD* = 0.47) with models explaining approximately 29.72% of the variance in week eight PTSD-RH across folds (see Figure S17 & S18 for model performance metrics). These findings indicate consistency across different subsets of the data, with relatively small variability in prediction error, which was also replicated in the RF regression model, suggesting that the model's performance is stable and generalisable across different data partitions. This consistency further supports the model's robustness and reliability in predicting week eight PTSD-RH symptoms.

To further assess feature importance and model interpretability, a SHAP analysis (see Figure S19) was conducted to examine how week two and week eight thought suppression influenced predictions of week eight PTSD-RH symptoms. The actual predicted score for week eight PTSD-RH was 11.06, compared to an average predicted value of 5.16 across all observations, indicating that the model tended to underestimate symptom severity.

Week eight thought suppression had a SHAP value of 18, with a phi value of approximately 4.7, suggesting a strong positive influence on predicted PTSD-RH symptoms. In contrast, week two thought suppression had a SHAP value of 20 and a phi value of 1.2, indicating a smaller but still positive effect. These results suggest that week eight thought suppression plays a more influential role in predicting PTSD-RH symptom severity than week two thought suppression, aligning with results of feature importance.

PDP and ICE

To further assess the influence of thought suppression on PTSD-RH symptom severity at week eight, Partial Dependence Plots (PDPs) and Individual Conditional Expectation (ICE) plots were generated.

The PDPs (Figure 2) illustrate the average effect of week two and week eight thought suppression on predicted PTSD-RH symptoms. A positive relationship was observed in both cases, with higher thought suppression scores corresponding to increased PTSD-RH symptoms. The week eight thought suppression PDP showed a steeper incline at higher values, suggesting that the relationship between thought suppression and PTSD-RH symptoms strengthens over time. This is consistent with the RF regression results, which identified week eight thought suppression as the stronger predictor relative to week two thought suppression.

The ICE plots (Figure 2) revealed most trajectories followed the general trend of increasing PTSD-RH symptoms with greater thought suppression, yet considerable variation was evident across participants in week two. The substantial variability observed in the week two suggested interaction effects and moderating factors may influence the early predictive relationship between thought suppression and longstanding PTSD-RH symptoms. The variation in individual ICE curves indicated that, while some participants exhibited an overall positive

association, others did not. This variability indicated that certain factors could either amplify or diminish the effect of thought suppression on PTSD-RH symptomatology. Notably, in both week two and week eight, *mild* to *moderate* levels of thought suppression led to minimal change in PTSD-RH scores, suggesting that only high levels of thought suppression significantly impacted later PTSD-RH symptoms. The ICE plot for week eight thought suppression exhibited a more consistent upward trajectory across individuals, reinforcing the finding that thought suppression later in the timeline exerts a stronger influence on PTSD-RH symptom severity.

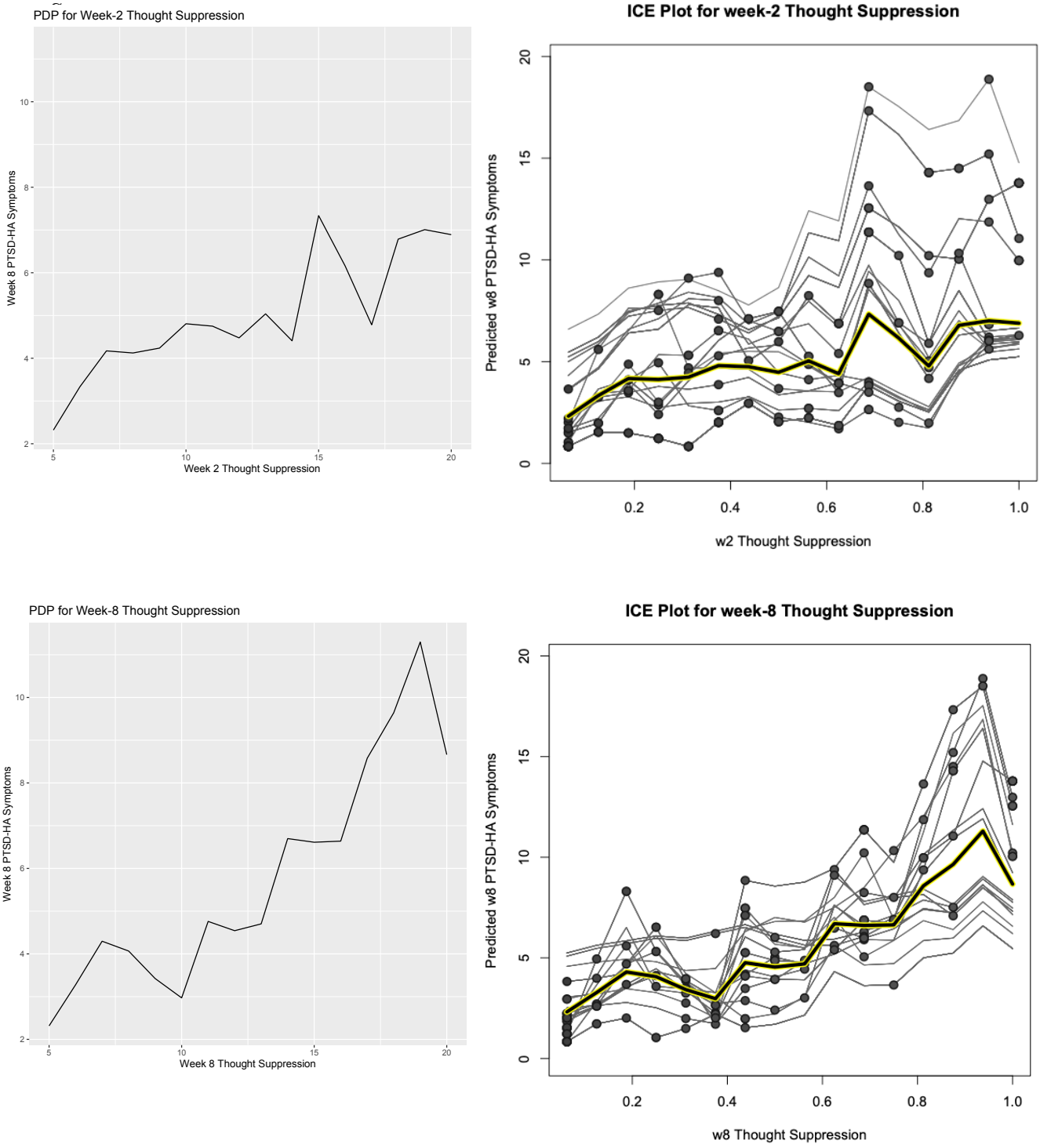
These findings align with the SHAP analysis, which indicated that week eight thought suppression exerted a greater influence on the predicted PTSD-RH score (phi = 4.7) than week two thought suppression (phi = 1.2). Taken together, these results highlight that while thought suppression at both time points contributes to PTSD-RH symptoms, its effect becomes more pronounced over time. The variability observed in the week two ICE plot suggests that other factors may further shape this relationship.

Research Question 3 - Moderation Analysis

Multiple regression analyses were performed to assess the moderation effects of study variables on the relationship between week two thought suppression and week eight PTSD-RH symptoms. Table 8 summarises the results including effect sizes, confidence intervals, and significance levels.

Figure 2

PDP and ICE plots for week two and week eight Thought Suppression against PTSD-RH



Note. PDP lines (left) are displayed in the corresponding ICE plots (right) as highlighted yellow average trend line

Table 8

Moderation Output for all Model Variables (Week two) on Dependant Variable PTSD-RH Symptoms (Week eight)

Variable	*b*	*SE*	*t*	*p*	95% CI *LL*	95% CI *UL*
			Misappraisals			
			Step 1 - Linear Regression			
TS	0.250	0.789	3.193	**0.002****	0.101	0.417
CPTCI	0.250	0.026	9.487	**< 0.001*****	0.185	0.313
			Step 2 - Adding interaction term			
TS	0.122	0.199	0.613	0.541	-0.264	0.558
CPTCI	0.193	0.085	2.262	**0.025***	0.009	0.390
TS x CPTCI	0.004	0.005	0.705	0.482	-0.009	0.102
			Trauma Memory Quality			
			Step 1 - Linear Regression			
TS	0.235	0.086	2.721	**0.007****	0.075	0.392
TMQQ	0.049	0.061	8.118	**<0.001*****	0.364	0.633
			Step 2 - Adding interaction term			
TS	-0.185	0.257	-0.719	0.473	-0.668	0.303
TMQQ	0.231	0.166	1.389	0.166	-0.095	0.588
TS x TMQQ	0.019	0.011	1.731	0.085	-0.006	0.043
			Rumination			
			Step 1 - Linear Regression			
TS	0.337	0.092	3.648	**<0.001*****	0.165	0.536
Rumination	0.919	0.160	5.755	**<0.001*****	0.545	1.257
			Step 2 - Adding interaction term			
TS	-0.280	0.234	-1.189	0.236	-0.690	0.323
Rumination	0.010	0.356	0.028	0.978	-0.599	0.699
TS x Rumination	0.080	0.028	2.847	**0.005****	0.012	0.135
			Perceived Social Support			
			Step 1 - Linear Regression			
TS	0.656	0.080	8.205	**<0.001*****	0.501	0.832
MSPSS	-0.006	0.030	-0.203	0.840	-0.069	0.05
			Step 2 - Adding interaction term			
TS	0.870	0.461	1.882	0.061	-0.056	1.900
MSPSS	0.029	0.081	0.358	0.721	-0.100	0.168
TS x MSPSS	-0.003	0.006	-0.466	0.641	-0.017	0.010
			Data Driven Processing			

			Step 1 - Linear Regression			
TS	0.486	0.084	5.789	**<0.001*** **	0.325	0.662
CDDPQ	0.323	0.068	4.722	**<0.001*** **	0.177	0.478
			Step 2 - Adding interaction term			
TS	-0.093	0.223	-0.417	0.677	-0.469	0.296
CDDPQ	-0.115	0.171	-0.675	0.501	-0.398	0.159
TS x CDDPQ	0.037	0.013	2.789	**0.005** **	0.013	0.062

Note. 95% confidence intervals are bootstrapped based on 5000 resamples. TS = Thought Suppression; CPTCI = Child Post-Traumatic Cognitions Inventory; TMQQ = Trauma Memory Quality Questionnaire; Rumination = Trauma-Related Rumination; MSPSS = Multidimensional Scale of Perceived Social Support; CDDPQ = Child Data Driven Processing Questionnaire.
* $p < .05$
** $p < .01$
*** $p < .001$

Rumination significantly moderated the relationship between week two thought suppression and week eight PTSD-CD ($p = 0.005$). These findings indicated that although thought suppression and rumination independently predict PTSD-RH symptom severity, their individual significance diminished upon the introduction of the interaction term, which emerged as significant. This shift highlighted a potential interactive effect between thought suppression and rumination, in that their combined presence may have intensified PTSD-RH symptoms.

In Model 5, data-driven processing (CDDPQ) also emerged as a significant moderator, with the interaction term being significant ($p = 0.005$). These findings suggested that, while thought suppression and data-driven processing independently predicted PTSD-RH symptom severity, their combined effect—revealed through the interaction term—appeared to intensify symptoms. This highlighted a complex interplay between the two variables, indicating that their interaction may have exacerbated PTSD-RH symptoms more than either factor alone.

There was no observed moderating effect of misappraisals (CPTCI), trauma memory quality (TMQQ) or perceived social support (MSPSS) on the relationship between week two thought suppression (TS) and week eight PTSD-CD symptoms.

Discussion

The present study explored the relationship between thought suppression and PTSD-RH symptoms in youth following a single-event trauma. Results indicate that early thought suppression is positively associated with later PTSD-RH symptoms, as shown by linear modelling. RF regression revealed a complex, non-linear relationship, with increased variability between week two thought suppression and week eight PTSD-RH. Interestingly, PTSD-RH symptoms remained stable in some cases despite mild to moderate suppression. By week eight, suppression became a more consistent predictor of PTSD-RH than at week two. This early-course variability highlights that, for some, suppression may not yet be a stable predictor of PTSD-RH symptoms, potentially functioning as a short-term coping mechanism before transitioning into a more maladaptive response over time. The stronger predictive value of week eight thought suppression aligns with theoretical models that conceptualise avoidance strategies as harmful when used as a long-term coping mechanism (Ehlers & Clark, 2000).

Moderation analyses revealed that rumination and data-driven processing intensified the relationship between week two thought suppression and week eight PTSD-RH symptoms. This suggests that youth engaging in repetitive negative thinking or process trauma in a fragmented manner are at heightened risk for PTSD-RH symptoms when using suppression. In contrast, perceived social support, trauma memory quality, and misappraisals did not significantly moderate the relationship, indicating that these cognitive processes may not directly influence the effect of suppression on PTSD-RH symptoms in this sample. These findings align with research indicating that cognitive avoidance, combined with maladaptive cognitive processes, intensifies PTSD symptoms (LoSavio et al., 2017; Schweizer et al., 2019).

Interpretation of findings

Our findings contribute to research examining the paradoxical effects of thought suppression in post-trauma recovery. Consistent with Wegner's (1987) theory of ironic processes, youth with higher levels of thought suppression at week two are at increased risk for heightened PTSD-RH symptoms by week eight. Suppressing distressing thoughts can increase their frequency and emotional intensity over time (Najmi, 2013; Shipherd & Beck, 2005), however the variability between *early* suppression and PTSD-RH symptoms suggests a more nuanced relationship. For some, suppression may initially serve as a short-term coping strategy immediately after trauma (Roth & Cohen, 1986), due to the overwhelming distress caused by immediate processing of trauma memories, leaving youth with no alternative but to suppress intrusive thoughts in an attempt to manage acute emotional pain (Konstantinou et al., 2024). In such cases, suppression may provide a sense of control, preventing further dysregulation until adaptive coping strategies are developed (Hofmann & Hay, 2018). Appraisal theory suggests positive appraisal and emotion regulation may buffer the early-course relationship between suppression and PTSD symptoms (Troy & Mauss, 2011). Given the limited research on emotion regulation profiles and emotionality in PTSD (McLean & Foa, 2017), future research should explore adaptive coping and emotion regulation processes as potential mechanisms influencing the impact of suppression on PTSD symptoms.

Threshold Effects: When does suppression become maladaptive?

A key question raised by our findings is whether thought suppression is inherently maladaptive or can serve a protective function early in trauma recovery. Interestingly, our findings implicate that *mild to moderate* thought suppression across both timepoints may be relatively benign, rather than beneficial. Notably, only *high* levels of thought suppression became consistently problematic after week eight, with high levels of week two thought

suppression showing increased variability. These results provide evidence for a 'tipping-point' post-trauma, whereby sustained suppression contributes to increased PTSD symptoms, offering clinical and research relevance. Furthermore, the findings highlight the nuanced nature of thought suppression as a post-trauma cognitive strategy. Rather than functioning as a binary construct i.e. either adaptive or maladaptive, suppression appears to operate along a continuum, where its utility may depend on both timing and context. In the immediate aftermath of trauma, mild to moderate levels of suppression may serve a short-term protective function, helping individuals manage overwhelming distress and maintain daily functioning. However, over time, persistent reliance on suppression may hinder emotional processing and memory integration, increasing vulnerability to intrusive symptoms and psychological distress. This temporal shift echoes theoretical models suggesting that avoidance-based coping becomes problematic when it disrupts adaptive processing of trauma (Ehlers & Clark, 2000; Wegner, 1994).

Our findings challenge the view that all forms of avoidant thought control are harmful (Coll et al., 2022; Holeva et al., 2001; Simons, 2010). Initially, youth may rely on suppression for temporary relief, as suppressing intrusive memories can reduce emotional expression (Dunn et al., 2009; Mary et al., 2020) and perceived shame (Van Vliet, 2010). However, the cost of prolonged suppression increases cognitive load, undermining effectiveness, and creates a cycle of failed expectation and growing distress over time (Najmi & Wegner, 2009). Research indicates individual differences, such as heightened anxiety, may increase difficulty in controlling thoughts, making suppressed thoughts more salient and invasive (Tolin et al., 2002). Understanding the conditions in which suppression becomes problematic can inform treatment which should provide support to youth exhibiting high suppression behaviour post-trauma. Person centred approaches are vital in promoting post-traumatic growth (Joseph, 2015).

Clinicians should help youth to recognise the impact of overreliance on suppressive strategies that exacerbate symptoms rather than provide relief. These findings also resonate with Approach-Avoidance Theory in coping with stress (Roth & Cohen, 1986), which suggests short-term avoidance may reduce distress, allowing for dosing of distressing stimuli, but prolonged avoidance hinders emotional processing and impedes recovery.

The gradual shift from more 'functional' to 'dysfunctional' suppression is also reflected in cognitive models of PTSD, which offer a theoretical lens through which to understand the psychological mechanisms underpinning these trajectories. Within Ehlers & Clark (2000) framework, thought suppression can intensify symptoms by preventing processing and contextualisation of trauma memories, therefore maintaining their emotional salience. Similarly, Brewin's (2001) dual representation theory suggests that suppression interferes with the integration of sensory-bound trauma memories (S-reps) into verbally accessible memories (VAMs), resulting in fragmented, intrusive recollections. Prolonged suppression may therefore limit opportunities for memory reconsolidation and reappraisal, reinforcing intrusive symptoms over time. The present findings support these theoretical accounts by demonstrating that thought suppression is not inherently pathological but may become problematic when it disrupts the natural course of emotional and cognitive recovery post-trauma.

Interaction effect with cognitive processes

Our findings also highlight the role of cognitive processes in the relationship between thought suppression and PTSD-RH symptoms. Specifically, rumination and data-driven processing significantly amplified the impact of week two thought suppression on week eight PTSD-RH symptoms, suggesting when suppression is paired with repetitive negative thinking or fragmented trauma processing, its harmful effects increase. These results align with theories

suggesting rumination reinforces distressing memories and trauma-related beliefs (Vanderveren et al., 2020), prolonging distress by increasing cognitive rigidity (Ehlers et al., 1998), thereby trapping youth in a cycle of negative appraisal and intrusive memories. This in turn prevents the cognitive flexibility needed for adaptive trauma processing. Therefore, interventions should target both thought suppression and disrupting rumination cycles, promoting healthier cognitive processing strategies that facilitate emotional integration. Similarly, data-driven processing significantly magnified the relationship between week two thought suppression and week eight PTSD-RH symptoms, indicating that cognitive processing styles are crucial to suppressions long-term effects. Fragmented, sensory-based trauma encoding contributes to intrusively distressing memories (Meiser-Stedman et al., 2019). When combined with suppression, this disrupts emotional processing and prevents trauma resolution, leaving unresolved memories that perpetuate PTSD symptoms. This interaction blocks the cognitive restructuring needed for recovery, thereby making it difficult for individuals to regain a sense of control or closure. Trauma-focused treatments should prioritise cognitive restructuring to break the cycle of negative thinking and promoting adaptive coping (Larsson et al., 2016). Mindfulness techniques may also help shift from avoidance to acceptance, fostering non-judgmental awareness and reducing suppression's paradoxical effects (Batten et al., 2005).

Despite the well-established role of social support, trauma memory quality, and misappraisals in trauma recovery, they did not significantly moderate the relationship between thought suppression and PTSD-RH symptoms. One possible explanation might be that thought suppression operates independently as a core cognitive avoidance strategy, overriding other influences. Perhaps the protective effects of social support and trauma memory quality might be more relevant in different contexts or stages of recovery. While social support helps buffer

against emotional dysregulation associated with PTSD (Koenen et al., 2017), it may not alter maladaptive patterns caused by suppression. Similarly, misappraisals may negatively influence PTSD symptomatology (Gómez de La Cuesta et al., 2019), but not specifically interact with suppression to worsen symptoms. Future research should explore how these variables interact over time, particularly in the longer-term course of PTSD or under different conditions.

While the current study examined the role of cognitive processes in predicting PTSD symptom trajectories among youth, it did not account for differences in trauma type. Emerging evidence suggests that the relationship between thought suppression and post-traumatic symptoms may be influenced by the nature of the trauma experienced. Interpersonal traumas, such as abuse, assault, or domestic violence, often evoke heightened shame, guilt, and fear of disclosure, which may intensify reliance on cognitive avoidance strategies like thought suppression (Tipsword et al., 2025). In contrast, non-interpersonal traumas (e.g., accidents or natural disasters) may not elicit the same psychological dynamics or suppression patterns. Future research should investigate how trauma type moderates the relationship between suppression and symptom severity, as this could inform more nuanced, trauma-specific approaches to intervention in youth populations.

Limitations

A limitation of this study is the use of a simplified 6-item self-reported measure of thought suppression may not fully capture the complex nature of suppression-related effects. As outlined by Wenzlaff and Wegner (2000), thought suppression can lead to paradoxical effects, such as the rebound effect, immediate surges in target thoughts, and intensified intrusions triggered by cognitive demands. These variations in suppression responses were not fully addressed by the measure, which may have impacted on the interpretation of how thought

suppression interacts with PTSD symptoms. Furthermore, self-reported suppression may be subject to recall bias or social desirability effects. Incorporating data-collection strategies such as ecological momentary assessment (EMA) could offer real-time insights into suppression behaviours, reducing retrospective bias (Lorenz et al., 2019).

Our sample was limited to youth exposed to single-event trauma, limiting generalisability to chronic or complex trauma populations. Future research should examine whether suppression operates differently in cases of prolonged or repeated trauma exposure. Lastly, this study only assessed suppression at two time points (week two and week eight), with the long-term trajectory remaining unclear. Future studies should track suppression over months or years to determine when and how it transitions from adaptive to maladaptive. Additionally, examining non-linear suppression effects could refine understanding of threshold points in PTSD development.

Conclusion

This study highlights the complex role of thought suppression in PTSD development, emphasising that its impact is shaped by cognitive context and co-occurring processes. While mild suppression may initially help individuals cope with trauma, prolonged suppression—especially when coupled with rumination and fragmented trauma processing—appears to contribute to the persistence of PTSD-RH symptoms. Routine screening for thought suppression can facilitate early detection, which is critical for preventing maladaptive avoidance strategies (Bryant, 2021). Our findings emphasise the importance of early identification of suppression tendencies in trauma-exposed youth, allowing for timely intervention, specifically *when* appropriate, as early attempts to remove suppression for some, may lead to increased distress (Rassin, 2005).

Finally, this study highlights the potential of machine learning in PTSD research and clinical practice. Techniques like Random Forest models, ICE plots, and SHAP analyses offer valuable insights into individual differences and symptom trajectories, presenting opportunities for personalised interventions. Future research should explore further integration of these data-driven models into clinical decision-making to enhance outcomes for youth exposed to trauma.

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Additional Methods: Empirical Paper

Predictive Modelling Using Random Forest Regression

The analysis employed a Random Forest (RF) regression model to examine the relationship between thought suppression (at week two and week eight) and PTSD-RH (week eight). RF regression is an ensemble learning method that constructs multiple decision trees, each trained on a random subset of the data. The final prediction is made by averaging the predictions from all the trees, which helps improve accuracy and reduce overfitting. By averaging the outputs, RF minimises the risk of a model fitting too closely to the training data and performing poorly on unseen data.

The model was trained with 500 trees, using week two and week eight thought suppression scores to predict PTSD-RH at week eight. The default setting of two predictor variables per split was sufficient, given the low number of predictors. No further hyperparameter tuning was conducted, as the model used a limited number of predictors. Additionally, RF models typically perform well with default hyperparameters settings provided in software packages (Probst et al., 2019).

To evaluate the model, we reported R-squared as a measure of effect size, Root Mean Square Error (RMSE), or how far predictions are from actual values, and Mean Absolute Error (MAE) which quantifies prediction errors by averaging the absolute differences between predicted and actual values, providing a clear measure of model accuracy. Unlike MSE, which gives greater weight to larger errors due to squaring, MAE treats all errors equally, making it less sensitive to outliers. Feature importance scores were extracted to evaluate which thought suppression scores (week two and week eight) were most influential in predicting PTSD-RH. Two metrics were used to evaluate the relative importance of each predictor. IncMSE measures

how much removing a predictor increases prediction error (%), and IncNodePurity shows how well a predictor distinguishes between different outcomes.

To assess performance of the model, we used 10-fold cross validation. Cross-validation is a technique used to assess how well the model generalises to new, unseen data by repeatedly splitting the dataset into multiple training and testing subsets. In 10-fold cross-validation, the dataset is divided into 10 equal parts (or 'folds'). For each iteration, the model is trained on 9 of these folds and tested on the remaining fold. This process is repeated 10 times, ensuring that each fold is used as the test set once. By averaging the performance across these 10 iterations, cross-validation provides a more reliable estimate of how the model will perform on new data. A 10-fold cross-validation approach is commonly used as it balances computational efficiency and accuracy, providing a reliable estimate of model performance while ensuring that each iteration is trained on a substantial portion of the data (Berrar, 2019). Figure S17 shows the 10-splits along with corresponding RMSE scores at each fold.

Since power analysis for machine learning models does not align with traditional hypothesis testing, model stability and generalisability were assessed through cross-validation. This method tests the model on different data subsets to ensure that predictions are not overly specific to a single dataset. To evaluate the predictive accuracy of the RF regression model, we performed 5-fold, 10-fold, and 20-fold cross-validation. Data were partitioned into training and testing sets multiple times, and the model's performance was assessed based on Root Mean Square Error (RMSE), which measures the average difference between predicted and actual PTSD-RH scores. Lower RMSE values indicate better model performance, as they reflect smaller prediction errors. Minimal variation in RMSE across folds indicated the model's reliability and its generalisability across data subsets (see Table S4).

This technique contrasts with the final model test, where a single holdout test set is used to evaluate performance after the model has been trained. Cross-validation helps to mitigate the risk of bias due to a single test split and ensures that every data point is used both for training and testing. The cross-validated RMSE was calculated to quantify how well the model predicted week eight PTSD-RH symptoms across the different splits. Cross-validation also provided Mean Absolute Error (MAE) and R-squared values, which were used to assess the model's accuracy and strength of predicted relationship.

Visualising Model Behaviour – PDP & ICE

To visualise these relationships, Partial Dependence Plots (PDPs) can be used to illustrate the average effect of thought suppression on PTSD symptoms while holding other variables constant. This aligns with the concept of exposure-response curves, where PDPs estimate population-level relationships by quantifying how changes in one variable affect outcomes while other variables are fixed (Cox, 2023). In addition, Individual Conditional Expectation (ICE) plots capture individual variations, revealing how different youth may uniquely experience thought suppression. ICE plots, akin to individual risk distributions in exposure-response assessments, clarify the variability across individuals and provide personalised insights, making these tools particularly useful for understanding both population and individual-level effects (Cox, 2023). Together, these techniques provide a comprehensive approach to understanding both population-level trends and individual variations, offering deeper insights into the complex relationships between variables.

In our model, PDP were used to capture how changes in thought suppression at week two affect predicted PTSD-RH symptoms at week eight, assisting with understanding towards the

general effect of each predictor. ICE plots show how individual observations were affected by changes in a predictor, providing a more granular view of the model's decision process.

Additional Performance Tests

Finally, we performed a residual analysis to check for patterns in the models' predicted errors (Figure S18). Ideally, residuals should be randomly distributed with no significant patterns. A Shapley Additive Explanations (SHAP) analysis was conducted to quantify the contribution of thought suppression at week two and week eight on individual predictions of PTSD-RH scores, relative to the average predicted value across the dataset. The phi values derived from SHAP quantify the strength of each predictor's contribution, with higher phi values indicating a greater impact on the model's final prediction. These findings help clarify the relative impact of early versus later thought suppression on PTSD-RH symptoms. For full R-Syntax, please see Appendix K.

Supplementary Materials: Empirical Paper

Table S4

Cross-validation scores across folds

Metrics	Fold Split		
	5-Folds	10-Folds	20-Folds
R squared	0.31	0.30	0.36
RMSE	5.35 (0.48)	5.48 (0.60)	5.15 (1.40)
MAE	3.87 (0.33)	3.94 (0.47)	3.80 (1.03)

Note. RMSE = Root Mean Square Error; MAE = Mean Absolute Error; Mean & SD are presented as M(SD).

Table S5

Assumptions Table Across All Regression Analysis

Moderator Variable	Linearity/Outliers (Scatterplots)	Independence of errors (Durbin-Watson Test)	Normality of Residuals (Shapiro-Wilk Test)	Homoscedasticity (Breusch-Pagan Test)	No Multicollinearity (VIF)
			Simple Linear		
TS	Met	2.108, $p = 0.78$	**0.94, $p < 0.001$**	**28.658, $p < .001$**	N/A
			Multiple Regression		
CPTCI	Met	2.012, $p = 0.56$	**0.937 $p < .001$**	**22.784, $p < .001$**	**14.84**
TMQQ	Met	2.036, $p = 0.60$	**0.981, $p = .009$**	**50.130, $p < .001$**	**11.61**
Rumination	Met	2.039, $p = 0.61$	**0.949, $p < .001$**	**29.123, $p < .001$**	8.07
MSPSS	**Not Met**	2.102, $p = 0.76$	**0.938, $p < .001$**	**28.157, $p < .001$**	7.21
CDDPQ	Met	2.101, $p = 0.76$	**0.959, $p < .001$**	**46.258, $p < .001$**	7.95

Note. Violated assumptions in bold. TS = Thought Suppression; CPTCI = Child Post-Traumatic Cognitions Inventory; TMQQ = Trauma Memory Quality Questionnaire; Rumination = *Trauma-Related Rumination*; MSPSS = Multidimensional Scale of Perceived Social Support; CDDPQ = Child Data Driven Processing Questionnaire.

Figure S17

Cross-validation RMSE Distribution across each fold.

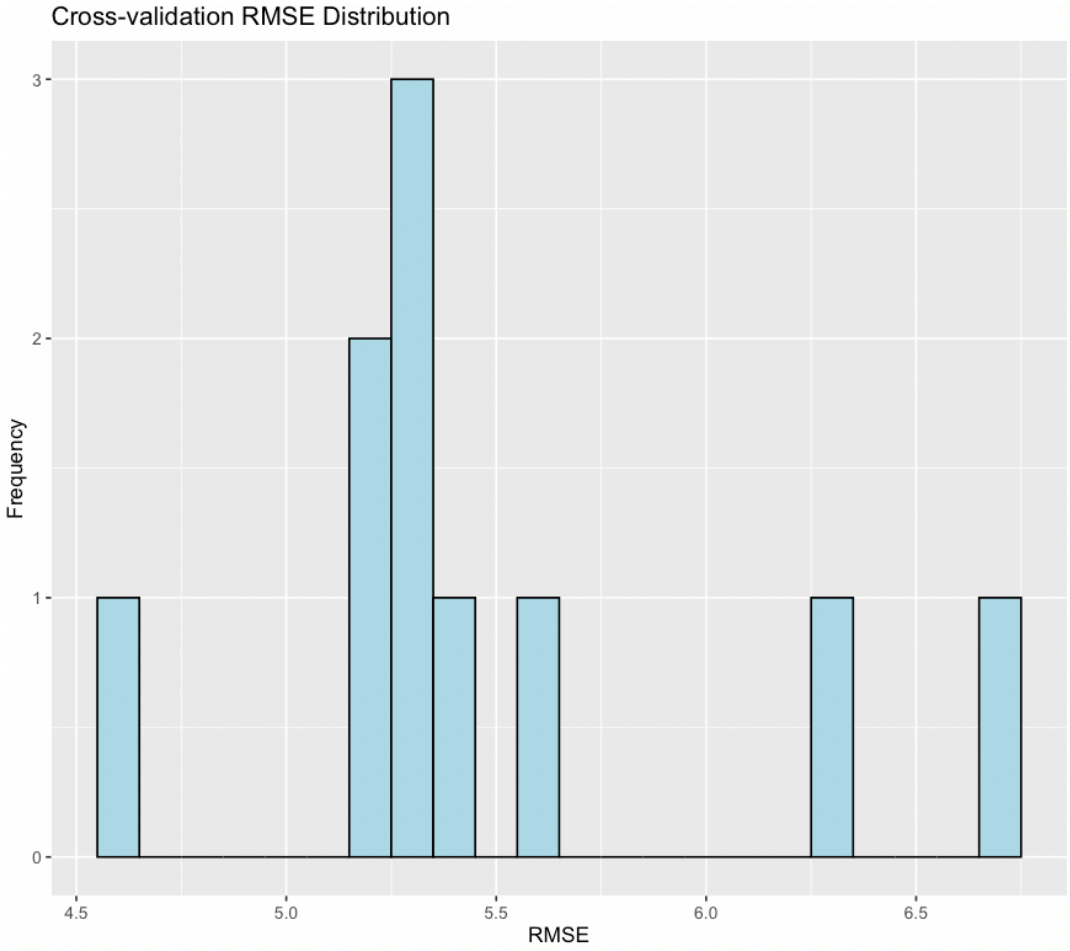


Figure S18

Residual Analysis of Final RF Model

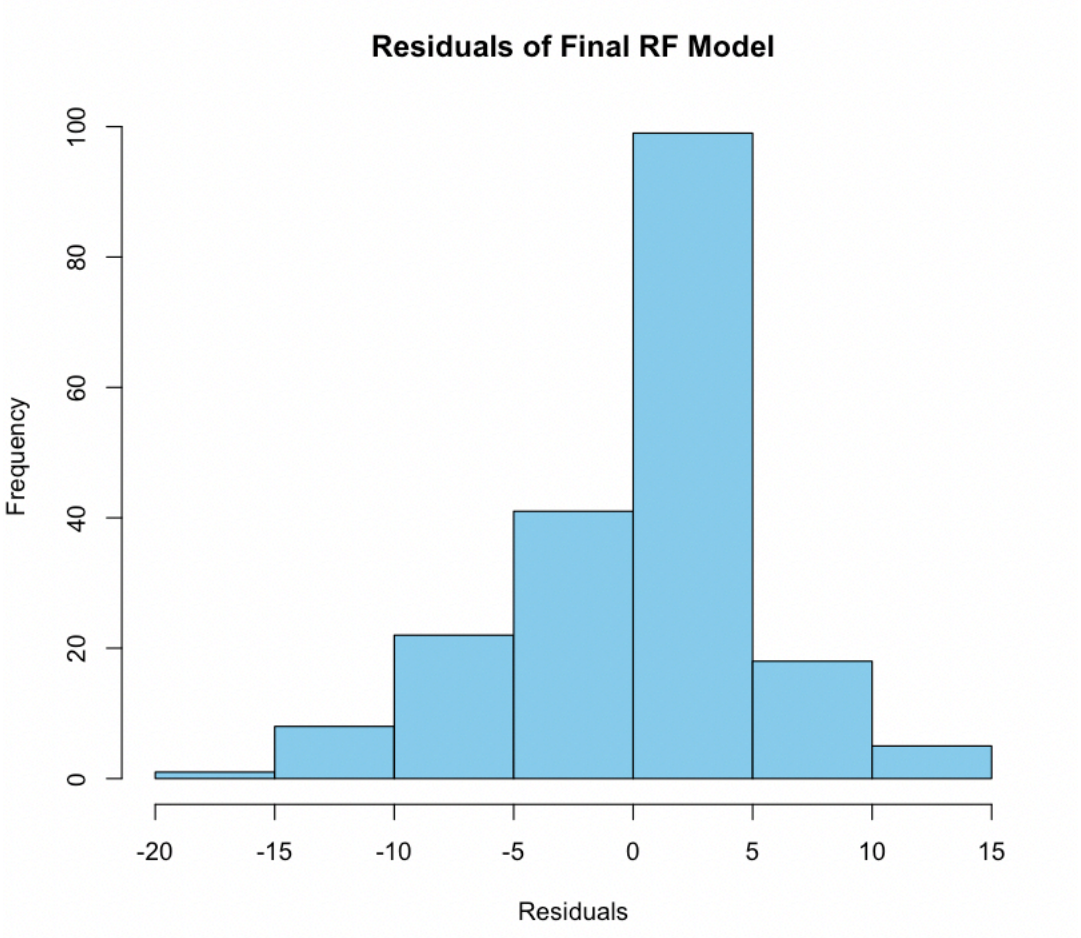
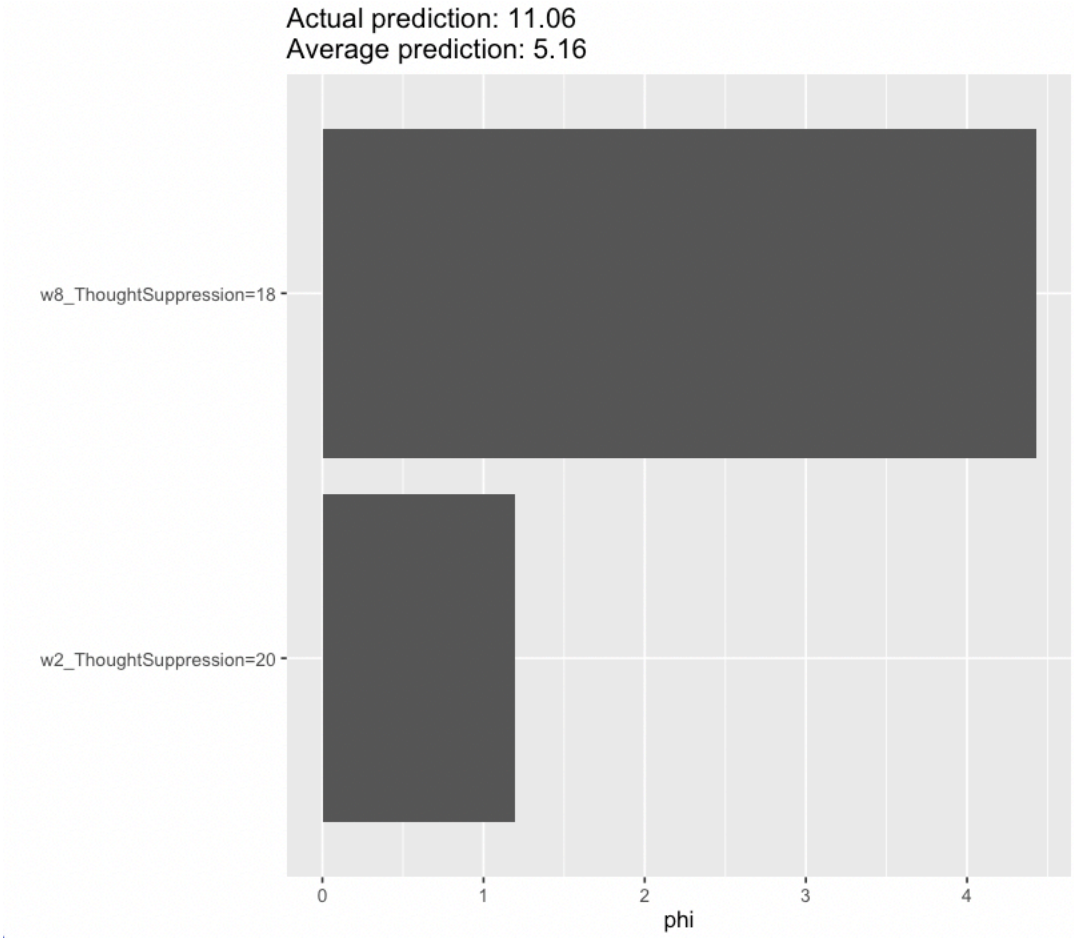


Figure S19

SHAP Analysis of the influence of both model predictors



Chapter 5.

Thesis Discussion & Critical Evaluation

Word Count (excl. references): 2890

Thesis Discussion and Critical Evaluation

This thesis explored the relationship between trauma-related cognitive processes and post-traumatic stress symptoms in youth, focusing on thought suppression and childhood maltreatment. Two key studies were conducted: (1) a systematic review and meta-analyses examining the associations between five sub-classes of childhood maltreatment (measured by the Childhood Trauma Questionnaire) and depression, anxiety, and PTSD, and (2) an empirical paper investigating how thought suppression predicts PTSD symptoms in trauma exposed youth at different time points. This discussion synthesises main findings, considers implications, acknowledges limitations, and outlines future research directions.

Summary of findings

The systematic review and meta-analysis synthesised data from 62 studies, highlighting that all five CTQ subtypes showed small to moderate positive correlations with depression, anxiety, and PTSD. Emotional abuse had the strongest and most consistent association with poor mental health, underscoring its profound impact on youth well-being. In contrast, physical neglect and sexual abuse were the weakest predictors, suggesting observed effects may be more complex or influenced by additional factors. These findings reinforce the need to assess each maltreatment subtype separately rather than simply as a total risk factor, as doing so may obscure the particularly harmful effects of maltreatment subtypes, specifically emotional abuse. Sensitivity analyses confirmed the robustness of these findings, with results remaining stable after removing low-quality studies or converted coefficient values. Moderation analyses revealed cultural differences: the link between sexual abuse and depression was weaker in Chinese studies than in other regions, while emotional neglect had stronger associations with anxiety in China.

This highlights the potential influence of cultural context and regional factors on the impact of different types of maltreatment on mental health outcomes.

The empirical study employed regression, moderation analyses, and machine learning techniques (Random Forest regression, PDPs, and ICE plots) to examine how thought suppression influences PTSD symptoms over time. Linear regression showed that thought suppression at two weeks post-trauma significantly predicted PTSD-RH severity, identifying it as a key risk factor for post-traumatic symptoms. Machine learning analyses provided a more nuanced perspective. Interestingly, *mild* to *moderate* forms of suppression at both time points highlighted a benign impact on PTSD-RH symptoms. Although week two thought suppression showed high individual variability—suggesting it may initially function as a coping mechanism for some—it became a stronger and more stable predictor of PTSD-RH symptoms at week eight. This indicates that thought suppression's role in PTSD is not straightforward and its impact likely depends on how it evolves over time. Notably, cognitive factors such as trauma-related appraisals and data-driven processing moderated the thought suppression-PTSD relationship. These findings suggest that suppression interacts with an individual's cognitive framework, reinforcing the need for interventions that target maladaptive appraisals and information-processing biases to improve PTSD outcomes.

Assessing novel contributions, advancing knowledge and implications for practice

This thesis makes several original contributions to the knowledge in the fields of trauma psychology and cognitive processes in youth populations.

Systematic review

To our knowledge, this is the first large-scale meta-analysis to examine the differential effects of childhood maltreatment subtypes on common mental health outcomes in community

youth samples. Previous meta-analyses have primarily examined cumulative maltreatment risk, individual subtypes in isolation, or different populations such as adults or clinical samples, limiting the ability to disentangle the unique contributions of specific maltreatment subtypes on a range of mental health outcomes (Gardner et al., 2019; Humphreys et al., 2020; Norman et al., 2012). By focusing exclusively on community youth samples, our study provides a clearer understanding of how specific forms of maltreatment independently relate to youth mental health in an underrepresented group. Childhood maltreatment is frequently underreported in the community due to fear of consequences, privacy concerns, and societal biases (Bensley et al., 2004; Vollmer-Sandholm et al., 2024). Witnessed abuse is often dismissed, with bystanders hesitant to report cases, assuming the 'benefit of the doubt for parents' (Wolf et al., 2018). Even healthcare professionals, a key safeguard for abused children, often hesitate in reporting maltreatment to authorities (Vollmer-Sandholm et al., 2024). This underreporting has major implications for research and interventions as it can lead to an underestimation of the true prevalence and impact of maltreatment in community samples. Without accurate reporting, affected youth may not receive necessary support, and research may not fully capture the extent of maltreatment-related mental health risks. This highlights the importance of refining assessment methods and increasing awareness among educators, healthcare providers, and the general public to improve identification and intervention efforts.

Understanding the distinct effects of different maltreatment subtypes allows for more precise clinical assessment and intervention. Traditional approaches that categorise maltreatment as a single construct risk oversimplifying its impact, overlooking the psychological consequences unique to each subtype (A. McGuire et al., 2024). This distinction is critical, as broad maltreatment assessments may fail to capture the specific effects of different abuse types,

potentially missing key opportunities for targeted intervention and support. For instance, emotional abuse has been found to be a stronger predictor of internalising disorders, such as anxiety and depressive disorders, and is associated with increased loneliness, submission and vulnerability (Rafi et al., 2017). In contrast, physical abuse and neglect have been linked to societal difficulties, including diminished enjoyment in daily life, reduced hope for the future, social withdrawal and low self-esteem (Ney et al., 1994). Moreover, emotional abuse is strongly associated with the highest incidence rates of re-victimisation and PTSD symptoms severity in youth (Finkelhor et al., 2007; Gama et al., 2021). Recognising these nuanced effects in clinical practice would enhance risk screening, ultimately improving outcomes and support strategies for the maltreated child, which is vital in preventing the damaging consequences that abuse has on youths' socio-cognitive development.

Moreover, our findings suggest that the impact of maltreatment subtypes may vary in severity and chronicity. Abuse-related subtypes, such as emotional, physical, and sexual abuse, often lead to immediate emotional distress due to their direct violation of personal safety and autonomy (Briere & Elliott, 2003; Cicchetti & Toth, 2005). In contrast, neglect-related subtypes, including emotional and physical neglect, may exert more insidious, long-term effects by impairing a child's ability to develop secure attachments, regulate emotions, and establish a stable sense of self-worth (Hildyard & Wolfe, 2002a). Perhaps it may be more important to explore the unique degree (both severity and frequency) of abuse, as research suggests it may be more beneficial to talk about rather than the type of maltreatment alone (Higgins, 2004). These distinctions have significant implications for intervention, as they emphasise the need for both crisis-focused responses for abuse survivors and long-term, resilience-building approaches for those who have experienced neglect.

Empirical Paper

This research makes significant contributions to the understanding of trauma-related cognitive processes, specifically the role of thought suppression and maintenance of PTSD symptoms in youth. Prior research has examined thought suppression in various psychological disorders (Magee et al., 2012; Purdon, 1999), but to our knowledge, no studies have specifically investigated suppression's predictive role in PTSD symptom development within community youth populations. We also present novel evidence for the necessary further use of predictive modelling through using machine learning techniques to better understand complex relationships observed in trauma-related research.

Existing literature has predominantly focused on the maladaptive aspects of thought suppression without exploring the specific mechanisms through which it contributes to the perpetuations of PTSD symptoms over time (Amstadter & Vernon, 2008; Ehlers & Clark, 2000). However, our findings suggest that only high rates of engagement in suppression strategies at a later time point (week eight) post-trauma are indicative of increased PTSD symptoms, supporting the notion that the trajectory between thought suppression and PTSD may be influenced by other cognitive factors (Michael et al., 2007; Pineles et al., 2011), and show a non-linear relationship. This distinction is crucial as it suggests that not all forms of cognitive avoidance are equally detrimental, and the impact of thought suppression may depend on the severity or intensity of the suppressing behaviour. By examining these variations, our work adds further contribution to the understanding of trauma-related cognitive processes in youth and highlights the importance of considering different levels of thought suppression when developing interventions.

The findings of this research have several important implications for clinical practice. First, the limited impact of *mild* to *moderate* thought suppression on PTSD symptoms suggests that interventions should not necessarily target these behaviours universally across all youth. Clinicians may need to focus on identifying and addressing extreme forms of cognitive avoidance or suppression, which appear to have a more pronounced effect on trauma recovery. This insight helps to refine existing cognitive-behavioural interventions, particularly in the context of trauma-focused therapies. The emphasis on emotional regulation and cognitive processing, which have been found to be key treatment strategies to assist in reducing the impact of PTSD symptoms (Bryant et al., 2003), could be adjusted based on the severity of thought suppression.

Second, the identification of high levels of thought suppression as a significant factor in worsening PTSD symptoms has important clinical applications. For youth exhibiting more intense suppression behaviours, interventions could incorporate strategies that reduce cognitive avoidance, such as mindfulness-based approaches or cognitive restructuring, which help individuals process and engage with trauma-related thoughts without over-relying on suppression (Hayes et al., 2012). In contrast, for those demonstrating mild or moderate suppression, therapists may focus less on directly challenging these behaviours and more on enhancing overall emotional regulation and resilience. These findings also highlight the need for a more differentiated approach to trauma interventions, where thought suppression is not treated as a uniform response but rather one that varies between individuals in its impact on mental health. Clinicians should be supported to assess thought suppression not only as a standalone factor, but in the context of broader cognitive biases and trauma-related symptoms. This comprehensive

understanding will enable practitioners to better support trauma survivors in managing their mental health in ways that align with their cognitive and emotional processing capacities.

Finally, the study highlights how cognitive factors shape the suppression-PTSD relationship. Thought suppression does not operate in isolation; it is influenced by trauma-related appraisals and information-processing styles (Ehlers et al., 2012). This underscores the importance of addressing these cognitive processes in therapy, reinforcing the need for interventions that move beyond suppression itself to tackle underlying maladaptive beliefs.

Future directions

While this thesis contributes to the growing body of research in trauma-related outcomes in youth populations, several limitations must be acknowledged. These limitations provide a platform for future research incentives, particularly in improving detection of maltreatment and thought suppression, and enhancing future therapeutic intervention strategies.

Methodological Constraints and Self-Report Biases

A key limitation in both the systematic review and the empirical study is the reliance on self-reported measures, which, while valuable for capturing personal experiences, introduce potential biases such as underreporting, avoidance tendencies or recall errors. Youth often display reluctance in reporting abuse to professionals, preferring to cope independently, or rely on peers, due to fearing the potential loss of control over decisions (Ungar et al., 2009). This is particularly relevant in cases where maltreatment is ongoing, and the young person perceives disclosure as a risk to their safety (Jobe & Gorin, 2013). Emerging evidence suggests that young people are more likely to disclose experiences of abuse through social media platforms, particularly in emotionally distressed states or when exposed to related content (Williams et al., 2024) . While digital platforms may facilitate disclosure, concerns regarding privacy, anonymity

and the potential for abuser surveillance remain significant barriers. Future research should explore interventions that provide youth with safe, confidential, and supportive spaces for disclosure, whether online or offline, and assess their effectiveness in improving help-seeking behaviours. The empirical paper highlights ongoing concerns around reporting accuracy, particularly in clinical settings, where recall bias can significantly influence the reliability of self-reported data. Recall bias has been significantly associated with increased PTSD symptoms, psychopathology and cognitive distortions (memory deletion, memory creation) as a result of trauma (Krayem et al., 2021). This challenge in accurate reporting underscores the need for alternative methods that may mitigate such biases. Using alternative reporting measures, such as non-verbal report cards, has shown similar or greater effects than verbal reporting suggesting it to be a beneficial method to address underreporting or stigmatisation in trauma experiences (Harling et al., 2021). Future research should explore the long-term effectiveness and feasibility of non-verbal reporting methods in reducing recall bias, enhancing trauma disclosure accuracy, and improving therapeutic practices across diverse clinical settings and populations.

In addition to the concerns around self-report bias, another area for future research pertains to the timing of data-collection of the empirical paper. While the study tracked changes in thought suppression over time, the measurement points (week two and week eight post-trauma) are still relatively close, and longitudinal studies with more time points could provide deeper insights into the long-term trajectories of thought suppression and PTSD symptoms. A broader range of follow-up assessments would allow for more robust conclusions about the chronicity and fluctuating nature of trauma-related cognitive processes. Perhaps adopting a staging perspective in trauma screening across axes measurements such as neurobiological markers, information processing, stress reactivity and consciousness may add to the development

of personalised and targeted treatment approaches (Nijdam et al., 2023). Furthermore, it would enable the identification of early versus late-phase predictors of PTSD, which could inform intervention timing and strategies. This approach would help to determine the persistence of thought suppression's effects on PTSD symptoms, as well as its potential bidirectional relationship with other cognitive and emotional factors that evolve over longer periods following trauma exposure.

Individual Difference

Individual differences play a crucial role in how individuals experience and process trauma, as well as in how they respond to interventions. However, the empirical paper did not account for individual differences in its analysis. Factors such as personality traits, cognitive styles, coping mechanisms, and genetic predispositions can significantly influence the severity and persistence of trauma-related symptoms (Crestani Calegaro et al., 2019; Princip et al., 2022; Ryan et al., 2016). For instance, individuals who are more prone to rumination or experiential avoidance behaviour show strong associations with subsequent PTSD symptoms (Miethe et al., 2023). In contrast, attachment style, resilience, and social support networks can serve as protective factors, buffering against the negative effects of trauma (Nguyen et al., 2024; Sippel et al., 2015). Moreover, research suggests that different forms of abuse may have gender specific consequences, influencing the expression of internalising and externalising psychopathology (Keyes et al., 2012). Recognising these individual differences is essential for developing personalised interventions that address each individual's cognitive, emotional, and social profile. Future research should continue to explore these individual factors to improve the precision and efficacy of trauma-informed treatments.

Cultural difference

As noted in the systematic review, cultural differences were evident in some associations between childhood maltreatment and mental health outcomes, suggesting that cultural context may play a greater role in shaping how maltreatment is experienced and processed than previously recognised. Future research should further explore these differences through cross-cultural studies that examine how cultural values, social norms, and family structures influence trauma responses. For instance, Japanese participants allegedly report lower overall rates of childhood maltreatment but demonstrate higher acceptability of certain maltreatment subtypes, including neglect, physical abuse, and sexual abuse, when compared with other countries (Wadji et al., 2023). Investigating specific cultural groups across diverse geographical contexts could help identify culturally specific risk and protective factors for PTSD and other trauma-related outcomes, ultimately informing more tailored and culturally sensitive interventions. It would be valuable to incorporate qualitative research methods in future studies to capture the lived experiences of youth who have undergone maltreatment. Interviews, focus groups, and narrative analysis could provide deeper insights into how cultural attitudes towards trauma, help-seeking, and coping mechanisms influence the relationship between maltreatment and mental health. Such an approach would ensure that interventions are culturally sensitive and relevant, offering more effective support for trauma survivors.

Intervention Development and Testing

Building on the empirical paper's findings, future research should aim to develop and test interventions tailored to the different forms of thought suppression and their relationship to PTSD symptoms. Specifically, interventions could be designed to target early-stage suppression and identify those at risk for the progression to more maladaptive suppression strategies. Such interventions could incorporate elements of cognitive-behavioural therapy (CBT), mindfulness,

or acceptance and commitment therapy (ACT), which have been shown to help individuals reduce maladaptive avoidance strategies and increase emotional regulation (Raja, 2012; Spidel et al., 2018).

Building on this, ACT, offers a particularly relevant framework for addressing the patterns of avoidance identified in this thesis. The current findings suggest that thought suppression, while potentially adaptive in the short term, can become embedded as a safety behaviour over time, mirroring ACT's conceptualisation of experiential avoidance. Rather than reducing distress, persistent suppression may limit psychological flexibility and sustain trauma-related symptoms. ACT posits that psychological suffering is maintained not by the presence of difficult thoughts or feelings, but by rigid attempts to avoid them (Hayes et al., 1999). For youth who engage in high levels of thought suppression, ACT-informed interventions can help foster acceptance, cognitive defusion, and values-based action. Encouraging young people to relate differently to their trauma-related cognitions i.e., meeting difficult thoughts non-judgmentally rather than engaging in resistance or avoidance, may help to interrupt the suppression-distress cycle. Incorporating these strategies into trauma-focused care could enhance emotional processing and long-term recovery outcomes for trauma exposed youth.

Considering the non-linear relationship between thought suppression and PTSD, personalised interventions that consider individual differences in cognitive style and trauma-related appraisals could be more effective. Future research could examine the feasibility and efficacy of such tailored interventions, testing their impact on different subgroups of youth based on the severity of their trauma exposure and their specific cognitive processing patterns.

Conclusion

This thesis contributes to the growing body of research on trauma-related cognitive processes and mental health outcomes in youth populations. By examining the differential effects of childhood maltreatment subtypes and the predictive role of thought suppression in PTSD symptom development, the findings highlight the complexity of trauma responses and underscore the importance of tailored, individualised interventions. However, the study also identifies several methodological challenges, including self-report biases and the need for more comprehensive, longitudinal data. Future research should build on these findings by exploring the cultural and contextual factors influencing trauma outcomes, developing, and testing targeted interventions, and expanding the scope of cognitive processes examined. With these advancements, we can better understand how trauma impacts youth and how to offer the best support in their recovery journeys.

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Appendices

Ethical approval documentation, participant consent forms, and information sheets are included in Appendices E–I for reference.

Appendix A

Author Guidelines for Submission to the Journal of Affective Disorders

Aims and scope

Official Journal of the International Society for Affective Disorders *The Journal of Affective Disorders* publishes papers concerned with affective disorders in the widest sense: depression, mania, mood spectrum, emotions and personality, anxiety and stress. It is interdisciplinary and aims to bring together different approaches for a diverse readership. Top quality papers will be accepted dealing with any aspect of affective disorders, including neuroimaging, cognitive neurosciences, genetics, molecular biology, experimental and clinical neurosciences, pharmacology, neuroimmunoendocrinology, intervention and treatment trials.

Journal of Affective Disorders is the companion title to the open access Journal of Affective Disorders Reports.

Article types

The Journal primarily publishes:

Full-Length Research Papers

(up to 5000 words, excluding references and up to 6 tables/figures)

Review Articles and Meta-analyses

(up to 8000 words, excluding references and up to 10 tables/figures)

Short Communications

(up to 2000 words, 20 references, 2 tables/figures)

Correspondence

(up to 1000 words, 10 references, 1 table/figure).

At the discretion of the accepting Editor-in-Chief, and/or based on reviewer feedback, authors may be allowed fewer or more than these guidelines.

Peer review

This journal follows a single anonymized review process. Your submission will initially be assessed by our editors to determine suitability for publication in this journal. If your submission is deemed suitable, it will typically be sent to a minimum of two reviewers for an independent expert assessment of the scientific quality. The decision as to whether your article is accepted or rejected will be taken by our editors.

Read more about peer review.

Our editors are not involved in making decisions about papers which:

- they have written themselves.
- have been written by family members or colleagues.
- relate to products or services in which they have an interest.

Any such submissions will be subject to the journal's usual procedures and peer review will be handled independently of the editor involved and their research group. Read more about editor duties.

Authors may submit a formal appeal request to the editorial decision, provided the it meets the requirements and follows the procedure outlined in Elsevier's Appeal Policy. Only one appeal per submission will be considered and the appeal decision will be final.

Special issues and article collections

The peer review process for special issues and article collections follows the same process as outlined above for regular submissions, except, a guest editor will send the submissions out to the reviewers and may recommend a decision to the journal editor. The journal editor oversees the peer review process of all special issues and article collections to ensure the high standards of publishing ethics and responsiveness are respected and is responsible for the final decision regarding acceptance or rejection of articles.

Open access

We refer you to our open access information page to learn about open access options for this journal.

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Authors must follow ethical guidelines stated in Elsevier's Publishing Ethics Policy.

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- the article's publication is approved by all authors and tacitly or explicitly by the responsible authorities where the work was carried out.
- if accepted, the article will not be published elsewhere in the same form, in English or in any other language, including electronically, without the written consent of the copyright-holder.

To verify compliance with our journal publishing policies, we may check your manuscript with our screening tools.

Authorship

All authors should have made substantial contributions to all of the following:

1. The conception and design of the study, or acquisition of data, or analysis and interpretation of data.
2. Drafting the article or revising it critically for important intellectual content.
3. Final approval of the version to be submitted.

Authors should appoint a corresponding author to communicate with the journal during the editorial process. All authors should agree to be accountable for all aspects of the work to ensure that the questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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The editors of this journal generally will not consider changes to authorship once a manuscript has been submitted. It is important that authors carefully consider the authorship list and order of authors and provide a definitive author list at original submission.

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- Honoraria
- Paid expert testimony
- Patent applications or registrations
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The Declaration of Interests tool should always be completed.

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List funding sources in this standard way to facilitate compliance to funder's requirements:

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If no funding has been provided for the research, it is recommended to include the following sentence:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of generative AI in scientific writing

Authors must declare the use of generative AI in scientific writing upon submission of the paper. The following guidance refers only to the writing process, and not to the use of AI tools to analyse and draw insights from data as part of the research process:

- Generative AI and AI-assisted technologies should only be used in the writing process to improve the readability and language of the manuscript.
- The technology must be applied with human oversight and control and authors should carefully review and edit the result, as AI can generate authoritative-sounding output that can be incorrect, incomplete or biased. Authors are ultimately responsible and accountable for the contents of the work.
- Authors must not list or cite AI and AI-assisted technologies as an author or co-author on the manuscript since authorship implies responsibilities and tasks that can only be attributed to and performed by humans.

The use of generative AI and AI-assisted technologies in scientific writing must be declared by adding a statement at the end of the manuscript when the paper is first submitted. The statement will appear in the published work and should be placed in a new section before the references list. An example:

- Title of new section: Declaration of generative AI and AI-assisted technologies in the writing process.
- Statement: During the preparation of this work the author(s) used [NAME TOOL / SERVICE] in order to [REASON]. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

The declaration does not apply to the use of basic tools, such as tools used to check grammar, spelling and references. If you have nothing to disclose, you do not need to add a statement.

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Inclusive language acknowledges diversity, conveys respect to all people, is sensitive to differences, and promotes equal opportunities. Authors should ensure their work uses inclusive language throughout and contains nothing which might imply one individual is superior to another on the grounds of:

- age
- gender
- race
- ethnicity
- culture
- sexual orientation
- disability or health condition

We recommend avoiding the use of descriptors about personal attributes unless they are relevant and valid. Write for gender neutrality with the use of plural nouns

("clinicians, patients/clients") as default. Wherever possible, avoid using "he, she," or "he/she."

No assumptions should be made about the beliefs of readers and writing should be free from bias, stereotypes, slang, reference to dominant culture and/or cultural assumptions.

These guidelines are meant as a point of reference to help you identify appropriate language but are by no means exhaustive or definitive.

Reporting sex- and gender-based analyses

There is no single, universally agreed-upon set of guidelines for defining sex and gender. We offer the following guidance:

- Sex and gender-based analyses (SGBA) should be integrated into research design when research involves or pertains to humans, animals or eukaryotic cells. This should be done in accordance with any requirements set by funders or sponsors and best practices within a field.
- Sex and/or gender dimensions of the research should be addressed within the article or declared as a limitation to the generalizability of the research.
- Definitions of sex and/or gender applied should be explicitly stated to enhance the precision, rigor and reproducibility of the research and to avoid ambiguity or conflation of terms and the constructs to which they refer.

We advise you to read the Sex and Gender Equity in Research (SAGER) guidelines and the SAGER checklist (PDF) on the EASE website, which offer systematic approaches to the use of sex and gender information in study design, data analysis, outcome reporting and research interpretation.

For further information we suggest reading the rationale behind and recommended use of the SAGER guidelines.

Definitions of sex and/or gender

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- Sex generally refers to a set of biological attributes that are associated with physical and physiological features such as chromosomal genotype, hormonal levels, internal and external anatomy. A binary sex categorization (male/female) is usually designated at birth ("sex assigned at birth") and is in most cases based solely on the visible external anatomy of a newborn. In reality, sex categorizations include people who are intersex/have differences of sex development (DSD).

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- Institutional affiliations: Authors should use either the full, standard title of their institution or the standard abbreviation of the institutional name so that the institutional name can be independently verified for research integrity purposes.

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You are required to provide a concise and factual abstract which does not exceed 250 words. The abstract should briefly state the purpose of your research, principal results and major conclusions. Some guidelines:

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You are required to provide article highlights at submission.

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- Our preferred file types for graphical abstracts are TIFF, EPS, PDF or MS Office files.

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Math formulae

- Submit math equations as editable text, not as images.
- Present simple formulae in line with normal text, where possible.
- Use the solidus (/) instead of a horizontal line for small fractional terms such as X/Y.
- Present variables in italics.
- Denote powers of e by exp.
- Display equations separately from your text, numbering them consecutively in the order they are referred to within your text.

Tables

Tables must be submitted as editable text, not as images. Some guidelines:

- Place tables next to the relevant text or on a separate page(s) at the end of your article.
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- Please provide captions along with the tables.
- Place any table notes below the table body.
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Figures, images, artwork, diagrams and other graphical media must be supplied as separate files along with the manuscript. We recommend that you read our detailed artwork and media instructions. Some excerpts:

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    - Methods article template (*MethodsX*)
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Cancer Research UK, 2023. Cancer statistics reports for the UK. http://www.cancerresearchuk.org/aboutcancer/statistics/cancerstatsreport/ (accessed 13 March 2023).

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Oguro, M., Imahiro, S., Saito, S., Nakashizuka, T., 2015. Mortality data for Japanese oak wilt disease and surrounding forest compositions [dataset]. Mendeley Data, v1. https://doi.org/10.17632/xwj98nb39r.1.

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Coon, E., Berndt, M., Jan, A., Svyatsky, D., Atchley, A., Kikinzon, E., Harp, D., Manzini, G., Shelef, E., Lipnikov, K., Garimella, R., Xu, C., Moulton, D., Karra, S., Painter, S., Jafarov, E., & Molins, S., 2020. Advanced Terrestrial Simulator (ATS) v0.88 (Version 0.88) [software]. Zenodo. https://doi.org/10.5281/zenodo.3727209.

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Appendix B

Quality Assessment Framework and Risk of Bias Tool used for Included Studies.

1.	Was the study population clearly specified, defined and well described?	Yes (1) = Clear description of ≥ 4 of the following: - age - gender split - ethnicity - country/location of recruitment - inclusion/exclusion criteria - population size - context/setting (school-based vs community based) No (0) = Clear description of < 4 of the list provided: - age - gender split - ethnicity - country/location of recruitment - inclusion/exclusion criteria - population size - context/setting (school-based vs community based)
2.	Was the participation rate of eligible persons at least 50%?	Yes (1) = Threshold is above 50% participation rate. No (0) = Threshold falls below a 50% participation rate; OR not reported in method.
3.	Was sampling carried out appropriate to the study design, such that the likelihood of sampling bias was minimised as far as possible?	Yes (1) = Probability sampling was used, e.g. random, whole community method, cluster & systematic sampling. No (0) = Non-probability sampling was used, e.g. convenience, self-referral, purposive, snowball sampling
4.	Was non-response bias minimised minimal or accounted for as far as possible?	Yes (1) = More than 50% of eligible and approached participants took part and, if reported, there were no significant differences between those who took part and those who did not. No (0) = Less than 50% of those approached took part, and differences between those who took part and those who did not were not reported or highlighted significant differences; OR response rate was not reported.

5.	Was the Childhood Trauma Questionnaire (CTQ) sensitivity measure used reliable?	Yes (1) = Each subscale measure used with internal consistency (Cronbach's alpha or Omega) ≥ 0.7 as reported in the paper. No (0) = Measure with internal consistency (Cronbach's alpha) < 0.7 as reported in the paper; AND measure that is not validated in other peer reviewed papers as having adequate internal consistency
6.	Were the common mental health outcomes (PTSD, Anxiety & Depression) sensitivity measure used reliable?	Yes (1) = Each subscale measure used with internal consistency (Cronbach's alpha or Omega) ≥ 0.7 as reported in the paper; OR measure that is validated in other peer reviewed papers as having adequate internal consistency. No (0) = Each subscale measure with internal consistency (Cronbach's alpha) < 0.7 as reported in the paper; AND measure that is not validated in other peer reviewed papers as having adequate internal consistency.

Appendix C

Systematic Review R Syntax

Primary Meta-Analyses with both moderation analyses included

```
  #----select working directory----
setwd("/Users/dominic/Documents/UEA PHD/Thesis Portfolio/SR/R Data")

  #----load up data-----
mydata = read.csv("SR_Included_Studies.csv")

  #----load libraries----
library("metafor")
library(dplyr)

  #----Print data to ensure correct columns----
print(mydata)

  #----Programming rules for each meta-analysis----
  #----Define the meta-analysis (with moderator)
run_meta_analysis <- function(data, variable, sample_size, label, moderator1 =
"Country_Code_C", moderator2 = "Country_Code", save_path = "plots") {
  #----(customised "function" command for running multiple analyses using same rules)----

if (!dir.exists(save_path)) { dir.create(save_path) } # Creates "plots" folder in my doc's

  # ----Subset only the relevant rows, filter out missing values----
subset_data <- data[!is.na(data[[variable]]), ]

  # ----Calculate the effect sizes----
subset_data <- escalc(measure = "ZCOR", ri = subset_data[[variable]], ni =
subset_data[[sample_size]], data = subset_data)

# ---- Calculate and print the total number of participants for each subgroup ----
total_n_china <- sum(subset_data[[sample_size]][subset_data$Country_Code_C == 1], na.rm =
TRUE) # China
total_n_row <- sum(subset_data[[sample_size]][subset_data$Country_Code_C == 0], na.rm =
TRUE) # Rest of World
total_n_na <- sum(subset_data[[sample_size]][subset_data$Country_Code == 1], na.rm =
TRUE) # North America
total_n_row2 <- sum(subset_data[[sample_size]][subset_data$Country_Code == 0], na.rm =
TRUE) # Rest of World (Mod2)


  #----Run the random-effects meta-analysis----
res <- rma(yi, vi, data = subset_data)
```

```
  #---- Run Moderation Analysis (Mod1)----
res.mod1 <- rma(yi, vi, mods = as.formula(paste("~", moderator1)), data = subset_data)

  #---- Run Moderation Analysis (Mod2)----
res.mod2 <- rma(yi, vi, mods = as.formula(paste("~", moderator2)), data = subset_data)

  #----Print the results----
print(res)
print(confint(res)) #----CI for the model----
print(predict(res, transf = transf.ztor)) #----Transforms back to r from fisher's z----

  #----Print Total Sample Size for each analysis----
cat("Total N for", label, ":", sum(subset_data[[sample_size]]), "\n") #----cat function: combines
text and number ( e.g. Total N for EN vs Dep : 1200)----

  #---- Print Moderation 1 Analysis Results ----
cat(label, "Moderation Analysis Results China vs Rest Of World:\n")
print(res.mod1)

  #---- Run Subgroup Analysis for Mod1 (China vs ROW)----
res.mod1.yes <- rma(yi, vi, data = subset_data, subset = (subset_data[[moderator1]] == 1))
cat(label, "Moderation (China) Results:\n")
print(res.mod1.yes)
print(predict(res.mod1.yes, transf = transf.ztor))
cat("Total N for China:", total_n_china, "\n")

res.mod1.no <- rma(yi, vi, data = subset_data, subset = (subset_data[[moderator1]] == 0))
cat(label, "Moderation (Rest Of World) Results:\n")
print(res.mod1.no)
print(predict(res.mod1.no, transf = transf.ztor))
cat("Total N for Rest of World:", total_n_row, "\n")

#---- Print Moderation 2 Analysis Results ----
cat(label, "Moderation Analysis Results North America vs Rest of World:\n")
print(res.mod2)

  #---- Run Subgroup Analysis for Mod2 (North America vs ROW) ----
res.mod2.yes <- rma(yi, vi, data = subset_data, subset = (subset_data[[moderator2]] == 1))
cat(label, "Moderation (North America) Results:\n")
print(res.mod2.yes)
print(predict(res.mod2.yes, transf = transf.ztor))
cat("Total N for North America:", total_n_na, "\n")

res.mod2.no <- rma(yi, vi, data = subset_data, subset = (subset_data[[moderator2]] == 0))
cat(label, "Moderation (Rest Of World) Results:\n")
```

```
print(res.mod2.no)
print(predict(res.mod2.no, transf = transf.ztor))
cat("Total N for Rest of World (Mod2):", total_n_row2, "\n")

  #----Save the forest plots as a PNG----
png(filename = paste0(save_path, "/", label, "_forest_plot.png"), width = 800, height = 700)

  #----Create and save the forest plot----
forest(res, transf = transf.ztor, slab = paste(subset_data$study), digits = 2, header = TRUE,
refline = 0, addpred = TRUE, showweights = TRUE)
  #showweights = weight of study on output

  #----Close the graphics device to save the plot----
dev.off()

  #----Perform leave-one-out analysis----
print(leave1out(res))

  #----Perform Egger's test----
egger_test <- regtest(res)

  #----Print Egger's test ----
cat(label, "Egger's test:\n")
print(egger_test)

  #----Funnel plot (visual publication bias)----
png(filename = paste0(save_path, "/", label, "_funnel_plot.png"), width = 800, height = 700)
funnel(res)
dev.off()

  #----Trim-and-fill analysis (corrected effect size accounting for pub bias)----
taf <- trimfill(res)

  #----Print Trim-and-fill results----
cat(label, "Trim-and-fill analysis:\n")
print(taf)

  #----Funnel plot with missing studies filled in----
png(filename = paste0(save_path, "/", label, "_funnel_plot_filled.png"), width = 800, height =
700)
funnel(taf, legend = TRUE)
dev.off()

  #---- Return the Results ----
```

```
return(list(res = res, res.mod1 = res.mod1, res.mod2 = res.mod2, res.mod1.yes = res.mod1.yes,
res.mod1.no = res.mod1.no, res.mod2.yes = res.mod2.yes, res.mod2.no = res.mod2.no)) # returns
the meta-analysis and moderation analysis results
}

  #----Summary of data (Helpful for missing data, mean, SD for each variable)----
summary(mydata)

  #----Run each meta-analysis from Depression (Dep)----
res.EN_x_Dep <- run_meta_analysis(mydata, "EN_x_Dep", "N", "EN vs Dep")
res.PN_x_Dep <- run_meta_analysis(mydata, "PN_x_Dep", "N", "PN vs Dep")
res.SA_x_Dep <- run_meta_analysis(mydata, "SA_x_Dep", "N", "SA vs Dep")
res.EA_x_Dep <- run_meta_analysis(mydata, "EA_x_Dep", "N", "EA vs Dep")
res.PA_x_Dep <- run_meta_analysis(mydata, "PA_x_Dep", "N", "PA vs Dep")

  # ----Run each meta-analysis for Anxiety (Anx) ----
res.EN_x_Anx <- run_meta_analysis(mydata, "EN_x_Anx", "N", "EN vs Anx")
res.PN_x_Anx <- run_meta_analysis(mydata, "PN_x_Anx", "N", "PN vs Anx")
res.SA_x_Anx <- run_meta_analysis(mydata, "SA_x_Anx", "N", "SA vs Anx")
res.EA_x_Anx <- run_meta_analysis(mydata, "EA_x_Anx", "N", "EA vs Anx")
res.PA_x_Anx <- run_meta_analysis(mydata, "PA_x_Anx", "N", "PA vs Anx")

  # ----Run each meta-analysis for PTSD (PTSD) ----
res.EN_x_PTSD <- run_meta_analysis(mydata, "EN_x_PTSD", "N", "EN vs PTSD")
res.PN_x_PTSD <- run_meta_analysis(mydata, "PN_x_PTSD", "N", "PN vs PTSD")
res.SA_x_PTSD <- run_meta_analysis(mydata, "SA_x_PTSD", "N", "SA vs PTSD")
res.EA_x_PTSD <- run_meta_analysis(mydata, "EA_x_PTSD", "N", "EA vs PTSD")
res.PA_x_PTSD <- run_meta_analysis(mydata, "PA_x_PTSD", "N", "PA vs PTSD")
```

Code for Sensitivity Analysis – Minus converted r scores.

```
  #----select working directory----
setwd("/Users/dominic/Documents/UEA PHD/Thesis Portfolio/SR/R Data")

  #----load up data----
mydata = read.csv("SR_Included_Studies_Minus_Convert.csv")

  #----load libraries----
library("metafor")
library(dplyr)

print(mydata)
```

```
  #----Programming rules for each meta-analysis----

  #----Define the meta-analysis
run_meta_analysis <- function(data, variable, sample_size, label, save_path = "plots_convert") {
if (!dir.exists(save_path)) { dir.create(save_path) } # Creates "plots_convert" folder in my doc's
  #----(customised "function" command for running multiple analyses using same rules)----

  # ----Subset only the relevant rows, filter out missing values----
subset_data <- data[!is.na(data[[variable]]), ]

  # ----Calculate the effect sizes----
subset_data <- escalc(measure = "ZCOR", ri = subset_data[[variable]], ni =
subset_data[[sample_size]], data = subset_data)

  #----Run the random-effects meta-analysis----
res <- rma(yi, vi, data = subset_data)

  #----Print the results----
print(res)
print(confint(res)) #----CI for the model----
print(predict(res, transf = transf.ztor)) #----Tranforms back to r from fisher's z----
cat("Total N for", label, ":", sum(subset_data[[sample_size]]), "\n")
  #----cat function: combines text and number ( e.g. Total N for EN vs Dep : 1200)----

  #----Save the forest plots as a PNG----
png(filename = paste0(save_path, "/", label, "_forest_plot.png"), width = 800, height = 700)

  #----Create and save the forest plot----
forest(res, transf = transf.ztor, slab = paste(subset_data$study), digits = 2, header = TRUE,
refline = 0, addpred = TRUE, showweights = TRUE)
  #showweights = weight of study on output

  #----Close the graphics device to save the plot----
dev.off()

  #----Perform leave-one-out analysis----
print(leave1out(res))

  #----Perform Egger's test----
egger_test <- regtest(res)

  #----Print Egger's test results directly to the R console/output (publication bias)----
cat(label, "Egger's test:\n")
print(egger_test)

  #----Funnel plot (visual publication bias)----
```

```
png(filename = paste0(save_path, "/", label, "_funnel_plot.png"), width = 800, height = 700)
funnel(res)
dev.off()

  #----Trim-and-fill analysis (corrected effect size accounting for pub bias)----
taf <- trimfill(res)

  #----Print Trim-and-fill results----
cat(label, "Trim-and-fill analysis:\n")
print(taf)

  #----Funnel plot with missing studies filled in----
png(filename = paste0(save_path, "/", label, "_funnel_plot_filled.png"), width = 800, height =
700)
funnel(taf, legend = TRUE)
dev.off()

  #----Return the result----
return(res)
}

  #----Summary of data (Helpful for missing data, mean, SD for each variable)----
summary(mydata)

  #----Run each meta-analysis from Depression (Dep)----
res.EN_x_Dep <- run_meta_analysis(mydata, "EN_x_Dep", "N", "EN vs Dep")
res.PN_x_Dep <- run_meta_analysis(mydata, "PN_x_Dep", "N", "PN vs Dep")
res.SA_x_Dep <- run_meta_analysis(mydata, "SA_x_Dep", "N", "SA vs Dep")
res.EA_x_Dep <- run_meta_analysis(mydata, "EA_x_Dep", "N", "EA vs Dep")
res.PA_x_Dep <- run_meta_analysis(mydata, "PA_x_Dep", "N", "PA vs Dep")

  # ----Run each meta-analysis for Anxiety (Anx) ----
res.EN_x_Anx <- run_meta_analysis(mydata, "EN_x_Anx", "N", "EN vs Anx")
res.PN_x_Anx <- run_meta_analysis(mydata, "PN_x_Anx", "N", "PN vs Anx")
res.SA_x_Anx <- run_meta_analysis(mydata, "SA_x_Anx", "N", "SA vs Anx")
res.EA_x_Anx <- run_meta_analysis(mydata, "EA_x_Anx", "N", "EA vs Anx")
res.PA_x_Anx <- run_meta_analysis(mydata, "PA_x_Anx", "N", "PA vs Anx")

  # ----Run each meta-analysis for PTSD (PTSD) ----
res.EN_x_PTSD <- run_meta_analysis(mydata, "EN_x_PTSD", "N", "EN vs PTSD")
res.PN_x_PTSD <- run_meta_analysis(mydata, "PN_x_PTSD", "N", "PN vs PTSD")
res.SA_x_PTSD <- run_meta_analysis(mydata, "SA_x_PTSD", "N", "SA vs PTSD")
res.EA_x_PTSD <- run_meta_analysis(mydata, "EA_x_PTSD", "N", "EA vs PTSD")
res.PA_x_PTSD <- run_meta_analysis(mydata, "PA_x_PTSD", "N", "PA vs PTSD")
```

Code for Sensitivity Analysis – Minus low-quality studies

```
  #----select working directory----
setwd("/Users/dominic/Documents/UEA PHD/Thesis Portfolio/SR/R Data")

  #----load up data----
mydata = read.csv("SR_Included_Studies_Minus_Poor_Qual.csv")

  #----load libraries----
library("metafor")
library(dplyr)

print(mydata)

  #----Programming rules for each meta-analysis----

  #----Define the meta-analysis
run_meta_analysis <- function(data, variable, sample_size, label, save_path =
"plots_poor_qual") {
if (!dir.exists(save_path)) { dir.create(save_path) } # Creates "plots_poor_qual" folder in my
doc's
  #----(customised "function" command for running multiple analyses using same rules)----

  # ----Subset only the relevant rows, filter out missing values----
subset_data <- data[!is.na(data[[variable]]), ]

  # ----Calculate the effect sizes----
subset_data <- escalc(measure = "ZCOR", ri = subset_data[[variable]], ni =
subset_data[[sample_size]], data = subset_data)

  #----Run the random-effects meta-analysis----
res <- rma(yi, vi, data = subset_data)

  #----Print the results----
print(res)
print(confint(res)) #----CI for the model----
print(predict(res, transf = transf.ztor)) #----Tranforms back to r from fisher's z----
cat("Total N for", label, ":", sum(subset_data[[sample_size]]), "\n")
  #----cat function: combines text and number ( e.g. Total N for EN vs Dep : 1200)----

  #----Save the forest plots as a PNG----
png(filename = paste0(save_path, "/", label, "_forest_plot.png"), width = 800, height = 700)

  #----Create and save the forest plot----
```

```
forest(res, transf = transf.ztor, slab = paste(subset_data$study), digits = 2, header = TRUE,
refline = 0, addpred = TRUE, showweights = TRUE)
  #showweights = weight of study on output

  #----Close the graphics device to save the plot----
dev.off()

  #----Perform leave-one-out analysis----
print(leave1out(res))

  #----Perform Egger's test----
egger_test <- regtest(res)

  #----Print Egger's test results directly to the R console/output (publication bias)----
cat(label, "Egger's test:\n")
print(egger_test)

  #----Funnel plot (visual publication bias)----
png(filename = paste0(save_path, "/", label, "_funnel_plot.png"), width = 800, height = 700)
funnel(res)
dev.off()

  #----Trim-and-fill analysis (corrected effect size accounting for pub bias)----
taf <- trimfill(res)

  # Print Trim-and-fill results
cat(label, "Trim-and-fill analysis:\n")
print(taf)

  #----Funnel plot with missing studies filled in----
png(filename = paste0(save_path, "/", label, "_funnel_plot_filled.png"), width = 800, height =
700)
funnel(taf, legend = TRUE)
dev.off()

  #----Return the result----
return(res)
}

  #----Summary of data (Helpful for missing data, mean, SD for each variable)----
summary(mydata)

  #----Run each meta-analysis from Depression (Dep)----
res.EN_x_Dep <- run_meta_analysis(mydata, "EN_x_Dep", "N", "EN vs Dep")
res.PN_x_Dep <- run_meta_analysis(mydata, "PN_x_Dep", "N", "PN vs Dep")
res.SA_x_Dep <- run_meta_analysis(mydata, "SA_x_Dep", "N", "SA vs Dep")
```

```
res.EA_x_Dep <- run_meta_analysis(mydata, “EA_x_Dep”, “N”, “EA vs Dep”)
res.PA_x_Dep <- run_meta_analysis(mydata, “PA_x_Dep”, “N”, “PA vs Dep”)

  # ----Run each meta-analysis for Anxiety (Anx) ----
res.EN_x_Anx <- run_meta_analysis(mydata, “EN_x_Anx”, “N”, “EN vs Anx”)
res.PN_x_Anx <- run_meta_analysis(mydata, “PN_x_Anx”, “N”, “PN vs Anx”)
res.SA_x_Anx <- run_meta_analysis(mydata, “SA_x_Anx”, “N”, “SA vs Anx”)
res.EA_x_Anx <- run_meta_analysis(mydata, “EA_x_Anx”, “N”, “EA vs Anx”)
res.PA_x_Anx <- run_meta_analysis(mydata, “PA_x_Anx”, “N”, “PA vs Anx”)

  # ----Run each meta-analysis for PTSD (PTSD) ----
res.EN_x_PTSD <- run_meta_analysis(mydata, “EN_x_PTSD”, “N”, “EN vs PTSD”)
res.PN_x_PTSD <- run_meta_analysis(mydata, “PN_x_PTSD”, “N”, “PN vs PTSD”)
res.SA_x_PTSD <- run_meta_analysis(mydata, “SA_x_PTSD”, “N”, “SA vs PTSD”)
res.EA_x_PTSD <- run_meta_analysis(mydata, “EA_x_PTSD”, “N”, “EA vs PTSD”)
res.PA_x_PTSD <- run_meta_analysis(mydata, “PA_x_PTSD”, “N”, “PA vs PTSD”)
```

Appendix D

Author Guidelines for Submission to the Journal of Clinical Child & Adolescent Psychology

Instructions for authors

Thank you for choosing to submit your paper to us. These instructions will ensure we have everything required so your paper can move through peer review, production and publication smoothly. Please take the time to read and follow them as closely as possible, as doing so will ensure your paper matches the journal's requirements.

We offer a range of editing, manuscript preparation and post publication services to assist you in preparing your manuscript for submission, increase your chance of acceptance, or broaden the readership of your article. General guidance on every stage of the publication process is available at our Author Services website.

Contents

About the Journal

Journal of Clinical Child & Adolescent Psychology is an international, peer-reviewed journal publishing high-quality, original research. Please see the journal's Aims & Scope for information about its focus and peer-review policy.

Please note that this journal only publishes manuscripts in English.

Journal of Clinical Child & Adolescent Psychology accepts the following types of article:

- Regular Articles, Brief Reports, Future Directions

The Journal of Clinical Child and Adolescent Psychology (JCCAP) is the official journal for the Society of Clinical Child and Adolescent Psychology, American Psychological Association, Division 53. It publishes original contributions on the following topics: (1) development and evaluation of assessment and intervention techniques for use with clinical child and adolescent populations; (2) development and maintenance of clinical child and adolescent problems; (3) cross-cultural and sociodemographic issues that have a clear bearing on clinical child and adolescent psychology theory, research, or practice; and (4) training and professional practice in clinical child and adolescent psychology as well as child advocacy. Manuscripts that discuss theoretical and/or methodological issues on topics pertinent to clinical child and adolescent psychology also are considered. Authors need not be members of Division 53 to submit articles to JCCAP.

There are several criteria that increase the likelihood that a manuscript will be favorably evaluated in JCCAP: (1) The paper reflects a substantive advance in our understanding of clinical child and adolescent psychology. (2) The paper is of such importance that it likely will influence an area of research. (3) The paper presents new ideas or creative methods. (4) The paper offers theoretically-driven hypotheses. (5) Multiple measures, informants, or procedures are used to collect data. (6) Sophisticated methodologies are carefully employed. (7) Longitudinal methods are used. (8) Data are rigorously and appropriately analyzed. (9) The implications of the findings for clinical child and adolescent psychology are well articulated.

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*Citations received up to 9th June 2021 for articles published in 2018-2022. Data obtained on 23rd August 2023, from Digital Science's Dimensions platform, available at https://app.dimensions.ai
**Usage in 2020-2022 for articles published in 2018-2022.

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Preparing Your Paper

Regular Articles, Brief Reports, Future Directions

- Should be written with the following elements in the following order: title page; abstract; main text; references; appendices (as appropriate); table(s) with caption(s) (on individual pages); figures; figure captions (as a list)
- Should contain a structured abstract of 250 words.
- Read making your article more discoverable, including information on choosing a title and search engine optimization.

- A Regular Article may not exceed 11,000 words (i.e., 35 pages), including references, footnotes, figures, and tables. Brief Reports include empirical research that is soundly designed, but may be of specialized interest or narrow focus. Brief Reports may not be submitted in part or whole to another journal of general circulation. Brief Reports may not exceed 4,500 words for text and references. These limits do not include the title page, abstract, author note, footnotes, tables, and figures. Manuscripts that exceed these page limits and that are not prepared according to the guidelines in the Manual will be returned to authors without review. Future Directions submissions are written by leading scholars within the field. These articles provide a brief summary of important advances that are needed within a specific research or practice area pertinent to clinical child and adolescent psychology. Future Directions submissions are by invitation only and undergo peer review.

  All Regular Article and Brief Report submissions must include a title of 15 words or less that identifies the developmental level of the study participants (e.g., children, adolescents, etc.). JCCAP uses a structured abstract format. For studies that report randomized clinical trials or meta-analyses, the abstract also must be consistent with the guidelines set forth by CONSORT or MARS, respectively. The Abstract should include up to 250 words, presented in paragraph form. The Abstract should be typed on a separate page (page 2 of the manuscript), and must include each of the following label sections: 1) Objective (i.e., a brief statement of the purpose of the study); 2) Method (i.e., a detailed summary of the participants, N, age, gender, ethnicity, as well as a summary of the study design, measures, and procedures; 3) Results (i.e., a detailed summary of the primary findings that clearly articulate comparison groups (if relevant); 4) Conclusions (i.e., a description of the research and clinical implications of the findings). Avoid abbreviations, diagrams, and reference to the text in the abstract. JCCAP will scrutinize manuscripts for a clear theoretical framework that supports central study hypotheses.

  In addition, a clear developmental rationale is required for the selection of participants at a specific age. The Journal is making diligent efforts to insure that there is an appropriately detailed description of the sample, including a) the population from which the sample was drawn; b) the number of participants; c) age, gender, ethnicity, and SES of participants; d) location of sample, including country and community type (rural/urban), e) sample identification/selection; f) how participants were contacted; g) incentives/rewards; h) parent consent/child assent procedures and rates; i)

inclusion and exclusion criteria; j) attrition rate. The Discussion section should include a comment regarding the diversity and generality (or lack thereof) of the sample. The Measures section should include details regarding item content and scoring as well as evidence of reliability and validity in similar populations.

All manuscripts must include a discussion of the clinical significance of findings, both in terms of statistical reporting and in the discussion of the meaningfulness and clinical relevance of results. Manuscripts should a) report means and standard deviations for all variables, b) report effect sizes for analyses, and c) provide confidence intervals wherever appropriate (e.g., on figures, in tables), particularly for effect sizes on primary study findings. In addition, when reporting the results of interventions, authors should include indicators of clinically significant change. Authors may use one of several approaches that have been recommended for capturing clinical significance, including (but not limited to) the reliable change index (i.e., whether the amount of change displayed by a treated individual is large enough to be meaningful, the extent to which dysfunctional individuals show movement to the functional distribution).

All manuscripts should conform to the criteria listed in Table 1 of the 2008 APA Publications and Communications Board Working Group on Journal Article Reporting Standards (published in American Psychologist). These reporting standards apply to all empirical papers. In addition, JCCAP requires that reports of randomized clinical trials conform to CONSORT reporting standards (http://www.consort-statement.org/index.aspx?o=2965), including the submission of a flow diagram and checklist. Nonrandomized clinical trials must conform to TREND criteria (see http://www.cdc.gov/trendstatement/docs/AJPH_Mar2004_Trendstatement.pdf) and meta-analyses should conform to MARS standards (see Table 4 in 2008 American Psychologist article).

Style Guidelines

Please refer to these quick style guidelines when preparing your paper, rather than any published articles or a sample copy.

Please use American spelling style consistently throughout your manuscript.

Please use double quotation marks, except where “a quotation is ‘within’ a quotation”. Please note that long quotations should be indented without quotation marks.

Formatting and Templates

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Word templates are available for this journal. Please save the template to your hard drive, ready for use.

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References

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2. You can opt to include a **video abstract** with your article. Find out how these can help your work reach a wider audience, and what to think about when filming.
3. **Funding details.** Please supply all details required by your funding and grant-awarding bodies as follows:
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5. **Data availability statement.** If there is a data set associated with the paper, please provide information about where the data supporting the results or analyses presented in the paper can be found. Where applicable, this should include the hyperlink, DOI or other persistent identifier associated with the data set(s). Templates are also available to support authors.
6. **Data deposition.** If you choose to share or make the data underlying the study open, please deposit your data in a recognized data repository prior to or at the time of submission. You will be asked to provide the DOI, pre-reserved DOI, or other persistent identifier for the data set.
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9. **Tables.** Tables should present new information rather than duplicating what is in the text. Readers should be able to interpret the table without reference to the text. Please supply editable files.
10. **Equations.** If you are submitting your manuscript as a Word document, please ensure that equations are editable. More information about mathematical symbols and equations.
11. **Units.** Please use SI units (non-italicized).

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Queries

Should you have any queries, please visit our Author Services website or contact us here.

Updated 18-11-2021

Appendix E

Ethical Approval from NHS England for the original ASPECTS Project

NHS
National Research Ethics Service
Cambridgeshire 1 Research Ethics Committee

Victoria House
Capital Park
Fulbourn
Cambridge
CB21 5XB

Telephone: 01223 597653
Facsimile: 01223 597645

29 April 2010

Dr Richard Meiser-Stedman
MRC Clinician Scientist Fellow
MRC Cognition & Brain Sciences Unit
15 Chaucer Road
Cambridge CB2 7EF

Dear Dr Meiser-Stedman

Study Title:	**Cognitive behavioural therapy (CBT) as an early intervention for post-traumatic stress disorder (PTSD) in youth: preliminary efficacy and mechanisms of action**
REC reference number:	**10/H0304/11**
Protocol number:	**Version 2**

Thank you for your letter of 19 April 2010, responding to the Committee's request for further information on the above research and submitting revised documentation.

The further information has been considered on behalf of the Committee by the Chair.

Confirmation of ethical opinion

On behalf of the Committee, I am pleased to confirm a favourable ethical opinion for the above research on the basis described in the application form, protocol and supporting documentation as revised, subject to the conditions specified below.

Ethical review of research sites

The favourable opinion applies to all NHS sites taking part in the study, subject to management permission being obtained from the NHS/HSC R&D office prior to the start of the study (see "Conditions of the favourable opinion" below).

The Committee has not yet been notified of the outcome of any site-specific assessment (SSA) for the non-NHS research site(s) taking part in this study. The favourable opinion does not therefore apply to any non-NHS site at present. I will write to you again as soon as one Research Ethics Committee has notified the outcome of a SSA. In the meantime no study procedures should be initiated at non-NHS sites.

Conditions of the favourable opinion

The favourable opinion is subject to the following conditions being met prior to the start of the study.

Management permission or approval must be obtained from each host organisation prior to the start of the study at the site concerned.

For NHS research sites only, management permission for research ("R&D approval") should be obtained from the relevant care organisation(s) in accordance with NHS research governance arrangements. Guidance on applying for NHS permission for research is available in the Integrated Research Application System or at http://www.rdforum.nhs.uk. *Where the only involvement of the NHS organisation is as a Participant Identification Centre, management permission for research is not required but the R&D office should be notified of the study. Guidance should be sought from the R&D office where necessary.*

Sponsors are not required to notify the Committee of approvals from host organisations.

Other conditions specified by the REC

- The following statement on the Information Sheets for the 8-10 year old children appears to have a superfluous 'to complete': "*We would like you and a parent to complete to speak to us on the telephone or face-to-face.*" You are asked to remove this.
- The Parent Information Sheets now include the details: "*We will record our sessions using a video or audio recording device*". You need to also include information that the recording will be stored in a secure location and destroyed within a set period of time once the information has been transcribed. The set period of time will need to be detailed.
- The Information for Children (8-10) about the Study (control, trauma-exposed) is missing the version number and date, you are asked to include this detail.

Final versions of documents should be provided to the Committee for information; please be advised that dates and version numbers of these documents will need to be revised.

Authority is delegated to the Co-ordinator to ensure compliance with the above request.

It is the responsibility of the sponsor to ensure that all the conditions are complied with before the start of the study or its initiation at a particular site (as applicable).

Approved documents

The final list of documents reviewed and approved by the Committee is as follows:

Document	*Version*	*Date*
Covering Letter from Dr Richard Meiser-Stedman, MRC Clinician Scientist Fellow		29 January 2010
REC application	Code: 38523/94073/1/925	29 January 2010
Investigator CV - Dr Richard Meiser-Stedman		29 January 2010
Participant Consent Form: Youg person (trial)	Version 1	29 January 2010
Letter of invitation to participant - for school parents	Version 1	29 January 2010
GP/Consultant Information Sheets - GP letter	Version 1	29 January 2010
Participant Consent Form: Young person (control)	Version 1	29 January 2010
Letter from Sponsor, email from Tanya Izzard		13 January 2010
MRC Fellowship award to Mr R A Meiser-Stedman		
Peer Review Assessment Form - Referee 1		
Peer Review Assessment Form - Referee 2		
Peer Review Assessment Form - Referee 3		

Peer Review Assessment Form - Referee 4		
Letter from Statistician - letter from Dr Tim Croudace		19 November 2008
Questionnaire: CPSS		
Questionnaire: RIES-C		
Questionnaire: SPENCE Children's Anxiety Scale		1994
Questionnaire: Mood and Feelings		
Trial flow diagram		27 January 2010
Questionnaire cover sheet		
Questionnaire: CPTCI		2003
Questionnaire: MMQ		2003
Questionnaire: Multidimensional Scale of Perceived Social Support		1988
Questionnaire: Thoughts during the frightening event		
Questionnaire: Autobiographical Memory Questionnaire		
Protocol	Version 1	29 January 2010
Questionnaire: The centrality of events scale		
Questionnaire: Self-Control Scale		
Questionnaire: Working Alliance Inventory		1989
GP Postcard 'Exposure to a terrifying event?'		
Protocol	Version 2	15 April 2010
Participant Information Sheet: Information for Parents about the study (screening)	v2	15 April 2010
Participant Information Sheet: Information for Parents about the study (trial)	v2	15 April 2010
Participant Information Sheet: Information for Parents about the study (control, non-trauma)	v2	15 April 2010
Participant Information Sheet: Information for Parents about the study (control, trauma-exposed)	v2	15 April 2010
Participant Information Sheet: Information for Young People (8-10) about the study (screening)	v2	15 April 2010
Evidence of insurance or indemnity - MRC Statement of Indemnity	Version 1	October 2008
Questionnaire: Spence Children's Anxiety Scale	1994 - Susan H. Spence	1994
Questionnaire: Short Mood and Feelings Questionnaire - Child Version		
Response to Request for Further Information from Dr Richard Meiser-Stedman		19 April 2010
Participant Information Sheet: Information for Children (8-10) about the Study (trial)	v2	15 April 2010
Participant Information Sheet: Information for Children (8-10) about the Study (control, non-trauma)	v2	15 April 2010
Participant Information Sheet: Information for Children (8-10) about the Study (control, trauma-exposed)	v2	15 April 2010
Participant Information Sheet: Information for Young People (11-15) about the Study (screening)	v2	15 April 2010
Participant Information Sheet: Information for Children (11-15) about the Study (trial)	v2	15 April 2010
Participant Information Sheet: Information for Young People (11-15) about the Study (controls, non-trauma)	v2	15 April 2010
Participant Information Sheet: Information for Young People (11-15) about the Study (controls, trauma-exposed)	v2	15 April 2010
Participant Information Sheet: Information for Young People	v2	15 April 2010

(16-17) about the Study (screening)		
Participant Information Sheet: Information for Children (16-17) about the Study (trial)	v2	15 April 2010
Participant Information Sheet: Information for Young People (16-17) about the Study (controls, non-trauma)	v2	15 April 2010
Participant Information Sheet: Information for Young People (16-17) about the Study (controls, trauma exposed)	v2	15 April 2010
Participant Consent Form: Parent Consent Form - screening	v2	15 April 2010
Participant Consent Form: Parent Consent Form - trial	v2	15 April 2010
Participant Consent Form: Parent Consent Form - control	v2	15 April 2010
Participant Consent Form: Young person consent form - screening	v2	15 April 2010
Letter of invitation to participant - Initial contact letter from hospital	v2	15 April 2010
Advertisement - "Would you like to help with a research study?"	v1	15 April 2010
A76 and A77 of Application Form detailing indemnity arrangements		01 February 2010
D1 Declaration by the Sponsor's representative		19 April 2010

Statement of compliance

The Committee is constituted in accordance with the Governance Arrangements for Research Ethics Committees (July 2001) and complies fully with the Standard Operating Procedures for Research Ethics Committees in the UK.

After ethical review

Now that you have completed the application process please visit the National Research Ethics Service website > After Review

You are invited to give your view of the service that you have received from the National Research Ethics Service and the application procedure. If you wish to make your views known please use the feedback form available on the website.

The attached document *"After ethical review – guidance for researchers"* gives detailed guidance on reporting requirements for studies with a favourable opinion, including:

- Notifying substantial amendments
- Adding new sites and investigators
- Progress and safety reports
- Notifying the end of the study

The NRES website also provides guidance on these topics, which is updated in the light of changes in reporting requirements or procedures.

We would also like to inform you that we consult regularly with stakeholders to improve our service. If you would like to join our Reference Group please email referencegroup@nres.npsa.nhs.uk.

10/H0304/11	**Please quote this number on all correspondence**

Yours sincerely

Dr Daryl Rees
Chair

Email: susan.davies@eoe.nhs.uk

Enclosures: "After ethical review – guidance for researchers"

Copy to: Mr Brien Patel
R & D Depart
Box 277 – Addenbrooke's Hospital

Professor William Marslen-Wilson
Director of Cognition and Brain Sciences Unit
MRC Cognition & Brain Sciences Unit
15 Chaucer Road
Cambridge CB2 7EF

Appendix F

Consent form (Adult)

Parent/Guardian Consent Form ID number: _____

ASPECTS: Acute Stress Programme for Children and Teenagers:
Young people's feelings after a frightening experience

A) Please circle the answer that is right for you:

1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. YES/NO

2. I understand that our participation is voluntary and that we are free to withdraw at any time without giving any reason, without our medical care or legal rights being affected. YES/NO

3. I understand that relevant sections of medical notes and data collected during the study from both me and my child may be looked at by individuals from the research team where it is relevant to our taking part in this research. I give permission for these individuals to have access to my records. YES/NO

4. I agree to both me and my child taking part in the above study. YES/NO

5. I agree to a researcher contacting me after the end of this study about possible future research and follow up about my child. YES/NO

…… …….. ……..
Name of Patient's parent or carer Date Signature

Status of relationship (e.g. mother): …….

B) Optional - you and your child can still take part in the research if you do not agree to the following (Please circle the answer that is right for you):

i. I agree to my child providing saliva samples which will be used in gene analysis. YES/NO

ii. I agree to my child's genes being stored after the study so that testing could be carried on them in future (with ethics committee permission). YES/NO

…… …….. ……..
Name of Patient's parent or carer Date Signature

OFFICE USE ONLY (Please do not complete)

The researcher who explained this project to you needs to sign too

Print name …….

Signed…..……Date……..

Appendix G

Assent form (Child)

Young Person's Consent Form ID number: _____

ASPECTS: Acute Stress Programme for Children and Teenagers:
Young people's feelings after a frightening experience

A) Please circle the right answer for you

1. Have you read (or had read to you) information about this study?	YES/NO
2. Has somebody explained this study to you?	YES/NO
3. Have you asked all the questions you want?	YES/NO
4. Have you had your questions answered in an understandable way?	YES/NO
5. Do you understand it's ok to stop taking part at any time?	YES/NO
6. Do you agree to take part?	YES/NO
7. Do you agree to a researcher contacting you after the end of this study about possible future research?	YES/NO

If any answers to the above are 'no' or if you don't want to take part, don't sign your name!

If you do want to take part, please sign below:

Your name…….

Signed……...Date……

B) Optional - you can still take part in the research if you do not agree to the following:

i. Do you agree to saliva samples being used for genetic analysis?	YES/NO
ii. Do you agree to us storing your spit after the study so that we can carry out testing on them in future (with ethics committee permission)?	YES/NO

Your name…….

Signed……...Date……

OFFICE USE ONLY (Please do not complete)

The researcher who explained this project to you needs to sign too

Print name …….

Signed…..……Date……..

Appendix H

Information sheet (adult)

Young people's feelings after a frightening experience

We would like to invite you and your child to participate in our study. Please read this information sheet if you wish for you and your child to participate. Your participation is *entirely voluntary*.

Purpose of the study:
We are conducting a research study looking at how children and teenagers cope shortly after being involved in any kind of frightening experience. Your child's participation in the study will help us to better identify why some young people are at risk of developing severe, long-term reactions to frightening events, and how we can help these children to get over what has happened to them.

We may ask you to take part in another important piece of research as well. This other research is aimed at trying to *help* young people who are experiencing distress after a frightening event, and understand *why* some young people experience significant distress. This research is also voluntary and described in more detail below.

Do we have to take part?
No, it is up to you and your child to decide. If you do want to join in we'll ask you to sign a consent form, a copy of which you can keep with this information sheet. Both you and your child are free to withdraw from the study at any point *without giving us a reason*. You will not be treated any differently by any NHS service if you choose not to participate in this study or if you decide to withdraw.

What the study will involve:
We would like you and your child to complete two interviews by telephone, and for your child to complete some questionnaires. If you would prefer we could arrange to meet for a face-to-face interview. These interviews will take place about 2 weeks after attending Addenbrooke's hospital, and then again about 2 months after coming to Addenbrooke's.

We would like to talk to you and your child about the frightening event, and any problems your child might have had since it happened. Each interview will take about 30 minutes in total, and the questionnaires will take about 30 minutes to complete. These interviews and questionnaires are to do with your child's feelings since the event that led to them going to Addenbrooke's hospital, and how they have been thinking and coping.
We would like to record some of the interviews, so that we can check that we are doing them properly. These recordings would only be kept for the duration of the study, after which they will be destroyed. We will check with you before starting to record any interviews – You are under no obligation to have your interview and your child's interview recorded.

We're also looking at whether certain genes affect how children and teenagers cope with being involved in a frightening event. We can measure genes from saliva (spit) – we do not need to do blood tests. Your child can return their spit sample in a special container in the post. You can choose not to give a spit sample if you do not wish to do this part of the research.

We may invite you to complete a further interview and abbreviated questionnaire booklet at about 9 months after attending Addenbrooke's hospital; this again will be completely voluntary and you are free to withdraw

from this phase of the research. Due to limited resources we will not be inviting everyone to take part in this part of the research. We will only contact you at this later date if you give us your permission to do so.

How will I know if my child has been upset by taking part in the telephone interview, and how can I get help?
We do not think that it is likely that any young person taking part in this study will become very distressed as a result of completing the telephone interview. If they are very distressed, they may become very tearful, very angry, or refuse to talk about the interview. In this case you may wish to contact our colleague working on the ASPECTS study, Dr Richard Meiser-Stedman, who is a clinical psychologist experienced in working with young people who have been caught up in frightening events. His contact details are given below.

Who is running this study?
The study is a joint project between Addenbrooke's hospital, the Medical Research Council Cognition and Brain Sciences Unit, and the University of Cambridge. All the information we collect will be stored and analysed by psychologists at the Medical Research Council Cognition and Brain Sciences Unit. Your details will only be passed onto them if you decide to take part in this project.

Who is taking part?
We are inviting all young people aged 8-17 who attend Addenbrooke's hospital after a frightening experience (e.g. a road traffic accident, a sudden serious injury or illness) to take part in our study. We hope to have around 400 young people take part.

Is there other research taking place?
This research project is part of a wider project that is trying to understand how we can help young people after a frightening event, if they are experiencing a lot of distress. This wider project is called *ASPECTS: Acute Stress Programme for Children and Teenagers*. This other research will involve testing how effective a short term (10 weeks), practical, psychological programme is for children and teenagers. There are also some experiments in a laboratory that we will ask some children and teenagers to take part in.

You are not yet being invited to take part in the rest of the ASPECTS study. We will ask you later if you are happy to be considered for this other research.

Confidentiality – who will know we are taking part in this study?
All information collected about you and your child during the research will be kept strictly confidential. The only time we would break this agreement would involve situations in which either you or your child told us something which suggested a person was at some sort of risk or danger of being harmed. Information will only be analysed by the Medical Research Council Cognition and Brain Sciences Unit, and they will only be able to contact you if you give them permission to do so.

The results we obtain may be published in order to help other people working with children who have been in frightening events, but you or your child would *not* be named.

What will happen to any DNA samples my child gives? Will any genetic tests be done?
Saliva samples will not have names on them, only an identification code. We'll ask you to post their saliva to our office, where they will be stored in a freezer and then taken (without names on) to a laboratory.

We would like to test your child's saliva for some genes that we think may affect how they cope after a frightening experience. We would like to store the part of the saliva that contains their genes (DNA) after the study, in case future research tells us that we should test it for other genes. It is up to you whether we store this DNA after the study and we shall only do this if you give us specific permission on the consent form. If you do not want us to do this, we shall destroy your child's samples after the study. We would need

separate permission from an ethics committee to carry out these additional tests after the study. We will identify genes that affect the levels of serotonin and dopamine in the brain. These are natural chemicals in the brain and are thought to be involved in our mood. We will not tell anyone else about the results of these genetic tests.

What happens if we withdraw from the study?
If you withdraw from the study it is up to you whether we use any information we have collected or your child's saliva sample; if you wish these will be destroyed.

Will we receive anything as a thank you for helping with this research?
Yes, we will send you £10 (to be given to your child as you feel appropriate) each time he or she completes an interview and the questionnaires. This is to say "thank you" for your time and *effort.* "If you would like to complete the online questions only then you will receive a £5 pound payment for completing each internet survey."

What if my child is having emotional difficulties after their frightening experience?
If at the end of the study we think that your child might be suffering from any serious problems relating to the frightening event, we will talk to you about the possibility of receiving help through the ASPECTS study. We can also discuss with you how you might access appropriate help through your GP and your local NHS Child and Adolescent Mental Health Service.

Has this research study been approved by an ethics committee?
Yes, this study has been approved by Cambridgeshire 1 Research Ethics Committee (Study No. 10/H0304/11).

I have some questions about this study, who do I contact?
You can contact Andrea Edwards, the research nurse at Addenbrooke's hospital who wrote to you:

Address: West Anglia NIHR CLRN, S4 Building, Box 277, Cambridge University Hospitals NHS Foundation Trust, Hills Road, Cambridge CB2 0QQ
Direct line: 07590 486045
Email: andrea.edwards@addenbrookes.nhs.uk

You can also contact Dr Richard Meiser-Stedman at the MRC Cognition and Brain Sciences Unit who is over-seeing this project. His address and contact details are:

Address: MRC Cognition and Brain Sciences Unit, 15 Chaucer Road, Cambridge, CB2 7EF
Direct line: 01223 273624
Email: richard.meiser-stedman@mrc-cbu.cam.ac.uk

What if I am not happy about the research study or wish to make a complaint?
If you are not happy about this research study or wish to make a complaint about it, then please contact Dr Richard Meiser-Stedman (see contact details above), the NHS Patient Advisory Liaison Service at Addenbrooke's Hospital (01223 216 756, pals@addenbrookes.nhs.uk), or Dr Tim Dalgleish, Senior Scientist at the MRC Cognition and Brian Sciences Unit (01223 273685, tim.dalgleish@mrc-cbu.cam.ac.uk).

Thank you very much for reading this information sheet about the frightening events study - we hope you decide to take part in this study.

Appendix I

Information sheet (child)

Young people's feelings after a frightening experience

What is a research study?
A research study is a careful experiment to find out the answer to a question.

Why have I been asked to do this research study?
You have recently been to Addenbrooke's hospital, after an event that might have been quite scary.

Why is this study being done?
This study is to see how you are feeling about the event now. We want to help other children who have been in frightening events. What you tell us will help us to do that.

Do we have to take part?
No, it is up to you and your family!
You can decide to come out of the study at any point, and *you do not have to tell us why*. You will not be treated any differently by any hospital or doctor if you decide you do not want to take part in this study.

What happens in the study?
We would like you and a parent to speak to us on the telephone or face-to-face. We would also like you to answer some questions on a piece of paper or on the computer. We want to do this two times.

We would like to talk to you about the frightening event, and any problems you might have had since it happened. Each time we will talk to you for about half an hour. The questions you answer on paper or on the computer will take about 30 minutes to finish. These interviews and questionnaires are to do with how you've been feeling and thinking since the event happened.

We may ask you if we can record our talk with you. This is for us to check that we are talking to you in the right way. You do not have to let our talk be recorded - It is completely up to you.

We're also looking at whether certain *genes* affect how children feel after being involved in a frightening event. Genes are found all throughout your body. They make your body work properly. We can measure genes from your spit. We would like you to return a spit sample in a special container in the post. You don't have to do this if you don't want to.

We might ask you do one more interview in about 9 months' time. It is up to you whether you do this extra interview. If you don't want us to, then we won't contact you again for this.

Who is running this study?

The study is a joint project between Addenbrooke's hospital and some other places in the city of Cambridge where scientists work. They are called the "Medical Research Council Cognition and Brain Sciences Unit" and the "University of Cambridge."

Who is taking part?
We are asking all children and teenagers aged 8-17 who go to Addenbrooke's hospital after a frightening experience (like a road traffic accident, or a serious injury) to take part in our study.

What if I feel upset when I talk to you on the phone?
We will always check that one of your parents is around when we start the interview, so that you are not alone. When you are talking with us on the phone we will often check that you are OK. If you feel upset then you can tell us how you are feeling and we can talk about it. You can always take a break, go and talk to one of your parents, or decide to stop to talking to us. It is completely up to you.

Is there other research is taking place?
Yes, other research is going on. We are also trying to help children who keep having bad feelings after something frightening. We might ask you to take part in this research, but we won't talk to you about this if you do not want us to.

Who will know I am taking part in this study?
Your name and address and all the things you tell us will stay just with us – we won't tell anyone else. The only time we would break this promise would be if you told us something which made us think that you or another person were in danger of being harmed.
We will use all the things that people tell us to try and help other children in the future, but we won't tell your name and address to anyone else.

What will happen to my spit?
We will store your spit and then measure it with a special machine to find out about genes. We will store it in a safe way, so that no one knows the spit came from you.

We might test your spit again in the future to learn about other genes, but only if you are happy for us to do this. It is up to you. We will not tell anyone else about your genes.

Will I receive anything as a thank you for helping with this research?
Yes, we will give your parent £10 to share with you each time you complete an interview and the questionnaires. This is to say "thank you" for your time. If you would like to complete the online questions only then you will receive a £5 pound payment for completing each internet survey.

What if I feel really bad after what happened to me?
If at the end of the study you still feel bad, we will talk with you and your family about how you might get help.

Has this research study been check by an ethics committee?
Yes, this study has been checked by Cambridgeshire 1 Research Ethics Committee (Study No. 10/H0304/11) and they are happy for the research to take place.

I have some questions about this study, who do I contact?

You can contact Andrea Edwards, the research nurse at Addenbrooke's hospital who wrote to you:

Address: West Anglia NIHR CLRN, S4 Building, Box 277, Cambridge University Hospitals NHS Foundation Trust, Hills Road, Cambridge CB2 0QQ
Direct line: 07590 486045
Email: andrea.edwards@addenbrookes.nhs.uk

You can also contact Dr Richard Meiser-Stedman at the MRC Cognition and Brain Sciences Unit who is in charge of this project. His address and contact details are:

Address: MRC Cognition and Brain Sciences Unit, 15 Chaucer Road, Cambridge, CB2 7EF
Direct line: 01223 273624
Email: richard.meiser-stedman@mrc-cbu.cam.ac.uk

Thank you very much for reading this information sheet about the frightening events study - we hope you decide to take part in this study.

Appendix J

Summary of the ASPECTS Questionnaire Measures

Children's A&E 2-3months
non-PTSD/PTSD sample (LONG SELF REPORT QUESTIONS)
BASELINE

Children's Questionnaires

Child's ID: _____

Today's date: _____

Thank you very much for agreeing to participate in this survey.

In this survey we will ask you some questions about your thoughts, feelings and reactions since your recent trauma. These questions will take 20-30 minutes to complete.

Please complete these questions on your own and in a quiet place. **There are no right or wrong answers** to these questions, so try and answer these questions as honestly as you can. Also, we ask that you try and answer **every question**. If there is a question you do not understand, please take a quick break to ask your parents to help explain the meaning of the question.

Children's A&E 2-3months
non-PTSD/PTSD sample (LONG SELF REPORT QUESTIONS)
BASELINE

1) We would like to know about some of the thoughts and feelings you were having **before** the frightening event that happened to you. Please read each sentence carefully and choose the response which best matches your thoughts and feelings before the event. There are no right or wrong answers.

		Not at all like that	*A little bit like that*	*Like that*	*Very much like that*
1	Before the event I used to feel really sad sometimes.	[ ]	[ ]	[ ]	[ ]
2	Before the event I sometimes felt very nervous or scared about things.	[ ]	[ ]	[ ]	[ ]
3	Before the event I had big problems with feeling very sad or scared.	[ ]	[ ]	[ ]	[ ]
4	Before the event I always knew someone I could really trust.	[ ]	[ ]	[ ]	[ ]
5	Before the event there were always people in my life who helped me.	[ ]	[ ]	[ ]	[ ]
6	Before the event I could always talk to my family and friends about my thoughts and feelings.	[ ]	[ ]	[ ]	[ ]
7	Before the event I always had good support from my friends and my family.	[ ]	[ ]	[ ]	[ ]
8	Before the event I often got angry at people.	[ ]	[ ]	[ ]	[ ]
9	Before the event I often got upset and scared.	[ ]	[ ]	[ ]	[ ]
10	Before the event I was very calm and relaxed.	[ ]	[ ]	[ ]	[ ]

CPT

2) We would now like to know about some of the thoughts you had during the frightening event. Please read each sentence below carefully and tell us how much you agree with each one, by ticking the box which best matches what you were thinking during the event. There are no right or wrong answers.

"While the event was happening...."		*Disagree a lot*	*Disagree a bit*	*Agree a bit*	*Agree a lot*
1.	I really thought that I was going to die.	[ ]	[ ]	[ ]	[ ]
2.	I thought that I was going to be very badly hurt.	[ ]	[ ]	[ ]	[ ]
3.	I was really scared.	[ ]	[ ]	[ ]	[ ]

CDDPQ

3) We would now like to know about what you were thinking, feeling, seeing and hearing **during** the event. Please read each sentence carefully and choose the answer which best matches how you felt during the event. There are no right or wrong answers.

"While the event was happening...."		*Not at all like that*	*A little bit like that*	*Like that*	*Very much like that*
1.	There was so much happening I couldn't understand everything that was going on.	[ ]	[ ]	[ ]	[ ]
2.	I did not fully understand what was going on.	[ ]	[ ]	[ ]	[ ]
3.	It was just like lots of different thoughts and feelings going through my mind which didn't join together to make a story.	[ ]	[ ]	[ ]	[ ]
4.	I could not think clearly.	[ ]	[ ]	[ ]	[ ]
5.	It was all too much, I couldn't put it all together.	[ ]	[ ]	[ ]	[ ]
6.	I felt very confused about what was happening.	[ ]	[ ]	[ ]	[ ]
7.	My mind was full with what I saw, heard, smelled or felt.	[ ]	[ ]	[ ]	[ ]

4) We would now like to know about the feelings that you experienced in your body **during** the frightening event. Please read each sentence carefully, and choose the answer which best matches how you felt during the event. There are no right or wrong answers.

While the event was happening...		*No*	*Yes*
1.	... did you have pain in your chest?	[ ]	[ ]
2.	... did you feel very hot or cold?	[ ]	[ ]
3.	... did you feel like you were choking, like you couldn't breathe?	[ ]	[ ]
4.	... did you feel dizzy or faint?	[ ]	[ ]
5.	... did you feel like you couldn't control yourself anymore, or that you were going mad?	[ ]	[ ]
6.	... did you heart beat very fast, or go boom-boom-boom very loud?	[ ]	[ ]
7.	... did you feel sick, like you might throw up?	[ ]	[ ]
8.	... did you sweat a lot?	[ ]	[ ]
9.	... did you find it hard to breathe?	[ ]	[ ]
10.	... did you shake or tremble?	[ ]	[ ]

CPSS-R

1a) Below is a list of thoughts and feelings that some children and young people have ***during*** frightening events. Read each sentence carefully and choose the answer that best matches your feelings **during** the event.

	"During the event..."	*Not at all*	*A little like that*	*Like that*	*Very much like that*
1.	Being so shocked that I didn't feel anything	[ ]	[ ]	[ ]	[ ]
2.	Not really noticing what was going on around me (like being in a bubble)	[ ]	[ ]	[ ]	[ ]
3.	Feeling like I was in a dream	[ ]	[ ]	[ ]	[ ]
4.	Feeling like I was outside my body, or that my body didn't belong to me	[ ]	[ ]	[ ]	[ ]

CPSS-R

1b) Some children also have these thoughts and feelings after the frightening event is over. I would now like you to read through this same list again and choose the response that best fits you in the **past week.**

	"Since the event...."	*Not at all or only one time*	*Once a week or less/once in a while*	*2 to 4 times a week/half the time*	*5 or more times a week/ almost always*
1.	Being so shocked that I didn't feel anything	[ ]	[ ]	[ ]	[ ]
2.	Not really noticing what was going on around me (like being in a bubble)	[ ]	[ ]	[ ]	[ ]
3.	Feeling like I was in a dream	[ ]	[ ]	[ ]	[ ]
4.	Feeling like I was outside my body, or that my body didn't belong to me	[ ]	[ ]	[ ]	[ ]

1c) Here is a list of some problems that children and young people sometimes have *after* experiencing a frightening event. Read each sentence one carefully and choose the response that best describes how often that problem has bothered you in the **past week.**

	"Since the event...."	*Not at all or only one time*	*Once a week or less/once in a while*	*2 to 4 times a week/half the time*	*5 or more times a week/ almost always*
1.	Having upsetting thoughts or images about the event that came into your head when you didn't want them to	[ ]	[ ]	[ ]	[ ]
2.	Having bad dreams or nightmares	[ ]	[ ]	[ ]	[ ]
3.	Acting or feeling as if the event was happening again (hearing something or seeing a picture about it and feeling as if I am there again)	[ ]	[ ]	[ ]	[ ]
4.	Feeling upset when you think or hear about the event (for example, feeling scared, angry, sad, guilty etc).	[ ]	[ ]	[ ]	[ ]
5.	Having feelings in your body when you think about or hear about the event (for example, breaking out in a sweat, heart beating fast).	[ ]	[ ]	[ ]	[ ]
6.	Trying not to think about, talk about, or have feelings about the event.	[ ]	[ ]	[ ]	[ ]
7.	Trying to avoid activities, people, or places that remind you of the traumatic event.	[ ]	[ ]	[ ]	[ ]
8.	Not being able to remember an important part of the upsetting event.	[ ]	[ ]	[ ]	[ ]
9.	Having much less interest or not doing the things you used to do.	[ ]	[ ]	[ ]	[ ]
10.	Not feeling close to people around you.	[ ]	[ ]	[ ]	[ ]
11.	Not being able to have strong feelings (for example, being unable to cry or unable to feel very happy).	[ ]	[ ]	[ ]	[ ]
12.	Feeling as if your future plans or hopes will not come true (for example, you will not have a job or get married or have kids).	[ ]	[ ]	[ ]	[ ]
13.	Having trouble falling or staying asleep.	[ ]	[ ]	[ ]	[ ]
14.	Feeling irritable or having fits of anger.	[ ]	[ ]	[ ]	[ ]
15.	Having trouble concentrating (for example, losing track of a story on television, forgetting what you read, not paying attention in class).	[ ]	[ ]	[ ]	[ ]
16.	Being overly careful (for example, checking to see who is around you and what is around you).	[ ]	[ ]	[ ]	[ ]

	"Since the event...."	*Not at all or only one time*	*Once a week or less/once in a while*	*2 to 4 times a week/half the time*	*5 or more times a week/ almost always*
17.	Being jumpy or easily startled (for example, when someone walks up behind you).	[ ]	[ ]	[ ]	[ ]
18.	Completely blaming myself or someone else for what happened.	[ ]	[ ]	[ ]	[ ]
19.	Feeling scared, angry, guilty or ashamed a lot of the time.	[ ]	[ ]	[ ]	[ ]
20.	Thinking that the world is very dangerous or that your life has been ruined by what happened.	[ ]	[ ]	[ ]	[ ]
21.	Taking more risks and being reckless or dangerous.	[ ]	[ ]	[ ]	[ ]

1d) Please indicate below if the problems you rated above have got in the way of any of the following areas of your life during the past 2 weeks. Circle Y for Yes, N for No.

(22) Y N Fun and hobby activities

(23) Y N Relationships with your friends

(24) Y N Schoolwork

(25) Y N Relationship with your family

(26) Y N Chores and duties at home

(27) Y N General happiness with your life

SCAS

2) We would now like to ask you some questions about different thoughts and feelings you may have been having in your life over the **past week**. Again, there are no right or wrong answers to these questions, so please tick the box that best describes you in the past week.

		Never	*Sometimes*	*Often*	*Always*
1.	I worry about things	[ ]	[ ]	[ ]	[ ]
2.	I am scared of the dark	[ ]	[ ]	[ ]	[ ]
3.	When I have a problem, I get a funny feeling in my stomach	[ ]	[ ]	[ ]	[ ]
4.	I feel afraid	[ ]	[ ]	[ ]	[ ]
5.	I would feel afraid of being on my own at home	[ ]	[ ]	[ ]	[ ]
6.	I feel scared when I have to take a test	[ ]	[ ]	[ ]	[ ]
7.	I feel afraid if I have to use public toilets or bathrooms	[ ]	[ ]	[ ]	[ ]
8.	I worry about being away from my parents	[ ]	[ ]	[ ]	[ ]
9.	I feel afraid that I will make a fool of myself in front of people	[ ]	[ ]	[ ]	[ ]
10.	I worry that I will do badly at my school work	[ ]	[ ]	[ ]	[ ]
11.	I am popular amongst other kids my own age	[ ]	[ ]	[ ]	[ ]
12.	I worry that something awful will happen to someone in my family	[ ]	[ ]	[ ]	[ ]
13.	I suddenly feel as if I can't breathe when there is no reason for this	[ ]	[ ]	[ ]	[ ]
14.	I have to keep checking that I have done things right (like the switch is off, or the door is locked)	[ ]	[ ]	[ ]	[ ]
15.	I feel scared if I have to sleep on my own	[ ]	[ ]	[ ]	[ ]
16.	I have trouble going to school in the mornings because I feel nervous or afraid	[ ]	[ ]	[ ]	[ ]
17.	I am good at sports	[ ]	[ ]	[ ]	[ ]
18.	I am scared of dogs	[ ]	[ ]	[ ]	[ ]
19.	I can't seem to get bad or silly thoughts out of my head	[ ]	[ ]	[ ]	[ ]
20.	When I have a problem, my heart beats really fast	[ ]	[ ]	[ ]	[ ]
21.	I suddenly start to tremble or shake when there is no reason for this.	[ ]	[ ]	[ ]	[ ]
22.	I worry that something bad will happen to me	[ ]	[ ]	[ ]	[ ]

		Never	*Sometimes*	*Often*	*Always*
23.	I am scared of going to the doctors or dentists	[ ]	[ ]	[ ]	[ ]
24.	When I have a problem, I feel shaky	[ ]	[ ]	[ ]	[ ]
25.	I am scared of being in high places or lifts (elevators)	[ ]	[ ]	[ ]	[ ]
26.	I am a good person	[ ]	[ ]	[ ]	[ ]
27.	I have to think of special thoughts to stop bad things from happening (like numbers or words)	[ ]	[ ]	[ ]	[ ]
28.	I feel scared if I have to travel in the car, or on a Bus or a train.	[ ]	[ ]	[ ]	[ ]
29.	I worry what other people think of me	[ ]	[ ]	[ ]	[ ]
30.	I am afraid of being in crowded places (like shopping centres, the movies, buses, busy playgrounds)	[ ]	[ ]	[ ]	[ ]
31.	I feel happy	[ ]	[ ]	[ ]	[ ]
32.	All of a sudden I feel really scared for no reason at all	[ ]	[ ]	[ ]	[ ]
33.	I am scared of insects or spiders	[ ]	[ ]	[ ]	[ ]
34.	I suddenly become dizzy or faint when there is no reason for this.	[ ]	[ ]	[ ]	[ ]
35.	I feel afraid if I have to talk in front of my class.	[ ]	[ ]	[ ]	[ ]
36.	My heart suddenly starts to beat too quickly for no reason	[ ]	[ ]	[ ]	[ ]
37.	I worry that I will suddenly get a scared feeling when there is nothing to be afraid of	[ ]	[ ]	[ ]	[ ]
38.	I like myself	[ ]	[ ]	[ ]	[ ]
39.	I am afraid of being in small closed places, like tunnels or small rooms.	[ ]	[ ]	[ ]	[ ]
40.	I have to do some things over and over again (like washing my hands, cleaning or putting things in a certain order)	[ ]	[ ]	[ ]	[ ]
41.	I get bothered by bad or silly thoughts or pictures in my mind	[ ]	[ ]	[ ]	[ ]
42.	I have to do some things in just the right way to stop bad things happening	[ ]	[ ]	[ ]	[ ]
43.	I am proud of my school work	[ ]	[ ]	[ ]	[ ]

		Never	*Sometimes*	*Often*	*Always*
44.	I would feel scared if I had to stay away from home overnight	[ ]	[ ]	[ ]	[ ]
45.	Is there something else that you are really afraid of?	[ ]	[ ]	[ ]	[ ]

MFQ

3) We would now like to know about how you have been feeling and acting in the **past week**. If a sentence was not true, tick the box for not true. If a sentence was sometimes true, tick the box for sometimes. If a sentence was true most of the time, tick the box for true.

	Not true	*Sometimes*	*True*
1. I felt miserable or unhappy	[ ]	[ ]	[ ]
2. I didn't enjoy anything at all	[ ]	[ ]	[ ]
3. I was less hungry than usual	[ ]	[ ]	[ ]
4. I ate more than usual	[ ]	[ ]	[ ]
5. I felt so tired I just sat around and did nothing	[ ]	[ ]	[ ]
6. I was moving and walking more slowly than usual	[ ]	[ ]	[ ]
7. I was very restless	[ ]	[ ]	[ ]
8. I felt I was no good anymore	[ ]	[ ]	[ ]
9. I blamed myself for things that weren't my fault	[ ]	[ ]	[ ]
10. It was hard for me to make up my mind	[ ]	[ ]	[ ]
11. I felt grumpy and cross with my parents	[ ]	[ ]	[ ]
12. I felt like talking less than usual	[ ]	[ ]	[ ]
13. I was talking more slowly than usual	[ ]	[ ]	[ ]
14. I cried a lot	[ ]	[ ]	[ ]
15. I thought there was nothing good for me in the future	[ ]	[ ]	[ ]
16. I thought that life wasn't worth living	[ ]	[ ]	[ ]
17.I thought about death and dying	[ ]	[ ]	[ ]
18. I thought my family would be better off without me	[ ]	[ ]	[ ]
19. I thought about killing myself	[ ]	[ ]	[ ]
20. I didn't want to see my friends	[ ]	[ ]	[ ]
21. I found it hard to think properly or concentrate	[ ]	[ ]	[ ]
22. I thought bad things would happened to me	[ ]	[ ]	[ ]
23. I hated myself	[ ]	[ ]	[ ]
24. I felt I was a bad person	[ ]	[ ]	[ ]
25. I thought I looked ugly	[ ]	[ ]	[ ]
26. I worried about aches and pains	[ ]	[ ]	[ ]
27. I felt lonely	[ ]	[ ]	[ ]
28. I thought nobody really loved me	[ ]	[ ]	[ ]
29. I didn't have any fun at school	[ ]	[ ]	[ ]
30. I thought I could never be as good as other kids	[ ]	[ ]	[ ]
31. I did everything wrong	[ ]	[ ]	[ ]
32. I didn't sleep as well as I usually sleep	[ ]	[ ]	[ ]
33. I slept a lot more than usual	[ ]	[ ]	[ ]

TMQQ

4) Here are some questions about what your memories for the frightening event are like **now**. There are no right or wrong answers to these questions. Please read each sentence carefully and tell us how much you agree with each one, by ticking the box which best matches what your memories are like.

		Disagree a lot	*Disagree a bit*	*Agree a bit*	*Agree a lot*
1.	My memories of the frightening event are mostly pictures or images.	[ ]	[ ]	[ ]	[ ]
2.	I can't seem to put the frightening event into words.	[ ]	[ ]	[ ]	[ ]
3.	When I have memories of what happened I sometimes hear things in my head that I heard during the frightening event.	[ ]	[ ]	[ ]	[ ]
4.	When I remember the frightening event I feel like it is happening right now.	[ ]	[ ]	[ ]	[ ]
5.	When I think about the frightening event I can sometimes smell things that I smelt when the frightening event happened.	[ ]	[ ]	[ ]	[ ]
6.	I can talk about what happened very easily.	[ ]	[ ]	[ ]	[ ]
7.	I remember the frightening event as a few moments, and each moment is a picture in my mind.	[ ]	[ ]	[ ]	[ ]
8.	My memories of the frightening event are like a film that plays over and over.	[ ]	[ ]	[ ]	[ ]
9.	My memories of the frightening event are very clear and detailed.	[ ]	[ ]	[ ]	[ ]
10.	Remembering what happened during the frightening event is just like looking at photographs of it in my mind.	[ ]	[ ]	[ ]	[ ]
11.	When memories come to mind of what happened, I feel my body is in the same position as when the frightening event occurred.	[ ]	[ ]	[ ]	[ ]

5) We would like to ask you some questions about how you think and feel about the frightening event that happened to you a while ago. There are no right or wrong answers to these questions.

		Disagree a lot	*Disagree a bit*	*Agree a bit*	*Agree a lot*
1.	The frightening event is part of who I am now.	[ ]	[ ]	[ ]	[ ]
2.	The frightening event has changed how I think and feel about myself and the world.	[ ]	[ ]	[ ]	[ ]
3.	If I were to tell a story about my life, the frightening event would be one of the most important parts.	[ ]	[ ]	[ ]	[ ]
4.	The frightening event has changed the way I think and feel about things that happen now and in the past.	[ ]	[ ]	[ ]	[ ]
5.	The frightening event has changed my life forever.	[ ]	[ ]	[ ]	[ ]
6.	I always think about how the frightening event will affect my future.	[ ]	[ ]	[ ]	[ ]
7.	The frightening event is a turning point in my life.	[ ]	[ ]	[ ]	[ ]

6) Do you ever have memories of the frightening event that come to you out of the blue and make you feel really upset, worried or angry? If your answer is "NO", please tick the 'NO MEMORY' column right when answering each of the following questions below. If you answered YES, please think of a time in the past week where you had a frightening memory of the event. What date did you have this memory? _____

Please think about you recent memory of the event when you answer the questions below.

	"When I remembered the event....."	*Not at all like that*	*A little bit like that*	*Like that*	*Very much like that*	*NO MEMORY*
1.	I can actually see myself in this picture, as if I was watching from another person's body.	[ ]	[ ]	[ ]	[ ]	[ ]
2.	When I remembered the event, I had extremely positive emotions.	[ ]	[ ]	[ ]	[ ]	[ ]
3.	When I remembered the event, I had extremely negative emotions about the accident.	[ ]	[ ]	[ ]	[ ]	[ ]
4.	When I remembered the event, I experienced really strong emotions (e.g., sadness, worry, anger).	[ ]	[ ]	[ ]	[ ]	[ ]
5.	When I remembered the event, my mood changed.	[ ]	[ ]	[ ]	[ ]	[ ]
6.	When I remembered the event, it came to me as a story with words.	[ ]	[ ]	[ ]	[ ]	[ ]
7.	My memory of the frightening event came to me as a complete story with no missing parts.	[ ]	[ ]	[ ]	[ ]	[ ]
8.	My memory of the event came to me out of the blue, without even trying.	[ ]	[ ]	[ ]	[ ]	[ ]
9.	When I remembered the frightening event, memories of other accidents also came into my mind.	[ ]	[ ]	[ ]	[ ]	[ ]
10.	When I remembered the frightening event, memories of other events that happened at the time also came into my mind.	[ ]	[ ]	[ ]	[ ]	[ ]
11.	An event (e.g., something on television, a conversation) caused me to have the frightening memory.	[ ]	[ ]	[ ]	[ ]	[ ]
12.	A thought (e.g., thinking about cars) caused me to have the frightening memory.	[ ]	[ ]	[ ]	[ ]	[ ]
13.	When I remembered the frightening event, I felt as if it was actually happening to me all over again.	[ ]	[ ]	[ ]	[ ]	[ ]
14.	The memory I had of the frightening event was completely true.	[ ]	[ ]	[ ]	[ ]	[ ]

CPTCI

7) We would now like to find out about your thoughts and feelings about the frightening event in the **past week**. Please read this list of thoughts some children have after frightening events and then tell us how much you AGREE or DISAGREE with each sentence, by ticking the box that best matches how you think about the event. Remember, people react to frightening events in many different ways, and there are no right or wrong answers to these questions.

		Don't agree at all	*Don't agree a bit*	*Agree a bit*	*Agree a lot*
1.	Anyone could hurt me.	[ ]	[ ]	[ ]	[ ]
2.	Everyone lets me down.	[ ]	[ ]	[ ]	[ ]
3.	I am a coward.	[ ]	[ ]	[ ]	[ ]
4.	My reactions since the frightening event mean I have changed for the worse.	[ ]	[ ]	[ ]	[ ]
5.	I don't trust people.	[ ]	[ ]	[ ]	[ ]
6.	My reactions since the frightening event mean something is seriously wrong with me.	[ ]	[ ]	[ ]	[ ]
7.	I am no good.	[ ]	[ ]	[ ]	[ ]
8.	Not being able to get over all my fears means that I am a failure.	[ ]	[ ]	[ ]	[ ]
9.	Small things upset me.	[ ]	[ ]	[ ]	[ ]
10.	I can't cope when things get tough.	[ ]	[ ]	[ ]	[ ]
11.	I can't stop bad things from happening to me.	[ ]	[ ]	[ ]	[ ]
12.	I have to watch out for danger all the time.	[ ]	[ ]	[ ]	[ ]
13.	My reactions since the frightening event mean I will never get over it.	[ ]	[ ]	[ ]	[ ]
14.	I used to be a happy person but now I am always sad.	[ ]	[ ]	[ ]	[ ]
15.	Bad things always happen.	[ ]	[ ]	[ ]	[ ]
16.	I will never be able to have normal feelings again.	[ ]	[ ]	[ ]	[ ]
17.	I'm scared that I'll get so angry that I'll break something or hurt someone.	[ ]	[ ]	[ ]	[ ]
18.	Life is not fair.	[ ]	[ ]	[ ]	[ ]
19.	My life has been destroyed by the frightening event.	[ ]	[ ]	[ ]	[ ]
20.	I feel like I am a different person since the frightening event.	[ ]	[ ]	[ ]	[ ]

		Don't agree at all	*Don't agree a bit*	*Agree a bit*	*Agree a lot*
21.	My reactions since the frightening event show that I must be going crazy.	[ ]	[ ]	[ ]	[ ]
22.	Nothing good can happen to me anymore.	[ ]	[ ]	[ ]	[ ]
23.	Something terrible will happen if I do not try to control my thoughts about the frightening event.	[ ]	[ ]	[ ]	[ ]
24.	The frightening event has changed me forever.	[ ]	[ ]	[ ]	[ ]
25.	I have to be really careful because something bad could happen.	[ ]	[ ]	[ ]	[ ]

CRSQ

8) Here is a list of some more thoughts that some children have after scary events. Please read this list carefully and then tell us how much you AGREE or DISAGREE with each sentence by ticking the box that best matches how you have been thinking in the **past week**. Again, there are no right or wrong answers to these questions.

		Disagree a lot	*Disagree a bit*	*Agree a bit*	*Agree a lot*
1.	I keep wishing that I could go back in time and stop the event from happening.	[ ]	[ ]	[ ]	[ ]
2.	Whenever I think of the event I wonder why it happened to us.	[ ]	[ ]	[ ]	[ ]
3.	I am always wondering if my family or I might get hurt again.	[ ]	[ ]	[ ]	[ ]
4.	I made the event happen.	[ ]	[ ]	[ ]	[ ]
5.	It was my fault the event happened.	[ ]	[ ]	[ ]	[ ]

TC & SB

9) We would now like you to know about the things that you have been doing when you think about the frightening event. Please read each sentence and tick the box that best matches what you have been doing in the **past week**. There are no right or wrong answers to these questions.

		Disagree a lot	*Disagree a bit*	*Agree a bit*	*Agree a lot*
1.	When I have thoughts or memories about what happened I try hard to push them out of my mind.	[ ]	[ ]	[ ]	[ ]
2.	When I have thoughts or memories about what happened I try to think about something else instead.	[ ]	[ ]	[ ]	[ ]
3.	When I have thoughts or memories about what happened I keep busy doing other things	[ ]	[ ]	[ ]	[ ]
4.	When I have thoughts or memories about what happened I try to control how I feel	[ ]	[ ]	[ ]	[ ]
5.	When I have thoughts or memories about what happened I try to get rid of the memory.	[ ]	[ ]	[ ]	[ ]

AP

10) Here is a list of the some things children may do after a frightening event. Please read this list carefully and then tell us how much you AGREE or DISAGREE with each sentence by ticking the box that best matches you in the **past week**. There are no right or wrong answers to these questions.

		Disagree a lot	*Disagree a bit*	*Agree a bit*	*Agree a lot*
1.	I try to understand what happening during the event.	[ ]	[ ]	[ ]	[ ]
2.	I try and piece it together in my mind.	[ ]	[ ]	[ ]	[ ]
3.	I explain the whole story to my friends and family.	[ ]	[ ]	[ ]	[ ]
4.	I think it through so that what happened makes sense in my mind.	[ ]	[ ]	[ ]	[ ]
5.	I get help from my family and friends to understand the accident.	[ ]	[ ]	[ ]	[ ]

CP

11) The following questions are about your pain. Please tick the right answer for you. There are no right or wrong answers to these questions.

	Not at all	*A little*	*Some*	*A lot*
1. How much pain were you in at the time of the accident?	[ ]	[ ]	[ ]	[ ]
2. Are you in pain at the moment?	[ ]	[ ]	[ ]	[ ]

13) We would now like to find out about the different things you have been doing since the frightening event in the past week. Please read this list and then tell us how much you AGREE or DISAGREE with each sentence, by ticking the box that best matches you. Remember, there are no right or wrong answers to these questions.

	Never	*Sometimes*	*Often*	*Always*
1. I do not like being away from adults that I trust (e.g., teachers, parents)	[ ]	[ ]	[ ]	[ ]
2. I always check that my friends and family are safe	[ ]	[ ]	[ ]	[ ]
3. I am always thinking about ways to make myself safer	[ ]	[ ]	[ ]	[ ]
4. I am really careful to stay away from unsafe situations	[ ]	[ ]	[ ]	[ ]
5. I am careful not to do dangerous things	[ ]	[ ]	[ ]	[ ]
6. I often do things to try and make myself feel safer	[ ]	[ ]	[ ]	[ ]
7. I always check that doors and windows are locked or I ask my parents to	[ ]	[ ]	[ ]	[ ]
8. When I go somewhere now I always check for the quickest way to leave in case something goes wrong	[ ]	[ ]	[ ]	[ ]
9. I do not like to try new things	[ ]	[ ]	[ ]	[ ]
10. I try to stop my feelings about it	[ ]	[ ]	[ ]	[ ]
11. I always check my body is okay	[ ]	[ ]	[ ]	[ ]
12. I do not like changing the way I do things	[ ]	[ ]	[ ]	[ ]
13. I try really hard to stop my thoughts about it	[ ]	[ ]	[ ]	[ ]
14. I try not to let other people see how I am feeling	[ ]	[ ]	[ ]	[ ]
15. I like to know exactly what is happening around me	[ ]	[ ]	[ ]	[ ]
16. I do extra things to make sure the places I am are safe	[ ]	[ ]	[ ]	[ ]
17. I do not like making choices	[ ]	[ ]	[ ]	[ ]
18. I always like to make sure that the people around me are not dangerous (e.g., by asking mum, staring at people)	[ ]	[ ]	[ ]	[ ]
19. I carry an object (e.g., special toy, sharp object) to make myself feel safer	[ ]	[ ]	[ ]	[ ]
20. I sleep with the lights on so that I feel safer	[ ]	[ ]	[ ]	[ ]
21. I like to be near a telephone, or, I like my parents to be near a telephone so they or I can quickly call for help	[ ]	[ ]	[ ]	[ ]
22. I have a plan of what I should do if things go wrong	[ ]	[ ]	[ ]	[ ]

14) The following questions are about how you have been acting in the past week. Please read the list carefully and choose the answer that best describes you in the past week.

	Not at all like that	*A little bit like that*	*Like that*	*Very much like that*
1. I am good at stopping myself from doing naughty or cheeky things	[ ]	[ ]	[ ]	[ ]
2. It is hard for me to stop my bad habits	[ ]	[ ]	[ ]	[ ]
3. I am lazy	[ ]	[ ]	[ ]	[ ]
4. I always say the wrong thing	[ ]	[ ]	[ ]	[ ]
5. I never lose control of myself	[ ]	[ ]	[ ]	[ ]
6. I do things that I am not allowed to do, if I think they are fun	[ ]	[ ]	[ ]	[ ]
7. I have trouble saying no	[ ]	[ ]	[ ]	[ ]
8. I change my mind a lot	[ ]	[ ]	[ ]	[ ]
9. I always say things without thinking first	[ ]	[ ]	[ ]	[ ]
10. Other people (e.g., teacher, mother) always say I do things without thinking	[ ]	[ ]	[ ]	[ ]
11. I refuse things that are bad for me	[ ]	[ ]	[ ]	[ ]
12. I keep everything neat (e.g., desk at school, my bedroom)	[ ]	[ ]	[ ]	[ ]
13. I often do what I want without thinking of others	[ ]	[ ]	[ ]	[ ]

Children's A&E 2-3months
non-PTSD/PTSD sample (LONG SELF REPORT QUESTIONS)
BASELINE

MSPSS

We would now like to ask you some questions regarding your thoughts and feelings about your friends and family. These answers are between you and me, so try and answer these questions as honestly as possible as there are no right or wrong answers. Please read each sentence carefully and tell us how much each of these sentences is true for you.

Circle the "1" if you Very Strongly Disagree
Circle the "2" if you Strongly Disagree
Circle the "3" if you Mildly Disagree
Circle the "4" if you are Neutral
Circle the "5" if you Mildly Agree
Circle the "6" if you Strongly Agree
Circle the "7" if you Very Strongly Agree

		Very strongly disagree						*Very strongly agree*
1.	There is a special person who is around when I am in need.	1	2	3	4	5	6	7
2.	There is a special person with whom I can share my joys and sorrows.	1	2	3	4	5	6	7
3.	My family really tries to help me.	1	2	3	4	5	6	7
4.	I get the emotional help and support I need from my family.	1	2	3	4	5	6	7
5.	I have a special person who is a real source of comfort to me.	1	2	3	4	5	6	7
6.	My friends really try to help me.	1	2	3	4	5	6	7
7.	I can count on my friends when things go wrong.	1	2	3	4	5	6	7
8.	I can talk about my problems with my family.	1	2	3	4	5	6	7
9.	I have friends with whom I can share my joys and sorrows.	1	2	3	4	5	6	7
10.	There is a special person in my life who cares about my feelings.	1	2	3	4	5	6	7
11.	My family is willing to help me make decisions.	1	2	3	4	5	6	7
12.	I can talk about my problems with my friends.	1	2	3	4	5	6	7

Well done. You have now finished your questionnaires. Thank you very much for your participation.

Appendix K

R & SPSS Syntax for ERP

#Final R Code for ERP

```
#----Set working directory----
setwd("/Users/dominic/Documents/UEA PHD/Thesis Portfolio/Thesis SPSS Data")

#----Load data----
mydata <- read.csv("Updated_Data_Sheet.csv")

#----Remove rows with NA values----
mydata <- na.omit(mydata)

#----Check the number of rows----
total_cases <- nrow(mydata)
print(total_cases)

#----Load required libraries----
library(randomForest)
library(pdp)
library(ggplot2)
library(ICEbox)
library(caret)
library(dplyr)
library(iml)
library(lme4)
library(car)
library(lmtest)
library(corrplot)
library(psych)

#----Create new variables for Total Re-experiencing + Hyperarousal (w2 & w8)----

mydata$w2_CPSS_TotalReExpHa <- rowSums(cbind(mydata$w2_CPSSIntrusion,
mydata$w2_CPSSArousal), na.rm = TRUE)

mydata$w8_CPSS_TotalReExpHa <- rowSums(cbind(mydata$w8_CPSSIntrusion,
mydata$w8_CPSSArousal), na.rm = TRUE)

#----Check the first few rows to ensure variables correctly created----
head(mydata)
```

#RQ1: Thought Suppression Predict PTSD Symptoms across time

```
#----Fit the regression model----
model <- lm(w8_CPSS_TotalReExpHa ~ w2_ThoughtSuppression, data = mydata)

#----Display the summary of the regression model----
summary(model)

#----Bootstrapping the data----
fit_b <- Boot(model, R = 5000)

summary (fit_b)
confint (fit_b, level = .95)
```

#----Correlation matrix----

```
# Create my data frame with all specified variables
data <- data.frame(
  w2_ThoughtSuppression = mydata$w2_ThoughtSuppression,
  w2_CPSS_TotalReExpHa = mydata$w2_CPSS_TotalReExpHa,
  w2_CPTCITotal = mydata$w2_CPTCITotal,
  w2_TMQQTotal = mydata$w2_TMQQTotal,
  w2_Rumination = mydata$w2_Rumination,
  w2_MSPSSTotal = mydata$w2_MSPSSTotal,
  w2_CDDPQTotal = mydata$w2_CDDPQTotal,
  w8_ThoughtSuppression = mydata$w8_ThoughtSuppression,
  w8_CPSS_TotalReExpHa = mydata$w8_CPSS_TotalReExpHa,
  w8_CPTCITotal = mydata$w8_CPTCITotal,
  w8_TMQQTotal = mydata$w8_TMQQTotal,
  w8_Rumination = mydata$w8_Rumination,
  w8_MSPSSTotal = mydata$w8_MSPSSTotal,
  w8_CDDPQTotal = mydata$w8_CDDPQTotal
)

#----Calculate the correlation matrix and significance levels----
cor_test_results <- corr.test(data, use = "complete.obs")

#----Extract correlation matrix and p-values----
cor_matrix <- cor_test_results$r  # Correlation coefficients
p_values <- cor_test_results$p  # P-values

#----Print the correlation matrix and p-values----
print("Correlation Matrix:")
print(cor_matrix)

print("P-Values:")
print(p_values)
```

```
#----Create a correlation plot with significance levels----
#----Customise colours for significance----
corrplot(cor_matrix, method = "circle", type = "upper",
         tl.col = "black", tl.srt = 45,
         addCoef.col = "black",
         p.mat = p_values,
         sig.level = 0.05,
         insig = "blank")
```

#----RQ2: MACHINE LEARNING----

```
# ---- Cross-Validation ---- #
set.seed(42)  # For reproducibility
cv <- trainControl(method = "cv", number = 10)

cv_model <- train(w8_CPSS_TotalReExpHa ~ w2_ThoughtSuppression +
w8_ThoughtSuppression,
                  data = mydata,
                  method = "rf",
                  trControl = cv)

# Print cross-validation results
print(cv_model)

# ---- Performance of CV (RMSE & MAE SDs) ----
cv_results <- cv_model$resample

#----Standard Deviation of CV RMSE----
sd_rmse <- sd(cv_results$RMSE)
cat("Standard Deviation of RMSE:", sd_rmse, "\n")

#----Standard Deviation of CV MAE----
sd_mae <- sd(cv_results$MAE)
cat("Standard Deviation of MAE:", sd_mae, "\n")

#----Histogram of CV RMSE distribution----
cv_results <- cv_model$resample
ggplot(cv_results, aes(x = RMSE)) +
  geom_histogram(binwidth = 0.1, fill = "lightblue", color = "black") +
  labs(title = "Cross-validation RMSE Distribution", x = "RMSE", y = "Frequency")

# ---- Train Final RF Model ----
set.seed(42) #ensures reproducibility when using random model
```

```
final_rf <- randomForest(w8_CPSS_TotalReExpHa ~ w2_ThoughtSuppression +
w8_ThoughtSuppression,
                         data = mydata,
                         ntree = 500,  # Increase trees for better generalization
                         importance = TRUE)  # Enables feature importance extraction

#----Print summary of final RF model----
print(final_rf)

#----Give MSE from the output----
mse <- 27.3601

#----Calculate RMSE of Final Model----
rmse <- sqrt(mse)

#----Print RMSE----
print(paste("RMSE of the final model:", round(rmse, 2)))

# ---- Calculate the MAE for the Final Model ----
# Generate predictions from the final model
predictions <- predict(final_rf, newdata = mydata)

#----Calculate the residuals (difference between actual and predicted values)----
residuals <- mydata$w8_CPSS_TotalReExpHa - predictions

#----Calculate the MAE (Mean Absolute Error)----
mae <- mean(abs(residuals))

#----Print the MAE----
print(paste("MAE of the final model:", round(mae, 2)))

# ---- Feature Importance ----
importance(final_rf)  # Print feature importance scores
varImpPlot(final_rf)  # Visualise feature importance


# ---- PDP & ICE Plots ----
#----Ensure no missing values in numeric columns before PDP----
numeric_cols <- sapply(mydata, is.numeric)
mydata[, numeric_cols] <- lapply(mydata[, numeric_cols], function(x) ifelse(is.na(x), mean(x,
na.rm = TRUE), x))

#----Generate PDPs for the predictors----
pdp_w2 <- partial(final_rf, pred.var = "w2_ThoughtSuppression", train = mydata)
pdp_w8 <- partial(final_rf, pred.var = "w8_ThoughtSuppression", train = mydata)
```

```
#----Ensure 'yhat' column (w8 PTSD-RH) exists in both pdp_w2 and pdp_w8----
if (!"yhat" %in% colnames(pdp_w2) | !"yhat" %in% colnames(pdp_w8)) {
  stop("Error: 'yhat' column not found in PDP output. Check column names.")
}

#----Set y-axis limits safely----
y_min <- min(pdp_w2$yhat, pdp_w8$yhat, na.rm = TRUE)
y_max <- max(pdp_w2$yhat, pdp_w8$yhat, na.rm = TRUE)

#----Plot PDP for w2_ThoughtSuppression----
plot_pdp_w2 <- ggplot(pdp_w2, aes(x = w2_ThoughtSuppression, y = yhat)) +
  geom_line() +
  xlab("Week 2 Thought Suppression") +
  ylab("Week 8 PTSD-RH Symptoms") +
  ylim(y_min, y_max) +
  ggtitle("PDP for Week two Thought Suppression")

#----Plot PDP for w8_ThoughtSuppression----
plot_pdp_w8 <- ggplot(pdp_w8, aes(x = w8_ThoughtSuppression, y = yhat)) +
  geom_line() +
  xlab("Week 8 Thought Suppression") +
  ylab("Week 8 PTSD-RH Symptoms") +
  ylim(y_min, y_max) +
  ggtitle("PDP for Week eight Thought Suppression")

#----Print PDP plots----
print(plot_pdp_w2)
print(plot_pdp_w8)


#----ICE Plots----
explainer <- ice(object = final_rf,
                 X = mydata[, !names(mydata) %in% "w8_CPSS_TotalReExpHa"],
                 y = mydata$w8_CPSS_TotalReExpHa,
                 predictor = "w2_ThoughtSuppression")

plot_ice_w2 <- plot(explainer, xlab = "w2 Thought Suppression", ylab = "Predicted w8 PTSD-
RH Symptoms", main = "ICE Plot for week two Thought Suppression")

explainer_w8 <- ice(object = final_rf,
                    X = mydata[, !names(mydata) %in% "w8_CPSS_TotalReExpHa"],
                    y = mydata$w8_CPSS_TotalReExpHa,
                    predictor = "w8_ThoughtSuppression")
```

```
plot_ice_w8 <- plot(explainer_w8, xlab = "w8 Thought Suppression", ylab = "Predicted w8
PTSD-RH Symptoms", main = "ICE Plot for week eight Thought Suppression")

print(plot_ice_w2)
print(plot_ice_w8)

# ---- Additional Performance Tests ----

# ---- SHAP Test ----
# Create the model predictor object for SHAP analysis
predictor <- Predictor$new(final_rf, data = mydata[, c("w2_ThoughtSuppression",
"w8_ThoughtSuppression")],
                           y = mydata$w8_CPSS_TotalReExpHa)

#----Compute SHAP values for the prediction-----
shap_values <- Shapley$new(predictor, x.interest = mydata[1, c("w2_ThoughtSuppression",
"w8_ThoughtSuppression")])

#----Plot SHAP values----
shap_values$plot()

# ---- Residual Analysis ----
# Check residuals to ensure there are no significant patterns (for regression tasks)
residuals_rf <- final_rf$predicted - mydata$w8_CPSS_TotalReExpHa
hist(residuals_rf, main = "Residuals of Final RF Model", xlab = "Residuals", col = "skyblue",
border = "black")
```

#----RQ3: Moderation analysis on w2_TS & w8-PTSD-RH----

```
#Bootstrapping code applied for all moderations under main analyses
```

#----CPTCI ----

```
#----Model 1 – Simple----

w8_CPSS_TotalReExpHa.mod1simp = lm(w8_CPSS_TotalReExpHa ~
w2_ThoughtSuppression + w2_CPTCITotal, data=mydata)
summary(w8_CPSS_TotalReExpHa.mod1simp)

#----Bootstrapping----
  fit_b <- Boot(w8_CPSS_TotalReExpHa.mod1simp, R = 5000)
  summary (fit_b)

#----Model 2 – Interaction----
w8_CPSS_TotalReExpHa.mod1 = lm(w8_CPSS_TotalReExpHa ~ w2_ThoughtSuppression +
w2_CPTCITotal + w2_ThoughtSuppression*w2_CPTCITotal, data=mydata)
summary(w8_CPSS_TotalReExpHa.mod1)
```

```
print(w8_CPSS_TotalReExpHa.mod1)

#----Bootstrapping----
 fit_b <- Boot(w8_CPSS_TotalReExpHa.mod1, R = 5000)
 summary (fit_b)
 confint (fit_b, level = .95)

#----TMQQ----
#----Model 1 – Simple----

w8_CPSS_TotalReExpHa.mod2simp = lm(w8_CPSS_TotalReExpHa ~
w2_ThoughtSuppression + w2_TMQQTotal, data=mydata)
summary(w8_CPSS_TotalReExpHa.mod2simp)

#----Bootstrapping----
  fit_b <- Boot(w8_CPSS_TotalReExpHa.mod2simp, R = 5000)
  summary (fit_b)
  confint (fit_b, level = .95)

#----Model 2 – Interaction----
w8_CPSS_TotalReExpHa.mod2 = lm(w8_CPSS_TotalReExpHa ~ w2_ThoughtSuppression +
w2_TMQQTotal + w2_ThoughtSuppression*w2_TMQQTotal, data=mydata)
summary(w8_CPSS_TotalReExpHa.mod2)
print(w8_CPSS_TotalReExpHa.mod2)

#----Bootstrapping----
 fit_b <- Boot(w8_CPSS_TotalReExpHa.mod2, R = 5000)
 summary (fit_b)
 confint (fit_b, level = .95)

#----Rumination----

#----Model 1 – Simple----
w8_CPSS_TotalReExpHa.mod3simp = lm(w8_CPSS_TotalReExpHa ~
w2_ThoughtSuppression + w2_Rumination, data=mydata)
summary(w8_CPSS_TotalReExpHa.mod3simp)

#----Bootstrapping----
  fit_b <- Boot(w8_CPSS_TotalReExpHa.mod3simp, R = 5000)
  summary (fit_b)
  confint (fit_b, level = .95)


#----Model 2 – Interaction ----
w8_CPSS_TotalReExpHa.mod3 = lm(w8_CPSS_TotalReExpHa ~ w2_ThoughtSuppression +
w2_Rumination + w2_ThoughtSuppression*w2_Rumination, data=mydata)
```

```
summary(w8_CPSS_TotalReExpHa.mod3)
print(w8_CPSS_TotalReExpHa.mod3)

#----Bootstrapping----
 fit_b <- Boot(w8_CPSS_TotalReExpHa.mod3, R = 5000)
 summary (fit_b)
 confint (fit_b, level = .95)
```

#----MSPSS----

```
#----Model 1 – Simple----
w8_CPSS_TotalReExpHa.mod4simp = lm(w8_CPSS_TotalReExpHa ~
w2_ThoughtSuppression + w2_MSPSSTotal, data=mydata)
summary(w8_CPSS_TotalReExpHa.mod4simp)

#----Bootstrapping----
  fit_b <- Boot(w8_CPSS_TotalReExpHa.mod4simp, R = 5000)
  summary (fit_b)
  confint (fit_b, level = .95)


#----Model 2 – Interaction----
w8_CPSS_TotalReExpHa.mod4 = lm(w8_CPSS_TotalReExpHa ~ w2_ThoughtSuppression +
w2_MSPSSTotal + w2_ThoughtSuppression*w2_MSPSSTotal, data=mydata)
summary(w8_CPSS_TotalReExpHa.mod4)
print(w8_CPSS_TotalReExpHa.mod4)

#----Bootstrapping----
 fit_b <- Boot(w8_CPSS_TotalReExpHa.mod4, R = 5000)
 summary (fit_b)
 confint (fit_b, level = .95)
```

#----CDDPQ----

```
#----Model 1 – Simple ----
w8_CPSS_TotalReExpHa.mod5simp = lm(w8_CPSS_TotalReExpHa ~
w2_ThoughtSuppression + w2_CDDPQTotal, data=mydata)
summary(w8_CPSS_TotalReExpHa.mod5simp)

#-----Bootstrapping----
  fit_b <- Boot(w8_CPSS_TotalReExpHa.mod5simp, R = 5000)
  summary (fit_b)
  confint (fit_b, level = .95)


#----Model 2 – Interaction----
```

```
w8_CPSS_TotalReExpHa.mod5 = lm(w8_CPSS_TotalReExpHa ~ w2_ThoughtSuppression +
w2_CDDPQTotal + w2_ThoughtSuppression* w2_CDDPQTotal, data=mydata)
summary(w8_CPSS_TotalReExpHa.mod5)
print(w8_CPSS_TotalReExpHa.mod5)

#----Bootstrapping----
 fit_b <- Boot(w8_CPSS_TotalReExpHa.mod5, R = 5000)
 summary (fit_b)
 confint (fit_b, level = .95)
```

#----Assumptions of moderator testing----

```
#----Durbin Watson Test----
dwtest(w8_CPSS_TotalReExpHa.mod1)
# Q-Q Plots
qqnorm(residuals(w8_CPSS_TotalReExpHa.mod1))
qqline(residuals(w8_CPSS_TotalReExpHa.mod1))

#----Shapiro-Wilk Test----
shapiro.test(residuals(w8_CPSS_TotalReExpHa.mod1))

#----Cooks Residual (Outliers)----
plot(w8_CPSS_TotalReExpHa.mod1, which = 5)

#----Homoscedasticty (Scale-Location Plot)----
plot(w8_CPSS_TotalReExpHa.mod1, which = 3)

#----Calculate VIF for all variables in the model----
vif_values_mod1 <- vif(w8_CPSS_TotalReExpHa.mod1)
print(vif_values_mod1)

#----Repeat for all models 1-5----
```

SPSS Syntax:

#----Clean Missing Data in SPSS----

```
SELECT IF NMiss
(w2_cpassocial,w2_cpasemotional,w2_CPTTotal,w2_CDDPQ,w2_CPPTotal,w2_CPSS_peridiss
oc,w2_CPSSTotal,w2_CPSSIntrusion,w2_CPSSAvoidance,w2_CPSSArousal,w2_CPSSDiagno
sis,w2_scastotalraw,w2_scasrawpanicagoraphobia,w2_scasrawseparationanxiety,w2_scasrawph
ysicalinjury,w2_scasrawsocialphobia,w2_scasrawocd,w2_scasrawgad,w2_scasdiagnosis,w2_sca
socddiagnosis,w2_scassocialdiagnosis,w2_scaspanicdiagnosis,w2_scasseparationdiagnosis,w2_s
casphysicaldiagnosis,w2_scasgaddiagnosis,w2_SMFQTotal,w2_SMFQDiagnosis,w2_TMQQTo
tal,w2_CPTCITotal,w2_CPTCIChange,w2_CPTCIFragile,w2_Rumination,w2_SelfBlame,w2_T
```

houghtSuppression,w2_AdaptiveProcessing,w2_MSPSSTotal,w2_MSPSSFamily,w2_MSPSSFriends,w2_MSPSSSigOthers,w8_csdctotal,w8_CPTTotal,w8_CDDPQTotal,w8_CPPTotal,w8_CPSSTotal,w8_CPSSIntrusion,w8_CPSSAvoidance,w8_CPSSArousal,w8_CPSSDiagnosis,w8_scastotalraw,w8_scasrawpanicagoraphobia,w8_scasrawseparationanxiety,w8_scasrawphysicalinjury,w8_scasrawsocialphobia,w8_scasrawocd,w8_scasrawgad,w8_scasdiagnosis,w8_scasocddiagnosis,w8_scassocialdiagnosis,w8_scaspanicdiagnosis,w8_scasseparationdiagnosis,w8_scasphysicaldiagnosis,w8_scasgaddiagnosis,w8_SMFQTotal,w8_SMFQDiagnosis,w8_TMQQTotal,w8_CPTCITotal,w8_CPTCIChange,w8_CPTCIFragile,w8_Rumination,w8_SelfBlame,w8_ThoughtSuppression,w8_AdaptiveProcessing,w8_MSPSSTotal,w8_MSPSSFamily,w8_MSPSSFriends,w8_MSPSSSigOthers)<1

Correlations Matrix

```
DATASET ACTIVATE DataSet1.
CORRELATIONS
/VARIABLES=w2_ThoughtSuppression w2_CPSS_TotalReExpHa w2_CPTCITotal
w2_TMQQTotal w2_Rumination w2_MSPSSTotal w2_CDDPQ w8_ThoughtSuppression
w8_CPSS_TotalReExpHa w8_CPTCITotal w8_TMQQTotal w8_Rumination w8_MSPSSTotal
w8_CDDPQTotal
  /PRINT=TWOTAIL NOSIG FULL
  /MISSING=PAIRWISE.
```