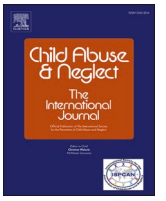
Child Abuse & Neglect 157 (2024) 107060

Contents lists available at ScienceDirect

Child Abuse & Neglect

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



Research article

Child maltreatment in a high adversity context: Associations of age, type and timing of exposure with psychopathology in middle childhood

Florian Juen [a,*], Tobias Hecker [b,c,d], Katharin Hermenau [d,e], Marty H. Teicher [f,g], Getrude Mikinga [d,h], Mabula Nkuba [d,i], Faustine B. Masath [i], Inga Schalinski [a,d]

[a] Department of Human Sciences, Institute of Psychology, Universität der Bundeswehr München, Germany
[b] Department of Psychology, University of Bielefeld, Germany
[c] Institute for interdisciplinary Research on Conflict & Violence, University of Bielefeld, Germany
[d] Non-Governmental Organization Vivo International e.V., Konstanz, Germany
[e] Clinic of Child and Adolescent Psychiatry and Psychotherapy, Protestant Hospital Bethel, University Hospital EWL, Bielefeld University, Germany
[f] Department of Psychiatry, Harvard Medical School, Boston, MA, United States of America
[g] Developmental Biopsychiatry Research Program, McLean Hospital, Belmont, MA, United States of America
[h] Department of Educational Psychology and Curriculum Studies, Mkwawa University College of Education, Iringa, Tanzania
[i] Department of Educational Psychology and Curriculum Studies, Dar es Salaam University College of Education, Dar es Salaam, Tanzania

ARTICLE INFO

Keywords:
Type and timing
Childhood maltreatment
Psychopathology
Sensitive periods

ABSTRACT

Background: While cumulative childhood maltreatment (CM) has been linked to psychopathological outcomes, recent studies point to the relevance of the type and timing of exposure. The aim of the current study was to better understand their importance beyond the cumulative burden of CM for psychopathological symptoms in middle childhood.
Methods: A total of $N = 341$ children ($M = 9.92$, $SD = 1.51$) were interviewed to assess trauma load (UCLA - University of California at Los Angeles Event List), exposure to CM (pediMACE - Maltreatment and Abuse Chronology of Exposure - Pediatric Interview) and different outcomes of psychopathology (UCLA Posttraumatic Stress Disorder Reaction Index, Children's Depression Inventory (CDI), Strengths and Difficulties Questionnaire (SDQ). We employed conditioned random forest regression, incorporating type, timing, and cumulative indicators of CM, to assess the importance of each predictor simultaneously.
Results: Exposure to CM (abuse, neglect and cumulative indicators) exhibited a robust association with psychopathological outcomes. Recent abuse and recent neglect showed most robust associations with outcomes, neglect was stronger related to internalizing problems and timing of exposure showed clear associations with diverse pathological outcomes.
Conclusion: Beyond the cumulative burden, type and timing of CM show direct and diverse associations to pathological outcomes in middle childhood. Our results highlight the critical importance of early and detailed identification of CM, particularly recent exposure. This finding is valuable for researchers and clinicians, as it can refine diagnostic assessments and pave the way for effective early intervention strategies for affected children.

* Corresponding author at: Department of Human Sciences, Institute of Psychology, Universität der Bundeswehr München, Werner von Heisenberg Ring, Germany.
E-mail address: praxis@f-juen.de (F. Juen).

https://doi.org/10.1016/j.chiabu.2024.107060
Received 16 March 2024; Received in revised form 29 June 2024; Accepted 12 September 2024
Available online 18 September 2024

1. Introduction

Child maltreatment (CM) is a pervasive global phenomenon with profound health implications for millions of individuals. CM includes various forms of mistreatment experienced by individuals under 18, such as sexual, physical, and emotional abuse, as well as physical or emotional neglect (Juwariah et al., 2022; Manly, 2005) . Global prevalence rates for different types of CM range from 12.7 % (sexual abuse) to 36.3 % (emotional abuse) (Stoltenborgh et al., 2015) with even higher rates in some countries due to social and legal acceptance of violence against children (Moody et al., 2018; Myers et al., 2021). Empirical research has consistently illustrated a broad spectrum of aberrant individual outcomes linked to CM, such as lower levels of education and employment prospects (Currie & Widom, 2010), an elevated risk of psychopathology in adulthood (Petruccelli et al., 2019; Porter et al., 2020) or alterations in brain structure and functioning (McLaughlin et al., 2016; Teicher et al., 2016). Also during childhood and adolescence devastating effects have been described including higher rates of internalizing problems like anxiety and depression (Elmore & Crouch, 2020), suicidal behavior (Miller et al., 2013) and the development of aggressive and externalizing behavior problems (Kerker et al., 2015; Kızıltepe et al., 2020; Masath et al., 2023; Nkuba et al., 2019; Vilariño et al., 2022). Additionally, CM has been associated with impairments in cognitive functioning (Ainamani et al., 2021). Overall, several dimensions of CM exposure have lasting, multifinal effects on health and functioning throughout the entire lifespan demonstrated by a robust dose-response function describing the relationship between CM exposure and short- and long-term outcomes (Frewen et al., 2019; Schiff et al., 2023).

Yet, a cumulative analytic approach has its limitations when it comes to providing intricate insights into various aspects of maltreatment, such as type and timing, recency of exposure, duration or severity in the prediction of psychopathology. Diverse CM dimensions might act via distinct proximal pathways (McGinnis et al., 2022) and there is evidence for sensitive periods reporting relevance of CM exposure especially during middle childhood, e.g., for emotion dysregulation (Dunn et al., 2018), of emotional subtypes of CM (abuse and especially neglect) for lifetime depression (Gerke et al., 2018; see also review of Li et al., 2023) and of emotional neglect at ages 8–9 for severity of depressive symptoms in adults with mental illness (Schalinski et al., 2016). Dunn et al. (2023) report that girls exposed to harsh physical discipline at age 9 and boys exposed at age 5 were at highest risk for both internalizing and externalizing symptoms. Moreover, middle childhood is reported to be a highly vulnerable period in the developing brain structure (Tomoda et al., 2024). A recent meta-analysis (Schaefer et al., 2022) concludes that while timing effects are consistently reported, specific sensitive periods have yet to be identified for diverse outcomes (Herzog et al., 2020; Schaefer et al., 2022; Schalinski et al., 2016). In a longitudinal study Russotti et al. (2021) reported that chronic CM experiences over several developmental periods including middle childhood (compared to non-chronic exposure) predicted both greater short-term internalizing and externalizing childhood symptoms, as well as indirect pathways that resulted in greater anxiety, depression or substance dependence symptoms in emerging adulthood. In addition, exposure to abuse (especially physical abuse) correlated more strongly with externalizing problems whereas other forms, especially emotional neglect, appeared to be primarily associated with internalizing problems (Gomis-Pomares & Villanueva, 2022). However, most of the research stems from retrospective report of adults, official records or adolescent self-reports.

Little is known about differential type and timing effects on short-term consequences in middle childhood and pre-adolescence on self-report data. Therefore, it is important to take a deeper look at this early and vulnerable age group. Knowledge on underlying developmental mechanisms linking childhood adversity to psychopathology remains cursory. A better understanding of these pathways following exposure to adversity including CM could lead us to better detection, as well as more targeted and timely interventions for children to mitigate negative mental health outcomes following maltreatment exposure.

Yet, research on type, timing and pathological outcomes in children face two major problems: First, effects are difficult to examine in isolation due to high collinearity among maltreatment parameters (Hales et al., 2022; Wang et al., 2021). The DMAP (Dimensional Model of Adversity and Psychopathology) model of childhood adversity (Miller et al., 2018) categorizes experiences along dimensions of threat and deprivation (both physical and emotional), emphasizing how these distinct forms of CM uniquely affect developmental trajectories and psychopathological outcomes. CM types often co-occur and characteristics of CM are not homogeneous in their risk that they confer for psychopathology. Various methods have been employed in research to address these challenges. For instance, person-centered methods such as latent class analysis have been employed to capture natural occurrences of exposure (Handley et al., 2024; Villodas et al., 2012; Warmingham et al., 2019).

Another difficulty is the lack of information about timing and duration of exposure (Lew & Xian, 2019; Oh et al., 2018; Reuben et al., 2016) in childhood with a noticeable gap in the availability of instruments that capture the child's perspective. Here, we face challenges by the developing autobiographical narrative skills from early to middle childhood/early adolescence (Bauer & Larkina, 2020). The developmentally increasing integration of memories of past experiences into an overarching life narrative may impact the accuracy of reports of children about their life experiences (Fivush, 2011). On the other hand, this subjective child's view on CM exposure could clearly help us to better understand subjective dimensions of underlying CM exposure to outcome relations. The pediMACE (Maltreatment and Abuse Chronology of Exposure—Pediatric Interview; Isele et al., 2017) has been developed as a promising tool that includes information about type, timing, as well as cumulative measures such as duration, multiplicity and severity of CM exposure.

In sum, a distinct consideration of the highly vulnerable early and prepubertal periods in combination with self-report measures could help to gain initial insights into potential underlying developmental pathways following exposure to adversity. To ensure sufficient variation and prevalence in subtypes and timing information, we examined a high adversity sample of Tanzanian children, a society where violence is socially accepted and thus highly prevalent in child rearing. Our primary objectives were (1) to replicate the association between cumulative exposure to adverse experiences (different traumatic experiences and CM severity, multiplicity and duration) and psychopathological symptoms in this high-risk middle-childhood sample using self-report measures. We assessed

psychopathological symptoms that have been previously associated with traumatic experiences and CM: symptoms of post-traumatic stress disorder (PTSD), depressive symptoms, internalizing and externalizing problems. Moreover, the study (2) aimed to scrutinize the role adverse experiences (traumatic experiences and type and timing of abuse and neglect) on psychopathological outcome and compare the contribution of a larger predictor dataset (including number of different traumatic experiences, CM severity, multiplicity, and duration, along with abuse and neglect (occurring at a certain age or recently). To achieve this aim, we employed conditioned random forest regression (CRF), a method that measure the variable importance of all predictors simultaneously and thus, allows a more fine-grained view. Furthermore, (3) descriptively the results from the overall sample (age range 6–12) were compared to the older subsample (10−12) to gain further insights into consistencies of the effects to the prepubertal age.

2. Methods

2.1. Sample and setting

All participating children were enrolled at a primary school in a small town in Southern Tanzania with approximately 150.000 inhabitants. The school supports orphans and children coming from difficult family backgrounds. All children from grades 2 to 7 and their caregivers were asked to participate. Overall, 80 % of families agreed to participate resulting in an initial subject pool of 409 children (52 % boys). To focus on middle childhood, we included a subsample of 341 children between age 6 and 12 (M = 9.92, SD = 1.51, range = 6–12) in our analysis. We focused on middle childhood because of the reported time specific impact between early childhood and (pre) adolescents. An overall sample (N = 341, ages 6–12) and a subsample (n = 205, ages 10–12) were formed to compare potential variations and consistencies in the exposure-outcome relationship within the age group.

2.2. Procedure

Structured interviews of approximately 1.5 h were conducted in Swahili with the children by a team of psychologists. Assessment of quality was ensured by constant supervision of the procedures and settings of the interviews. Reliability was monitored by double rating of 33 interviews by two independent assessors. Written informed consent forms, as well as letters explaining the study's purpose, were sent to all caregivers for approval before their children participated in the study. Only children whose parents or caregivers had signed and returned the informed consent form were interviewed. The interviews were conducted individually in a quiet setting in school. First, the interviewers introduced themselves and explained the assessment procedure to the child. Every child was verbally informed that this activity was voluntary and that they could end the interview at any time. In addition, they were assured that what they said would be kept confidential. A female interviewer interviewed girls. The Tanzanian Commission for Science and Technology as well as the Ethical Review Board of the University of Konstanz, Germany, approved the study. More details on sample and procedure can be found elsewhere (Hecker et al., 2014; Hecker et al., 2019; Hecker, Hermenau, et al., 2016; Hecker, Radtke, et al., 2016).

2.3. Measures

Socio-demographic information (sex, age, class, life circumstances) were collected.

2.3.1. Child maltreatment

CM was measured using the pediMACE (Isele et al., 2017). The interview consists of 45 dichotomous (yes/no) items measuring adversity exposure during each year of childhood up to 18 (or the current age of the child). Originally 10 subscales are aggregated: parental physical violence / parental emotional violence / sibling(s) physical violence / sibling(s) emotional violence / witnessing interparental violence / witnessing violence to sibling(s) / peer physical / emotional violence / sexual abuse / physical neglect / emotional neglect. To be more comparable to the adult version (MACE), two subscales of siblings related emotional and physical abuse were excluded (see Teicher & Parigger, 2015 for the adult version). Duration was defined as percentage of lifetime with moderate to severe exposure to any type of maltreatment relative to the child's age (potential range: 0–100). The multiplicity score indicates the number of exposures to subtypes exceeding a defined severity cut-off (range: 0–8). The global severity score is formed overall with a range from 0 to 80 and for each subscale (range: 0–10). Neglect sums up the two neglect scales (range: 0–20) and abuse the remaining six scales (range from 0 to 60). Moreover, we aggregate scores for recent abuse and recent neglect defined as exposure within the past year. Cohen's k interrater-reliability in the sample was 0.99 (range 0.88–1).

2.3.2. Trauma load and PTSD symptoms

To evaluate the cumulative impact of trauma, encompassing various types of exposure regardless of their frequency (trauma load) and to identify potential PTSD symptoms we employed the Child Version of the UCLA PTSD Reaction Index and Event List (Steinberg et al., 2004). This self-report instrument is suitable for school-age children and adolescents who report traumatic experiences. The occurrence of each of the symptoms within the last month is scored on a 5-point Likert scale ranging from 0 (none of the time) to 4 (most of the time). The UCLA PTSD Reaction Index has good psychometric properties and has been successfully used in African countries (Ellis et al., 2006). An overall PTSD severity score can be calculated by summing the scores for each symptom (of criteria B, C, D), which results in a maximum possible score of 68. Cronbach's alpha coefficient was 0.90 and Cohen's k-coefficient in the full sample was 0.98 (range 0.82–1).

2.3.3. Depressive symptoms

The Children's Depression Inventory (Kovacs, 2014; Sitarenios & Stein, 2004) is a well-tested and reliable instrument for assessing the severity of depressive symptoms in children and adolescents. The CDI has 27 items with a 3-point Likert scale, ranging from 0 to 2 with higher values indicating more severe symptoms. Children are asked to pick one of three statements that best fits them. The CDI has been successfully used in Tanzania (Hermenau et al., 2015; Traube et al., 2010). The total severity score ranges from 0 to 54. In the current sample, Cronbach's alpha coefficient was 0.77 and Cohen's k-coefficient in the full sample was 0.99 (range 0.93–1).

2.3.4. Internalizing and externalizing problems

Self-reported internalizing and externalizing behavior problems were assessed with the Swahili translation of the Strength and Difficulties Questionnaire (SDQ, Goodman et al., 2000). The SDQ has good psychometric properties and is used globally. The questionnaire has also been successfully implemented in Tanzania (Hermenau et al., 2011; Traube et al., 2010). In the current study, the 25-item self-report version for children was used in interview form. The version consists of five subscales with 5 items each: (1) conduct problems, (2) hyperactivity, (3) emotional problems, (4) peer problems and (5) prosocial behavior. Each subscale of the SDQ ranges from 0 to 10. A score for externalizing problems sums scale 1 and 2 and a score for internalizing problems sums scale 3 and 4, both with a range from 0 to 20 (Goodman et al., 2010). Cronbach's alpha coefficient for the total score was 0.85 and Cohen's k-coefficient in the full sample was 0.99 (range 0.94–1).

2.4. Statistical analysis

Analyses were performed using R version 4.3.1 and SPSS 29.0. Alpha levels were set at 0.05 (two-tailed). Pearson correlation coefficients and multiple regression models were used to assess the association between exposure to experienced CM and outcome measures. To design predictive models for outcomes we chose a two-step procedure. First, we calculated Conditional Random Forest (CRF) Regression with all potential predictors available in our data, both for the overall sample and for older children (10–12 years) separately. The additional analysis was done to provide information on the impact of older ages of exposure as the full sample limits analysis to the effects of exposure up to age 6. From the CRF analyses we extracted the statistically significant predictors variables (potential risk factors). In a second step we used traditional multiple regression analysis to further explore the associations between the significant predictor variables and outcome measures for the entire sample and for specific age groups.

2.4.1. Random forest regression with conditional tree

We employed a random forest regression with conditional inference trees to pinpoint the most influential risk factors, simultaneously considering a comprehensive matrix of predictors. This choice stemmed from the limitations of traditional statistical methods, like multiple regression, which are ill-suited for assessing the significance of individual predictors in scenarios where substantial collinearity exists within the predictor matrix. The random forest regression with conditional inference trees method demonstrates robust resistance to the high collinearity, is not reliant on the scaling properties of predictor variables and provides a distributions free assessment of associations between predictors and outcomes (Breiman, 2001). The predictor matrix consists of cumulative measures of trauma load (UCLA event list), CM related factors (pediMACE duration, multiplicity and severity) as well as the age of the children, the sex, and measures of the timing of neglect and abuse exposure (pediMACE) up to the age of the child and the exposure to recent abuse and neglect (during the past year) (pediMACE).

This methodological approach has been applied in various studies to identify the most critical risk factors for diverse outcomes in adult samples, such as for depressive symptoms (Khan et al., 2015; Schalinski et al., 2016). It relies on decision trees and involves the utilization of separate training and test data sets to prevent overfitting (Breiman, 2001; Strobl et al., 2007; Strobl et al., 2009). Notably, this approach introduces a novel metric known as 'variable importance' (VI) for each predictor. It is determined by sequentially permuting (randomizing to assess irrelevance) each predictor in the model, refitting the random forest, and measuring the extent to which permutation of the predictors impacts the goodness of fit, as quantified by an increase in mean square error. Perturbing essential predictors results in a substantial increase in mean square error, while perturbing unimportant predictors has a negligible effect. This process was iterated 100 times with different training and test data splits to derive average VI values. To ascertain the statistical significance of these VI measurements, the random forest analyses were repeated 5000 times using shuffled outcome measures. Subsequently, random chance importance measures and standard deviations were calculated for each predictor. A *Z*-test with Bonferroni correction was then applied to determine the likelihood of observing high VI values due to chance. The VI metric is a valuable tool for identifying significant predictors. However, to gain a comprehensive understanding of the direction of the associations, it is essential to provide additional descriptive details. To achieve this, we will choose the important predictors for further examination through traditional multiple regression analysis. We excluded predictors with correlations above 0.85 from our regression models to avoid multicollinearity and instead picked the predictor with the highest importance.

3. Results

3.1. Sample description and descriptive statistics

The sample contained an almost equal number of girls (50.1 %) and boys. There were no significant sex differences in the trauma load, duration, multiplicity, overall severity of exposure, or severity of exposure to specific types of CM on the pediMACE. There were also no significant sex differences in PTSD symptoms (UCLA Reaction Index), depressive symptoms (CDI) or internalizing problems

(SDQ). Externalizing problems (SDQ) however, were higher in boys compared to girls (t(339) =2.48, $p < .01$). Descriptive data are displayed in Table 1. Fig. 1 shows the time course of severity of abuse and neglect (pediMACE) as a function of recollected age of exposure.

3.2. Dose – response analysis

We calculated bivariate correlations for CM scores with outcome scores. As expected, we found significant positive correlations between trauma load (UCLA Event List), the CM global scores duration, multiplicity and severity (pediMACE), recent abuse and recent neglect (pediMACE) with the outcome scores PTSD symptoms (UCLA PTSD Reaction Index), depressive symptoms (CDI), internalizing and externalizing problems (SDQ) (see Table 1).

3.3. Contribution of type and timing

Results of CRF are shown in Table 2 indicating all predictors with significant importance for any of our outcome measures separated into the overall sample and the older subsample (see also Fig. 2).

3.3.1. PTSD symptoms (UCLA PTSD reaction index)

The trauma load (UCLA Event List) was the most important predictor for PTSD symptoms, followed by the severity score and recent neglect (pediMACE) for the overall sample. For the subsample of older children (10–12) we found an additional timing effect of neglect age 10 (pediMACE).

3.3.2. Depressive symptoms (CDI)

Recent abuse (pediMACE) was the most important predictor followed by recent neglect and the severity score and neglect age 6 (pediMACE) for the overall sample. For the subsample of older children, we found additional timing effects of neglect age 7 and abuse age 10 (pediMACE).

3.3.3. Internalizing problems (SDQ)

Recent abuse (pediMACE) was the most important predictor followed by the severity score (pediMACE) for the overall sample. For the subsample of older children, we found an additional timing effect of abuse age 5 (pediMACE).

3.3.4. Externalizing problems (SDQ)

Recent abuse was the most important predictor followed by the severity score (pediMACE) for the overall sample. For the subsample of older children, there was an additional timing effect of abuse age 10 (pediMACE).

3.4. Results from multiple regression

In a next step, we tested our models for each outcome separately for the overall sample and the subsample of children (10–12 years old) in multiple regressions with the significant predictors extracted from CRF (see Table 3 for the overall sample and Table 4 for the subsample).

Table 1
Correlations of trauma load, indicators of child maltreatment and psychological problems in children 6–12 years ($N = 341$).

	M (SD)	UCLA PTSD	CDI depression	SDQ internal	SDQ external
M (SD)		4.54 (8.62)	6.67 (4.50)	5.46 (3.18)	4.84 (3.36)
UCLA trauma load	4.21 (1.47)	0.32**	0.13*	0.11*	0.11*
		[0.23,0.42]	[0.03,0.24]	[0.00,0.21]	[0.01,0.22]
pediMACE duration	19.31 (18.82)	0.17**	0.23**	0.24**	0.29**
		[0.07,0.27]	[0.12,0.32]	[0.14,0.34]	[0.19,0.38]
pediMACE multiplicity	2.43 (1.55)	0.25**	0.28**	0.32**	0.35**
		[0.15,0.35]	[0.18,0.37]	[0.22,0.41]	[0.26,0.44]
pediMACE severity	21.29 (10.33)	0.30**	0.31**	0.32**	0.38**
		[0.20,0.40]	[0.21,0.41]	[0.22,0.41]	[0.29,0.47]
pediMACE recent abuse	9.04 (7.02)	0.13*	0.32**	0.31**	0.39**
		[0.02,0.23]	[0.23,0.42]	[0.21,0.41]	[0.30,0.48]
pediMACE recent neglect	1.15 (2.10)	0.22**	0.24**	0.09	0.19**
		[0.11,0.31]	[0.14,0.34]	[−0.01,0.20]	[0.08,0.29]

Note: University of California at Los Angeles Posttraumatic Stress Disorder Reaction Index (UCLA PTSD); Children's Depression Index (CDI); Strength and Difficulties Questionnaire (SDQ); Maltreatment and Abuse Chronology of Exposure—Pediatric Interview (pediMACE);
** $p < .01$;
* $p < .05$.

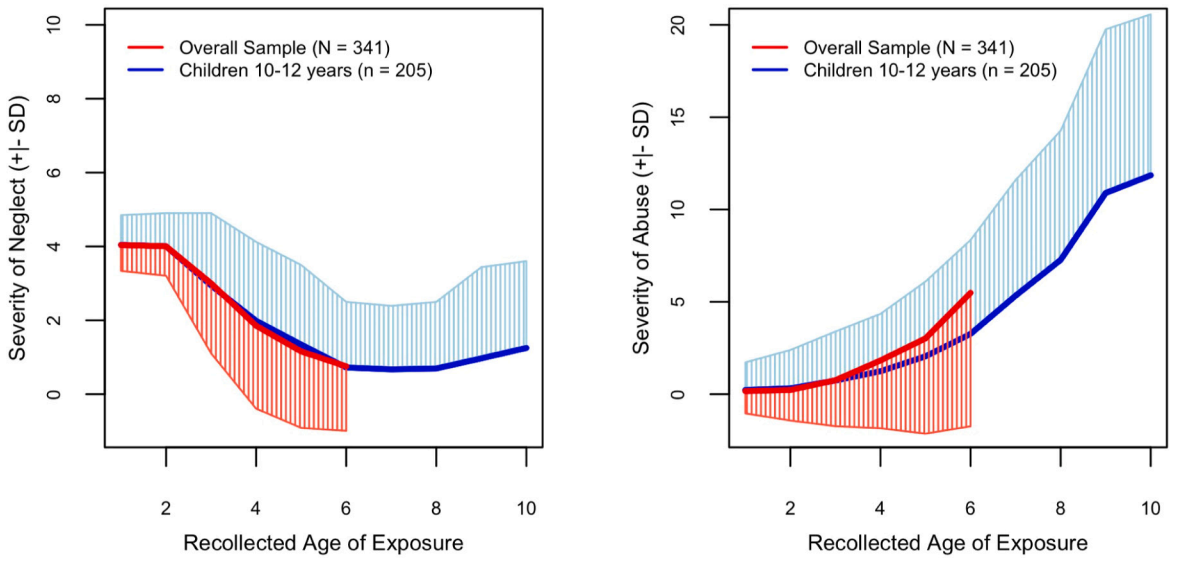


Fig. 1. The time course of the severity of neglect and abuse are shown for the overall sample (6–12 years) in red and for the subsample of children (10–12 years) in blue. The standard deviation is displayed for the overall sample as lower error bars (in red) while the standard deviation for the subsample of children are shown as upper error bars (in blue). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

3.4.1. PTSD symptoms (UCLA PTSD reaction index)

Trauma load (UCLA Event List), severity and recent neglect (pediMACE) contribute significantly to the prediction model explaining 15 % of variance for the overall sample. For the subsample of older children, the model includes trauma load, severity and recent neglect as well as neglect at age 10 (pediMACE) and explains in total 16 % of variance.

3.4.2. Depressive symptoms (CDI depression)

Recent abuse and recent neglect (pediMACE) contribute significantly to the prediction model explaining 14 % of variance for the overall sample. For the subsample of older children, we found an additional timing effect of neglect age 7 and abuse age 10 (pediMACE) in the model. The model explained 18 % of the variance.

3.4.3. Internalizing problems (SDQ)

Recent abuse and severity (pediMACE) contribute significantly to the prediction model explaining 12 % of variance for the overall sample. For the subsample of older children (10–12) the model includes abuse age 5 (pediMACE) and explains in total 14 % of variance.

3.4.4. Externalizing problems (SDQ)

Recent abuse and severity (pediMACE) contribute significantly to the prediction model explaining 18 % of variance for the overall sample. For the subsample of older children, abuse age 10 (pediMACE) was also significant. The model explained 26 % of the variance.

4. Discussion

In the present study we replicated the dose-response relationship of CM intensity / exposure and psychopathological symptoms during middle childhood with self-report measures in a high adversity sample and supplement previous findings (Elmore & Crouch, 2020; Russotti et al., 2021; Schiff et al., 2023). More in depth, we found support for an intricate interplay between type and timing of maltreatment in association with psychopathological symptoms during middle childhood. Our analysis yielded distinct effects for type and timing of CM exposure. The pathways varied depending on the outcome, whether it was PTSD symptoms, depressive symptoms, internalizing or externalizing problems. This fits with results reporting global indicators of CM alone as less sensitive to the diversity of psychopathology in middle childhood compared to combined analysis together with type and timing aspects (Russotti et al., 2021).

As the timing effects are spread over several years in the older sample, the probability of recency effects is higher in the overall sample.

Other timing effects like significant associations of CM exposure at ages 5, 7 and 10 with psychopathology in the sample showed clear relevance and remained prominent within middle childhood and prepuberty but along with other studies and systematic reviews (Herzog et al., 2020; Schaefer et al., 2022) detailed interpretation remains difficult.

Differences between our sample and previous findings in adults (Schaefer et al., 2022) could be discussed depending on the developmental age. Effects may be changed by developmental processes and neurobiological embedding, but also underline the

Table 2
Significant importance in conditioned random forest regression for trauma load, indicators of child maltreatment and psychological problems in children 6–12 years (N = 341) and older subsample (10–12 years) (*n* = 205).

	PTSD symptoms (UCLA PTSD)					
	6–12 years			10–12 years		
	Importance	SD	p	Importance	SD	p
UCLA trauma load	8.65***	0.46	0.00001	4.77**	0.43	0.0014
pediMACE severity	5.86***	0.35	0.00001	3.90**	0.35	0.0018
pediMACE recent neglect	3.32**	0.21	0.0020	2.21***	0.27	0.0074
pediMACE multiplicity	1.30*	0.21	0.047	0.97*	0.18	0.0068
pediMACE neglect age 10				1.91**	0.15	0.0012
pediMACE neglect age 9				0.63*	0.07	0.047
	Depressive symptoms (CDI)					
	6–12 years			10–12 years		
	Importance	SD	P	Importance	SD	p
pediMACE recent abuse	8.51***	0.53	0.00001	6.90***	0.51	0.0004
pediMACE recent neglect	4.40***	0.22	0.0006	1.89**	0.13	0.001
pediMACE severity	3.50***	0.26	0.002	3.06***	0.32	0.003
pediMACE neglect age 6	1.42*	0.09	0.023	1.99*	0.09	0.0023
pediMACE neglect age 7				2.52**	0.02	0.0012
pediMACE abuse age 10				1.45*	0.01	0.0012
	Internalizing problems (SDQ)					
	6–12 years			10–12 years		
	Importance	SD	P	Importance	SD	p
pediMACE recent abuse	4.45***	0.29	0.0004	2.38*	0.21	0.015
pediMACE severity	4.61***	0.19	0.0008	3.02**	0.33	0.0044
pediMACE multiplicity	3.07**	0.26	0.0032	3.31**	0.29	0.0016
pediMACE duration	1.57**	0.09	0.0036	2.57**	0.14	0.007
pediMACE abuse age 5				1.01*	0.11	0.048
	Externalizing problems (SDQ)					
	6–12 years			10–12 years		
	Importance	SD	P	Importance	SD	p
pediMACE recent abuse	9.34***	0.41	0.00001	6.78***	0.50	0.00001
pediMACE severity	6.70***	0.38	0.0001	7.25***	0.68	0.0001
pediMACE multiplicity	2.96**	0.18	0.0028	3.32**	0.29	0.0020
pediMACE duration	1.21*	0.11	0.048	1.49*	1.68	0.0030
pediMACE abuse age 10				9.98***	0.98	0.00001

Note: University of California at Los Angeles Posttraumatic Stress Disorder Reaction Index (UCLA PTSD); Children's Depression Index (CDI); Strength and Difficulties Questionnaire (SDQ); Maltreatment and Abuse Chronology of Exposure—Pediatric Interview (pediMACE);
*** $p < .001$,
** $p < .0$,
* $p < .05$.

importance or later exposure to maltreatment or even windows of opportunity, and buffering factor.

Our data on type and timing provide hints that these aspects are important and support Schaefer et al. (2022) conclusion that specific sensitive periods have yet to be identified. In sum, while type and timing aspects are important, even when using self-report measures in middle childhood, the consistency of these findings into adulthood needs to be explored in longitudinal studies. Effects may interact with further exposure to adversities and buffering factors.

Another challenge is the changing memory functions in children. Linking variations within middle childhood to a growth in autobiographical narrative skills integrating memories of past experiences as a gradually developing system across childhood into an overarching life narrative are visible but blurred. So further research on timing effects of CM exposure should clearly consider developmental aspects of autobiographical memory, for example by objectifying the self-report data with official file records. We hypothesize that as children age, the detailed reflection on maltreatment exposure in an interview becomes increasingly accurately reportable. Nevertheless, self-reported exposure to CM could offer guidance to a deeper understanding of intrapsychic processes underlying developmental pathways from CM experience to increased psychopathology.

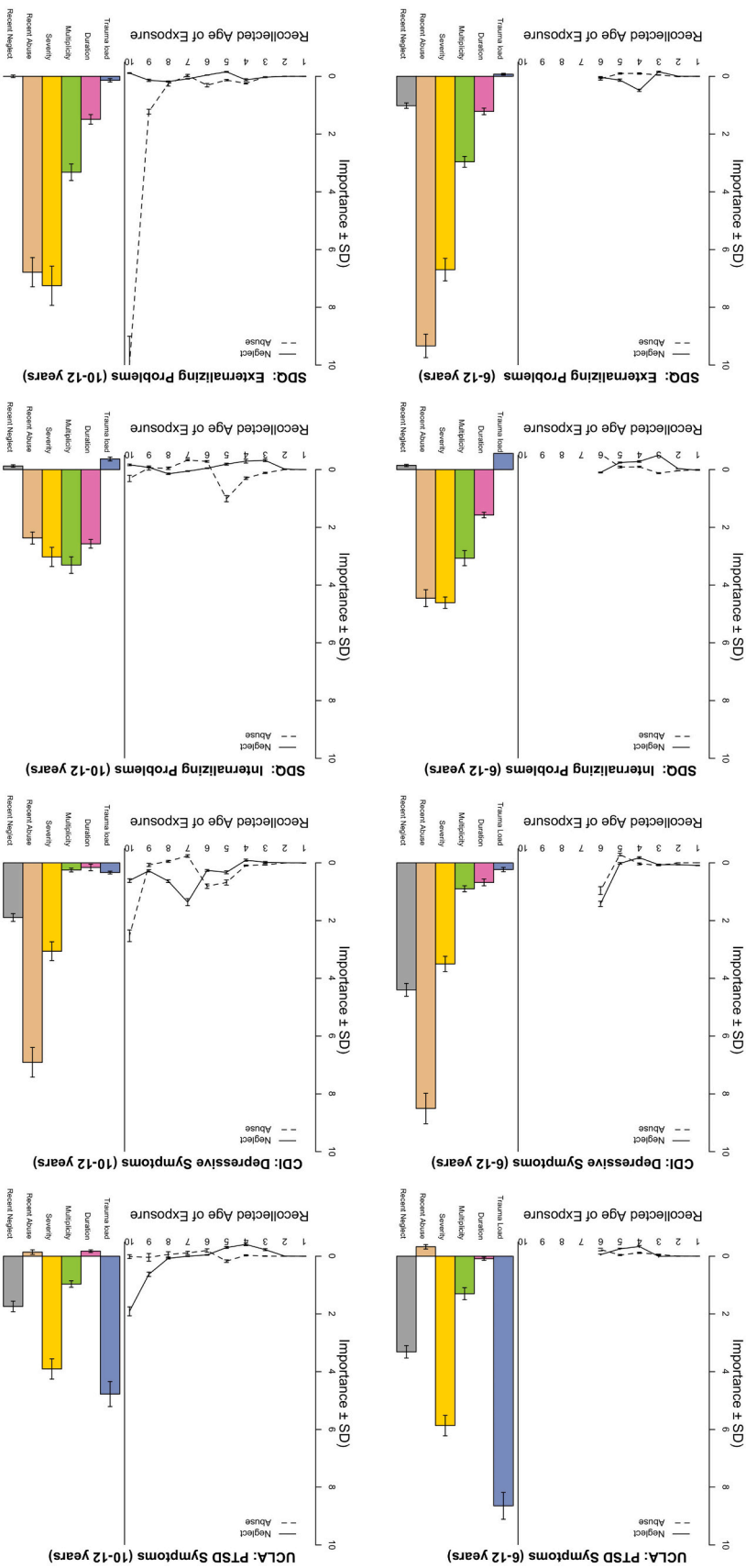


Fig. 2. The importance of predictors resulting from CRF regression for each outcome are shown for the overall sample (6–12 years) and for the subsample of children (10–12 years). Variable importance measures are displayed for trauma load (blue), duration (red), multiplicity (green), severity(yellow), recent abuse (orange), recent neglect (grey). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

Table 3
Linear regression model for trauma load, indicators of child maltreatment and psychological problems in all children (6–12 years) (N = 341).

PTSD Symptoms (UCLA PTSD): F(3, 337) = 20.43; $p < .001$, corr. $R^2 = 0.15$					
	Unstandardized coefficients		Standardized coefficients		
	B	SE	Beta (β)	T	p
Intercept	4,86	1.37		3.54***	0.0004
UCLA trauma load	1.49	0.32	0.32	4.61***	0.0005
pediMACE severity	0.11	0.05	0.12	2.27*	0.023
pediMACE recent neglect	0.56	0.23	0.56	2.46*	0.001

Depressive symptoms (CDI): F(4, 336) = 14.32; $p < .001$, corr. $R^2 = 0.14$					
	Unstandardized coefficients		Standardized coefficients		
	B	SE	Beta (β)	T	p
Intercept	3.94	0.53		7.41***	0.0001
pediMACE recent abuse	0.15	0.04	0.23	3.52***	0.0005
pediMACE recent neglect	0.32	0.12	0.15	5.63*	0.0042
pediMACE severity	0.04	0.03	0.10	1.36	0.174
pediMACE neglect age 6	0.10	0.11	0.05	0.51	0.353

Internalizing problems (SDQ): F(2, 338) = 23.91; $p < .001$, corr. $R^2 = 0.12$					
	Unstandardized coefficients		Standardized coefficients		
	B	SE	Beta (β)	T	p
Intercept	3.35	0.37		6.95**	0.0002
pediMACE recent abuse	0.08	0.03	0.26	4.02**	0.006
pediMACE severity	0.06	0.02	0.22	3.41***	0.001

Externalizing problems (SDQ): F(2, 337) = 33.42; $p < .001$, corr. $R^2 = 0.18$					
	Unstandardized coefficients		Standardized coefficients		
	B	SE	Beta (β)	T	p
Intercept	2.23	0.37		6.29***	0.002
pediMACE recent abuse	0.12	0.03	0.21	4.02***	0.0001
pediMACE severity	0.07	0.02	0.24	3.41***	0.0007

Note: University of California at Los Angeles Posttraumatic Stress Disorder Reaction Index (UCLA PTSD); Children Depression Index (CDI); Strength and Difficulties Questionnaire (SDQ); Maltreatment and Abuse Chronology of Exposure—Pediatric Interview (pediMACE);
*** $p < .001$,
** $p < .01$,
* $p < .05$.

4.1. Type effects

Besides timing aspects, in line with previous studies, we observed varying patterns in the relationship between CM exposure and outcomes, depending on the type of maltreatment (Miller et al., 2018). For PTSD symptoms, trauma load was the most important predictor followed by severity and recent neglect. Additionally, neglect at age 10 was significantly associated with PTSD symptoms in the older sample. Trauma load and severity were also robustly related to adult PTSD symptoms in other studies (Dunn et al., 2017), as well as neglect to PTSD symptomatology in adults with mental illness (Schalinski et al., 2016). For depressive symptoms recent abuse, recent neglect and severity were the most important predictors followed by neglect at age 6, age 7 and abuse at age 10 in the older subsample. Depressive symptoms might reflect an immediate withdraw reaction to aversive experiences. Also, other studies reported the importance of exposure in middle childhood for depressive symptoms (Li et al., 2023), however, this hypothesis would subsequently have to be examined longitudinally and in comparison to other psychopathological outcomes. Overall combining type and timing show important risk, but without clear specificity concerning the particular outcome. The importance of recency of exposure seems obvious and especially recent exposure to neglect has shown association with immediate internalizing, but not with externalizing problems. This specificity of neglect and depressive symptoms is consistent with previous research (Gomis-Pomares & Villanueva, 2022). In further studies, it will be important to differentiate between physical and emotional neglect, the latter to be expected more specific to depressive symptoms (e.g., Schalinski et al., 2016).

For internalizing and externalizing problems, recent abuse followed by severity were the most important correlates. In the 10–12 years old subsample abuse age 5 (for internalizing problems) and abuse age 10 (for externalizing problems) were additionally

Table 4
Linear regression model for trauma load, indicators of child maltreatment and psychological problems in the older subsample (10–12 years; N = 205).

PTSD symptoms (UCLA PTSD): F(4, 201) = 8.31; p < .001, corr. R^2 = 0.16					
	Unstandardized coefficients		Standardized coefficients		
	B	SE	Beta (β)	t	p
Intercept	−4.34	2.00		−2.16*	0.031
UCLA trauma load	1.42	0.45	0.22	3.14**	0.0019
pediMACE severity	0.13	0.08	0.14	1.71	0.088
pediMACE recent neglect	0.10	0.40	0.22	0.24	0.808
pediMACE neglect age 10	0.53	0.37	0.13	1.44	0.151

Depressive symptoms (CDI): F(5, 200) = 9.13; p < .001, corr. R^2 = 0.18					
	Unstandardized coefficients		Standardized coefficients		
	B	SE	Beta (β)	t	p
Intercept	3.91	0.67		5.78***	0.0003
pediMACE recent abuse	0.11	0.06	0.28	2.88**	0.004
pediMACE recent neglect	0.24	0.16	0.18	1.55	0.124
pediMACE severity	0.03	0.04	0.08	0.36	0.722
pediMACE neglect age 6	0.30	0.18	0.68	1.67	0.097
pediMACE abuse age 7	0.03	0.05	0.09	0.59	0.559

Internalizing problems (SDQ): F(3,202) = 10.78; p < .001, corr. R^2 = 0.14					
	Unstandardized coefficients		Standardized coefficients		
	B	SE	Beta (β)	t	p
Intercept	3.48	0.48		7.19***	0.00001
pediMACE recent abuse	0.08	0.04	0.18	2.01*	0.044
pediMACE severity	0.05	0.03	0.20	1.83	0.07
pediMACE abuse age 5	0.13	0.06	0.16	2.42*	0.017

Externalizing problems (SDQ): F(3, 202) = 24.73; p < .001, corr. R^2 = 0.26					
	Unstandardized coefficients		Standardized coefficients		
	B	SE	Beta (β)	t	p
Intercept	1.84	0.47		3.94***	0.0002
pediMACE recent abuse	0.10	0.05	0.20	2,27*	0.024
pediMACE severity	0.06	0.03	0.19	2,18*	0.030
pediMACE abuse age 10	0.08	0.04	0.20	2,25*	0.025

Note: University of California at Los Angeles Posttraumatic Stress Disorder Reaction Index (UCLA PTSD); Children Depression Index (CDI); Strength and Difficulties Questionnaire (SDQ); Maltreatment and Abuse Chronology of Exposure—Pediatric Interview (pediMACE);
*** p < .001,
** p < .01,
* p < .05.

associated with problem behavior. In contrast to studies on adolescents, abuse was not specifically correlated with externalizing problems as reported elsewhere for adolescents (Gomis-Pomares & Villanueva, 2022).

Overall, the findings demonstrate the multifinality of adverse experiences in our middle childhood sample. CM exposure seems to be a powerful risk factor for many diverse co-occurring forms of psychopathology. To embed our results into a developmental framework a transdiagnostic model of psychopathology could be most suitable especially in childhood (McLaughlin et al., 2020). Conditioned random forest regression (CRF) allows the prediction of psychopathology within a set of collinear predictors and might enable us to better understand the complex interplay between the type and timing of maltreatment exposure. In our quest to better understand the role of type timing, we used an age appropriate, structured and detailed interview (pediMACE) to assess detailed information on previous exposure to maltreatment from self-reports. The earlier we can directly gather information from the child, the better our insights on short and long-term developmental pathways will be. This holds true from both a clinical and a research standpoint.

4.2. Clinical implications

Our findings emphasize a critical implication for the diagnostic and early intervention process in children. Engaging directly with

the child as early as possible seeking detailed information about their experiences could provide substantial information understanding pathways from CM exposure to psychopathology.

However, we must consider the child's (cognitive) development when we gather information directly from the child. This may lead us to better detection, as well as more targeted and timely interventions for affected children.

4.3. Research implications

For research purposes we need fine-grained interviews like the pediMACE, coupled with analytical techniques like CRF to better understand the complex type and timing interplay to enhance our knowledge of developmental pathways. Moreover, it is essential to consider additional factors that influence development, such as poverty and living conditions, particularly within a longitudinal research framework. Furthermore, establishing a close connection with neurobiological data related to sensitive periods is of utmost importance (Teicher et al., 2022; Zhu et al., 2023) as this can offer valuable insights into mechanistic trajectories mediating type and timing effects and the child's neurodevelopment. Using longitudinal study designs, cross-lagged analyses and multi-informant assessment is important and recommended for future studies and would help to identify more stable links between risks and psychopathology.

5. Strengths and limitations

We explored the effects of the timing of CM within a high adversity context using a substantial sample of $N = 341$ children from an understudied population. High adversity exposure enables us to look differentially on timing aspects. Furthermore, we concentrated on assisted self-reports of both maltreatment experiences and psychological issues, enabling us to gain insight into the child's perspective. However, it is important to acknowledge the constraints when interpreting the findings. The cross-sectional design employed does not permit us to draw causal inferences. Additionally, our conclusions are derived solely from self-reported data, raising the possibility of biases stemming from limitations in memory capacity, social desirability and recall (Van der Ende et al., 2012). Moreover, we could not control our results for other important aspects such as attachment or personality functioning whether they are mediators or outcomes.

6. Conclusion

In this study, we replicated the association between cumulative indicators of CM, traumatic experiences and psychopathological symptoms in middle childhood with self-report data. Furthermore, we applied for the first time the methodological approach of conditioned random forest to gain a more detailed insight into relevant predictors of adversities in a sample in middle childhood. We add to prior findings in showing more pronounced sensitivity of type and timing aspects (esp. recency of maltreatment) that were related to symptoms of PTSD upon trauma load, depression and internalizing and externalizing behavior problems within a highly vulnerable age period assessed with a comprehensive self-report interview of CM with children aged 6–12 years.

Along with other studies in adults, we found several type and timing effects that may warrant further research. Early identification of CM including information directly from the child is of utmost importance for research and clinical practice and should be considered in diagnostic assessments and early interventions for children and their caregivers. A deeper understanding of the complex interplay of type and timing of CM adds to a more precise understanding how CM links to outcomes.

Credit authorship contribution statement

Florian Juen: Writing – review & editing, Writing – original draft. **Tobias Hecker:** Project administration, Funding acquisition, Data curation, Conceptualization. **Katharin Hermenau:** Writing – review & editing. **Marty H. Teicher:** Writing – review & editing. **Getrude Mikinga:** Writing – review & editing. **Mabula Nkuba:** Writing – review & editing. **Faustine B. Masath:** Writing – review & editing. **Inga Schalinski:** Writing – review & editing, Supervision, Methodology, Formal analysis.

Data availability

Data will be made available on request.

Acknowledgment

This research was supported by the 'Deutsche Forschungsgemeinschaft' (DFG, 175998462) and the Universität der Bundeswehr, Munich.

References

Ainamani, H. E., Rukundo, G. Z., Nduhukire, T., Ndyareba, E., & Hecker, T. (2021). Child maltreatment, cognitive functions and the mediating role of mental health problems among maltreated children and adolescents in Uganda. *Child and Adolescent Psychiatry and Mental Health, 15*(1), 22. https://doi.org/10.1186/s13034-021-00373-7

Bauer, P. J., & Larkina, M. (2020). Predictors of age-related and individual variability in autobiographical memory in childhood. In *Remembering and Forgetting Early Childhood* (pp. 63–78). Routledge.

Breiman, L. (2001). Random forests. *Machine Learning, 45*(1), 5–32. https://doi.org/10.1023/A:1010933404324
Currie, J., & Widom, C. S. (2010). Long-term consequences of child abuse and neglect on adult economic well-being. *Child Maltreatment, 15*(2), 111–120. https://doi.org/10.1177/1077559509355316
Dunn, E., Busso, D. S., Davis, K. A., Smith, A. D., Mitchell, C., Tiemeier, H., & Susser, E. S. (2023). Sensitive periods for the effect of child maltreatment on psychopathology symptoms in adolescence. *Complex Psychiatry, 145–153*. https://doi.org/10.1159/000530120
Dunn, E., Nishimi, K., Gomez, S. H., Powers, A., & Bradley, B. (2018). Developmental timing of trauma exposure and emotion dysregulation in adulthood: Are there sensitive periods when trauma is most harmful? *Journal of Affective Disorders, 227*, 869–877. https://doi.org/10.1016/j.jad.2017.10.045
Dunn, E., Nishimi, K., Powers, A., & Bradley, B. (2017). Is developmental timing of trauma exposure associated with depressive and post-traumatic stress disorder symptoms in adulthood? *Journal of Psychiatric Research, 84*, 119–127. https://doi.org/10.1016/j.jpsychires.2016.09.004
Ellis, B. H., Lhewa, D., Charney, M., & Cabral, H. (2006). Screening for PTSD among Somali adolescent refugees: Psychometric properties of the UCLA PTSD index. *Journal of Traumatic Stress, 19*(4), 547–551. https://doi.org/10.1002/jts.20139
Elmore, A. L., & Crouch, E. (2020). The Association of Adverse Childhood Experiences with Anxiety and Depression for children and youth, 8 to 17 years of age. *Academic Pediatrics, 20*(5), 600–608. https://doi.org/10.1016/j.acap.2020.02.012
Fivush, R. (2011). The development of autobiographical memory. *Annual review of psychology, 62*(1), 559–582.
Frewen, P., Zhu, J., & Lanius, R. (2019). Lifetime traumatic stressors and adverse childhood experiences uniquely predict concurrent PTSD, complex PTSD, and dissociative subtype of PTSD symptoms whereas recent adult non-traumatic stressors do not: Results from an online survey study. *European Journal of Psychotraumatology, 10*(1), 1606625. https://doi.org/10.1080/20008198.2019.1606625
Gerke, J., Koenig, A. M., Conrad, D., Doyen-Waldecker, C., Pauly, M., Gündel, H., & Kolassa, I.-T. (2018). Childhood maltreatment as risk factor for lifetime depression: The role of different types of experiences and sensitive periods. *Mental Health & Prevention, 10*, 56–65. https://doi.org/10.1016/j.mhp.2018.03.002
Gomis-Pomares, A., & Villanueva, L. (2022). *Adverse childhood experiences: Pathways to internalising and externalising problems in young adulthood*. Child Abuse Review: Advance online publication. https://doi.org/10.1002/car.2802
Goodman, A., Lamping, D. L., & Ploubidis, G. B. (2010). When to use broader internalising and externalising subscales instead of the hypothesised five subscales on the strengths and difficulties questionnaire (SDQ): Data from British parents, teachers and children. *Journal of Abnormal Child Psychology, 38*(8), 1179–1191. https://doi.org/10.1007/s10802-010-9434-x
Goodman, R., Ford, T., Simmons, H., Gatward, R., & Meltzer, H. (2000). Using the strengths and difficulties questionnaire (SDQ) to screen for child psychiatric disorders in a community sample. *The British Journal of Psychiatry : The Journal of Mental Science, 177*, 534–539. https://doi.org/10.1192/bjp.177.6.534
Hales, G. K., Saribaz, Z. E., Debowska, A., & Rowe, R. (2022). Links of adversity in childhood with mental and physical health outcomes: A systematic review of longitudinal mediating and moderating mechanisms. *Trauma, Violence & Abuse, 15248380221075087*. https://doi.org/10.1177/15248380221075087
Handley, E. D., Duprey, E. B., Russotti, J., Levin, R. Y., & Warmingham, J. M. (2024). Person-centered methods to advance developmental psychopathology. *Development and Psychopathology, 1–9*. https://doi.org/10.1017/S0954579424000282
Hecker, T., Boettcher, V. S., Landolt, M. A., & Hermenau, K. (2019). Child neglect and its relation to emotional and behavioral problems: A cross-sectional study of primary school-aged children in Tanzania. *Development and Psychopathology, 31*(1), 325–339. https://doi.org/10.1017/S0954579417001882
Hecker, T., Hermenau, K., Isele, D., & Elbert, T. (2014). Corporal punishment and children's externalizing problems: A cross-sectional study of Tanzanian primary school aged children. *Child Abuse & Neglect, 38*(5), 884–892.
Hecker, T., Hermenau, K., Salmen, C., Teicher, M., & Elbert, T. (2016). Harsh discipline relates to internalizing problems and cognitive functioning: Findings from a cross-sectional study with school children in Tanzania. *BMC Psychiatry, 16*, 118. https://doi.org/10.1186/s12888-016-0828-3
Hecker, T., Radtke, K. M., Hermenau, K., Papassotiropoulos, A., & Elbert, T. (2016). Associations among child abuse, mental health, and epigenetic modifications in the proopiomelanocortin gene (POMC): A study with children in Tanzania. *Development and Psychopathology, 28*(4pt2), 1401–1412. https://doi.org/10.1017/S0954579415001248
Hermenau, K., Eggert, I., Landolt, M. A., & Hecker, T. (2015). Neglect and perceived stigmatization impact psychological distress of orphans in Tanzania. *European Journal of Psychotraumatology, 6*, 28617. https://doi.org/10.3402/ejpt.v6.28617
Hermenau, K., Hecker, T., Ruf, M., Schauer, E., Elbert, T., & Schauer, M. (2011). Childhood adversity, mental ill-health and aggressive behavior in an African orphanage: Changes in response to trauma-focused therapy and the implementation of a new instructional system. *Child and Adolescent Psychiatry and Mental Health, 5*, 29. https://doi.org/10.1186/1753-2000-5-29
Herzog, J. I., Thome, J., Demirakca, T., Koppe, G., Ende, G., Lis, S., & Schmahl, C. (2020). Influence of severity of type and timing of retrospectively reported childhood maltreatment on female amygdala and hippocampal volume. *Scientific Reports, 10*(1), 1903. https://doi.org/10.1038/s41598-020-57490-0 chrome://settings/search
Isele, D., Hecker, T., Hermenau, K., Elbert, T., Ruf-Leuschner, M., Moran, J., & Schauer, M. (2017). Assessing childhood adversities: The pediatric Maltreatment and Abuse Chronology of Exposure Interview.
Juwariah, T., Suhariadi, F., Soedirham, O., Priyanto, A., Setiyorini, E., Siskaningrum, A., . . . Da Fernandes, A. C. (2022). Childhood adversities and mental health problems: A systematic review. Journal of Public Health Research, 11(3), 22799036221106613. doi:https://doi.org/10.1177/22799036221106613.
Kerker, B. D., Zhang, J., Nadeem, E., Stein, R. E. K., Hurlburt, M. S., Heneghan, A., & McCue Horwitz, S. (2015). Adverse childhood experiences and mental health, chronic medical conditions, and development in young children. *Academic Pediatrics, 15*(5), 510–517. https://doi.org/10.1016/j.acap.2015.05.005
Khan, A., McCormack, H. C., Bolger, E. A., McGreenery, C. E., Vitaliano, G., Polcari, A., & Teicher, M. H. (2015). Childhood maltreatment, depression, and suicidal ideation: Critical importance of parental and peer emotional abuse during developmental sensitive periods in males and females. *Frontiers in Psychiatry, 6*, 42. https://doi.org/10.3389/fpsyt.2015.00042
Kızıltepe, R., Irmak, T. Y., Eslek, D., & Hecker, T. (2020). Prevalence of violence by teachers and its association to students' emotional and behavioral problems and school performance: Findings from secondary school students and teachers in Turkey. *Child Abuse & Neglect, 107*, Article 104559. https://doi.org/10.1016/j.chiabu.2020.104559
Kovacs, M. (2014). Children's depression inventory (CDI and CDI 2). In R. L. Cautin, & S. O. Lilienfeld (Eds.), *The encyclopedia of clinical psychology* (pp. 1–5). Hoboken, NJ, USA: John Wiley & Sons, Inc.. https://doi.org/10.1002/9781118625392.wbecp419
Lew, D., & Xian, H. (2019). Identifying distinct latent classes of adverse childhood experiences among US children and their relationship with childhood internalizing disorders. *Child Psychiatry and Human Development, 50*(4), 668–680. https://doi.org/10.1007/s10578-019-00871-y
Li, M., Gao, T., Su, Y., Zhang, Y., Yang, G., D'Arcy, C., & Meng, X. (2023). The timing effect of childhood maltreatment in depression: A systematic review and meta-analysis. *Trauma, Violence & Abuse, 24*(4), 2560–2580. https://doi.org/10.1177/15248380221102558
Manly, J. T. (2005). Advances in research definitions of child maltreatment. *Child Abuse & Neglect, 29*(5), 425–439. https://doi.org/10.1016/j.chiabu.2005.04.001
Masath, F. B., Scharpf, F., Dumke, L., & Hecker, T. (2023). Externalizing problems mediate the relation between teacher and peer violence and lower school performance. *Child Abuse & Neglect, 135*, Article 105982. https://doi.org/10.1016/j.chiabu.2022.105982
McGinnis, E. W., Sheridan, M., & Copeland, W. E. (2022). Impact of dimensions of early adversity on adult health and functioning: A 2-decade, longitudinal study. *Development and Psychopathology, 34*(2), 527–538.
McLaughlin, K. A., Colich, N. L., Rodman, A. M., & Weissman, D. G. (2020). Mechanisms linking childhood trauma exposure and psychopathology: A transdiagnostic model of risk and resilience. *BMC Medicine, 18*(1), 1–11.
McLaughlin, K. A., Sheridan, M. A., Gold, A. L., Duys, A., Lambert, H. K., Peverill, M., & Pine, D. S. (2016). Maltreatment exposure, brain structure, and fear conditioning in children and adolescents. *Neuropsychopharmacology, 41*(8), 1956–1964. https://doi.org/10.1038/npp.2015.365
Miller, A. B., Esposito-Smythers, C., Weismoore, J. T., & Renshaw, K. D. (2013). The relation between child maltreatment and adolescent suicidal behavior: A systematic review and critical examination of the literature. *Clinical Child and Family Psychology Review, 16*(2), 146–172. https://doi.org/10.1007/s10567-013-0131-5

Miller, A. B., Sheridan, M. A., Hanson, J. L., McLaughlin, K. A., Bates, J. E., Lansford, J. E., & Dodge, K. A. (2018). Dimensions of deprivation and threat, psychopathology and potential mediators: A multi-year longitudinal analysis. *Journal of Abnormal Psychology, 127*(2), 160–170. https://doi.org/10.1037/abn0000331

Moody, G., Cannings-John, R., Hood, K., Kemp, A., & Robling, M. (2018). Establishing the international prevalence of self-reported child maltreatment: A systematic review by maltreatment type and gender. *BMC Public Health, 18*(1), 1164. https://doi.org/10.1186/s12889-018-6044-y

Myers, B., Bantjes, J., Lochner, C., Mortier, P., Kessler, R. C., & Stein, D. J. (2021). Maltreatment during childhood and risk for common mental disorders among first year university students in South Africa. *Social Psychiatry and Psychiatric Epidemiology, 56*(7), 1175–1187. https://doi.org/10.1007/s00127-020-01992-9

Nkuba, M., Hermenau, K., & Hecker, T. (2019). The association of maltreatment and socially deviant behavior—Findings from a national study with adolescent students and their parents. *Mental Health & Prevention, 13*, 159–168. https://doi.org/10.1016/j.mhp.2019.01.003

Oh, D. L., Jerman, P., Purewal Boparai, S. K., Koita, K., Briner, S., Bucci, M., & Harris, N. B. (2018). Review of tools for measuring exposure to adversity in children and adolescents. *Journal of Pediatric Health Care : Official Publication of National Association of Pediatric Nurse Associates & Practitioners, 32*(6), 564–583. https://doi.org/10.1016/j.pedhc.2018.04.021

Petruccelli, K., Davis, J., & Berman, T. (2019). Adverse childhood experiences and associated health outcomes: A systematic review and meta-analysis. *Child Abuse & Neglect, 97*, Article 104127. https://doi.org/10.1016/j.chiabu.2019.104127

Porter, C., Palmier-Claus, J., Branitsky, A., Mansell, W., Warwick, H., & Varese, F. (2020). Childhood adversity and borderline personality disorder: A meta-analysis. *Acta Psychiatrica Scandinavica, 141*(1), 6–20. https://doi.org/10.1111/acps.13118

Reuben, A., Moffitt, T. E., Caspi, A., Belsky, D. W., Harrington, H., Schroeder, F., & Danese, A. (2016). Lest we forget: Comparing retrospective and prospective assessments of adverse childhood experiences in the prediction of adult health. *Journal of Child Psychology and Psychiatry, and Allied Disciplines, 57*(10), 1103–1112. https://doi.org/10.1111/jcpp.12621

Russotti, J., Warmingham, J. M., Duprey, E. B., Handley, E. D., Manly, J. T., Rogosch, F. A., & Cicchetti, D. (2021). Child maltreatment and the development of psychopathology: The role of developmental timing and chronicity. *Child Abuse & Neglect, 120*, Article 105215. https://doi.org/10.1016/j.chiabu.2021.105215

Schaefer, J. D., Cheng, T. W., & Dunn, E. C. (2022). Sensitive periods in development and risk for psychiatric disorders and related endpoints: A systematic review of child maltreatment findings. *The Lancet. Psychiatry, 9*(12), 978–991. https://doi.org/10.1016/S2215-0366(22)00362-5

Schalinski, I., Teicher, M. H., Nischk, D., Hinderer, E., Müller, O., & Rockstroh, B. (2016). Type and timing of adverse childhood experiences differentially affect severity of PTSD, dissociative and depressive symptoms in adult inpatients. *BMC Psychiatry, 16*, 295. https://doi.org/10.1186/s12888-016-1004-5

Schiff, M., Auslander, W. F., & Gerke, D. R. (2023). Child maltreatment, mental health, and self-reported health among adolescent girls in child welfare: Mediating pathways. *Journal of Child & Adolescent Trauma. Advance online publication.*. https://doi.org/10.1007/s40653-023-00545-x

Sitarenios, G., & Stein, S. (2004). Use of the Children's depression inventory. In M. E. Maruish (Ed.), The use of psychological testing for treatment planning and outcomes *Volume 2* (3rd ed., pp. 1–38). Mahwah: Lawrence Erlbaum Associates. doi:https://doi.org/10.4324/9781410610621-1.

Steinberg, A. M., Brymer, M. J., Decker, K. B., & Pynoos, R. S. (2004). The University of California at Los Angeles post-traumatic stress disorder reaction index. *Current Psychiatry Reports, 6*(2), 96–100. https://doi.org/10.1007/s11920-004-0048-2

Stoltenborgh, M., Bakermans-Kranenburg, M. J., Alink, L. R. A., & van IJzendoorn, M. H.. (2015). The prevalence of child maltreatment across the globe: Review of a series of Meta-analyses. *Child Abuse Review, 24*(1), 37–50. https://doi.org/10.1002/car.2353

Strobl, C., Boulesteix, A.-L., Zeileis, A., & Hothorn, T. (2007). Bias in random forest variable importance measures: Illustrations, sources and a solution. *BMC Bioinformatics, 8*, 25. https://doi.org/10.1186/1471-2105-8-25

Strobl, C., Hothorn, T., & Zeileis, A. (2009). *Party on!*.

Teicher, M. H., Gordon, J. B., & Nemeroff, C. B. (2022). Recognizing the importance of childhood maltreatment as a critical factor in psychiatric diagnoses, treatment, research, prevention, and education. *Molecular Psychiatry, 27*(3), 1331–1338. https://doi.org/10.1038/s41380-021-01367-9

Teicher, M. H., & Parigger, A. (2015). The "Maltreatment and abuse chronology of Exposure" (MACE) scale for the retrospective assessment of abuse and neglect during development. *PLoS One, 10*(2), Article e0117423. https://doi.org/10.1371/journal.pone.0117423

Teicher, M. H., Samson, J. A., Anderson, C. M., & Ohashi, K. (2016). The effects of childhood maltreatment on brain structure, function and connectivity. *Nature Reviews. Neuroscience, 17*(10), 652–666. https://doi.org/10.1038/nrn.2016.111

Tomoda, A., Nishitani, S., Takiguchi, S., et al. (2024). The neurobiological effects of childhood maltreatment on brain structure, function, and attachment. *European Archives of Psychiatry and Clinical Neuroscience*. https://doi.org/10.1007/s00406-024-01779-y

Traube, D., Dukay, V., Kaaya, S., Reyes, H., & Mellins, C. (2010). Cross-cultural adaptation of the child depression inventory for use in Tanzania with children affected by HIV. *Vulnerable Children and Youth Studies, 5*(2), 174–187. https://doi.org/10.1080/17450121003668343

Van der Ende, J., Verhulst, F. C., & Tiemeier, H. (2012). Agreement of informants on emotional and behavioral problems from childhood to adulthood. *Psychological Assessment, 24*(2), 293–300. https://doi.org/10.1037/a0025500

Vilariño, M., Amado, B. G., Seijo, D., Selaya, A., & Arce, R. (2022). Consequences of child maltreatment victimisation in internalising and externalising mental health problems. *Legal and Criminological Psychology, 27*(2), 182–193. https://doi.org/10.1111/lcrp.12212

Villodas, M. T., Litrownik, A. J., Thompson, R., Roesch, S. C., English, D. J., Dubowitz, H., … Runyan, D. K. (2012). Changes in youth's experiences of child maltreatment across developmental periods in the LONGSCAN consortium. *Psychology of Violence, 2*(4), 325–338. https://doi.org/10.1037/a0029829

Wang, P., Kelifa, M. O., Yu, B., & Yang, Y. (2021). Classes of childhood adversities and their associations to the mental health of college undergraduates: A nationwide cross-sectional study. *Environmental Health and Preventive Medicine, 26*(1), 73. https://doi.org/10.1186/s12199-021-00993-7

Warmingham, J. M., Handley, E. D., Rogosch, F. A., Manly, J. T., & Cicchetti, D. (2019). Identifying maltreatment subgroups with patterns of maltreatment subtype and chronicity: A latent class analysis approach. *Child Abuse & Neglect, 87*, 28–39.

Zhu, J., Anderson, C. M., Ohashi, K., Khan, A., & Teicher, M. H. (2023). Potential sensitive period effects of maltreatment on amygdala, hippocampal and cortical response to threat. *Molecular Psychiatry, 1–12*. https://doi.org/10.1038/s41380-023-02002-5