



Research Paper

Measuring early life adversity in adults: French translation and validation of the Maltreatment and Abuse Chronology of Exposure (MACE) scale

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ABSTRACT

In contrast to other tools used with adults to retrospectively assess exposure to early adversity, the Maltreatment and Abuse Chronology of Exposure (MACE) scale (Teicher & Parigger, 2015) investigates exposure to a wide range of adverse childhood experiences (ACEs). It also explores the timing and duration of this exposure, which has been shown to be important in identifying developmentally sensitive periods for exposure to childhood adversity. The main goal of this study was therefore to provide a French translation of the MACE and to assess its psychometric properties. An experimental group of $N = 402$ French adults ($M_{\text{age}} = 39.1 \pm 10.8$ years) from the general population completed the French version of the 52-item MACE scale online, along with other questionnaires. Statistical analyses show that a 50-item version reliably captures exposure to the 10 types of ACEs investigated by the scale. The MACE scale exhibits excellent convergent validity with the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994, 1997), and is more effective than the CTQ in predicting psychiatric morbidities such as dissociation and anxiety. Test-retest reliability was assessed online over a period of more than 12 months in a subgroup of 50 participants. Results show adequate test-retest reliability for both composite and subscale scores. Overall, the MACE-50 (Fr) comprehensively assesses exposure to early childhood adversity in adults, has acceptable psychometric properties, and is a reliable tool both for clinical practice and research.

R É S U M É

En comparaison d'autres outils utilisés chez l'adulte pour évaluer rétrospectivement l'exposition à l'adversité précoce, l'Echelle Chronologique d'Exposition à la Maltraitance et aux Abus (MACE ; Teicher & Parigger, 2015) s'intéresse à un nombre important de types d'expériences adverses précoces (ACEs). Elle questionne également le moment et la durée de cette exposition, ce qui a été montré comme important pour déterminer des périodes sensibles du développement pour l'exposition à l'adversité précoce. L'objectif principal de cette étude était donc de proposer une traduction de la MACE et d'en déterminer les propriétés psychométriques. Un groupe expérimental de $N = 402$ adultes français ($M_{\text{âge}} = 39,1 \pm 10,8$ ans) issus de la population générale ont complété en ligne la traduction française de la version clinique de la MACE en 52 items, ainsi que différents questionnaires. Les analyses statistiques montrent qu'une version en 50 items permet de capturer de manière fiable l'exposition aux 10 types d'ACEs que l'échelle permet d'investiguer. La MACE présente par ailleurs une excellente validité convergente avec le *Childhood Trauma Questionnaire* (CTQ ; Bernstein et al., 1994, 1997), et elle présente de meilleures qualités prédictives que le CTQ au regard de morbidités psychiatriques comme la dissociation et l'anxiété. La fiabilité test-retest a été évaluée à plus de 12 mois sur un sous-groupe de 50 participants. Les résultats montrent une bonne fiabilité test-retest à la fois pour les scores composites et les sous-échelles. Dans l'ensemble, la MACE-50 items (Fr) permet d'évaluer de manière comprehensive l'exposition à l'adversité précoce chez les adultes. Grâce à des qualités psychométriques satisfaisantes, elle se présente comme un outil fiable à la fois pour la pratique clinique et la recherche.

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Introduction

Adverse childhood experiences (ACEs) are conceptualized as: “childhood events, varying in severity and often chronic, occurring within a child’s family or social environment that cause harm or distress, thereby disrupting the child’s physical or psychological health and development” (Kalmakis & Chandler, 2014; p.7). The concept of ACE reflects the dose-response relationship between exposure to violence inside and outside the home (including community violence) and household dysfunction and a wide range of damaging consequences across the lifespan. These can be developmental and emotional consequences in children, health-risk behaviors in adolescents, or physical and mental health issues later in adulthood (e.g., Humphreys & Zeanah, 2015; McKay et al., 2022; McLaughlin et al., 2013). Early adversity is a global phenomenon (Kalmakis & Chandler, 2014) that extends to Europe and France (Sethi et al., 2013) and constitutes a public health issue. It has been estimated that eradicating early adversity (abuse, neglect and household dysfunction) would lead to a 22.9% reduction in mood disorders, a 31% reduction in anxiety disorders, a 41.6% reduction in behavioral disorders, and a 27.5% reduction in substance use disorders (Kessler et al., 2010). Nevertheless, few tools for assessing ACEs are available in French-speaking countries compared with English-speaking countries (see Berman et al., 2022). Tarquinio et al. (2023) may have initiated a change by recently proposing a French version of the Adverse Childhood Experiences international questionnaire (ACE-IQ) developed by the World Health Organization (WHO). In this context, we thought that a validated French version of the Maltreatment and Abuse Chronology of Exposure (MACE) scale would be useful for French-speaking practitioners and researchers. Importantly, this scale is considered one of the scales most compatible with the dimensional model of adversity that is currently emerging in the literature (Berman et al., 2022; McLaughlin et al., 2021).

Like other instruments in the same field of assessment, the MACE scale allows for the retrospective assessment in adults of early adverse experiences during their first 18 years of life. Teicher and Parigger (2015) have developed this tool by observing that other childhood adversity assessment tools such as the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994, 1997) or the Adverse Childhood Experiences scale (ACE; Felitti et al., 1998) had several limitations. One of the main limitations is that they do not assess a number of adverse childhood experiences, including witnessing domestic violence or peer abuse. Yet, peer victimization, for example, has been widely reported as a major risk factor for later psychopathology, including suicide and substance abuse (e.g., Kim & Leventhal, 2011; Teicher et al., 2010). The ACE questionnaire also focuses on multiplicity of exposure while omitting to assess severity. Finally, all the instruments that are typically used in adults do not address the developmental changes that may have occurred as a result of exposure to neglect and abuse during childhood and adolescence. This information is, however, crucial. There is strong evidence that there are sensitive periods when adverse experiences exert maximal effects on the developmental trajectory of specific brain regions (S. L. Andersen et al., 2008; Hart & Rubia, 2012; Herringa, 2017; Rao et al., 2010), and when the risk for specific mental health issues is highest (S. L. Andersen et al., 2008; S. L. Andersen & Teicher, 2009; Schalinski et al., 2016).

As a result, the MACE scale was developed to investigate ten types of early adverse experiences including domestic violence and peer abuse. In addition, respondents are invited to specify each year of occurrence between the ages of 1 and 18 for each type of exposure. The scale allows for the computation of both a total severity score (MACE Severity) and a multiplicity score (MACE Multiplicity) that are respectively comparable to CTQ and ACE scores, especially in terms of predictive value for the development of later psychopathology and psychosocial difficulties. However, it also documents the timing and duration (MACE Duration) of exposure, as well as how exposure levels may have changed over the course of development. The U.S. MACE is freely available for download

as supplementary material to the original paper by Teicher and Parigger (2015). There is currently a German (Isele et al., 2014) and a Norwegian (Fosse et al., 2020) version. And all three versions have shown excellent psychometric properties. The MACE has also been translated into Brazilian Portuguese (Kluwe-Schiavon et al., 2016). The goal of the current study was therefore to:

- 1 Provide a French translation of the 52-item version of the MACE scale by following the International Test Commission (2017) guidelines for translating and adapting tests.
- 2 Assess the reliability and validity of the ten French MACE subscales.
- 3 Assess the test-retest reliability of the translated scale.
- 4 Assess convergent validity between the French MACE and the CTQ, and specify clinical cutoffs for each of the early adverse experiences captured by the instrument.
- 5 Estimate the prevalence of early maltreatment and abuse in a non-clinical sample of French adults.
- 6 Estimate the predictive validity of the French MACE compared with the CTQ for several mental health outcomes including dissociation, anxiety, and perceived levels of parental care and protection in childhood and adolescence.

Materials and method

Design of the study and ethics statement

The French version of the 52-item MACE scale and the other questionnaires included in the present study were administered as part of a larger study investigating the neuropsychological consequences of early adversity in adults. All questionnaires were completed online by the participants using a secure website devoted to the research <https://datapsy.org>. For the present study, the main inclusion criterion was to be fluent in French. The exclusion criterion was not having completed any of the MACE items. The overall study received approval from the Ethics Committee for Non-interventional Research (CERNI) on September 10, 2020, under the number 2020–66. Each participant was provided with information about the study and electronically signed a consent form.

Participants

Our sample included 402 participants who at least partially completed all 52 items of the French version of the MACE. They were between 19 and 68 years old ($M = 39.1 \pm 10.8$ years) and included 140 men (34.48%) and 266 women (65.52%). The sample was drawn from a non-clinical population, as most participants were recruited via social networks (53.3%) and word-of-mouth (17%). The group reported an average of 16 years of post-kindergarten education, with no difference between men and women. Complete demographics and means of recruitment are presented in Table A of Supplementary Material S1 of the study.

French translation

Translation of the U.S. version of the MACE was conducted in agreement with the recommendations of the International Test Commission (2017). The scale was first translated from English to French by a committee of three bilingual psychology researchers. The consensus version obtained was then back-translated from French to English by an independent committee of two bilingual researchers, including one from outside the field of psychology. Finally, the consensus French version was pretested on a group of 15 psychology students ($M = 23.4$ years ± 1.3 years; 66.67% women). With no notable differences or remarks at each stage, the initial consensus translation was finally validated by the first committee of researchers, and this version of the MACE was administered to the participants of the present study.

Measures

The MACE scale has 52 items for assessing 10 types of early adverse experiences including: Parental Verbal Abuse, Parental Nonverbal Emotional Abuse, Parental Physical Maltreatment, Emotional Neglect, Physical Neglect, Witnessing Interparental Violence, Witnessing Violence to Siblings, Sexual Abuse, Peer Emotional Abuse, and Peer Physical Bullying. Each item is scored with a Yes or No response, and respondents are asked to indicate all years that apply from age 1 to 18. As 6 items refer to positive outcomes, responses are reversed (Yes = 0, No = 1) before analysis. Previous studies have indicated that the MACE has excellent psychometric properties, both in its original English-American version (Teicher & Parigger, 2015) and in its German (Isele et al., 2014) and Norwegian (Fosse et al., 2020) translations. More specifically, the MACE scale exhibits excellent test-retest reliability and convergent validity with both the CTQ and ACE questionnaires. It has been shown to be more effective than the CTQ in predicting numerous symptoms subsequent to early adversity, including anxiety, depression, somatization, hostility, and interpersonal sensitivity (Fosse et al., 2020; Teicher & Parigger, 2015). Other studies have also associated early adversity as assessed by the MACE with posttraumatic stress disorder (PTSD), shutdown dissociation, sleep disorder, abnormalities in amygdala response to threatening or salient stimuli, and better resilience (Ohashi et al., 2019; Schalinski et al., 2016; Teicher et al., 2017; Zhu et al., 2019).

For the current study of the psychometric properties of the French version of the MACE, several scores were computed to allow statistical analysis:

- 1 For each subscale corresponding to a type of early adverse experience (ACE), a raw score representing the sum of positive responses endorsed by the participant. Raw scores are used in association with clinical severity cutoff scores (see the Results section for their determination). If a raw score equals or exceeds the cutoff score, then the type of abuse has been experienced by the respondent at severe levels (ACE = 1).
- 2 For each subscale, a MACE Subscale Severity score (0–10) determined by scaling to 10 the raw subscale scores.
- 3 A total MACE Severity score obtained by summing the 10 subscale scores scaled to 10 (0–100), or scores of the 6 subscales that have a corresponding CTQ subscale (0–60).
- 4 A MACE Multiplicity score (0–10) representing the number of different types of maltreatment to which participants were exposed at severe levels during their first 18 years of life. It was determined using the raw scores of the 10 subscales, in association with their corresponding clinical cutoffs.
- 5 A MACE Duration score that reflects the number of years the respondent had been exposed to at least one type of maltreatment that exceeds the clinical severity cutoff score (0–18). For example, if the respondent's MACE Multiplicity score is equal to 3 at age 1, equal to 2 at ages 6 and 7, and equal to 0 for all other years, then the participant's MACE Duration score is equal to 3 years.
- 6 A score representing the mean severity score of exposure to maltreatment experienced during the first 18 years of life (MACE Severity Quotient). It was calculated by adding the total MACE Severity score for each of the 18 years and dividing that sum by 18 (0–100).
- 7 A Neglect score that includes the severity scores on the Physical and Emotional Neglect subscales (0–20) and an Abuse score that includes the severity scores on the other 8 subscales (0–80).

The Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994, 1997) retrospectively documents five types of maltreatment: Physical Abuse, Sexual Abuse, Emotional Abuse, Physical Neglect, and Emotional Neglect. A 3-item Denial/Minimization subscale that suggests a tendency to minimize or deny abuse and neglect is also included. The CTQ

asks respondents to self-report on a 5-point Likert-type scale (ranging from "Never true" to "Very often true"), and each type of adversity is assessed through 5 statements for a total of 28 items. A score for each type of maltreatment is calculated by summing scores obtained on its corresponding items (5–25). A total severity score (CTQ Severity) is derived by summing the scores on the 25 items (i.e., excluding the sum of the 3 Denial scale items). In addition, a CTQ Multiplicity score (0–5) can be calculated using the cutoff scores provided by Fink and Bernstein (1998)). Psychometric properties were found acceptable by Paquette et al. (2004) for the French version of the questionnaire.

Dissociative symptoms, which have been associated with early adversity (Kate et al., 2020; Schalinski et al., 2016), were assessed using the Dissociative Experience Scale (DES; Bernstein & Putnam, 1986). The French version of the scale (Laroï et al., 2013) includes 28 items that describe everyday-life situations. Participants are asked to indicate how often these experiences happen to them compared to other people using an 11-level Likert-type scale (ranging from "Much less than others" to "Much more than others"). Along with a total score that can range between 0 and 100, the instrument assesses two factors associated with two types of dissociative experiences: a Depersonalization/Derealization Factor that refers to a pathological type of defensive dissociation, and an Absorption Factor that corresponds to the tendency to become frequently immersed in one's own thoughts and imagination while neglecting other stimuli in the environment. Following other studies that investigated the English version (e.g., van Ijzendoorn & Schuengel, 1996), Laroï et al. (2013) established that the French DES had excellent psychometric properties.

Trait-anxiety has also been associated with early adversity (e.g., Watt et al., 2019). It was assessed using Form Y-B of the State-Trait Anxiety Inventory (STAI Y-B; Spielberger et al., 1983, 1993). Trait-anxiety is a dispositional form of anxiety that is not particularly context-sensitive in contrast to state-anxiety (Gauthier & Bouchard, 1993). The scale consists of 20 statements that ask how the respondent generally feels (e.g., nervous, agitated). The respondent answers on a 4-point Likert scale ranging from "Almost never" to "Almost always". A total score is calculated by summing the intensity scores of all items, with 7 reverse-scored items. Psychometric properties of the full version (STAI Y-A and Y-B) have been described as excellent, both in its English and French versions (Gauthier & Bouchard, 1993; Spielberger et al., 1993).

Deficit in parental care has been shown to be a robust predictor of child abuse and maltreatment (e.g., Rambau et al., 2018; Singh et al., 2012). Retrospective parent-child attachment associated with parenting practices was assessed using the Parental Bonding Instrument (PBI), first developed by Parker et al. (1979), translated in French by Saucier et al. (1988) and validated by Pelchat et al. (1997, 2003). The PBI consists of 25 statements that investigate two dimensions. The "Overprotection" dimension assesses the extent to which a parent was overcontrolling and intrusive or, on the opposite fostered autonomy and independence. The "Care" dimension assesses the continuum from parental affection and warmth to indifference and neglect. Participants are asked to respond on a 4-level Likert scale ranging from 0 ("Very different") to 3 ("Very similar"). An "Overprotection" and "Care" score can thus be obtained separately for the father and mother, as well as a total score accounting for parental care and protection before age 16. Low care and high overprotection are considered least optimal, whereas high care and low overprotection are considered optimal. The PBI has been shown to have acceptable psychometric properties (Garbarino, 1996; Parker, 1983; Parker et al., 1979; Pelchat et al., 1997).

Statistical analysis

Subscale analysis

For the purpose of replicability of previous MACE studies (i.e., Fosse et al., 2020; Teicher & Parigger, 2015), we used the item response theory (IRT) to assess the reliability and validity of the French MACE subscales. Within this theory, the Rasch measurement model is

materialized by a mathematical function that considers a single characteristic for an item: its difficulty associated with the respondent's level of ability to answer it. The most rarely endorsed responses thus correspond to the most difficult items, or to the most severe level of exposure to maltreatment in the specific context of the MACE. For example, on the Parental Verbal Abuse (PVA) subscale, we would expect respondents to endorse item 9 ("Spanked you on your buttocks, arms or legs") more often than item 7 ("Hit you so hard that it left marks for more than a few minutes") and item 7 more often than item 8 ("Hit you so hard that you needed medical attention"). The Rasch model suggests that individuals with the most severe levels of exposure to PVA are expected to agree with the most difficult item (i.e., the most infrequent event) while agreeing with the "easiest" items, while those with lower levels of exposure are expected to agree with the "easiest" item only. High scores on the PVA subscale thus indicate a high degree of severity of parental verbal abuse.

The adequacy of an item to reflect a latent trait (i.e., a type of abuse) is appreciated primarily by mean square fit criteria as measured by infit and outfit mean square fits. A disordered infit (inlier-pattern-sensitive fit statistic) describes unexpected responses because the level of difficulty of an item is close to the individual's exposure level, whereas a disordered outfit (outlier-sensitive fit statistic) indicates unexpected responses to the item because its difficulty is distinct from the individual's exposure level. Mean square is the chi-square statistic divided by its degrees of freedom (χ^2/df). Consequently, a mean square fit close to 1.0 represents an expected value (i.e., predictable). Values less than 1.0 indicate observations that are too predictable (redundancy, data overfit the model). Values greater than 1.0 indicate unpredictability (other source of variance, data underfit the model). There is an agreement that mean square fits should not exceed 1.5 or be lower than 0.5. However, acceptable ranges for means square fit statistics are still debated. Authors such as Linacre et al. (1994) recommend that mean square fit values between 0.7 and 1.3 be considered acceptable, and those that fall within the range of 0.5 to 0.7 and 1.3 to 1.5 be considered sufficient. The overall model fit of each subscale was assessed using Andersen's Likelihood Ratio (LR) test (E. B. Andersen, 1973) with gender and age (participant median) as split criteria. Andersen's LR test is a powerful test to detect differential item functioning (DIF) that may occur when individuals with the same level of exposure differ in their responses to a specific item depending on their age or gender. When the Andersen test was significant, a Wald test was used to identify items with differential parameters. Finally, the Test Information Function was plotted. We expected subscales to be maximally informative between 0 and 2 logits in order to best differentiate between moderate and severe exposure levels.

Test-retest reliability

In agreement with Qin et al.'s (2019) recommendations, test-retest reliability for all MACE total scores and all ten subscale scores was assessed using two-way mixed-effect analysis of variance (ANOVA) models, with interaction for the absolute agreement between single scores as the ICC (intraclass correlation coefficient) formula. ICCs were based on an average test-retest interval of 385 days. In agreement with Cicchetti (1994), we defined ICC values between 0.60 to 0.74 as good, and above 0.75 as excellent.

Convergent validity

Convergent validity between the French MACE and the CTQ was assessed using Pearson's correlation coefficients. The total CTQ Severity score was compared to the total MACE Severity score including the 10 subscales, and to the total MACE Severity score excluding the four subscales corresponding to types of adversity not investigated by the CTQ (i.e., emotional and physical abuse by peers, witnessing interparental violence, and violence to siblings). Next, we estimated the ability of the MACE subscales to predict the presence or absence of clinically relevant levels of exposure on the corresponding CTQ subscales (i.e., Emotional Abuse, Emotional Neglect, Physical Neglect, Physical Abuse,

and Sexual Abuse). To discriminate between moderate and severe levels of exposure to adversity, the clinical cutoffs originally proposed by Fink and Bernstein (1998) for the CTQ subscales were used. Receiver-Operating Characteristic (ROC) tests were applied to determine clinical cutoffs for the corresponding MACE subscales. The sensitivity and specificity of each subscale were observed. Sensitivity indicates the ability of the test to identify with the highest accuracy the individuals who have actually been exposed to severe levels of maltreatment (true positives), and this statistical index was considered first, with a criterion of 0.70. Specificity, i.e., the ability of each subscale to identify true negatives, was considered second. Optimal clinical cutoffs were considered to reflect the highest sensitivity-specificity combination. For the MACE subscales with no corresponding CTQ subscale, the clinical cutoffs of the U.S. version of the MACE were used. The clinical cutoffs obtained were used to calculate prevalence rates for each type of adversity in our sample, while examining differences between female and male participants.

Predictive validity

Predictive validity of the MACE was approached using linear regression models. Beta (β) coefficients, equivalent to Pearson's correlation coefficients, were calculated between MACE (and CTQ) total scores and participants' scores on different scales (dissociation, anxiety, and parent-child attachment). Means were compared using the Hotelling-Lawley t-trace for within-sample comparisons.

Statistical analyses were performed using RStudio version 12.0 (2022), The jamovi project 2022, and IBM Corporation 2019.

Results

Subscale analysis using rasch models

Results derived from our dataset for each of the 10 MACE subscales are presented below. They are complemented by Figures A to J available in File S2 of the Supplementary Material.

Parental verbal abuse

The subscale showed acceptable fit for the collection of items, with mean square fit statistics ranging from 0.86 to 1.16 (Table 1). The Andersen LR test was nonsignificant, indicating response invariance regardless of age or gender. Figure A (File S2 of the Supplementary Material) shows Item Characteristic Curves, Item Fit Curves, and Test Information Function for the Rasch Model of Parental Verbal Abuse. The overall Test Information Function indicated that the subscale was most informative in the range of 0 to 2 logits, with 41.08% information.

Parental nonverbal emotional abuse

Mean square fit statistics were acceptable for all items and ranged from 0.92 to 1.10 (Table 2). The Andersen LR test was nonsignificant for both gender and age, indicating acceptable fit. The peak of the test information curve revealed optimal discrimination for high exposure levels with 37.59% of the total information in the range between logit scores -2 and 0 (Figure B, S2 File).

Table 1
Rasch analysis of Parental Verbal Abuse.

Item	% Yes	Difficulty (SE)	Infit	Outfit
1. Swore at you, said insulting things	47.1	0.19 (0.13)	0.96	0.91
2. Said hurtful things that made you feel humiliated	53.4	-0.21 (0.13)	0.93	0.86
3. Made you feel afraid of being physically hurt	36.2	0.90 (0.13)	1.06	1.14
4. Threatened to leave or abandon you	21.7	1.98 (0.15)	1.06	1.16

Infit = Information-weighted mean square statistic; outfit = Outlier-sensitive mean square statistic; SE = standard error.

Table 2
Rasch analysis of Parental Nonverbal Emotional Abuse.

Item	% Yes	Difficulty (SE)	Infit	Outfit
5. Locked you in a closet, attic, basement or garage	9.59	2.58 (0.18)	1.06	1.09
38. Parent very difficult to please	59.59	-0.46 (0.11)	0.98	0.96
39. Parent not interested or with no time to talk to you	52.85	-0.13 (0.11)	0.93	0.92
46. You had to shoulder adult responsibilities	44.30	0.28 (0.11)	0.98	0.97
47. Family under severe financial pressure	40.93	0.44 (0.11)	1.02	1.02
48. Important secrets or facts were kept from you	37.31	0.62 (0.11)	1.06	1.10

Parental physical maltreatment

As indicated in Table 3, mean square fit statistics were below 1.3 and acceptable for items 6, 7, 9, 10, and 11, and sufficient (> 0.50) for item 8 outfit. The Andersen LR test was significant when comparing the model for younger and older participants ($\chi^2(5) = 14.57, p = .012$), but not with gender as a split criterion. A Wald test indicated invariance between younger and older participants for item 11 ($Z = 3.79, p < .001$). For the entire sample, the peak of the test information curve revealed optimal discrimination between moderate to severe exposure levels with 35.16% of the information ranging between logit scores of 0 and 2 (Figure C). The peak of the test information curve was in the same range both in the younger and the older participant subgroups (with respectively 33.48 and 35.68% of the information). The same number of positive responses to the subscale was thus likely to discriminate between moderate and severe levels of exposure to physical abuse in both subgroups and in the whole sample.

Emotional neglect

Mean square infit and outfit statistics were acceptable and ranged from 0.86 to 1.23 (Table 4). The Andersen LR test yielded a significant result with gender as a split criterion ($\chi^2(4) = 11.9, p = .018$), and a non-significant result for age, suggesting that the scale does not deviate from the Rasch model on this latter criterion. For the overall sample as well as for women and men, the peak of the test information curve revealed optimal discrimination between moderate to severe exposure levels with logit scores between 0 and 2, with respectively 39.17, 38.35, and 40.32% of the total information (Figure D).

Physical neglect

Mean square infit and outfit statistics of items 43, 44, 45, and 49 were acceptable as they ranged from 0.81 to 1.29, whereas item 42 had a sufficient outfit mean square value of 0.67 (Table 5). The Andersen LR test was non-significant and indicated response invariance regardless of participant gender and yielded a significant result for age as the split criterion ($\chi^2(4) = 10.2, p = .037$). A Wald test indicated score invariance

Table 3
Rasch analysis of Parental Physical Maltreatment.

Item	% Yes	Difficulty (SE)	Infit	Outfit
6. Intentionally pushed, grabbed, slapped, kicked you	45.86	0.26 (0.13)	0.98	0.97
7. Hit you so hard that it left marks	25.81	1.79 (0.15)	0.88	0.73
8. Hit you so hard that you needed medical attention	4.01	4.93 (0.29)	1.01	0.58
9. Spanked you on your buttocks, arms or legs	69.17	-1.40 (0.14)	1.04	1.05
10. Spanked you on your unclothed buttocks	25.81	1.79 (0.15)	1.05	0.98
11. Spanked you with an object (strap, belt, brush...)	26.07	1.77 (0.15)	0.96	1.21

Table 4
Rasch analysis of Emotional Neglect.

Item	% Yes	Difficulty (SE)	Infit	Outfit
36. Mother unavailable for poor reasons	53.0	-0.19 (0.13)	1.03	1.04
37. Father unavailable for poor reasons	57.4	-0.45 (0.13)	1.11	1.23
40. A family member made you feel loved (<i>reversed</i>)	20.1	2.01 (0.15)	0.91	0.86
41. A family member made you feel important (<i>reversed</i>)	39.7	0.62 (0.13)	1.00	1.00
50. Your family was source of support and strength (<i>reversed</i>)	44.6	0.31 (0.13)	0.92	0.87

Table 5
Rasch analysis of Physical Neglect.

Item	% Yes	Difficulty (SE)	Infit	Outfit
42. A family member was there to take care of you (<i>reversed</i>)	13.59	2.80 (0.17)	0.91	0.67
43. A family member was there to take you to the doctor or the hospital if needed (<i>reversed</i>)	4.87	4.27 (0.26)	0.96	0.92
44. You were not given enough food	5.38	4.14 (0.25)	1.04	1.03
45. You had to wear dirty clothes	4.87	4.27 (0.26)	1.08	1.29
49. Members in your family looked out for each other (<i>reversed</i>)	35.90	0.92 (0.13)	1.00	1.00

between younger and older participants for item 50 ($Z = 2.45, p = .014$). The test information function indicated that the subscale was most informative in the interval between 2 and 4 logits, with 38.59% of the information. The peak of information was located in the same logit interval for both subgroups constituted from the median age.

Witnessing interparental violence

In the original U.S. version of the MACE, this subscale consisted of 5 items. None of these items had mean square fit statistics over 1.5. However, items 22 and 23 (respectively: Witnessed adults living in the home hit your mother so hard that it left marks for more than a few minutes, and Witnessed adults living in the home hit your mother so hard that she needed medical attention) exhibited mean square outfit statistics lower than 0.5. Item 23 (required medical attention) was thus eliminated. As indicated in Table 6, the mean square fit statistics for the remaining items 20, 22, and 23 were acceptable (ranging from 0.72 to 1.12), and sufficient for item 21 (mean square outfit statistic = 0.52). The Andersen LR test was non-significant with gender as the split criterion. However, it was significant with age ($\chi^2(3) = 8.69, p = .034$). The Wald test showed invariance between younger and older participants on item 21 ($Z = 2.05, p = .04$). For the overall sample, the test information function curve indicated that the subscale was most informative in the interval between 2 and 4 logits, with 37.38% of the total information.

Table 6
Rasch analysis of Witnessing Interparental Violence.

Item	% Yes	Difficulty (SE)	Infit	Outfit
20. Saw adults push, grab... your mother (stepmother, grandmother)	25.13	1.83 (0.15)	0.95	0.94
21. Saw adults push, grab... your mother (stepmother, grandmother) so hard that it left marks	6.78	4.11 (0.23)	1.00	0.52
22. Saw adults push, grab... your father (stepfather, grandfather)	10.55	3.44 (0.20)	1.03	1.12
23. Saw adults push, grab... your father (stepfather, grandfather) so hard that it left marks	2.01	5.59 (0.39)	1.01	0.72

The peak of this function was located in the same interval for the subgroups constituted using age as the split criterion.

Witnessing violence to siblings

The subscale showed acceptable mean square fit statistics for items 14, 16, and 17 (between 0.99 and 1.12), while the mean square outfit statistic for item 15 (= 0.54) was sufficient (Table 7). The Andersen LR test was non-significant for both gender and age, indicating acceptable fit. The peak of the test information curve revealed optimal discrimination between moderate to severe exposure levels with 34.08% of the information between logit scores of 2 and 4 (Figure G).

Sexual abuse

In the original U.S. version of the MACE scale, this subscale consisted of 7 items. None of these items had mean square fit statistics over 1.5. However, item 14 (Had you touch their body in a sexual way) exhibited mean square outfit statistics lower than 0.5. This item was therefore discarded. As indicated in Table 8, from the remaining 6 items, items 12, 13, 18, and 35 had acceptable mean square fit statistics (ranging from 0.84 to 1.20), and items 19 and 34 sufficient ones (> 0.5). The Andersen LR test was non-significant for both gender and age, indicating acceptable fit. The peak of the test information curve revealed optimal discrimination between moderate to severe exposure levels with 42.94% of the information between logit scores of 2 and 4 (Figure H).

Peer emotional abuse

As indicated in Table 9, the subscale showed acceptable mean square fit statistics for items 24, 25, 26, and 27 (between 0.99 and 1.12), while the mean square outfit statistic for item 28 (= 1.42) was sufficient. The Andersen LR test was non-significant with age as the split criterion. However, it was significant with gender ($\chi^2(4) = 18.8, p = .001$). The Wald test showed invariance between female and male participants on item 28 ($Z = -3.87, p < .001$). For the overall sample, the test information function curve indicated that the subscale was most informative in the interval between 0 and 2 logits, with 37.51% of the total information (Figure I). The peak of this function was located in the same interval for the subgroups constituted using gender as the split criterion.

Peer physical bullying

As Table 10 shows, mean square fit statistics were acceptable for items 29, 31, and 33 (between 0.82 and 0.99), and sufficient for other items (between 0.65 and 1.38). The Andersen LR test was significant both for gender ($\chi^2(4) = 18.8, p = .001$) and age ($\chi^2(4) = 10.3, p = .036$). The Wald test showed invariance between female and male participants on items 29 ($Z = -3.07, p = .002$), 31 ($Z = -2.85, p = .004$) and 33 ($Z = -2.79, p = .005$), and invariance between younger and older participants on item 30 ($Z = 2.07, p = .038$). For the overall sample, the test information function curve indicated that the subscale was most informative in the interval between 2 and 4 logits, with 35.95% of the information (Figure J). The peak of this function was located in the same interval for the subgroups constituted using age as the split criterion and

Table 7
Rasch analysis of Witnessing Violence to Siblings.

Item	% Yes	Difficulty (SE)	Infit	Outfit
14. Parent or adult living in the house hit your sibling (stepsibling) so hard that it left marks	23.65	1.72 (0.14)	0.99	0.99
15. Parent ... hit your sibling (stepsibling) so hard that they needed medical attention	3.34	4.51 (0.30)	0.98	0.54
16. Parent ... made inappropriate sexual comments to your sibling	3.86	4.34 (0.28)	1.05	1.07
17. Parent ... touched your sibling in a sexual way	1.29	5.59 (0.47)	1.07	1.12

Table 8
Rasch analysis of Sexual Abuse.

Item	% Yes	Difficulty (SE)	Infit	Outfit
12. Parent made inappropriate sexual comments	11.20	3.20 (0.19)	1.12	1.20
13. Parent touched your body in a sexual way	7.12	3.86 (0.22)	1.06	0.94
18. Adult made you touch their body in a sexual way	12.21	3.10 (0.18)	1.08	1.09
19. Adult had sexual intercourse with you	8.65	3.58 (0.21)	0.94	0.57
34. Peer(s) forced you to engage in sexual activity against your will	12.98	2.96 (0.18)	0.90	0.65
35. Peer(s) forced you to do things sexually you did not want to do	17.05	2.51 (0.16)	0.95	0.84

Table 9
Rasch analysis of Peer Emotional Abuse.

Item	% Yes	Difficulty (SE)	Infit	Outfit
24. Swore at you, called you names more than a few times a year	47.7	0.17 (0.13)	0.87	0.74
25. Said hurtful things that made you feel humiliated	61.8	-0.79 (0.13)	0.87	0.78
26. Said things behind your back, spread rumors about you	47.2	0.21 (0.13)	1.04	1.08
27. Intentionally excluded you from activities or groups	56.3	-0.40 (0.13)	0.99	0.93
28. Acted in a way that made you feel afraid to be physically hurt	32.2	1.25 (0.14)	1.19	1.42

Table 10
Rasch analysis of Peer Physical Bullying.

Item	% Yes	Difficulty (SE)	Infit	Outfit
29. Threatened you in order to take your money or possessions	12.66	3.05 (0.18)	0.99	0.96
30. Forced or threatened you to do things you did not want to do	16.96	2.54 (0.17)	1.17	1.38
31. Intentionally pushed, grabbed, slapped... you	39.24	0.72 (0.13)	0.96	0.93
32. Hit you so hard that it left marks for more than a few minutes	14.68	2.80 (0.17)	0.88	0.65
33. Hit you so hard that you needed medical attention	5.32	4.37 (0.26)	0.92	0.82

for female participants. In contrast, the peak of the test information curve was between 0 and 2 logits (with 40.04% of the information) for men.

Summary

Results of the Rasch model analysis of the 10 subscales are summarized in Table 11. The corresponding French version of the MACE [Echelle Chronologique d'Exposition à la Maltraitance et aux Abus; MACE-50 (Fr)] is available in File S3 of theS Supplementary Material. Excel spreadsheets for scoring the French MACE are also included: File S4 for clinical use and File S5 for research use. Once the participant's responses have been entered (File S4) or copied and pasted (File S5), total and subscale scores are automatically generated. They are available on the "Cotation" sheet for File S4, and in the right-hand columns for file S5. For File 4, the file has been designed such as practitioners can ask their patients to provide their answers directly on the first sheet.

Table 11
Distribution of the 50 items of the French MACE after subscale analysis.

Subscale	Number of items (item weight)*	Item number in each subscale**	
		Item number in the original MACE scale	Item number in the MACE-50 (Fr)
Parental Verbal Abuse	4 (2,5)	1, 2, 3, 4	1, 2, 3, 4
Parental Nonverbal Emotional Abuse	6 (1,67)	5, 40, 41, 48, 49, 50	5, 38, 39, 46, 47, 48
Parental Physical Maltreatment	6 (1,67)	6, 7, 8, 9, 10, 11	6, 7, 8, 9, 10, 11
Emotional Neglect	5 (2)	38, 39, 42R, 43R, 52R	36, 37, 40R, 41R, 50R
Physical Neglect	5 (2)	44R, 45R, 46, 47, 51R	42R, 43R, 44, 45, 49R
Witnessing Interparental Violence	4 (2,5)	21, 22, 23, 24, 25	20, 21, 22, 23
Witnessing Violence to Siblings	4 (2,5)	15, 16, 17, 18	14, 15, 16, 17
Sexual Abuse	6 (1,67)	12, 13, 14, 19, 20, 36, 37	12, 13, 18, 19, 34, 35
Peer Emotional Abuse	5 (2)	26, 27, 28, 29, 30	24, 25, 26, 27, 28
Peer Physical Bullying	5 (2)	31, 32, 33, 34, 35	29, 30, 31, 32, 33
MACE total	50	52	50

* The score for each subscale is calculated by summing positive responses. Each sum is then scaled to 10 (score between 0 and 10). Item weight refers to the proportion (out of 10) that each item represents on its subscale. For example, for a 4-item scale, the weight of each item is $10/4 = 2.5$.

** Items followed by the letter R require reverse scoring.

Test-retest reliability

Test-retest reliability was assessed online over a 385-day period (± 118) among 50 participants ($M = 34.28 \pm 10.08$ years) close in age to the overall sample ($M = 39.1 \pm 10.8$ years). The subsample included 14 men (28%) and 36 women (72%), which is close to the proportion in the overall sample (34.48% men and 65.52% women). Educational levels were identical within both groups. MACE Severity and Multiplicity total scores were also close when comparing measures collected from the overall sample ($M = 26.7 \pm 15$ and $M = 2.75 \pm 2.31$, respectively) and

Table 12
Results of the ICC test-retest reliability analysis of the 6 MACE total scores and the 10 MACE subscales, using two-way mixed effect ANOVA models with interaction for the absolute agreement ($N = 50$).

MACE score	ICC	95% CI	F-test	p-value
<i>Total scores</i>				
Severity	0.90	[0.83–0.94]	9.79	.000
Multiplicity	0.87	[0.77–0.93]	7.69	.000
Neglect	0.86	[0.75–0.92]	7.25	.000
Abuse	0.87	[0.77–0.93]	7.42	.000
Duration	0.73	[0.50–0.85]	4.0	.000
Severity Quotient	0.83	[0.70–0.90]	5.76	.000
<i>Subscale scores</i>				
Parental Verbal Abuse	0.72	[0.50–0.84]	3.46	.000
Parental Nonverbal Emotional Abuse	0.74	[0.54–0.85]	3.82	.000
Parental Physical Maltreatment	0.91	[0.85–0.95]	11.38	.000
Emotional Neglect	0.87	[0.76–0.92]	7.70	.000
Physical Neglect	0.70	[0.48–0.83]	3.40	.000
Witnessing Interparental Violence	0.85	[0.74–0.91]	6.62	.000
Witnessing Violence to Siblings	0.88	[0.78–0.93]	8.14	.000
Sexual Abuse	0.82	[0.68–0.90]	5.50	.000
Peer Emotional Abuse	0.85	[0.74–0.92]	6.75	.000
Peer Physical Bullying	0.71	[0.49–0.83]	3.44	.000

ICC = Intraclass correlation coefficient based on an average test-retest period of 385 days.

MACE Severity and Multiplicity total scores collected from the retest subsample ($M = 23 \pm 16$ and $M = 2 \pm 2$, respectively). As shown in Table 12, test-retest reliability was excellent for most MACE total scores and subscale scores (between 0.82 and 0.91), and good (between 0.70 and 0.74) for the MACE Duration score and 4 subscale scores (Parental Verbal and Nonverbal Emotional Abuse, Physical Neglect, and Peer Physical Bullying).

Convergent validity

As shown in Table 13, convergent validity between the MACE-50 (Fr) and the CTQ was assessed using Pearson's correlation coefficients. Results showed that MACE Severity and MACE Multiplicity total scores (including all 10 subscales) were highly correlated with CTQ Severity and Multiplicity scores ($r = 0.83$ and $r = 0.75$, respectively). As expected, these correlations increased when MACE total scores included the only six factors also assessed by the CTQ ($r = 0.85$ and $r = 0.78$, respectively). In addition, the MACE Duration score correlated less strongly with both Severity and Multiplicity CTQ scores, suggesting that this factor represents another aspect of early adversity (Fosse et al., 2020). Moderate to strong correlations were observed between MACE subscales and their corresponding CTQ subscales (Table 14).

ROC-analyses were used to determine optimal cutoffs to discriminate between moderate to severe exposure levels on the MACE subscales that have a corresponding subscale on the CTQ. Results are presented in Table 15. For example, the MACE Parental Verbal Abuse subscale predicted CTQ Emotional Abuse with reasonable accuracy (AUC = 0.88, 95% CI 0.84–0.91). With 73.74% sensitivity and 86.55% specificity, cutoff was set at 3 positive items to clinically define presence versus absence of severe exposure to Parental Verbal Abuse on the MACE.

Once the clinical severity cutoff scores had been determined, we were able to complete a table summarizing all the total and subscale scores for the whole sample as well as for women and men. These descriptive statistics are presented in Table B of the Supplementary Material S6 of the study.

Prevalence rates

Prevalence per type of abuse

Within the overall sample, self-reported prevalence of exposure ranged from 12.4% for Witnessing Violence to Siblings to 47.2% for Parental Non-verbal Emotional Abuse (Table 16). Emotional abuse, whether by parents or peers, was the item most reported by participants, with prevalence rates of 47.2% for parental emotional abuse, 39.6% for emotional neglect, and 34% for peer emotional abuse including harassment and ostracism. Significant gender differences were found and, although not always significant, the frequency of the different types of abuse was always greater among female than among male participants. In particular, rates of sexual assault and verbal abuse during

Table 13
Pearson correlations between MACE and CTQ total scores.

MACE total score	CTQ Severity r, p [95% CI]		CTQ Multiplicity r, p, [95% CI]	
	M	SD		
MACE Severity (10 subscales)	26.7	15.0	0.83, $p < 0.001$, [0.79–0.85]	0.73, $p < 0.001$, [0.68–0.77]
MACE Severity (6 subscales)	18.1	10.9	0.85, $p < 0.001$, [0.82–0.88]	0.77, $p < 0.001$, [0.73–0.81]
MACE Multiplicity (10 subscales)	2.75	2.31	0.82, $p < 0.001$, [0.78–0.85]	0.75, $p < 0.001$, [0.70–0.79]
MACE Multiplicity (6 subscales)	1.79	1.66	0.84, $p < 0.001$, [0.80–0.86]	0.78, $p < 0.001$, [0.74–0.82]
MACE Duration*	9.92	7.57	0.68, $p < 0.001$, [0.62–0.73]	0.61, $p < 0.001$, [0.54–0.67]

* Number of years during which the respondent was exposed to at least one type of maltreatment above the clinical cutoff for severity.

Table 14

Pearson correlations between MACE subscale severity scores and their corresponding CTQ subscales.

MACE subscale	CTQ subscale	r,p, [95% CI]
Parental Verbal Abuse	Emotional Abuse	0.72, $p < .001$, [0.67–0.77]
Emotional Neglect	Emotional Neglect	0.71, $p < .001$, [0.66–0.76]
Physical Neglect	Physical Neglect	0.66, $p < .001$, [0.60–0.72]
Parental Nonverbal Emotional Abuse	Emotional Abuse	0.58, $p < .001$, [0.51–0.64]
	Emotional Neglect	0.54, $p < .001$, [0.47–0.61]
Parental Physical Maltreatment	Physical Abuse	0.65, $p < .001$, [0.59–0.70]
Sexual Abuse	Sexual Abuse	0.67, $p < .001$, [0.61–0.72]

Table 15

Ability of the MACE subscales to clinically predict relevant levels of exposure on the CTQ subscales.

MACE subscale	CTQ subscale	Area under the ROC curve (AUC) [95% CI]	Optimal cutoff* (n items with positive response)	Sensitivity (%) / specificity (%)
Parental Verbal Abuse	Emotional Abuse	0.88 [0.84–0.91]	3	73.74 / 86.55
Emotional Neglect	Emotional Neglect	0.87 [0.83–0.91]	3	79.55 / 80.54
Physical Neglect	Physical Neglect	0.93 [0.87–0.97]	2	85.0 / 87.53
Parental Nonverbal Emotional Abuse	Emotional Abuse	0.78 [0.73–0.83]	3	81.82 / 64.48
Emotional Neglect	Emotional Neglect	0.78 [0.73–0.82]	3	76.52 / 67.70
Parental Physical Maltreatment	Physical Abuse	0.93 [0.87–0.98]	4	95.65 / 83.83
Sexual Abuse	Sexual Abuse	0.91 [0.87–0.95]	2	82.61 / 87.61

* In agreement with Teicher and Parigger's (2015) analysis, the following cutoff scores were selected for the 4 MACE subscales with no corresponding CTQ subscales: Witnessing Interparental Violence, 2; Witnessing Violence to Siblings, 1; Peer Emotional Abuse, 4; Peer Physical Bullying, 2.

childhood reported by women were significantly higher than those reported by men (odds ratio 2.77, $\chi^2(1) = 11.5$, $p < .001$ for Sexual Abuse, and 1.53; $\chi^2(1) = 3.41$, $p = .007$ for Parental Verbal Abuse). Odds were reversed only for Peer Physical Bullying, with men reporting significantly more exposure than women (odds ratio 0.28, $\chi^2(1) = 28.3$, $p < .001$).

Multiplicity of exposure

Only 12.7% of the women and 6.9% of the men, representing a cumulative percentage of 19.5% of the participants, reported not having experienced any form of childhood abuse (Table 17). One-third of the overall sample (33%) reported having experienced between 1 and 2 types of maltreatment, and over half (56.6%) had experienced between 1 and 4 different types of adverse childhood experiences. However, there was no clear-cut gender differences in prevalence of exposure to number of different types of maltreatment ($\chi^2(10) = 7.39$, $p = .69$).

It is not uncommon for individuals who face the most severe levels of exposure to also report the highest number of types of maltreatment. Table 18 confirms that severity scores between the different types of maltreatment are intercorrelated. The strongest correlations are found between the different types of parental abuse, particularly between verbal and non-verbal emotional abuse ($r = 0.58$) and between verbal

Table 16

Prevalence of self-reported exposure to different types of abuse in the overall sample and among female and male participants.

Type of maltreatment	Sample	Females	Males	Odds ratio [95% CI]	χ^2
Parental Verbal Abuse	34.0%	24.4%	9.6%	1.53 [0.97–2.40]	3.41, $p = .007$
Parental Nonverbal Emotional Abuse	47.2%	32.5%	14.7%	1.32 [0.87–2.01]	1.73, $p = .188$
Parental Physical Maltreatment	21.6%	13.2%	8.4%	0.79 [0.48–1.29]	0.89, $p = .346$
Emotional Neglect	39.6%	26.9%	12.7%	1.20 [0.78–1.84]	0.70, $p = .404$
Physical Neglect	16.2%	9.9%	6.3%	0.79 [0.46–1.37]	0.70, $p = .403$
Witnessing Interparental Violence	12.4%	7.6%	4.8%	0.81 [0.44–1.50]	0.45, $p = .503$
Witnessing Violence to Siblings	26.4%	18.0%	8.4%	1.19 [0.74–1.91]	0.49, $p = .486$
Sexual Abuse	20.6%	16.8%	3.8%	2.77 [1.51–5.08]	11.5, $p < .001$
Peer Emotional Abuse	34.0%	21.3%	12.7%	0.83 [0.54–1.28]	0.70, $p = .402$
Peer Physical Bullying	23.4%	9.9%	13.5%	0.28 [0.17–0.45]	28.3, $p < .001$

Table 17

Prevalence of self-reported exposure to number of different types of abuse in the overall sample and among female and male participants.

MACE Multiplicity	Sample	Females	Males
0	19.5%	12.7%	6.9%
1	18.3%	11.7%	6.6%
2	14.7%	9.1%	5.6%
3	12.7%	9.1%	3.6%
4	10.9%	7.4%	3.6%
5	8.9%	5.6%	3.3%
6	7.6%	5.8%	1.8%
7	4.6%	2.5%	2.0%
8	1.5%	1.0%	0.5%
9	1.0%	0.3%	0.8%
10	0.3%	0.3%	0.0%

and physical abuse ($r = 0.56$). As might be expected, the weakest correlations were found between maltreatment within the family and peer abuse. For example, emotional neglect was weakly associated with peer emotional abuse ($r = 0.11$). The correlation was significant, however, suggesting a victimization process at play.

Predictive validity

Total scores on both the MACE and CTQ were significantly correlated with all scales and subscales used for comparison (Table 19). Regression coefficients were equal and even overall slightly higher for the MACE than for the CTQ, at least for dissociation and trait-anxiety. For both these outcomes, correlations were also stronger with severity scores than with multiplicity scores. Severity of maltreatment, rather than a large number of different types of abuse, is what leads to increased levels of anxiety and dissociation in adults who were maltreated as children.

Results for the Parental Bonding Instrument (PBI) were consistent with the literature (e.g., Claes et al., 2003; Parker et al., 1979). Low scores on the care dimension (i.e., emotional coldness, indifference) and high scores of overprotection (i.e., intrusiveness, infantilization, excessive contact, promoting dependency) were associated with higher levels of abuse (severity and multiplicity) resulting from poor or absent parent-child attachment. Expectedly, a deficit of care from both parents worsened the severity of maltreatment ($\beta = -0.58$, $t = -13.9$, $p < .001$) compared to maltreatment by the mother ($\beta = -0.50$, $t = -11.3$, $p < .001$) or father ($\beta = -0.39$, $t = -8.38$, $p < .001$) alone. Similar

Table 18
Intercorrelations (Pearson's r) between MACE subscale severity scores.

	PVA	PNEA	PPM	EN	PN	WIV	WVS	SA	PEA	PPB
Parental Verbal Abuse (PVA)	—									
Parental Nonverbal Emotional Abuse (PNEA)	0.58 < .001	—								
Parental Physical Maltreatment (PPM)	0.56 < .001	0.37 < .001	—							
Emotional Neglect (EN)	0.40 < .001	0.45 < .001	0.33 < .001	—						
Physical Neglect (PN)	0.36 < .001	0.41 < .001	0.33 < .001	0.56 < .001	—					
Witnessing Interparental Violence (WIV)	0.32 < .001	0.33 < .001	0.33 < .001	0.23 < .001	0.28 < .001	—				
Witnessing Violence to Siblings (WVS)	0.44 < .001	0.31 < .001	0.53 < .001	0.23 < .001	0.30 < .001	0.32 < .001	—			
Sexual Abuse (SA)	0.25 < .001	0.29 < .001	0.15 < .001	0.20 < .001	0.18 < .001	0.16 < .001	0.24 < .001	—		
Peer Emotional Abuse (PEA)	0.27 < .001	0.22 < .001	0.20 < .001	0.11 < .001	0.09 ns*	0.14 0.005	0.14 0.007	0.11 0.023	—	
Peer Physical Bullying (PPB)	0.21 < .001	0.19 < .001	0.25 < .001	0.07 ns	0.15 0.004	0.19 < .001	0.22 < .001	0.12 0.018	0.50 < .001	—

* ns = non-significant.

Table 19
Linear regression coefficient β and Hotelling-Lawley trace significance for the comparison between MACE and CTQ total scores and scores on various questionnaires.

Scales and subscales (M, SD)	Severity scores Severity Quotient*	MACE Severity	CTQ Severity	Multiplicity scores MACE Multiplicity	CTQ Multiplicity
Dissociative Experience Scale (DES)					
Absorption (37.9, 16.2)	0.19, $p < .001$	0.24, $p < .001$	0.18, $p < .001$	0.19, $p < .001$	0.13, $p = .009$
Depersonalization and derealization (17.5, 9.65)	0.19, $p < .001$	0.20, $p < .001$	0.20, $p < .001$	0.17, $p < .001$	0.16, $p = .002$
Total DES score (27.6, 11.5)	0.20, $p < .001$	0.24, $p < .001$	0.20, $p < .001$	0.20, $p < .001$	0.16, $p = .002$
State-Trait Anxiety Inventory (STAI)					
Trait anxiety (STAI-Y-B) (51.8, 10.8)	0.18, $p < .001$	0.20, $p < .001$	0.18, $p < .001$	0.20, $p < .001$	0.15, $p = .004$
Parental Bonding Instrument (PBI)					
Care - Mother (20.4, 9.89)	-0.56, $p < .001$	-0.50, $p < .001$	-0.63, $p < .001$	-0.50, $p < .001$	-0.60, $p < .001$
Overprotection - Mother (15.7, 9.42)	0.38, $p < .001$	0.36, $p < .001$	0.33, $p < .001$	0.34, $p < .001$	0.31, $p < .001$
Care - Father (17.4, 8.45)	-0.42, $p < .001$	-0.39, $p < .001$	-0.41, $p < .001$	-0.39, $p < .001$	-0.35, $p < .001$
Overprotection - Father (9.98, 7.0)	0.34, $p < .001$	0.29, $p < .001$	0.30, $p < .001$	0.29, $p < .001$	0.30, $p < .001$
Care - Parents (37.8, 14.3)	-0.63, $p < .001$	-0.58, $p < .001$	-0.68, $p < .001$	-0.58, $p < .001$	-0.62, $p < .001$
Overprotection - Parents (25.7, 13.1)	0.45, $p < .001$	0.41, $p < .001$	0.39, $p < .001$	0.40, $p < .001$	0.38, $p < .001$

* Severity Quotient = mean severity score of exposure to maltreatment experienced during the first 18 years of life.

observations were made regarding overprotection and multiplicity of early adverse experiences.

Discussion

The goal of this study was to provide a French version of the 52-item Maltreatment and Abuse Chronology of Exposure (MACE) scale (Teicher & Parigger, 2015), to assess its psychometric properties, and to provide prevalence rates of self-reported maltreatment in a non-clinical sample of French adults.

Statistical analyses show that each type of adverse childhood experience (ACE) assessed by the MACE can be captured with 4 to 6 items, which add up to a total of 50 items, slightly fewer than in the U.S. (52 items) and Norwegian (55 items) versions of the scale. Some of the subscales were found to elicit different response patterns depending on the gender or age of the respondent. Among possible explanations for the differences between younger and older participants, Fosse et al. (2020) hypothesized a change in parenting practices in Norway, with current practices assumed to be less abusive. A complementary explanation might be that events that are normalized by young adults (e.g., witnessing interparental violence) might acquire a different meaning as they grow older and gain experience, especially when they become parents themselves. For gender differences, prevalence rates indicate that girls are always disadvantaged. One explanation could be that girls generally experience a wider or different range of mistreatment within each type of abuse, or that they have a greater awareness and knowledge

(i.e., literacy) of what mistreatment or abuse is because they are more often victims. This awareness could also increase with their own motherhood.

With respect to prevalence rates, those derived from our sample are particularly alarming considering that our experimental population consisted mostly of adults from the general population. In particular, we found that 80% of the study population reported having been exposed to between 1 and 10 ACEs, even though these figures do not capture exposure to moderate levels of maltreatment, but only to severe levels. They also do not capture all possible types of ACEs, knowing that the review by Oh et al. (2018) identified 29 of them including exposure to community violence or poverty. Prevalence rates in our sample could not be compared to Norwegian rates, which were not calculated in the study by Fosse et al. (2020). However, prevalence rates of self-reported exposure to abuse in our sample are much higher than those reported in the United States by Teicher and Parigger (2015). For example, "only" 10.4% of U.S. participants reported having been sexually abused compared to 20.6% in the French sample, roughly double. Similarly, 19.70% of U.S. adults reported severe levels of early exposure to emotional neglect versus 39.6% of French adults. Regarding the multiplicity of adversity sources, less than 20% of our participants reported having experienced no ACE (41.77% in the U.S. sample), implying that 80% of them had been exposed to between 1 and 10 ACEs. In addition, although gender differences were not always statistically significant with respect to severity and multiplicity of exposure to adversity (except for sexual abuse, parental verbal abuse, and peer physical bullying), it is

clear that female gender is a risk factor for early neglect and abuse. This risk factor follows closely behind the primary one which is being a child.

Test-retest reliability was good given the time interval between measures. Even after more than one year, score stability was comparable (although understandably slightly lower) to that reported in the two MACE studies from Norway and the USA. For example, the correlation between MACE Severity scores obtained over a two-week period was $r = 0.96$ in the Norwegian experimental group, and $r = 0.91$ in the U.S. group over a 6-month period; it was equal to $r = 0.90$ in our group over a period of more than 12 months.

Results for convergent validity between the French MACE and the CTQ are close to those of Fosse et al. (2020) and Teicher and Parigger (2015) for the Norwegian and the U.S. version. Like these authors, we found that MACE Duration scores were less strongly correlated with CTQ total scores than Multiplicity and Severity total scores. This observation is consistent with previous studies suggesting that duration and timing of exposure to adversity provide information that is different and complementary to multiplicity and severity scores. For example, Schalinski et al. (2016) showed in a sample of 129 psychiatric inpatients that PTSD symptoms were best predicted by MACE Severity total scores, whereas dissociative and depressive symptoms were best predicted by certain types of adversity and sensitive time periods. Specifically, Emotional Neglect from age 4 to 5 and Physical Neglect at age 5 were associated with increased levels of dissociation in adulthood, whereas Emotional Neglect from age 8 to 9 worsened depressive symptoms. In relation to these associations, we found evidence of statistically significant relationships between MACE scores and dissociative symptoms, whether non-pathological and associated with absorption in one's imagination and thoughts, or pathological with episodes of depersonalization and derealization. Significant associations were also found between MACE composite scores and trait anxiety.

In addition, MACE total scores (Severity and Multiplicity) were better predictors than CTQ scores of both dissociative and anxiety symptoms. These results add to previous findings by Teicher and Parigger (2015) who assessed predictive validity of the MACE using the Kellner Symptom Questionnaire (SQ; Kellner, 1987) and Fosse et al. (2020) who used the Symptom checklist 90 (SCL-90; Derogatis, 2017). Significant positive associations were found between MACE composite scores and all mental health problems assessed by the SCL-90 (i.e., somatization, obsessive-compulsive symptoms, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, and psychoticism) and between MACE and SQ components (i.e., dissociation, limbic irritability, and suicidal ideation). Correlations were also stronger with the MACE than with the CTQ. While correlation is not necessarily evidence of causality, the strong links between early adversity and a variety of serious mental health issues confirm a fact that is now widely established in the literature; namely, that early exposure to neglect and abuse is a powerful and critical risk factor for developing a variety of mental health problems across the life course.

Strengths and limitations

Berman et al. (2022) recently identified a dozen different tools for measuring early adversity (threat and deprivation) in English-speaking adults. We are far from having a comparable number of tools to assess early exposure to adversity among French-speaking adults. As a result, a new screening tool with acceptable psychometric properties should be a valuable contribution to both clinical practice and research. The advantage of the French 50-item MACE is to account for more types of adverse experiences than the gold standard CTQ (10 ACEs vs. 5). Moreover, in addition to a severity and a multiplicity score (number of types of maltreatment experienced), the MACE also investigates the timing and duration of exposure. This possibility for temporal evaluation parallels numerous observational studies that increasingly show early-life adversity as an aggravating or precipitating factor in brain developmental dysfunction (e.g., Sheridan et al., 2017; Tanti et al.,

2022). Nevertheless, as with many screening questionnaires, the MACE relies on the testimony of respondents, which means that the collection of certain aspects of abuse (i.e., verbal or emotional abuse) may be subjective and dependent on the sensitivity of each respondent. Comparably, the age of onset of each ACE depends on participants' long-term memory, which may be imperfect. As Teicher and Parigger (2015) have pointed out, some reported events from early childhood may reflect events they have heard about from relatives. Finally, the concerning prevalence rates found among our French participants would need to be replicated in a larger representative sample. However, a comparative study published in 2007 involving several European countries indicated that over half of parents in France had already spanked their children on the buttocks, compared to 17% in Germany and Austria and 4% in Sweden (Busmann et al., 2010). The explanation was that Sweden adopted a law prohibiting corporal punishment of children in 1979, while such a law only exists in France since 2019. According to Sethi et al.' (2013) report for the World Health Organization, a survey conducted by the Union of Families in Europe found that 96% of French children had already been smacked and 30% had been punished with a whip. This was much higher than other European countries (e.g., 48.7% of Slovenian parents reported having raised their hand on their child, and 2.5% hitting them with an object). Finally, using medical and judicial data, Tursz et al. (2010) found that 71% of homicides by fatal maltreatment identified by the French courts were not coded as such in mortality statistics. This result, much higher than in the United States for example, led the authors to conclude that the number of infant homicides in official national statistics was underestimated. At the time the study was conducted, nearly 33% of "accidental" deaths and 25% of deaths from unknown cause in mortality statistics were in fact suspicious/violent deaths. All these results taken together do not suggest that parenting practices in France are improving.

Conclusion

The French 50-item MACE [MACE-50 (Fr)] scale is adapted from the clinical version of the U.S. MACE scale originally developed by Teicher and Parigger (2015) and is freely available for download. It retrospectively assesses ten types of maltreatment and their time of occurrence between the age of 1 and 18. In a non-clinical sample of 402 French adults, we established that the MACE-50 (Fr) had acceptable psychometric properties, including good convergent validity with the Childhood Trauma Questionnaire (CTQ; Bernstein et al., 1994, 1997), good test-retest reliability at 385 days, and better ability than the CTQ to predict a number of mental health problems, including dissociation and trait-anxiety. As a result, the MACE-50 (Fr) can be considered as a useful and reliable tool for both clinical practice and research.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.ejtd.2023.100336](https://doi.org/10.1016/j.ejtd.2023.100336).

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