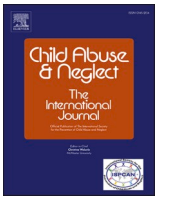
Child Abuse & Neglect 158 (2024) 107117

Contents lists available at ScienceDirect

Child Abuse & Neglect

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



The Comprehensive Adversity Measure (CAM): A measure of early adversity and its severity

Pascal Schlechter [a,*], Nina M. Lutz [b], Nexhmedin Morina [a], Jon E. Grant [c], Christine Lochner [d], Samuel R. Chamberlain [e,f], Paul O. Wilkinson [b], Jessica Fritz [g]

[a] Institute of Psychology, University of Münster, Germany
[b] Department of Psychiatry, University of Cambridge, UK
[c] Department of Psychiatry & Behavioral Neuroscience, University of Chicago, Chicago, IL, USA
[d] SA MRC Unit on Risk and Resilience in Mental Disorders, Department of Psychiatry, Stellenbosch University, South Africa
[e] Department of Psychiatry, Faculty of Medicine, University of Southampton, UK
[f] Southern Health NHS Foundation Trust, Southampton, UK
[g] Institute of Psychology, University of Osnabrück, Germany

ARTICLE INFO

Keywords:
Early adversity
Childhood adversity
Childhood trauma
Severity of adversity
Assessment of adversity

ABSTRACT

Background: Early adversity scales often display insufficient content coverage and typically assess the presence of adversity, but not its severity.
Objective: To address some of these limitations, we developed the 13-item Youth and Childhood Adversity Scale. We subsequently revised and expanded the scale regarding content coverage and item wording, resulting in a 22-item version, which we here describe.
Methods: We conducted one cross-sectional ($N = 1498$; 43.9 % females; 24.42 years, $SD = 3.72$, range: 18–30 years) and one longitudinal study ($N = 1084$; 39.6 % females; 32 years, $SD = 10.49$, range: 18–75 years). To reflect the nature of the revised measure more accurately, it was named the Comprehensive Adversity Measure (CAM).
Results: Exploratory factor analysis suggested a one-factor model for both the presence/absence and the severity facet, which both displayed good model fit in subsequent confirmatory factor analyses. Factor models demonstrated at least scalar measurement invariance across gender and country (US/UK). Correlations with psychological distress, depression, anxiety, substance use, posttraumatic stress symptoms, obsessive-compulsive symptoms, suicide attempts, rumination, social comparison, self-esteem, and quality of life provided evidence in support of construct validity – concurrently and prospectively.
Conclusions: The CAM offers a psychometrically-sound, content-wise comprehensive, and free to use assessment of early adversity.

1. Introduction

Early adversities refer to distressing events or circumstances during childhood or adolescents that cause significant emotional or physical stress, which can have lasting negative effects on an individual's well-being and development (McLaughlin, 2016). Exposure to adverse or traumatic experiences in early life is a significant risk factor for poor mental health (McLaughlin, 2016). Early adversities

* Corresponding author.
E-mail address: p_schl20@uni-muenster.de (P. Schlechter).

https://doi.org/10.1016/j.chiabu.2024.107117
Received 9 May 2024; Received in revised form 9 October 2024; Accepted 16 October 2024

– such as neglect, unwanted sexual experiences, domestic violence, and severe disruptions in caregiving – constitute a major public health concern (Hughes et al., 2017). Early adversity can occur within the family as well as in the wider environment. It affects up to half of the population in Western countries (Green et al., 2010), and up to one-third of mental health problems among adults worldwide are associated with early adversity (Kessler et al., 2010). These numbers reflect the importance of adequately capturing and understanding the effects of early adversity. Since the Adverse Childhood Experience study (ACE; Felitti et al., 1998), the prevailing approach to conceptualize early adversity is the cumulative risk approach (Evans et al., 2013). Studies using this approach demonstrate a clear dose-response relationship between early adversity and mental health outcomes in adulthood (Felitti et al., 1998; McLaughlin et al., 2012).

However, as this approach calculates a cumulative presence vs. absence index of multiple possible early adversities without weighing their importance and severity – sometimes referred to as yes/no scoring – it is likely an oversimplified conceptualization of early adversity and may eventually impede progress in understanding its complex nature (Evans et al., 2013). In addition to oversimplified presence/absence scoring, progress in early adversity research is also impeded by limitations of current assessment scales. These limitations range from insufficient content coverage and poor item wording to a lack of the assessment of the severity of early adversity (for reviews, see Burgermeister, 2007; Saini et al., 2019). Therefore, it is no surprise that according to recent debates surrounding the value of cumulative early adversity models (McLaughlin et al., 2021; Smith & Pollak, 2021) and integrative attempts to synthesize leading theories (Ellis et al., 2022), the differential impact of different types of early adversity and their severity is still poorly understood. Some of the mentioned limitations have been addressed by the development of the 13-item Youth and Childhood Adversity Scale (Schlechter et al., 2021). However, there is still room for improvement for this scale to better capture the complexity of early adversity – which we here aim to achieve.

1.1. The Youth and Childhood Adversity Scale (YCAS)

Although many scales [e.g. the revised ACE scale (Finkelhor et al., 2013, 2015) or different versions of the Childhood Trauma Questionnaire (Bernstein et al., 1994, 1998, 2003)] contributed notably to a more accurate understanding of early adversity, many relevant measures a) focus on circumscribed family adversities, b) are restricted to one specific type of adversity, or c) constitute long lists of events that go beyond the scope of the early adversity construct (e.g., daily hassles; for a review, see Oh et al., 2018). Moreover, most early adversity scales focus on immediate family members, and neglect adverse experiences affecting close peers or significant others. However, having a friend or partner with mental health or drug abuse problems, or witnessing a significant other being a victim of violence may also constitute early adversity (Kim & Cicchetti, 2010). Therefore, the wording and item content of the YCAS include events that either happened to significant others or were caused by significant others. Moreover, the YCAS is one of the few available scales that contains a severity index of adversity (Schlechter et al., 2021). The subjective severity of childhood adversity refers to the intensity of the perception of an adverse event. According to Danese and Widom (2020), subjectively reported early adversity displays a stronger effect on subsequent mental health than objectively identified early adversity (Danese & Widom, 2020). This is important because population-based associations between early adversity and mental health do not always translate to individuals (Fisher et al., 2018) nor to prediction for individuals (Baldwin et al., 2021). The YCAS conceptualizes perceived severity by asking about how traumatic the event was on a scale ranging from (1) *not at all traumatic* to (7) *extremely traumatic*. This perception varies among people and may potentially help explain why some individuals remain resilient despite adversity, while others develop mental health problems. By including the severity dimension, the YCAS allows for a finer-grained assessment of the subjective impact of early adversity beyond unweighted, cumulative yes-no scores that treat all adversities as equally important.

The YCAS consists of 13 items (Supplemental Table s1) and was validated in two samples (first sample: 596 adolescents aged 16–19 years; second sample: 451 medical students aged 18–30+ years; Schlechter et al., 2021). Even though this original version enables a practical, reliable, and valid assessment of early adversity and its severity, it still has notable limitations in terms of a) item content coverage and b) item wording. Therefore, we developed a revised version of the YCAS, which is the focus of this manuscript. More specifically, we a) added nine adversities to the scale to capture the construct more comprehensively and b) carefully evaluated and refined the item wording (see Supplemental material 1 and Table s1 as well as the Methods section for details of these changes). Importantly, the revised instrument is called the Comprehensive Adversity Measure (CAM) to convey the nature of the assessment more accurately.

1.2. Aims and hypotheses

In the present study, we examined the psychometric properties of the CAM in one cross-sectional and one longitudinal study. We sought to evaluate the dimensionality, reliability, and measurement invariance, as well as to establish evidence in support of construct validity through examining 'well-known' relationships with mental health constructs (Green et al., 2010). Our previous work with the YCAS revealed a unidimensional model (Schlechter et al., 2021); however, since nine new items were added to the scale, we had no hypothesis regarding its dimensionality (i.e. factor structure). Given that females report more early adversity than men (Leban & Gibson, 2020), we additionally tested whether the CAM measures the same underlying construct (i.e., is measurement invariant) across gender. Likewise, we tested whether participants from the United States (US) and the United Kingdom (UK) represent the underlying early adversity construct similarly. Lastly, we examined correlations with relevant mental health constructs as a proxy indication for the construct validity of the CAM. This approach allowed us to investigate whether CAM scores are indeed consistent with theoretical expectations and have an explanatory value for relevant mental health constructs. Based on prior literature, we hypothesized that the yes/no and severity scores would be positively associated with psychological distress (Manyema et al., 2018), depression and anxiety

(Green et al., 2010; Kessler et al., 2010), substance use (Leza et al., 2021), posttraumatic stress disorder (PTSD; Green et al., 2010) symptoms, obsessive-compulsive disorder symptoms (Visser et al., 2014), suicide attempts (Hughes et al., 2017), rumination (Mansueto et al., 2021), and social comparison (Schlechter et al., 2024), as well as negatively associated with self-esteem (Zilioli et al., 2016) and quality of life (Mosley-Johnson et al., 2019).

2. Methods

2.1. Participants and design

In Study 1, 1498 participants were recruited from the online panel provider Prolific (Palan & Schitter, 2018). Ethical approval was granted by the ethics committee of the University of Cambridge. Inclusion criteria comprised individuals aged 18–30 years residing in either the UK or the US. No further exclusion criteria were applied. Prolific verifies the participants' country of residence and English language fluency when they register on the platform. Data collection was carried out from May 5 to December 1, 2021. All eligible Prolific users received invitations via email on a first-come, first-served basis. Demographic pre-screening was conducted to recruit at least 100 people who are transgender, non-binary or have other gender non-conforming identities. This is because this study was part of a larger project focused on examining specific research questions related to gender non-conforming identities. However, by including this subsample, we were able to investigate variations in the prevalence of adversity among different gender identities. This information is helpful because gender minorities often face more early adversity than cisgender individuals (Barboza-Salerno & Meshelemiah, 2024). Initially, 1763 survey responses were gathered. Subsequently, 233 duplicate responses were excluded, and 16 participants were dismissed without payment for failing more than two attention check questions (e.g., "*Please select 'Slightly Agree' for this question*"). Additionally, four participants were excluded without payment for prematurely exiting the survey after responding only to demographic questions. Twelve more participants left the survey before completing the CAM questionnaire. Of the 1498 included participants, 723 were from the UK, and 775 from the US.

Study 2 contains two timepoints. Data collection for Wave 1 began on September 12, 2022, and lasted approximately one week. Three months later, participants were contacted again, with the final data collection concluding on December 10, 2022. At the first timepoint, 1119 participants provided informed consent. At the second timepoint, three months later, 948 participants provided informed consent. As in Study 1, participants were recruited from the online panel provider Prolific (Palan & Schitter, 2018). Prolific has a participant pool consisting of people from most of the 38 OECD (Organization for Economic Cooperation and Development; www.oecd.org) countries, which were the target of Study 2. Ethical approval was granted by the ethics committee of the University of Münster. Participants had to be fluent in English (as established by Prolific before participants can take part in surveys) and at least 18 years of age. We would have excluded participants if they had failed two out of three attention checks (same attention check as above), but this scenario did not occur (see above). We however excluded 21 participants who completed the survey in under 10 min, as this response time was indicative of non-conscientious responses. Additionally, 12 participants were excluded for taking over one hour to complete the survey, as this suggests interruptions while taking the survey. Two participants had no variance in their responses to the items, even though some items were reversely coded. As this could indicate careless responding, these participants were excluded, too. Accordingly, 1084 participants constituted the final analysis sample at the first timepoint. At the second time-point, 6 participants had to be excluded due to a lack of variance in their ratings on both positive and negatively phrased items before recoding. This led to a final follow-up sample of 942 participants (86.9 % of the analysis sample of timepoint 1).

2.2. YCAS refinement into CAM

The CAM is free to use under a CC BY-NC-SA 4.0 license for non-commercial purposes by researchers and clinicians, and can be found on the open science framework (OSF: https://osf.io/b3w25/?view_only=f597afcf0e9a4acf850299249d78817f). While the YCAS imposes no age restrictions, the CAM specifically evaluates adverse events occurring prior to the age of 18, which allows for a more focused assessment of adverse events experienced during childhood or adolescence. The CAM consists of 22 items of adverse experiences (see Table s1 for all items), which we derived from both theoretical considerations and established early adversity scales with good content validity (Hawes et al., 2021; Morrill et al., 2019). Initially, three authors of the manuscript formulated items based on the theoretical considerations outlined below (as well as in Supplemental material 1), and discussed their fit with the scope of the scale, clarity of the language, and non-redundancy. In several revision rounds, we eliminated and refined items based on these criteria, which resulted in the inclusion of nine additional adversity items. Consistent with the YCAS, the response format has remained unchanged in the CAM. Participants are initially asked to indicate whether a given event occurred by responding to a yes/no question. The total number of yes responses is then used for the calculation of a yes/no score. If participants answer yes, they are presented with a follow-up question regarding the severity of the event. This question offers seven response options ranging from (1) *not at all traumatic* to (7) *extremely traumatic*. Subsequently, a severity score is computed, with participants who indicate 'no' on any given yes/no item receiving a zero on the corresponding severity item.

To address the limitations of the YCAS, the CAM offers several key improvements. The YCAS is limited in terms of its content and wording, for instance by its inadequate coverage of abuse types (i.e., verbal or emotional abuse), absence of neglect items (i.e., physical and emotional neglect), and exclusion of bullying (e.g., Afifi et al., 2020; Finkelhor et al., 2015). Additionally, it fails to account for environmental adversities, experiences in foster care, and socioeconomic hardships like growing up in dangerous neighborhoods, mass violence, and homelessness (e.g., El-Khodary & Samara, 2018; Hambrick et al., 2016). Therefore, the CAM expands the YCAS coverage by including such items. To balance construct breadth and scale length, the CAM assesses different kinds of adverse events each via a

single dichotomous question, followed-up with an ordinal severity question when an event has been indicated. Previous research has suggested that such dichotomous questions, while only being a proxy, are still suited to serve as a reliable indicator of significant adverse experiences (Schlechter et al., 2021). The CAM items are also refined in terms of wording, to increase clarity. For example, the item "*A death of a very close friend or family member?*" was revised to "*Did a very close friend or family member die? (except for a grandparent, unless they were the primary caregiver)*." Of note, there is significant variation among participants in their subjective perception to certain items of the scale, such as for physical and sexual abuse. It is hoped that by asking for the subjective perception of the occurrence, the sensitivity of capturing events is higher (Danese & Widom, 2020) – which however inevitably comes at the expense of specificity (for limitations of this approach, see the Discussion section). Particularly for items with a high sensitivity, the severity facet of the CAM appears to be important in further detailing the intensity of the events. Table s1 in Supplemental material 1 illustrates the here detailed changes, highlighting specifically how the CAM builds on and improves the YCAS framework.

2.3. Study 1: additional measures

2.3.1. The 10-Item Kessler Psychological Distress Scale (K10)

The K10 assesses non-specific psychological distress over the past 30 days (Kessler et al., 2002). This scale comprises 10 items, each rated on a 5-point scale from 1 ("*none of the time*") to 5 ("*most of the time*"). An example item is: "*In the past 4 weeks, about how often did you feel tired out for no good reason?*". A score $\geq$ 30 indicates a probable severe mental disorder. In the present study, the internal consistency was good, $\alpha = 0.89$.

2.3.2. Drug use

We employed a dichotomous question to assess drug use ("*In the past 12 months, did you take any drugs (non-alcohol) more than once, to get high, to feel elated, to get 'a buzz' or to change your mood?*").

2.3.3. Mini International Neuropsychiatric Interview - Obsessive-Compulsive Disorder (MINI-OCD)

The MINI is a structured diagnostic tool to assess various mental health conditions (Sheehan et al., 1998). In the present study, we included the subsection of the MINI that contains specific questions and criteria to diagnose obsessive-compulsive disorder (OCD) symptom severity. More specifically, we used four dichotomous items for self-report on OCD symptoms (e.g., "*In the past month, have you been bothered by recurrent thoughts, impulses, or images that were unwanted, distasteful, inappropriate, intrusive, or distressing?*"). Internal consistency was acceptable in the present study, $\alpha = 0.79$.

2.3.4. Suicide attempts

We used a dichotomous question to assess lifetime suicide attempts ("*Have you ever made an actual attempt to kill yourself in which you had at least some intent to die?*"). This question is derived from the suicide attempt history question of the Self-Injurious Thoughts and Behaviours Interview (Nock et al., 2007).

2.3.5. Brunnsviken Brief Quality of Life Scale (BBQ)

The BBQ taps into subjective well-being and quality of life across multiple domains (Lindner et al., 2016). It uses 12 items on a scale from 0 ("*strongly disagree*") to 4 ("*strongly agree*"). An example item reads: "*I am satisfied with my leisure time: I have the opportunity to do what I want in order to relax and enjoy myself*." Internal consistency was good in the present study, $\alpha = 0.82$.

2.4. Study 2: additional measures

2.4.1. Patient Health Questionnaire-4 (PHQ-4)

Depression and anxiety symptoms were assessed with the PHQ-4. The PHQ is a four-item questionnaire assessing symptoms on a four-point scale from 0 ("*not at all*") to 3 ("*nearly every day*"). Symptom endorsement of the last two weeks was assessed, concerning the core symptoms of depression and anxiety (loss of interest, depressed mood, anxiety, constant worries, Löwe et al., 2010). Sum scores $\geq$3 for each subscale suggest probable depression or anxiety disorder diagnosis. Internal consistencies were good, α =0.84 (at both timepoints) for depression and $\alpha_{t1} = 0.85$, $\alpha_{t2} = 0.87$ for anxiety.

2.4.2. International Trauma Questionnaire (ITQ)

The ITQ (Cloitre et al., 2021) quantifies PTSD symptoms. It first assesses the respondent's index traumatic event and establishes when this event occurred. In the present sample, 840 participants experienced a potentially traumatic event. Participants then respond to the ensuing questions in reference to this event. The ITQ comprises six items covering PTSD symptoms defined in the 11th version of the International Classification of Diseases (World Health Organization, 2018). Items (e.g., "*Being 'super-alert', watchful, or on guard?*") assess the level of distress they have caused in the last month, ranging from 0 ("*not at all*") to 4 ("*extremely*"). Probable PTSD diagnosis is indicated when participants have a score above 2 in one of two items for each of the three facets (1) re-experiencing in the here and now, (2) avoidance, and (3) sense of current threat, along endorsement of at least one indicator of functional impairment associated with these symptoms (note that we did not assess the functional impairment indicators). Internal consistencies were good ($\alpha_{T1} = 0.86$, $\alpha_{T2} = 0.85$).

2.4.3. Meta-Cognitions Questionnaire-30 (MCQ-30)

We used the *beliefs about uncontrollability of thoughts and corresponding danger* subscale of the MCQ-30 (Wells & Cartwright-Hatton, 2004). Items (e.g., "*My worrying is dangerous for me*") are scored on a four-point ordinal-scale 1 ("*do not agree*") to 4 ("*agree very much*"). Internal consistencies were excellent, i.e., $\alpha = 0.91$ at both timepoints.

2.4.4. Response Style Questionnaire (RSQ)

To evaluate the tendency to engage in brooding rumination (also sometimes called repetitive negative thinking) responses to depressed mood, we used the five-item Brooding subscale of the RSQ (Nolen-Hoeksema, 1991). An example item is "*Think what am I doing to deserve this?*". This measure has a four-point response-scale ranging from 0, "*never*", to 3, "*always*". Internal consistencies were good, $\alpha_{t1} = 0.80$, $\alpha_{t2} = 0.84$.

2.4.5. Scale for Social Comparison of Well-Being (SSC-W)

We used the upward comparison subscale of the SSC-W (Morina et al., 2024) to assess the frequency of upward social comparison concerning one's own well-being. It consists of two items assessing the frequency of well-being comparisons in the past three weeks on a six-point ordinal scale (0 = "*not at all*" to 5 = "*very often*"). An example item reads: "*Over the past three weeks when considering your well-being, how often have you compared yourself with others in your close circles who were doing better than you?*". Internal consistencies were acceptable, $\alpha_{t1} = 0.79$, $\alpha_{t2} = 0.75$.

2.4.6. Rosenberg Self-Esteem Scale (RSES)

The RSES (Rosenberg, 1965) assesses general self-esteem with ten items (e.g., "*On the whole, I am satisfied with myself*") on a four-point ordinal scale (0 = "*strongly disagree*" to 3 = "*strongly agree*"). Internal consistencies were excellent in the present study, $\alpha_{t1} = 0.92$, $\alpha_{t2} = 0.93$.

2.5. Analysis plan

Data for Study 2, as well as R code for both studies to reproduce the present analyses, are available on OSF: https://osf.io/4kq6t/?

Table 1
Demographics characteristics for both studies.

Demographics characteristics	Study 1 (N = 1498)	Study 2 (N = 1084)
Gender[a]		
Female	658 (43.9 %)	429 (39.6 %)
Male	761 (50.8 %)	643 (59.3 %)
Non-binary	71 (4.7 %)	–
Another gender identity	7 (<1 %)	12 (1.1 %)
Ethnicity		
Asian, South Asian, or Southeast Asian	163 (10.88 %)	
Black, African, or Caribbean	140 (9.34 %)	
Hispanic or Latino	95 (6.34 %)	
Middle Eastern	12 (0.80 %)	
Mixed/multiple ethnic groups	61 (4.07 %)	
Native or Indigenous group	3 (0.20 %)	
Another ethnic group	8 (0.53 %)	
White or Caucasian	1016 (67.83 %)	
Educational backgrounds		
A-levels or equivalent	237 (15.82 %)	
College/university graduate	370 (24.75 %)	
Completed GCSE/CSE/O-Levels or equivalent (at school until aged 16)	17 (1.13 %)	
Completed GCSE/CSE/O-levels or equivalent (at school until age 16)	39 (2.60 %)	
Completed post-16 vocational course	11 (0.73 %)	
High school graduate (completed grade 12)	135 (9.01 %)	
Less than high school (less than grade 12)	10 (0.67 %)	
No qualifications	4 (0.27 %)	
Postgraduate degree	98 (6.54 %)	
Some college/university	260 (17.36 %)	
Undergraduate degree or professional qualification	317 (21.15 %)	
Less than a high school degree		11 (1.02 %)
High school degree or equivalent		198 (18.29 %)
Some college education without a degree		204 (18.87 %)
Associate degree		51 (4.71 %)
Bachelor's degree		417 (38.51 %)
Graduate degree		203 (18.75 %)
Marital status		
Single		678 (62.5 %)
Married or in a domestic partnership		371 (34.2 %)

[a] 1 person did not disclose their gender.

view_only=5eb281686e2e482fb6810cf743463111. For Study 1, requests for access to anonymized study data should be made to the chief investigator (see data availability statement). Our studies were not preregistered. All analyses were conducted using R version 4.3.0 (Core Team R, 2021). As there is no unifying consensus regarding the dimensional nature of early adversity models (McLaughlin et al., 2021; Smith & Pollak, 2021), we chose a data-driven approach to evaluate the dimensionality, reliability, measurement invariance, and construct validity of the CAM. First, we conducted an Exploratory Factor Analysis (EFA) to examine the underlying number of latent factors. Second, we employed Confirmatory Factor Analysis (CFAs) to confirm the factor structure suggested by the EFA. To that end, we randomly split the entire sample of Study 1 into one sample for the EFA and one for the CFA (both $n = 749$). The randomly drawn subsamples did not differ in any of the demographic variables described in Table 1, all $ps > 0.38$. In Study 2, we re-conducted the CFA to confirm the factor solution found in Study 1.

2.5.1. Exploratory factor analysis

To explore the underlying structure of the data, we ran EFAs separately for the yes/no and the severity facet. To discern the number of latent factors, we conducted parallel analysis and visually inspected the scree-plot (Fabrigar & Wegener, 2011). Following Fabrigar and Wegener (2011), we also employed the Velicer's Minimum Average Partial (MAP) test, the Very Simple Structure (VSS), and the Kaiser criterion (eigenvalues above 1). As rotation method, we chose promax rotation (allowing factors to be correlated) as we assumed that the underlying factors (if more than one factor was found) would be correlated. We included items in subsequent analyses when their factor loadings exceeded 0.30. As items were considered to be ordinal, we used a weighted least squares approach (Asparouhov & Muthén, 2010). We used the *psych package* in R to conduct EFAs (Revelle & Revelle, 2015).

2.5.2. Confirmatory factor analysis and reliability

To confirm the factor structure that was revealed in the EFA, we used the second subsample of Study 1 ($n = 749$) and the sample of Study 2 to conduct a CFA with the EFA-revealed factor structure. As items were considered to be ordinal, we used the WLSMV estimator (Asparouhov & Muthén, 2010). We used the following criteria to evaluate model fit: Comparative Fit Index (CFI) and Tucker–Lewis Index (TLI) values of higher than 0.95 indicate a good fit, and values higher than 0.90 indicate an acceptable fit; root mean square error of approximation (RMSEA) and Standardized Root Mean Square Residuals (SRMR) values of <0.05 indicate good fit, and values <0.10 indicate an acceptable fit (Hu & Bentler, 1999). Internal consistency, the index we used to pinpoint the reliability, was measured using Cronbach's α and MacDonalds' ω_{total}. Values above 0.80 indicate good internal consistency. We used the *lavaan package* to conduct these analyses (Rosseel, 2012).

2.5.3. Measurement invariance across gender and countries

We examined measurement invariance across female and male gender (other gender identity participants were excluded from this analysis as this group was too small for a separate invariance analysis) in both studies, and across country (US versus UK) in Study 1, using a multigroup CFA framework (Meredith, 1993). To this end, we tested whether differences in the observed scores of the groups are indeed attributable to differences in the underlying latent construct, or constitute an artifact of biased measurement properties (Meredith, 1993). Nested models were tested against each other. The respective constraints on the model parameters were added at each step, in addition to the constraints introduced in the step before. First, the *factor structure* was constrained to be equal across gender (or countries) to investigate whether the construct is equally represented among groups (i.e., *configural invariance*). Second, the *factor loadings* were additionally constrained to be equal across gender (or countries) to discern whether the items equally relate to the underlying factors (i.e., *metric invariance*). Third, the *item thresholds* were constrained to be equivalent to gauge whether the observed thresholds do not differ across gender (or countries; i.e., *scalar invariance*). Last, the *residual variances* of the items were set equal to scrutinize whether the variance in the items that is not explained by the latent factor does not differ across gender (or countries; i.e., *residual invariance*). To detect violations of measurement invariance, we evaluated changes (Δ) in the two fit indices CFI and RMSEA. When the ΔCFI exceeds 0.015 and ΔRMSEA exceeds 0.007 the assumptions of measurement invariance are violated (Chen, 2007; Meredith, 1993). We tested measurement invariance for both facets (yes/no & severity) with the full samples of each study, separately, to have enough participants in each group.

2.5.4. Evidence in support of construct validity

To examine the evidence in support of construct validity of the CAM, we calculated sum scores of the resulting CAM facets (i.e., yes/no and severity, and where relevant subscales thereof) and correlated them with the total scores of the mental health measures that are theoretically expected to be associated with early adversity. In Study 1, we correlated the resulting yes/no and severity scores with psychological distress, drug use, OCD-symptoms, suicide attempts, and quality of life. In Study 2, the yes/no and severity scores at timepoint 1 were correlated with depression, anxiety, PTSD symptoms, meta-cognitive beliefs about worry (uncontrollability and danger), rumination, social comparison in the domain of well-being, and self-esteem – at both timepoints. In both studies, we employed cut-off values for probable diagnosis and conducted logistic regressions to assess whether the CAM presence (yes/no) and severity scores predict a higher probability of surpassing the specified diagnostic thresholds. Odds ratios (ORs) >1 indicate an increased likelihood of surpassing the diagnostic threshold. Moreover, we compared whether the magnitudes of the correlation coefficients differed significantly between the yes/no and the severity facets, using the *cocor* package in R (Diedenhofen & Musch, 2015).

3. Results

3.1. Sample characteristics

Detailed demographic characteristics of both samples can be found in Table 1. In the first study, participants were on average 24.42 years old ($SD = 3.72$, range 18 to 30 years). The sample included 658 female participants (including 8 transgender women), 761 male participants (including 18 transgender men), 71 non-binary participants, and 7 participants who disclosed another gender identity. Most participants were White or Caucasian, and smaller proportions represented various ethnic backgrounds such as Asian, Black, and Hispanic or Latino. Educational backgrounds varied widely with undergraduate degrees and some college/university education being common among participants.

In the second study, participants were on average 32 years old ($SD = 10.49$, range 18 to 75 years). The sample included 429 female, 643 male and 12 gender non-conforming participants. When asked to estimate their social standing on the MacArthur scale of subjective social status, using a 0–10 ladder with 10 indicating the highest scoring, participants reported an average score of 5.48 ($SD = 1.56$). Individuals who did not participate at the second timepoint were younger ($M = 29.29$, $SD = 9.55$) compared to those who participated at both timepoints ($M = 31.95$, $SD = 10.57$, $t(276.03) = 3.36$, $p < .01$). Educational background varied with most participants having a Bachelor's degree. Moreover, most participants were single followed by being married or in a domestic partnership.

3.2. Descriptive statistics of the CAM

In studies 1 and 2 respectively, the '*family transitions*' (Item 2, 39 %, 42 %), '*emotional or verbal abuse*' (Item 14, 35 %, 57 %) and '*bullying*' (Item 17, 45 %, 57 %) adversities had notably high prevalences (see Table 2). Interestingly, Items 14 and 17 had also the highest mean severity in both studies. Four items had a prevalence of <10 % in both studies: '*experiencing physical neglect*' (Item 16), '*growing up in a violent or very unsafe neighbourhood*' (Item 18), '*being raised by someone other than your parents*' (Item 19), and '*home or neighborhood destruction*' (Item 20). The latter item (Item 20) was only endorsed by 1–2 % of the participants. Items 16, 18 19, and 20 had also the lowest mean severity in both studies.

3.3. Exploratory factor analysis

For the dimensionality of the yes/no facet, three out of five criteria suggested a one-factor model (scree plot = 1; VSS = 1; MAP = 1). The Kaiser Criterion suggested a two-factor solution, as the second highest Eigenvalue was 1.09, and the parallel analysis suggested a nine-factor solution, which we however deemed unrealistic given that the CAM only contains 22 items. Therefore, we continued with a one-factor model. Given that the lowest factor loading in this unidimensional model had a value of 0.35 (see Table 2 for EFA factor loadings), we concluded that all items contribute sufficiently to the early adversity construct. For the severity facet, again three out of

Table 2
Descriptive statistics and factor loadings of the EFA and CFA models.

Item	Study 1 ($N = 1498$)						Study 2 ($N = 1084$)			
	% yes	Severity (mean/SD)	Factor loading EFA (yes/no)	Factor loading EFA (severity)	Factor loading CFA (yes/no)	Factor loading CFA (severity)	% yes	Severity (mean/SD)	Factor loading CFA (yes/no)	Factor loading CFA (severity)
1	24.87	1.27 (2.35)	0.35	0.38	0.25	0.31	37.21	1.97 (2.69)	0.45	0.50
2	38.54	1.67 (2.35)	0.45	0.46	0.60	0.68	41.55	1.92 (2.46)	0.50	0.54
3	19.50	1.02 (2.18)	0.45	0.48	0.53	0.53	19.11	0.99 (2.17)	0.37	0.43
4	25.87	1.19 (2.19)	0.63	0.64	0.70	0.68	45.34	2.20 (2.64)	0.60	0.63
5	24.53	1.24 (2.30)	0.69	0.65	0.75	0.75	35.36	1.85 (2.63)	0.65	0.66
6	15.82	0.64 (1.60)	0.48	0.50	0.37	0.39	44.23	1.95 (2.43)	0.60	0.62
7	11.19	0.49 (1.48)	0.40	0.49	0.25	0.28	22.16	1.11 (2.22)	0.50	0.53
8	18.57	0.93 (2.07)	0.35	0.42	0.43	0.44	40.63	2.23 (2.83)	0.51	0.55
9	23.53	1.13 (2.18)	0.53	0.51	0.51	0.57	25.67	1.38 (2.45)	0.44	0.47
10	18.70	0.69 (1.69)	0.60	0.56	0.58	0.61	24.84	0.98 (1.94)	0.62	0.61
11	25.47	1.04 (1.97)	0.57	0.53	0.61	0.62	36.38	1.79 (2.56)	0.60	0.64
12	17.23	0.86 (2.02)	0.66	0.63	0.65	0.69	27.61	1.43 (2.44)	0.62	0.63
13	08.31	0.39 (1.39)	0.62	0.64	0.69	0.70	10.43	0.49 (1.53)	0.68	0.64
14	35.12	1.88 (2.69)	0.66	0.61	0.79	0.78	56.51	2.89 (2.78)	0.70	0.71
15	20.72	1.10 (2.25)	0.69	0.66	0.73	0.74	31.86	1.68 (2.61)	0.66	0.67
16	05.09	0.24 (1.14)	0.78	0.76	0.76	0.77	8.03	0.40 (1.42)	0.71	0.65
17	44.97	2.06 (2.51)	0.35	0.38	0.35	0.36	57.43	2.86 (2.71)	0.38	0.45
18	05.16	0.20 (0.94)	0.42	0.57	0.64	0.59	9.23	0.43 (1.44)	0.51	0.52
19	04.29	0.13 (0.75)	0.64	0.69	0.73	0.75	9.05	0.25 (0.98)	0.48	0.49
20	01.41	0.06 (0.54)	0.46	0.64	0.46	0.46	1.85	0.09 (0.70)	0.34	0.31
21	10.39	0.52 (1.60)	0.48	0.52	0.33	0.31	28.62	1.51 (2.51)	0.56	0.61
22	10.86	0.64 (1.87)	0.60	0.62	0.36	0.39	31.76	1.81 (2.74)	0.58	0.63

Note. EFA = exploratory factor analysis, CFA = confirmatory factor analysis, SD = standard deviation

five criteria suggested a one factor solution (scree plot = 1; VSS = 1; MAP = 1). The Kaiser Criterion suggested a two-factor solution, as the second highest Eigenvalue was 1.17, and the parallel analysis suggested a seven-factor solution, which we again deemed unrealistic given that the CAM only contains 22 items. Hence, we continued with a one-factor model for the severity facet. Given that the lowest factor loading in this unidimensional model had a value of 0.38 (Table 2), we concluded once more that all items contribute sufficiently to the early adversity construct.

3.4. Confirmatory factor analysis and reliability

We used the second subsample of Study 1 to conduct a CFA ($n = 749$) to confirm the one-factor model for both the yes/no and the severity facet. Except for items 1 ("*Did a very close friend or family member die? (except for a grandparent, unless they were the primary caregiver*"), loading for yes/no = 0.25) and item 7 ("*Were you ever extremely sick or hurt?*", loading for yes/no = 0.25, loading for severity = 0.28), factor loadings were good (i.e., > 0.30) for all items (see Table 2 for details). In Study 1, model fit was good according to the CFI, TLI and the RMSEA but not acceptable according to the SRMR. In Study 2, all factor loadings were good (> 0.30) and model fit was acceptable according to all indices. Internal consistencies were good for both factors in both studies (Table 3), suggesting a sufficient reliability of both the presence/absence and the severity facet of the CAM.

3.5. Measurement invariance

Supplemental Table s2 presents the measurement invariance analyses across female and male gender as well as US and UK participants. For all yes/no analyses, we found evidence for measurement invariance on all four invariance levels (i.e., configural, metric, scalar, strict). Model fit did not deteriorate substantially for any of the tested comparisons (gender and country) when model parameters were increasingly constrained in both studies. For the severity facet, all four measurement invariance levels could be established for the comparison across US and UK participants. While there was no difference in the frequency of early adversity (i.e., yes/no sum scores) between countries ($p = .078$), US participants ($M = 20.29$, $SD = 19.1$) reported higher severity sum scores than UK participants ($M = 17.93$, $SD = 17.80$; $p < .05$). For the gender comparison of the severity facet, we could establish the first three invariance levels (i.e., configural, metric, and scalar), but not strict invariance (i.e., the fourth level), in both studies.

In Study 1, males (*Myes/no* = 3.76, *SD* = 3.31; *Mseverity* = 16.65, *SD* = 16.97) reported lower sum scores than females (*Myes/no* = 4.18, *SD* = 3.34; *Mseverity* = 20.42, *SD* = 18.86, all *ps* < 0.05), while non-binary (*Myes/no* = 6.51, *SD* = 3.70; *Mseverity* = 33.01, *SD* = 22.40) and other gender identity (*Myes/no* = 8.50, *SD* = 3.63; *Mseverity* = 39.25, *SD* = 17.38) had higher sum scores than females ($p < .001$) for both yes/no and severity. In Study 2, males (*Myes/no* = 6.07, *SD* = 4.09; *Mseverity* = 28.71, *SD* = 22.34) reported lower sum scores compared to females (*Myes/no* = 6.89, *SD* = 4.43; *Mseverity* = 36.95, *SD* = 27.64, $p < .001$) for both yes/no and severity.

3.6. Evidence in support of construct validity

Table 4 shows the correlations of the two facets (yes/no and severity) with other constructs. As expected, in Study 1 both the yes/no sum scores as well as the severity sum scores correlated positively with psychological distress, drug use, OCD symptoms, and suicide attempts. Both sum scores correlated negatively with quality of life. ORs for passing the threshold of a probable severe disorder according to the K10 were 1.04 and 1.23 for yes/no and severity sum scores, respectively, both *ps* < 0.001. Supplemental Table 2 shows the results separately for participants from the UK and USA. These results confirmed the correlational evidence for participants from both countries. In Study 2, both facets were cross-sectionally as well as prospectively positively associated with depressive and anxiety symptoms, PTSD symptoms, uncontrollability of worrying, rumination, and upward social comparison. They were negatively associated with self-esteem. Only for the correlations with PTSD symptoms at timepoint 1, we found that the severity facet displayed a stronger correlation than the yes/no facet, $z = -2.48$, $p = .007$, all other *ps* > 0.07. For depression, anxiety, and PTSD cut-offs, both facets predicted higher ORs of passing the thresholds for probable diagnosis, with ORs ranging from 1.02 (CAM severity predicting depression at timepoint 2) to 1.24 (CAM yes/no predicting PTSD at timepoint 1), all *ps* < 0.001. Cumulative number and mean severity of early adversity set off against established cut-offs for general psychological distress, depression, anxiety and PTSD symptoms can be found in Table 5.

Table 3
Model fit for the one-factor model in the CFAs.

Factor model	$\chi^2(df)$	*p*	CFI	RMSEA	SRMR	TLI	α	ω_{total}
Yes/no Study 1	412 (209)	<.001	0.96	0.04	0.11	0.96	0.90	0.90
Severity Study 1	507 (209)	<.001	0.96	0.04	0.14	0.96	0.91	0.91
Yes/no Study 2	819 (209)	<.001	0.93	0.05	0.09	0.92	0.80	0.81
Severity Study 2	969 (209)	<.001	0.95	0.06	0.08	0.95	0.84	0.84

Note. CFI = Comparative Fit Index; RMSEA = root mean square error of approximation; SRMR = standardized root mean square residuals. TLI = Tucker–Lewis index; df = degrees of freedom; α = Cronbach's alpha; ω_{total} = Macdonald's omega (total).

Table 4
Correlations with theoretical important measures.

Study		Study 1 (N = 1498)		Study 2 (N = 1084)		Study 2 follow-up (N = 942)	
Instruments/constructs		Yes/no	Severity	Yes/no	Severity	Yes/no	Severity
MINI-OCD	OCD	0.41 [0.37; 0.45]	0.40 [0.35; 0.44]	–	–	–	–
BBQLS	Quality of life	−0.18 [−0.23; −0.13]	−0.15 [−0.20; −0.10]	–	–	–	–
K10	Psychological distress	0.39 [0.35; 0.44]	0.40 [0.35; 0.44]	–	–	–	–
	Suicide attempt	0.33 [0.28; 0.37]	0.34 [0.29; 0.38]	–	–	–	–
	Drug use	0.19 [0.15; 0.24]	0.18 [0.13; 0.23]	–	–	–	–
SSC-W	Social comparison/well-being	–	–	0.27 [0.22; 0.33]	0.32 [0.26; 0.37]	0.25 [0.19; 0.31]	0.27 [0.21; 0.33]
MCQ-30	Uncontrollability worrying	–	–	0.24 [0.19; 0.30]	0.30 [0.24; 0.35]	0.20 [0.14; 0.27]	0.24 [0.18; 0.30]
PHQ-4	Depression	–	–	0.31[0.25; 0.36]	0.32 [0.27; 0.38]	0.27 [0.20; 0.33]	0.26 [0.20; 0.33]
	Anxiety	–	–	0.33[0.28; 0.38]	0.37 [0.32; 0.42]	0.25 [0.19; 0.31]	0.28 [0.21; 0.33]
RSES	Self-esteem	–	–	−0.18 [−0.23; −0.12]	−0.17 [−0.23; −0.11]	−0.22 [−0.28; −0.16]	−0.23 [−0.29; −0.16]
RSQ	Rumination	–	–	0.30 [0.24; 0.35]	0.35 [0.30; 0.40]	0.26 [0.20; 0.32]	0.31 [0.25; 0.36]
ITQ	PTSD symptoms			0.46 [0.40; 0.51]	0.54 [0.49; 0.59]	0.33 [0.27; 0.38]	0.34 [0.27; 0.38]

Note. BBQLS = Brunnsviken Brief Quality of Life Scale; K10 = Kessler Psychological Distress Scale; MCQ-30 = Meta-Cognitions Questionnaire-30; MINI-OCD = Mini International Neuropsychiatric Interview Obsessive-Compulsive Disorder; PHQ-4 = Patient Health Questionnaire-4; RSES = Rosenberg Self-Esteem Scale; RSQ = Response Style Questionnaire; ITQ = International Trauma Questionnaire; SSC-W = Scale for Social Comparison of Well-Being. All *ps* were <.001. Numbers in parentheses represent 95 % confidence intervals.
While factor models provide a more accurate representation of the psychometric properties of a scale, sum scores are more often used in applied research than factor scores - most likely because of their straightforward calculation (for a thorough discussion see McNeish & Wolf, 2020; Widaman & Revelle, 2022). Therefore, we opted to used sum scores for our validation analyses.

Table 5
Cumulative number and mean severity of early adversity set off against established cut-offs for general psychological distress, depression, anxiety and PTSD symptoms.

	Cumulative number of early adversity		Cumulative mean severity of early adversity	
	For participants below the cut-off	For participants above the cut-off	For participants below the cut-off	For participants above the cut-off
Distress (K10)	3.37	5.84	15.16	28.88
Depression (PHQ-4)	5.56 (T1)	8.02 (T1)	26.86 (T1)	41.88 (T1)
	6.15 (T2)	8.17 (T2)	30.4 (T2)	43.01 (T2)
Anxiety (PHQ-4)	5.54 (T1)	7.90 (T1)	26.03 (T1)	42.26 (T1)
	6.11 (T2)	8.21 (T2)	29.88 (T2)	44.80 (T2)
PTSD (ITQ)	6.77 (T1)	10.38 (T1)	32.91 (T1)	59.62 (T1)
	5.72 (T2)	9.21 (T2)	27.32 (T2)	51.06 (T2)

Note. K10 = Kessler Psychological Distress Scale; PHQ-4 = Patient Health Questionnaire-4; ITQ = International Trauma Questionnaire.

4. Discussion

The YCAS was originally developed to address the limitations of existing early adversity scales. In the present study, we revised the YCAS in order to address its limitations, enhancing its content coverage and item wording. We subsequently assessed the psychometric properties of the new version, now called the CAM. By employing data-driven reduction methods, we derived a one-factor model for both the yes/no and the severity facets. We confirmed this factor solution in two different samples and found evidence for measurement invariance across gender (female/male) and the two participating countries (UK/USA). Furthermore, the findings confirmed the hypothesized associations between the CAM total scores and theoretically relevant constructs such as psychopathological symptoms and well-being. We conclude that the CAM is a comprehensive and reliable measure of early adversity, that displays evidence in support of construct validity consistent with theoretical expectations.

The aim of improving content coverage of the original early adversity scale by including several additional adversities has been achieved. Specifically, the '*emotional or verbal abuse*' item was among the most prevalent items in both studies and among the adversities with the highest mean severity. This is important as emotional and verbal abuse are associated with numerous mental health

problems (Sheffler et al., 2020). Similarly, the new item to assess bullying was among the adversities with the highest prevalence and mean severity, which is in line with research showing that bullying is associated with mental health problems beyond classic early adversities (Cronholm et al., 2015; Finkelhor et al., 2015). Therefore, these two additions seem to have improved the content coverage and may have facilitated the construct validity, suggesting that the CAM offers a more comprehensive assessment of early adversity than the YCAS.

The aim to improve the wording of several YCAS items also appeared to be successful, since factor loadings of the revised items in the CAM were predominately good, and overall better when compared to the factor loadings in the initial YCAS study in which some displayed problematic psychometric properties (Schlechter et al., 2021). There was one item for which we observed lower factor loadings for the CAM than for the YCAS, for both yes/no and severity: "*Were you ever extremely sick or hurt? (e.g. a long-term or life-threatening illness or injury)*". Moreover, for the yes/no facet we also observed a lower factor loading for the CAM than for the YCAS, for the item: "*Did a very close friend or family member die? (except for a grandparent, unless they were the primary caregiver*)". Importantly however, these lower factor loadings were only observed in the CFA in Study 1, and both items had good factor loadings in the EFA in Study 1 as well as in the CFA in Study 2. Overall, it may be concluded that the content and wording of the CAM items are well-suited to capture early adversity.

The CAM demonstrated measurement invariance across both gender and country. Given that females reported more early adversity than males, both in prior research (e.g., Leban & Gibson, 2020) as well as in our study, it is crucial that our measurement invariance results suggest that gender effects are "true" effects and not a result of measurement error or other artifacts. Some minor violations of measurement invariance were observed for severity scores on the residual invariance level. However, this may not be critical as for most research application the first three measurement invariance levels are sufficient (Meredith, 1993), because these levels of invariance allow for examination of linear associations and mean differences across groups. The CAM also demonstrated measurement invariance across countries – UK vs. US – which is important for cross-cultural investigations. Further testing of measurement invariance of the CAM with more countries and ideally with differing cultures or ethnic groups is needed.

Given that the CAM appears to be a one-dimensional construct with a good reliability, the examination of sum scores and their associations with other constructs seems acceptable (Widaman & Revelle, 2022). The observed associations of the sum scores with other measures are consistent with our hypotheses, present small-to-moderate effect sizes (Green et al., 2010; Hughes et al., 2017; Mansueto et al., 2021; Zilioli et al., 2016), and thus support the evidence for the construct validity of the CAM. In addition, the correlations align with findings of the previous YCAS and other scale validations that found similar correlations of adversity scores with mental health outcomes and self-esteem (Schlechter et al., 2021). The fact that all of the tested associations had the expected direction and were significant, in combination with the fact that cumulative number and mean severity of early adversity correlated with clinical-cut offs, underpin the strength of the correlational evidence of the CAM and showcases the usefulness of the CAM for psychological and psychiatric research, particularly in the general population. Moreover, the strong psychometric characteristics of the CAM suggest that the scale may also be a suitable measure for clinical purposes. Accordingly, the utility of the CAM for clinical populations and/or clinical settings should be tested in future research. For such endeavors, it would be useful to further test the CAM against clinical diagnoses.

The severity scores of the CAM displayed slightly stronger associations with the outcome measures than the yes/no scores, but differences were (with one exception) not statistically significant. This finding is in line with the initial YCAS validation study (Schlechter et al., 2021). Therefore, the severity scores do not necessarily seem to be more 'valid' or 'useful' than the yes/no scores. That said, they may well prove useful for more nuanced research questions. For instance, we found that the severity of early adversity was significantly more strongly associated with PTSD symptoms than the yes/no score. Yet, this finding needs to be interpreted with great caution, as the severity of early adversity was only concurrently and not prospectively *more* strongly associated with PTSD symptoms than the yes/no score. In summary, for a quick assessment of early adversity, the yes/no scoring may be both efficient and sufficient. Importantly, this finding supports the cumulative methodology used for most early adversity scales; that is, simply summing the number of types of adversities up and treating them as equal contributors for the total early adversity score.

4.1. Strengths & limitations

Our study has several strengths. The CAM was developed based on a rigorous process of content and wording refinement. Moreover, we thoroughly examined the psychometric properties of the CAM in two large studies, providing sound evidence for the reliability and preliminary evidence for the validity of the CAM. However, our study has also notable limitations. First, while we found substantial correlational evidence supporting the construct validity of the scale, we did not have an external criterion or gold standard to establish external validity. Our findings suggest consistency of the CAM in terms of correlational directions across mental health outcomes as well as predictive value for several relevant mental health constructs. Yet, the absence of an external criterion, that goes beyond clinical cut-offs presented in Table 5, means that we cannot irrevocably corroborate the external validity of the measure. Therefore, future research is necessary to provide cumulative evidence in this regard. Second, the CAM assesses adverse events via single, dichotomous questions that are framed in a subjective way. Single items, and in particular dichotomous ones, can most likely not capture the complex and multifaceted nature of adverse events. Moreover, while subjectively measured adverse events are on average more sensitive (i.e., have higher reporting numbers) and higher correlated with psychopathology than objectively measured events, for some individuals objective measurement (e.g., service records) identifies adverse events that are not reported subjectively (Danese & Widom, 2020). Therefore, for a more in-depth assessment of specific adverse events (e.g., physical or sexual abuse), researchers should complement the CAM with subjective event-specific follow-up questionnaires or interviews, and for a fully exhaustive assessment objective information such as service records should be used where available (Oh et al., 2018; Uher & McGuffin, 2008).

Third, although our scale contains a facet assessing the subjective severity of adverse experiences, we here did not include a facet that specifically assesses the chronicity (e.g., operationalized as frequency and/or duration) of adverse experiences. Yet, it could be important to more specifically capture the impact of frequency and/or duration of adverse experiences on long-term mental health outcomes, as extended periods of adversity are often associated with more severe and lasting effects (Russotti et al., 2021). Therefore, chronicity should be addressed in future research and could theoretically be easily added as facet to the CAM. Fourth, we did not include or correlate the CAM with another adversity measure (e.g., Morrill et al., 2019) or neurodevelopmental problems (Smith & Pollak, 2021), which would have provided more evidence for the robustness of our scale. Fifth, despite the relatively large sample sizes and several demographic differences between our two investigated samples, future research is needed to examine the CAM with even broader, and more diverse groups of participants, especially also including participants from non-Western countries. Similarly, despite providing evidence in line with prior work that gender non-confirming individuals reported more, and more severe adversities (Barboza-Salerno & Meshelemiah, 2024), we could not test measurement invariance for the comparison of non-binary and binary participants, due to the small proportion of non-binary participants. This may therefore be a valuable aim for future research, to better understand adversity in these populations. Sixth, there is currently a lack of knowledge concerning cut-offs for the evaluation of differences in fit indices when establishing measurement invariance in ordinal data. Our measurement invariance conclusions therefore need to be interpreted with caution (Chen, 2007). Seventh and finally, despite using longitudinal data, the CAM was only assessed at one timepoint, which is why we could not examine test-retest reliability or temporal measurement invariance of the CAM.

5. Conclusion

We showed that the CAM provides a comprehensive and reliable assessment of traumatic or stressful experiences during childhood and adolescence, and for both the yes/no and the severity facet we found evidence supporting its construct validity. In our study, the CAM was also invariant across gender and country (i.e., the UK and US). We therefore believe that the CAM is a psychometrically sound tool for the assessment of early adversity and its effect on mental health.

Funding statement

Data collection was funded by a Wellcome Trust grant awarded to Prof. S. Chamberlain [references: 110049/Z/15/Z & A]; Prof. P. O. Wilkinson's unrestricted University of Cambridge departmental research fund; internal funds from the University of Chicago provided by Prof. J. Grant; a grant from the National Research Foundation of South Africa awarded to Prof. C. Lochner [reference: CSRU180501325167]; and Dr. J. Fritz's Junior Research Fellowship research expense allowance from Wolfson College, University of Cambridge. The study was reviewed and approved by the Cambridge Psychology Research Ethics Committee (reference: PRE.2020.141, project: A comprehensive neurocognitive enquiry into problematic use of the internet (PUI) and non-suicidal self-injury (NSSI), Chief Investigator Prof. S. Chamberlain).

CAM

The CAM is free to use under a CC BY-NC-SA 4.0 license for non-commercial purposes by researchers and clinicians, and can be found on the open science framework (OSF: https://osf.io/b3w25/?view_only=f597afcf0e9a4acf850299249d78817f).

CRediT authorship contribution statement

Pascal Schlechter: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Nina M. Lutz:** Writing – original draft, Methodology, Funding acquisition, Data curation, Conceptualization. **Nexhmedin Morina:** Writing – original draft, Funding acquisition, Data curation. **Jon E. Grant:** Writing – original draft, Funding acquisition. **Christine Lochner:** Writing – original draft, Funding acquisition. **Samuel R. Chamberlain:** Writing – original draft, Funding acquisition, Conceptualization. **Paul O. Wilkinson:** Writing – original draft, Supervision, Funding acquisition, Formal analysis, Conceptualization. **Jessica Fritz:** Writing – original draft, Supervision, Methodology, Investigation, Formal analysis, Data curation, Conceptualization, Funding acquisition.

Declaration of competing interest

The authors declare that they have no competing interests. Dr. Grant has received research grants from Janssen and Biohaven Pharmaceuticals. He receives yearly compensation from Springer Publishing for acting as Editor-in-Chief of the Journal of Gambling Studies and has received royalties from Oxford University Press, American Psychiatric Publishing, Inc., Norton Press, and McGraw Hill.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chiabu.2024.107117.

Data availability

The data for Study 2 and R code for both studies used in this study are openly available: https://osf.io/4kq6t/?view_only=5eb281686e2e482fb6810cf743463111.

Requests for access to anonymised study data for Study 1 for research purposes from academic institutions should be made to S. Chamberlain at: srchamb@pm.me.

References

Afifi, T. O., Salmon, S., Garcés, I., Struck, S., Fortier, J., Taillieu, T., … MacMillan, H. L. (2020). Confirmatory factor analysis of adverse childhood experiences (ACEs) among a community-based sample of parents and adolescents. *BMC Pediatrics, 20*(1), 178. https://doi.org/10.1186/s12887-020-02063-3

Asparouhov, T., & Muthén, B. (2010). Weighted least squares estimation with missing data. *Mplus Technical Appendix, 2010*(1–10), 5.

Baldwin, J. R., Caspi, A., Meehan, A. J., Ambler, A., Arseneault, L., Fisher, H. L., … Poulton, R. (2021). Population vs individual prediction of poor health from results of adverse childhood experiences screening. *JAMA Pediatrics, 175*(4), 385–393.

Barboza-Salerno, G. E., & Meshelemiah, J. C. A. (2024). Associations between early child adversity and lifetime suicide attempts among gender diverse individuals: A moderated mediation. *Child Abuse & Neglect, 149*, Article 106705. https://doi.org/10.1016/j.chiabu.2024.106705

Bernstein, D. P., Fink, L., Handelsman, L., & Foote, J. (1998). Childhood trauma questionnaire. In *Assessment of family violence: A handbook for researchers and practitioners*. https://doi.org/10.1037/t02080-000

Bernstein, D. P., Fink, L., Handelsman, L., Foote, J., Lovejoy, M., Wenzel, K., … Ruggiero, J. (1994). Initial reliability and validity of a new retrospective measure of child abuse and neglect. *The American Journal of Psychiatry, 151*(8), 1132–1136.

Bernstein, D. P., Stein, J. A., Newcomb, M. D., Walker, E., Pogge, D., Ahluvalia, T., … Desmond, D. (2003). Development and validation of a brief screening version of the Childhood Trauma Questionnaire. *Child Abuse & Neglect, 27*(2), 169–190.

Burgermeister, D. (2007). Childhood adversity: A review of measurement instruments. *Journal of Nursing Measurement, 15*(3), 163–176.

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling: A Multidisciplinary Journal, 14*(3), 464–504. https://doi.org/10.1080/10705510701301834

Cloitre, M., Hyland, P., Prins, A., & Shevlin, M. (2021). The international trauma questionnaire (ITQ) measures reliable and clinically significant treatment-related change in PTSD and complex PTSD. *European Journal of Psychotraumatology, 12*(1), Article 1930961. https://doi.org/10.1080/20008198.2021.1930961

Cronholm, P. F., Forke, C. M., Wade, R., Bair-Merritt, M. H., Davis, M., Harkins-Schwarz, M., … Fein, J. A. (2015). Adverse childhood experiences: Expanding the concept of adversity. *American Journal of Preventive Medicine, 49*(3), 354–361.

Danese, A., & Widom, C. S. (2020). Objective and subjective experiences of child maltreatment and their relationships with psychopathology. *Nature Human Behaviour, 4*(8), 811–818.

Diedenhofen, B., & Musch, J. (2015). cocor: A comprehensive solution for the statistical comparison of correlations. *PLoS One, 10*(4), Article e0121945.

El-Khodary, B., & Samara, M. (2018). The effect of exposure to war-traumatic events, stressful life events, and other variables on mental health of Palestinian children and adolescents in the 2012 Gaza War. *The Lancet, 391*, S6.

Ellis, B. J., Sheridan, M. A., Belsky, J., & McLaughlin, K. A. (2022). Why and how does early adversity influence development? Toward an integrated model of dimensions of environmental experience. *Development and Psychopathology, 34*(2), 447–471. https://doi.org/10.1017/S0954579421001838

Evans, G. W., Li, D., & Whipple, S. S. (2013). Cumulative risk and child development. *Psychological Bulletin, 139*(6), 1342–1396. https://doi.org/10.1037/a0031808

Fabrigar, L. R., & Wegener, D. T. (2011). *Exploratory factor analysis*. Oxford University Press.

Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., & Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine, 14*(4), 245–258.

Finkelhor, D., Shattuck, A., Turner, H., & Hamby, S. (2013). Improving the adverse childhood experiences study scale. *JAMA Pediatrics, 167*(1), 70–75.

Finkelhor, D., Shattuck, A., Turner, H., & Hamby, S. (2015). A revised inventory of Adverse Childhood Experiences. *Child Abuse & Neglect, 48*, 13–21. https://doi.org/10.1016/j.chiabu.2015.07.011

Fisher, A. J., Medaglia, J. D., & Jeronimus, B. F. (2018). Lack of group-to-individual generalizability is a threat to human subjects research. *Proceedings of the National Academy of Sciences, 115*(27). https://doi.org/10.1073/pnas.1711978115

Green, J. G., McLaughlin, K. A., Berglund, P. A., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., & Kessler, R. C. (2010). Childhood adversities and adult psychiatric disorders in the national comorbidity survey replication I: Associations with first onset of DSM-IV disorders. *Archives of General Psychiatry, 67*(2), 113–123.

Hambrick, E. P., Oppenheim-Weller, S., N'zi, A. M., & Taussig, H. N. (2016). Mental health interventions for children in foster care: A systematic review. *Children and Youth Services Review, 70*, 65–77.

Hawes, D. J., Lechowicz, M., Roach, A., Fisher, C., Doyle, F. L., Noble, S., & Dadds, M. R. (2021). Capturing the developmental timing of adverse childhood experiences: The Adverse Life Experiences Scale. *American Psychologist, 76*(2), 253–267. https://doi.org/10.1037/amp0000760

Hu, L., & Bentler, P. M. (1999). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods, 3*, 424–453. https://doi.org/10.1037/1082-989X.3.4.424

Hughes, K., Bellis, M. A., Hardcastle, K. A., Sethi, D., Butchart, A., Mikton, C., … Dunne, M. P. (2017). The effect of multiple adverse childhood experiences on health: A systematic review and meta-analysis. *The Lancet Public Health, 2*(8), e356–e366. https://doi.org/10.1016/S2468-2667(17)30118-4

Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S.-L. T., … Zaslavsky, A. M. (2002). Short screening scales to monitor population prevalences and trends in non-specific psychological distress. *Psychological Medicine, 32*(6), 959–976. https://doi.org/10.1017/S0033291702006074

Kessler, R. C., McLaughlin, K. A., Green, J. G., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., , … Gureje, O., et al. (2010). Childhood adversities and adult psychopathology in the WHO World Mental Health Surveys. *The British Journal of Psychiatry, 197*(5), 378–385. https://doi.org/10.1192/bjp.bp.110.080499

Kim, J., & Cicchetti, D. (2010). Longitudinal pathways linking child maltreatment, emotion regulation, peer relations, and psychopathology. *Journal of Child Psychology and Psychiatry, 51*(6), 706–716. https://doi.org/10.1111/j.1469-7610.2009.02202.x

Leban, L., & Gibson, C. L. (2020). The role of gender in the relationship between adverse childhood experiences and delinquency and substance use in adolescence. *Journal of Criminal Justice, 66*, Article 101637.

Leza, L., Siria, S., López-Goñi, J. J., & Fernandez-Montalvo, J. (2021). Adverse childhood experiences (ACEs) and substance use disorder (SUD): A scoping review. *Drug and Alcohol Dependence, 221*, Article 108563.

Lindner, P., Frykheden, O., Forsström, D., Andersson, E., Ljótsson, B., Hedman, E., … Carlbring, P. (2016). The Brunnsviken Brief Quality of Life Scale (BBQ): Development and psychometric evaluation. *Cognitive Behaviour Therapy, 45*(3), 182–195. https://doi.org/10.1080/16506073.2016.1143526

Löwe, B., Wahl, I., Rose, M., Spitzer, C., Glaesmer, H., Wingenfeld, K., Schneider, A., & Brähler, E. (2010). A 4-item measure of depression and anxiety: Validation and standardization of the Patient Health Questionnaire-4 (PHQ-4) in the general population. *Journal of Affective Disorders, 122*(1), 86–95. https://doi.org/10.1016/j.jad.2009.06.019

Mansueto, G., Cavallo, C., Palmieri, S., Ruggiero, G. M., Sassaroli, S., & Caselli, G. (2021). Adverse childhood experiences and repetitive negative thinking in adulthood: A systematic review. *Clinical Psychology & Psychotherapy, 28*(3), 557–568. https://doi.org/10.1002/cpp.2590

Manyema, M., Norris, S. A., & Richter, L. M. (2018). Stress begets stress: The association of adverse childhood experiences with psychological distress in the presence of adult life stress. *BMC Public Health, 18*(1), 835. https://doi.org/10.1186/s12889-018-5767-0

McLaughlin, K. A. (2016). Future directions in childhood adversity and youth psychopathology. *Journal of Clinical Child & Adolescent Psychology, 45*(3), 361–382. https://doi.org/10.1080/15374416.2015.1110823

McLaughlin, K. A., Greif Green, J., Gruber, M. J., Sampson, N. A., Zaslavsky, A. M., & Kessler, R. C. (2012). Childhood adversities and first onset of psychiatric disorders in a national sample of US adolescents. *Archives of General Psychiatry, 69*(11), 1151–1160. https://doi.org/10.1001/archgenpsychiatry.2011.2277

McLaughlin, K. A., Sheridan, M. A., Humphreys, K. L., Belsky, J., & Ellis, B. J. (2021). The value of dimensional models of early experience: Thinking clearly about concepts and categories. *Perspectives on Psychological Science, 16*(6), 1463–1472. https://doi.org/10.1177/1745691621992346

McNeish, D., & Wolf, M. G. (2020). Thinking twice about sum scores. *Behavior Research Methods, 52*, 2287–2305. https://doi.org/10.3758/s13428-020-01398-0

Meredith, W. (1993). Measurement invariance, factor analysis and factorial invariance. *Psychometrika, 58*(4), 525–543. https://doi.org/10.1007/BF02294825

Morina, N., Meyer, T., McCarthy, P., Hoppen, T. H., & Schlechter, P. (2024). Evaluation of the Scales for Social Comparison of Appearance (SSC-A) and Social Comparison of Well-being (SSC-W). *Journal of Personality Assessment, 106*(5), 625–637. https://doi.org/10.1080/00223891.2023.2298887

Morrill, M. I., Schulz, M. S., Nevarez, M. D., Preacher, K. J., & Waldinger, R. J. (2019). Assessing within- and between-family variations in an expanded measure of childhood adversity. *Psychological Assessment, 31*(5), 660–673. https://doi.org/10.1037/pas0000691

Mosley-Johnson, E., Garacci, E., Wagner, N., Mendez, C., Williams, J. S., & Egede, L. E. (2019). Assessing the relationship between adverse childhood experiences and life satisfaction, psychological well-being, and social well-being: United States Longitudinal Cohort 1995–2014. *Quality of Life Research, 28*, 907–914.

Nock, M. K., Holmberg, E. B., Photos, V. I., & Michel, B. D. (2007). Self-Injurious Thoughts and Behaviors Interview: Development, reliability, and validity in an adolescent sample. *Psychological Assessment, 19*(3), 309–317. https://doi.org/10.1037/1040-3590.19.3.309

Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology, 100*(4), 569–577. https://doi.org/10.1037/0021-843X.100.4.569

Oh, D. L., Jerman, P., Boparai, S. K. P., 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, 32*(6), 564–583.

Palan, S., & Schitter, C. (2018). Prolific.ac—A subject pool for online experiments. *Journal of Behavioral and Experimental Finance, 17*, 22–27. https://doi.org/10.1016/j.jbef.2017.12.004

R Core Team. (2021). *R: A language and environment for statistical computing*. Vienna, Austria: R Foundation for Statistical Computing (2012).

Revelle, W., & Revelle, M. W. (2015). Package 'psych.' The Comprehensive R Archive Network, 337(338). http://mirror.ibcp.fr/pub/CRAN/web/packages/psych/psych.pdf.

Rosenberg, M. (1965). Rosenberg self-esteem scale. *Journal of Religion and Health*.

Rosseel, Y. (2012). lavaan: An R package for structural equation modeling. *Journal of Statistical Software, 48*, 1–36. https://doi.org/10.18637/jss.v048.i02

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

Saini, S. M., Hoffmann, C. R., Pantelis, C., Everall, I. P., & Bousman, C. A. (2019). Systematic review and critical appraisal of child abuse measurement instruments. *Psychiatry Research, 272*, 106–113. https://doi.org/10.1016/j.psychres.2018.12.068

Schlechter, P., Fritz, J., Cassels, M., Neufeld, S. A., & Wilkinson, P. O. (2021). The Youth and Childhood Adversity Scale: A step towards developing a new measure of adversity and its severity. *European Journal of Psychotraumatology, 12*(1), Article 1981573.

Schlechter, P., Hoppen, T. H., & Morina, N. (2024). Associations among posttraumatic stress disorder symptoms, life satisfaction, and well-being comparisons: A longitudinal investigation. *Journal of Traumatic Stress, 37*, 448–459. https://doi.org/10.1002/jts.23018

Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J., Weiller, E., … Dunbar, G. C. (1998). The Mini-International Neuropsychiatric Interview (MINI): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry, 59*(20), 22–33.

Sheffler, J. L., Stanley, I., & Sachs-Ericsson, N. (2020). ACEs and mental health outcomes. In *Adverse childhood experiences* (pp. 47–69). Elsevier. https://www.sciencedirect.com/science/article/pii/B9780128160657000045.

Smith, K. E., & Pollak, S. D. (2021). Rethinking concepts and categories for understanding the neurodevelopmental effects of childhood adversity. *Perspectives on Psychological Science, 16*(1), 67–93. https://doi.org/10.1177/1745691620920725

Uher, R., & McGuffin, P. (2008). The moderation by the serotonin transporter gene of environmental adversity in the aetiology of mental illness: Review and methodological analysis. *Molecular Psychiatry, 13*(2), 131–146. https://doi.org/10.1038/sj.mp.4002067

Visser, H. A., van Minnen, A., van Megen, H., Eikelenboom, M., Hoogendoorn, A. W., Kaarsemaker, M., … van Oppen, P. (2014). The relationship between adverse childhood experiences and symptom severity, chronicity, and comorbidity in patients with obsessive-compulsive disorder. *The Journal of Clinical Psychiatry, 75*(10), Article 17275.

Wells, A., & Cartwright-Hatton, S. (2004). A short form of the metacognitions questionnaire: Properties of the MCQ-30. *Behaviour Research and Therapy, 42*(4), 385–396. https://doi.org/10.1016/S0005-7967(03)00147-5

Widaman, K. F., & Revelle, W. (2022). Thinking thrice about sum scores, and then some more about measurement and analysis. *Behavior Research Methods*, 1–19. https://doi.org/10.3758/s13428-022-01849-w

World Health Organization. (2018). International Statistical Classification of Diseases and Related Health Problems (11th Revision). Retrieved from https://www.who.int/classifications/icd/en/.

Zilioli, S., Slatcher, R. B., Chi, P., Li, X., Zhao, J., & Zhao, G. (2016). Childhood adversity, self-esteem, and diurnal cortisol profiles across the life span. *Psychological Science, 27*(9), 1249–1265. https://doi.org/10.1177/0956797616658287