




ORIGINAL ARTICLE

Measuring accumulation: Constructing a tool for evaluating cumulative harm in children engaged with an intensive family support service

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Abstract

There is a significant body of research that attests to the deleterious impact of an accumulation of adverse childhood experience across the lifespan, which provides a strong rationale for the development of a means for evaluating this accumulation in a high-risk population. We developed a theory-driven measure, the Cumulative Experiences Index, and conducted a pilot study to test its utility. The Cumulative Experiences Index derives a cumulative harm score that can be used to inform intervention and prevention strategies, programmes and initiatives across all tiers of public health prevention intervention. The Cumulative Experiences Index was piloted with 50 participants aged 8–17 years old who were actively engaged with an Intensive Family Support service. The study explores whether cases rated as low, medium or high severity on the Cumulative Experiences Index corresponded with severity ratings on the three measures of concurrent validity: the Strengths and Difficulties Questionnaire, Kessler-10 and Children's Revised Impact of Events Scale. The Index provides a valid and accurate means of reflecting the interconnectedness and complexity of exposure to different forms of harm that accumulates over time. Practitioners and researchers will benefit from using the Cumulative Experiences Index—a new valid and reliable measure of cumulative harm.

Key Practitioner Messages

- The Cumulative Experiences Index assists practitioners understand the frequency, duration and severity of the harm to a child or young person.
- The Index provides a valid and accurate means of reflecting the interconnectedness and complexity of exposure to different forms of harm that accumulates over time.
- Practitioners and researchers are likely to benefit from using the Cumulative Harm Index—a new valid and reliable measure of cumulative harm.

KEYWORDS

adverse childhood experiences (ACEs), child protection, cumulative harm, index, intensive family support, trauma, validity

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INTRODUCTION

The Intensive Family Support (IFS) initiative was deemed a critical component of the Queensland Government's Child and Family Reforms, undertaken in response to the recommendations of the Queensland Child Protection Commission of Inquiry in 2013. The IFS services embedded across Queensland focused on diverting lower-risk families away from tertiary child protection systems and into community-based, non-government organizations that have a mandate of early intervention, diversion, and prevention (Collier & Bryce, 2021). The Queensland Government defines IFS services as follows:

A voluntary case management service intended to support vulnerable families with children (unborn to 18 years old) who are involved in or at risk of becoming involved with tertiary child protection system (Department of Communities, Child Safety and Disability Services, 2017, see also Australian Institute of Health and Welfare [AIHW], 2017).

The focus of current IFS service models is on improving the functioning, safety and well-being of families with multiple and complex needs. Specifically, IFS services aim to increase the parenting capacity of clients through an intensive, time-limited period of case management. There are many referral pathways available for vulnerable families to connect with an IFS service; however, the primary referral source is the statutory Child Protection Authority in Queensland (the Department of Children, Youth Justice and Multicultural Affairs).

By virtue of the risk of harm reporting system in Australia, child protection authorities typically respond to episodic events and isolated incidents of harm to a child or young person (Broadley, 2014; Sheehan, 2019). A referral to an IFS service is warranted if the child protection investigation has identified or substantiated that the child of concern is at significant risk of harm (Parenting Research Centre and University of Queensland, 2018).

Cumulative harm and risk accumulation

Empirical research, and our professional experiences working with vulnerable families, supports the notion that an accumulation of risk and harm is far more predictive and valuable in informing practice than viewing these adversities in isolation (Appleyard et al., 2004; MacKenzie et al., 2011). Cumulative risk is well accounted for in the literature and assumes that the accumulation of risk factors has a higher predictive power for negative clinical outcomes and developmental issues than any single risk factor alone (Li et al., 2014; MacKenzie et al., 2011; MacKenzie et al., 2011; Sameroff, 2000). The seminal adverse childhood experiences (ACEs) study (Felitti et al., 1998) and the work of Finkelhor on poly-victimization (Finkelhor, Ormrod, & Turner, 2009) have provided robust evidence on the magnitude of cumulative risk experiences across diverse populations.

As risk accumulates, so does the resultant harm. Bromfield, Gillingham, & Higgins (2007) coined the term 'cumulative harm' to describe the profound and exponential effects of an accumulation of adverse experiences in a child's life. Cumulative harm is experienced by a child having been exposed to 'a series or pattern of harmful events and experiences that may be historical, or ongoing, with the strong possibility of the risk factors being multiple, inter-related and co-existing over critical developmental periods' (Miller, 2007, p. 1).

To illustrate the magnitude of the catastrophic impacts of cumulative harm, the authors draw attention to recent findings of several coronial investigations in Australia, all of which highlight the role unaddressed cumulative harm played in the tragic and unnecessary death of children (Bentley, 2014; Bentley, 2020; Johns, 2015; Ryan, 2015). All coronial recommendations across these reports included strengthening the understanding and application of risk assessment (including cumulative harm) and developing and enhancing skills in frontline work that includes risk assessment and cumulative harm.

Cumulative harm is largely an Australian term, with international research using the more global terminology of complex trauma to encapsulate the lifespan implications of the accumulation of childhood adversity. It is important to note the definitional distinction between cumulative harm and complex trauma, in that cumulative harm is the input variable and complex trauma is the potential result of the harm experiences. It is equally important to note that accumulated adversity does not always result in complex trauma. The terms cumulative harm, cumulative abuse, cumulative trauma, cumulative risk and ACEs have all been referenced in various harm related research, demonstrating that definitional challenge when exploring this topic.

Assessment of cumulative experiences

Currently, there is no streamlined method to specifically evaluate cumulative risk or harm or the impact of interventions that address the accumulation of adversity within Queensland-based tertiary child protection services. Although

no validated measure currently exists, several researchers have commented on the need for, and value of, a method for reliably identifying and quantitatively scoring cumulative harm. Spratt et al. (2012) proposed the development of an assessment tool, based on the ACEs questionnaire. Carnochan, Rizik-Baer, & Austin (2013) suggested the use of structured decision-making tools, combining actuarial risk assessment and clinical judgement to aid in decision-making, particularly at intake. Jonson-Reid, Kohl, & Drake (2012) and Li & Godinet (2014) emphasized the need for comprehensive and ongoing assessment and intervention with children who experience chronic maltreatment, in order to address health and well-being outcomes and alleviate cumulative harm across childhood. Further to this, both Spratt et al. (2012) and Li & Godinet (2014) recommended child protection systems identify children experiencing multiple adversities as a priority group for targeted intervention. Such identification is important in order to better identify and reach these children and accommodate the complexity of cumulative harm, common within statutory child protection practice (Hood, 2014; Munro, 2011; Sheehan, 2019). To address this need, we developed the Cumulative Experiences Index (CEI) and piloted its use in an IFS service.

Development of a method for scoring cumulative adversities: The CEI

The CEI is a tool that measures the cumulative harmful experiences of a target population for which there is adequate historical information, for example, clients of an IFS service who have had past or current involvement with statutory child protection. The primary aim of the present study is to determine whether the CEI tool adequately measures the cumulative harm experiences of children and young people involved with an IFS. We developed the CEI by combining and modifying elements of three existing adverse experience scoring systems that included the ACEs checklist (Felitti et al., 1998), Bromfield, Gillingham, & Higgins' (2007) study of cumulative harm and the Modified Maltreatment Classification System (MMCS) (Barnett et al., 1993). We discuss these elements below.

ACEs

The ACEs study is seminal and one of the largest investigations on the impact of childhood abuse, neglect and family dysfunction on life-long health and well-being outcomes. The study identified that 87% of maltreated individuals had experienced two or more types of ACEs, highlighting that ACEs rarely occur in isolation (Felitti, 2002). The conclusion drawn by Felitti and colleagues (1998; Edwards et al., 2003) was that a dose-like relationship exists, whereby the more ACEs a child experiences, the higher the risk of physical and mental illness and social issues experienced as an adult. In their ACEs research, Felitti et al. (1998) collated specific clusters of ACEs into 10 distinct categories: emotional abuse, physical abuse, sexual abuse, witnessing domestic and family violence, community violence, parental substance misuse, parental incarceration, parental separation and divorce, emotional neglect and physical neglect. As the ACEs study has been proposed as a basis for developing an assessment tool for measuring accumulation (Spratt, 2012), and given the foundational nature of this work, these 10 adverse experiences form the initial experience categories for the CEI. However, in developing the CEI, we modified the ACE original 'neglect' category, dividing it into four separate neglect experiences: care neglect, supervisory neglect, medical neglect and environmental neglect taking guidance from the MMCS and Robinson (2019). These neglect distinctions were considered particularly useful for practitioners as the variation in neglect presentations would necessitate varying responses from the practitioner. Additionally, we added 'fetal abuse' as an additional category of adverse experiences to the CEI given the increasing prevalence rates in Australia and internationally of children at or pre-birth becoming involved with the child protection system (O'Donnell et al., 2023). Research indicates that that exposure to adverse or toxic conditions while in utero can have negative effects for the child across multiple neurodevelopmental domains including birth abnormalities and neurodevelopmental deficits (Kelly, 2013; Schroedel & Peretz, 1994). We adopted the foetal abuse definition outlined by Kelly (2013) within the CEI. Finally, to broaden the scope of what constitutes adversity in the CEI, we also included removal from family of origin and placement breakdown experiences to capture the cumulative impact of out-of-home care experiences. In total, the CEI scored 17 adverse experiences. See Table S1 for the CEI coding sheet that lists all experiences included and the particular calculating method applied. The ACE checklist is a common method of measuring interrelated adverse events that have significant lasting consequences though the scoring standards remain an 'unsettled' matter (Choi et al., 2021). The criticism being that merely calculating an individual's ACE score does not provide enough detail to appropriately elucidate the breadth and impact that the cumulative experiences may have. Further measures of experience specificity were added to the CEI-based aspects of the MMCS and the cumulative harm study by Bromfield, Gillingham, & Higgins (2007). These included frequency, severity and chronicity.

Frequency, duration and severity

Bromfield, Gillingham, & Higgins (2007) argued that traditional child protection approaches tend to ‘shape thinking towards an incident-focused conceptualization of maltreatment’ (p. 36). However, many individual acts of commission or omission may fall below the threshold for intervention because, taken on their own, they are of low-to-moderate severity. Their study of chronic child maltreatment, as well as the work of Bryce & Collier (2022) illustrated that it was persistent dysfunction—even when individual acts or omissions generally fell below the threshold for statutory intervention—which resulted in lifelong ‘cumulative harm’. Bromfield, Gillingham, & Higgins (2007) identified that frequency, duration and severity of individual acts were key elements in determining cumulative harm, and thus, these three factors have been integrated into the CEI. These harm experience characteristics are also identified within the MMCS as measures with which to extrapolate more nuanced details from case files about the harmful experiences. The MMCS has been widely applied to research and practice and offers useful guidance as to how to reliably code characteristics of maltreatment in the present study. Frequency, duration and severity measures are coded for each harm experience in the CEI as follows.

- Number of reported incidents (frequency) – 0–2 = 1, 3–4 = 2, 6–8 = 3, 8+ = 4
- Repetition/time over which the maltreatment took place (duration) – less than a week = 1, between 1 week and 3 months = 2, between 3–12 months = 3, more than a year = 4
- The five MMCS severity rating groups collapsed to create three CEI severity categories, where the MMCS uses ratings of 1–2, the CEI rating is ‘low’, 3–4 = ‘medium’ and 5 = ‘high’. Collapsing of scores was conducted to match CEI scoring system and to reduce practitioner subjectivity by offering fewer options.

The severity categories in the CEI are assigned based on the level of danger or threat to physical integrity or emotional well-being and using the approach developed by Jackson et al. (2014) to coding severity using the MMCS. This severity weighting approach is also consistent with the cluster analysis by Higgins (2004) in which outcomes were best predicted by maltreatment when maltreatment was clustered according to low, medium and high degrees of abuse. All categories described for the severity, duration and frequency measures were implemented in this pilot study.

Implementing the CEI

Using the Cumulative Experience Index to ascertain an individual child’s overall cumulative experience score requires a three-step process.

1. Record all ACEs reported for the subject child in the CEI data extraction matrix. Information may be retrieved from both statutory child protection bodies and non-government service provider files though duplicate reports from multiple sources should only be recorded as one incident.
2. Each individual experience is calculated using the formula below, from which an incident score is derived.

$$\text{Frequency} + \text{Severity} + \text{Duration} = \text{incident score.}$$

3. A total CEI score is calculated for the subject child by summing all incident scores and adding the total number of ACEs (different types of harm).

$$\left(\sum \text{all incident scores} \right) + \text{total no. of ACEs} = \text{CEI score.}$$

An example of using the CEI scoring method for a singular incident is described below.

A report filed with the statutory child protection department for subject Child A reads:

Lunch packed with ‘no nutrition for weeks now’, (subject Child A) always dirty and smelly, Mo (Mother) blames kindy [kindergarten] (an establishment where children below the age of compulsory education play and learn, prior to the first year of formal education).

Text is recorded in the data extraction matrix along with other key information such as report source, and the date the report was received. This type of adverse experience is scored as ‘Care Neglect (CN)’ for the lack of nutritionally appropriate food and a second time for the child’s poor hygiene. We took care to categorize every type of adverse

TABLE 1 Approach to scoring using the CEI data extraction matrix.

Data source	Date received	ACE type	Frequency	Duration	Severity	Evidence	Incident score
CP	Mar 2016	CN	3	2	1	Lunch packed no nutrition for weeks now, child always dirty and smelly, Mother blames kindergarten	12
		CN	3	2	1		

Abbreviations: ACE, adverse childhood experience; CEI, Cumulative Experiences Index.

experience mentioned within each report. In assessing the frequency, a rating of 3 was given as the reporter indicates the actions of concern have repeated over multiple occasions. Given that the exact frequency is unknown based on this report, we used a conservative estimate in this example where a frequency rating of '3' indicated 6–8 times. The duration was rated '2' as the report emphasizes that the concern had been held for multiple consecutive weeks. Severity was rated as low based on the guidance provided in the MMCS. An example of the data extraction matrix for this instance of harm reported for Child A is available in Table 1. In this example, a total score of 12 for this singular incident was calculated by summing the frequency, duration and severity totals (3 + 3 + 2 + 2 + 1 + 1). A child's total CEI score is the sum of all individual incident scores plus the number of different types of ACEs reported. If, for example, over the course of all reports filed for Child A, care neglect, foetal abuse, sexual abuse and parental incarceration were identified, the total ACE score would be '4', and this would be added to each incident total to get the final CEI score for Child A.

The CEI is not intended to be predictive or a holistic assessment of risk; it is also not intended to replace or reduce the value of specific abuse type assessment and scoring tools or the structured decision-making tools that statutory officers use to assess safety and future risk. The CEI is considered additional to existing tools that focus on assessment separately for each specific type of child maltreatment, for each child in the family unit. Existing research clearly attests to the chronicity and multiplicity of maltreatment. Therefore, to effectively understand the context of abuse and harm for a child, analysis of the accumulation of maltreatment must be considered. While we acknowledge that the tool is gathering contextual information about what is not working well for families, it is not intended to be a deficit driven tool, as this information is collected to inform targeted intervention that will drive capacity building and skill development for families to promote family preservation and reunification.

METHOD

Once the development of the CEI was complete, we tested it in a pilot study with an IFS service in Queensland, Australia. The pilot study involved close collaboration with Case Workers of the IFS to measure and score the cumulative experiences of a convenience sample of the service's clients. Research has repeatedly shown that experiencing childhood adversity has a dose-like response effect in that the greater number of adverse experiences typically equates to poorer physical and mental health outcomes (Anda, Porter, & Brown, 2020; Scott et al., 2023). Given that this is the first tool, to our knowledge, that captures and scores the cumulative experience of harm, including an indefinite number of harm experiences per person, we did not have any other established tools from which we could compare the CEI tool with. As a result, the research team decided to compare the scores of the tool with scores on tools that capture similar information—the Strengths and Difficulties Questionnaire (SDQ), Kessler-10 (K-10) and Children's Revised Impact of Events Scale-13 (CRIES-13). These three related tools capture the symptoms of cumulative harm rather than the exact number of harm experiences. Conceptually, these tools were likely to show a similar construct in that the greater number of harm incidents experienced, the greater number of symptoms or poorer well-being scores would be evident. This hypothesis is strongly grounded in the maltreatment literature that demonstrates a clear, dose-like relationship between the two. Therefore, to assess the validity of the CEI and its ability to identify children and young people who have experienced cumulative harm, we compared the results of the CEI with these three common measures of childhood psychological and behavioural functioning.

Participants

Participants in this pilot study were families actively engaged with the IFS Service. A family is defined as any parent/caregiver with a child or children, unborn to 18 years old. We refer to 'families' as this is the unit receiving support from the IFS. However, for this study, we involved only one parent/caregiver and one child. The children and parent/caregiver had consented to work with the IFS prior to their engagement in this pilot study. Participants of this study met all the following inclusion criteria:

- Family had an open and active case of support with the IFS at the time of the study.
- Parent/caregiver scored 'high' across multiple future risk evaluations.
- Family had been observed to have made limited or no progress towards the child-focused goals featured in their case plans by IFS staff.
- Child displayed highly complex psychosocial behaviours and/or developmental delays.
- Family had evidence of life-long statutory or non-government intervention.

Preference was given to inclusion of children who were 8 years or older as this is the minimum age required for completion of the construct validity measures. Families with significant involvement with child protection and welfare agencies were selected by caseworkers for inclusion.

Many re-referrals into the IFS for families indicated typically higher levels of harm or childhood adversity and maltreatment. This pattern of engagement with an IFS was reflected in the family's child protection history. Typically, families with minimal history of IFS or departmental involvement were not nominated for the study.

Recruitment

Families are referred to the IFS programme due to experiencing multiple and complex compounding issues that are impacting on overall family functioning and the safety and well-being of the children. The family is assigned a tertiary qualified practitioner to manage these complexities once engaged with the IFS. As there was typically an existing level of rapport between the family and IFS practitioner, both the practitioner and the research assistant approached eligible families together regarding participation in the study. All families engaged in the service during the study period who met eligibility criteria were asked if they would like to participate. Those who consented were included in the study. Adult participants were provided with in-depth information regarding their participation and signed a consent form indicating their consent to participate in the study. Equally, children 8 years and older provided consent to participate. This was separate to their consent to participate in the IFS service. If there were multiple children present, the eldest child was selected for the study as their exposure to chronic maltreatment and adversity was generally the most profound. In some cases, multiple children from the same family were individually assessed for cumulative harm using the CEI.

Case Workers for the families conducted the K-10, Strengths and Difficulties Questionnaire (SDQ) and the Child's Impact of Events Scale (13) each on all of the eligible participants. Assessments were only completed once per child as a point in time determination of their functioning and symptomology. In some cases, it was appropriate for the SDQ assessments to be completed by a parent or caregiver on behalf of the child. The practitioners completing the assessments held a minimum undergraduate degree in a relevant tertiary discipline (social work, human services, psychology) and held an average length of service of 3 years. Contextual factors relevant to assessment administration require consideration. These factors include the level of rapport the parent/child had with the case-worker administering the assessment. Often, the assessments were delivered in the family home or in the community, as these are conditions under which the support service intervenes with their clients. These conditions were not controlled, and there were situations where the participant could be distracted by external factors (interruptions from parenting duties or other children/siblings). In one case example, where the SDQ was administered by the Case Worker, the parent allegedly responsible for perpetrating domestic and family violence insisted on completing the SDQ in lieu of the protective parent. The resulting SDQ score for this child was 'moderate'. The research team held concerns that the parent may have deliberately minimized the impacts of the abuse and neglect experienced by the subject child as the practitioner/researcher team found a consensus of 'high' cumulative harm using the CEI. Other factors that were noted as potential influences on the administration of the assessments, particularly the K-10, included the child's developmental and cognitive capacity that sometimes impacted their ability to comprehend certain questions or maintain focus for the duration of the assessment. Both internal and external factors may have led to variations in scores that is expected; however, we aimed to counter this possibility by using three distinct assessments to measure construct validity.

Over a 12-month timeframe data were gathered from 50 clients with 50 CEI scores derived from this available data. The full suite of construct validity measures could not be completed for six clients, as four families relocated or finished with the IFS service during the study period and two were under the age of eight. A total of 44 clients completed the CEI and all three construct validity measures. Of the 44 children included in this sample, the average age was 9 with the range being 8–12, and 22 (50%) were male.

The research ethical approval was given by University of Southern Queensland Human Research Ethics Committee (H20REA182P1).

Measures

CEI

To determine the CEI, the research team convened a panel of IFS practitioners to pilot the CEI, using their practice experience to assess the complexities and support needs of families. Research assistants liaised with the Department of Child Safety (QLD) to attain full harm reports for all child participants in the study. In addition, reports on each of the participants were collated from the IFS's data management system before panel meetings were convened. For some families, this collection of reports was extensive as there had been more than 10 episodes where a statutory child protection investigation and assessment had occurred over several years. Some participants' files also included 'Child Concern Reports', which are reports of alleged harm recorded by the statutory system that did not meet the threshold for immediate harm. Both substantiated reports of harm and child concern reports were included in the pilot of the CEI for all study participants. All reported instances of harm, regardless of duration, severity or frequency were included in the assessment of the CEI score per child.

We derived the final CEI score for each child in the sample as a consensus of all raters. The rating team comprised one IFS practitioner and either one or two of the research team who independently completed a CEI score assessment for each of the participants, using the method described in the case example earlier. The CEI rating process was completed by up to three members of the rating team in an aim to increase the reliability of the scoring. In total, 14 cases were rated by all three raters, whereas the remaining 36 cases were rated by a combination of two raters (one IFS practitioner and one independent researcher). Occasionally, the family's case worker or a social work student would participate in the process providing a third or fourth CEI score for some cases. For 43 of the 50 included cases, all raters initially agreed on the same CEI rating (initial inter-rater agreement on 86% of cases). Typically, discrepancies occurred where one rater allocated an overall score just above or below the cut-off point for the score that the rest of the team gave. For example, with Case SL, three raters assigned a CEI score of 'high', whereas one rated it as 'moderate' (but it was clearly marginal, with a moderate score of 117, which is only 3 points below the cut-off for 'high': 120). Where such rating discrepancies occurred ($n = 7$), raters discussed and reached agreement so that a final CEI consensus score was allocated to each case. All cases in this pilot study were allocated one CEI score for application among the construct validity tests presented hereafter.

Construct validity measures

SDQ

The SDQ is a validated behavioural screening questionnaire designed to be administered directly to young people or their parent/caregiver or other stakeholders within the child's life (Goodman, 1997). The SDQ is a common tool used across a variety of youth services including child and youth mental health services in Australia and research internationally. The brief instrument includes 25 items on a 3-point Likert scale to measure emotional symptoms, conduct problems, hyperactivity, peer problems and the participant's prosocial abilities. When scoring the five domains, 'Somewhat True' is always scored as a '1', but the scoring of 'Not true' and 'Certainly True' varies between domains, with results always being entered in the same way. If participants answer 'no' to item 26, an 'overall' question, participants are not invited to complete items 27 through to 33. These items are then coded as an eight for 'not applicable' with the impact score being coded to zero. The SDQ was completed either by the subject child or their primary caregiver.

K-10

The Kessler psychological distress measure is a series of 10 questions intended to yield an overall measure of depressive and anxious symptoms that the participant has experienced throughout the previous 4-week period. See below for an example. The total scores are then added together to determine the individual's overall level of psychological distress. A score of <20 indicates the participant is well. Between 20 and 29, the participant could have a mild-moderate disorder with any score over 30 indicating severe distress. An example item is: 'During the last 30 days, about how often did you feel tired out for no good reason?' (1 = *none of the time*; 5 = *all the time*).

CRIES-13

The CRIES-13 was originally developed to evaluate the phenomena of re-experiencing a traumatic event and subsequent feelings of avoidance towards re-experiencing that event, symptoms associated with post-traumatic stress disorder (PTSD). The CRIES-13 measures three subscales of intrusion, avoidance and arousal, across 13 items each on a 4-point scale with the highest score being 20, 20 and 25, respectively, for each subscale. If individuals score higher than 30 overall, it is highly likely that they are experiencing PTSD.

TABLE 2 Scoring categories for three construct validity measures and the Cumulative Experience Index.

Measure	Subscale	Low	Moderate	High
CRIES (13)	Intrusion	0–7	8–14	15–20
	Avoidance	0–7	8–14	15–20
	Arousal	0–8	9–17	17–25
	Overall	0–22	23–43	44–65
K-10		0–20	20–29	30–50
SDQ		0–11	12–23	24–40
CEI		0–68	69–119	120+

Abbreviations: CEI, Cumulative Experience Index; CRIES (13), Children's Revised Impact of Events Scale-13; K-10, Kessler-10; SDQ, Strengths and Difficulties Questionnaire.

All three construct validity measures use different scoring ranges that make them ordinarily difficult to compare. Therefore, we grouped the scores for each of the measures and the CEI into three categories: low, medium and high and coded these 1, 2 and 3, respectively. Based on previously reported scoring systems for the K-10, SDQ and the CRIES-13, (Goodman, 1997; New South Wales Institute of Psychiatry, 2005; Oranga Tamariki Ministry for Children, 2019), we adapted the scoring cut-off points for each of the measures to suit our low-high categorization, as detailed in Table 2. Practitioner and researcher clinical judgement and practice wisdom were used to determine the scoring categories for the CEI representing a realistic picture of cumulative harm. Scores of 0–68 on the CEI represent a 'low' categorization, 69–119 equates to a 'medium' categorization and any score beyond 120 represents a 'high' categorization. Given that the total number of maltreatment numbers is almost indefinite for any child, there is no cut-off point signifying the top end of the 'high' category. Having standardized the cut-off points and scoring system for all measures, we were able to systematically compare scores from the CEI with scores from the other three assessments.

Data analysis

Following the capture of 50 individual data sets, we conducted several descriptive analyses to assess first the inter-rater reliability of the CEI as a standalone tool and, second, the concurrent validity of the CEI compared with each of the existing validated assessments: SDQ, K-10 and CRIES-13. To test the reliability of raters' agreement on the CEI tool, we used a basic test of inter-rater reliability calculated a percentage score representing how often each case was scored the same by different raters using the CEI rating system. For example, 8 of the 10 cases that were rated as 'high' on the CEI were also rated in the 'high' range for the SDQ; therefore, the rating agreement percentage is 80% for the SDQ high category. We also used an intra-class correlation (ICC) test to confirm the within-tool agreement.

Next, we compared the CEI scores with the scores derived from each of the assessments individually. We used a percentage score measure of inter-rater reliability to determine the level of agreement between scores on the CEI tool and those on the three other tools.

RESULTS

The most frequent CEI rating ($n = 34$; 68%) was 'high'. These results are consistent with the referral criteria of children that were identified to participate in the study, where children have documented multiple and extended ACEs across childhood. As can be seen from Table 3 below, the level of inter-rater agreement was highest in cases that we classified as 'high' (88.2%) and lowest in those classified as 'low' (75%). A high degree of reliability was found between raters on the CEI tool, particularly for cases with moderate or high severity scores. The average measure of ICC was 0.949 with a 95% confidence interval from 0.875 to 0.982 ($F(13) = 21.74$, $p < 0.001$) when all three raters were included in analysis. However, given that the third rater only completed ratings for 14 of the 50 scores, we also ran the same ICC test for the first two raters who scored all 50 cases. The ICC statistic also showed high correlation between these two raters; 0.965 (CI, 0.938–0.981, $F(47) = 28.47$, $p < 0.001$).

After resolving issues of rater discrepancy, raters agreed that in total, our CEI data were made up of four cases rated 'low', 12 cases rated 'medium' and 34 cases rated 'high'. This is the breakdown of ratings per case used as comparison with the three subsequent tools, the K-10, SDQ and CRIES-13.

TABLE 3 Inter-rater agreement at each CEI severity level.

CEI severity level	Number of cases per CEI severity level (<i>n</i>)	Cases with agreement between all raters <i>n</i> (%)
Low	4	3 (75%)
Moderate	12	10 (83.3%)
High	34	30 (88.2%)
Total	50	43 (86%)

Abbreviation: CEI, Cumulative Experience Index.

TABLE 4 Concurrent validity between CEI and SDQ severity ratings (*N* = 44).

CEI rating	SDQ rating			Total
	Low	Moderate	High	
Low	2	2	0	4
Moderate	1	7	2	10
High	0	7	23	30
Total				44

Abbreviations: CEI, Cumulative Experience Index; SDQ, Strengths and Difficulties Questionnaire.

Concurrent validity measures

SDQ

In total, 44 participants were assessed using the SDQ. Of the 30 cases that were rated as ‘high’ on the CEI within this group, 23 were also found to rate as ‘high’ on the SDQ; see Table 4. The level of agreement was lower for cases that scored ‘low’ on the CEI: of the four rated low using the CEI rating system, only two were also rated as low on the SDQ. Overall, 72.7% (*n* = 32) cases had severity levels on the CEI and SDQ that aligned. This strong consistency shows high concurrent construct validity of the CEI with a valid and reliable measure of well-being—the SDQ. For cases with lower scores on the CEI, the concurrent validity was not as strong (although this may have been influenced by the smaller number of cases that were rated as low severity on both the SDQ or the CEI).

K-10

For this analysis, we only included children who had scores on both the Kessler and CEI scales that resulted in 44 cases being compared. Of these cases, a total of 33 (75%) matched CEI and K-10 rating scores; see Table 5. Our panel allocated 30 of these cases to the high classification by using the CEI, and 24 also met criteria for the high category on the K-10 assessment reaching an agreement of 80%. For the 10 cases that were rated as moderate using the CEI, seven of those were similarly rated moderate on the K-10 assessment, demonstrating a 70% agreement rating. Finally, and with the lowest level of construct validity, two of four cases that were identified as reaching the ‘low’ threshold on the CEI met the ‘low’ criteria on the K-10 assessment.

CRIES-13

As with the K-10, there were six cases without CRIES-13 data, despite 50 CEIs being completed, so our analysis focused on the 44 cases where both assessments were available. As shown in Table 6, for the CRIES-13 measure, the most common rating for the avoidance and intrusion subscales was ‘moderate’ that contrasts with the pattern we observed with scores derived through the SDQ, K-10 and the CEI that showed most responses met the ‘high’ threshold. Other results in this study have shown that raters struggle to determine whether a case meets moderate or low thresholds but are more confident in identifying those that meet ‘high’ severity levels. Table 7 provides the details of agreement on ratings between the CEI and the CRIES-13 overall scores. Only 18 cases were identified as sharing the same rating score on both the CEI and the CRIES-13 reaching an inter-rater agreement of only 40.9%, lower than for the SDQ and JK-10 comparison tests.

TABLE 5 Concurrent validity between CEI severity and K-10 distress severity ratings ($N = 44$).

CEI rating	K-10 rating			Total
	Low	Moderate	High	
Low	2	2	0	4
Moderate	1	7	2	10
High	0	6	24	30
Total				44

Abbreviations: CEI, Cumulative Experience Index; K-10, Kessler-10.

TABLE 6 Concurrent validity of CEI severity using CRIES-13 severity and subscale ratings for arousal avoidance and intrusion.

CEI severity level	C-13 arousal (n)	C-13 avoidance (n)	C-13 intrusion (n)
Low	6	7	8
Mod	16	27	25
High	22	10	11

Abbreviation: CEI, Cumulative Experience Index.

TABLE 7 Concurrent validity of CEI severity using CRIES-13 severity ratings ($N = 44$).

CEI rating	CRIES-13 rating			Total
	Low	Moderate	High	
Low	3	1	0	4
Moderate	2	7	1	10
High	3	19	8	30
Total				44

Abbreviations: CEI, Cumulative Experience Index; CRIES-13, Children's Revised Impact of Events Scale-13.

Summary

We aimed to explore whether cases rated as low, medium or high on the CEI corresponded with ratings on the three measures of concurrent validity—namely, SDQ, K-10 and CRIES-13. The above results have shown that the methodology, design and assessment tool for assessing the overall levels of cumulative harm in young people is valid in the pilot phase. While we found evidence of high concurrent construct validity, the level of agreement between ratings were stronger for those cases that the team gave a CEI rating of 'high', compared with slightly lower levels of agreement for those cases that the team rated as 'moderate' and 'low'. The above results have shown promising validity of the new method for assessing cumulative harm in young people: the CEI.

Our findings are reflective of the profile of cases in preventative family support services where the referral criteria include 'multiple and complex' needs. Assessing levels of cumulative harm is most important for children that have extensive incidents of harm and multiple documented attempts to provide statutory and non-statutory interventions. Children with low or moderate CEI scores are atypical IFS clients—therefore, greater variability within these subgroups is to be expected. Assessing levels of cumulative harm is most important for children that have extensive reported incidences of harm and multiple documented attempts at both statutory and non-statutory intervention. Despite higher levels of variance within the lower and moderate domains, these participants are the most likely to benefit from typical standards of intervention. The impacts of cumulative harm and poly-victimization are less profound and therefore less worthy of assessing and treating.

It is worth noting that the inconsistencies between the CEI scores and the CRIES-13 avoidance and intrusion subscales are likely due to the distinct nature of lived experiences of multiple ACEs throughout childhood. Children who have experienced abuse and neglect are known for being 'poorly behaved' as these experiences impact on their ability to participate and function at home and at school (McLean, 2016). Abused and neglected children typically show high levels of arousal. This explains why practitioners can readily identify arousal-based behaviours in their clients. Further, participants in this pilot study remained in the care of their biological parents where the adverse experiences have

occurred and possibly continue to occur. The context of continued exposure to abusive and neglectful environments and triggers leaves little space to 'avoid' negative thoughts and experiences and means that negative thoughts are unlikely to be experienced by children as intrusive memories (as measured in the CRIES-13). Considering the total CRIES-13 scores, it becomes apparent that typically lower scoring in the intrusion and avoidance domains lowers the total percentage of agreement. Therefore, the CRIES-13 scoring of arousal validates the CEI with the other domains (intrusion and avoidance) less likely to be observed in this population group.

DISCUSSION

The aim of this pilot study was to test a method of evaluating the accumulation of adverse experiences in a child's life. The findings of this study demonstrate both the validity and the utility of the CEI in assessing cumulative experiences in the context of family support and intervention. The most significant achievement of this pilot study was the successful testing of a means by which to understand and assess cumulative adverse experiences, and that demonstrates utility from a clinical and practice perspective. The CEI, particularly the quantitative scoring tool itself, adds new dimensions to the process of assessment, formulation and treatment of and engagement with children and families experiencing cumulative adversity.

Researchers, coroners and practitioners alike have vehemently argued that stakeholders must be guided by frameworks and supported by resources that accurately identify and acknowledge the impact of ongoing exposure to adverse experiences to effectively intervene in matters of chronic and cumulative maltreatment (Bath, 2014, Broadley, 2014; Bryce, 2018; Collier & Bryce, 2021). Assessment, therefore, must reflect the equally pervasive and damaging nature of cumulative harm and risk on the development and functioning of the individual and allow for intervention in matters of ongoing maltreatment, regardless of whether the child is exhibiting indicators of harm at the time the maltreatment is identified.

Although cumulative harm is recognized within structured decision-making tools, used globally, it is not explicitly identified nor specifically assessed within these tools (Bromfield, Gillingham, & Higgins, 2007; Goddard et al., 1999). Although much research has examined aspects of accumulation, such as multi-type maltreatment (Higgins & McCabe, 2003), poly-victimization (Finkelhor, Ormrod, & Turner, 2007a, 2007b) and ACEs (Edwards et al., 2003; Felitti et al., 1998), each of these existing processes possesses their own limiting characteristics, and prior to this study, there was no current method of evaluating the accumulation of all these elements simultaneously. The use of the CEI supports the shift away from the current incident-focused concept of abuse, neglect and adversity and provides a process that can adequately represent the entirety of the child's experience. The CEI has a broad scope that acknowledges those individual maltreatment events that are low to moderate in severity and that often fail to meet thresholds for action in the statutory child protection's usual evaluation processes.

The CEI provides a means of accurately reflecting the interconnectedness and complexity of harm exposure. Price-Robertson et al. (2013) argued for the value of in-depth measures that account for as many adversities as possible. Their analysis suggested that 'the more child victimization experiences that are measured, the more sensitively researchers will be able to detect relationships with later outcomes' (p. 92). Collier & Bryce (2021) emphasized the clear implication of this gap - the need for an assessment method that draws together all elements contributing to the chronic maltreatment experience for a child and family - multiplicity, diversity and severity. This scoring tool successfully accounts for the pervasive effects of the accumulated harm through the provision of a numerical score that is reflective of the frequency, duration and severity of the cumulative harm. The use of ACEs as the measure of interrelated events as the premise of the CEI supports capturing the breath and impact of the individual's maltreatment experiences in a coordinated and purposeful manner.

The CEI demonstrates strong inter-rater reliability particularly for cases scored as medium or high severity (a typical client profile in the IFS service). When considering these results collectively, it demonstrates that the CEI is a useful tool of assessment of cumulative harm in a frontline, non-government child protection service working with families with multiple and complex presentations.

With the use of standardized, psychometrically valid measures, we achieved high levels of concurrent validity, particularly for cases where CEI scores were categorized as high. There was greatest congruence between CEI and measures of concurrent validity for the participants who experienced high levels of childhood adversity. Those with low or moderate scores would likely not qualify or require such specialized intervention (as discussed below). Yet, the administration of the CEI to these participants provided their caseworker with further contextual considerations for practice and ultimately informed the assessment and intervention with the participant. This further supports the utility of the CEI within a frontline, non-government child protection service. Completing the CEI can provide frontline practitioners with a reliable means of identifying heightened levels of risk to children that require highly specialized levels of support, beyond the scope of an IFS.

Practice implications

Expanding current assessment and evaluation processes to account for cumulative experiences for each child within a family unit will enable further insights into a child's history of trauma, as well as their likelihood of future risk and cumulative harm (Collier & Bryce, 2021). This pilot study has shown the potential practical advantage of the CEI, in providing a method of mapping and scoring accumulation in clients, based on existing literature and research that identifies key elements necessary for this process to be accurate (Bromfield, Gillingham, & Higgins, 2007; Felitti et al., 1998; Barnett, Manly & Cicchetti, 1993). However, further testing of the CEI with practitioners as part of their everyday case work is necessary to determine with greater certainty the utility and efficacy of the tool.

When a child's level of cumulative adversity is determined, this will inform the intervention for each child and the family. The CEI score will guide the practice frameworks and resources required to facilitate a more targeted intervention for the family, and the child in more specific terms than the child protection sector, statutory, tertiary and secondary is currently established to do. Regarding the outcome of the assessment and measuring process, practice decisions can be tailored to each child's specific needs. Through this process, the child is at the centre, and the impact of the chronic and multi-type maltreatment and poly-victimization becomes more evident. This evaluation will promote the scaffolding of intervention focused on addressing the future cumulative risk, should the family's entrenched maladaptive functioning and subsequent complex trauma remain unaddressed for the child.

This process of assessing cumulative adversity and maltreatment, through identifying themes of traumatic exposure, enables the intervening practitioner to provide a more targeted intervention to address or to advocate for a more robust and comprehensive assessment and service provision. The CEI provides a means of justifying individualized, bespoke practice formulations in the treatment, engagement and support to individuals that have experienced high levels of cumulative harm. Rather than services attempting to justify interventions based on incident specific maltreatment events, the sector now has a means to rationalize and action targeted support for those individuals that have experienced high levels of cumulative harm that have resulted in complex support needs. The CEI offers practitioners an evidence-informed approach to innovative and differentiated practice design, to support individuals that have experienced intergenerational transmission of mental illness, substance misuse and experiences of maltreatment where the accumulation of harm and future risk remains severe in nature and likely to be prologued and ongoing (Bryce & Collier, 2022; Collier & Bryce, 2021).

Limitations and research implications

This assessment of the utility of the CEI was a pilot study based on a small sample of clients from one IFS in one state of Australia. To determine reproducibility of the CEI, future research will need to evaluate the use of the CEI in a broader scope of practice, beyond IFS client groups and without the support of a research team. Research is recommended that investigates the broader efficacy of the CEI and of specialist practitioners to provide bespoke and tailored interventions to address accumulated risk and harm in the family unit. As the IFS movement progresses, statutory child protection services may only be able to cope and respond to immediate harm of children, not the cumulative risk and harm that often permeates a family unit and explains the trauma-based responses that children and young people exhibit in their homes, schools and the community.

As mentioned, the CEI is designed to be a tool to complement not replace current items within the practitioner's 'toolkit' as it does not identify the strengths or needs of clients. While the CEI provides practitioners with a systematic way of identifying contextual information that is frequently missing, it does require them to absorb another administrative task into their already resource poor schedule that may present as a limitation to widescale adoption of the CEI in practice.

A key limitation of our study was finding the best tools to compare the CEI with to test concurrent construct validity, given that the CEI quantifies complex cumulative experiences, something that—to the best of our knowledge—no other tool does. As such, we were unable to compare the CEI with a tool that fits the purpose exactly. Instead, we opted to compare the CEI tool with three other validated measurement tools that conceptually demonstrate similar outcomes. Although we could not compare the CEI with another measure that calculates the accumulation of harm experiences, we could compare it with tools that measure the extent of the symptoms of harm experiences and that theoretically are closely linked.

Another limitation involved the CEI inter-rater agreement process that was conducted as a discussion to achieve consensus between raters rather than a rigorous independent process. In further tests of the CEI tool, studies would benefit from having a standardized process to follow when raters disagree on the CEI score.

A final limitation of this pilot study was that external factors are likely to have had an impact on the accuracy of assessment results, such as parents choosing to respond for children and the environment in which assessments were conducted. Further research would need to consider mitigating any circumstances that could influence the outcome of the assessments. Another limitation is that the child participations could have recently experienced a distressing event that

may or may not be related to the child protection concerns reported (e.g., bullying at school), compounding their current experiences of psychological distress. Also, the CEI can only measure instances of harm that have been reported to statutory authorities or the current service engagement, which may mean that other experiences are not included as they go unreported. The final limitation of the study is that children under eight were not able to be fully assessed using the construct validity measures, and as such, the impact of earlier experiences was not able to be compared against the rest of the sample. Future research might use other validity testing measures that include the assessment of younger children.

CONCLUSION

The cumulative harm and developmental trauma that many children are experiencing is largely untreated and requires a specialist approach to prevent further trauma and costs to the community. The future costs are likely to extend beyond the age of 18 years and potentially will consist of rehabilitation, justice and law enforcement, future victimization and neglect of generations of children, mental health concerns, disabilities, educational disengagement and homelessness. In a commissioned report on the economic cost of adult survivors of child abuse, Kezelman (2015) revealed the Australian Government's annual cost of childhood trauma was \$16 billion. The development of the CEI has resulted in a validated tool for bridging the gap between legislative semantics and grassroots action, to allow practitioners to be responsive to cumulative harm in a clinical, therapeutic, statutory or legal context. The CEI shows great potential as a tool to increase practitioner knowledge of the broader contextual history of a client, which, in turn, is expected to support more accurate decision-making and assist better targeted interventions.

AUTHOR CONTRIBUTIONS

India Bryce: conceptualization; data curation; investigation; methodology; project administration; roles/writing - original draft, review & editing. Simone Collier: conceptualization; investigation; data curation; methodology, roles/writing - original draft, review & editing. Lottie Harris: formal analysis; roles/writing - revision, review and editing. Daryl Higgins: conceptualization; formal analysis; methodology; validation; roles/writing - original draft, review & editing. Joseph Toohey: data curation; formal analysis; methodology; writing - original draft.

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CONFLICT OF INTEREST STATEMENT

Simone Collier and Joseph Toohey are employed by Act for Kids, the agency where the data collection took place. India Bryce, Lottie Harris and Daryl Higgins have no competing interests to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

AUTHOR DECLARATION

The work described has not been published previously, is not under consideration for publication elsewhere and will not be published elsewhere in the same form, in English or in any other language, including electronically without the written consent of the copyright-holder.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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