

REIMAGINING THE MEASUREMENT OF ADVERSE CHILDHOOD EXPERIENCES: A DELPHI STUDY TO DEVELOP ACE DIMENSION ITEMS

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This study aimed to develop a screening measure which incorporates five common adverse childhood experience (ACE) dimensions for the 10 original ACE domains. We used a Delphi method to collect data from 16 subject matter experts (SMEs) based in the USA, Canada, and the UK. SMEs were asked to determine the relative importance of dimensions, how dimension items and response options should be worded, and how dimensions should be analyzed. SMEs agreed that the five proposed dimensions are relevant for most ACE domains. We created dimension items and response options, and an analysis approach for the dimensions based on SME feedback. Conceptual ACE dimensions appear to be relevant for the measurement of ACEs. More research is needed to quantitatively evaluate different dimension scoring approaches and to develop an overall ACE dimensions score.

Keywords: Adverse childhood experiences; Delphi study; Scale development; Measurement; Screening.

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Well over half of the US adult population has experienced childhood adversity (Cronholm et al., 2015; Merrick et al., 2019). Adverse childhood experiences (ACEs) are a significant contributor to various negative health outcomes in later life (e.g., Kalmakis & Chandler, 2015) including cardiometabolic disease (Friedman et al., 2015; Jakubowski et al., 2018), and anxiety and depression (Hughes et al., 2017; Kalmakis & Chandler, 2015). In a recent meta-analysis, ACEs were significantly related to cardiometabolic disease in all analyses with a cumulative odds ratio (OR) of 1.4, 95% CI [1.3, 1.5], for all effects (Jakubowski et al., 2018). Having four or more ACEs increases the risk for attempted suicide by 2,900% (OR: 30.1, 95% CI [14.7, 61.7]; Hughes et al., 2017). Research shows a graded dose-response relationship of ACEs with various health outcomes — the more types of ACEs a person has experienced, the higher the number of ailments, the more severe the impact of a condition, the earlier the onset, and the faster the progression of a condition (Merrick et al., 2017; Zarse et al., 2019). However, some outcomes have shown a more complicated relationship with ACE, such as alcohol use behaviors (Mersky et al., 2013) and physical inactivity (Hughes et al., 2017). These variations in relationships might occur because of variations in the study populations,

because of different approaches to measure outcomes, or because of differences in ACE assessment (survey vs. interview). Another possible reason is the level of detail assessed for ACEs.

SHORTCOMINGS OF CURRENT ACE ASSESSMENT APPROACHES

The original ACE-Study questionnaire (Dube et al., 2001; Felitti et al., 1998) assesses 10 types of ACEs, or ACE domains (e.g., physical abuse, household violence) with binary response options (*yes/no*); an ACE index is created by adding up the number of affirmative responses to determine the cumulative number of adversities experienced. Researchers have continued to develop the concept of ACEs, and revised original domains (Campbell et al., 2016; Zarse et al., 2019) or added new domains, such as bullying and peer violence, community violence, or war (Cronholm et al., 2015; Finkelhor et al., 2013; World Health Organization, 2020). A simple index of binary ACE exposures is particularly convenient for screening purposes. Screening for ACEs can provide insights into who might have experienced which ACEs and who might be at increased risk for health consequences. It does not, however, provide sufficient information to determine who might have the highest need for treatment and intervention to prevent the longer-term consequences of ACEs. A simple screening tool such as the ACE-Study questionnaire may be appropriate for assisting in clinical diagnoses but does not provide the nuance needed for researching the pathways and effects of ACEs (Anda et al., 2020).

Effects of ACEs on a person's health can differ greatly by the type of adversity experienced, but also depending on other factors such as the frequency and severity of the experience (e.g., Felitti et al., 1998), or how the person appraises a certain experience. The ACE index does not provide information about these nuances. For example, a person who has experienced repeated severe child sexual abuse from multiple perpetrators is categorized as having one ACE, and would therefore fall into a "low trauma" category (Monnat & Chandler, 2015), when in reality this person has experienced severe childhood adversity. Thus, more detail is required about adverse experiences to better determine the extent of adversity experienced (Zarse et al., 2019). These details can be achieved by assessing ACE dimensions, such as the frequency or timing of an adverse event. In a recent scoping review of ACE dimensions, Krinner et al. (2021) identified four primary dimensions that were relevant to eight of the 10 original ACE domains — frequency, timing, perception, and the role of the perpetrator. Additionally, a number of secondary and domain-specific dimensions were found, which generally relate to the intensity of traumatic events.

REFINING ACES SCREENING EFFORTS

In recent years, researchers have voiced their concerns about the simplistic assessment of ACEs using the existing index measure (Anda et al., 2020; Bifulco & Schimmenti, 2019). From a research perspective, the ACE index measure weighs each type of experience equally and does not allow for meaningful interpretation of the effect of the experience, nor does it take into account other aspects of the experience.

Because of limited public health resources, we need to improve our ACE screening tools so that we can deploy interventions and treatments to those most in need, which depends on the intensity and effect of adversity experienced. Including the dimensions of ACEs will be helpful in increasing the accuracy of ACE screening tools to better inform decision-making about treatment, and to increase our understanding of the downstream effects of experiencing childhood adversity. At the same time, it is important to avoid a major

increase in participant burden and risk of retraumatization by adding items and requesting additional details about adverse experiences.

PROBLEM STATEMENT

It is currently unclear which dimensions of ACEs are relevant for research and practice, and how they can be measured in a meaningful way. Across the studies reviewed by Krinner et al. (2021), there was little consistency in the way ACE dimension items were worded, assessed, and analyzed. Many studies did not provide details on how they operationalized and worded questions on ACE dimensions. The lack of detail and the inconsistent terminology complicates the psychometric evaluation of ACE domains and dimensions.

AIMS AND OBJECTIVES

The goal of this study was to develop a set of dimension items that can be added to the existing 10-item ACE-Study questionnaire, as a foundation for future research in the field. We included the four primary dimensions identified by Krinner et al. (2021). Additionally, we created an intensity dimension to capture the secondary and domain-specific dimensions discussed in the literature. In this study, we addressed the following research questions:

1. What is the relative importance of different conceptual dimensions for each of the 10 original ACE domains?
2. What are expert opinions on operationalization and wording of dimensions?
3. What are expert opinions on the ranking of the dimension response options based on their intensity and impact on later-life outcomes?

MEASUREMENT THEORY FOR SCALE DEVELOPMENT

Scale development is a complex and iterative process. Not all phenomena can be observed and measured directly (Morgado et al., 2017). While many types of adversity are directly observable, we cannot directly observe and measure certain ACE dimensions, such as the perception or appraisal of an event, or the relationship to the perpetrator (Tay & Jebb, 2017). It is imperative to use the appropriate method to measure a phenomenon based on its observability so that the measure reflects the phenomenon's true value (Bandalos, 2018). This can be done by either using a deductive approach to scale development, which is based on preexisting literature or scales, or an inductive approach, based on the collection of qualitative information and opinions (Morgado et al., 2017). The combination of both approaches is advised when there is ambiguity in the definition or dimensionality of the construct, as is the case for ACEs (Tay & Jebb, 2017). With this study, we build on previous research that determined the state of the literature surrounding the dimensionality of ACEs as a deductive approach to identifying existing ACE dimensions used in research (Krinner et al., 2021). We conducted a Delphi study with subject matter experts (SMEs) in the field of ACE research and practice as an inductive approach to develop a systematic measurement approach for ACE dimensions as an extension to the original ACE-Study questionnaire.

METHODS

Delphi Approach

We used a Delphi method to develop dimension items for the 10 original ACE domains (Dube et al., 2001; Felitti et al., 1998). Since this specific area of research related to ACEs is rather new, a Delphi approach was most flexible and accommodated the complexity of the new topic. A Delphi method is an iterative process; several rounds of questionnaires are sent out to a group of SMEs. Responses to the questionnaires are synthesized and presented back to the experts for further evaluation with the goal to reach a consensus on a specific topic (RAND Corporation, 2020). SMEs can equally provide their educated opinion to find a solution for a specific problem (Avella, 2016). The final result of this present Delphi study is meant to be a true consensus of the group of SMEs about how the domains and their dimensions should be assessed and ranked for practice and research. The Delphi method has been adapted and used previously in content validation and scale development (Aazami & Mozafari, 2015; Bauer et al., 2019; Thomas et al., 2020).

Recruitment

Initial contact emails with basic study information were sent to 98 SMEs in the field of ACEs. We used the following sampling frames to identify researchers and practitioners: (1) author lists of relevant journal articles and editorial board members from key journals, and (2) the directory of participants in the 2019 American Psychological Association Committee on Children, Youth, & Families Summit “Adverse Childhood Experiences (ACEs): Translation to Action.” A follow-up recruitment email was sent out a few days after the initial contact.

We aimed to include experts who either have specific knowledge on a certain ACE domain or who have expertise related to the overall concept of ACEs and surrounding research. Our goal was to include at least one expert with specific knowledge of each of the 10 original ACE domains. Because of language and time restrictions, we limited our search to English-speaking experts. In accordance with Ludwig (1997), who points out that neither a too small nor too large sample is advantageous for the Delphi process, we aimed for a sample of 15 to 20 experts.

Data Collection

We collected two rounds of anonymous questionnaires over the course of three months. Before the start of data collection, SMEs were asked to sign a nondisclosure agreement via DocuSign (DocuSign.com). A Qualtrics survey (Qualtrics.com) was generated for each round of data collection. Participating SMEs received a link to the Qualtrics survey for each round via email with a brief description of the content of the survey and an estimate for how long it will take them to complete the survey. We provided an online consent form on the first page of Survey 1. SMEs had the opportunity to provide comments and suggestions regarding each question in both survey rounds, as well as to the survey results summaries. The dimensions, phrasing of the dimension items, and possible dimension response options emerged from a recent scoping review of empirical literature on ACE dimensions published after 1998 (Krinner et al., 2021). SMEs who agreed to

participate initially had 10 days to complete the survey in each round. We sent out a reminder email after seven days. This study was approved by the University's Institutional Review Board (protocol # 21-0040).

Round 1 Data Collection

In the first round, we asked SMEs about three things: (1) which dimensions are relevant for each ACE domain; (2) their level of agreement with proposed dimension item phrasing; and (3) their level of agreement on the dimension response options. For example, to determine the relevance of the dimension *frequency*, we asked: "The first part of this question relates to the relevance of frequency for each ACE domain with regard to the impact on the individual's later-life outcomes. Please indicate for which domains you consider frequency to be relevant in the table below." Response options range from *very irrelevant* to *very relevant* on a 5-point Likert scale.

To gain feedback on the item wording for the dimension frequency we asked: "Do you agree with the way this question is worded: *How often did the event occur?*" Response options range from *strongly disagree* to *strongly agree* on a 5-point Likert scale. SMEs had the opportunity to provide comments or suggestions on how to rewrite this item.

A sample item related to the wording of response options related to the dimension frequency is: "In our literature review, we identified two common sets of response options for the frequency of an adverse event. Please indicate which of the two options you think is the superior one, or provide an alternative assessment approach:

- 1) never, once, more than once, frequently, almost all the time,
- 2) this never happened, this happened one time, this happened more than once, this happened more than 10 times, this happened more than 20 times, or
- 3) if neither of the two, please indicate an alternative assessment approach."

SMEs had the opportunity to provide comments or suggestions on how to rewrite the response options. At the end of survey Round 1, SMEs provided their demographic information and scientific background.

Round 2 Data Collection

In survey Round 2, we asked SMEs (1) how we should anchor the dimension items within a domain so that participants focus on a specific adverse event, and (2) how we should rank the severity of the dimension response options developed in Round 1.

(1) For participants who experienced multiple instances of a given type of ACE, it is necessary to anchor their memory to a specific adverse event within each ACE domain. For example, regarding the dimension of *timing*, a participant could have experienced physical abuse at ages 4, 7, and age 16. To facilitate consistent assessment, we asked the SMEs' opinions about which specific adverse event a participant should focus on. SMEs were asked:

"How should we proceed if a participant would select multiple responses to the dimension questions?

Ask them to indicate:

- the FIRST occurrence of the event
- the most SEVERE occurrence of the event

- the most RELEVANT occurrence of the event to them
- the most FREQUENT occurrence of the event, or
- ALL occurrences of the event.”

(2) Next, we asked the SMEs to rank the dimension response options for each ACE domain based on their negative impact on later-life outcomes relative to each other. We assessed the ranking of response options for the dimensions of frequency and perception once for all 10 ACE domains, as the ranking likely is the same across all domains. For the dimensions of timing, perpetrator, and intensity, we assessed the ranking of dimension response options individually for each ACE domain. A sample item related to the impact ranking of dimension response options is: “For the dimension of *timing*, please indicate how you would rank the impact of *emotional abuse* on later-life outcomes for these age groups on a scale from 1 (*lowest impact*) to 5 (*highest impact*): 0-2 years, 3-5 years (preschool), 6-9 years (elementary school), 10-13 years (middle school), 14-17 years (high school).”

Data Analysis

We synthesized the quantitative survey responses and the comments after each survey round. We then presented an aggregate summary to SMEs seven days after we closed the survey. SMEs had 10 days to provide comments. We used comments from the survey Round 1 summary to further inform questions in survey Round 2, and comments on the survey Round 2 summary to inform the development of a scoring approach for the dimension response options. SMEs did not provide additional feedback to our summaries of results.

RESULTS

Subject Matter Experts

We invited 98 SMEs from a wide variety of scientific backgrounds and from different geographic locations in the USA, Canada, and the UK. Sixteen agreed, 19 declined participation, and 63 did not respond to our emails. SMEs were between 34 and 80 years old (mean 53 years) and were mostly female (73%). Except for one SME who preferred not to answer, all SMEs indicated that they were White/European American. All SMEs had a PhD (80%) or other terminal degree (JD or MD). Seven SMEs (44%) indicated Psychology as their main field of employment, while others reported Medicine, Public Health, Education, or Nursing. Most SMEs were involved in research (87%) either as a primary occupation or in an academic environment. In addition to general expertise related to ACE, SMEs had specific knowledge on child development, child behavior, child maltreatment, emotional neglect, parental separation/divorce, and parental incarceration.

Delphi Round 1 Survey Results

The Delphi Round 1 focused on (1) which dimensions are relevant for which ACE domain; (2) the level of agreement with the way the dimension items were phrased; and (3) the level of agreement on the dimension response options. Fifteen SMEs responded to the Round 1 survey.

Relevance of ACE Dimensions for the 10 Original ACE Domains

In general, there was strong agreement among the SMEs about the relevance of the proposed dimensions for the 10 original ACE domains (see Table 1). One SME commented that “[Adding concept dimensions] gets at dosage effect more directly per item than simply adding single category types up.” For the dimensions of frequency and perpetrator within the domain parental separation/divorce, 50% or fewer SMEs selected *relevant* or *very relevant*. We excluded these dimensions from that domain in future surveys, and they do not appear in the final proposed ACE dimensions measure. All other dimensions were identified as *relevant* or *very relevant* for the remaining domains by a majority of Delphi SMEs (69-100%).

An example SME comment highlighting the relevance of ACE dimensions is: “[The effects of an ACE] would depend upon the circumstances surrounding these events. For divorce, was it contentious, do both parents still have a supportive role in the child’s life, did a parent divorce three times? For mental illness, is this managed well with appropriate healthcare, or unmanaged? What is the mental illness? How much has this affected the child?” Example SME comments specifically related to the relevance of the dimension of timing are: “[ACEs are] likely to have profound effects if they occurred during the major periods of neurobiological development since all of the emotion and behavioral regulations systems are at maximum organization at the time and provide set points for emergence of psychopathology” and “Infancy/early childhood and early adolescence, periods of heightened neural plasticity, may be especially important.”

TABLE 1
Agreement on the relevance of ACE dimensions for the 10 original ACE domains

Dimensions	Frequency	Timing	Perpetrator	Intensity	Perception
% SMEs who selected <i>relevant</i> or <i>very relevant</i> *					
1. Emotional abuse	92.9	91.7	92.3	100	90.0
2. Physical abuse	83.8	91.7	92.3	92.8	90.0
3. Sexual abuse	84.6	91.7	92.3	92.9	90.0
4. Emotional neglect	85.8	91.7	92.8	92.8	90.0
5. Physical neglect	85.7	91.7	84.7	85.7	90.0
6. Parental separation/divorce	50.0	83.3	38.5	85.7	90.0
7. Household violence	92.3	100	84.6	92.9	100
8. Household substance use	100	91.7	88.8	85.8	90.0
9. Household mental illness	91.6	91.7	75.0	92.9	80.0
10. Household member incarceration	83.4	100	84.7	69.3	100

Note. *only valid responses included. Greyed out cells were not considered as *relevant* or *very relevant* by SMEs.

Dimension Item Wording

The proposed dimension item wording from Delphi Round 1 and then the subsequent revised item wording are shown in Table 2. An overall comment by two SMEs related to the wording of items and response

options was that we should adjust the wording to a lower literacy level (5-6th grade). There was low agreement on the proposed item wording and SME comments were used to revise the items. For example, regarding the dimension of perpetrator, one SME commented that “*perpetrator* assumes they have a pejorative view of the person. You might consider just asking ‘who did this?’” Another SME pointed out, that “the word *perpetrator* does not work for all categories [domains] (e.g., incarceration, mental illness, divorce).” Based on these and other comments, we revised the item wording for the dimension of perpetrator from the proposed wording “Who was the perpetrator?” to “Who did this to you?” for the domains emotional, physical and emotional abuse, and emotional and physical neglect, and “Which household member was this?” for the domains household violence, household substance use, household mental illness, and household member incarceration. SMEs also indicated that with the increased level of detail assessed with dimension items, it is important to frame questions in a way that maintains the power balance between researcher and participant.

TABLE 2
Proposed and revised wording of ACE dimension items

Dimension	Item wording		
	Delphi Round 1 proposed item wording	Agreement*	Revised item wording
Frequency	How often did the event occur?	57.1%	How often did this happen to you?
Timing	When did the event occur?	50.0%	How old were you when this happened to you?
Perpetrator	Who was the perpetrator?	35.7%	Who did this to you? (EA [‡] , PA, SA, EN, PN) Which household member was this? (HV [‡] , HSU, HMI, HInc)
Intensity	How would you rate the severity of the adverse event?	61.5%	Which of these answers best reflects the intensity of the event?
Perception	How would you rate the perceived stressfulness/impact of the event?	46.2%	Looking back at the event now, what impact did this event have on you?

Note. * % of SMEs who selected *agree* or *strongly agree* regarding the wording of the item. ‡ EA = emotional abuse, PA = physical abuse, SA = sexual abuse, EN = emotional neglect, PN = physical neglect, HV = household violence, HSU = household substance use, HMI = household mental illness, HInc = household member incarceration.

Wording of Dimension Response Options

In addition to the wording of dimension items, we asked SMEs to provide feedback on the dimension response options we proposed in survey Round 1. Response options were the same for all domains for the dimensions of frequency, timing, perpetrator, and perception; response options for the dimension intensity were domain specific. We used SME comments to revise the dimension response options. All proposed and revised response options are presented in Appendix A (Supplemental Table 1).

For example, regarding the dimension of timing, most SMEs opted for response options indicating age in a categorical format: 0-2 years, 3-5 years, 6-9 years, 10-13 years, 14-17 years. One SME commented that “you might also consider using anchors like adding which age people tend to be in which [school] grade.” Based on this feedback, we revised the response options to read 0-2 years (preschool), 3-5 years (elementary school), 10-13 years (middle school), 14-17 years (high school).

Delphi Round 2 Survey Results

In Round 2, we asked the SMEs (1) how we should anchor the dimension items so that participants focus on a specific adverse event, and (2) to rank the response options for each dimension based on their intensity relative to each other. Ten SMEs responded to the Round 2 survey.

Anchoring of Adverse Events

When asked if we should anchor participants to the first, most relevant, most severe, or most frequent event related to each type of adversity, most SMEs (62.5%) indicated that we should assess the most relevant event. Three SMEs proposed the term “meaningful” instead of “relevant”: “[...] most relevant makes sense because it’s what is most meaningful to the individual. It may also be the one they remember most accurately.” One SME pointed out that assessing the most meaningful adverse event might reduce participants’ recall bias. We shared this change with all SMEs in the Delphi Round 2 summary. SMEs were able to provide feedback about this revision.

Item Ranking Based on Negative Impact on Later-Life Health Consequences

We asked SMEs to rank the dimension response options for each ACE domain based on their intensity relative to each other in terms of later-life consequences. SMEs generally agreed on the ranking of response options in terms of the least impactful to the most impactful response. For example, for the dimension of perpetrator within the domain physical abuse, SMEs rated the response option *a stranger* as having the lowest negative impact, and *mother/stepmother* as having the highest negative impact on later-life consequences of ACEs. Rankings of moderate impact response options were less consistent, and some response options within a dimension were rated to have a similar impact. Table 3 presents the final dimension item wording within each domain, and the final set of response options categorized by lowest, moderate, and highest impact.

TABLE 3
Final ACE dimension item and response options wording and ranking of response options impact

Domains	Dimension	Item wording	Lowest impact	Moderate impact	Highest impact
Emotional abuse	Frequency	How often did this happen to you?	Once	More than once/sometimes, frequently	Almost all the time
	Timing	Thinking about your <i>most meaningful experience</i> of this, how old were you when this happened to you?	14-17 years (high school)	0-2 years, 3-5 years (preschool), 6-9 years (elementary school)	10-13 years (middle school)

(table 3 continues)

Table 3 (continued)

Domains	Dimension	Item wording	Lowest impact	Moderate impact	Highest impact
(Emotional abuse)	Perpetrator	Thinking about your <i>most meaningful experience</i> of this, who did this to you?	A stranger	Father/stepfather, other family member, other adult you knew (baby-sitter, teacher, family friend, etc.)	Mother/step-mother
	Intensity	Thinking about your <i>most meaningful experience</i> of this, how intense was this event?	Put you down/humiliated you	Insulted you, called you things like “ugly,” “lazy,” or “stupid”; threatened to leave you; threatened to physically hurt you	Said they hated you or they wish you had never been born
	Perception	Looking back at your <i>most meaningful experience</i> of this, what impact did this event have on you?	Very positive	Positive, neither positive nor negative, both negative and positive, negative	Very negative
Physical abuse	Frequency	How often did this happen to you?	Once	More than once/sometimes, frequently	Almost all the time
	Timing	Thinking about your <i>most meaningful experience</i> of this, how old were you when this happened to you?	14-17 years (high school)	0-2 years, 6-9 years (elementary school), 10-13 years (middle school)	3-5 years (preschool)
	Perpetrator	Thinking about your <i>most meaningful experience</i> of this, who did this to you?	A stranger	Father/stepfather, other family member, other adult you knew (baby-sitter, teacher, family friend, etc.)	Mother/step-mother
	Intensity	Thinking about your <i>most meaningful experience</i> of this, how intense was this event?	Grabbed, shook, slapped, pinched, spanked you on bottom with/without object — no injury	Grabbed, shook, slapped, pinched, spanked you on bottom with/without object (minor injury, left me with bruises or marks); punched, kicked, knocked you down, threw a hard object at you (minor injury, left me with bruises or marks); punched, kicked, knocked you down, threw a hard object at you (major injury, had to see a doctor or go to the hospital)	Hit you with a hard object, choked, beat, burned you, or threatened you with a weapon (major injury, had to see a doctor or go to the hospital)

(table 3 continues)

Table 3 (continued)

Domains	Dimension	Item wording	Lowest impact	Moderate impact	Highest impact
(Physical abuse)	Perception	Looking back at your <i>most meaningful experience</i> of this, what impact did this event have on you?	Very positive	Positive, neither positive nor negative, both negative and positive, negative	Very negative
	Frequency	How often did this happen to you?	Once	More than once/sometimes, frequently	Almost all the time
	Timing	Thinking about your <i>most meaningful experience</i> of this, how old were you when this happened to you?	0-2 years	3-5 years (preschool), 6-9 years (elementary school), 14-17 years (high school)	10-13 years (middle school)
Sexual abuse	Perpetrator	Thinking about your <i>most meaningful experience</i> of this, who did this to you?	A stranger	Mother/stepmother, other family member, other adult you knew (babysitter, teacher, family friend, etc.)	Father/stepfather
	Intensity	Thinking about your <i>most meaningful experience</i> of this, how intense was this event?	Exposed your private parts or their private parts to you against your will	Forced you to watch others engaged in sexual acts; fondled or touched private parts of your body or made you touch theirs against your wishes; threatened to hurt you or tell lies about you unless you did something sexual with them; forced oral, anal, or vaginal penetration on you with their fingers or genitals	Forced anal or vaginal penetration on you with objects
	Perception	Looking back at your <i>most meaningful experience</i> of this, what impact did this event have on you?	Very positive	Positive, neither positive nor negative, both negative and positive, negative	Very negative
Emotional neglect	Frequency	How often did this happen to you?	Once	More than once/sometimes, frequently	Almost all the time
	Timing	Thinking about your <i>most meaningful experience</i> of this, how old were you when this happened to you?	14-17 years (high school)	0-2 years, 6-9 years (elementary school), 10-13 years (middle school)	3-5 years (preschool)

(table 3 continues)

Table 3 (continued)

Domains	Dimension	Item wording	Lowest impact	Moderate impact	Highest impact
(Emotional neglect)	Perpetrator	Thinking about your <i>most meaningful experience</i> of this, who did this to you?	A stranger	Father/stepfather, other family member, other adult you knew (baby-sitter, teacher, family friend, etc.)	Mother/step-mother
	Intensity	Thinking about your <i>most meaningful experience</i> of this, how intense was this event?	Your parents/guardians did not know what you were doing with your free time when you were not at school or work	People in your family did not care about your emotional needs; people in your family did not look out for each other; your parents/guardians did not understand your problems and worries	You did not feel loved by your family members
	Perception	Looking back at your <i>most meaningful experience</i> of this, what impact did this event have on you?	Very positive	Positive, neither positive nor negative, both negative and positive, negative	Very negative
Physical neglect	Frequency	How often did this happen to you?	Once	More than once/sometimes, frequently	Almost all the time
	Timing	Thinking about your <i>most meaningful experience</i> of this, how old were you when this happened to you?	14-17 years (high school)	0-2 years, 6-9 years (elementary school), 10-13 years (middle school)	3-5 years (preschool)
	Perpetrator	Thinking about your <i>most meaningful experience</i> of this, who did this to you?	A stranger	Father/stepfather, other family member, other adult you knew (baby-sitter, teacher, family friend, etc.)	Mother/step-mother
	Intensity	Thinking about your <i>most meaningful experience</i> of this, how intense was this event?	You did not have enough clothes to wear to keep you warm or protected from the weather <i>and</i> there was nobody to take you to the doctor if you needed it	You had nobody to take care of you and protect you; you did not have enough clothes to wear to keep you warm or protected from the weather; there was nobody to take you to the doctor if you needed it	Your parents/guardians did not give you enough food even when they could easily have done so <i>and</i> your parents/guardians were too drunk or intoxicated by drugs to take care of you

(table 3 continues)

Table 3 (continued)

Domains	Dimension	Item wording	Lowest impact	Moderate impact	Highest impact
(Physical neglect)	Perception	Looking back at your <i>most meaningful experience</i> of this, what impact did this event have on you?	Very positive	Positive, neither positive nor negative, both negative and positive, negative	Very negative
	Timing	Thinking about your <i>most meaningful experience</i> of this, how old were you when this happened to you?	0-2 years	3-5 years (preschool), 6-9 years (elementary school), 14-17 years (high school)	10-13 years (middle school)
Parental separation/divorce	Intensity	Thinking about your <i>most meaningful experience</i> of this, how intense was this event?	Your parents/guardians separated peacefully and harmoniously	Your standard of living decreased significantly after the separation/divorce of your parents/guardians; your parents/guardians said bad things about each other and tried to get you on their side; you had to talk to a lawyer or judge during your parents'/guardians' separation/divorce	You lost contact with one parent/guardian after the separation/divorce
	Perception	Looking back at your <i>most meaningful experience</i> of this, what impact did this event have on you?	Very positive	Positive, neither positive nor negative, both negative and positive, negative	Very negative
Household violence	Frequency	How often did this happen to you?	Once	More than once/sometimes, frequently	Almost all the time
	Timing	Thinking about your <i>most meaningful experience</i> of this, how old were you when this happened to you?	0-2 years and 14-17 years (high school)	3-5 years (preschool), 6-9 years (elementary school)	10-13 years (middle school)
	Perpetrator	Thinking about your <i>most meaningful experience</i> of this, which household member was this?	Other family member	Mother/stepmother, other adult living in your home (e.g., mother's boyfriend, a family friend, etc.)	Father/stepfather

(table 3 continues)

Table 3 (continued)

Domains	Dimension	Item wording	Lowest impact	Moderate impact	Highest impact
(Household violence)	Intensity	Thinking about your <i>most meaningful experience</i> of this, how intense was this event?	Being called names or having something thrown at — no injury	Being grabbed, pushed, shook, pulled (minor injury); being slapped, bit, hit with a minor object, threw something, punched, kicked with injury; being choked, hit with a major object, burned, threatened with a weapon, or misused (major injury)	Being killed by another family member
	Perception	Looking back at your <i>most meaningful experience</i> of this, what impact did this event have on you?	Very positive	Positive, neither positive nor negative, both negative and positive, negative	Very negative
Household substance use	Frequency	How often did this happen to you?	Once	More than once/sometimes, frequently	Almost all the time
	Timing	Thinking about your <i>most meaningful experience</i> of this, how old were you when this happened to you?	0-2 years	3-5 years (preschool), 6-9 years (elementary school), 14-17 years (high school)	10-13 years (middle school)
	Perpetrator	Thinking about your <i>most meaningful experience</i> of this, which household member was this?	Other family member	Father/stepfather, other adult living in your home (e.g., mother's boyfriend, a family friend, etc.)	Mother/step-mother
	Intensity	Thinking about your <i>most meaningful experience</i> of this, how intense was this event?	A household member was hospitalized/institutionalized because of substance use	You did not have your daily needs fulfilled because of a household member's substance use (e.g., you did not have enough food); you had to take on additional responsibilities because of a family member's substance use (e.g., you had to take care of your siblings); the substance use of a household member negatively influenced your education	A household member died because of substance use

(table 3 continues)

Table 3 (continued)

Domains	Dimension	Item wording	Lowest impact	Moderate impact	Highest impact
(Household substance use)	Perception	Looking back at your <i>most meaningful experience</i> of this, what impact did this event have on you?	Very positive	Positive, neither positive nor negative, both negative and positive, negative	Very negative
	Frequency	How often did this happen to you?	Once	More than once/sometimes, frequently	Almost all the time
	Timing	Thinking about your <i>most meaningful experience</i> of this, how old were you when this happened to you?	0-2 years and 14-17 years (high school)	3-5 years (preschool), 6-9 years (elementary school)	10-13 years (middle school)
Household mental illness	Perpetrator	Thinking about your <i>most meaningful experience</i> of this, which household member was this?	Other family member	Father/stepfather, other adult living in your home (e.g., mother's boyfriend, a family friend, etc.)	Mother/step-mother
	Intensity	Thinking about your <i>most meaningful experience</i> of this, how intense was this event?	Took medication and/or received treatment for mental illness	Attempted suicide; was institutionalized because of mental illness; had a mental illness that negatively influenced your education and daily needs; had a mental illness and did not receive treatment for it	Blamed you for their mental illness
	Perception	Looking back at your <i>most meaningful experience</i> of this, what impact did this event have on you?	Very positive	Positive, neither positive nor negative, both negative and positive, negative	Very negative
Household member incarceration	Frequency	How often did this happen to you?	Once	More than once/sometimes, frequently	Almost all the time
	Timing	Thinking about your <i>most meaningful experience</i> of this, how old were you when this happened to you?	0-2 years	3-5 years (preschool), 6-9 years (elementary school), 14-17 years (high school)	10-13 years (middle school)

(table 3 continues)

Table 3 (continued)

Domains	Dimension	Item wording	Lowest impact	Moderate impact	Highest impact
(Household member incarceration)	Perpetrator	Thinking about your <i>most meaningful experience</i> of this, which household member was this?	Other family member <i>and</i> other adult living in your home (e.g., mother's boyfriend, a family friend, etc.)	Father/stepfather	Mother/step-mother
	Intensity	Thinking about your <i>most meaningful experience</i> of this, how intense was this event?	You experienced any additional adversity you have not experienced before the incarceration of a household member	You witnessed a household member's arrest; you had to move or live with somebody else because a household member was incarcerated; your standard of living decreased significantly because a household member was incarcerated; your education was impacted because a household member was incarcerated	You were not able to stay in contact with a household member after they were incarcerated
	Perception	Looking back at your <i>most meaningful experience</i> of this, what impact did this event have on you?	Very positive	Positive, neither positive nor negative, both negative and positive, negative	Very negative

Establishing ACE Dimension Values

The ultimate goal of this study is to develop a psychometrically valid scale that can be used to evaluate details of adults' ACE exposure by assessing ACE dimensions. SME rankings of dimension response options were used to determine the underlying values for the dimension items. An example for the dimension of timing within the domain physical abuse is shown in Table 4. SMEs ranked the relative impact of each response option (in this case age category) on a scale from 1 (*lowest impact*) to 5 (*highest impact*). A casual glance at the data indicate strong agreement on that the least impactful time period with respect to physical neglect is during the high school years with 80% of SMEs selecting that as lowest impact and 20% selecting that category as the next lowest. We see similar agreement for highest impact in the preschool age category. To establish more systematically how values would be determined, we calculated a weighted average of the proportion of SMEs who selected each impact value for each age category. As an example for the response option "0-2 years," 20% of the SMEs selected the intensity scores 1, 3, and 4, respectively, and 40% selected the intensity score 5. Therefore, we calculate a weighted average of $(.2*1) + (.2*3) + (.2*4) + (.4*5) = 3.6$. We used this weighted average to determine the underlying dimension response values to be used in calculating an overall score. Supplemental Table 2 (Appendix B) lists the response options values for all dimensions within each domain.

TABLE 4
Response options ranking results for the dimension of timing within the domain physical neglect
from 1 (*lowest impact*) to 5 (*highest impact*)

Relative impact	1	2	3	4	5	Weighted average rankings	Rounded dimension values
Age categories	% of SMEs who selected each ranking						
0-2 years	20		20	20	40	$(.2*1) + (.2*3) + (.2*4) + (.4*5) = 3.6$	4
3-5 years (preschool)				40	60	$(.4*4) + (.6*5) = 4.6$	5
6-9 years (elementary school)			60	40		$(.6*3) + (.4*4) = 3.4$	3
10-13 years (middle school)		80	20			$(.8*2) + (.2*3) = 2.2$	2
14-17 years (high school)	80	20				$(.8*1) + (.2*2) = 1.2$	1

In a next step, dimension response option values will be used to calculate a domain score as well as an overall ACE score. Possible approaches to calculate a domain score are to (1) sum all dimension values within a domain; (2) calculate a mean value across the dimensions within a domain; or (3) calculate the mean of the dimension values for frequency, timing, perpetrator, and intensity within a domain and then multiply it by the participant's perception rating to "weight" the domain-dimension score by perception. We will conduct a pilot study to evaluate these scoring approaches in a future study.

Based on our results, the new ACE dimensions questionnaire (ACE-DQ) has a minimum of 10 questions (the 10 original ACE domain items) if each domain stem question is answered with *no*. If all original ACE domain stem questions are answered with *yes*, then participants would complete the dimension items within each domain resulting in a maximum of 48 items.

DISCUSSION

The purpose of this Delphi study was to develop a measurement approach to assess the five ACE dimensions of frequency, timing, perpetrator, intensity, and perception. We asked SMEs to (1) evaluate the relevance of ACE dimensions for each of the 10 original ACE domains; (2) provide their opinion on how dimension items and response options should be worded; (3) determine how dimension items should be anchored; and (4) how dimension response options should be ranked based on their negative impact on later-life health outcomes. We used these results to develop the ACE-DQ measure consisting of 48 items with underlying scoring values.

Research Questions

Relevance of ACE Dimensions

SMEs considered most conceptual dimensions relevant for all 10 original ACE domains. These results of this study support our research objective.

Wording of Dimension Items and Response Options

SME provided feedback on the wording of dimension items, and we revised the items accordingly. For some dimensions, for example, for the dimension of perpetrator, we created two different item versions for certain domains. This feedback highlights the difference between different dimensions within different domains and supports our goal to design a targeted assessment approach for dimensions within different domains.

Most SMEs agreed that we should ask participants to focus on the adverse event most meaningful to them. While anchoring can introduce bias in decision-making processes (e.g., Saposnik et al., 2016), SMEs suggest that asking participants to focus on a specific event will reduce recall bias and ensure consistent answers across dimensions within a domain.

Item Ranking Based on Negative Impact on Later-life Health Consequences

SMEs generally agreed on the ranking of response options for the dimensions of frequency, perpetrator, and perception, and for most intensity items. However, we noticed great variability in the interpretation of the intensity of the negative effects on later-life outcomes of other dimension response options. These results again support our goal to develop targeted assessment for different dimensions within the domains, as opposed to using a uniform assessment approach for dimensions within each domain.

Complexity of Adverse Childhood Experiences

ACEs are a complex phenomenon including a variety of distinct experiences. The high variability in SME survey responses reflects our difficulty in finding experts familiar with all forms of childhood adversity and the complexity of conducting conceptual research using online methods. We purposefully recruited SMEs to ensure expert knowledge on each of the 10 original ACE domains. Most SMEs had specialized knowledge on one or two individual domains but had greater difficulty speaking to the concept of ACEs as a whole.

Based on comments we received, there may be a disconnect between ACE measurement and theory. For example, SMEs expressed confusion around the time of ACE occurrence of an adverse event or the role of the perpetrator, and how those might relate to later-life outcomes. Both of these concept dimensions are directly derived from theory as described below. Our understanding of how ACEs physiologically, psychologically, and emotionally affect the body are based on important theories in gerontology and psychology. For example, the Theory of Cumulative Inequality (Ferraro et al., 2009) relates to the frequency of events; developmental and life-course frameworks (Ben-Shlomo & Kuh, 2002; Dunn et al., 2018; Nurius et al., 2015) relate to the timing of events; the Theory of Stress and Coping (McEwen, 1998) relates to the perception of events; and Betrayal Trauma (Freyd, 2008) and Attachment Theory (Kwako et al., 2010) relate to the role of the perpetrator. These theories and frameworks are interrelated on a metatheoretical basis (Bifulco & Schimmenti, 2019). Variation in SME responses might be due to different theoretical frameworks used to describe the phenomenon of ACEs. Our results suggest a need to develop a theoretical foundation of ACE dimensions to inform scale development and to conceptually refine ACEs.

Implications for Future ACE Research

Feedback from our SMEs supported our goal to include conceptual dimensions in the measurement of ACEs and develop measurement for ACE dimensions. Follow-up research should quantitatively evaluate the scoring of the newly developed ACE-DQ and test its predictive validity against different adult health outcomes.

As evidence emerges for the relevance of other adverse events in childhood, such as bullying and poverty, we need to review and develop a consistent measurement approach for ACE dimensions for a wider variety of ACE domains. Researchers might consider using a similar Delphi approach focused on individual ACE domains to develop a more specific dimension assessment approach. As we add dimensions to each domain, the scoring will increase in complexity. Moving forward, we will have to consider if any improvement in the scale's predictive validity is going to be offset by decreased usefulness in the field.

Limitations and Strengths

This Delphi study has a few shortcomings. We were not able to recruit SMEs with specific knowledge of each of the 10 ACE domains. The dimension items we developed in this study are based on North American culture and might not be applicable to other cultures and countries. Based on the variance of specialized SME expertise, we were not able to reach a complete consensus related to all research questions. Despite the importance of ACE screening and the detail which can be captured with the newly developed dimension items, a narrative ACE assessment is a critical approach to capture experiences more thoroughly (Bifulco & Schimmenti, 2019).

This study also has several strengths. A Delphi method is ideal to establish face validity in cases where no solid knowledge about a topic exists yet (Avella, 2016; Morgado et al., 2017). Since this specific area of research related to ACEs is rather new, a Delphi approach was most flexible and accommodated the complexity of the new topic. Lastly, we included SMEs from a broad range of disciplines, who were able to contribute their unique knowledge to this study. Except for one respondent, all SMEs described four or more years of experience in the field of ACEs.

CONCLUSION

Adverse childhood experiences are a complex phenomenon with low agreement on how they should be defined and hence measured. This Delphi study endorses the relevance of conceptual dimensions for the assessment of ACEs. The lack of consensus on the ranking of dimension details points toward a greater need to return to theory for the conceptual refinement of ACEs. In the present study, we developed a set of consistent dimension items that can be added to the 10-item ACE-Study questionnaire. Future research is needed to pilot test the new measure and evaluate different scoring approaches for these dimension items.

ACKNOWLEDGEMENTS

We acknowledge all subject matter experts who took the time to participate in our study.

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APPENDIX A
Supplemental Table 1
ACE dimension item and response options wording pre and post survey Round 1

Dimension	Response option wording		
	Domain	Survey Round 1 proposed response options	Revised response option wording
Frequency		(1) Never; once, more than once; frequently; almost all the time (2) this never happened; this happened 1 time; this happened more than once; this happened more than 10 times; this happened more than 20 times (3) If neither of the two, please indicate an alternative assessment approach:	Never; once; sometimes (EN, PN, HSU, HMI)/more than once (EA, PA, SA, PSD, HV, HInc); frequently; almost all the time.
Timing		(1) Indicate age in years (2) Indicate age category: 0-2 years; 3-5 years; 6-9 years; 10-13 years; 14-17 years (3) Other (please specify):	0-2 years; 3-5 years (preschool); 6-9 years (elementary school); 10-13 years (middle school); 14-17 years (high school).
Perpetrator		(1) Mother/stepmother; father/stepfather; other (2) Mother/stepmother; father/stepfather; other family member; an acquaintance (babysitter, teacher, friend, etc.); a stranger (3) Other (please specify):	Mother/stepmother; father/stepfather; other family member; other adult you knew (babysitter, teacher, family friend, etc.); a stranger (EA, PA, EN, PN). Mother/stepmother; father/stepfather; other family member; other adult living in your home (e.g., mother's boyfriend, a family friend, etc.) (HV, HSU, HMI, HInc).
Intensity	Emotional abuse	When you were growing up, somebody: swore at you; insulted you, called you things like "ugly," "lazy," or "stupid"; put you down/humiliated you; said they hated you; said they wish you had never been born; threatened to physically hurt you.	When you were growing up, somebody: insulted you, called you things like "ugly," "lazy," or "stupid"; put you down/humiliated you; said they hated you or they wish you had never been born; threatened to leave you; threatened to physically hurt you.
	Physical abuse	When you were growing up, somebody: grabbed, shook, slapped, pinched, spanked on bottom with/without object (no injury); grabbed, shook, slapped, pinched, spanked on bottom with/without object (minor injury, left me with bruises or marks); punched, kicked, knocked down, hard object thrown (minor injury, left me with bruises or marks); punched, kicked, knocked down, hard object thrown (major injury, had to see a doctor or go to the hospital); hit with hard object, choked, beaten, burned, threatened with weapon (major injury, had to see a doctor or go to the hospital).	When you were growing up, somebody: grabbed, shook, slapped, pinched, spanked you on bottom with/without object (no injury); grabbed, shook, slapped, pinched, spanked you on bottom with/without object (minor injury, left me with bruises or marks); punched, kicked, knocked you down, threw a hard object at you (minor injury, left me with bruises or marks); punched, kicked, knocked you down, threw a hard object at you (major injury, had to see a doctor or go to the hospital); hit you with a hard object, choked, beat, burned you, or threatened you with a weapon (major injury, had to see a doctor or go to the hospital).

(appendix A continues)

Appendix A (continued)

Dimension	Response option wording		
	Domain	Survey Round 1 proposed response options	Revised response option wording
(Intensity)	Sexual abuse	When you were growing up, somebody: exposed their private parts to you or your private parts against your will; fondled or touched private parts of your body or make you touch theirs against your wishes or when you were asleep; threatened to hurt you or tell lies about you unless you did something sexual with them; forced anal or vaginal penetration on you with objects; forced oral, anal, or vaginal penetration on you with their fingers or genitals.	When you were growing up, somebody: exposed your private parts or their private parts to you against your will; forced you to watch others engaged in sexual acts; fondled or touched private parts of your body or made you touch theirs against your wishes; threatened to hurt you or tell lies about you unless you did something sexual with them; forced anal or vaginal penetration on you with objects; forced oral, anal, or vaginal penetration on you with their fingers or genitals.
	Emotional neglect	When you were growing up: you did not feel loved; you did not feel close to your family members; people in your family did not look out for each other; your parents/guardians did not know what you were doing with your free time when you were not at school or work; your parents/guardians did not understand your problems and worries; your family did not serve as a source of strength and support.	When you were growing up: you did not feel loved by your family members; people in your family did not care about your emotional needs; people in your family did not look out for each other; your parents/guardians did not know what you were doing with your free time when you were not at school or work; your parents/guardians did not understand your problems and worries.
	Physical neglect	When you were growing up: you had nobody to take care of you and protect you; you had to wear dirty or unfitting clothes; your parents/guardians intentionally did not give you enough food even when they could easily have done so; your parents/guardians were too drunk or intoxicated by drugs to take care of you; there was nobody to take you to the doctor if you needed it.	When you were growing up: you had nobody to take care of you and protect you; you did not have enough clothes to wear to keep you warm or protected from the weather; your parents/guardians did not give you enough food even when they could easily have done so; your parents/guardians were too drunk or intoxicated by drugs to take care of you; there was nobody to take you to the doctor if you needed it.
	Parental separation/divorce	When you were growing up: your parents separated peacefully and harmoniously; your standard of living decreased significantly after the separation/divorce of your parents; your parents used lawyers and/or went to court to separate/get divorced; you had to testify in court/take sides during your parents' separation/divorce.	When you were growing up: your parents/guardians separated peacefully and harmoniously; your standard of living decreased significantly after the separation/divorce of your parents/guardians; your parents/guardians said bad things about each other and tried to get you on their side; you lost contact with one parent/guardian after the separation/divorce; you had to talk to a lawyer or judge during your parents'/guardians' separation/divorce.

(appendix A continues)

Appendix A (continued)

Dimension	Response option wording		
	Domain	Survey Round 1 proposed response options	Revised response option wording
(Intensity)	Household violence	When you were growing up, you saw a family member: having something thrown at (no injury); being grabbed, pushed, shook, pulled (no injury); being grabbed, pushed, shook, pulled (minor injury); being slapped, bit, hit with minor object, threw something, punched, kicked with injury; being choked, hit with major object, burned, threatened with weapon, used weapon, sexual assault (major injury).	When you were growing up, you saw a household member: being called names or having something thrown at (no injury); being grabbed, pushed, shook, pulled (minor injury); being slapped, bit, hit with minor object, threw something, punched, kicked with injury; being choked, hit with major object, burned, threatened with weapon, or misused (major injury); being killed by another family member.
	Household substance use	When you were growing up: a household member was hospitalized because of substance use; the substance use of a household member negatively influenced your education; the substance use of a household member interfered with your daily schedule.	When you were growing up: a household member was hospitalized/institutionalized because of substance use; you did not have your daily needs fulfilled because of a household member's substance use (e.g., you did not have enough food); you had to take on additional responsibilities because of a family member's substance use (e.g., you had to take care of your siblings); the substance use of a household member negatively influenced your education; a household member died because of substance use.
	Household mental illness	When you were growing up, a household member: took medication for mental illness; attempted suicide; was institutionalized because of mental illness; blamed you for their mental illness; had a mental illness that interfered with your daily schedule; had a mental illness that negatively influenced your education.	When you were growing up, a household member: took medication and/or received treatment for mental illness; attempted suicide; was institutionalized because of mental illness; blamed you for their mental illness; had a mental illness that negatively influenced your education and daily needs; had a mental illness and did not receive treatment for it.
	Household member incarceration	When you were growing up: you were not able to visit your family member in prison; you had to move or live with somebody else because a household member was incarcerated; your standard of living decreased significantly because a household member was incarcerated; you experienced any additional adversity you have not experienced before the incarceration of a household member; your education was impacted because a household member was incarcerated.	When you were growing up: you were not able to stay in contact with a household member after they were incarcerated; you witnessed a household member's arrest; you had to move or live with somebody else because a household member was incarcerated; your standard of living decreased significantly because a household member was incarcerated; you experienced any additional adversity you have not experienced before the incarceration of a household member; your education was impacted because a household member was incarcerated.
Perception		Not at all traumatic; a little traumatic; somewhat traumatic; traumatic; very traumatic; extremely traumatic.	Very negative; negative; neither positive nor negative; both negative and positive; positive; very positive.

Note. EN = emotional neglect; PN = physical neglect; HSU = household substance use; HMI = household mental illness; EA = emotional abuse; PA = physical abuse; SA = sexual abuse; PSD = parental separation/divorce; HV = household violence; HInc = household member incarceration.

APPENDIX B
Supplemental Table 2
ACE dimension response option values for scoring

Dimension	Response options	Scoring value	
<i>All domains</i>			
Frequency (not for Parental separation/ divorce)	Once	1	
	More than once/sometimes	2.33	
	Frequently	3.66	
	Almost all the time	5	
Perception	Very positive	-2	1/3*
	Positive	-1	1/2
	Neither positive nor negative	0	1
	Both negative and positive	0	1
	Negative	1	2
	Very negative	2	3
<i>Emotional abuse</i>			
Timing	0-2 years		3
	3-5 years (preschool)		3
	6-9 years (elementary school)		3
	10-13 years (middle school)		4
	14-17 years (high school)		1
Perpetrator	Mother/stepmother		5
	Father/stepfather		4
	Other family member		3
	Other adult you knew (babysitter, teacher, family friend, etc.)		2
	A stranger		1
Intensity	Insulted you, called you things like “ugly,” “lazy,” or “stupid”		3
	Put you down/humiliated you		1
	Said they hated you or they wish you had never been born		4
	Threatened to leave you		3
	Threatened to physically hurt you		3
<i>Physical abuse</i>			
Timing	0-2 years		3
	3-5 years (preschool)		5
	6-9 years (elementary school)		3
	10-13 years (middle school)		3
	14-17 years (high school)		1
Perpetrator	Mother/stepmother		5
	Father/stepfather		4
	Other family member		3
	Other adult you knew (babysitter, teacher, family friend, etc.)		2
	A stranger		1
Intensity	Grabbed, shook, slapped, pinched, spanked you on bottom with/ without object (no injury)		1
	Grabbed, shook, slapped, pinched, spanked you on bottom with/ without object (minor injury, left me with bruises or marks)		2
	Punched, kicked, knocked you down, threw a hard object at you (minor in- jury, left me with bruises or marks)		3
	Punched, kicked, knocked you down, threw a hard object at you (major in- jury, had to see a doctor or go to the hospital)		4
	Hit you with a hard object, choked, beat, burned you, or threatened you with a weapon (major injury, had to see a doctor or go to the hospital)		5

(appendix B continues)

Appendix B (continued)

Dimension	Response options	Scoring value
<i>Sexual abuse</i>		
Timing	0-2 years	1
	3-5 years (preschool)	3
	6-9 years (elementary school)	3
	10-13 years (middle school)	4
	14-17 years (high school)	3
Perpetrator	Mother/stepmother	4
	Father/stepfather	5
	Other family member	3
	Other adult you knew (babysitter, teacher, family friend, etc.)	2
	A stranger	1
Intensity	Exposed your private parts or their private parts to you against your will	1
	Forced you to watch others engaged in sexual acts	2
	Fondled or touched private parts of your body or made you touch theirs against your wishes	2
	Threatened to hurt you or tell lies about you unless you did something sexual with them	4
	Forced anal or vaginal penetration on you with objects	5
	Forced oral, anal, or vaginal penetration on you with their fingers or genitals	5
<i>Emotional neglect</i>		
Timing	0-2 years	4
	3-5 years (preschool)	4
	6-9 years (elementary school)	3
	10-13 years (middle school)	2
	14-17 years (high school)	2
Perpetrator	Mother/stepmother	5
	Father/stepfather	4
	Other family member	3
	Other adult you knew (babysitter, teacher, family friend, etc.)	2
	A stranger	1
Intensity	You did not feel loved by your family members	5
	People in your family did not care about your emotional needs	4
	People in your family did not look out for each other	2
	Your parents/guardians did not know what you were doing with your free time when you were not at school or work	2
	Your parents/guardians did not understand your problems and worries	2
<i>Physical neglect</i>		
Timing	0-2 years	4
	3-5 years (preschool)	5
	6-9 years (elementary school)	3
	10-13 years (middle school)	2
	14-17 years (high school)	1
Perpetrator	Mother/stepmother	5
	Father/stepfather	4
	Other family member	3
	Other adult you knew (babysitter, teacher, family friend, etc.)	2
	A stranger	1
Intensity	You had nobody to take care of you and protect you	3
	You did not have enough clothes to wear to keep you warm or protected from the weather	2
	Your parents/guardians did not give you enough food even when they could easily have done so	4
	Your parents/guardians were too drunk or intoxicated by drugs to take care of you	4
	There was nobody to take you to the doctor if you needed it	2

(appendix B continues)

Appendix B (continued)

Dimension	Response options	Scoring value
<i>Parental separation/divorce</i>		
Timing	0-2 years	1
	3-5 years (preschool)	2
	6-9 years (elementary school)	4
	10-13 years (middle school)	5
	14-17 years (high school)	3
Intensity	Your parents/guardians separated peacefully and harmoniously	1
	Your standard of living decreased significantly after the separation/divorce of your parents/guardians	3
	Your parents/guardians said bad things about each other and tried to get you on their side	4
	You lost contact with one parent/guardian after the separation/divorce	5
	You had to talk to a lawyer or judge during your parents'/guardians' separation/divorce	3
<i>Household violence</i>		
Timing	0-2 years	2
	3-5 years (preschool)	3
	6-9 years (elementary school)	3
	10-13 years (middle school)	4
	14-17 years (high school)	2
Perpetrator	Mother/stepmother	3.66
	Father/stepfather	5
	Other family member	1
	Other adult living in your home (e.g., mother's boyfriend, a family friend, etc.)	2.33
Intensity	Being called names or having something thrown at (no injury)	1
	Being grabbed, pushed, shook, pulled (minor injury)	2
	Being slapped, bit, hit with minor object, threw something, punched, kicked with injury	3
	Being choked, hit with major object, burned, threatened with weapon, or misused (major injury)	4
	Being killed by another family member	5
<i>Household substance use</i>		
Timing	0-2 years	2
	3-5 years (preschool)	2
	6-9 years (elementary school)	4
	10-13 years (middle school)	4
	14-17 years (high school)	3
Perpetrator	Mother/stepmother	5
	Father/stepfather	3.66
	Other family member	1
	Other adult living in your home (e.g., mother's boyfriend, a family friend, etc.)	2.33
Intensity	A household member was hospitalized/institutionalized because of substance use	2
	You did not have your daily needs fulfilled because of a household member's substance use (e.g., you did not have enough food)	4
	You had to take on additional responsibilities because of a family member's substance use (e.g., you had to take care of your siblings)	3
	The substance use of a household member negatively influenced your education	3
	A household member died because of substance use	5

(appendix B continues)

Appendix B (continued)

Dimension	Response options	Scoring value
<i>Household mental illness</i>		
Timing	0-2 years	2
	3-5 years (preschool)	3
	6-9 years (elementary school)	3
	10-13 years (middle school)	4
	14-17 years (high school)	2
Perpetrator	Mother/stepmother	5
	Father/stepfather	3.66
	Other family member	1
	Other adult living in your home (e.g., mother's boyfriend, a family friend, etc.)	2.33
Intensity	Took medication and/or received treatment for mental illness	1
	Attempted suicide	5
	Was institutionalized because of mental illness	3
	Blamed you for their mental illness	5
	Had a mental illness that negatively influenced your education and daily needs	4
	Had a mental illness and did not receive treatment for it	4
<i>Household member incarceration</i>		
Timing	0-2 years	1
	3-5 years (preschool)	3
	6-9 years (elementary school)	4
	10-13 years (middle school)	5
	14-17 years (high school)	3
Perpetrator	Mother/stepmother	5
	Father/stepfather	3.66
	Other family member	2.33
	Other adult living in your home (e.g., mother's boyfriend, a family friend, etc.)	2.33
Intensity	You were not able to stay in contact with a household member after they were incarcerated	4
	You witnessed a household member's arrest	4
	You had to move or live with somebody else because a household member was incarcerated	4
	Your standard of living decreased significantly because a household member was incarcerated	3
	You experienced any additional adversity you have not experienced before the incarceration of a household member	3
	Your education was impacted because a household member was incarcerated	3

Note. *scoring values for perception-weighted domain scores.