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BASIC RESEARCH ARTICLE

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Empirically-derived dimensions of childhood adversity and cumulative risk: associations with measures of depression, anxiety, and psychosis-spectrum psychopathology

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ABSTRACT

Background: Investigating different approaches to operationalizing childhood adversity and how they relate to transdiagnostic psychopathology is relevant to advance research on mechanistic processes and to inform intervention efforts. To our knowledge, previous studies have not used questionnaire and interview measures of childhood adversity to examine factor-analytic and cumulative-risk approaches in a complementary manner.

Objective: The first aim of this study was to identify the dimensions underlying multiple subscales from three well-established childhood adversity measures (the Childhood Trauma Questionnaire, the Childhood Experience of Care and Abuse Interview, and the Interview for Traumatic Events in Childhood) and to create a cumulative risk index based on the resulting dimensions. The second aim of the study was to examine the childhood adversity dimensions and the cumulative risk index as predictors of measures of depression, anxiety, and psychosis-spectrum psychopathology.

Method: Participants were 214 nonclinically ascertained young adults who were administered questionnaire and interview measures of depression, anxiety, psychosis-spectrum phenomena, and childhood adversity.

Results: Four childhood adversity dimensions were identified that captured experiences in the domains of *Intrafamilial Adversity*, *Deprivation*, *Threat*, and *Sexual Abuse*. As hypothesized, the adversity dimensions demonstrated some specificity in their associations with psychopathology symptoms. *Deprivation* was uniquely associated with the negative symptom dimension of psychosis (negative schizotypy and schizoid symptoms), *Intrafamilial Adversity* with schizotypal symptoms, and *Threat* with depression, anxiety, and psychosis-spectrum symptoms. No associations were found with the *Sexual Abuse* dimension. Finally, the cumulative risk index was associated with all the outcome measures.

Conclusions: The findings support the use of both the empirically-derived adversity dimensions and the cumulative risk index and suggest that these approaches may facilitate different research objectives. This study contributes to our understanding of the complexity of childhood adversity and its links to different expressions of psychopathology.

Dimensiones derivadas empíricamente de la adversidad infantil y el riesgo acumulativo: Asociación con medidas de psicopatología de depresión, ansiedad y del espectro psicótico.

Antecedentes: La investigación de los distintos abordajes para operacionalizar la adversidad infantil y cómo se relacionan con la psicopatología transdiagnóstica es relevante para avanzar en la investigación sobre los procesos mecanicistas y para informar los esfuerzos de intervención. Hasta donde sabemos, los estudios previos no han utilizado cuestionarios ni medidas de entrevistas de la adversidad infantil para examinar los enfoques analítico factorial y de riesgo acumulativo de manera complementaria.

Objetivo: El primer objetivo de este estudio fue identificar las dimensiones subyacentes a múltiples subescalas de tres medidas de adversidad infantil bien establecidas (el Cuestionario de Trauma Infantil, la Entrevista de Experiencias de Cuidado y Abuso en la infancia y la Entrevista de Eventos Traumáticos en la Infancia) y crear un índice de riesgo acumulativo basado en las dimensiones resultantes. El segundo objetivo de este estudio fue examinar las dimensiones de adversidad infantil y el índice de riesgo acumulativo

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关键词
童年不良经历; 童年创伤; 心理病理学; 维度模型; 累积风险; 分裂型; 精神病; 抑郁; 焦虑

HIGHLIGHTS

- We investigated how different approaches to operationalizing childhood adversity relate to transdiagnostic psychopathology.
- Four childhood adversity dimensions were found to underlie multiple subscales from three well-established childhood adversity measures.
- The childhood adversity dimensions demonstrated some specificity in their associations with the psychopathology symptom domains and the cumulative risk index was associated with all the outcomes.

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como predictores de medidas de psicopatología de depresión, ansiedad y del espectro psicótico.
Método: Los participantes fueron 214 adultos jóvenes evaluados no clínicamente a quienes se les administraron cuestionarios y medidas de entrevista de depresión, ansiedad, fenómenos del espectro psicótico y adversidad infantil.
Resultados: Se identificaron cuatro dimensiones de adversidad infantil que capturaron experiencias en los dominios *Adversidad Intrafamiliar, Deprivación, Amenaza, y Abuso Sexual*. Como hipotetizamos, las dimensiones de adversidad demostraron alguna especificidad en sus asociaciones con síntomas psicopatológicos. La *deprivación* se asoció únicamente con la dimensión de síntomas negativos de psicosis (síntomas esquizotípicos negativos y esquizoides), la *Adversidad Intrafamiliar* con síntomas esquizotípicos y la *Amenaza* con síntomas de depresión, ansiedad y del espectro psicótico. No se encontraron asociaciones con la dimensión *Abuso Sexual*. Finalmente, el índice de riesgo acumulativo se asoció con todas las medidas de resultado.
Conclusiones: Los hallazgos apoyan tanto el uso de las dimensiones de adversidad derivadas empíricamente como del índice de riesgo acumulativo y sugieren que estos abordajes pueden facilitar objetivos de investigación diferentes. Este estudio contribuye a nuestra comprensión de la complejidad de la adversidad infantil y su nexo con diferentes expresiones de psicopatología.

童年不良经历和累积风险的经验衍生维度：与抑郁、焦虑和精神病谱心理病理学测量的关联

背景：考查处理童年不良经历的不同方法以及它们与跨诊断心理病理学的关系与推进机制过程研究和启发干预工作相关。据我们所知，以前的研究没有使用童年不良经历的问卷调查和访谈测量这样互补的方式来考查因素分析和累积风险方法。
目的：本研究第一个目的是从三个成熟的童年不良经历测量（童年创伤问卷、童年照顾和虐待经历访谈以及童年创伤事件访谈）确定多个分量表的维度，并确定根据结果维度创建一个累积风险指数。本研究第二个目的是考查童年不良经历维度和累积风险指数作为抑郁、焦虑症和精神病谱心理病理学测量的预测因素。
方法：参与者是 214 名非临床确定的年轻人，他们接受了抑郁、焦虑、精神病谱系现象和童年不良经历的问卷调查和访谈测量。
结果：确定了捕捉了家庭内不良经历、剥夺、威胁和性虐待等领域经历的四个童年不良经历维度。 正如假设一样，不良经历维度在与心理病理学症状的关联中表现出一些特异性。剥夺与精神病阴性症状维度（阴性分裂型和分裂样症状）、家庭内不良经历与分裂型症状、威胁与抑郁、焦虑和精神病谱系症状具有独特关联。未发现与性虐待维度的关联。最后，累积风险指数与所有结果指标相关联。
结论：研究结果支持使用实证得到的不良经历维度和累积风险指数，并表明这些方法可能有助于实现不同的研究目标。本研究有助于我们理解童年不良经历的复杂性及其与心理病理学不同表现形式的联系。

1. Introduction

The term childhood adversity refers to a range of negative early-life experiences that constitute deviations from the expectable environment and are likely to require considerable adaptation by a child (McLaughlin, 2016). These experiences include childhood abuse and neglect, bullying, witnessing domestic violence, losses, and non-interpersonal experiences, such as accidents and natural disasters (Bifulco & Thomas, 2012; Butchart et al., 2006). Childhood adversity has been increasingly recognized as a leading risk factor for the development of multiple psychopathological conditions and subclinical manifestations, including depression, anxiety, and psychosis spectrum phenotypes (Copeland et al., 2018; Humphreys et al., 2020; Varese et al., 2012).

Despite the notable progress in the field of childhood adversity over the last decades, researchers continue to grapple with challenging conceptual and measurement issues (Lacey & Minnis, 2020). One such issue concerns how best to study the effects of childhood adversity on the risk for psychopathology (McLaughlin et al., 2021; Smith & Pollak, 2021), which has implications for advancing research on mechanistic processes and the design of intervention efforts (Danese & Lewis, 2022; Lacey & Minnis, 2020). For example, specificity models (i.e. focusing on the effects of individual adversity subtypes, such as sexual abuse) have received considerable theoretical attention and have been widely investigated. However, the evidence of the substantial co-occurrence of different adversity subtypes (and the resulting potential overestimation of the effects of individual subtypes in such models) has highlighted the need for complementary approaches (Cecil et al., 2017; McLaughlin et al., 2021).

Currently, the most common approach to measuring the effects of childhood adversity is the cumulative risk approach (Lacey & Minnis, 2020), which involves calculating a cumulative score by summing the number of adversities an individual experienced. Thus, cumulative risk is an additive model that focuses on the amount (not the kind) of adversities (Evans et al., 2013; Sheridan & McLaughlin, 2020). This approach offers several advantages, such as ease of

interpretation and benefits in terms of statistical power (Ettekal et al., 2019; Evans et al., 2013). Furthermore, a robust body of research demonstrates that experiencing an increased number of childhood adversities is associated with an increased risk for a range of psychopathological outcomes (Chapman et al., 2004; Evans et al., 2013; Stein et al., 2022). Nevertheless, the cumulative risk approach has been considered insufficient to fully characterize the effects of childhood adverse experiences because, among other things, it does not consider the patterning of adversities and assumes that all adversities impact development via similar mechanisms (Lacey & Minnis, 2020; McLaughlin & Sheridan, 2016).

Other approaches to operationalizing childhood adversity have focused on deriving dimensions of adversity. Theory-driven dimensional models suggest that different adversity subtypes share common features that are likely to influence developmental processes in similar ways (McLaughlin et al., 2021). In this regard, the Dimensional Model of Adversity and Psychopathology (McLaughlin & Sheridan, 2016) is an influential framework that proposes that childhood adversities can be conceptualized along two dimensions that have distinct pathways to psychopathology. These dimensions are threat (involving harm or threat of harm, e.g. abuse) and deprivation (involving lack of expected environmental inputs, e.g. neglect). Although empirical support for this approach has begun to accumulate (e.g. Miller et al., 2018; Schäfer et al., 2023), one limitation is that some adversity subtypes do not clearly map onto these dimensions or may include aspects of both (Smith & Pollak, 2021).

On the other hand, researchers have also obtained dimensions using empirically-driven methods, such as factor-analytic approaches, which group childhood adversities based on the extent to which they are correlated with each other. Factor scores have gained attention in the assessment of several constructs, such as externalizing and internalizing disorders (Caspi et al., 2014) and, to a lesser extent, childhood adversity (Brumley et al., 2019). Factor-analytic approaches allow for examining the impact of the specific patterning of childhood adversity subtypes (Lacey & Minnis, 2020) and have benefits for improving measurement parsimony (Mersky et al., 2017). Overall, the empirical literature in this domain is somewhat inconsistent, likely related to differences in the childhood adversity subtypes included across studies (Lian et al., 2022; Mersky et al., 2017). Other empirically-driven methods include person-centered approaches, such as latent class analysis, which identifies subgroups of individuals with similar patterns of adversities. Although studies vary in the number and composition of classes, several have identified low adversity and poly-victimization classes (Debowska et al., 2017; McLafferty et al., 2021) and differential associations between some adversity classes and mental health outcomes (Hagan et al., 2016; O'Donnell et al., 2017). Of note, studies using empirically-driven methods to operationalize adversity have tended to focus on experiences of abuse and neglect (Lacey & Minnis, 2020). Therefore, more work is needed that incorporates additional relevant experiences within the family (e.g. role reversal) and other relational environments (e.g. peer bullying).

Research has robustly linked childhood adversity with dimensional and categorical measures of depression, anxiety, and psychosis-spectrum phenomena using various approaches, including cumulative risk (Copeland et al., 2018; Kim et al., 2021; Longden et al., 2016; Morgan et al., 2020). Although variability in the operationalization of adversity complicates comparing results using other approaches, some notable findings have emerged. For example, depression has been prominently linked with experiences in the domain of emotional maltreatment (Humphreys et al., 2020; Mandelli et al., 2015). Meanwhile, in the field of psychosis, the adversity-psychosis link is especially robust for the positive symptom dimension (Gibson et al., 2016; Velikonja et al., 2015), and experiences characterized by an 'intention to harm' appear to be of particular relevance (Arseneault et al., 2011; Morgan et al., 2020; van Nierop et al., 2014). Even though the negative dimension of psychosis has received less attention (Gibson et al., 2016), evidence indicates stronger or more consistent associations with neglect than with other adverse experiences (Alameda et al., 2021; Bailey et al., 2018; Cristóbal-Narváez et al., 2016).

Several previous studies in the field have been limited by covering a narrow range of experiences and using checklist measures of adversity. Hence, using comprehensive questionnaire and interview measures should allow for greater precision of models linking childhood adversity and psychopathology (Bifulco & Schimmenti, 2019). Furthermore, research using different approaches in a complementary manner may offer useful insights regarding the operationalization of childhood adversity. For example, in a recent study, McGinnis et al. (2022) found that different theory-driven dimensions of adversity and a cumulative measure (constructed from these dimensions plus an additional adversity scale) were associated with long-term psychiatric and functional outcomes. They concluded that their results supported using the cumulative measure for estimating relative risk for these outcomes and the adversity dimensions for obtaining mechanistic insights. Thus, using theoretically – or empirically-derived dimensions of adversity to build a cumulative risk index may provide a valuable integration and contribute to the refinement of cumulative models.

1.1. The present study

Leveraging interview and self-report assessments of a range of childhood adversities, the present study used

factor-analytic and cumulative risk approaches in a complementary manner to investigate associations of childhood adversity with transdiagnostic psychopathology assessed in a non-clinically ascertained sample of young adults. Specifically, the first aim of the study was to use principal components analysis (PCA) to identify the dimensions underlying multiple subscales from three well-established childhood adversity measures and to create a cumulative risk index based on the resulting dimensions. As part of this aim, we sought to examine whether the PCA-derived childhood adversity dimensions were consistent with those proposed by the Dimensional Model of Adversity and Psychopathology, in which experiences of threat and deprivation are distinguished. The second aim of the study was to examine the PCA-derived childhood adversity dimensions and the cumulative risk index as predictors of depression, anxiety, and psychosis-spectrum symptom dimensions, assessed via questionnaire and interview measures.

PCA is an exploratory approach, and we did not make specific hypotheses regarding the number and nature of the PCA-derived dimensions. However, we expected that the resulting dimensions would show at least some degree of specificity in their associations with psychopathology symptoms. To provide a robust test of this hypothesis and consistent with current recommendations (Cecil et al., 2017; Sheridan & McLaughlin, 2020), the childhood adversity dimensions were examined simultaneously to determine their unique effects. Finally, we expected that higher cumulative adversity would be associated with higher levels of symptoms.

2. Methods

2.1. Participants and procedure

The present study is part of the Barcelona Longitudinal Investigation of Schizotypy Study (BLISS; Barrantes-Vidal et al., 2013a, 2013b). Participants were students from the Universitat Autonòma de Barcelona who completed a battery of self-report and interview measures. Specifically, at time 1 (T1), 589 undergraduates completed self-report questionnaires as part of mass-screening sessions. Usable screening data was obtained from 547 participants (42 were excluded due to the invalid protocols). The mean age was 20.6 years (SD = 4.1) and 83% were women. A subset of 339 participants was invited to take part in an interview study with the goal of assessing 200 individuals. Those invited included all 189 who had standard scores based upon sample norms of at least 1.0 on one or more measures of schizotypy and psychotic like experiences, and 150 randomly selected participants who had standard scores < 1.0 on these measures. This enrichment procedure was done to increase the variance associated with mental health outcomes in the sample. At time 2 (T2), 214 participants (mean age = 21.4; SD = 2.4; 78% female) completed the interview study. Of the participants, 123 had elevated scores in one or more of the measures of schizotypy and psychotic-like experiences, and 91 had standard scores < 1.0. The mean time interval between T1 and T2 was 1.7 years (SD = 0.2; range = 1.4–2.2 years). The university ethics committee approved the study and participants provided informed consent at both assessments.

2.2. Measures

Clinical psychologists and trained advanced graduate students in clinical psychology administered the measures described below, along with other measures not used in the present study.

2.2.1. Childhood adversity measures

At T1, participants completed the Childhood Trauma Questionnaire-Short Form (CTQ-SF; Bernstein & Fink, 1998), a self-report measure that assesses sexual abuse, physical abuse, emotional abuse, emotional neglect, and physical neglect. CTQ items are answered on a 5-point Likert-type scale ranging from 'never true' to 'very often true' and are summed to obtain a score for each subtype of maltreatment.

At T2, participants were administered two interview measures, the Childhood Experience of Care and Abuse (CECA; Bifulco et al., 1994) and the Interview for Traumatic Events in Childhood (ITEC; Lobbestael et al., 2009; Lobbestael & Arntz, 2010). The CECA is a semi-structured, investigator-based interview that focuses on objective aspects of childhood experiences. The following CECA scales were used: Parental antipathy, role reversal, parental discord, violence between parents, and bullying. The scales are rated on a 4-point scale ranging from 'marked' to 'little/none,' based on specific rating rules and benchmark thresholds. When applicable, overall scale ratings were obtained (i.e. peak rating taking into account behaviour from both mother and father figure; see Sheinbaum et al., 2015). CECA scores were reversed such that higher scores indicate greater severity. The ITEC is a semi-structured interview that assesses sexual abuse, physical abuse, emotional abuse, emotional neglect, and physical neglect. Every endorsed ITEC item is followed by questions covering different parameters of the experience, including the age of onset, perpetrator(s), duration, and frequency. These parameters are rated according to predefined answer categories and are used to calculate composite severity scores for each maltreatment subtype.

2.2.2 Psychopathology measures

At T1, participants completed the depression and anxiety subscales of the Symptom Checklist- 90-

Revised (SCL-90-R; Derogatis, 1977), the suspiciousness subscale of the Schizotypal Personality Questionnaire (SPQ; Raine, 1991), and the Wisconsin Schizotypy Scales (WSS). The WSS are composed of the Perceptual Aberration Scale (Chapman et al., 1978), the Magical Ideation Scale (Eckblad & Chapman, 1983), the Revised Social Anhedonia Scale (Eckblad et al., 1982), and the Physical Anhedonia Scale (Chapman et al., 1976). The WSS reliably yield two factors, positive and negative schizotypy, that account for 80% of their variance. Participants were assigned positive and negative schizotypy dimensional scores based upon norms from 6,137 American young adults (Kwapil et al., 2007). Note that the factor structure underlying the WSS was found to be invariant across Spanish and American samples (Kwapil et al., 2012).

At T2, we used the Structured Clinical Interview for DSM–IV Axis II Disorders (SCID–II; First et al., 1997) to assess schizophrenia-spectrum personality disorders. Dimensional scores were computed by summing individual item ratings for each personality disorder. Depression was assessed via interview with the Calgary Depression Scale for Schizophrenia (CDSS; Addington et al., 1992) and via questionnaire with the Beck Depression Inventory-II (BDI; Beck et al., 1996). All of the measures are widely used and demonstrate good psychometric properties in young adult samples.

3. Statistical analysis

We first calculated descriptive statistics for the study variables and Pearson correlations among the childhood adversity subscales. To obtain the childhood adversity dimensions, we performed a PCA with an oblique (Promax) rotation, given that dimensions of childhood adversity are not expected to be independent. A parallel analysis was conducted to determine the optimal number of factors to retain in the PCA (Lim & Jahng, 2019). Factors were retained if their associated eigenvalue was larger than the 95th percentile of the corresponding eigenvalues derived from the random dataset (Ledesma & Valero-Mora, 2007). In addition, following guidelines by Hair et al. (2014), the cut-off used for interpreting factor loadings from the PCA was .40. When the childhood adversity subscales loaded above .40 on more than one factor, they were interpreted as belonging to the factor on which they had the highest loading.

Linear regression analyses were computed to compare the PCA-derived childhood adversity factor scores and the cumulative risk index as predictors of ten questionnaire and interview measures of depression, anxiety, and psychosis-spectrum psychopathology. Note that the factor scores and cumulative index were examined in separate regression models. In the regression analyses examining the dimensions as predictors, the childhood adversity factor scores were entered simultaneously to examine their unique contribution. In the regression analyses examining the cumulative risk approach, the cumulative risk index was entered as the sole predictor. The cumulative index was calculated by summing the dichotomized factor scores (dichotomized as 'present = 1' or 'absent = 0' at the 75th percentile; see Evans et al., 2013). Bootstrap procedures with 2,000 samples were used for the regression models.

4. Results

Descriptive statistics for all study variables are displayed in Table 1. The intercorrelations of the childhood adversity subscales are reported in the Supplemental Material.

4.1. PCA of childhood adversity subscales

The parallel analysis indicated that a four-factor solution best accounted for the data. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the PCA (KMO = .77) and Bartlett´s test of sphericity was significant ($\chi 2$ (105) = 1270.22, $p < .001$). The PCA yielded five components with Eigen values greater than 1. However, following the parallel analysis, we retained the first four factors.

Table 1. Descriptive statistics for the childhood adversity subscales and the psychopathology measures.

Measure	Mean	SD	Observed Range	Possible Range
Adversity subscales				
CTQ Emotional abuse	7.07	3.19	5–22	5–25
CTQ Physical abuse	5.42	1.35	5–17	5–25
CTQ Sexual abuse	5.39	1.87	5–25	5–25
CTQ Emotional neglect	9.27	3.43	5–21	5–25
CTQ Physical neglect	5.91	1.52	5–14	5–25
ITEC Emotional abuse*	3.96	4.50	0–22.58	NA
ITEC Physical abuse*	0.93	2.59	0–25.46	NA
ITEC Sexual abuse*	0.17	0.94	0–9.52	NA
ITEC Emotional neglect*	1.51	2.97	0–15.20	NA
ITEC Physical neglect*	1.59	3.22	0–21.40	NA
CECA Bullying	1.61	0.92	1–4	1–4
CECA Parental discord	1.70	1.00	1–4	1–4
CECA Violence between parents	1.13	0.48	1–4	1–4
CECA Antipathy	1.57	0.91	1–4	1–4
CECA Role reversal	1.59	0.87	1–4	1–4
Psychopathology measures				
Positive schizotypy*	0.31	1.18	−1.28–5.13	NA
Negative schizotypy*	0.21	1.22	−1.63–5.18	NA
Suspiciousness	2.97	2.05	0–8	0–8
Paranoid symptoms	1.53	2.08	0–12	0–14
Schizoid symptoms	0.90	1.54	0–8	0–14
Schizotypal symptoms	1.00	1.93	0–13	0–18
SCL-90-R Anxiety	6.99	5.64	0–29	0–40
SCL-90-R Depression	12.33	8.23	0–43	0–52
CDSS Depression	1.21	2.07	0–13	0–27
BDI Depression	5.33	5.33	0–29	0–63

Note1: CTQ= Childhood Trauma Questionnaire; ITEC= Interview for Traumatic Events in Childhood; CECA= Childhood Experience of Care and Abuse; SCL-90-R=Symptom Checklist-90-Revised; CDSS= Calgary Depression Scale for Schizophrenia; BDI=Beck Depression Inventory-II. SD=Standard Deviation; NA: Not applicable.

Note2: *Total range of ITEC severity scores are calculated for each individual based on a formula that includes parameters such as the age of onset, proximity to the perpetrator, and duration; The WSS dimensional scores are standardized scores with a mean of zero and SD of 1.

Table 2 presents the factor loadings of the rotated four-factor solution. The four factors explained 63% of the total variance and their intercorrelations ranged from -.04 to .49. Factor 1 accounted for 32.3% of the variance and was related to subscales indexing *Intrafamilial Adversity*, including CECA parental discord, CECA role reversal, CECA violence between parents, CECA antipathy, and ITEC emotional neglect. Factor 2 explained 12.4% of the variance and was mostly related to subscales indexing *Deprivation*, including ITEC physical neglect and CTQ physical and emotional neglect. Factor 3 accounted for 10.1% of the variance and was related to adversities indexing *Threat*, including CECA bullying by peers, ITEC emotional and physical abuse, and CTQ emotional and physical abuse. Finally, Factor 4 accounted for 8.1% of the variance and was mostly related to experiences of *Sexual Abuse*, including ITEC and CTQ sexual abuse. Although the highest factor loading per subscale was used to interpret the factors, the following subscales had secondary loadings on an additional factor: ITEC emotional abuse on Factor 1, CECA violence between parents on Factor 4, and CTQ emotional abuse, CTQ physical abuse, and ITEC emotional neglect on Factor 2.

Table 2. Results of the principal components analysis with promax rotation.

Adversity subscales	Factor scores			
	1 Intrafamilial Adversity	2 Deprivation	3 Threat	4 Sexual Abuse
CECA Parental discord	**.875**	−.119	−.011	.073
CECA Role reversal	**.771**	.082	−.048	−.029
CECA Violence between parents[a]	**.524**	−.087	−.218	.458
ITEC Emotional neglect[a]	**.513**	.455	−.070	−.044
CECA Antipathy	**.506**	.047	.345	−.179
CTQ Physical neglect	−.077	**.860**	−.218	−.016
ITEC Physical neglect	.221	**.727**	−.131	.045
CTQ Emotional neglect	−.051	**.709**	.158	.004
CECA Bullying	−.194	−.202	**.859**	.114
ITEC Emotional abuse[a]	.461	−.125	**.706**	.002
ITEC Physical abuse	.190	−.020	**.578**	−.086
CTQ Emotional abuse[a]	−.048	.479	**.517**	.071
CTQ Physical abuse[a]	−.142	.421	**.482**	.064
ITEC Sexual abuse	.015	−.012	.051	**.904**
CTQ Sexual abuse	−.066	.081	.119	**.875**
Percentage of Variance	32.25%	12.40%	10.05%	8.07%
Eigenvalue	4.84	1.86	1.51	1.21

Note1: Highest factor loadings for a given factor are bolded.
Note2: [a]This subscale has a loading of .40 or above on more than one factor.

4.2. Associations of the childhood adversity dimensions and the cumulative risk index with psychopathology

Table 3 shows the results of the linear regression analyses examining the PCA-derived childhood adversity dimensions and the cumulative risk index as predictors of the questionnaire and interview measures of depression, anxiety, and psychosis-spectrum psychopathology (the bivariate correlations between the adversity dimensions and outcomes are presented in Supplemental Table 2). The results of the regression analyses using the childhood adversity factor scores as predictors showed that *Intrafamilial Adversity* was significantly associated with schizotypal symptoms, *Deprivation* with negative schizotypy and schizoid symptoms, and *Threat* with all the outcome measures except for schizoid symptoms and CDSS depression. *Sexual Abuse* was not associated with these outcomes. The results of the regression analyses using the cumulative risk index as a predictor showed that cumulative risk was significantly associated with all the outcome measures. The models using the adversity dimensions explained between 8.5% and 25.3% of the variance in the psychopathology symptoms, whereas those using the cumulative risk index explained between 5% and 17.3% of the variance.

As seen in Table 3, the total effects tended to be larger for the adversity dimensions model (average effect size across the ten analyses of .18 [medium effect]) compared to the cumulative approach (average effect size of .12 [small effect]). All of the individual betas for the *Intrafamilial Adversity*, *Deprivation*, and *Sexual Abuse* dimensions were small effects. However, the effects sizes tended to be larger for the *Threat* dimension, especially for outcomes such as schizotypal and paranoid personality disorder symptoms. The beta values in the regression analyses represent the results for the residualized predictors after partialling out variance from the other three adversity dimensions. Examination of the correlations in Supplemental Table 2 indicates that bivariate associations of the individual adversity dimensions tended to be on the order of small-medium effects for *Intrafamilial Adversity* and *Deprivation*, and medium effects for the *Threat* dimension. There were no significant correlations with the *Sexual Abuse* dimension (all the values were below .1).

5. Discussion

This study aimed to (1) identify the dimensions underlying multiple subscales from three well-established childhood adversity measures and (2) use these dimensions and a cumulative risk index based on them as predictors of depression, anxiety,

Table 3. Linear regressions examining prediction of psychopathology measures by the childhood adversity dimensions and the cumulative risk index.

	Regression models												
	Adversity dimensions										Cumulative risk		
	Intrafamilial Adversity		Deprivation		Threat		Sexual abuse		Total effect		Risk index	Total effect	
Criteria	**β**	**f^2**	**β**	**f^2**	**β**	**f^2**	**β**	**f^2**	**R^2**	**f^2**	**β**	**R^2**	**f^2**
Questionnaire													
Positive Schizotypy	.094	.01	.150	.02	.169*	.02	.095	.01	.116***	.13	.356***	.092***	.10
Negative Schizotypy	−.113	.01	.215**	.04	.216**	.04	−.008	.00	.114***	.13	.316***	.067***	.07
Suspiciousness	−.009	.00	.138	.02	.317***	.09	.031	.00	.160***	**.19**	.415***	.173***	**.21**
SCL-90 Anxiety	.091	.01	.133	.01	.256***	.06	.045	.00	.153***	**.18**	.336***	.113***	.13
SCL-90 Depression	.132	.02	.040	.00	.358***	.12	.093	.01	.205***	**.26**	.391***	.153***	.13
BDI Depression	.130	.02	.009	.00	.263**	.06	.018	.00	.115***	.13	.288***	.083***	.10
Interview													
Paranoid Symptoms	.080	.01	.012	.00	.434***	**.18**	.010	.00	.226***	**.29**	.401***	.161***	**.19**
Schizoid Symptoms	.028	.00	.152*	.02	.180	.03	−.005	.00	.091***	.10	.225**	.050***	.05
Schizotypal Symptoms	.168*	.03	.085	.01	.362**	.13	.037	.00	.253***	**.34**	.373***	.139***	**.16**
CDSS Depression	.151	.02	.028	.00	.181	.03	.006	.00	.085***	.09	.249**	.062***	.07

$p < .05$, ** $p < .01$, *** $p < .001$.
Note 1: Bootstrap procedures (with 2,000 samples) were employed.
Note 2: SCL-90 = Symptom Checklist-90-Revised; CDSS = Calgary Depression Scale for Schizophrenia; BDI = Beck Depression Inventory-II
Note 3: According to Cohen (1992), f^2 values above .15 are medium effect sizes (in bold).

and psychosis-spectrum psychopathology. To our knowledge, this is the first investigation to use questionnaire and interview measures of adversity to examine factor-analytic and cumulative-risk approaches in a complementary manner. Our results identified four meaningful childhood adversity dimensions and showed that both approaches to operationalizing adversity (i.e. empirically-derived dimensions and cumulative risk) yielded significant associations with the measures of psychopathology. As hypothesized, the adversity dimensions demonstrated some specificity in their associations with the psychopathology symptom domains. Furthermore, the cumulative risk index was associated with all the outcomes. Overall, the study contributes to current efforts to elucidate how different operationalization approaches can inform our understanding of the complexity of childhood adversity and its links to different expressions of psychopathology.

5.1. Childhood adversity dimensions

Regarding the first aim of the study, the results identified four childhood adversity dimensions that captured experiences in the domains of *Intrafamilial Adversity*, *Deprivation*, *Threat*, and *Sexual Abuse*. The finding that the dimensions distinguished between experiences of threat and deprivation provides empirical support to the conceptual distinction proposed by the Dimensional Model of Adversity and Psychopathology. At the same time, however, the results did not fully align with the model, as not all of the proposed threat-related adversities clustered together in our data. Most notably, the CTQ and ITEC sexual abuse subscales formed a coherent separate dimension. This resonates with the results of large factor-analytic studies of adversity items in which sexual abuse loaded separately from other forms of abuse (Brown et al., 2013; Ford et al., 2014). Together, this evidence appears to bolster the view that sexual abuse may be considered a distinct form of adversity (Cohen-Cline et al., 2019) – even distinct from those that also share an element of threat. Alternatively, the findings could be related to issues previously reported to attenuate the association between sexual and non-sexual maltreatment (i.e. the overall low base rate of sexual abuse and that most cases are accompanied by other maltreatment subtypes; see Vachon et al., 2015). Additional research across diverse sample types may help clarify the nature of this finding.

Another consideration concerning the threat-deprivation distinction is that CTQ physical and emotional abuse cross-loaded onto the *Deprivation* dimension. This finding seems to be consistent with the common co-occurrence of experiences of abuse and neglect, which has been proposed to complicate distinguishing among these experiences in research using data-driven approaches (Sheridan et al., 2020). In this regard, the fact that CTQ, but not ITEC, subscales cross-loaded onto *Deprivation* may suggest that interview measures that assess multiple features of maltreatment are better able than self-reports to differentiate between the domains of abuse and neglect. This possibility is in line with several researchers' contention that in-depth interview measures that allow for probing and clarification offer greater precision in their assessment of environmental experience (Bifulco & Schimmenti, 2019; Fisher et al., 2015; Lobbestael et al., 2009).

We also found that *Intrafamilial Adversity* explained the most variance in our data, indicating that the threat-deprivation model is insufficient to account for the variability in childhood adversity.

Four CECA subscales and one ITEC subscale loaded primarily onto this dimension. While shared method variance may have contributed to the clustering of CECA subscales, the finding that CECA bullying loaded exclusively onto *Threat* appears to strengthen the interpretation that these negative environmental experiences within the family environment represent a distinct construct. That ITEC emotional neglect loaded primarily onto this dimension may reflect that this subscale's assessment of the failure to meet a child's emotional needs also taps into elements associated with other poor parenting behaviors (e.g. those related to role reversal). Although previous research has not assessed the same adversity subtypes included in our study, the emergence of this dimension is broadly consistent with earlier findings that adversities related to household dysfunction tend to form a separate factor (Ford et al., 2014; Mersky et al., 2017).

5.2. Associations of childhood adversity with the psychopathology measures

Regarding the second aim of the study, we found that when the adversity dimensions were modelled together, they tended to explain more variance in the outcomes than the cumulative risk index. This dovetails with epidemiological research comparing latent maltreatment factors with a cumulative maltreatment score (Brumley et al., 2019) and supports the utility of this empirical approach. Additionally, the analyses with the adversity dimensions showed that *Threat* was a significant predictor of depression, anxiety, and psychosis-spectrum psychopathology. Notably, within the psychosis symptom domains, *Threat* was more consistently associated with phenotypes involving positive psychotic features, which is in keeping with research pointing to the relevance of adversities characterized by an 'intention to harm' in conferring risk for reality distortion (Arseneault et al., 2011; van Nierop et al., 2014). Our results pertaining to *Threat* are also in agreement with a recent study that found that a dimension of threat-related adversities was associated with anxiety and depressive disorders (McGinnis et al., 2022). It is of note that we found *Threat* to be associated with self-reported depressive symptoms across two time points using different instruments, but not with interview-rated symptoms. Although the reason for this discrepancy is unclear, it may be partly due to a relatively low representation of CDSS ratings in our sample, which had lower mean scores than those reported in a study that established reference values in a healthy sample (Müller et al., 2005). On the whole, the results with the *Threat* dimension are consistent with theoretical and empirical accounts of the patterns of multifinality associated with threat-related adversities (McLaughlin, 2016; McLaughlin et al., 2020).

In line with our expectations, the results with the adversity dimensions demonstrated the presence of specific effects. In particular, *Deprivation* showed a unique association with the negative dimension of psychosis across self-report and interview-based assessments. This parallels meta-analytic findings demonstrating associations between neglect and negative symptoms (Alameda et al., 2021; Bailey et al., 2018) and extends such findings by showing an association over-and-above the variance accounted for by other adversity dimensions. Moreover, these results support prior theorizing that the absence of expected environmental inputs may shape the risk for deficit-like features, such as diminished emotional experience and social disinterest (Gallagher & Jones, 2013).

In addition, *Intrafamilial Adversity* was uniquely associated with schizotypal PD symptoms. This is important considering that identifying environmental precursors to schizotypal PD can contribute to our etiological understanding of the schizophrenia spectrum (Kwapil & Barrantes-Vidal, 2015). However, the symptom heterogeneity that characterizes schizotypal PD complicates the interpretation of this finding – particularly because positive, negative, and disorganized symptoms are thought to involve different developmental pathways (Barrantes-Vidal et al., 2015). Thus, future work considering the multidimensional nature of this construct may better elucidate its associations with childhood adversity. Finally, it is worth noting that the *Sexual Abuse* dimension was not associated with our other adversity dimensions or our outcome measures both in the regression and bivariate analyses. While there is ample research demonstrating links between sexual trauma and psychopathology (Noll, 2021), the evidence in nonclinical populations is less consistent (Vachon et al., 2015). However, some caution should be taken in interpreting the results for the *Sexual Abuse* dimension. This is likely driven by the fact that a very small proportion of participants reported any sexually abusive experiences (only about 10% did so on the CTQ, with the majority reporting the lowest rating for such experiences). This may in part reflect less willingness of participants to report sexual abuse relative to other forms of abuse. Therefore, additional work is needed to examine these associations in vulnerable populations with greater sexual abuse prevalence and severity.

The current study also found that the cumulative risk index was associated with all the symptoms – indicating that an undifferentiated measure of adversity provides broad (and undifferentiated) associations with psychopathology outcomes. This converges with the literature showing that the accumulation of adverse experiences is pivotal in conferring risk for various psychopathological outcomes, including

depression, anxiety, and psychosis-spectrum phenomena (Copeland et al., 2018; Evans et al., 2013; Kim et al., 2021; Morgan et al., 2020). Furthermore, the findings support the predictive value of focusing on the cumulative effect of empirically-derived adversity dimensions, which to our knowledge had not been previously examined. Thus, we believe that a risk score constructed from individual adversity dimensions offers a refinement of cumulative indices that merits further investigation.

The results of this study suggest that both operationalization approaches may offer complementary information to the field. From a theoretical perspective, drawing on previous literature (e.g. Bentall et al., 2014; Evans et al., 2013), it seems plausible that the experiences comprising the childhood adversity dimensions could shape certain developmental processes in partially specific ways while also contributing to a general vulnerability that cumulatively impacts the expression of psychopathology. From a research standpoint, we believe the results highlight a point that other scholars have made (Henry et al., 2021; McGinnis et al., 2022) – namely, that the optimal operationalization approach may be goal-dependent. For instance, while the empirically-derived dimensions may facilitate identifying potential specificity and underlying mechanisms, the cumulative approach may help maximize adversity-outcome associations and facilitate investigating complex interactions with other levels of explanation (e.g. genetic factors).

5.3. Strengths and limitations

A strength of the current study is the comprehensive assessment of childhood adversity and psychopathology conducted with both questionnaire and interview measures. In particular, employing in-depth interview measures of childhood adversity serves to minimize biases associated with subjective responding (Bifulco & Schimmenti, 2019; Lobbestael et al., 2009). In addition, the focus on subclinical phenotypes is considered to facilitate etiological research as participants do not present with the critical confounding factors associated with clinical status, such as high comorbidity, biographical disruption, stigma, medication side effects, etc. (e.g. Barrantes-Vidal et al., 2015).

The limitations of the study include its cross-sectional nature, which limits inferences about the causal effects of childhood adversities. In addition, our use of a predominantly female university student sample may restrict the generalizability of the findings. In this regard, we note that a recent review found that college student samples tend to produce similar findings than non-student samples in the field of trauma research (Boals et al., 2020). Nevertheless, research in community samples with a more representative distribution of sociodemographic characteristics would enhance generalizability. Finally, additional studies are necessary to examine the extent to which the findings apply to the clinical expression of these phenotypes.

5.4. Conclusions and Future Directions

In sum, this study investigated different approaches to operationalizing childhood adversity and their links to transdiagnostic psychopathology. The use of comprehensive adversity measures allowed us to obtain a fine-grained characterization of the environment that is not typically afforded by epidemiological research and thus complements existing literature in the field. Using longitudinal designs and investigating the moderators of the links identified in the present study represents an important avenue for future research. For example, some research has found sex differences in the exposure and effects of childhood adversities (e.g. Haahr-Pedersen et al., 2020). Therefore, future work with sex-balanced samples may consider investigating sex as a moderating variable. Furthermore, dimensional models have suggested some specificity in the mechanisms linking different childhood adversity dimensions with psychopathology (McLaughlin et al., 2021). In this regard, elucidating mediating mechanisms and their specificity is a relevant next step that may help identify potential targets for intervention. Continued work in this area is crucial to advance our understanding of risk and resilience in the service of informing preventive intervention and clinical practice for individuals who have experienced childhood adversity.

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Data availability statement

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

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