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Psychometric Characteristics of the Connor-Davidson Resilience Scale (CD-RISC) in Postpartum Mothers with Histories of Childhood Maltreatment

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Abstract

Background: There is increased awareness that resilience serves as a protective factor against adverse psychophysiological sequelae in the context of stress. However, there are few instruments to assess this construct in adult populations. The Connor-Davidson resilience scale (CD-RISC) has been developed to assess adaptation following stress exposure. While this instrument has previously demonstrated impressive reliability and construct validity, prior research has not supported the consistency of the originally described factor structure. There is also limited evidence regarding the measurement of resilience in the context of cumulative stress exposure.
Objectives: This research explores the psychometric properties of the CD-RISC in mothers with childhood histories of maltreatment
Materials and Methods: Postpartum women who endorsed a history of childhood abuse or neglect (N = 141) completed the CD-RISC, the childhood trauma questionnaire and other surveys measuring positive and negative health and functioning. We calculated descriptive statistics with percentage counts and means as appropriate. Internal reliability was evaluated by Cronbach's alpha and the calculation of item-to-total score correlations. Parallel analysis (PA) was utilized to derive the number of retained factors.
Results: A recent parenting transition concomitant with a history of maltreatment was associated with lower CD-RISC scores. Internal reliability and concurrent validity analyses were satisfactory and consistent with predicted hypotheses. Exploratory factor analysis (EFA) supported a four-factor model of resilience with this population.
Conclusions: This research offers further evidence of the reliability and validity of the CD-RISC. Further, the results of the EFA with parallel analysis offer an empirically-driven derivation of factors for this population.

Keywords: Connor-Davidson Resilience Scale, Resilience, Postpartum, Mothers, Trauma, Abuse, Neglect, Maltreatment, Validity, Reliability

1. Background

Resilience has been conceptualized as the ability of individuals to be "tested by adversity and continue to demonstrate adaptive psychological and physiological stress responses" (1). To date, resilience has been chiefly investigated in the areas of early child development and reactions to severe trauma (2, 3).

Historically, psychosocial research with adult populations has overwhelmingly focused on pathology with limited consideration of positive functioning. Currently, there is increased impetus to elucidate potential relationships between positive psychology concepts and salient public health outcomes including psychiatric and physiological disease susceptibility, prognosis, and adaptation to life stresses and chronic medical conditions (4-9). Consequently, the accurate assessment of resilience is imperative to facilitate our knowledge respective of individual differences in psychophysiological trajectories in the context of difficulty. Yet, there is limited research on the reliability and validity of developed instruments and their appropriate for use with various populations.

1.1. Connor-Davidson Resilience Scale

While several empirically evaluated scales exist to research resilience in children or immediately following exposure to a traumatic event, instruments assessing resilience in adulthood are limited and under-researched. Connor and Davidson (10) developed the Connor-Davidson resilience scale (CD-RISC) to fill this gap. In their preliminary research, the full-scale 25-item measure demonstrated evidence of reliability in community, primary care, and psychiatric populations. They further described a 5-factor structure interpreted as: personal competence, high standards, and tenacity; tolerance of negative affect and strengthening effects of stress; positive acceptance of change and secure relationships; control; and spiritual influences.

Subsequent research with the CD-RISC has provided continued support for the reliability and convergent and predictive validity of the full-scale instrument with adolescents and young adults (11, 12), fertility patients (13), earthquake survivors (14), older community dwelling women (15), and Veterans (16). However, later research has generally failed to replicate the original factor structure proposed by Connor and Davidson (11) through exploratory or confirmatory analyses (11-17).

The relationships between cumulative background and acute stressors and adverse outcomes are often the subject of empirical inquiry. Yet there is limited attention to potential methodological and measurement issues that may arise when resilience-related measures, such as the CD-RISC, are used with individuals who are repeatedly strained. This has important implications if instrument characteristics cannot be assumed to generalize under complex, but commonly encountered, conditions. While previous research with this measure has evaluated this instrument with community samples and those exposed to either a current stressor or a history of adverse advent exposure, the performance of the CD-RISC with individuals presenting with multiple stressors is unknown. Evaluating the CD-RISC in the context of multiple vulnerability factors is needed to establish its appropriateness for use in research or clinical settings. To this end, this research focuses on the psychometric properties of the CD-RISC with postpartum women with histories of childhood abuse or neglect.

1.2. Acute Stressor: Childbearing

Developmentally, childbearing represents one of the most salient periods of vulnerability for women. Although not necessarily more prevalent than the general population of adults, one meta-analysis concluded seven percent of women meet criteria for a major depressive episode and approximately 20% experience major or minor depression within three months of giving birth (18). Irrespective of whether having a child is primarily appraised by the mother as a positive or negative event, there are several common stressors that may impinge on women's postpartum well-being including role and identity conflicts, childcare demands, physiological changes, interpersonal and financial strains, and sleep disturbances.

Yet, despite the significant public health consequences of postpartum psychiatric symptoms, it is important to emphasize that the majority of women do not demonstrate poor mental health functioning after delivery. In fact, pregnancy and childbearing may represent a period during which some women are uniquely motivated to improve health behaviors, such as reducing or eliminating smoking (19, 20) or risky alcohol behaviors (21). Additional research has identified relationships between markers of well-being and improved postpartum psychiatric functioning (22-24) and mother-infant attachment (25). These results suggest, for a significant percent of women, childbearing may promote psychological health and that greater attention is warranted to elucidate potential moderating influences of positive psychological characteristics to postpartum adjustment.

1.3. Background Stressor: Childhood Trauma

Individuals who have experienced early life traumas evidence increased risk for MDD and posttraumatic stress disorder (PTSD) in general (26) and postpartum (24, 27) populations. For women with histories of sexual assault, delivery and obstetric care may trigger trauma recall, dissociation, or feelings of powerlessness. It has been suggested this may result in exacerbation of distress or avoidance of perinatal routine examinations (28). Postpartum, researchers have associated maternal histories of adverse childhood experiences with increased parenting stress (29), difficulties in maternal-child interactions (30), as well as maternal and infant impairments in hypothalamic-pituitary-adrenal (HPA) axis functioning (31).

2. Objectives

Investigating resilience with postpartum women with histories of childhood maltreatment may improve our understanding of those who are more able to adjust and even thrive despite repeated exposure to stress. Ethical standards emphasize the need to utilize sound instruments in assessment practices.

The primary aim of this study was to evaluate the psychometric properties of the CD-RISC in postpartum women with a history of trauma. We explored internal

reliability and convergent validity. We predicted that CD-RISC scores would evidence significant positive associations with measures of family well-being and perception of parenting mastery and negative relationships with current symptoms of posttraumatic stress and depression. Given the debate regarding the temporal stability of resilience, we compared the CD-RISC scores of women with and without a history of PTSD, but did not conjecture about the significance or direction of this potential relationship. In order to assess the most optimal factor structure of the CD-RISC, we used exploratory factor analysis.

3. Materials and Methods

3.1. Procedures

Participants in this study (n = 141) were recruited as part of a longitudinal study, maternal anxiety during the childbearing years (MACY; NIMH K23 MH080147; PI: Muzik), investigating the adjustment of female childhood abuse and/or neglect survivors as they enter motherhood, intergenerational transmission of risk and resilience, and mother-infant dyadic behaviors. Specifically, the MACY project investigates how mothers who have had traumatic experiences cope with maternal stresses, the role of stress and trauma on parenting outcomes, the mother and infant biology, and child development. Women were recruited through the use of flyers in the community and from a linked study assessing women's mental health during pregnancy (32). Research data was collected from 2007 through 2012.

Participants were non-psychiatrically referred English-speaking women, ages 18 and older. Eligible women endorsed childhood abuse or neglect and were mothers of singleton births. Exclusion criteria included diagnoses of schizophrenia or bipolar disorder, drug or alcohol problems within the last three months, and mothers of infants with severe health/developmental problems or born more than six weeks prematurely. Data collection for the longitudinal, postpartum study spanned from 4 to 18 months postpartum; assessments were conducted either in the home, the university-based women and infants mental health clinic specialty playroom or by phone. The results presented in this paper are restricted to data collected four months postpartum, when the CD-RISC was utilized.

At four months postpartum, mothers completed a wide-ranging phone interview to assess trauma history, mental health status, parenting sense of competence, and family well-being. Women received an honorarium of $10 for the 4 months phone interview and a maximum honorarium of $130 for their participation in the overall longitudinal research.

3.2. Ethical Considerations

As the study involved screening of mental health complaints, safety assessment and intervention procedures for care were delineated for participants considered at risk to self, child, or others. Mental health referrals were available as part of standard practice of care within the recruiting hospital. The human subjects committee of the university of michigan institutional review board approved the research protocol and all study participants completed the informed consent process including verbal and written informed consent.

3.3. Measures

3.3.1. Demographics and Health Questionnaire

Participants completed a 28-item assessment of cohabitation status, race/ethnicity, employment, income, and educational history, maternal and child health concerns, and prenatal and postpartum medication use and illnesses.

3.3.2. Resilience

Resilience was assessed using the Connor-Davidson resilience scale (11). This instrument is a 25-item, 5-point Likert scale assessing "personal qualities that enable one to thrive in the face of adversity" (11). Scores range from 0 (not true at all) to 4 (true nearly all the time). Brief descriptors of scale items are included in Table 1. The CD-RISC has demonstrated adequate internal reliability (alpha = .89). As described above, the CD-RISC includes five subscales that have not been consistently replicated. The mean score on the scale using a general population sample was reported as 80.4 (SD = 12.8).

3.3.3. Childhood Trauma

Participant histories of abuse and neglect were evaluated using the childhood trauma questionnaire (CTQ) (33) and the revised life stressor checklist (LSCL) (34). The CTQ is a 28-item self-report Likert scale. Responses range from 1 (never true) to 5 (very true). Scoring yields five subscales: Emotional Abuse, Physical Abuse, Sexual Abuse, Physical Neglect, and Emotional Neglect. The LSCL assesses 29 potential trauma exposures, including detailed assessment of childhood and adult abuse. For the purposes of this research, participants with scores exceeding established cut scores for any type of abuse or neglect on the CTQ or LSCL were categorized as having experienced a history of childhood trauma.

3.3.4. Family-Specific Well-Being

The family adaptation, partnership, growth, affection, and resolve (FAPGAR) scale (35) was used to evaluate global family functioning. The 5-item Likert scale (0 = never, 4 =

Table 1. Connor-Davidson Resilience Scale: Item Characteristics and Factor Loadings[a]

Item (description)	Mean	SD	I-TC	Factor 1	Factor 2	Factor 3	Factor 4
14 (ability to maintain focus)	2.8	1.0	0.58	0.76			
23 (enjoy challenges)	2.6	1.0	0.47	0.64			
17 (personal strength)	3.0	0.9	0.65	0.60			
24 (hard working)	3.1	0.9	056	0.58			
15 (direct problem-solving)	2.9	1.0	0.46	0.56			
22 (in control)	2.8	1.0	0.62	0.55			
16 (irrepressibility)	2.7	1.0	0.56	0.51			
4 (capable when challenged)	3.0	0.9	0.64	0.48			
12 (ability to endure stress)	3.2	0.9	0.65	0.46			
5 (history of success)	3.1	0.9	0.65	0.37			
6 (humor)	2.9	0.9	0.53	0.34			
21 (life purpose)	3.1	0.9	0.51		0.49		
1 (adaptability)	3.1	1.0	0.45		0.47		
25 (gratified by triumphs)	3.4	0.8	0.63		0.33		
2 (social support)	3.5	1.0	0.47			0.69	
19 (distress tolerance)	2.8	0.9	0.42			0.50	
20 (self-assurance in decision making)	2.4	1.0	0.27			0.48	
18 (self-reliance in choices)	2.6	1.0	0.47			0.47	
9 (finding meaning in challenges)	3.2	0.9	0.45				0.68
11 (self-confidence)	3.3	0.8	0.67				0.53
3 (religious/faith beliefs)	3.0	1.2	0.23				0.45
10 (determination)	3.3	0.7	0.59				0.44
7 (coping with stress increases strength)	2.8	1.0	0.55				0.43
8 (ability to bounce back)	3.1	0.9	0.55				0.40
13[b] (awareness of supports)	3.2	0.9	0.56				

Abbriviation: I-TC, Item-total correlation.
[a] Descriptions are representative and are not reproductions of licensed CD-RISC scale content.
[b] Item 13 failed to load on any factor > 0.32.

always) assesses maternal views of interpersonal supports in the areas of adaptation, partnership, growth, affection, and resolve with higher scores representing greater satisfaction with supports. Total scores range from 0 to 20. For this study, the internal consistency reliability was good (0.85).

3.3.5.Postpartum Mastery

Maternal sense of mastery was assessed via an adapted version of the parenting sense of competence scale (PSCS) ((36) as adapted by (37)). The PSCS is an 11-item, 5-point Likert scale (1 very dissatisfied to 5 very satisfied) assessing maternal satisfaction with her competence as a mother. Scores range from 11 to 55 with higher scores representing greater satisfaction. The internal consistency reliability in this research was good (0.81)

3.3.6. Posttraumatic Stress

The national women's study PTSD module (NWSPTSD) (38) was utilized to assess for the presence of lifetime and postpartum PTSD. The model is a version of the diagnostic interview schedule (DIS). The NWSPTSD is intended for use by trained lay researchers and evaluates trauma-related symptoms with modifications based on a large epidemiological study of PTSD with women conducted with the national crime victim center. The NWSPTSD interview provides a continuous symptom count and a dichotomous diagnosis based on minimum elevations on multiple symp-

tom clusters. Both scoring algorithms were used in this study. This measure yielded good internal consistency reliability in this study (0.86).

3.3.7. Depression

Depression was evaluated with the postpartum depression screening scale (PDSS) (39). The PDSS is a 35-item self-report instrument of depressive symptoms. It is often preferred to general depression screening instruments with this population because of potential confounding symptoms that may be normative in a postpartum context (e.g., frequent nighttime awakenings). Items are rated from 1 (strongly disagree) to 5 (strongly agree). Cutoff scores above 80 are used to indicate likely MDD. In this research, both continuous and dichotomous scoring algorithms were used. The internal consistency reliability was high with this study population (0.96).

3.4. Data Analyses

We initially evaluated CD-RISC data for missing values. In cases where an item was omitted, we imputed missing data at the item level with a multinomial logistic regression prediction model using SAS Proc MI. Imputation was based on distributing CD-RISC item scores by income, an associated demographic characteristic in previous research with this measure (40). We calculated descriptive statistics with percentage counts and means as appropriate. Internal reliability was evaluated by Cronbach's alpha and the calculation of item-to-total score correlations. We utilized parallel analysis (PA) to derive the number of retained factors. PA offers a data-driven approach using a process that compares obtained and random data in order to derive the optimal number of factors for retention (41, 42). PA is less susceptible to overestimation and unreliability of extracted factors than other commonly employed methods such as Kaiser's eigenvalue-greater-than-one rule and Cattell's Scree test. This research employed O'Connor's (41) parallel analysis procedure and syntax. Based on the PA results, we conducted an Exploratory Factor Analysis (EFA) using principal axis factoring (PAF) with Oblimin rotation. This method was selected as we anticipated a correlated factor structure (43). Finally, Pearson correlations and independent t-tests were utilized to evaluate the relationships between the CD-RISC and positive family functioning, maternal mastery, and psychopathology to evaluate convergent validity. The a priori significance threshold for analyses was $P < 0.01$. Analyses were conducted with SPSS 17.0.

4. Results

4.1. Participant and Trauma Characteristics

Four months postpartum, 141 women completed the CD-RISC and other assessment instruments. Participants were generally young adults, (mean age = 27.8 years, SD = 6), as would be expected in a study of childbearing women. Fifty seven percent of participants identified as Caucasian. Eighty percent had completed at least some college. Most mothers cohabitated with a romantic partner (68%). Economically, 73% described annual household incomes above $15,000. Using dichotomous cutoff scoring, prevalence rates were 27%, 25%, and 37% for postpartum PTSD, postpartum MDD, and lifetime history of PTSD, respectively.

Of the five types of abuse and neglect assessed, most women endorsed experiencing multiple types (mean = 2.54, SD = .5). Emotional abuse and neglect were most commonly acknowledged. The average CTQ score was 47.7 (SD = 17). The CTQ severity score was not significantly correlated with full-scale CD-RISC scores (r = -0.16, P = .057). Childhood trauma characteristics and severity data are presented in Table 2.

Table 2. Childhood Trauma Characteristics (N = 141)

Trauma Type and Severity	N	Endorse (%)	CTQ Subscale Mean (SD)
Emotional abuse			11.6 (5)
Endorse any	98	70%	
Endorse severe	31	22%	
Physical			8.7 (5)
Endorse any	57	40%	
Endorse severe	25	18%	
Sexual abuse			8.8 (6)
Endorse any	64	46%	
Endorse severe	35	25%	
Emotionalneglect			11.1 (5)
Endorse any	86	61%	
Endorse severe	14	10%	
Physicalneglect			7.6 (3)
Endorse any	52	37%	
Endorse severe	13	9%	

Abbriviation: CTQ, Childhood Trauma Questionnaire.

4.2. CD-RISC Characteristics

The mean CD-RISC score was 74.7 (SD = 13.3). The internal reliability of the scale was high (α = 0.92) and would

not have increased upon deletion of any individual item. Means, standard deviations, item-total characteristics, and factor loadings are presented in Table 1. Mean item scores ranged from to 2.4 (item 20) to 3.5 (item 2). Pearson correlations between items and CD-RISC full-scale scores ranged from 0.23 to 0.67 on items 3 and 11, respectively.

4.3. Exploratory Factor Analysis

The PA procedure supported the extraction of four factors. The study and random data eigenvalues and variance explained per factor are included in Table 3. The KMO measure for the CD-RISC was 0.87. Bartlett's test of sphericity was significant (χ^2 = 1492.4, df = 300, P < 0.01) supporting the suitability of factor analysis. Item 13 had a communality below recommended guidelines (< 0.32) (43) on all derived subscales and was omitted from the EFA. The resulting four-factor model explained 43.9% of the variance.

Table 3. Principal Axis Parallel Analysis of the Connor-Davidson Resilience Scale

Extracted Factors	Study Eigenvalues	Random Data Eigenvalues (95% ile)	Proportion of Variance Explained
Factor 1	8.15	1.23	32.4%
Factor 2	1.09	1.02	4.2%
Factor 3	0.98	0.89	3.8%
Factor 4	0.90	0.79	3.5%

Factor loadings of individual items are presented in Table 1. Interpretations of these dimensions are as follows: Factor 1 (11 items) denotes tenacity; Factor 2 (3 items) corresponds to goal establishment and attainment; Factor 3 (4 items) relates to basic trust; Factor 4 (6 items) relates to acceptance and faith.

4.4. Associations Between the CD-RISC and Psychosocial Variables

As expected, CD-RISC scores were significantly and positively associated with positive family functioning and maternal mastery as measured by the FAPGAR (r = 0.419, P < 0.001) and PSCS (r = 0.449, P < 0.001) scales. CD-RISC total scores were not associated with the total trauma load (CTQ total scores). Regarding associations between resilience and current symptoms of psychopathology, the CD-RISC was significantly and negatively correlated with total posttraumatic stress (r = -0.289, P = 0.001) and depression (r = -.37, P < 0.001) as hypothesized. Similar, CD-RISC scores were significantly lower in mothers with current PTSD (t = 3.23, P = 0.002) and MDD (t = 4.69, P < 0.001) when dichotomous NWSPTSD and PDSS scoring was used (see Figure 1). In contrast, CD-RISC scores were not significantly related to lifetime history of PTSD (t = 1.55, P = .125). All of the EFA-derived subscales followed the same pattern, except Factor 4, which was not significantly associated with current PTSD.

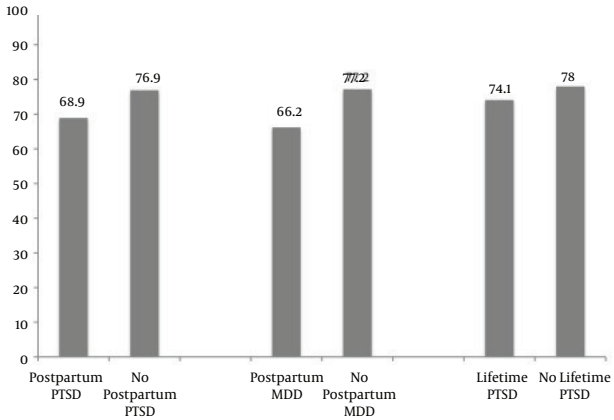

Figure 1. Comparison of CD-RISC Scores Based on Postpartum PTSD and MDD and Lifetime PTSD Status

5. Discussion

The results of this research suggest that the average CD-RISC scores of postpartum women with histories of childhood maltreatment are lower than norms described in the general population by Connor and Davidson (11). In contrast, our participants evidenced greater resilience than samples derived from primary care (71.8) and psychiatric outpatient (68.0) samples (10). Despite experiencing an acute and historical stressor, the postpartum women in this sample also reported greater resilience than female fertility patients (68.1) (13), despite the similarity in gender and age-related demographic characteristics of these samples. Particularly in light of the standard deviations described in CD-RISC research, further research is warranted to evaluate the clinical utility of these discrepancies.

The internal consistency of the CD-RISC in this study was high and paralleled previous CD-RISC research (10, 14, 15). Analysis of the lowest and highest item means and item-to-total correlations demonstrated an identical item pattern as that reported by Lamond and colleagues (15) with older community dwelling women. These findings support the reliability of the instrument in this population.

A four-factor model emerged based on EFA. The described factor structure differed from that presented by Connor and Davidson (10) and others using female or

trauma exposed populations (13-15). One possible interpretation of this finding may be that the discrepancies arose due to differences in EFA methodology and the criteria used to determine the number of extracted factors. The existent CD-RISC psychometric literature has been previously criticized for the utilization of principal components extraction or orthogonal rotation methods (44), which may be inappropriate for factoring this construct (43). Further, reliance on the K1 rule, Scree plot analysis, or non-empirical methods to determine the number of factors to retain may result in selecting too few or many factors and renders across-study comparisons more difficult. Another explanation may be related to either unique population characteristics such as perinatal status, childhood abuse or neglect, or context interactions related to their experiences of multiple adaptive demands. Continued research is warranted to further elucidate the associations between biological, neuroendocrine, developmental, interpersonal, historical, and cultural variables with resilience, as well as the ways in which the presence of multiple stressors may relate to resilience and CD-RISC performance.

As expected, resilience was positively associated with maternal sense of mastery and improved functioning and negatively related to psychiatric symptoms providing preliminary evidence of the CD-RISC's concurrent validity with this population. Consistent with previous investigations of postpartum psychiatric morbidity in the context of childhood maltreatment, the percentages of women with current PTSD and MDD were higher than those generally reported in general postpartum samples. However, it should be noted that the majority of mothers in this study did not meet DSM criteria for PTSD or MDD. Interestingly, our participants with postpartum PTSD and MDD scored demonstrably higher on the CD-RISC than has been previously reported for populations with PTSD (47.8-52.8) (10) and MDD (41.2-57.1) (10). It is worth noting that despite the statistical significance of the relationships between resilience and symptom severity, the correlations were moderate in size underscoring that resilience is not simply "the absence of pathology" (45). Continued resilience research is warranted to better understand the adaptive functioning of most women during this time despite their increased cumulative risk.

Regarding the influence of past events on current CD-RISC scores, endorsement of childhood maltreatment was associated with lower resilience in comparison with other normative samples, providing some support for trait models of resilience. In contrast, while resilience scores were associated with current psychiatric symptoms, they were not related to lifetime PTSD or the reported severity of childhood trauma. These results support the contention that resilience, at least as measured by the CD-RISC, demonstrates some evidence of plasticity that may be dynamically informed by both current and past psychosocial context. These mixed findings raise additional questions about the nature of resilience. For instance, is it the case that the experience of stressful early life events is more strongly related to the development or stability of resilience than psychiatric morbidity? Alternately, it may be that childhood maltreatment occurred during a critical window in resilience development and that the subsequent experience of psychiatric morbidity exerted transitory, but not permanent, effects.

Several limitations of this research are worth noting. First, one aim of this study was to evaluate the psychometric performance of the CD-RISC in the context of dual-vulnerability. These results may not extend to postpartum women without a history of childhood maltreatment or to trauma survivors outside of a childbearing context. Second, our findings specific to the associations between CD-RISC scores and measures of positive and negative functioning do not provide insight into underlying reliance-related processes or potential cause-and-effect relationships. Third, the assessment battery administered was solely comprised of self-report measures. Further research with genetic or endocrine assays with this population could further augment the establishment of construct validity.

Despite these weaknesses, this study has several unique contributions. The psychometric performance of the CD-RISC has not been previously evaluated with postpartum women, those exposed to childhood trauma, or specifically with individuals with multiple adaptive demands. This research offers further evidence of the reliability and validity of the CD-RISC. Further, the results of the EFA with parallel analysis offer an empirically-driven derivation of factors for this population.

This research raises additional questions about the resilience in the context of childbearing. For example, does resilience reduce intergenerational transmission of psychological risk? Is resilience related to differences in parent-child attachment or postpartum engagement in infant- and health-care behaviors? Is postpartum resilience associated with maternal and infant HPA-axis functioning? Does postpartum intervention improve resilience? Such research may enhance the understanding and fostering of positive adaptation in the context of stress.

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Footnotes

Authors' Contribution: All authors contributed to the study conception and execution; The second author collected the quantitative data; The first author conducted data analysis and interpretation; All authors contributed to the completion of the manuscript.

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