



Psychometric properties of the Spanish version of the 10-item Connor Davidson Resilience Scale (CD-RISC) among adolescent mothers in Peru

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Abstract

The objective of this research is to assess the psychometric properties of the Connor-Davidson Resilience Scale (CD-RISC) in order to contribute to the literature identifying validated resilience measures in low-resource settings where individuals face significant adversity. This cross-sectional study included 789 adolescent mothers who delivered at a maternity hospital in Lima, Peru. The Spanish version of the 10-item CD-RISC was used to measure resilience. Internal consistency and construct validity were assessed by evaluating individual item characteristics as well as the association of CD-RISC score with symptoms of depression, anxiety and sleep disturbance. Exploratory factor analysis (EFA) was performed to test the factorial structure of the CD-RISC. The CD-RISC was found to have good internal consistency (Cronbach's alpha = 0.85). CD-RISC scores were positively associated with school attendance, financial hardship, and history of childhood abuse; scores were negatively associated with household dysfunction, depression, anxiety and poor sleep quality. The results of the EFA showed that the CD-RISC contained a two-factor solution, which accounted for 46% of the variance. Overall, these findings suggest that the Spanish-language version of the CD-RISC-10 is an adequate measure of resilience in this population. Further research is needed to incorporate culturally-specific constructs into resilience measures.

Keywords Adolescent · Peru · Pregnancy · Psychometrics · Resilience

Introduction

Psychological resilience, the capacity of the individual to maintain healthy functioning in the face of traumatic or

destabilizing experiences, can be most effectively studied in the context of adversity (Luthar et al., 2000; Masten, 2011). Eighty-five percent of the world's population lives in low and middle-income countries (LMICs), which experience higher rates of adversity, including armed conflict, homicide, and intimate partner violence (IPV) (WHO, 2014). Given the greater exposure to adversity, resilience must be studied in LMICs in distinct cultural contexts.

Once considered a trait possessed by certain invulnerable individuals, resilience is now thought to be a process characterized by the interaction of multiple levels of factors, from individual, to family, community, and national level factors (Betancourt & Khan, 2008; Panter-Brick, 2014). In LMICs, community and national resources are often limited, placing greater emphasis on individual and family resilience factors (Theron et al., 2015; Tol et al., 2013; Ungar, 2013). For this reason, there is a need to compare individuals within similar contexts, as well as groups of individuals across contexts, in order to better understand how a range of contextual and cultural attributes can impact the resilience of individuals, and whether some individual factors may contribute to resilience in all settings.

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Childhood trauma is an adverse exposure that has been shown to be associated with physical and mental health problems in adulthood (Banducci et al., 2014; Chapman et al., 2004; Dube et al., 2001; Frans et al., 2005). Moreover, psychiatric disturbances in pregnant women and mothers are associated with psychiatric disturbances in their children (Lahti et al., 2017). While childhood trauma predicts psychiatric disturbances in adulthood, resilience mediates the association such that as trauma burden increases, resilient individuals experience less increase in anxiety and depressive symptoms (Goldstein et al., 2013; Scali et al., 2012). Thus, resilience in pregnant women and mothers who are at high risk for depression and other psychiatric disturbances has implications for the health of their children.

According to the World Health Organization (WHO), 61% of Peruvian women living in rural areas and 49% in urban areas reported physical IPV; 49% of rural women and 26% of urban women reported severe physical violence (WHO, 2005). In our own studies of pregnant Peruvian women residing in Lima, 69% reported experiencing abuse in childhood, and the lifetime prevalence of IPV was 39% (Barrios et al., 2015). These estimates have been corroborated by a number of other studies (Bardales & Huallpa, 2005; Guerrero & Rojas, 2016). Given the high burden of interpersonal trauma and the limited data available about resilience in this population, we chose to conduct this research in Peru.

A review article examining 15 different measures of resilience found that the Connor-Davidson Resilience Scale (CD-RISC) had good construct validity and was one of the three scales with the best overall psychometric properties (Windle et al., 2011). The CD-RISC was developed in order to quantify resilience and identify factors that impact resilience (Connor & Davidson, 2003). The initial validation study, completed in a combined sample of general population and psychiatric outpatient adults, demonstrated good psychometric properties of the 25-item instrument. Furthermore, results from initial factor analyses yielded five factors: 1) competence; 2) affect tolerance; 3) acceptance of change; 4) control; and 5) spirituality. Subsequent analysis of the 25-item version of the CD-RISC found an unstable factor structure, which led to the development of a 10-item version (CD-RISC-10) with a unifactor model (Campbell-Sills & Stein, 2007).

The CD-RISC-10 was then translated into Spanish and validated in a population of university students in Spain (Notario-Pacheco et al., 2011). Suarez translated the CD-RISC into Quechua and attempted to validate the measure in a population of women in Ayacucho, Peru (Suarez, 2013). To estimate how extensively the CD-RISC has been used, we performed the following Pubmed search on February 18, 2019: “((validation[Title/Abstract]) OR psychometric[Title/Abstract]) AND CD-RISC[Title/Abstract]”. This search identified 30 unique studies that reported on the psychometric properties of the CD-RISC-25, CD-RISC-10, or both. The

studies were performed in 18 different countries, and in 12 different languages. A summary of these studies is presented in Appendix, Table 4. To the best of our knowledge, no version of the CD-RISC has been validated in a pregnant population.

The goal of this research is to assess the psychometric properties of the Spanish version of the CD-RISC-10 as a measure of resilience among pregnant adolescents living in Peru, where high rates of child maltreatment and IPV are impacting the next generation. This will contribute to the growing body of literature seeking to identify cross-culturally validated measures of resilience.

Method

Participants and Procedure

The population of this study was drawn from participants in the Teen Pregnancy Outcomes, Maternal and Infant Study (T-PrOMIS). The T-PrOMIS study was designed to understand the risk and protective factors for trauma and mental health among adolescent mothers. T-PrOMIS participants were adolescent postpartum mothers, aged 14–18 years old, who gave birth at El Hospital Nacional Docente Madre Niño San Bartolomé in Lima, Peru. Information was collected from participants enrolled in T-PrOMIS between November 2016 and September 2018. During this period, a total of 789 young mothers completed the interview. All participants provided written informed consent prior to interview. The institutional review boards of San Bartolome, Lima, Peru and the Harvard T. H. Chan School of Public Health, Office of Human Research Administration, Boston, MA, approved all procedures used in this study.

Each participant was interviewed using a structured questionnaire in a private setting, either in the patient’s room if it was a single room or in a private room dedicated for the study. The questionnaire was used to elicit information regarding maternal sociodemographic and lifestyle characteristics, sleep quality, histories of childhood abuse and intimate partner violence, symptoms of depression and anxiety, and resilience.

Measures

The CD-RISC-10 was used to measure resilience (Campbell-Sills & Stein, 2007). The 10-item instrument was developed as a brief version of the 25-item CD-RISC (Connor & Davidson, 2003). The CD-RISC is a self-report instrument that measures resilience on a 5-point scale (0–4), with scores ranging from 0 to 40 for the 10-item version. In this study, the Spanish language version of the scale was used (Notario-Pacheco et al., 2011).

The study questionnaire also contained a section designed to assess adverse childhood experiences (ACEs). Participants were asked whether they had experienced: 1) abuse, including emotional, physical, and sexual; 2) neglect, including emotional and physical; and 3) household dysfunction, including household substance abuse, mental illness, physical violence, and incarceration of a household member. The questionnaire was adapted from Childhood Physical and Sexual Abuse Questionnaire (Felitti et al., 1998).

The Spanish-language version of the Patient Health Questionnaire (PHQ-9), a 9-item depression-screening scale (Kroenke et al. 2001; Spitzer et al. 1999), was used to assess depression. In our study, this questionnaire assessed nine depressive symptoms experienced by participants in the 14 days prior to evaluation. Each item was rated on the frequency of a depressive symptom. The PHQ-9 score was calculated by assigning a score of 0, 1, 2, or 3 to the response categories of “not at all,” “several days,” “more than half the days,” or “nearly every day,” respectively. The PHQ-9 was previously validated for screening for depression in pregnant Peruvian women (Zhong et al., 2015a).

The Generalized Anxiety Disorder (GAD-7) is a 7-item questionnaire developed to identify probable cases of GAD and measure the severity of GAD symptoms (Spitzer et al., 2006). The GAD-7 asks participants to rate how often they have been bothered by each of these seven core symptoms over the past 2 weeks. Response categories are “not at all,” “several days,” “more than half the days,” and “nearly every day,” scored as 0, 1, 2, and 3, respectively. The Spanish-language version of the GAD-7, which was used in this study, has been validated in Peru as a screening instrument for GAD in pregnant women (Zhong et al., 2015a, b).

Sleep quality was assessed using the Pittsburgh Sleep Quality Index (PSQI), a 19-item survey that categorizes seven clinically derived components (Buysse et al., 1989). The components include (1) sleep duration, (2) disturbances during sleep, (3) sleep latency, (4) dysfunction during the day due to sleepiness, (5) efficiency of sleep, (6) overall sleep quality and (7) need for medication to sleep. Each component is scored 0–3, for a total global score of 0–21; a high score indicates poor sleep quality. Anyone with a global score greater than five is considered to have poor sleep quality. This study used the Spanish-language version of the PSQI, which has been found to have good reliability and construct validity (Zhong et al. 2015b).

Maternal sociodemographic and other characteristics were categorized as follows: age (14–15, 16–17, and 18–19 years); educational attainment (≤ 6 , 7–12, > 12 completed years of schooling); current school attendance (yes vs. no); maternal ethnicity (Mestizo (i.e., mixed Amerindian and European race/ethnicity) vs. others); living situation (living with parents vs. living with partner vs. other); access to basics including food and medical care (very hard/hard/somewhat hard vs. not very hard); parity (multiparous vs. nulliparous); planned

pregnancy (yes vs. no); and maternal early pregnancy body mass index (BMI), which was calculated as weight in kilogram divided by in square meters by height (kg/m^2) and categorized as underweight ($< 18.5 \text{ kg}/\text{m}^2$), normal weight ($18.5\text{--}24.9 \text{ kg}/\text{m}^2$), overweight ($25.0\text{--}29.9 \text{ kg}/\text{m}^2$), or obese ($\geq 30 \text{ kg}/\text{m}^2$).

Data Analysis

We first examined the frequency distributions of maternal characteristics according to resilience level as determined on the distribution of the CD-RISC score. We used Chi-square test when comparing categorical variables, and Student’s *t* test when comparing continuous variables. In addition, we reported mean scores and standard deviations (SD) for each item. We conducted an exploratory factor analysis (EFA) to examine the underlying constructs of the CD-RISC. Prior to performing EFA, we assessed the suitability of the data for performing factor analysis. This assessment showed that it was appropriate to proceed with factor analysis (Bartlett test of sphericity, *p* value < 0.0001 ; and the Kaiser-Meyer-Olkin measure of sampling adequacy = 0.904). We conducted the EFA using principal component analysis with orthogonal rotation. Factors with eigenvalues > 1 were assumed to be meaningful and were retained for rotation. Rotated factor loadings of ≥ 0.4 were considered sufficient, while items with factor loadings ≥ 0.4 on more than one factor were considered cross loading.

All statistical analyses were performed using R software (R Foundation for Statistical Computing, 2015). The level of statistical significance was set at *p* values < 0.05 , and all tests were two-tailed.

Results

Selected sociodemographic and reproductive characteristics of participants are presented in Table 1. The mean age of participants was 17.0 years (SD 1.1 years). The majority of participants were Mestizos of mixed Amerindian and European descent (68%) who completed at least seven years of schooling (96.5%). Difficulty accessing basic needs, including food, was reported by 73% of participants, and 83% of pregnancies were unplanned.

Figure 1 depicts the distribution of CD-RISC scores. The mean score was 34.5 (SD = 5.2, range 0–40) for the total resilience score. Table 2 shows the item characteristics for the CD-RISC. An overall Cronbach’s alpha of 0.85 was observed, although the assumption for one-factor structure was not met. The correlations between the ten component scores of the CD-RISC and the total CD-RISC score ranged from 0.83 to 0.86. Of the ten items, the mean score for each ranged from 2.79 (SD = 0.92) for item #7 (“I can stay focused under pressure.”) to 3.73 (SD = 0.60) for #9 (“I think of myself as a strong person.”). Item #3

Table 1 Demographics characteristics of the study population according to resilience status measured by the Connor-Davidson Resilience Scale ($N=789$)

Characteristics	All Participants ($N=789$)		Low Resilience (Percentile < 25) ($N=184$)		Moderate Resilience (Percentile 25–75) ($N=462$)		High Resilience (Percentile > 75) ($N=143$)		<i>P</i> values
	<i>n</i>	%	<i>n</i>	%					
Age (years) ^a	17.06 (1.12)		17.14 (1.13)		17.08 (1.10)		16.88 (1.17)		0.071
Age (years)									
≤15	91	11.68	18	9.89	51	11.21	22	15.49	0.128
16–17	309	39.67	64	35.16	183	40.22	62	43.66	
18	379	48.65	100	54.95	221	48.57	58	40.85	
Education (years)									
≤6	27	3.47	5	2.75	17	3.74	5	3.52	0.796
7–12	730	93.71	172	94.51	427	93.85	131	92.25	
>12	22	2.82	5	2.75	11	2.42	6	4.23	
In school	302	38.77	65	35.71	160	35.16	77	54.23	0.001
Mestizo ethnicity	537	68.06	113	61.41	316	68.40	108	75.52	0.024
Live with									
Parents	212	27.25	64	35.36	103	22.64	45	31.69	0.005
Father of your baby	351	45.12	75	41.44	223	49.01	53	37.32	
Other	215	27.63	42	23.20	129	28.35	44	30.99	
Difficulty paying for basics									
Very hard/hard/somewhat hard	539	73.23	88	51.76	350	80.65	101	76.52	<0.001
Not very hard	197	26.77	82	48.24	84	19.35	31	23.48	
Primigravida	655	83.33	150	82.42	379	82.21	126	88.11	0.237
Planned pregnancy	130	16.56	19	10.94	87	15.12	24	12.50	0.61
Pre-pregnancy BMI(kg/m ²)									
<18.5	57	7.46	14	8.09	30	6.70	13	9.09	0.057
18.5–24.9	543	71.07	119	68.79	322	71.88	102	71.33	
25–29.9	137	17.93	39	22.54	73	16.29	25	17.48	
>30	27	3.53	1	0.58	23	5.13	3	2.10	
Childhood sexual or physical abuse									
No	384	48.79	115	63.19	196	42.42	73	51.05	<0.001
Yes	403	51.21	67	36.81	266	57.58	70	48.95	
Types of abuse									
No abuse	384	48.79	115	61.19	196	42.42	73	51.05	<0.001
Physical abuse only	273	34.69	29	15.93	193	41.77	51	35.66	
Sexual abuse only	50	6.35	19	10.44	24	5.19	7	4.90	
Physical and sexual abuse	80	10.17	19	10.44	49	10.61	12	8.39	
Emotional neglect	136	17.30	30	16.57	88	19.05	18	12.59	0.195
Household dysfunction									
Household substance abuse	138	17.53	62	34.07	66	12.29	10	6.99	<0.001
Mental illness in household	63	8.01	36	19.78	25	5.41	2	1.40	<0.001
Mother treated violently	702	89.1	169	92.35	407	88.10	126	88.11	0.271
Incarcerated household member	104	13.28	25	13.81	66	14.35	13	9.15	0.273
PHQ-9 ≥ 10	81	10.27	20	15.63	22	7.56	4	4.55	0.007
GAD-7 ≥ 7	288	36.50	65	50.78	117	40.21	23	26.14	<0.001
PSQI > 5	89	17.73	33	25.78	50	17.18	6	6.82	0.001
PHQ-9 ^a	4.41 (3.68)		6.23 (4.71)		4.23 (3.11)		2.65 (2.28)		<0.001
GAD-7 ^a	5.62 (4.11)		7.24 (5.35)		5.45 (3.60)		4.10 (2.94)		<0.001
PSQI ^a	3.71 (2.33)		4.71 (2.33)		3.60 (2.34)		2.72 (1.73)		<0.001

^a Mean (Standard Deviation)

For continuous variables, *P* value was calculated using the Student's *t* test; for categorical variables, *P* value was calculated using the Chi-square test
Abbreviations: PHQ-9, The Patient Health Questionnaire 9-item; GAD-7, Generalized Anxiety Disorder 7-item; PSQI, Pittsburgh Sleep Quality Index

(“I try to see the humorous side of problems.”) had the largest item-total correlation coefficients ($r=0.73$) while item #7 had the smallest component-total correlation coefficient ($r=0.49$). Fig. 2 displays the correlations between each item. Correlations ranged from 0.17 between items #7 and #9 to 0.52 between items #4 (“I believe coping with stress can strengthen me.”) and #8 (“I am not easily discouraged by failure.”).

EFA results for the CD-RISC are displayed in Table 3. The EFA yielded a two-factor solution with eigenvalues of 3.7 for Factor 1 and 1.7 for Factor 2, corresponding to an ability to recover from painful experiences and an ability to persevere in the face of challenges, respectively. These two factors together explained 46% of the total variance.

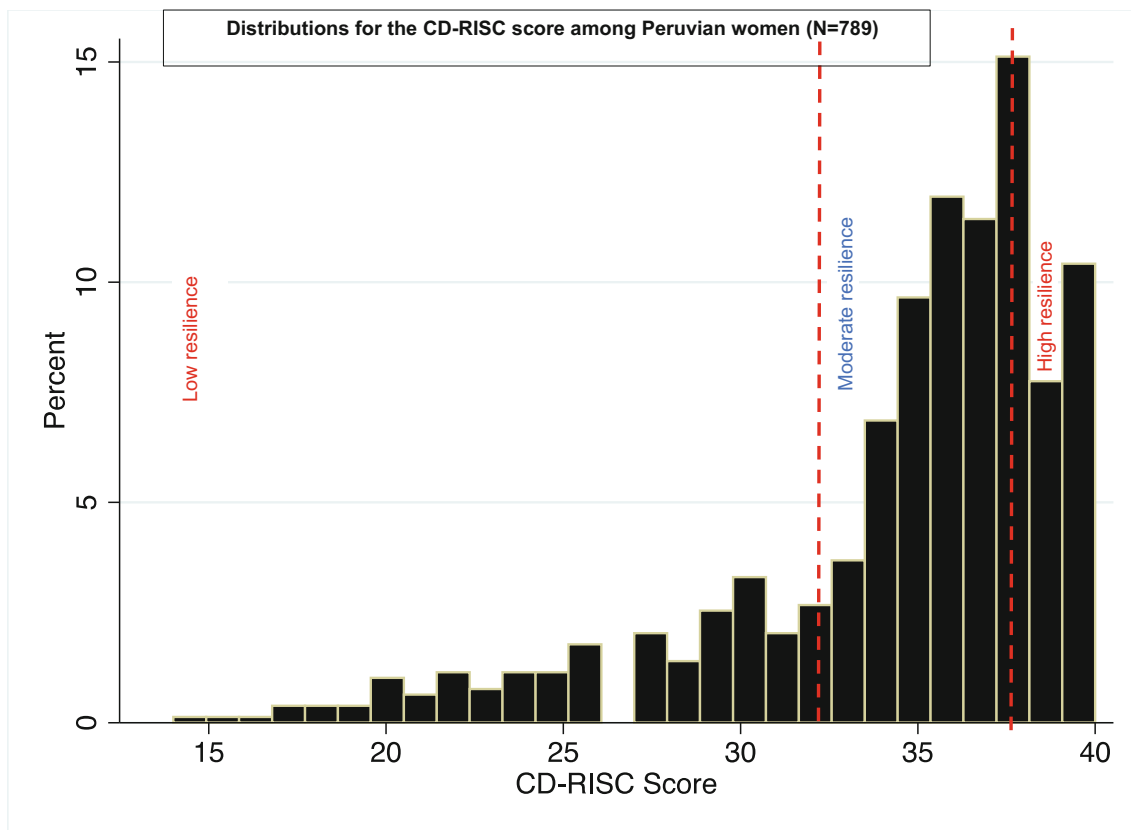


Figure 1. Distributions for the CD-RISC score among Peruvian women (N=789)

Discussion

The Spanish-language version of the CD-RISC-10 was found to be internally consistent in this population of pregnant Peruvian adolescents. The measure also demonstrated good construct validity, as the resilience score was negatively associated with depression, anxiety and poor sleep

quality. Factor analysis yielded a two-factor model which accounted for 46% of the variance.

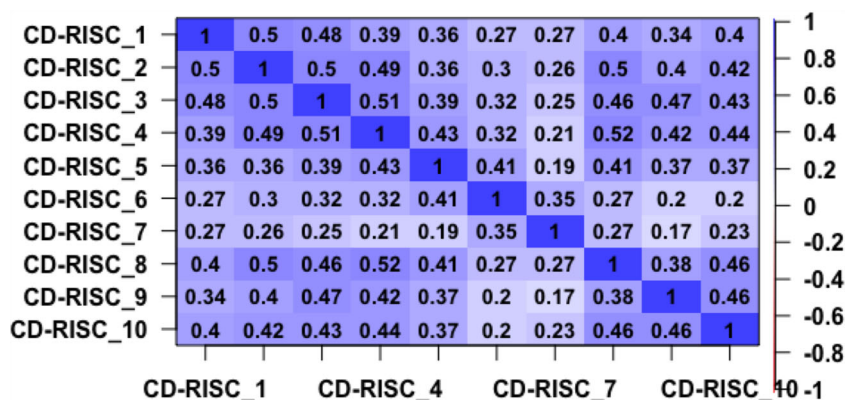
Childhood abuse has been consistently linked to mental illness later in life, including in a similar study population of pregnant adult women in Peru (Levey et al., 2018). Resilience predicts better mental health in survivors of childhood abuse (Campbell-Sills & Stein, 2007; Goldstein

Table 2 Item characteristics, item-total correlation, alpha if item deleted of the Connor-Davidson Resilience Scale among pregnant Peruvian women (N = 789)

Items	Mean	SD	Corrected Item-Total Correlation	Alpha if Item Deleted
1. I am able to adapt to change	3.33	0.89	0.67	0.84
2. I can deal with whatever comes my way.	3.57	0.75	0.72	0.83
3. I try to see the humorous side of problems.	3.57	0.78	0.73	0.83
4. I believe coping with stress can strengthen me.	3.60	0.78	0.72	0.83
5. I tend to bounce back after illness or hardship.	3.59	0.73	0.65	0.84
6. I can achieve goals despite obstacles.	3.38	0.74	0.55	0.85
7. I can stay focused under pressure.	2.79	0.92	0.49	0.86
8. I am not easily discouraged by failure.	3.47	0.97	0.71	0.83
9. I think of myself as a strong person.	3.73	0.60	0.64	0.84
10. I can handle unpleasant feelings	3.51	0.78	0.67	0.84
Overall Cronbach's alpha				0.85

Abbreviations: SD, standard deviation

Figure 2. Correlations between items of the CD-RISC among Peruvian women (N=789)



et al., 2013; Scali et al., 2012). This study found that childhood abuse was associated with worse mental health but greater resilience. The finding that childhood abuse history was positively associated with resilience is particularly puzzling. Other studies have reported that childhood abuse is associated with lower resilience (Campbell-Sills et al., 2009; Simeon et al., 2007). However, some research has identified a positive relationship between adversity and resilience. Severe adversity is typically associated with poor outcomes, but low adversity has been linked to positive long-term outcomes and higher levels of resilience when compared with no reported adverse experiences (Scali et al., 2012; Seery et al., 2010).

One possible explanation is that this enhanced resilience following childhood abuse is related to the phenomenon of posttraumatic growth, which some individuals experience in the process of challenging previous assumptions and confronting existential questions following a trauma. It can lead to an increased appreciation for life in general, more meaningful interpersonal relationships, an increased sense of personal strength, changed priorities, and a richer existential and spiritual life (Tedeschi & Calhoun, 2004). Posttraumatic growth has been studied primarily in adults; however, evidence of it in adolescents is lacking.

Table 3 Factor loadings in exploratory factor analysis of the Connor-Davidson Resilience Scale scores among pregnant Peruvian women (N = 789)

Items	Factor loadings	
	Factor 1	Factor 2
1. I am able to adapt to change	0.61	0.29
2. I can deal with whatever comes my way.	0.69	0.26
3. I try to see the humorous side of problems.	0.71	0.23
4. I believe coping with stress can strengthen me.	0.71	0.22
5. I tend to bounce back after illness or hardship.	0.53	0.39
6. I can achieve goals despite obstacles.	0.17	0.81
7. I can stay focused under pressure.	0.10	0.77
8. I am not easily discouraged by failure.	0.69	0.23
9. I think of myself as a strong person.	0.71	0.01
10. I can handle unpleasant feelings	0.72	0.07
% of the variance	46	

*Kaiser’s Measure of Sampling Adequacy: Overall MSA = 0.904

**Bartlett’s test of sphericity: $p < 0.0001$

***PCA with varimax rotation

Other factors associated with high resilience included financial hardship and school attendance. Financial hardship, similar to abuse and other trauma, can be understood to increase one’s sense of her ability to cope with challenges. School attendance likely has a bidirectional relationship with resilience. It has been reported to be protective against depression in adolescent mothers (Clemmens, 2002; Lara et al., 2012). Attending school while pregnant or after giving birth may also be a marker of resilience.

The factor analysis offers additional insights into how resilience is constituted in this population. EFA generated a two-factor model. Eleven other assessments of the CD-RISC-10 have generated one-factor models. In the other two-factor model described in the literature, Factor 1 is labelled “toughness” and contains six items, while Factor 2 is labelled “motivation” and contains four items (Aloba et al., 2016). In our study, Factor 1, “recovery,” contained eight items and Factor 2, “perseverance,” contained two. Studies of the long version of the CD-RISC have generated three-, four-, and five-factor models, all with different item distributions. Although these initial findings suggest the utility of the CD-RISC, given the variety of factor structures that have been described, future studies designed to measure resilience using culturally-specific questions are needed.

Previous research on the impact of the Peruvian armed conflict suggests the importance of recognizing culturally-specific expressions of trauma, which are referred to as “local idioms of distress” (LID) (Pedersen et al., 2008). The LIDs identified in this study included sorrow, fear, and “worrying memories.” The researchers also described how the armed conflict disrupted social support, an important contributor to resilience. In many cases farms were confiscated and families were forced to relocate. Those who stayed were forced to report on their neighbors, eroding trust in these communities. In her assessment of the CD-RISC among Peruvians in rural areas who were exposed to armed conflict, Suarez found that LIDs predicted resilience better than other measures of trauma that were not culturally specific (Suarez, 2013). This further highlights the importance of culturally-specific measures for resilience.

On an individual level, resilience measures can alert clinicians to patients who may have particular difficulty managing stressful events. On a community and a societal level, developing resilience measures that are culturally specific to particular populations has implications for identifying factors associated with resilience in those populations and developing strategies to cultivate such factors. The next step is to identify culturally-specific interventions that mitigate risk in vulnerable individuals. This is particularly important in pregnant women, whose mental health impacts the health of their children. For example, we found that school attendance was associated with resilience in pregnant adolescents. This finding supports the development of programs to help pregnant adolescents remain in school, as well as further research to characterize the relationship between school attendance and resilience.

Several limitations must be considered when interpreting the results of our study. First, resilience has been conceptualized as a multidimensional process highly influenced by contextual factors (Ungar, 2013). Different definitions emphasize different aspects of the resilience process; no single measure can fully capture all aspects. Many different measures have been developed to assess resilience; there is no gold standard. We selected the CD-RISC for several reasons. Namely, the instrument has the following desirable features: 1) it is one of the oldest and most widely studied measures; 2) it has been validated in 18 countries and in 12 languages, including Peru and Spanish; 3) the CD-RISC-10 is a short measure that is easily incorporated into a series of assessments. A second limitation to this study was that history of trauma, psychiatric symptoms, and resilience were all assessed based on self-report. Consequently we cannot rule out the risk of systematic non-disclosure leading to measurement error. There is also a risk of non-systematic recall bias, which could lead to underestimating the associations CD-RISC scores with

depression, anxiety and sleep quality. Third, the finding that childhood abuse was positively associated with resilience was unexpected. We did not collect detailed information about the abuse including age of onset, frequency, duration, relationship of perpetrator, and the nature of the abuse, which might have helped to better understand this finding. Finally, our cross-sectional study design (i.e., data were collected at a single time point, in the immediate post-partum period) did not allow for assessing the temporal relation and mediators of trauma exposure and resilience. Longitudinal assessments, beginning in childhood and going forward into the postpartum period would provide more information about how participants cope with adolescent motherhood, and would allow for predictors of resilience across a wider spectrum of the life course.

Overall, the Spanish-language version of the CD-RISC-10 demonstrated good reliability and construct validity in this population of pregnant Peruvian adolescents. The finding that childhood abuse predicts greater resilience while household dysfunction is associated with less resilience needs to be further explored through a detailed assessment of the impact of a range of childhood exposures on resilience, as well as the role of timing, duration and context. Interventions are needed to support resilience in adolescent mothers, as their psychological health impacts the next generation. Future research should be mindful of culturally-specific constructs of resilience and how they can be used to enhance the utility of the CD-RISC and other assessment tools.

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Compliance with Ethical Standards

Conflict of Interest Disclosure of potential conflicts of interest: No disclosures.

Research Involving Human Participants All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study. The institutional review boards of the INMP, Lima, Peru, and the Harvard T.H. Chan School of Public Health Office of Human Research Administration, Boston, MA, USA, approved all procedures used in this study.

Appendix

Table 4 Summary of studies assessing the psychometric properties of CD-RISC

Author(s) (Year)	Country	Version (Language-# of items)	Study population	Findings
Burns & Anstey (2010)	Australia	English-25	1775 general population adults (ages 20–24)	1) Reliability not reported; 2) resilience correlated with positive affect; 3) 3-factor model.
Solano et al. (2016)	Brazil	Portuguese-25	65 psychiatric and non-psychiatric adult out-patients	1) Excellent reliability ($\alpha = 0.93$); 2) resilience negatively correlated with stress and chronic pain; 3) 4-factor model.
Laliberté Durish et al. (2018)	Canada	English-25, 10	75 children with a history of concussion or orthopedic injury	1) Reliability not reported; 2) resilience was negatively correlated with depression, anxiety, and behavior problems; 3) the two instruments had divergent validity
Duong & Hurst (2016)	Cambodia	Cambodian-10	798 high school students	1) Good reliability ($\alpha = 0.82$); 2) resilience was negatively correlated with negative affectivity; 3) 1-factor model.
Ni et al. (2016)	China	Chinese-25	10,997 general population adults in Hong Kong	1) Excellent reliability ($\alpha = 0.97$); 2) resilience correlated with depression, family harmony and family functioning.
Wang et al. (2010)	China	Chinese-10	341 earthquake survivors	1) Excellent reliability ($\alpha = 0.91$); 2) resilience was negatively correlated with PTSD symptoms; 3) 1-factor model.
Xie et al. (2016)	China	Chinese-25	2357 members of the Chinese military	1) Excellent reliability (ordinal $\alpha = 0.94$); 2) resilience correlated with self esteem and positive affect; 3) 3-factor model.
Ye et al. (2017)	China	Chinese-10	460 parents of children with cancer	1) Good reliability ($\alpha = 0.88$); 2) resilience was positively correlated with social support and negatively correlated with distress and resignation; 3) 1-factor model.
Yu et al. (2011)	China	Chinese-25	2914 adolescent earthquake survivors	1) Good reliability ($\alpha = 0.89$); 2) resilience correlated with social support and less anxiety and depression; 3) 5-factor model.
Serrano-Parra et al. (2013)	Colombia	Spanish-10	168 general population elderly adults	1) Adequate reliability ($\alpha = 0.79$); 2) resilience was negatively correlated with stress and depression; 3) 1-factor model.
Lauridsen et al. (2017)	Denmark	Danish-10	272 hospital employees	1) Good reliability (ICC = 0.87); 2) resilience negatively correlated with perceived stress.
Tsigkaropoulou et al. (2018)	Greece	Greek-25	546 adults (302 psychiatric patients +244 university students)	1) Excellent reliability ($\alpha = 0.92$); 2) resilience correlated with functioning and quality of life; 3) 4-factor model.
Singh & Yu (2010)	India	English-25	256 students with disabilities	1) Good reliability ($\alpha = 0.89$); 2) resilience correlated with life satisfaction and positive affect; 3) 4-factor model.
Khoshouei et al. (2009)	Iran	Persian-25	323 university students	1) Good reliability (α not reported); 2) construct validity not reported; 3) 4-factor model.
Baek et al. (2010)	Korea	Korean-25	576 adults from the general population	1) Excellent reliability ($\alpha = 0.93$); 2) resilience correlated with self esteem and less depression and perceived stress; 3) 5-factor model.
Jung et al. (2012)	Korea	Korean-25	321 adults (127 psychiatric outpatients +194 general population)	1) Excellent reliability ($\alpha = 0.92$); 2) resilience correlated with positive affect and purpose in life and less perceived stress, depression, and anxiety; 3) 5-factor model.
Shin et al. (2018)	Korea	Korean-10	991 toxic chemical-exposed workers	

Table 4 (continued)

Author(s) (Year)	Country	Version (Language-# of items)	Study population	Findings
Sharma et al. (2018)	Nepal	Nepali-10	265 adults with chronic pain	1) Excellent reliability ($\alpha = 0.95$); 2) resilience was negatively correlated with psychiatric illness; 3) 1-factor model.
Aloba, Olabisi & Aloba (2016)	Nigeria	English-10	449 nursing students	1) Good reliability (ICC = 0.89; 2) resilience negatively correlated with depression, anxiety and pain catastrophizing; 3) 1-factor model.
Suarez (2013)	Peru	Quechua-25	75 adult women	1) Good reliability ($\alpha = 0.81$); 2) resilience correlated with self esteem, fewer psychiatric symptoms and less religiosity; 3) 2-factor model.
Kwan et al. (2019)	Singapore	English-10	108 axial spondyloarthritis patients	1) Good reliability ($\alpha = 0.84$); 2) resilience was negatively correlated with local idioms of distress.
Arias Gonzalez et al. (2015)	Spain	Spanish-25	444 general population adults	1) Excellent reliability ($\alpha = 0.94$); 2) resilience correlated with lower disease severity and higher functional status; 3) 1-factor model.
Blanco et al. (2019)	Spain	Spanish-10	294 elderly caregivers	1) Excellent reliability ($\alpha = 0.91$); 2) 1-factor model, after removing 3 items.
Notario-Pacheco et al. (2011)	Spain	Spanish-10	770 university students	1) Good reliability ($\alpha = 0.86$); 2) resilience correlated with self esteem and social support; 3) 1-factor model.
Karairmak (2010)	Turkey	Turkish-25	246 adult earthquake survivors	1) Good reliability ($\alpha = 0.85$); 2) adequate construct validity.
Bezdzijan et al. (2017)	United States	English-25	53,692 Air Force basic trainees	1) Excellent reliability ($\alpha = 0.92$); 2) resilience correlated with positive affect, self esteem, optimism and hope; 3) 3-factor model.
Coates et al. (2013)	United States	English-10	127 low-income African American men	1) Excellent reliability ($\alpha = 0.91$); 2) resilience was negatively correlated with attrition and mental illness; 3) no factor analysis.
Connor & Davidson (2003)	United States	English-25	806 adult men and women from 1) general population sample; 2) primary care outpatients; 3) general psychiatric PTSD patients	1) Reliability not reported; 2) resilience correlated with spirituality and low psychological distress; 3) 1-factor model had marginal fit.
Goins et al. (2013)	United States	English-25, 10	505 Native American elders	1) Good reliability ($\alpha = 0.89$); 2) resilience correlated with hardiness and less perceived stress; 3) 5-factor model.
Mealor et al. (2016)	United States	English-25	744 critical care nurses	1) Excellent reliability ($\alpha = 0.90$); 2) resilience correlated with fewer PTSD symptoms; 3) 3-factor model.

α = Cronbach's alpha

ICC = Internal correlation coefficient

Best fit model reported when factor analysis was performed

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