

**Psychometric Properties of the Connor-Davidson Resilience Scale (CD-RISC) in Spanish Adolescents**

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**Abstract**

To date, few studies have examined the psychometric properties of the Connor-Davidson Resilience Scale (CD-RISC) in a large adolescent community sample, finding a significant disparity. This study explores the fit of different models for the factor structure of the CD-RISC among Spanish adolescents. Additionally, Rasch analysis, measurement invariance (MI), and differential item functioning (DIF) across sex were conducted on the model with the best fit. Internal reliability and criterion validity of the best CD-RISC model with mental health outcomes were also examined.

463 adolescents (231 girls), aged 12 to 18 years, completed the CD-RISC and other measures on emotional status and quality of life.

Campbell-Sills and Stein's unidimensional CD-RISC-10 was the model displaying the best fit, providing an adequate item fit, supporting MI and DIF-free across sex, and showing strong associations with health-related quality of life, major depressive disorder symptoms, and emotional symptoms. A weak association was found between resilience and the male sex.

Campbell-Sills and Stein's CD-RISC-10 model emerges as the best to assess resilience among Spanish adolescents, as already reported in adults. Thus, independently of the developmental stage, the core of resilience may reside in the aspects of hardiness and persistence.

*Keywords:* CD-RISC; Confirmatory factor analysis; Measurement invariance; Rasch analysis; Adolescents

### **Psychometric Properties of the Connor-Davidson Resilience Scale (CD-RISC) in Spanish Adolescents**

The construct of resilience, which has received increasing attention in the last decades, is conceptualized as personal characteristics that promote positive adaptation in the face of adversity (Fletcher & Sarkar, 2013). Resilient individuals actively cope with stress and trauma (Li & Nishikawa, 2012), through adaptive psychological and physiological responses (Feder et al., 2009). A vast number of studies has demonstrated that resilience emerges as a key protective factor against negative indicators of mental health, including depression, anxiety, and negative affect (see Hu et al., 2015, for a meta-analysis). It has also been related to positive mental health outcomes, including life satisfaction and positive affect, with moderate to large effect sizes (Hu et al., 2015). Regarding intervention, significant improvements have been observed in resilience after applying a combination of cognitive behavior and pharmacological treatments, whereas post-traumatic stress symptoms are reduced (Connor & Davidson, 2003; Davidson et al., 2005). In addition, resilience interventions improve the levels of resilience and reduce depressive and stress symptoms (see Ang et al., 2022, for a meta-analysis).

The Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003) is one of the most employed instruments to measure resilience and has shown good psychometric properties (Windle et al., 2011). Based on exploratory factor analysis (EFA), the 25 items of the original scale converge into 5 factors: personal competence, high standards, and tenacity; trust in one's instincts, tolerance of negative affect, and strengthening effects of stress; positive acceptance of change and secure relationships; control; and spiritual influences (Connor & Davidson, 2003). However, the original factor structure usually fails to be replicated across independent samples of adolescents and adults from the same or different cultural settings, including Spanish adults (García-León et al., 2019; Pulido-Martos et al., 2020). In response to these structural problems, Campbell-Sills and Stein developed a brief 10-item version of the CD-RISC, which assesses a general factor of resilience focused on hardiness and persistence (Campbell-Sills & Stein, 2007). The CD-RISC-10 structure has been more successfully supported across research, including Spanish adults (Notario-Pacheco et al., 2011; Pulido-Martos et al., 2020). Concerning adolescent population, just a few studies have examined the factor structure of the original 25-item CD-RISC in large samples across cultural settings, and results have found a significant disparity in the factor structure. Even two

studies carried out among Chinese adolescents who suffered the 2008 Sichuan earthquake obtained different factor structures in the scale. Whereas one study, through an EFA, showed a 2-factor model consisting of rational thinking and self-awareness dimensions (Fu et al., 2014), the other work replicated the original 5-factor model through confirmatory factor analysis, CFA, (Yu et al., 2011). Moreover, the original factor model was not replicated in a sample of 701 South African adolescents, where the CFA supported a 3-factor structure (Jorgensen & Seedat, 2008). Finally, a single-factor model of the original 25-item CD-RISC was found in a sample of 988 Colombian adolescents, and a 10-item CD-RISC version was obtained, presenting a good model fit (Guzmán et al., 2019) but retaining different items from the Campbell-Sills and Stein CD-RISC-10 developed for adults (Campbell-Sills & Stein, 2007).

Most of the psychometric studies on CD-RISC do not explore sex differences. Yet, sex has emerged as a key factor moderating the relationship between resilience and mental health (Hu et al., 2015). Two meta-analyses exploring sex-based differences in resilience found mixed results: whereas one displayed equal resilience levels between women and men (Alkim & Çarkit, 2020), the other reported higher levels of resilience in favor of men (Ayşe & Kogar, 2021). In this sense, when considered a unidimensional CD-RISC factor structure, partial invariance across sex was reported over the lifespan, from young to older adults, but Items 2, 3, and 9 had to be removed because of their low loadings (Liu et al., 2015). Additionally, 10-item CD-RISC versions have supported measurement invariance (MI) across sex at metric and scalar levels in adults (Gonzalez et al., 2016; Pulido-Martos et al., 2020) and adolescents (Guzmán et al., 2019). Due to the few CD-RISC studies on sex MI, especially in adolescents, we must ensure that the resilience construct assessed by CD-RISC is psychometrically equivalent for male and female adolescents (Putnick & Bornstein, 2016) or make the necessary adjustments if this is not the case.

Furthermore, Rasch analyses, which provide information about item fit, have been only conducted on CD-RISC validation studies among adults. When the fit of the original CD-RISC-25 has been explored, versions of 21 and 22 items with acceptable fit have also been obtained (Arias et al., 2015; Papini et al., 2021). Regarding Campbell-Sills and Stein's CD-RISC-10, one study found that all the items confirmed the unifactorial structure of resilience (Pulido-Martos et al., 2020), whereas others reported the misfit of some items and proposed abridged versions of 7 and 8 items (Ehrich et al.,

2017; Heritage et al., 2021). The test for differential item functioning (DIF) according to sex suggested non-substantial differences in item responses between males and females (Arias et al., 2015; Ehrich et al., 2017; Heritage et al., 2021; Papini et al., 2021; Pulido-Martos et al., 2020).

To our knowledge, CD-RISC psychometric properties (factor structure, Rasch analyses, MI, and DIF) are still unexplored among Spanish adolescents. Validating a sound measure such as CD-RISC at these ages is important to assess resilience rigorously, which, therefore, may constitute a potential treatment outcome measure (Brownlee et al., 2013). Consequently, the current study aimed to examine the psychometric properties of a CD-RISC version for Spanish adolescents. The fit of different CD-RISC factor structures is tested: the original 5-factor model (Connor & Davidson, 2003), the 10-item single-factor model (Campbell-Sills & Stein, 2007), and other models found in large samples of adolescents (Fu et al., 2014; Guzmán et al., 2019; Jorgensen & Seedat, 2008). Once the best model is obtained, we will conduct Rasch analyses of the items and test MI and DIF across sex. The factor model scores will be associated with an extensive nomological network of psychopathological problems and health-related quality of life. Finally, reliability indices for the final CD-RISC model will be estimated.

## **Method**

### ***Participants***

Participants were recruited from different high schools located in urban areas of Elche and Tarragona (eastern Spain). The sample consisted of 463 adolescents (49.9% females), ages 12 to 18 years ( $M = 14.81$ ,  $SD = 1.48$ ). The parents or legal guardians of the participants gave written informed consent following the Declaration of Helsinki.

### ***Instruments***

The *Connor-Davison Resilience Scale (CD-RISC)* (Connor & Davidson, 2003). The 25-item scale assesses resilience on a 5-point Likert scale ranging from 0 (*not true at all*) to 4 (*true all the time*). The participants answered each item considering the last month. The Spanish version was employed, provided under official approval by the authors of the original version (Bobes et al., 2021).

The *KIDSCREEN-10* (Ravens-Sieberer et al., 2010). Participants rated the 10-item questionnaire on 5-point Likert scale. The items explore the adolescent's physical

activity and fitness, depressive moods, leisure time, relationships with parents and peers, and perception of school performance and cognitive capacity. Higher scores indicate greater well-being and health-related quality of life. Both Cronbach's alpha and McDonald's omega were .86.

The *Strength and Difficulties Questionnaire* (SDQ; Goodman, 2001); Spanish self-reported version (Gómez-Beneyto et al., 2013). The 25-item scale assesses 5 factors: emotional symptoms, conduct problems, hyperactivity, peer problems, and prosocial behaviors in children and adolescents on a 3-point Likert scale (0 = *not true*, 1 = *somewhat true*, and 2 = *certainly true*). In the current study, the internal consistency of the factors was the following: Cronbach's  $\alpha = .75$  and McDonald's  $\omega = .76$  for emotional symptoms, Cronbach's  $\alpha = .59$  and McDonald's  $\omega = .60$  for conduct problems, Cronbach's  $\alpha = .64$  and McDonald's  $\omega = .65$  for hyperactivity, Cronbach's  $\alpha = .60$  and McDonald's  $\omega = .61$  for peer problems, and Cronbach's  $\alpha$  and McDonald's  $\omega = .65$  for prosocial behaviors.

The *Revised Child Anxiety and Depression Scale-30* (RCADS-30; Sandín et al., 2010); a reduced Spanish version of the original scale (Chorpita et al., 2000). It consists of 5-item subscales corresponding to 6 factors assessing anxiety and depression symptoms: separation anxiety disorder (SAD), social phobia (SP), generalized anxiety disorder (GAD), panic disorder (PD), obsessive-compulsive disorder (OCD), and major depressive disorder (MDD). Items are rated on a 4-point Likert scale ranging from 0 (*never*) to 3 (*always*). The internal consistency was Cronbach's  $\alpha = .60$  and McDonald's  $\omega = .63$  for SAD, Cronbach's  $\alpha = .84$  and McDonald's  $\omega = .85$  for SP, Cronbach's  $\alpha$  and McDonald's  $\omega = .81$  for GAD, Cronbach's  $\alpha = .80$  and McDonald's  $\omega = .81$  for PD, Cronbach's  $\alpha = .73$  and McDonald's  $\omega = .74$  for OCD, and Cronbach's  $\alpha = .81$  and McDonald's  $\omega = .82$  for MDD.

### ***Procedure***

The study was conducted within the framework of two projects: Covitality-Spain (Covitality: Socioemotional Competencies and Mental Health in Spanish Adolescents); and EPINED-2 (Epidemiological Study of Neurodevelopmental Disorders), respectively.

This research was approved by the university's Ethical Committees and authorized by regional authorities (Covitality-Spain: ref. no. DPS.JPR.02.17 approved by the UMH Project Evaluation Committee; and EPINED-2: ref. no. 13-10-31/10proj5

approved by the Research and Ethics Committee of the Sant Joan University Hospital and by the Catalan Department of Education).

### *Data analyses*

Mplus, version 8 (Muthén & Muthén, 2018), was employed to perform CFAs and multiple-group CFAs using the robust maximum likelihood estimator (MLR). MLR offers adjusted standard errors and statistical fit tests that are robust to the non-normality of the data. Rasch analyses were conducted using the Jamovi (2.3) software (The jamovi project, 2022), through the module snowIRT: Item Response Theory (Seol, 2022). Pearson correlation coefficients between the CD-RISC final model scores and the rest of the target variables were performed with SPSS, version 28, together with Cronbach's alpha and McDonald's omega (estimated by a macro for SPSS, Hayes & Coutts, 2020). The online Supplementary material Table S1 displays the descriptive statistics of the study variables for the total sample and divided by sex and levels of resilience.

CFAs were carried out to explore the factor validity of the most relevant models for our sample observed in the literature: Model 1, the original 5-factor model with 25 items (Connor & Davidson, 2003); Model 2, a brief version of the original model consisting of a 1-factor model with 10 items (Campbell-Sills & Stein, 2007); Model 3, a 2-factor model with 25 items extracted from Chinese adolescents (Fu et al., 2014); Model 4, a 3-factor model with 25 items obtained among South African adolescents (Jorgensen & Seedat, 2008); and Model 5, a 1-factor model with 10 items from Colombian adolescents (Guzmán et al., 2019) different from Campbell-Sills and Stein (2007)'s model. The models' fit was assessed with various indices (West et al., 2012). The chi-square ( $\chi^2$ ) was estimated; a nonsignificant chi-square implies a well-fitting model. As this test is highly sensitive to large sample sizes, other fit indices were also considered. Values of .95 or above for the comparative fit index (CFI) and the Tucker-Lewis index (TLI), and of .06 or below for the root mean square error of approximation (RMSEA) suggest a good fit (Hu & Bentler, 1999). For the RMSEA 90% CI, values below .05 for the lower boundary and below .08 for the upper boundary are considered acceptable fit (MacCallum et al., 1996). The Polytomous Rasch Model was used to examine the quality of the individual items in the best CD-RISC factor model obtained. Accordingly, we employed infit and outfit statistics, which indicate the information-weighted mean square residuals between observed and expected responses (Linacre,

2002). Values in the range of 0.60 – 1.40 suggest a good fit (Linacre, 1999), whereas a value below the range indicates an item is redundant, and a value above the range expresses an item being out-of-concept (Khan et al., 2013).

Multiple-group CFA analyses were conducted to assess invariance of the best CD-RISC model across sex with a series of increasingly stringent multiple-group models (configural, ensuring that the construct has the same pattern of free and fixed loading; metric, testing for the equivalence of the item loadings on the factor; and scalar, examining that mean differences in the latent construct represent all the mean differences in the shared variance of the items (Putnick & Bornstein, 2016). The Satorra-Bentler scaled chi-square test,  $\chi^2_{S-B}$ , was estimated to assess the change in model fit tests (Satorra, 2000). However, due to the test's sensitivity to sample size, other indices were considered to examine the invariance between more and less constrained models. Therefore, the following criteria were used to consider a model to be invariant:  $\Delta CFI \leq 0.01$  (Cheung & Rensvold, 2002) and  $\Delta RMSEA \leq 0.015$  (Chen, 2007). In addition, DIF for ordinal data analysis (Hladka et al., 2022) was performed to test MI across sex at item level, that is, whether the items of the CD-RISC model functioned differently for males and females (Myers et al., 2006). Items are considered to present a different performance between groups if they show statistical significance,  $p < .05$  (Dorans et al., 1992).

## Results

CFAs from the different suggested CD-RISC models for adolescents were conducted, and their goodness of fit was compared (see Table 1). The fit of the CD-RISC models with more than one dimension were inadequate in our adolescent sample, whereas the 10-item unidimensional models showed a good fit. The brief 10-item version of the CD-RISC of Campbell-Sills and Stein showed a slightly better fit than the 10-item Colombian unidimensional CD-RISC version for adolescents (Guzmán et al., 2019). After supporting the unidimensionality, this previous study developed a new 10-item CD-RISC version removing from the original CD-RISC-25 those items with lower item-total correlations and factor loadings, as well as those reported by adolescents as being difficult to understand and more conceptually similar (Guzmán et al., 2019). However, the goodness of fit of Campbell-Sills and Stein's CD-RISC-10 version, highly supported among adults (Pulido-Martos et al., 2020), was not tested in the sample of



Colombian adolescents. Given these findings, Campbell-Sills and Stein's CD-RISC-10 was chosen for the subsequent analyses.

[Table 1 near here]

Table 2 shows the Rasch analysis for Campbell-Sills and Stein's CD-RISC-10 using infit and outfit statistics. All the values fell in the adequate range (0.708–1.377), showing an adequate model fit to the data.

[Table 2 near here]

The results of the MI across sex of the CD-RISC-10 are presented in Table 3. The fit indices of the CFAs for male and female groups were adequate. Thus, a multigroup CFA was conducted. Results indicated good fit indices and minimal changes, fulfilling the criteria recommended to consider a model invariant when metric and scalar invariance are examined. Additionally, DIF analyses revealed nonsignificant differences in item responses as a function of sex, with all the adjusted  $p$ -values above .05 (see Table 4).

[Table 3 near here]

[Table 4 near here]

To explore criterion-related validity of the CD-RISC-10, the scores of the scale were associated with sex, well-being and health-related quality of life, emotional and conduct problems, and specific symptoms for anxiety, depression, and OCD (see Table 5). Large associations ( $r > .50$ ) were observed with health-related quality of life, MDD symptoms, and emotional symptoms. Additionally, moderate-to-large effect sizes ( $r = .30 - .50$ ) were found between resilience and SP, OCD, PD symptoms, and peer and conduct problems. Finally, resilience showed small-to-moderate associations ( $r = .10 - .30$ ) between the male sex and subscales measuring hyperactivity and prosocial behavior and symptomatology of SAD and GAD. Furthermore, the CD-RISC-10 presented good reliability indices (McDonald's  $\omega$  and Cronbach's  $\alpha = .81$ ).

[Table 5 near here]

## Discussion

The current study explored the psychometric properties of different CD-RISC models in Spanish adolescents, examining which best fit the data among adolescents. Rasch analyses, MI and DIF by sex, and criterion validity regarding mental health outcomes were tested on the best model.

The 10-item unidimensional CD-RISC model of Campbell-Sills and Stein presented the best fit, in agreement with studies conducted in Spanish adult population (Notario-Pacheco et al., 2011; Pulido-Martos et al., 2020). Rasch analyses confirmed the goodness of fit of the items, in line with some of the previous psychometric Campbell-Sills and Stein CD-RISC-10 studies (Pulido-Martos et al., 2020) but not with all of them (Ehrich et al., 2017; Heritage et al., 2021). When the psychometric properties of the different CD-RISC versions are compared (Burns & Anstey, 2010; Gonzalez et al., 2016; Jiajia, 2014; Kuiper et al., 2019; Pulido-Martos et al., 2020), Campbell-Sills and Stein's CD-RISC-10 model emerges as psychometrically superior. Furthermore, this model has been successfully validated across different cultural settings (Pulido-Martos et al., 2020). However, the CD-RISC research focused on adolescents did not explore the goodness of fit of Campbell-Sills and Stein's CD-RISC-10 version, although the original 25-item CD-RISC version (Connor & Davidson, 2003) could not be replicated. Consequently, other versions have been developed (Fu et al., 2014; Guzmán et al., 2019; Jorgensen & Seedat, 2008).

The core of resilience, independently from the socio-cultural setting and developmental stage, appears to encompass the hardiness and persistence aspects assessed by the unidimensional 10-item CD-RISC of Campbell-Sills and Stein. In the present study, high positive correlations were observed between resilience and health-related quality of life, whereas an inverse pattern was shown with MDD and emotional symptoms. Thus, the resilience trait may be primarily explained by emotional stability and self-confidence. In this sense, resilience showed the highest association with the personality trait of neuroticism, with an estimated average coefficient of  $-.46$  (see Oshio et al., 2018, for a meta-analysis focused on the relationship between resilience and the Big Five personality traits). Hence, when resilience is treated, internalizing symptoms consequently improve (Ang et al., 2022; Connor & Davidson, 2003; Davidson et al., 2005).

Regarding sex and resilience, the present study shows MI across sex of Campbell-Sills and Stein's CD-RISC-10 in adolescents, replicating adult data (Gonzalez et al., 2016; Pulido-Martos et al., 2020). The absence of DIF across sex was also supported in the 10-item CD-RISC version, in line with other studies (Ehrich et al., 2017; Heritage et al., 2021; Pulido-Martos et al., 2020). As reported for Spanish adults (Pulido-Martos et al., 2020), adolescent males presented significantly more resilience

than adolescent females in our study. In this sense, two meta-analyses based on sex differences in resilience presented mixed results: one showed no sex differences (Alkım & Çarkit, 2020), and the other displayed higher levels of resilience in favor of males (Ayşe & Kogar, 2021). These findings may be substantially explained by the use of different instruments to assess resilience across studies.

The current study is not without limitations. Firstly, the participants comprise a convenience sample obtained from different high schools in Spain. In addition, the data was self-reported and, therefore, subject to well-known biases such as social desirability. Apart from that, minor differences were found in the CD-RISC items' drafting among Spanish translations, which might hinder the comparison of findings (García-León et al., 2019; Notario-Pacheco et al., 2011; Pulido-Martos et al., 2020). Despite these limitations, our research provides meaningful data, choosing the best CD-RISC model to assess adolescent resilience, something scarcely explored in the literature (Fu et al., 2014; Guzmán et al., 2019; Jorgensen & Seedat, 2008; Yu et al., 2011).

In conclusion, this study thoroughly examined psychometric properties of the CD-RISC in Spanish adolescents, comparing the fit of different models previously found in research and conducting Rasch analyses and MI and DIF across sex on the best model obtained. The unidimensional CD-RISC-10 of Campbell-Sills and Stein emerges as the best CD-RISC model to assess resilience among Spanish adolescents. The data highlight the need to cross-culturally examine the psychometric properties of Campbell-Sills and Stein's CD-RISC-10 among adolescents to test its universality, highly supported in adult populations, see Pulido-Martos et al. (2020)'s online Supplementary Table-S2.

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### References

- Alkım, F., & Çarkıt, E. (2020). Investigation of resilience in terms of gender: A meta-analysis study. *Research on Education and Psychology, 4*, 34-52.
- Ang, W. H. D., Lau, S. T., Cheng, L. J., Chew, H. S. J., Tan, J. H., Shorey, S., & Lau, Y. (2022). Effectiveness of resilience interventions for higher education students: A meta-analysis and meta-regression. *Journal of Educational Psychology, 114*, 1670–1694. <https://doi.org/10.1037/edu0000719>
- Arias González, V. B., Crespo Sierra, M. T., Arias Martínez, B., Martínez-Molina, A., & Ponce, F. P. (2015). An in-depth psychometric analysis of the Connor-Davidson Resilience Scale: Calibration with Rasch-Andrich model. *Health and Quality of Life Outcomes, 13*, 1-12. <https://doi.org/10.1186/s12955-015-0345-y>
- Ayşe, G. Ö. K., & KOĞAR, E. Y. (2021). A meta-analysis study on gender differences in psychological resilience levels. *Kıbrıs Türk Psikiyatri ve Psikoloji Dergisi, 3*, 132-143. <https://doi.org/10.35365/ctjpp.21.2.15>
- Bobes, J., Bascaran, M.T., García-Portilla, M.P., Bousoño, M., Sáiz, P.A., & Wallace, D.H. (2001). *Banco de instrumentos básicos de psiquiatría clínica*. Barcelona: Psiquiatría ED.
- Brownlee, K., Rawana, J., Franks, J., Harper, J., Bajwa, J., O'Brien, E., & Clarkson, A. (2013). A systematic review of strengths and resilience outcome literature relevant to children and adolescents. *Child and Adolescent Social Work Journal, 30*, 435-459. <https://doi.org/10.1007/s10560-013-0301-9>
- Burns, R. A., & Anstey, K. J. (2010). The Connor-Davidson Resilience Scale (CD-RISC): Testing the invariance of a uni-dimensional resilience measure that is independent of positive and negative affect. *Personality and Individual Differences, 48*, 527–531. <https://doi.org/10.1016/j.paid.2009.11.026>

- Campbell-Sills, L., & Stein, M. B. (2007). Psychometric analysis and refinement of the Connor-Davidson Resilience Scale (CD-RISC): Validation of a 10-item measure of resilience. *Journal of Traumatic Stress, 20*, 1019-1028. <https://doi.org/10.1002/jts.20271>
- Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14*, 464–504. <http://dx.doi.org/10.1080/10705510701301834>
- Cheung, G. W., & Rensvold, R. B. (2002). Evaluating goodness-of-fit indexes for testing measurement invariance. *Structural Equation Modeling, 9*, 233–255. [http://dx.doi.org/10.1207/s15328007sem0902\\_5](http://dx.doi.org/10.1207/s15328007sem0902_5)
- Chorpita, B. F., Yim, L., Moffitt, C., Umemoto, L. A., & Francis, S. E. (2000). Assessment of symptoms of DSM-IV anxiety and depression in children: A revised Child Anxiety and Depression Scale. *Behaviour Research and Therapy, 38*, 835–855. [https://doi.org/10.1016/s0005-7967\(99\)00130-8](https://doi.org/10.1016/s0005-7967(99)00130-8)
- Cohen, J. (1992). A power primer. *Psychological Bulletin, 112*, 155–159. <https://doi.org/10.1037/0033-2909.112.1.155>
- Connor, K. M., & Davidson, J. R. (2003). Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). *Depression and Anxiety, 18*, 76-82. <https://doi.org/10.1002/da.10113>
- Davidson, J. R., Payne, V. M., Connor, K. M., Foa, E. B., Rothbaum, B. O., Hertzberg, M. A., & Weisler, R. H. (2005). Trauma, resilience and saliostasis: Effects of treatment in post-traumatic stress disorder. *International Clinical Psychopharmacology, 20*, 43-48. <https://doi.org/10.1097/00004850-200501000-00009>

- Dorans, N. J., Schmitt, A. P., & Blestein, C. A. (1992). The standardization approach to assessing comprehensive differential item functioning. *Journal of Educational Measurement*, 29, 309–319. <https://doi.org/10.1111/j.1745-3984.1992.tb00379.x>
- Ehrich, J., Mornane, A., & Pown, T. (2017). Psychometric validation of the 10-item Connor-Davidson Resilience Scale. *Journal of Applied Measurement*, 18, 122–136.
- Feder, A., Nestler, E. J., & Charney, D. S. (2009). Psychobiology and molecular genetics of resilience. *Nature Reviews Neuroscience*, 10, 446–457. <https://doi.org/10.1038/nrn2649>
- Fletcher, D., & Sarkar, M. (2013). Psychological resilience: A review and critique of definitions, concepts and theory. *European Psychologist*, 18, 12–23. <https://doi.org/10.1027/1016-9040/a000124>
- Fu, C., Leoutsakos, J. M., & Underwood, C. (2014). An examination of resilience cross-culturally in child and adolescent survivors of the 2008 China earthquake using the Connor-Davidson Resilience Scale (CD-RISC). *Journal of Affective Disorders*, 155, 149-153. <https://doi.org/10.1016/j.jad.2013.10.041>
- García León, M. Á., González-Gomez, A., Robles-Ortega, H., Padilla, J. L., & Peralta-Ramirez, I. (2018). Propiedades psicométricas de la Escala de Resiliencia de Connor y Davidson (CD-RISC) en población española. *Anales de Psicología*, 35, 33–40. <https://doi.org/10.6018/analesps.35.1.314111>
- Gómez-Beneyto, M., Nolasco, A., Moncho, J., Pereyra-Zamora, P., Tamayo-Fonseca, N., Munarriz, M., Salzar, J., Tabarés-Seisdedos, R., & Girón, M. (2013). Psychometric behaviour of the Strengths and Difficulties Questionnaire (SDQ) in the Spanish National Health Survey 2006. *BMC Psychiatry*, 13, 1-10. <http://dx.doi.org/10.1186/1471-244x-13-95>

- Gonzalez, S. P., Moore, E. W. G., Newton, M., & Galli, N. A. (2016). Validity and reliability of the Connor-Davidson Resilience Scale (CD-RISC) in competitive sport. *Psychology of Sport and Exercise, 23*, 31-39. <https://doi.org/10.1016/j.psychsport.2015.10.005>
- Goodman, R. (2001). Psychometric properties of the Strengths and Difficulties Questionnaire. *Journal of the American Academy of Child & Adolescent Psychiatry, 40*, 1337-1345. <http://dx.doi.org/10.1097/00004583-200111000-00015>
- Guzmán, C. G., Martín, M. B. G., Falcón, J. C. S., & Sierra, M. A. (2019). Psychometric properties of the Connor-Davidson Resilience Scale (CD-RISC) on vulnerable Colombian adolescents. *International Journal of Psychology and Psychological Therapy, 19*, 277-289.
- Hayes, A. F., & Coutts, J. J. (2020). Use omega rather than Cronbach's alpha for estimating reliability. But.... *Communication Methods and Measures, 14*, 1-24. <http://dx.doi.org/10.1080/19312458.2020.1718629>
- Heritage, B., Al Asadi, A. A., & Hegney, D. G. (2021). Examination of the Connor-Davidson Resilience Scale 10 (CD-RISC-10) using the polytomous Rasch model. *Psychological Assessment, 33*, 672-684. <https://doi.org/10.1037/pas0001011>
- Hladka, A., Martinkova, P., & Zvara, K. (2022). *difNLR: DIF and DDF Detection by Non-Linear Regression Models*. [R package]. Retrieved from <https://CRAN.R-project.org/package=difNLR>.
- Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: a Multidisciplinary Journal, 6*, 1-55. <https://doi.org/10.1080/10705519909540118>

- Hu, T., Zhang, D., & Wang, J. (2015). A meta-analysis of the trait resilience and mental health. *Personality and Individual Differences*, 76, 18-27. <https://doi.org/10.1016/j.paid.2014.11.039>
- Jiajia Zhang, L. P. (2014). Comparison among different versions of Connor-Davidson Resilience Scale (CD-RISC) in rehabilitation patients after unintentional injury. *Journal of Psychiatry*, 17, 1-5. <https://doi.org/10.4172/psychiatry.1000153>
- Jorgensen, I. E., & Seedat, S. (2008). Factor structure of the Connor-Davidson Resilience Scale in South African adolescents. *International Journal of Adolescent Medicine and Health*, 20, 23-32. <https://doi.org/10.1515/ijamh.2008.20.1.23>
- Khan, A., Chien, C. W., & Brauer, S. G. (2013). Rasch-based scoring offered more precision in differentiating patient groups in measuring upper limb function. *Journal of Clinical Epidemiology*, 66, 681-687. <https://doi.org/10.1016/j.jclinepi.2012.12.014>
- Kuiper, H., van Leeuwen, C. C. M., Stolwijk-Swüste, J. M., & Post, M. W. M. (2019). Measuring resilience with the Connor-Davidson Resilience Scale (CD-RISC): Which version to choose? *Spinal Cord*, 57, 360–366. <https://doi.org/10.1038/s41393-019-0240-1>
- Li, M. H., & Nishikawa, T. (2012). The relationship between active coping and trait resilience across US and Taiwanese college student samples. *Journal of College Counseling*, 15, 157-171. <https://doi.org/10.1002/j.2161-1882.2012.00013.x>
- Linacre J. M. (2002). What do infit and outfit, mean-square and standardized mean. *Rasch Measurement Transactions*, 16, 878.
- Linacre, J. M. (1999). Investigating rating scale category utility. *Journal of Outcome Measurement*, 3, 103–122.



- Liu, D. W., Fairweather-Schmidt, A. K., Burns, R. A., & Roberts, R. M. (2015). The Connor-Davidson Resilience Scale: Establishing invariance between gender across the lifespan in a large community-based study. *Journal of Psychopathology and Behavioral Assessment*, *37*, 340-348. <https://doi.org/10.1007/s10862-014-9452-z>
- MacCallum R. C., Browne M. W., & Sugawara H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, *1*, 130–149. <http://dx.doi.org/10.1037/1082-989x.1.2.130>
- Muthén, L.K., & Muthén B.O. (2018). *Mplus user's guide. Eighth Edition*. Los Angeles, CA: Muthen & Muthen.
- Myers, N. D., Wolfe, E. W., Feltz, D. L., & Penfield, R. D. (2006). Identifying differential item functioning of rating scale items with the Rasch model: An introduction and an application. *Measurement in Physical Education and Exercise Science*, *10*, 215-240. [https://doi.org/10.1207/s15327841mpee1004\\_1](https://doi.org/10.1207/s15327841mpee1004_1)
- Notario-Pacheco, B., Solera-Martínez, M., Serrano-Parra, M. D., Bartolomé-Gutiérrez, R., García-Campayo, J., & Martínez-Vizcaíno, V. (2011). Reliability and validity of the Spanish version of the 10-item Connor-Davidson Resilience Scale (10-item CD-RISC) in young adults. *Health and Quality of Life Outcomes*, *9*, 1-6. <https://doi.org/10.1186/1477-7525-9-63>
- Oshio, A., Taku, K., Hirano, M., & Saeed, G. (2018). Resilience and Big Five personality traits: A meta-analysis. *Personality and Individual Differences*, *127*, 54-60. <https://doi.org/10.1016/j.paid.2018.01.048>
- Papini, N., Kang, M., Ryu, S., Griese, E., Wingert, T., & Herrmann, S. (2021). Rasch calibration of the 25-item Connor-Davidson resilience scale. *Journal of Health Psychology*, *26*, 1976-1987. <https://doi.org/10.1177/1359105320904769>

- Pulido-Martos, M., Fernández-Sánchez, M. D., & Lopez-Zafra, E. (2020). Measurement invariance across gender and age in the Connor-Davidson Resilience Scale (CD-RISC) in a Spanish general population. *Quality of Life Research*, *29*, 1373-1384. <https://doi.org/10.1007/s11136-019-02389-1>
- Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review*, *41*, 71-90. <https://doi.org/10.1016/j.dr.2016.06.004>
- Ravens-Sieberer, U., Erhart, M., Rajmil, L., Herdman, M., Auquier, P., Bruil, J., Power, M., Duer, W., Abel, T., Czemy, L., Mazur, J., Czimbalmos, A., Tountas, Y., Hagquist, C., & Kilroe, J. (2010). Reliability, construct and criterion validity of the KIDSCREEN-10 score: A short measure for children and adolescents' well-being and health-related quality of life. *Quality of Life Research*, *19*, 1487-1500. <https://doi.org/10.1007/s11136-010-9706-5>
- Sandín, B., Chorot, P., Valiente, R. M., & Chorpita, B. F. (2010). Development of a 30-Item version of the revised Child Anxiety and Depression Scale. *Revista de Psicopatología y Psicología Clínica*, *15*, 165-178. <https://doi.org/10.5944/rppc.vol.15.num.3.2010.4095>
- Satorra A. (2000). Scaled and adjusted restricted tests in multisample analysis of moment structures. In R. D. H. Heijmans, D. S. G. Pollock, & A. Satorra (Eds.), *Innovations in multivariate statistical analysis: A Festschrift for Heinz Neudecker* (pp. 233–247). London: Kluwer. [http://dx.doi.org/10.1007/978-1-4615-4603-0\\_17](http://dx.doi.org/10.1007/978-1-4615-4603-0_17)
- Seol, H. (2022). *snowIRT: Item Response Theory for jamovi*. [jamovi module]. Retrieved from <https://github.com/hyunsooseol/snowIRT>.
- The jamovi project (2022). *jamovi*. (Version 2.3) [Computer Software]. Retrieved from <https://www.jamovi.org>.

West, S. G., Taylor, A. B., & Wu, W. (2012). Model fit and model selection in structural equation modeling. *Handbook of Structural Equation Modeling*, 1, 209-231.

Windle, G., Bennett, K. M., & Noyes, J. (2011). A methodological review of resilience measurement scales. *Health and Quality of Life Outcomes*, 9, 1-18.  
<https://doi.org/10.1186/1477-7525-9-8>

Yu, X. N., Lau, J. T., Mak, W. W., Zhang, J., & Lui, W. W. (2011). Factor structure and psychometric properties of the Connor-Davidson Resilience Scale among Chinese adolescents. *Comprehensive Psychiatry*, 52, 218-224.  
<https://doi.org/10.1016/j.comppsy.2010.05.010>

**Table 1**

*Goodness-of-fit indices for the models assessed*

CD-RISC Factor structure	$\chi^2_{S-B}$ ( <i>df</i> )	CFI	TLI	RMSEA	90% CI
5-factor model with 25 items <sup>1</sup>	526.916(265)**	.908	.896	.046	.040, .052
1-factor model with 10 items <sup>2</sup>	54.767(35)*	.974	.966	.035	.015, .052
2-factor model with 25 items <sup>3</sup>	619.516(274)**	.879	.868	.052	.047, .058
3-factor model with 25 items <sup>4</sup>	562.558(272)**	.898	.888	.048	.042, .054
1-factor model with 10 items <sup>5</sup>	63.843(35)**	.973	.965	.042	.025, .058

*Note.*  $\chi^2_{S-B}$  = Satorra-Bentler scaled chi-square; *df* = degrees of freedom; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; RMSEA = Root Mean Square Error of Approximation; 90% CI = 90% confidence interval of the RMSEA.

<sup>1</sup> Connor & Davidson, 2003, <sup>2</sup> Campbell-Sills & Stein, 2007, <sup>3</sup> Fu et al., 2014, <sup>4</sup> Jorgensen & Seedat, 2008, <sup>5</sup> Guzmán et al., 2019.

\*  $p < .05$ . \*\*  $p < .001$ .

**Table 2**

*Item statistics for the CD-RISC-10*

Item	Measure	S.E. Measure	Infit	Outfit
1	-0.999	0.0536	0.935	0.983
4	-0.948	0.0530	0.708	0.719
6	-0.724	0.0509	1.001	0.990
7	-0.351	0.0485	0.960	0.980
8	-1.347	0.0581	1.377	1.255
11	-1.206	0.0561	0.807	0.806
14	-0.211	0.0480	1.232	1.235
16	-0.356	0.0485	1.196	1.225
17	-1.043	0.0541	0.919	0.870
19	-0.558	0.0497	0.957	1.003

*Note.* Measure = item difficulty; S.E. Measure = Standard Error measure; Infit = Information-weighted mean square statistic; Outfit = Outlier-sensitive means square statistic.

**Table 3**

*Model fit and measurement invariance of the CD-RISC-10 across sex*

	Model		$\chi^2_{S-B}$ (df)	CFI	TLI	RMSEA	90%CI	Ref	$\Delta$ CFI	$\Delta$ RMSEA
1-factor model with 10 items	1	Males	36.016(35)	.996	.995	.011	.000, .049	-	-	-
	2	Females	56.250(35)*	.954	.941	.051	.024, .075	-	-	-
Invariance testing across sex	3	Configural	91.190(70)*	.971	.962	.036	.006, .056	-	-	-
	4	Metric	102.527(79)*	.967	.963	.036	.009, .054	M3	-.004	.000
	5	Scalar	109.808(88)	.970	.969	.033	.000, .051	M4	.003	-.003

*Note.*  $\chi^2_{S-B}$  = Satorra-Bentler scaled chi-square; df = degrees of freedom; CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; 90% CI = 90% confidence interval of the RMSEA; Ref = reference model;  $\Delta$ CFI = change in CFI;  $\Delta$ RMSEA = change in RMSEA.

\*  $p < .05$ . \*\*  $p < .01$ .

**Table 4**

*Likelihood ratio Chi-square statistics of the CD-RISC-10 items*

Item	Statistic	<i>p</i>	<i>Adj.p</i>
1	1.469	0.480	0.762
4	4.299	0.117	0.388
6	4.685	0.096	0.388
7	0.544	0.762	0.762
8	3.263	0.196	0.489
11	5.903	0.052	0.388
14	0.828	0.661	0.762
16	2.374	0.305	0.610
17	0.550	0.760	0.762
19	0.614	0.736	0.762

*Note.* *Adj.p* = The adjusted *p*-values by likelihood ratio test using multiple comparison.

**Table 5**

*Correlation coefficients of the study variables related to the CD-RISC-10*

	CD-RISC-10
Sex	-.24
HRQoL	.57
SDQ	
Emotional Symptoms	-.52
Conduct Problems	-.30
Hyperactivity	-.23
Peer Problems	-.34
Prosocial Behaviors	.23
RCADS-30	
MDD	-.57
PD	-.41
SF	-.44
SAD	-.19
GAD	-.20
OCD	-.34

*Note.* Sex (Male = 1, Female = 2); HRQoL = Health-related quality of life; SDQ = Strength and Difficulties Questionnaire; RCADS-30 = Revised Child Anxiety and Depression Scale-30; MDD = Major Depressive Disorder; PD = Panic Disorder; SF = Social Phobia; SAD = Separation Anxiety Disorder; GAD = Generalized Anxiety Disorder; OCD = Obsessive-Compulsive Disorder.

All correlation values are significant at  $p < .001$ . Cohen's  $d$ -values 0.10, 0.30, and 0.50 correspond to small, medium, and large effects, respectively (Cohen, 1992).