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Article

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

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Abstract

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 psychometric properties of the CD-RISC among Spanish adolescents by means of exploratory factor analysis (EFA), Rasch analysis, and measurement invariance (MI) across sex, as well as internal consistency and criterion validity. The sample was comprised of 463 adolescents (231 girls), aged 12 to 18 years, who completed the CD-RISC and other measures on emotional status and quality of life. The EFA suggested that the CD-RISC structure presented a unidimensional model. Consequently, shorter unidimensional CD-RISC models observed in the literature were explored. Thus, the Campbell-Sills and Stein CD–RISC–10 showed the soundest psychometric properties, providing an adequate item fit and supporting MI and non-differential item functioning across sex. Item difficulty levels were biased toward low levels of resilience. Some items showed malfunctioning in lower response categories. With regard to reliability, categorical omega was. 82. Strong associations with health-related quality of life, major depressive disorder symptoms, and emotional symptoms were observed. 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: adolescents; CD-RISC; factor analysis; measurement invariance; Rasch analysis

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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 have 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, such as 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 this line, resilience interventions improve the levels of resilience and reduce depressive and stress symptoms (see Ang et al., 2022, for a meta-analysis).

The Connor-Davison 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) and recently adolescent populations (Chen et al., 2022). In this sense, just a few studies have examined the factor structure of the original 25-item CD-RISC in large samples of adolescents across cultural settings, whose results show a significant disparity in the structure. Even two studies carried out among Chinese adolescents who

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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, and an EFA suggested a possible 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 (Guarnizo Guzmán et al., 2019) but retaining different items from the Campbell-Sills and Stein CD–RISC–10 (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 (Ari & Çarkit, 2020), the other reported higher levels of resilience in favor of men (Yılmaz Koğar & Gök, 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) based on sex at metric and scalar levels in adults (Gonzalez et al., 2016; Pulido-Martos et al., 2020) and adolescents (Chen et al., 2022; Guarnizo 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.

Rasch analyses, which provide information about item fit, have been conducted on CD-RISC validation studies among adults exclusively. 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 González 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 González et al., 2015; Ehrich et al., 2017; Heritage et al., 2021; Papini et al., 2021; Pulido-Martos et al., 2020), just a study found a differential item functioning in Item 2 "Close and secure relationships", more difficult for men (Arias González et al., 2015). Furthermore, the exploration of item difficulty is essential to check if items effectively discriminate between individuals with different levels of resilience. In this manner, the item difficulty levels of CD-RISC seem to be biased toward low levels of resilience (Arias González et al., 2015; Heritage et al., 2021; Papini et al., 2021). As for item response categories, some studies conducted on the original 25-item CD-RISC (Arias González et al., 2015; Papini et al., 2021) and the 10-item Campbell-Sills and Stein CD-RISC (Heritage et al., 2021; Waddimba et al., 2022) observed non-redundant response categories, with thresholds ascending ordered.

To our knowledge, CD-RISC psychometric properties (i.e., factor and Rasch analyses, and MI across sex) 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.

Due to its inconsistent factor structure across research, the CD–RISC–25 was submitted to an EFA instead of a CFA (Fabrigar et al., 1999). Once the factor structure is checked, we will conduct Rasch analyses, and test MI across sex. The CD-RISC scores will be associated with an extensive nomological network of psychopathological problems and health-related quality of life. It is hypothesized that the resulting CD-RISC model will exhibit positive correlations with positive indicators of mental health and negative ones with negative outcomes (Hu et al., 2015). Specifically, we expect to find moderate to large associations with emotional/depression symptoms and anxiety problems (García-León et al., 2019; Kuiper et al., 2019; Waddimba et al., 2022; Wollny & Jacobs, 2021; Yu et al., 2011), as well as with health-related quality of life (Wollny & Jacobs, 2021). Finally, internal consistency for the final CD-RISC model will be properly estimated.

Method

Participants

Participants were recruited from different high schools located in urban areas of Alicante and Tarragona (eastern Spain). The sample consisted of 463 adolescents (49.9% females), ages 12 to 18 years (M = 14.81, SD = 1.48). Adolescents under 16 years of age, together with their parents/legal guardians, gave written informed consent following the Declaration of Helsinki, whereas adolescents above the age of 16 gave the informed content exclusively.

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., 2001).

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. Categorical omega was. 87.

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, categorical omega of the factors was the following:. 76 for emotional symptoms,. 61 for conduct problems,. 69 for hyperactivity,. 62 for peer problems, and. 66 for prosocial behaviors.

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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*). Categorical omegas were:. 67 for SAD,. 85 for SP,. 82 for GAD,. 82 for PD,. 77 for OCD, and. 82 for MDD.

Procedure

The study was conducted within the framework of the following projects: PSI2017–88280–R, RTI2018–097124–B–100, and PID2019–111138RB–I00/AEI/10.13039/501100011033, funded respectively by the Ministerio de Economía, Industria y Competitividad, the Ministerio de Ciencia, Innovación y Universidades, and the Agencia Estatal de Investigación of Spain.

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This research was approved by the university's Ethical Committees and authorized by the Valencian and Catalan regional education authorities.

Data Analyses

Mplus, version 8 (Muthén & Muthén, 2017), was employed to perform EFAs on the 25 items of the original CD-RISC scale and the subsequent CD-RISC models. Following the recommendations for EFAs suitable for our data (Fabrigar et al., 1999; Goretzko et al., 2021; Izquierdo et al., 2014), we employed the weighted least squares means and variance adjusted (WLSMV) estimator, using polychoric correlations, and oblimin rotation. WLSMV is particularly employed to handle ordinal data which is non-normally distributed. The number of factors was determined by optimal implementation of parallel analysis (Timmerman & Lorenzo-Seva, 2011) with polychoric correlations, as suggested, more appropriate for the skewness of ordinal data than Pearson correlations (Garrido et al., 2013), using the software FACTOR (Lorenzo-Seva & Ferrando, 2006). Furthermore, multiple-group CFAs in Mplus were conducted to assess invariance of the CD-RISC model extracted across sex. Hence, a series of increasingly stringent multiple-group models was conducted (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).

Once the CD-RISC unidimensionality was confirmed, tau-equivalence of items (i.e., equal discrimination parameters) was estimated (Viladrich et al., 2017) in Mplus[1]. Accordingly, Rasch analyses were conducted using the Jamovi (2.3) software (The jamovi project, 2022), through the module snowIRT: Item Response Theory (Seol, 2022). The Polytomous Rasch Model was used to examine the quality of the individual items in the CD-RISC factor model obtained. We employed in fit and outfit statistics, which indicate the information-weighted mean square residuals between observed and expected responses (Linacre, 2002). A Wright map (person-item map), which shows each participant's resilience level and item difficulties ordered from the highest to the lowest levels, was depicted. The goodness of item response categories, based on how much more likely an individual is to choose a higher response category compared to the previous one, given their level of proficiency; was estimated through delta-tau parameterization of the partial credit model (Masters & Wright, 1997). Delta parameters represent the differences between adjacent threshold values or category boundaries of an item, whereas tau parameters represent the threshold values themselves. The threshold values indicate the points along the latent trait continuum where the likelihood of choosing a higher response category increases. In this sense, response option characteristic curves of items were also examined, exhibiting response category probabilities for the five response category options in the scale. In addition, DIF for ordinal data analysis (Hladká & Martinková, 2020) 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).

Spearman correlation coefficients between the CD-RISC final model scores and the rest of the target variables were performed with SPSS, version 28. Categorical omega (Flora, 2020) was calculated through R, version 3.5.0. We used this reliability index, appropriated for categorical data, for the rest of the study scales solely since ordinal alpha requires the assumption of tau-equivalence of items (Flora, 2020; Viladrich et al., 2017). 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.

Goodness-of-fit for the factor analyses was assessed with various indices (West et al., 2012). The chi-square (χ^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). Sex MI adequacy was tested through multiple-group CFAs. The Satorra-Bentler scaled chi-square test, χ^2S-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: ΔCFI $\leq$ 0.01 (Cheung & Rensvold, 2002) and ΔRMSEA $\leq$ 0.015 (Chen, 2007).

For the Polytomous Rasch Model, infit and outfit 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). As for sex DIF, items are considered to present a different performance between groups if they show statistical significance, $p < .05$ (Dorans et al., 1992).

Results

The EFA and the parallel analysis were performed on the CD–RISC–25 and suggested that the CD-RISC items measured a unidimensional construct. Then, the EFAs and the parallel analyses were conducted on the unidimensional 10-item CD-RISC versions (Campbell-Sills & Stein, 2007; Guarnizo Guzmán et al., 2019). The

[1]https://ddd.uab.cat/record/205870

Table 1. Loading Matrix, Item Statistics, and Tau-Parameters for the CD-RISC-10

Item	Factor loading	Measure	*SE* Measure	Infit	Outfit	tau parameters			
						1	2	3	4
1	.572	–0.999	0.0536	0.935	0.983	–0.584	–1.152	0.334	1.403
4	.682	–0.948	0.0530	0.708	0.719	–0.790	–1.435	0.518	1.708
6	.575	–0.724	0.0509	1.001	0.990	–1.070	–0.699	0.666	1.104
7	.635	–0.351	0.0485	0.960	0.980	–1.074	–0.557	0.590	1.042
8	.555	–1.347	0.0581	1.377	1.255	–0.003	–0.478	–0.165	0.646
11	.714	–1.206	0.0561	0.807	0.806	–1.167	–0.912	0.670	1.410
14	.502	–0.211	0.0480	1.232	1.235	–0.665	–0.629	0.279	1.016
16	.528	–0.356	0.0485	1.196	1.225	–0.697	–0.661	0.447	0.912
17	.771	–1.043	0.0541	0.919	0.870	–0.267	–1.045	0.365	0.947
19	.554	–0.558	0.0497	0.957	1.003	–1.893	–0.339	0.897	1.336

Note. Factor loading = Estimator is WLSMV and Rotation is oblimin; Measure = item difficulty; *SE* Measure = Standard Error measure; Infit = Information-weighted mean square statistic; Outfit = Outlier-sensitive means square statistic.

1-factor model of the Campbell-Sills and Stein CD–RISC–10 was confirmed by parallel analysis, whereas the Eigenvalues from the EFA overlapped with those from the parallel analysis in the Guarnizo Guzmán et al. (2019) CD-RISC model. Eigenvalues of the EFAs and parallel analyses for the CD-RISC models are displayed at the online Supplementary material Table S2. The EFA for the Campbell-Sills and Stein CD–RISC–10 (see its factor loading in Table 1) provided a good fit, χ^2 = 83.429 (35), p <. 001; CFI =. 979, TLI =. 973, and RMSEA =. 055, 90% CI [.040,.070]. After supporting the CD–RISC–25 unidimensionality, Guarnizo Guzmán et al. (2019) 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. However, the goodness of fit of Campbell-Sills and Stein's CD–RISC–10 version, supported among adults cross-culturally (Pulido-Martos et al., 2020) and Chinese adolescents (Chen et al., 2022), 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.

Campbell-Sills and Stein's CD–RISC–10 items were shown to be essentially tau-equivalent with acceptable fit indices, CFI and TLI > 0.90 (Marsh et al., 2004), and RMSEA < 0.10 (Weston & Gore, 2006): χ^2 = 192.100 (44), p <. 001; CFI =. 935, TLI =. 934, and RMSEA =. 085, 90% CI [.073,. 098]. Thus, Rasch analyses were suitable. Table 1 shows the Rasch analysis for Campbell-Sills and Stein's CD-RISC-10, including item statistics and tau-parameters. All the infit and outfit values fell in the adequate range (0.708–1.377), showing an adequate model fit to the data. Figure 1 represents the Wright map of the Campbell-Sills and Stein's CD–RISC–10. It indicates that participant's resilience level presented wide distribution, albeit the item difficulty levels showed biased toward low levels of resilience, and high participant's resilience levels were not covered. The thresholds between response categories generally followed a similar trend for all the items (i.e., individuals with higher latent trait levels are more likely to choose higher response categories). However, Item 8 presented low discriminant power at the first 3 tau parameters; whereas Items 1, 4 and 17 did so at the first 2 tau parameters. In this line, Figure 2, via response option characteristic curves, illustrates this overlap among the corresponding response categories of these items and supports the adequacy of the other item's response category distributions.

The results of the MI across sex of the CD–RISC–10 are presented in Table 2. 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 3).

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 4). 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, prosocial behavior and symptomatology of SAD and GAD. Furthermore, the Campbell-Sills and Stein CD–RISC–10 presented good internal consistency (Categorical omega =. 82).

Discussion

The current study explored the psychometric properties of the CD-RISC in Spanish adolescents. Factor structure, Rasch analyses, MI by sex, and criterion validity regarding mental health outcomes were tested on the best CD-RISC model extracted.

The EFA conducted on the CD–RISC–25 suggests that resilience assessed by this scale is a unitary construct, in line with previous research (Burns & Anstey, 2010; Campbell-Sills & Stein, 2007; García-León et al., 2019; Guarnizo Guzmán et al., 2019). By contrast, other studies propose the existence of more than 1 factor, including the original CD-RISC study (e.g., Connor & Davidson, 2003; Fu et al., 2014; Jorgensen & Seedat, 2008; Yu & Zhang, 2007).

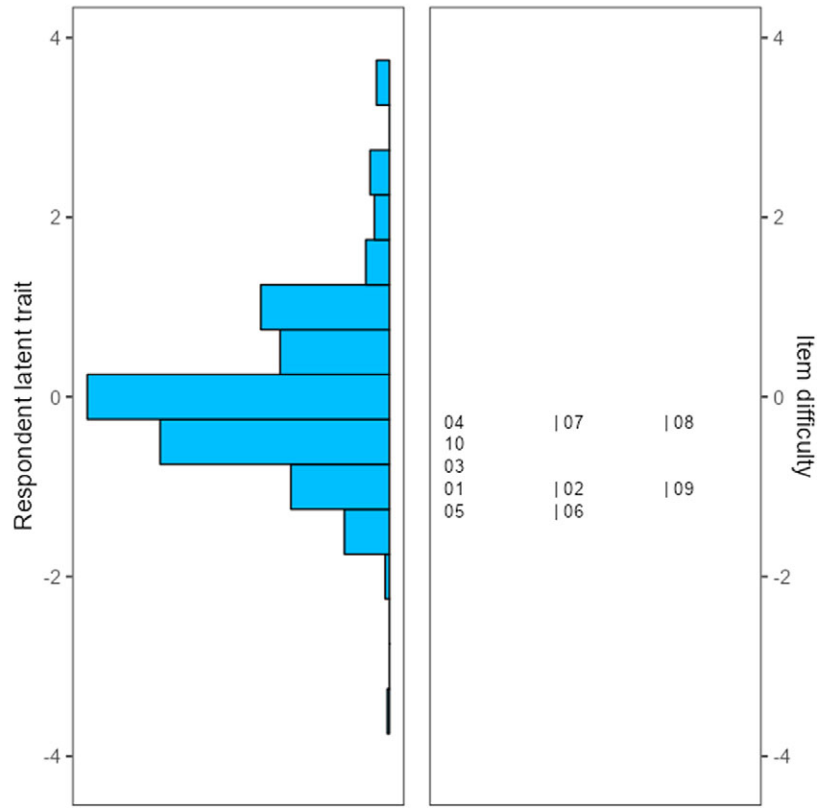

Figure 1. Wright Map (Person-Item Map).
Note. The number of each item corresponds to the CD-RISC-10.

Notwithstanding, these studies present some methodological flaws in the exploratory factor analyses, ignoring the recommendations for good practice (Fabrigar et al., 1999; Goretzko et al., 2021; Izquierdo et al., 2014). These shortcomings include:

1. The use of Principal Component Analysis as extraction method (Jorgensen & Seedat, 2008; Fu et al., 2014; Yu & Zhang, 2007), which is considered less sensitive than other methods.
2. The misestimation in the number of factors using just the eigenvalue as a criterion without conducting complementary analyses such as parallel analyses (Connor & Davidson, 2003; Jorgensen & Seedat, 2008; Yu & Zhang, 2007).
3. The employment of orthogonal rotation (e.g., Orthomax, Varimax, etc.) impeding factor intercorrelations (Connor & Davidson, 2003; Jorgensen & Seedat, 2008; Yu & Zhang, 2007).
4. And finally, the arbitrariness to justify the identification of factors composed by items conceptually different (Connor & Davidson, 2003; Fu et al., 2014; Jorgensen & Seedat, 2008; Yu & Zhang, 2007).

Accordingly, the 10-item unidimensional CD-RISC of Campbell-Sills and Stein emerged as the most appropriate model, in agreement with analyses conducted in Spanish adult population (Pulido-Martos et al., 2020). This model has also been previously supported among adolescent samples (Chen et al., 2022). When the psychometric properties of the different CD-RISC versions are compared (Burns & Anstey, 2010; Gonzalez et al., 2016; Peng et al., 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; Guarnizo Guzmán et al., 2019; Jorgensen & Seedat, 2008). In this sense, the Colombian CD–RISC–10 version for adolescents (Guarnizo Guzmán et al., 2019), which shares just 3 items with the Campbell-Sills and Stein's CD–RISC–10, was developed when the CD–RISC–25 emerged as a 1-factor construct. Yet, the Campbell-Sills and Stein's CD–RISC–10, which followed a conceptual approach to coherently define the resilience factor, was not tested on such adolescent sample. In short, the findings of the present study are in line with this trend, suggesting that the Campbell-Sills and Stein CD–RISC–10 model is also the best to assess resilience in adolescents.

Rasch analyses confirmed the goodness of fit of all 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). Our data showed that the CD–RISC–10 presented a balanced distribution of participants according to levels of resilience. However, item difficulty levels scarcely discriminated in high levels of resilience, a finding frequently observed in previous CD-RISC studies (Arias González et al., 2015; Heritage et al., 2021; Papini et al., 2021). The inclusion of new difficult items may be considered in the CD–RISC–10 to discriminate better among highly resilient participants. Our findings also indicate that some CD–RISC–10 items present response category misfits, especially on Items 8 (to a larger extent), 1, 4, and 17 in their first categories, unlike adult samples (Heritage et al., 2021; Waddimba et al., 2022).

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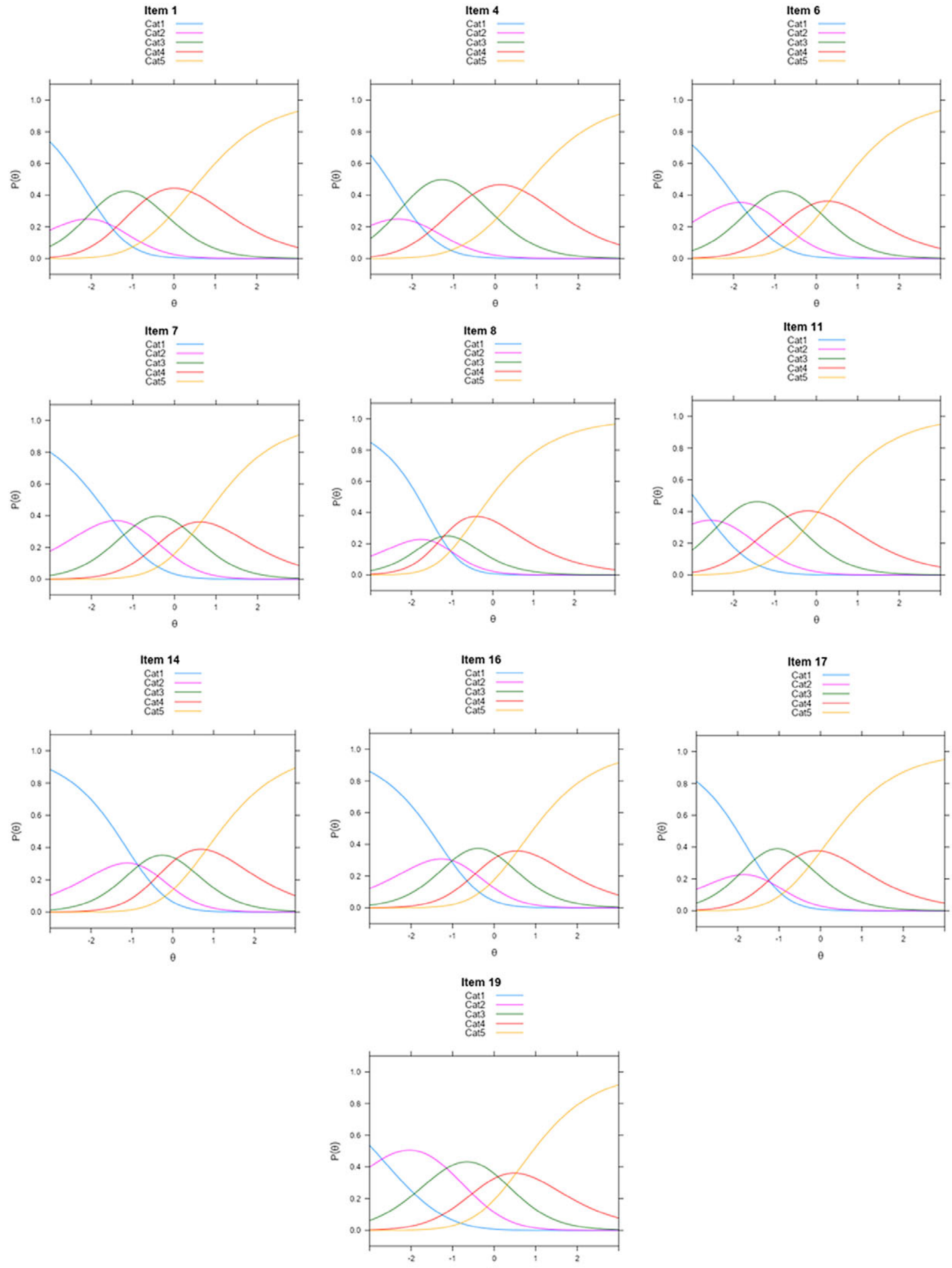

Figure 2. Response Option Characteristic Curves for the Items of the CD-RISC-10.

Regarding sex and resilience, the present study shows MI across sex of Campbell-Sills and Stein's CD–RISC–10 in Spanish adolescents, replicating findings from adults (Gonzalez et al., 2016; Pulido-Martos et al., 2020) and other adolescent samples (Chen et al., 2022). Despite our sex balanced sample, independent CFAs for sex indicated that girls presented a slightly worst, albeit still good, fit; in line with previous research (Chen et al., 2022; Pulido-Martos et al., 2020). The absence of DIF across sex was also

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Table 2. Model fit and Measurement Invariance of the CD-RISC-10 Across Sex

	$\chi^2_{S\text{-}B}$ (*df*)	CFI	TLI	RMSEA	90% CI	Ref	ΔCFI	ΔRMSEA
				1-factor model with 10 items				
M1. Males	55.748(35)*	.977	.971	.051	[.023,. 075]	–	–	–
M2. Females	78.536(35)**	.965	.954	.073	[.052,. 095]	–	–	–
				Invariance testing across sex				
M3. Configural	132.421(70)**	.971	.963	.062	[.046,. 078]	–	–	–
M4. Metric	131.392(79)**	.976	.972	.054	[.037,. 069]	M3	.005	–.008
M5. Scalar	169.452(108)**	.972	.976	.050	[.035,. 064]	M4	–.004	–.004

Note. χ2S-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; MX. = number of reference model; Ref = reference model; ΔCFI = change in CFI; ΔRMSEA = change in RMSEA.
*p <. 05. **p <. 001.

Table 3. Likelihood Ratio Chi-square Statistics of the CD-RISC-10 Items

Item	Statistic	*p*	*Adj.p*
1	1.469	.480	.762
4	4.299	.117	.388
6	4.685	.096	.388
7	0.544	.762	.762
8	3.263	.196	.489
11	5.903	.052	.388
14	0.828	.661	.762
16	2.374	.305	.610
17	0.550	.760	.762
19	0.614	.736	.762

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

Table 4. 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).

supported in the CD–RISC–10, 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 (Ari & Çarkit, 2020), and the other displayed higher levels of resilience in favor of males (Yılmaz Koğar & Gök, 2021). These findings may be substantially explained by the use of different instruments to assess resilience across studies.

Therefore, the core of resilience, independently from the socio-cultural setting and developmental stage, appears to encompass the hardiness and persistence aspects assessed by the CD–RISC–10 of Campbell-Sills and Stein. In the present study, high positive correlations were observed between the CD–RISC–10 and health-related quality of life, whereas an inverse pattern was shown with MDD and emotional symptoms; in line with the literature (Kuiper et al., 2019; Waddimba et al., 2022; Wollny & Jacobs, 2021). Accordingly, stronger relationships were found with psychopathological variables for the CD–RISC–10 compared to the CD–RISC–25 (Kuiper et al., 2019). 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).

The current study is not without limitations. Firstly, the participants comprise a convenience sample obtained from different high schools in Spain. In this sense, the use of larger samples of adolescents would imply better statistical power of the findings. In addition, the data was self-reported and, therefore, subjected 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;

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Pulido-Martos et al., 2020). And finally, the CD–RISC–10 items present problems to discriminate among adolescents with high levels of resilience. Despite these limitations, our research provides meaningful data, examining the best CD-RISC model to assess adolescent resilience, something scarcely explored in the literature (Fu et al., 2014; Guarnizo 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. 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, initially suggested among this age group (Chen et al., 2022) and highly supported in adult populations (Pulido-Martos et al., 2020).

Supplementary material. The supplementary material for this article can be found at http://doi.org/10.1017/SJP.2024.3.

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Data sharing. The data is openly available in Open Science Framework (OSF) at https://osf.io/f7rp3/?view_only=1cdcc49bc31d46f4a9f6ebdc4bdfbdd6.

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