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A multi-group confirmatory factor analysis of the revised children's anxiety and depression scale (RCADS) in Spain, Chile and Sweden

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ABSTRACT

Background: There is a need for a measure that can be used across countries and cultures to advance cross-cultural research about internalizing mental health symptoms in children and adolescents. The Revised Children's Anxiety and Depression Scale (RCADS) is a potential candidate, but no study has examined whether its scales are measured similarly in youth populations from different countries.
Methods: In this study, we use confirmatory factor analysis (CFA) and multi-group CFA to examine the cross-cultural properties of a short and free to use 30-item version of RCADS that assesses social, generalized, panic, and separation anxiety alongside depression and obsessive-compulsive symptoms. We tested the factor structure of RCADS in children and adolescents from Chile, Spain, and Sweden, recruited using different research designs (i.e., school-based studies and an anonymous web survey), and whether the factor structure showed measurement invariance across the three countries.
Results: The proposed factor structure of RCADS showed good model/data fit in all three countries and was superior to a unidimensional model in which correlations among scale items were explained by a single broad internalizing factor. Each RCADS subscale showed adequate to excellent internal consistency in all three countries and multi-group CFA supported scalar invariance across the three countries.
Limitations: No clinical sample was included.
Conclusions: This study provides an important first step in supporting the use of RCADS in cross-cultural research on depression, anxiety and obsessive-compulsive symptoms in children and adolescents, but more work on validity aspects of the scale across cultures is needed.

1. Introduction

Mental health problems are common in children and adolescents and are a major cause of impairment in day-to-day functioning (Gore et al., 2011; Suhrcke et al., 2008). The most common forms of mental health problems in youth involve emotional distress (e.g., depression and anxiety) (Polanczyk et al., 2015; Potrebny et al., 2017). At any given moment around 6% of youth suffer from an anxiety disorder and 3% from a depressive disorder, with depression rates increasing with age (Polanczyk et al., 2015; Potrebny et al., 2017).

Self-report questionnaires are important tools for assessing depression and anxiety in children and adolescents and a range of questionnaires have been developed, such as the *Children's Depression Inventory* (CDI; Kovacs, 2015), the *State-Trait Anxiety Inventory for Children* (STAI-C; Spielberger, 1973), the *Multidimensional Anxiety Scale for Children* (MASC; March et al., 1997), the *Revised Children's Manifest Anxiety Scale* (RCMAS; Reynolds and Richmond, 1978), the *Screen for Child Anxiety Related Emotional Disorders* (SCARED; Muris et al., 1998); the *Spence Children's Anxiety Scale* (SCAS; Spence, 1997, 1998); and the *Youth Anxiety Measure for DSM-5* (YAM-5; Muris et al., 2016). This plethora of measures have led to different measures being used by different research teams, hampering pooling of data, cross-cultural comparisons and research syntheses (e.g., meta-analyses).

To facilitate the comparison and pooling of results from different

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research teams around the world, there have been calls from the research community to settle on a smaller number of measures, which should include symptom items across several diagnostic categories (Sandín et al., 2009). The *Revised Child Anxiety and Depression Scale* (RCADS; Chorpita et al., 2000) may meet the current needs of the field. First, the RCADS includes scales that cover the most common anxiety disorders in youth, as well as a scale for depression. Depression and anxiety are highly co-occurring in youth, so this is an advantage compared to many other self-report scales that only assess depression *or* anxiety. Second, the RCADS includes a scale for obsessive-compulsive disorder (OCD) which is underdetected, underdiagnosed and undertreated in child and adolescent mental health settings. Third, the RCADS has shown promising psychometric properties across languages. Fourth, a short-version of the RCADS (composed of just 30 items) may adequately measure symptoms across the spectrum of anxiety, depression and OCD in youth, making the scale feasible in both clinical and research settings.

RCADS was developed from the *Spence Children's Anxiety Scale* (SCAS; Spence, 1998), following the DSM-IV criteria. The initial version included 47 items (RCADS-47) and six subscales: separation anxiety disorder (SAD), social phobia (SP), generalized anxiety disorder (GAD), panic/agoraphobia (PD), OCD and major depressive disorder (MDD) (Chorpita et al., 2000; Sandín et al., 2009). RCADS has proven to be a valid measure for the detection and assessment of anxiety and depression in both clinical and non-clinical samples of children and adolescents, ranging from 10 to 18 years of age (Piqueras et al., 2017a; Stevanovic et al., 2017). Likewise, the RCADS scales have been shown to be positively correlated with others instruments employed for the detection and assessment of anxiety and depression disorders, such as CDI (Kovacs, 2015) and SCARED (Muris et al., 1998) in child and adolescent clinical samples (Chorpita et al., 2005; Gormez et al., 2017; Piqueras et al., 2017b). RCADS also shows adequate sensitivity/specificity to detect clinical diagnoses of anxiety and depression (Ebesutani et al., 2010). Furthermore, sound psychometric properties of the measure have been shown in both clinical and non-clinical samples in meta-analyses and cross-cultural studies, and Spanish and Chilean participants have been included in these studies (Piqueras et al., 2017a; Stevanovic et al., 2017). For these reasons, RCADS has been included as a measure within international protocols for the transdiagnostic prevention and treatment approach of emotional disorders (i.e., depression, anxiety and related disorders) in adolescents (Ehrenreich-May et al., 2018; García-Escalera et al., 2020; Mohammadi et al., 2019; Sandín et al., 2019). RCADS has also been proposed as the standard outcome measure in research on anxiety and depression in youth (Krause et al., 2021). Further, the scale is publicly available and free to use without any costs.

Regarding internal consistency of the RCADS scales, a meta-analysis, which included multinational studies, found that the mean Cronbach's alpha value was excellent for both the total score ($\alpha = 0.93$) and for the overall anxiety scale ($\alpha = 0.93$), while alphas for the narrower subscales ranged from 0.74 to 0.85 in clinical and non-clinical samples (Piqueras et al., 2017a). Concerning moderators for reliability, no differences across countries, languages, or clinical/non-clinical samples appeared, neither for the total score nor for the SAD or OCD scales. However, for the SP, PD, GAD, and MDD scales, the mean reliability was higher for U. S. samples (Piqueras et al., 2017a). Evidently, several studies indicate that the RCADS has promising psychometric properties across countries and settings, but no study has conducted a formal test of whether the same constructs are measured, that is, whether measurement invariance is present. This is crucial since measurement invariance is a prerequisite for comparison of scores across samples. There are several possibilities that measurement invariance may not be present since norms, conceptualizations and semantics related to mental health, emotions, and distress may differ across countries (e.g., Koh et al., 2007). On the other hand, research indicates substantial cross-cultural consistency in the ways in which mental health problems manifest in childhood and adolescence (Crijnen et al., 1997). Thus, to which degree the RCADS exhibits measurement invariance across countries remains unanswered.

In accordance with research demands for short, multidimensional clinical measures, the RCADS has been adapted and developed with the main goal of reducing the number of items (Piqueras et al., 2017a; Sandín et al., 2009). For instance, Ebesutani et al. (2012) reduced the original RCADS to a shorter 25-item version. Later, a 30-item version was developed (RCADS-30) in which the six original subscales were retained (Sandín et al., 2010). This version has shown psychometric properties similar to the original, 47-item version (Pineda et al., 2018). Thus, currently there are 47-, 25- and 30-item versions of the RCADS. A meta-analysis found that the shorter versions had similar correlations among items, but that the 30-item version showed better internal consistency than the 25-item version (Piqueras et al., 2017a). Further, the OCD scale is not included in the 25-item version. Given the short format and the intactness of the original scales, the 30-item version of RCADS appears to be most useful for broad self-report assessment of depression, anxiety, and OCD in youth.

Using confirmatory factor analysis (CFA), the proposed six-factor structure of RCADS has shown adequate model/data fit for both the 47- and 30-item versions (e.g., Donnelly et al., 2019; Fontana et al., 2019; Pineda et al., 2018; Piqueras et al., 2017b; Stevanovic et al., 2017; Gormez et al., 2017; Martínez-González et al., 2020; Trent et al., 2013). Some studies have found that a five-factor model, called the RCADS-25, in which the OCD factor was removed, showed superior model/data fit (Muris et al., 2002). Later, Ebesutani et al. (2012) used exploratory bifactor modeling to develop a shortened RCADS, also called RCADS-25, that consisted of a reduced 15-item total anxiety scale and a 10-item MDD scale, which was identical to the MDD scale of the original version. Researchers have also analyzed a two-factor anxiety/depression structure (Ebesutani et al., 2012; Perkins and Alos, 2020) as well as a one-factor model (Chorpita et al., 2005; de Ross et al., 2002) and hierarchical models (Brown et al., 2013). Thus, there are several versions of the RCADS available, with partly different item constellations, that all show adequate psychometric properties.

Despite that work has been conducted in relation to the factor structure of RCADS, no study has examined whether the proposed six-factor RCADS structure is similar across languages and cultures (i.e., whether symptoms are endorsed in similar patterns across samples). This is a very important gap in the literature as language and cultural differences could hamper cross-cultural research and hinder researchers that aim to pool data in international research collaborations. The construct properties of a scale across different settings can be tested by examining measurement invariance. This is a statistical analysis that tests the degree to which measured constructs are measured similarly across populations. Empirical evidence for invariance for the RCADS-30 across cultures is an important first step in evaluating whether it can be used in cross-cultural research and would lend support to its status as a global measure of internalizing symptoms in youth, regardless of language or culture (Krause et al., 2021; Piqueras et al., 2017a; Stevanovic et al., 2017).

A study by Stevanovic et al. (2017) is the only study that has examined some aspects of measurement invariance of the RCADS across countries. The authors used a multiple-indicators, multiple-causes (MIMIC) model to test the 47 items of the original RCADS for differential item functioning (DIF) across 11 countries (Brazil, Bulgaria, Croatia, Indonesia, Montenegro, Nigeria, Palestinian Territories, the Philippines, Portugal, Romania and Serbia). When all cross-country comparisons were considered, ten items were found to be non-invariant (i.e., responses to items differed across countries), but few items were non-invariant in head-to-head comparisons. The authors concluded that the RCADS showed high cross-cultural validity. However, the above-mentioned study did not test for measurement invariance but only for invariance for specific items and not the latent constructs that these items are supposed to represent (e.g., depression, social anxiety). A well-suited statistical method to examine the latter is multi-group

confirmatory factor analysis (MG-CFA; Brown, 2015, p.245). Using MG-CFA, the properties of a measure's latent dimensions are examined and the degree to which a measure psychometrically captures the same constructs across populations can be directly tested. The latent dimensions of the RCADS correspond to its subscale scores, which are the scores typically used in research and clinical practice. Measurement invariance across groups is a prerequisite for interpretable and meaningful comparisons (e.g., Tam and Milfont, 2020). Therefore, an important first step in evaluating whether RCADS can be used in cross-national research and comparisons, is to test whether its subscales capture similar psychometric constructs across languages and cultures.

In this study we examine the psychometric properties of the 30-item version of RCADS in youth from Chile, Spain and Sweden. We first examine model/data fit of the proposed six-factor structure and internal consistency of all subscales in each country separately. We then test, using MG-CFA, whether the proposed factor structure show measurement invariance across the countries. Based on the item invariance study by Stevanovic et al. (2017) and adequate psychometric properties of the RCADS when evaluated in specific countries, we expected RCADS to show at least scalar invariance across countries, which implies that differences in scores are due to group differences and not differences in the psychometric constructs.

2. Methods

2.1. Participants and ethics

For the psychometric evaluation of the RCADS-30, we analyzed three samples of children and adolescents from Chile (n = 1016), Spain (n = 815), and Sweden (n = 407). The Chilean sample consisted of school-children from two schools in the metropolitan area of Santiago de Chile and two schools located in the south of Chile (in the sixth and ninth region). Eighteen participants were excluded: 11 for difficulties in reading comprehension or possible intellectual functioning difficulties, and seven who provided incomplete responses to questionnaires. No incentives were offered to participants. The Chilean participants completed the questionnaire in a pen-and-paper format.

The participants in the Spanish sample came from a city that has around 26.000 citizens from the Region de Murcia, in the southeast of Spain. 438 participants (53.7%) filled in the questionnaire on paper and pencil (372 secondary schools, 75%) and 377 online (175 secondary schools, 46%). There was no statistically significant difference for the mean total score of RCADS-30 between the paper and pencil and online response modality ($t = -0.445$; $p = .66$). No participants were excluded and no incentives were offered to participants.

The Swedish sample was recruited within a broader study investigating the psychometric properties of dimensional measures of psychopathology in children and adolescents. Recruitment for the Swedish study was carried out online using a web survey and all participants completed the RCADS alongside other measures of psychopathology. Swedish participants were anonymous and provided informed consent before completing the measures. Advertisement for the study was conducted through social media. No incentives were offered to participants. Parental consent was waived by the ethical review authorities since the online nature of the survey did not allow for collection of personal data (i.e., the survey was anonymous and did only collect broad background information).

The respective studies were approved by the ethics committee of Miguel Hernández University (Alicante, Spain; reference number DPS-JPR-001-10) and the Swedish Ethical Review Authority (reference number 2018/668). For the research in Chile, the procedure for field work was carried out following all the requirements established by the University of Santiago de Chile (USACH). The consent process for the Spanish and Chilean studies followed the same procedure that received ethics approval for similar research in schools; first, eligible schools were provided with information about the study, and interested schools signed written confirmation that their school wanted to participate. Second, schools provided a parental consent letter explaining the minimal risk and potential benefits associated with participation in the study and informed parents that they could withdraw their child from the study at any time. Third, all eligible children and adolescents were provided with information about the study, and they (only those between 10 and 19 years old) signed a written consent form to participate.

The same Spanish version of the RCADS-30 was used in Chile and Spain. The European Spanish version of the RCADS-30 was revised by two expert Chilean psychologists and one Spanish psychologist who corroborated the cultural equivalence of the items. Subsequently, the clarity and easy comprehension of the items were verified in a pilot trial with 30 participants: 12 children (6 boys and 6 girls), and 18 adolescents (8 boys and 10 girls) of the metropolitan area of Santiago de Chile. No comprehension difficulties were found, and therefore the vocabulary could be kept in European Spanish language. As a result of this exploration, it was concluded that it was not necessary to modify the original wording of the instrument. Therefore, the RCADS retro-translation was not necessary in the Chilean study. The Swedish version of the RCADS was translated as part of "Barninternetprojektet" which is a broad research project aimed at examining the efficacy of internet-delivered treatments for children and adolescents with emotional disorders. A translation-backtranslation process in line with the WHO guidelines was followed. Participant characteristics and scores on the RCADS-30 subscales across samples are presented in Table 1.

2.2. Measures

2.2.1. 30-item version of the Revised Child Anxiety and Depression Scale (RCADS-30; Sandín et al., 2010)

The RCADS-30 is composed of 30 items and the six subscales described in the introduction: SAD (5 items, e.g., "I feel scared if I have to sleep on my own"), SP (5 items, e.g., "I feel afraid that I will make a fool of myself in front of people"), GAD (5 items, e.g., "I worry that bad things will happen to me"), PD (5 items, e.g., "My heart suddenly starts to beat too quickly for no reason"), OCD (5 items, e.g., "I get bothered by bad or silly thoughts or pictures in my mind") and MDD (5 items, e.g., "I feel sad or empty"). All items are scored on a 0 to 3 scale (*Never* to *Almost always*). The best cut-off score for the diagnosis of a depressive disorder has been shown to be 29 points, and 24 points for an anxiety disorder on the RCADS-30 total score. Similarly, the cut-off scores assigned to each RCADS-30 subscales are: 5 (SF), 5 (PD), 8 (SAD), 7 (GAD), 4 (OCD), and 4 (MDD) in a clinical Spanish population (Piqueras et al., 2017b). There are no cut-off scores based on Swedish and Chilean data.

2.3. Data analysis plan

All analyses in the present study were carried out in R Studio, version 1.1.447 using the R packages *lavaan, psych* and *semTools*. Polychoric correlation matrices and the diagonally weighted least squares estimator were used in all analyses because of the ordinal nature of the RCADS items. Using this estimation method, the distribution of responses does not have to be normal but the underlying latent factor is assumed to be normally distributed. The R code is included as a Supplement.

2.3.1. Model-data fit

To examine the fit of the proposed six-factor model of the RCADS-30, we first performed separate confirmatory factor analyses (CFAs) in each country. The fit of the original model was compared to the fit of a unidimensional model, where item correlations were explained by as single broad internalizing factor. Last, we tested model/data fit of a higher-order model, where the six RCADS subscales load onto a broad internalizing factor. We used a global interpretation of the following fit indices to evaluate model fit: Confirmatory Fit Index (CFI), Root Mean Square Error of Approximation (RMSEA) and Standardized Mean Square Residual (SRMR). RMSEA below 0.06, SRMR below 0.08 and CFI and TLI

Table 1
Participant characteristics across samples together with mean scores on the RCADS-30 subscales for the different samples.

Sample	n	% Girls	Age *M* (*SD*) Min-max	RCADS-30 Depression *M* (*SD*) Min-max	RCADS-30 Social Anxiety *M* (*SD*) Min-max	RCADS-30 Panic *M* (*SD*) Min-max	RCADS-30 Generalized Anxiety *M* (*SD*) Min-max	RCADS-30 Separation Anxiety *M* (*SD*) Min-max	RCADS-30 OCD *M* (*SD*) Min-max
Chile	1016	39.6	14.83 (2.10) 10–19	4.16 (2.79) 0–15	5.02 (3.50) 0–15	2.42 (2.78) 0–15	6.95 (3.17) 0–15	1.74 (2.23) 0–15	3.69 (2.75) 0–15
Spain	815	51.5	13.29 (2.20) 10–18	3.44 (2.56) 0–15	4.83 (3.37) 0–15	1.79 (2.37) 0–15	7.20 (3.53) 0–15	1.87 (2.44) 0–14	3.36 (2.90) 0–14
Sweden	407	73.5	16.36 (2.15) 10–19	6.45 (3.65) 0–15	7.89 (4.01) 0–15	2.97 (3.33) 0–15	6.51 (3.44) 0–15	3.03 (3.03) 0–15	3.66 (3.19) 0–15

Notes. Missing data for the Spanish sample for mean and standard deviation estimations for the RCADS-30 subscales ranged from 0.1% to 0.4%. Missing data for the Swedish sample ranged from 5% to 15%. No missing data were present in the Chilean sample. OCD = Obsessive-compulsive disorder.

estimates greater than 0.90 are indicative of acceptable model-data fit; CFI and TLI estimates above 0.95 are indicative of good model-data fit (Hox et al., 2017). Scaled fit indices were used because of the ordinal nature of the data. The proportion of missing data was low in all three samples (Spain: 0.03%; Chile: 0.0%; Sweden: 3.3%) and missing data were handled using pairwise deletion within the CFA models.

2.3.2. Factorial invariance

To examine whether the proposed six-factor structure was invariant across countries, we used a MG-CFA approach developed for ordinal indicators (Wu and Estabrook, 2016). First, we tested for configural invariance, which indicates a similar factor structure across settings (i.e., the same items load onto the same factors across groups). Second, we tested for scalar invariance (the same thresholds and factor loadings across groups) which is the minimum level of invariance required to conduct cross-group comparisons, as it implies that differences in scale scores are caused by differences in groups and not in the psychometric constructs measured. For scalar invariance, we chose to constrain threshold and loadings in tandem as these parameters are dependent upon each other to define item functioning. Last, we tested for strict invariance (same factor loadings, thresholds and residuals across samples). There is no agreed-upon way to establish factorial invariance, but most sources recommend that a CFI change (ΔCFI) < 0.01 is indicative of factorial invariance across two models (Hirschfeld and Von Brachel, 2014; Kim et al., 2017). We followed the ΔCFI <0.01 guideline when interpreting our results.

2.3.3. Internal consistency

To examine the internal consistency of each subscale in each country, we computed Cronbach's alpha and McDonald's omega values. The latter reliability index has shown better properties, as it is based on a decomposition of the variance of measurement instrument within a factor analysis model which does not depend on the number of items (Cortina et al., 2020). Acceptable internal consistency is indicated by alpha and omega values above 0.70. Values above 0.80 are preferred.

3. Results

3.1. Model fit and internal consistencies in each country

We first tested, using CFA, the degree to which the original six-factor model fit to the data in each individual country. The model showed adequate fit in all three countries (Table 2) and superior fit compared to the unidimensional mode, which showed poor fit according to all fit indices in all countries. Internal consistency estimates for all scales were adequate to excellent (Table 3), with the MDD and OCD scales showing slightly lower internal consistency than the other scales. In all countries, all items loaded significantly onto their proposed factor and all loadings were above 0.50 (and a vast majority above 0.70) except one of the items of the GAD scale that had a loading just below 0.50 in Chile and Spain ("I worry about things").

The fit of the original six-factor model using the Swedish sample was somewhat poorer compared to the fit using the Chilean and Spanish samples. We explored ways to improve the fit using modification indices (MI), which is a method that aims to increase model fit by removing model restrictions. MI suggested the addition of two correlated residual pairs: items 3 and 4 of the GAD scale ("I worry that bad things will happen to me", " I worry that something bad will happen to me") and items 1 and 3 of the SAD scale ("I would feel afraid of being on my own at home", "I feel scared if I have to sleep on my own"). In a model where these residuals were allowed to correlate, model fit was adequate (CFI = 0.944, TLI = 0.937, RMSEA = 0.070, SRMR = 0.071). The model with correlated residuals for these two item pairs also showed improved fit using the Chilean (CFI = 0.944, TLI = 0.938, RMSEA = 0.051, SRMR =

Table 2
Results of the separate and multi-group CFAs.

	df; χ2	p	CFI	ΔCFI	TLI	RMSEA	SRMR
Chile							
Original model	390; 1496.3	<0.001	0.939	–	0.932	0.053	0.057
Unidimensional model	405; 3829.0	<0.001	0.810	–	0.796	0.091	0.091
Higher-order model	399; 1786.2	<0.001	0.923	–	0.916	0.059	0.065
Spain							
Original model	390; 1275.2	<0.001	0.941	–	0.934	0.053	0.062
Unidimensional model	405; 2802.0	<0.001	0.840	–	0.828	0.085	0.093
Higher-order model	399; 1423.2	<0.001	0.932	–	0.926	0.056	0.067
Sweden							
Original model	390; 1361.1	<0.001	0.929	–	0.921	0.078	0.076
Unidimensional model	405; 2591.7	<0.001	0.841	–	0.829	0.115	0.105
Higher-order model	399; 1379.8	<0.001	0.928	–	0.922	0.078	0.080
Multi-group CFA, Countries							
Configural	1170; 4125.9	<0.001	0.936	–	0.928	0.058	0.062
Scalar	1278; 4173.8	<0.001	0.937	+0.001	0.935	0.055	0.068
Strict	1338; 4301.0	<0.001	0.935	−0.002	0.937	0.055	0.068

Notes. CFA = Confirmatory factor analysis.

Table 3
Internal consistency coefficients in the form of Cronbach's Alpha and McDonald's o Omega for each subscale in each sample.

		Depression	Panic	Separation	Social anxiety	GAD	OCD
Chile	Alpha	0.80	0.88	0.83	0.83	0.80	0.74
	Omega	0.77	0.85	0.73	0.82	0.82	0.72
Spain	Alpha	0.80	0.86	0.85	0.81	0.84	0.78
	Omega	0.73	0.81	0.78	0.79	0.86	0.75
Sweden	Alpha	0.91	0.91	0.84	0.89	0.88	0.84
	Omega	0.89	0.91	0.90	0.89	0.92	0.86

0.055) and Spanish (CFI = 0.947, TLI = 0.941, RMSEA = 0.050, SRMR = 0.060) samples, but the increase in data-model fit was lower in these two samples. To keep with the original model, we did not include correlated residuals in the subsequent analyses.

Adequate model fit was retained for the higher-order model, compared to a model where the factors were allowed to correlate freely, using the Spanish and Swedish samples, but a somewhat larger decrease in model fit was found using the Chilean sample. In all countries, each RCADS subscale loaded significantly onto the broad internalizing factor and all standardized loadings were above 0.70 except for separation anxiety using the Spanish sample (standardized loading = 0.65).

3.2. Testing measurement invariance

We used the original 6-factor model where the six latent factors were allowed to correlate freely to test for measurement invariance. Results are presented in Table 2. The test for configural invariance showed adequate fit indices, indicating that the same items loaded onto the same factors in each country. The test for scalar invariance (i.e., constraining thresholds and loadings across groups) indicated only a slight decline in model-data fit, with the CFI in the more constrained model actually being 0.001 points higher; indices that took parsimony into account also showed similar fit while the SRMR index indicated a slight decrease in fit. The test for strict invariance (i.e., equal residuals across samples) supported strict invariance as the decrease in fit was minor, with a 0.002 point reduction in the CFI index.

After establishing strict measurement invariance, we compared, in a post hoc fashion, the latent means across the groups while adjusting for differences in age and sex. Results indicated statistically significantly higher means in the Swedish group compared to the Chilean group for MDD, SAD, and SP ($ps < 0.01$), no significant different on OCD and PD, and higher score in the Chilean group for GAD ($p < .01$). Significant differences were in the small to moderate range (βs: 0.13 [GAD] to 0.28 [SP]). Compared to the Spanish group, the Swedish group had significantly higher scores on all scales ($ps < 0.01$) except GAD, where the Spanish group had higher scores ($p < .01$). Differences were small for OCD and GAD (βs: 0.13, −0.13) and medium for MDD, SAD, PD, and SP (βs: 0.28 [PD] to 0.36 [MDD]). The Chilean group had significantly higher scores than the Spanish group on MDD, PD, SAD, and OCD ($ps < 0.01$). All differences were in the small range (βs: 0.09, 0.19). Of note, girls had significantly higher scores than boys on all factors in all comparisons ($ps < 0.01$), with differences being in the small to moderate range (βs: 0.10 to 0.31).

4. Discussion

This study evaluated the psychometric properties of the RCADS-30 in three countries with different socioeconomic and cultural backgrounds (Chile, Spain and Sweden) and we carried out a formal test of multi-national measurement invariance across these three countries. The study showed that the original six-factor model of the RCADS-30 had good fit in each country separately. The results for alpha and omega coefficients showed excellent reliability for the PD, GAD and SAD subscales and acceptable reliability for the OCD, SP and MD subscales. Our findings are consistent with previous studies on the internal consistency of the RCADS-30 (Piqueras et al., 2017a). A higher-order model compared to a model where the six RCADS factors were allowed to correlate freely did not result in substantial decrease in model fit. This suggests that the total score of RCADS may work adequately as a broad indicator of internalizing symptoms in youth, which is in line with previous research about sum scores and how they relate to broader symptom factors (Cervin et al., 2020; Patalay & Fried, 2021).

The study confirmed scalar invariance for the original RCADS factor structure across countries. This indicates that all three levels of equivalence are assumed (Van de Vijver and Leung, 2000). Thus, the same constructs can be assumed to be measured in all countries and differences and similarities between latent variables can be interpreted. In the present study, different age groups and recruitment sources were used, which impedes meaningful inference. For example, the Swedish sample was collected using an anonymous online survey, which may have resulted in oversampling of children and adolescents experiencing internalizing symptoms. Despite these differences, strong evidence for measurement invariance was found which further supports the robustness of the RCADS constructs across cultures. We strongly urge future multi-national research to conduct tests for measurement invariance before making cross-cultural inference, and the present study suggests that the RCADS may be a wise measure choice for internalizing mental health symptoms in such research. In a post hoc fashion, we conducted comparisons of factor means across groups while accounting for age and sex differences. Interestingly, higher scores for girls on all factors and all comparisons emerged, indicating cross-cultural consistency. The post hoc analyses also confirmed that the Swedish group generally had the highest burden of internalizing symptoms.

Our findings are partially consistent with an international consensus study presenting a standard set of outcome measures for anxiety, depression, OCD and post-traumatic stress in children and adolescents. This study recommended tracking emotional symptoms using the RCADS (Krause et al., 2020). Specifically, this international consortium recommended the RCADS-25, which does not include the OCD subscale. Instead, for OCD, the study recommended the Obsessive Compulsive Inventory-Child Version (OCI-CV). This may be a wise choice as OCD is very heterogenous (Cervin et al., 2021) and this heterogeneity is not well-captured by the RCADS. However, the five OCD items of RCADS-30 appear to be a general or broad measure of the OC spectrum and future work is needed to see whether the scale adequately captures the full breadth of OCD symptoms that may be experienced by children and adolescents. Which measure to include will depend on the research question. For questions that relate to broad OCD-related symptoms in general populations of youth, RCADS may be sufficient, while more specific OCD-work should consider more detailed OCD scales such as the OCI-CV.

The findings of the present study should be interpreted in the light of some limitations. First, the obtained results can only be extrapolated to Chilean, Spanish, and Swedish youth populations. Second, no clinical sample was included, and it would be important for future research to examine the degree of invariance of RCADS in multi-national clinical samples. Last, the Swedish sample was different than the Chilean and Spanish samples in that it was collected online. This may have led to an oversampling of youth with pronounced mental health problems. In turn, this may have inflated associations between both items and scales

(Fisher et al., 2020), which may be one reason that the fit indices of the original model were somewhat poorer using this sample. Last, the current study is limited to Chilean, Spanish and Swedish youth, and more work is needed to examine invariance aspects across other countries and cultures. This is important since constructs such as anxiety and depression can be influenced by Western ideas that are not always shared in other cultural contexts (Koh et al., 2007). Nevertheless, Stevanovic et al. (2017) reported no clear differences in item invariance attributable to culture, having included countries as varied and diverse as Brazil, Bulgaria, Croatia, Indonesia, Montenegro, Nigeria, Palestinian Territories, the Philippines, Portugal, Romania and Serbia, which are not exclusively Western. In the present study, we bridged the gap between Europe and South America and found strong evidence for measurement invariance.

We conclude that the RCADS-30 shows promise in being a measure of choice when conducting research on internalizing symptoms in children and adolescents aged 10–19 years. It covers GAD, MD, OCD, PD, SAD, and SP, takes less than 10 min to complete, does not come with any costs for non-commercial use, is reliable, available in many different languages (Krause et al., 2021; Piqueras et al., 2017a; Stevanovic et al., 2017) and now has evidence for measurement invariance across youth in Chile, Spain and Sweden. Future research needs to examine validity aspects of RCADS-30 across countries.

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CRediT authorship contribution statement

Matti Cervin: Professor Cervin has performed the psychometric analyzes and drafted part of the article.

Alejandro Veas: Professor Veas has performed the psychometric analyzes and drafted part of the article.

José Antonio Piqueras: Professor Piqueras has participated in the bibliographic update and drafting of the manuscript.

Agustín Ernesto Martínez-González: Professor Martinez-González has applied the tests to the subjects, created the database, and participated in the writing of the manuscript.

Conflict of interest

Author Matti Cervin declares that he has no conflict of interest.

Author Alejandro Veas declares that he has no conflict of interest.

Author Jose A. Piqueras declares that he has no conflict of interest.

Author Agustín E. Martínez-González declares that he has no conflict of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jad.2022.05.031.

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