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Evaluating the Brief Resilience Scale in 21 Countries: Psychometric Properties and Measurement Invariance Across Sex, Age, and Countries

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Abstract
The Brief Resilience Scale (BRS) is widely used for assessing resilience. However, evaluations of the BRS's measurement invariance across different countries are scarce. This study examines the psychometric properties of the BRS across 21 countries, using a sample of 10,259 participants from the COVIDiSTRESS II Global Survey dataset. It investigates the reliability, factor structure, criterion validity, and measurement invariance across age, sex, and countries. The results indicate that the BRS has high reliability, and the two-factor structure is the most widely applicable optimal structure. Full measurement invariance across sex was achieved, while partial measurement invariance across age was established. With respect to geographical heterogeneities, the Central American subgroup achieved full measurement invariance while partial measurement invariance was observed in the South American subgroup. Regarding cultural differences, partial measurement invariance was obtained in the Latin American subgroup. However, the full country group and the other country subgroups did not achieve measurement invariance. The significant correlations between the BRS and factors like stressors, perceived stress, loneliness, social support, and emotion regulation support its criterion validity. These findings suggest that the BRS is a valuable psychometric tool for resilience research. However, caution is needed when applying it across different age groups and countries.

Keywords
resilience, the brief resilience scale, psychometric evaluation, measurement invariance, cross-cultural study

Introduction

Resilience is a widely studied yet debated concept in health sciences, with diverse definitions and measurement approaches (Hiebel et al., 2021). Over the past two decades, researchers have primarily conceptualized resilience in three ways: as a trait, a process, or an outcome (Fletcher & Sarkar, 2013; Hiebel et al., 2021; Kalisch et al., 2015; Troy et al., 2023). First, resilience is seen as a relatively stable trait reflecting an individual's capacity to adapt to adversity, manifesting in qualities such as self-efficacy (Boardman et al., 2011) or humor (Edward et al., 2009). Second, it is understood as a dynamic process involving internal and external resources to respond adaptively to stress (Fergus & Zimmerman, 2005; Troy et al., 2023; Ungar, 2011). Third, resilience is considered an outcome, characterized by maintaining psychological health or achieving positive functioning despite adversity (Bonanno & Mancini, 2011; Kalisch et al., 2015; Sapienza & Masten, 2011).

Despite these variations, resilience remains fundamental across psychological research, particularly in positive psychology and psychopathology (Mak et al., 2011; Shrivastava & Desousa, 2016). It is associated with adaptive outcomes and plays a crucial role in mitigating mental health challenges (Bonanno, 2004). To measure resilience, various scales have been developed, reflecting its conceptual diversity. Trait-oriented measures, such as the Resilience Scale (RS; Wagnild & Young, 1993) and the Connor-Davidson Resilience Scale (CD-RISC; Connor & Davidson, 2003), assess personal competencies and adaptive capacities. Process-

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oriented measures, such as the California Healthy Kids Survey (Sun & Stewart, 2007), evaluate personal and social protective factors, while resilience as an outcome is often mapped through trajectories following traumatic events (Bonanno et al., 2011).

This study focuses on the Brief Resilience Scale (BRS), developed by Smith et al. (2008) as a concise, trait-oriented tool that measures resilience as the ability to bounce back from stress. Unlike longer scales such as the RS and CD-RISC, the BRS's brevity (6 items, see Table S1 in Supplemental Material) reduces participant burden while capturing resilience in its most fundamental sense—recovering from adversity (Smith et al., 2008). Validated across various cultural contexts, including Malaysia (Amat et al., 2014), Spain (Rodríguez-Rey et al., 2016), and China (Fung, 2020), the BRS demonstrates good internal consistency and a robust factor structure.

Researchers are increasingly focusing on the measurement invariance of the BRS across sex, age, and cultural backgrounds to verify its generalizability. For example, Kyriazos et al. (2018) examined the BRS's measurement invariance across sex and age among Greek adults, supporting configural and metric invariance using a two-factor model. Similarly, de Holanda Coelho et al. (2016) explored cross-cultural invariance between Brazil and the USA, identifying partial measurement invariance after freely estimating the intercept parameter for Item 2.

The BRS has demonstrated strong associations with various psychological variables, including stressors, perceived stress, loneliness, social support, and emotion regulation. Studies indicate that both primary and secondary stressors negatively correlate with resilience (Ntontis et al., 2023), while perceived social support positively influences resilience, enhancing recovery from stress (Karadaş & Duran, 2022). Moreover, resilience is negatively associated with perceived stress and loneliness, suggesting that more resilient individuals perceive lower stress and feel less lonely (Alıcı et al., 2023; Pineda et al., 2022). In emotion regulation, strategies like reappraisal enhance resilience, while suppression has no significant effect (Thomas & Zolkoski, 2020).

Despite its widespread use, unresolved issues remain regarding the BRS's factor structure. Some studies support a one-factor model (loading all BRS items onto a single latent factor), while others favor a two-factor (positive-worded items form the positive factor, while negative-worded items form the negative factor) or bifactor model (one general factor and two specific factors represented by positive- and negative-worded items), highlighting inconsistencies across populations (Broll et al., 2024; Sánchez et al., 2021). Additionally, cross-cultural validation remains limited, often involving only a few countries, restricting generalizability.

To address these gaps, this study examines the BRS's factor structure and cross-cultural measurement invariance using data from the COVIDiSTRESS II Global Survey, covering 21 countries: Specifically, we assess the reliability, factor structure, and measurement invariance of the BRS across sex, age, and countries. In assessing measurement invariance across countries, we subdivided the 21 countries into different subgroups based on cultural similarities and geographic location. Furthermore, we evaluate the criterion validity of the BRS by analyzing its correlations with stressors, social support, loneliness, and emotion regulation. We hypothesize that stressors (overall, primary, and secondary), perceived stress, and loneliness will be negatively correlated with the BRS, while perceived social support and reappraisal will be positively correlated. Given the limited evidence regarding suppression, we do not propose a specific hypothesis for its relation with the BRS. The study aims to answer the following questions:

RQ1: What is the optimal factor structure of the BRS across sex, age, and countries?
RQ2: Does the BRS exhibit measurement invariance across sex, age, and countries?
RQ3: How does the BRS correlate with other validated measures to assess its criterion validity?

Methods

Data Resources

The data used in this study come from the COVIDiSTRESS Global Survey Round II, which is part of the COVIDiSTRESS Consortium project (Blackburn et al., 2022). This is a cross-sectional survey based on the COVIDiSTRESS II Global Survey, which was conducted online worldwide from May 28 to August 29, 2021. We used the cleaned dataset, which includes 15,740 participants from 120 countries.

To ensure data quality and alignment with research objectives, the dataset for this study once again underwent a rigorous cleaning process. First, as resilience is the primary variable of interest, we excluded 2,492 participants with any missing data in the BRS. Second, we removed 138 participants who either did not specify their sex as male or female or had missing values for this variable. Third, 40 participants with missing values for the age variable were excluded, and according to literature in developmental psychology (Reifman & Niehuis, 2023; Vernon & Gage, 2016), the remaining age data were categorized into specific age subgroups: 18 to 29 years (emerging adulthood), 30 to 45 years (established adulthood), 46 to 65 years (middle adulthood), and $\geqslant 66$ years (late adulthood). Lastly, to ensure robust cross-country analysis, we retained only countries with at least 200 valid respondents, leading to the exclusion of 2,812 additional participants. These steps produced a final dataset of 10,259 participants from 21 countries. These 21 countries are distributed in seven major geographical regions: Central America, South America, Eastern Europe, Northern Europe, Southern Europe, Western Europe, and East Asia (United Nations, 1999), and four major civilization clusters: Latin American, Orthodox, Western and Japanese (Huntington, 1996).

Measures

Brief Resilience Scale. The BRS consists of 6 items, with items 1, 3, and 5 being positive-worded and items 2, 4, and 6 being negative-worded. In the original study by Smith et al. (2008), all items were rated on a 5-point Likert scale. However, in the COVIDiSTRESS II Global Survey, the items were rated on a 7-point Likert scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) (Blackburn et al., 2022). To score the BRS, the negative-worded items (2, 4, and 6) are reverse-coded so that higher scores consistently indicate greater resilience. The overall BRS score is calculated as the mean of all 6 items, with higher scores reflecting a stronger ability to bounce back from stress. Additionally, the mean scores of the positive and negative worded items are calculated separately.

Stressors. The stressors scale in the COVIDiSTRESS II Global Survey has 18 items, adapted from primary and secondary stress categories (Lock et al., 2012). Each item is rated from 0 (*not at all concerned*) to 4 (*very concerned*), with a NA (*does not apply to me*) option. There were 4 items in the primary stressors category, and 14 items in the secondary stressors category. Due to the high number of missing values for specific secondary stressors in the COVIDiSTRESS II global survey dataset, this study follows the classification by Ntontis et al. (2023) and selects the category with the high response rate, termed "general secondary stressors," which includes a total of 4 items. The stressors are calculated using the mean score from 8 items, divided into primary stressors (4 items) and general secondary stressors (4 items).

Perceived Stress. Perceived stress was measured by the Perceived Stress Scale-10 (PSS-10; Cohen et al., 1983). The PSS-10 assesses the perception of unpredictability, uncontrollability, and overload experienced by respondents (Ntontis et al., 2023). Each item on the PSS-10 is rated on a 5-point Likert scale ranging from 0 (*never*) to 4 (*very often*). The PSS-10 contains 6 negatively worded items (e.g., "felt that you were unable to control the important things in your life?") and 4 positively worded items (e.g., "felt that things were going your way?"). The 6 negative items are non-reverse-scored and the 4 positive items are reverse-scored. Perceived stress is represented by the mean score of the 10 items after reverse scoring. The higher the score, the greater the stress perceived by the individual.

Loneliness. Loneliness was measured using a three-item loneliness scale (Hughes et al., 2004), rated on a 5-point Likert scale ranging from 0 (*never*) to 4 (*very often*). Loneliness is calculated by the mean score of the 3 items. The higher the mean score, the stronger the individual's loneliness.

Perceived Social Support. Perceived social support was assessed using the Perceived Social Support Scale, which comprises three items adapted from a scale of perceived social support during a natural disaster (Kaniasty & Norris, 1995). It is rated on a 7-point Likert scale ranging from 0 (*strongly disagree*) to 6 (*strongly agree*). The scale was scored that the median score was expressed for the neutral option, and the mean score of the three items was calculated.

Emotion Regulation. This study uses the ERQ-8 (Balzarotti, 2021) to assess emotion regulation, which consists of 8 items, and participants are asked to rate using a 7-point Likert scale ranging from 1 (*strongly disagree*) to 7 (*strongly disagree*). The ERQ-8 contains 4 items measuring reappraisal and 4 items measuring suppression. By considering the neutral option as the median, we calculated the mean scores of the reappraisal and suppression items, to represent reappraisal and suppression in emotion regulation, respectively.

Statistical Analysis

In this study, our statistical analysis consisted of four stages. In Stage 1, we conducted a descriptive analysis to provide an overview of the total sample and each subgroup and assessed the scale's reliability using Cronbach's alpha and McDonald's omega (DeVellis & Thorpe, 2021).

In Stage 2, we conducted confirmatory factor analysis (CFA) using one-factor model, two-factor model, and bifactor model to verify the latent structure of the BRS. Following the approach of Sánchez et al. (2021), the one-factor model loads all BRS items onto a single latent factor, the two-factor model separates items into positive- and negative-worded items, and the bifactor model includes a general factor and two specific factors for positive- and negative-worded items. Additionally, we use the criteria for assessing model fit recommended by Schermelleh-Engel et al. (2003) and follow the principle of Occam's razor (Falk & Muthukrishna, 2023) to select a model with better fit and more simplicity. We assessed and compared the fit of models using the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), the Standardized Root Mean Squared Residual (SRMR), and Tucker–Lewis index (TLI). The criteria for good model fit were: $0 \leqslant \text{RMSEA} \leqslant 0.05$, $0 \leqslant \text{SRMR} \leqslant 0.05$, $0.97 \leqslant \text{TLI} \leqslant 1.00$, and $0.97 \leqslant \text{CFI} \leqslant 1.00$. The criteria for acceptable model fit were $0.05 < \text{RMSEA} \leqslant 0.08$, $0.05 < \text{SRMR} \leqslant 0.10$, $0.95 \leqslant \text{TLI} < 0.97$, and $0.95 \leqslant \text{CFI} < 0.97$. Among the three models fitted to the total sample and each subgroup, the model achieving a "good fit" is considered optimal. If none of the models meet the "good fit" criteria, the model with an "acceptable fit" is chosen as optimal. When multiple models fall into the same fit category (either "good fit" or "acceptable fit"), the simplest model is selected as the optimal choice.

Stage 3 involved assessing measurement invariance across sex, age, and countries. When assessing measurement invariance across countries, we also considered cultural and geographical heterogeneities, as researchers may need to compare countries with high cultural similarity in real-world research scenarios. To address this, we subdivided the 21 countries into different subgroups based on Huntington's classification of civilizations (Huntington, 1996) and the United Nations' geographical regions (United Nations, 1999), in order to separately present cultural and geographical heterogeneities. As shown in Supplemental Material Table S2, the 21 countries were categorized into 4 major civilizations and 7 geographical regions. Since the Japanese civilization, Western Europe, and East Asia subgroups each consisted of only one country, measurement invariance testing was not conducted for these subgroups. Thus, our analysis of measurement invariance across countries consisted of three parts: the full country group, culturally defined subgroups, and geographically defined subgroups.

This study examines the measurement invariance of the BRS across sex, age, and countries in five steps. First, measurement invariance is tested using the most optimal factor structure model identified for each group. This model represents the optimal structure that is most consistently observed across subgroups. Second, the samples are input as group variables to verify the consistency of the factor structure within each group (configural invariance). Third, the factor loadings are fixed to be equal across subgroups within each group (metric invariance). Fourth, fixing the factor loadings and intercepts (scalar invariance). Fifth, fixing the factor loadings, intercepts, and residuals (strict invariance). In addition, measurement invariance is assessed using specific evaluation criteria. Chen (2007) recommended a threshold of a 0.01 change in $|\text{CFI}|$, with accompanying changes in $|\text{RMSEA}|$ of 0.015 and $|\text{SRMR}|$ of 0.030 for metric invariance, or 0.015 for scalar or residual invariance. In addition, Rutkowski and Svetina (2014) further suggested $|\text{CFI}|$ changes of 0.02 and $|\text{RMSEA}|$ changes of 0.03 as appropriate for large group metric invariance tests, while traditional criteria of 0.01 for both $|\Delta\text{CFI}|$ and $|\Delta\text{RMSEA}|$ apply to scalar invariance tests. Based on these recommendations, we adopted thresholds for measurement invariance across age and sex groups, as well as culturally and geographically defined country subgroups, as follows: $|\Delta\text{CFI}| < 0.01$, $|\Delta\text{RMSEA}| < 0.015$, and $\Delta\text{SRMR} < 0.030$ for metric invariance; $\Delta\text{SRMR} < 0.015$ for scalar or strict invariance. For the full country group, the criteria are: $|\Delta\text{CFI}| < 0.02$ for metric invariance and <0.01 for scalar or strict invariance; $|\Delta\text{RMSEA}| < 0.03$ for metric invariance and <0.015 for scalar or strict invariance; $\Delta\text{SRMR} < 0.030$ for metric and < 0.015 for scalar or strict invariance.

Once full measurement invariance across configural, metric, scalar, and strict levels is not supported, partial measurement invariance testing is subsequently conducted. Previous research recommends that an expected parameter change (EPC) threshold of >0.1 can be used to determine which items should be released (Saris et al., 1987). In this study, item with the highest EPC was released in partial measurement invariance testing. Additionally, achieving partial invariance requires most items to remain invariant. If this criterion cannot be met, partial invariance cannot be established (Luong & Flake, 2023; Steenkamp & Baumgartner, 1998; Vandenberg & Lance, 2000).

Stage 4, correlation analysis was conducted to evaluate the criterion validity of the BRS. Accordingly, the current study conducted a correlation analysis between the BRS and the following variables: stressors, perceived stress, loneliness, perceived social support, and emotion regulation. This study follows Cohen (1988)'s guidelines, $.10 \leqslant |r| < .30$ indicates a weak correlation, $.30 \leqslant |r| < .50$ indicates a moderate correlation, and $|r| \geqslant 0.50$ indicates a strong correlation.

In addition, the above measurement invariance procedures were performed using the R package *semTools*. All other additional statistical analyses were also performed using the R programming environment.

Transparency and Openness

The dataset used in this study is available on the Open Science Framework (OSF) at https://osf.io/36tsd/. The R code utilized for this study is accessible via the OSF at https://osf.io/hc97q/.

Results

Descriptive Analysis and Reliability

Firstly, Table 1 presents an overview of the total sample and the samples from each country in this study. The results indicate that the sample sizes for Japan and the Russian Federation are larger compared to other countries. The average age of participants ranges from 25 to 46 years, with females making up more than half of the participants in most of the samples. Additionally, in the samples from various countries, most participants primarily hold a university degree, while the proportion of those with a PhD is relatively low. Furthermore, single or married participants make up the majority in most of the samples.

Secondly, Table 2 shows the descriptive statistics of the BRS and other scales measured in this study. As shown, except for the primary stressors scale (Cronbach's alpha = .673; McDonald's Omega = .696), all other scales demonstrated either acceptable or high reliability. Among them, Cronbach's alpha coefficients for the BRS, positive-worded items, and negative-worded items are .878, .787, and .842, respectively, while the corresponding McDonald's Omega coefficients were .879, .788, and .843. Although the Cronbach's alpha (.673) and McDonald's omega (.696) for the primary stressors scale are below the commonly accepted threshold of 0.70, Nunnally (1978) suggests that reliability coefficients between 0.65 and 0.70 can still be considered minimally acceptable.

Confirmatory Factor Analysis

As shown in Table 3, the one-factor, two-factor, and bifactor models were successfully fitted to the total sample and all subgroups, with the exception of the bifactor model in the Estonia and Finland subgroups. In the total sample, although both the two-factor and bifactor models are acceptable, the two-factor model is identified as the optimal choice. In the sex group, the two-factor model is acceptable for male subgroup, while both the two-factor and bifactor models are acceptable for female subgroup. Therefore, the two-factor model is identified as the optimal model for both male and female subgroups. In the age group, the optimal model is the two-factor model for the emerging adulthood, middle adulthood, and late adulthood subgroups, and for the established adulthood subgroup, while the bifactor model is the optimal model.

In the country group, there is no acceptable model for Brazil subgroup, the optimal model is the bifactor model for Colombia, Ecuador, Italy, and Ukraine subgroups, the optimal model is the one-factor model for Guatemala, Ireland, Norway, and Slovakia subgroups, and the optimal model is the two-factor model for the remaining countries. In summary, the two-factor model is the optimal model for the BRS across sex subgroups and the majority of age and country subgroups.

Measurement Invariance

Table 4 summarizes the results of the measurement invariance testing for the two-factor model of the BRS across age, sex, and countries at the configural, metric, scalar, and strict invariance levels. To begin with, full measurement invariance across sex was supported, indicating that the mean scores of the BRS are comparable between sex.

Next, partial measurement invariance of the BRS across age was supported. Firstly, both configural and metric invariance have been achieved, but scalar and strict invariance were not achieved. After freely estimating the intercept parameter of Item 2 and the residual variance of Item 1, which showed the highest EPC, partial scalar and strict invariance were achieved. Partial measurement invariance of the BRS across age was supported, indicating that the mean scores of the BRS are somewhat comparable across age.

Subsequently, in the measurement invariance across countries, measurement invariance was not achieved for the full country group. For the culturally defined subgroups, the Latin American subgroup achieved partial measurement invariance, while the Orthodox and Western subgroups did not pass the measurement invariance test. Regarding the geographically defined subgroups, the Central America subgroup achieved full measurement invariance, the South America subgroup achieved partial measurement invariance, whereas the Eastern Europe, Northern Europe, and Southern Europe subgroups did not achieve measurement invariance.

In the full country group, configural invariance was supported. After freely estimating the factor loading of Item 5, partial metric invariance was achieved. Then, the intercept parameters of Items 6 and 2 were also freely estimated; however, scalar and strict invariance were not achieved.

The measurement invariance results for the culturally defined subgroups are as follows. These subgroups were based on cultural classifications: Latin American, Orthodox, and Western. In the Latin American subgroup, configural and metric invariance were supported. After freely estimating the intercept parameter of Item 6, partial scalar and strict invariance were also achieved. In the Orthodox subgroup, configural invariance was supported. After freely estimating the factor loading of Item 1, partial metric invariance was achieved.

Table 1. Descriptive Statistics of the Sample.

Country	N	Age (years)	Female (%)	Educational background: Less than 12 Years (%)	Incomplete Degree (%)	Uni Degree (%)	PhD (%)	Marital status: Single (%)	Married (%)	Dating (%)	Cohabiting (%)	Separated/ Divorced (%)	Widowed (%)
Total sample	10,259	37.908	67.2	20.3	26.4	47.1	5.4	30.3	34.2	14.5	13.0	5.2	1.1
Brazil	395	38.223	73.2	3.8	15.4	66.3	14.4	28.9	35.7	18.0	9.6	7.1	0.5
Bulgaria	258	40.391	74.8	10.1	34.5	48.8	5.8	18.2	30.2	19.4	19.0	5.8	4.7
Colombia	450	40.387	67.6	4.2	11.8	77.6	6.2	29.8	32.0	14.9	15.8	7.1	0.2
Costa Rica	220	36.427	74.1	4.5	12.7	81.4	1.4	30.9	25.0	20.0	19.5	3.6	0.9
Czech Republic	295	33.868	70.5	15.3	29.2	49.8	5.8	22.4	33.9	15.3	23.1	2.7	0.7
Ecuador	211	33.047	68.2	2.8	20.9	72.0	3.8	37.0	28.4	17.1	9.5	7.1	0.9
Estonia	208	39.361	86.5	19.2	21.2	57.7	1.4	20.2	34.1	9.6	28.8	4.8	1.4
Finland	889	46.156	80.4	21.3	18.8	54.4	4.6	19.0	43.5	6.9	20.4	7.5	1.7
Guatemala	226	37.327	85.4	2.7	26.1	67.7	3.5	26.1	40.3	17.7	8.8	5.8	0.4
Honduras	307	25.404	67.8	15.6	64.8	18.6	0.7	48.5	8.1	32.2	8.1	2.3	0
Ireland	309	29.421	69.9	1.0	43.4	50.8	4.9	45.0	16.5	26.2	9.1	2.9	0.3
Italy	271	45.369	73.4	23.6	22.5	45.4	7.0	25.5	35.8	15.5	9.6	8.5	2.6
Japan	1,997	45.568	42.0	43.7	20.3	32.5	1.0	35.9	50.3	5.3	1.1	4.7	0.9
Norway	329	41.170	82.1	11.9	18.8	60.8	7.9	14.3	35.0	7.9	32.5	5.8	0.9
Portugal	389	32.805	71.5	12.3	21.1	43.4	23.1	44.2	19.5	24.7	7.5	2.8	1.3
Russian Federation	1,774	26.224	71.1	23.4	46.4	29.3	0.6	35.4	22.7	22.5	10.1	4.7	0.7
Slovakia	270	35.052	89.3	14.1	26.3	50.4	7.4	25.9	33.0	23.3	8.1	8.1	0.4
Spain	489	40.640	65.6	3.9	21.7	54.0	20.4	26.0	35.6	14.5	18.0	4.5	1.0
Switzerland	525	45.282	63.8	28.4	18.1	45.9	7.0	22.1	34.3	3.6	33.7	2.7	2.1
Ukraine	222	31.360	64.9	5.0	5.9	78.4	10.8	29.3	37.8	11.7	13.1	6.3	0.5
Uruguay	225	42.182	86.7	7.6	12.4	73.8	5.8	15.1	39.1	10.7	21.3	10.7	2.7

Note. Less than 12 Years = participants who received less than 12 years of school education. Specifically, this category includes three subgroups: Up to 12 years of school, Up to 6 years of school, and Up to 9 years of school. Incomplete Degree = participants with some university education or equivalent (e.g., currently enrolled or completed some courses but did not graduate). Uni_Degree = participants holding a university degree (e.g., BA, BSc, MA, MSc). PhD = participants who have PhD.

Table 2. Descriptive Statistics and Reliability of the Scales.

Variables	*N* (NA[a])	*M* (*SD*)	Min	Max	Cronbach's Alpha	McDonald's Omega
BRS	10,259 (0)	4.320 (1.257)	1	7	.878	.879
Positive-worded items	10,259 (0)	4.429 (1.313)	1	7	.787	.788
Negative-worded items	10,259 (0)	4.211 (1.413)	1	7	.842	.843
Perceived stress	10,217 (42)	2.228 (0.688)	0.4	4.4	.870	.870
Loneliness	10,241 (18)	1.583 (1.084)	0	4	.885	.886
Perceived social support	10,248 (11)	5.032 (1.469)	1	7	.873	.879
Stressors	5,965 (4294)	1.641 (0.866)	0	4	.766	.768
Primary stressors	9,709 (550)	1.816 (0.985)	0	4	.673	.696
Secondary stressors	6,142 (4117)	1.498 (1.063)	0	4	.728	.732
Reappraisal	10,014 (245)	4.831 (1.191)	1	7	.805	.821
Suppression	10,031 (228)	3.821 (1.338)	1	7	.766	.770

Note.[a]NA refers to the count of missing responses.
BRS = Brief Resilience Scale.

Subsequently, the intercept parameters of Items 6 and 2 were also freely estimated; however, scalar and strict invariance were not achieved. In the Western subgroup, configural invariance was supported. After allowing the factor loading of Item 2 to be freely estimated, partial metric invariance was achieved. Further, after freely estimating the intercept parameters of Items 5 and 2, partial scalar invariance was achieved. Then, after freely estimating the residual variance parameter of Item 4, strict invariance still failed. In conclusion, among the culturally defined subgroups, only the Latin American subgroup achieved partial measurement invariance, indicating that the BRS mean scores are comparable across the countries in the Latin American subgroup to some extent.

The measurement invariance for the geographically defined subgroups revealed the following findings. These subgroups were based on geographical region classifications: Central America, South America, Eastern Europe, Northern Europe, and Southern Europe. In the Central America subgroup, full measurement invariance was achieved. In the South America subgroup, configural invariance was supported. After freely estimating the factor loading of Item 2, partial metric invariance was achieved. Then, the intercept parameter of Item 2 was also freely estimated, and partial scalar invariance was achieved. Subsequently, the residual variance parameter of Item 4 was freely estimated, and partial strict invariance was also achieved. In the Eastern Europe subgroup, configural invariance was supported. After freely estimating the factor loading of Item 1, partial metric invariance was achieved. Subsequently, after freely estimating the intercept parameters of Items 6 and 2, scalar and strict invariance failed. In the Northern Europe subgroup, configural and metric invariance were achieved. Then, after freely estimating the intercept parameters of Items 1, 3, and 4, scalar and strict invariance failed. In the Southern Europe subgroup, configural and metric invariance were supported. After freely estimating the intercept parameter of Item 1, partial scalar invariance was achieved. Subsequently, after freely estimating the residual variance parameters of Items 4 and 3, strict invariance failed. To sum up, among the geographically defined subgroups, the Central America subgroup achieved full measurement invariance, and the South America subgroup achieved partial measurement invariance, indicating that the BRS mean scores are comparable across the countries in these subgroups.

Criterion Validity

The results of criterion validity of the BRS are presented in Table 5. Perceived stress shows strong negative correlations with the BRS, positive factor, and negative factor, while loneliness has moderate negative correlations with the BRS, positive factor, and negative factor. Perceived social support exhibits moderate positive correlations with the BRS and positive factor, as well as a weak positive correlation with negative factor. Both overall stressors and primary stressors show weak negative correlations with the BRS, positive factor, and negative factor. Secondary stressors exhibit moderate negative correlations with the BRS and negative factor, and a weak negative correlation with positive factor. Emotion regulation reappraisal shows moderate positive correlations with the BRS and the positive factor, and a weak positive correlation with the negative factor. In contrast, suppression exhibits weak negative correlations with the BRS and the negative factor, and a minimal negative correlation with the positive factor.

Table 3. Model Fit Indices for CFA.

Group/Model	χ^2	*df*	RMSEA	CFI	TLI	SRMR	Good fit	**Acceptable fit**	**Optimal**
Good fit criteria			[0, 0.05]	[0.97, 1.00]	[0.97, 1.00]	[0, 0.05]			
Acceptable fit criteria			(0.05, 0.08]	[0.95, 0.97)	[0.95, 0.97)	(0.05, 0.10]			
Total sample (*N* = 10,259)									
One-factor model	923.805	9	0.120	0.954	0.923	0.039			
Two-factor model	264.971	8	0.065	0.988	0.977	0.019		√	√
Bifactor model	84.288	3	0.068	0.995	0.975	0.011		√	
Sex									
Male (*N* = 3,363)									
One-factor model	444.584	9	0.151	0.934	0.890	0.048			
Two-factor model	92.441	8	0.067	0.989	0.978	0.019		√	√
Bifactor model	40.203	3	0.081	0.994	0.968	0.013			
Female (*N* = 6,896)									
One-factor model	499.039	9	0.104	0.963	0.939	0.034			
Two-factor model	164.359	8	0.061	0.989	0.979	0.019		√	√
Bifactor model	44.589	3	0.059	0.996	0.981	0.010		√	
Age									
Emerging adulthood (*N* = 3,694)									
One-factor model	388.456	9	0.124	0.935	0.891	0.049			
Two-factor model	84.017	8	0.057	0.988	0.977	0.020		√	√
Bifactor model	35.867	3	0.069	0.993	0.966	0.013		√	
Established adulthood (*N* = 3,418)									
One-factor model	291.104	9	0.114	0.962	0.936	0.035			
Two-factor model	85.280	8	0.061	0.990	0.982	0.018		√	
Bifactor model	17.032	3	0.048	0.998	0.989	0.008	√		√
Middle adulthood (*N* = 2,694)									
One-factor model	192.977	9	0.108	0.971	0.951	0.029			
Two-factor model	69.678	8	0.065	0.991	0.982	0.017		√	√
Bifactor model	23.220	3	0.070	0.996	0.980	0.011		√	
Late adulthood (*N* = 453)									
One-factor model	51.991	9	0.124	0.943	0.904	0.050			
Two-factor model	25.111	8	0.080	0.979	0.960	0.036		√	√
Bifactor model	9.391	3	0.091	0.990	0.949	0.021			
Country									
Brazil (*N* = 395)									
One-factor model	58.235	9	0.131	0.939	0.898	0.048			
Two-factor model	34.800	8	0.101	0.968	0.940	0.035			
Bifactor model	10.541	3	0.099	0.988	0.942	0.025			
Bulgaria (*N* = 258)									
One-factor model	35.410	9	0.107	0.967	0.946	0.036			
Two-factor model	15.869	8	0.061	0.990	0.982	0.021		√	√
Bifactor model	5.177	3	0.057	0.997	0.985	0.013		√	
Colombia (*N* = 450)									
One-factor model	53.877	9	0.125	0.951	0.919	0.048			

(continued)

Table 3 (continued)

Group/Model	χ^2	*df*	RMSEA	CFI	TLI	SRMR	Good fit	**Acceptable fit**	**Optimal**
Two-factor model	16.109	8	0.054	0.992	0.985	0.022		√	
Bifactor model	2.672	3	0.000	1.000	1.002	0.008	√		√
Costa Rica (*N* = 220)									
One-factor model	31.990	9	0.113	0.959	0.931	0.044			
Two-factor model	13.201	8	0.057	0.991	0.983	0.026		√	√
Bifactor model	7.890	3	0.098	0.990	0.948	0.020			
Czech Republic (*N* = 295)									
One-factor model	15.473	9	0.060	0.989	0.982	0.026		√	
Two-factor model	10.017	8	0.035	0.997	0.994	0.023	√		√
Bifactor model	4.368	3	0.059	0.997	0.983	0.018		√	
Ecuador (*N* = 211)									
One-factor model	21.879	9	0.093	0.951	0.918	0.053			
Two-factor model	15.523	8	0.074	0.972	0.948	0.042			
Bifactor model	4.593	3	0.066	0.992	0.959	0.027		√	√
Estonia (*N* = 208)									
One-factor model	21.316	9	0.092	0.983	0.972	0.025			
Two-factor model	15.264	8	0.072	0.991	0.983	0.020		√	√
Bifactor model	-	-	-	-	-	-			
Finland (*N* = 889)									
One-factor model	65.859	9	0.104	0.978	0.963	0.022			
Two-factor model	36.779	8	0.078	0.989	0.979	0.018		√	√
Bifactor model	-	-	-	-	-	-			
Guatemala (*N* = 226)									
One-factor model	13.227	9	0.050	0.990	0.983	0.033	√		√
Two-factor model	13.246	8	0.059	0.987	0.976	0.033		√	
Bifactor model	3.330	3	0.029	0.999	0.994	0.019	√		
Honduras (*N* = 307)									
One-factor model	66.930	9	0.159	0.865	0.775	0.082			
Two-factor model	7.438	8	0.000	1.000	1.002	0.025	√		√
Bifactor model	1.640	3	0.000	1.000	1.020	0.010	√		
Ireland (*N* = 309)									
One-factor model	11.077	9	0.030	0.998	0.996	0.016	√		√
Two-factor model	9.576	8	0.028	0.998	0.997	0.015	√		
Bifactor model	2.895	3	0.000	1.000	1.001	0.010	√		
Italy (*N* = 271)									
One-factor model	24.965	9	0.093	0.976	0.960	0.030			
Two-factor model	14.194	8	0.061	0.991	0.983	0.024		√	
Bifactor model	3.397	3	0.027	0.999	0.997	0.011	√		√
Japan (*N* = 1,997)									
One-factor model	210.795	9	0.147	0.953	0.921	0.036			
Two-factor model	47.951	8	0.066	0.991	0.984	0.015		√	√
Bifactor model	34.772	3	0.107	0.992	0.958	0.013			
Norway (*N* = 329)									

(continued)

Table 3 (continued)

Group/Model	χ^2	*df*	RMSEA	CFI	TLI	SRMR	Good fit	**Acceptable fit**	**Optimal**
One-factor model	13.237	9	0.047	0.994	0.990	0.021	√		√
Two-factor model	7.103	8	0.000	1.000	1.002	0.015	√		
Bifactor model	4.005	3	0.042	0.998	0.992	0.013	√		
Portugal (*N* = 389)									
One-factor model	53.834	9	0.128	0.951	0.918	0.043			
Two-factor model	25.133	8	0.079	0.983	0.969	0.030		√	√
Bifactor model	6.572	3	0.067	0.996	0.978	0.012		√	
Russian Federation (*N* = 1,774)									
One-factor model	196.973	9	0.121	0.910	0.850	0.065			
Two-factor model	34.423	8	0.047	0.988	0.977	0.022	√		√
Bifactor model	15.055	3	0.058	0.993	0.965	0.015		√	
Slovakia (*N* = 270)									
One-factor model	12.291	9	0.043	0.996	0.993	0.018	√		√
Two-factor model	10.853	8	0.042	0.997	0.994	0.017	√		
Bifactor model	5.249	3	0.079	0.995	0.977	0.015		√	
Spain (*N* = 489)									
One-factor model	122.601	9	0.190	0.906	0.844	0.058			
Two-factor model	16.599	8	0.052	0.994	0.988	0.016		√	√
Bifactor model	10.879	3	0.089	0.993	0.966	0.013			
Switzerland (*N* = 525)									
One-factor model	46.860	9	0.102	0.968	0.946	0.033			
Two-factor model	22.286	8	0.067	0.987	0.977	0.026		√	√
Bifactor model	9.968	3	0.080	0.993	0.966	0.017		√	
Ukraine (*N* = 222)									
One-factor model	23.205	9	0.085	0.970	0.951	0.039			
Two-factor model	22.575	8	0.092	0.969	0.942	0.039			
Bifactor model	3.061	3	0.012	1.000	0.999	0.020	√		√
Uruguay (*N* = 225)									
One-factor model	35.109	9	0.113	0.956	0.927	0.045			
Two-factor model	16.351	8	0.068	0.986	0.974	0.027		√	√
Bifactor model	7.896	3	0.098	0.989	0.946	0.019			

Note."-" indicates that the model estimation is unsuccessful. The criteria for good fit and acceptable fit come from the study of Schermelleh-Engel et al. (2003).
CFI = Comparative Fit Index; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Squared Residual; TLI = Tucker–Lewis index.

Table 4. Measurement Invariance Based on the Two-Factor Model for BRS.

Group/Invariance Model	χ^2	*df*	RMSEA	CFI	TLI	SRMR	ΔRMSEA	ΔCFI	ΔTLI	ΔSRMR
Measurement invariance across sex										
Configural model	254.489	16	0.063	0.989	0.979	0.016				
Metric model	276.180	20	0.057	0.988	0.983	0.019	−0.006	−0.000	0.004	0.003
Scalar model	462.021	24	0.067	0.981	0.976	0.026	0.010	−0.008	−0.006	0.007
Strict model	460.257	30	0.063	0.979	0.979	0.027	−0.005	−0.002	0.003	0.001
Measurement invariance across age										
Configural model	262.455	32	0.062	0.989	0.980	0.017				
Metric model	335.351	44	0.058	0.987	0.982	0.026	−0.004	−0.002	0.003	0.009
Scalar model	613.657	56	0.069	0.976	0.975	0.035	0.012	−0.011	−0.008	0.009
Strict model	836.983	74	0.074	0.964	0.971	0.038	0.005	−0.012	−0.004	0.003
Partial measurement invariance across age[a]										
Configural model	262.455	32	0.062	0.989	0.980	0.017				
Metric model	335.351	44	0.058	0.987	0.982	0.026	−0.004	−0.002	0.003	0.009
Scalar model	513.229	53	0.065	0.980	0.978	0.032	0.007	−0.007	−0.005	0.006
Strict model	672.899	68	0.069	0.971	0.975	0.036	0.004	−0.009	−0.003	0.004
The full country group										
Measurement invariance across country										
Configural model	416.364	168	0.062	0.990	0.981	0.019				
Metric model	874.072	248	0.079	0.976	0.969	0.058	0.017	−0.014	−0.012	0.039
Scalar model	3076.247	328	0.142	0.897	0.901	0.093	0.063	−0.079	−0.068	0.035
Strict model	4424.815	448	0.155	0.831	0.881	0.101	0.014	−0.066	−0.020	0.008
Partial measurement invariance across country[b]										
Configural model	416.364	168	0.062	0.990	0.981	0.019				
Metric model	698.636	228	0.071	0.982	0.975	0.046	0.010	−0.008	−0.006	0.026
Scalar model	1367.366	268	0.100	0.958	0.951	0.077	0.028	−0.023	−0.024	0.031
Strict model	2841.377	388	0.133	0.893	0.913	0.091	0.033	−0.066	−0.038	0.014
Countries subgrouped by culture										
Measurement invariance across country within Latin American										
Configural model	116.681	56	0.066	0.985	0.972	0.026				
Metric model	175.390	80	0.069	0.977	0.970	0.051	0.003	−0.008	−0.002	0.025
Scalar model	262.137	104	0.077	0.963	0.963	0.057	0.008	−0.014	−0.007	0.006
Strict model	313.876	140	0.073	0.955	0.967	0.057	−0.004	−0.008	0.003	0.001
Partial measurement invariance across country within Latin American[c]										
Configural model	116.681	56	0.066	0.985	0.972	0.026				
Metric model	175.390	80	0.069	0.977	0.970	0.051	0.003	−0.008	−0.002	0.025
Scalar model	226.192	98	0.071	0.970	0.968	0.054	0.002	−0.007	−0.002	0.004
Strict model	279.665	134	0.069	0.962	0.970	0.055	−0.003	−0.008	0.002	0.000
Measurement invariance across country within Orthodox										
Configural model	74.678	24	0.055	0.986	0.974	0.021				
Metric model	201.781	32	0.089	0.951	0.932	0.060	0.034	−0.035	−0.042	0.039
Scalar model	410.477	40	0.115	0.898	0.885	0.066	0.027	−0.054	−0.047	0.006
Strict model	468.114	52	0.115	0.868	0.886	0.082	−0.001	−0.029	0.001	0.016
Partial measurement invariance across country within Orthodox[d]										
Configural model	74.678	24	0.055	0.986	0.974	0.021				
Metric model	104.613	30	0.061	0.979	0.968	0.032	0.006	−0.007	−0.006	0.011
Scalar model	170.847	34	0.076	0.962	0.950	0.047	0.015	−0.016	−0.018	0.015
Strict model	225.136	46	0.081	0.942	0.943	0.048	0.005	−0.021	−0.007	0.001
Measurement invariance across country within Western										
Configural model	168.200	80	0.060	0.992	0.985	0.018				
Metric model	291.156	116	0.068	0.985	0.981	0.049	0.008	−0.007	−0.004	0.031
Scalar model	1023.053	152	0.130	0.929	0.930	0.081	0.062	−0.056	−0.051	0.032
Strict model	1182.578	206	0.128	0.907	0.932	0.079	−0.002	−0.022	0.003	−0.002
Partial measurement invariance across country within Western[e]										
Configural model	168.200	80	0.060	0.992	0.985	0.018				
Metric model	230.915	107	0.060	0.989	0.985	0.034	0.000	−0.003	−0.000	0.016
Scalar model	288.680	125	0.063	0.986	0.984	0.038	0.003	−0.003	−0.001	0.003
Strict model	456.234	170	0.077	0.972	0.976	0.043	0.014	−0.014	−0.008	0.005

(continued)

Table 4 (continued)

Group/Invariance Model	χ^2	*df*	RMSEA	CFI	TLI	SRMR	ΔRMSEA	ΔCFI	ΔTLI	ΔSRMR
Countries subgrouped by geographical regions										
Measurement invariance across country within Central America										
Configural model	33.624	24	0.043	0.993	0.987	0.024				
Metric model	42.267	32	0.039	0.993	0.989	0.038	−0.004	−0.001	0.002	0.014
Scalar model	53.349	40	0.039	0.991	0.989	0.042	0.000	−0.002	0.000	0.003
Strict model	65.853	52	0.037	0.989	0.991	0.040	−0.002	−0.002	0.001	−0.002
Measurement invariance across country within South America										
Configural model	82.961	32	0.076	0.981	0.965	0.027				
Metric model	126.733	44	0.082	0.971	0.960	0.055	0.005	−0.011	−0.005	0.028
Scalar model	185.834	56	0.089	0.956	0.952	0.062	0.008	−0.015	−0.008	0.007
Strict model	231.551	74	0.089	0.942	0.953	0.064	0.000	−0.014	0.000	0.002
Partial measurement invariance across country within South America[f]										
Configural model	82.961	32	0.076	0.981	0.965	0.027				
Metric model	119.800	41	0.083	0.972	0.959	0.052	0.006	−0.009	−0.006	0.025
Scalar model	145.960	50	0.082	0.967	0.960	0.055	−0.001	−0.005	0.001	0.003
Strict model	164.225	65	0.076	0.963	0.966	0.058	−0.006	−0.004	0.006	0.004
Measurement invariance across country within Eastern Europe										
Configural model	91.127	40	0.052	0.990	0.981	0.020				
Metric model	289.519	56	0.093	0.954	0.938	0.075	0.041	−0.036	−0.042	0.055
Scalar model	716.438	72	0.134	0.877	0.872	0.099	0.041	−0.077	−0.067	0.023
Strict model	861.384	96	0.134	0.836	0.872	0.105	0.000	−0.041	0.000	0.006
Partial measurement invariance across country within Eastern Europe[g]										
Configural model	91.127	40	0.052	0.990	0.981	0.020				
Metric model	138.010	52	0.059	0.983	0.975	0.036	0.007	−0.007	−0.005	0.016
Scalar model	327.538	60	0.094	0.949	0.936	0.082	0.036	−0.034	−0.039	0.045
Strict model	494.850	84	0.107	0.909	0.918	0.084	0.012	−0.040	−0.017	0.002
Measurement invariance across country within Northern Europe										
Configural model	70.628	32	0.062	0.993	0.986	0.015				
Metric model	104.706	44	0.064	0.989	0.985	0.038	0.002	−0.003	−0.001	0.023
Scalar model	414.242	56	0.135	0.938	0.934	0.071	0.071	−0.051	−0.052	0.033
Strict model	452.537	74	0.130	0.924	0.939	0.077	−0.005	−0.014	0.005	0.007
Partial measurement invariance across country within Northern Europe[h]										
Configural model	70.628	32	0.062	0.993	0.986	0.015				
Metric model	104.706	44	0.064	0.989	0.985	0.038	0.002	−0.003	−0.001	0.023
Scalar model	149.022	47	0.079	0.982	0.977	0.044	0.016	−0.007	−0.008	0.006
Strict model	215.127	65	0.089	0.969	0.971	0.052	0.010	−0.013	−0.006	0.008
Measurement invariance across country within Southern Europe										
Configural model	55.186	24	0.064	0.990	0.981	0.020				
Metric model	87.464	32	0.073	0.983	0.976	0.047	0.008	−0.007	−0.005	0.027
Scalar model	135.429	40	0.084	0.971	0.968	0.054	0.011	−0.012	−0.008	0.007
Strict model	218.224	52	0.103	0.943	0.951	0.052	0.020	−0.028	−0.017	−0.002
Partial measurement invariance across country within Southern Europe[i]										
Configural model	55.186	24	0.064	0.990	0.981	0.020				
Metric model	87.464	32	0.073	0.983	0.976	0.047	0.008	−0.007	−0.005	0.027
Scalar model	125.025	38	0.082	0.974	0.969	0.053	0.010	−0.009	−0.007	0.005
Strict model	161.210	46	0.089	0.962	0.963	0.053	0.007	−0.011	−0.005	0.001

Note.[a]First, in the scalar model, the intercept parameter of Item 2 showed the highest EPC (0.234), the intercept parameter of this item was freely estimated across ages, and partial scalar invariance was achieved. Second, in the strict model, the intercept parameter of Item 2 was freely estimated, strict invariance was not achieved. Then, the residual variance parameter of Item 1 showed the highest EPC (0.268), thus the residual variance parameter of this item was freely estimated across ages, and partial strict invariance was achieved. Finally, the results showed that the BRS had partial measurement invariance across ages.

[b]In the metric model, the factor loading parameter for Item 5 showed the highest EPC (0.420). After allowing the factor loading of Item 5 to be freely estimated, partial metric invariance was achieved. In the scalar model, the factor loading parameter for Item 5 was allowed to be freely estimated; however, scalar invariance was not achieved. Next, the intercept parameter for Item 6, which exhibited the highest EPC (0.824), was released, but scalar invariance failed. Subsequently, the intercept parameter for Item 2, with the highest EPC (0.519), was also released, but scalar invariance still failed. In the strict model, the factor loading parameter for item 5, as well as the intercept parameters for Items 6 and 2, were allowed to vary freely across countries; however, strict invariance was not achieved.

[c]In the scalar model, the intercept parameter for Item 6 exhibited the highest EPC (0.214). After allowing the intercept parameter of Item 6 to be freely estimated, partial scalar invariance was achieved.

[d]In the metric model, the factor loading parameter for Item 1 exhibited the highest EPC (0.798). After allowing the factor loading of Item 1 to be freely estimated, partial metric invariance was achieved. In the scalar model, even after allowing the factor loading of Item 1 to be freely estimated, scalar invariance was not achieved. Subsequently, the intercept parameter for Item 6, which exhibited the highest EPC (0.651), was released, but scalar invariance still failed. Following this, the intercept parameter for Item 2, with the highest EPC (0.283), was released, yet scalar invariance remained unattained. In the strict model, after releasing the factor loading parameter of item 1, as well as the intercept parameters for Items 6 and 2, strict invariance was not achieved.
[e]In the metric model, the factor loading parameter for Item 5 exhibited the highest EPC (0.228). After allowing the factor loading of Item 5 to be freely estimated, partial metric invariance was achieved. In the scalar model, even after allowing the factor loading of Item 1 to be freely estimated, scalar invariance was not achieved. Subsequently, the intercept parameter for Item 5, which exhibited the highest EPC (0.469), was released, but scalar invariance failed. Following this, the intercept parameter for Item 2, with the highest EPC (0.325), was released, partial scalar invariance was achieved. In the strict model, after releasing the intercept parameters for Items 5 and 2, strict invariance was not achieved. Then, the residual variance parameter of Item 4 showed the highest EPC (0.967), thus the residual variance parameter of this item was freely estimated, yet strict invariance still failed.
[f]In the metric model, the factor loading parameter for Item 2 exhibited the highest EPC (0.135). After allowing the factor loading of item 2 to be freely estimated, partial metric invariance was achieved. In the scalar model, even after allowing the factor loading of item 2 to be freely estimated, scalar invariance was not achieved. Subsequently, the intercept parameter for item 2, which exhibited the highest EPC (0.188), was released, partial scalar invariance was achieved. In the strict model, after releasing the factor loading parameter of item 2, as well as the intercept parameters for Item 2, strict invariance was not achieved. Then, the residual variance parameter of Item 4 showed the highest EPC (0.460), thus the residual variance parameter of this item was freely estimated, partial strict invariance was achieved.
[g]In the metric model, the factor loading parameter for Item 1 exhibited the highest EPC (0.559). After allowing the factor loading of Item 1 to be freely estimated, partial metric invariance was achieved. In the scalar model, even after allowing the factor loading of Item 1 to be freely estimated, scalar invariance was not achieved. Subsequently, the intercept parameter for Item 6, which exhibited the highest EPC (0.614), was released, scalar invariance was not achieved. Following this, the intercept parameter for Item 2, with the highest EPC (0.329), was released, yet scalar invariance still failed. In the strict model, after releasing the factor loading parameter of Item 1, as well as the intercept parameters for Items 6 and 2, strict invariance was not achieved.
[h]In the scalar model, the intercept parameter for Item 1 exhibited the highest EPC (0.275). After allowing the intercept parameter of Item 1 to be freely estimated, scalar invariance was not achieved. Next, the intercept parameter for Item 3, which exhibited the highest EPC (0.275), was released, but scalar invariance failed. Subsequently, the intercept parameter for Item 4, with the highest EPC (0.172), was also released, but scalar invariance still failed. In the strict model, the intercept parameters for Item 1, Item 3, and Item 4 were allowed to freely estimated; however, strict invariance was not achieved.
[i]In the scalar model, the intercept parameter for Item 1, which exhibited the highest EPC (0.155), was released, partial scalar invariance was achieved. In the strict model, after releasing the intercept parameters for Item 1, strict invariance was not achieved. Then, the residual variance parameter of Item 4 showed the highest EPC (0.666), thus the residual variance parameter of this item was freely estimated, strict invariance failed. Following this, the residual variance parameter of Item 3 showed the highest EPC (0.427), thus the residual variance parameter of this item was freely estimated, yet strict invariance still failed.
CFI = Comparative Fit Index; EPC = expected parameter change; RMSEA = Root Mean Square Error of Approximation; SRMR = Standardized Root Mean Squared Residual; TLI = Tucker–Lewis index.

Table 5. Correlations Between the BRS and Its Two Factors and Other Measures.

Variables	BRS	Positive-worded items	Negative-worded items
Perceived stress	−.57***	−.50***	−.55***
Loneliness	−.43***	−.37***	−.42***
Perceived social support	.34***	.35***	.28***
Stressors	−.26***	−.21***	−.27***
Primary stressors	−.14***	−.11***	−.14***
Secondary stressors	−.30***	−.25***	−.31***
Reappraisal	.31***	.32***	.26***
Suppression	−.12***	−.08***	−.13***

Note. Positive-worded items include the items “I tend to bounce back quickly after hard times,” “It does not take me long to recover from a stressful event,” and “I usually come through difficult times with little trouble.” Negative-worded items include items such as “I have a hard time making it through stressful events,” “It is hard for me to snap back when something bad happens,” “I tend to take a long time to get over set-backs in my life.”
***$p < .001$.

Discussion

In this study, we conducted a comprehensive evaluation of the psychometric properties of the BRS across 21 countries, focusing on its reliability, factor structure, measurement invariance across sex, age, and countries, as well as its criterion validity. Our findings indicate that the BRS, along with other psychological scales, demonstrated acceptable or high reliability, with the exception of the primary stressors scale. The factor structure was validated through CFA, showing that the two-factor structure is the most widely applicable optimal structure across sex, age, and country subgroups. Measurement invariance analysis indicated that the two-factor model of the BRS achieved full measurement invariance across sex, while partial measurement invariance across age was established after releasing the intercept parameter of item 2 and the residual variance parameter of item 1. Regarding cultural differences, partial measurement invariance was achieved in the Latin American subgroup after releasing the intercept parameter for item 6. In terms of geographical heterogeneities, the Central American subgroup exhibited full measurement invariance. However, in the South American subgroup, partial measurement invariance was attained after releasing the factor loading and intercept parameters for Item 2, as well as the residual variance parameter for Item 4. However, the full country group and other country subgroups did not achieve measurement invariance. Finally, the criterion validity of the BRS is supported by its significant correlations with several psychological variables, such as perceived stress, loneliness, and perceived social support.

The Psychometric Properties of the BRS

Results indicate that the BRS has high reliability, with the two-factor structure being the most widely applicable optimal factor structure. First, reliability assessments show that the BRS exhibits high internal consistency, with Cronbach's alpha of .878 and McDonald's omega of .879. These values align with previous BRS validation studies conducted in various populations, such as Spanish and German samples (Chmitorz et al., 2018; Rodríguez-Rey et al., 2016). Second, CFA results demonstrate that the two-factor structure is the most frequently identified optimal model for the BRS in the total sample, as well as across sex subgroups (male and female). This finding is consistent with prior studies that validated the two-factor model, identifying positive (Items 1, 3, and 5) and negative (Items 2, 4, and 6) latent factors (Fung, 2020; Kyriazos et al., 2018). Notably, most previous research has typically focused on validating the BRS within single-country contexts or a limited number of countries, which makes direct comparisons challenging. In contrast, our study systematically assessed the BRS across 21 countries, providing a more comprehensive evaluation of its generalizability and highlighting the potential for cross-cultural variability.

However, in age and country subgroups, the two-factor model is not always the optimal model. In the age subgroups, the two-factor model is optimal for emerging adulthood, middle adulthood, and late adulthood, whereas the bifactor model is optimal for established adulthood. Some studies also indicate that resilience scores vary by age (Na et al., 2022; Rodríguez-Rey et al., 2016; Smith et al., 2010). These may be due to individuals being at different stages of life development, facing distinct challenges, and having diverse experiences, which can lead to varied understandings of resilience (Elder Jr., 1998; Luthar et al., 2000; Werner & Smith, 2001). Established adulthood refers to the age group of 30 to 45 years old, which appears after emerging adulthood and before middle adulthood (Reifman & Niehuis, 2023). Research suggests that the period of established adulthood is often highly stressful, with challenges related to career, marriage, and other responsibilities. For adults in some countries, this stage is frequently one of the most difficult and tense phases of life (Mehta et al., 2020). Therefore, diverse challenges and experiences may enable individuals in established adulthood to have a unique understanding of resilience. For country subgroups, the optimal factor structure is more varied, encompassing the one-factor, two-factor, and bifactor models. Previous validation studies on the application of the BRS in different countries also support the finding that its factor structure may vary across countries (Fung, 2020; Konaszewski et al., 2020; Rodríguez-Rey et al., 2016). One key reason for this variation is that participants from different countries may have distinct cultural backgrounds, leading to differences in their understanding of resilience (Theron et al., 2015; Ungar, 2008).

In addition, the results support full measurement invariance of the BRS across sex and partial measurement invariance across age. First, our findings on the measurement invariance of the BRS across sex enrich previous study, which supported configural, metric, and strict invariance but did not support scalar invariance (Kyriazos et al., 2018). Second, regarding cross-age measurement invariance, we further categorized adults into emerging adulthood, established adulthood, middle adulthood, and late adulthood. This detailed segmentation provides evidence for the applicability of the BRS across various stages of adulthood. However, partial measurement invariance across age was established after releasing the intercept parameter for Item 2 and the residual variance parameter for Item 1. This suggests that individuals at different stages of adulthood may understand these items differently.

Moreover, the results of measurement invariance across countries are complex and provide direct insights for the cross-country use of the BRS scale. Firstly, in the full country group, only configural and metric invariance were supported. This could be attributed to the varying cultural backgrounds of participants from the 21 countries, leading to different understandings of resilience. Some studies have mentioned that resilience is not a universally defined concept but is shaped by cultural norms, values, and practices (Ungar, 2008), and people from different cultural backgrounds may define and understand resilience differently (Panter-Brick, 2015; Ungar, 2013). For example, Betancourt and Khan (2008) emphasize that children from different cultural backgrounds have distinctly different understandings and experiences of resilience, particularly in the context of armed conflict. Kirmayer et al. (2009) found that the resilience of indigenous communities is deeply influenced by their cultural background and resilience should be understood within the framework of the community's cultural meanings and practices. Secondly, the BRS measurement invariance among culturally defined subgroups varied. Specifically, the Latin American subgroup achieved partial measurement invariance, the Western subgroup achieved configural, metric, and scalar invariance, and the Orthodox subgroup achieved configural and metric invariance. This suggests that cultural factors influence the results of BRS measurement invariance, and participants from the same cultural background may have similar understandings of resilience, particularly in the Latin American subgroup. Thirdly, the BRS measurement invariance among geographically defined subgroups also showed differences. Specifically, the Central America subgroup achieved full measurement invariance, the South America subgroup achieved partial measurement invariance, and the Southern Europe subgroup achieved configural, metric, and scalar invariance. In contrast, the Eastern Europe and Northern Europe subgroups only achieved configural and metric invariance. It is noteworthy that the Central America and South America subgroups demonstrated better BRS measurement invariance compared to other geographically defined subgroups, indicating that participants from countries in these subgroups are more likely to have a similar understanding of resilience.

Furthermore, the significant correlations between the BRS, the positive factor, and the negative factor with other psychological variables provide evidence of the BRS's criterion validity. The BRS, along with the positive and negative factors, is negatively correlated with perceived stress, loneliness, and stressors (including primary and secondary stressors), and positively correlated with perceived social support and reappraisal. These findings are consistent with our hypotheses and previous research (Alıcı et al., 2023; Karadaş & Duran, 2022; Ntontis et al., 2023; Pineda et al., 2022; Ruisoto et al., 2020; Thomas & Zolkoski, 2020). Additionally, we demonstrated that the BRS, along with the positive and negative factors, is significantly negatively correlated with suppression, further enriching the understanding of the relation between the BRS and suppression. What's more, the BRS and its positive and negative factors show consistent correlation directions and similar strengths with other psychological variables such as perceived stress, loneliness, perceived social support. This suggests that the positive and negative factors of the BRS may measure the same psychological construct, namely resilience, but are expressed in different forms. This supports the use of the BRS as a unified tool, indicating that it is appropriate to reverse-code the negative items and calculate a total score to reflect an individual's overall psychological resilience.

Future Directions and Limitations

This study has several limitations. First, due to data collection constraints, commonly examined variables related to the BRS, such as depression and anxiety (da Silva-Sauer et al., 2021; Leys et al., 2021; Rodríguez-Rey et al., 2016), were not included, limiting the assessment of criterion validity. Second, the study did not evaluate test–retest reliability given limited cross-sectional design, which is essential for assessing the consistency of BRS scores over time. Third, the BRS ratings in the COVIDiSTRESS Global Survey Round II data used in this study differ from those in the original research by employing a 7-point Likert scale instead of the original 5-point scale (Blackburn et al., 2022; Smith et al., 2008). Research has indicated that changing the number of response options has a non-negligible impact on basic scale norms (Simms et al., 2019). Although Preston and Colman (2000) noted that scales with a higher number of response categories (up to about 7) exhibit notably better reliability, validity, and discriminative power, further exploration is required to determine whether this also holds true for the BRS. Fourth, it is important to interpret findings related to primary stressors with caution, as the relatively lower internal reliability of the primary stressors scale may limit the robustness of the results. The inherent heterogeneity of primary stressors, which often encompass a wide range of context-specific factors, may contribute to the lower reliability. Consequently, the measurement may not fully capture the complexity and diversity of stressors experienced by participants. To address this limitation, future research could consider using alternative scales specifically designed to capture the multidimensional nature of primary stressors or revising the current scale to enhance internal consistency.

This study provides a direction for future research. The lack of cross-cultural measurement invariance suggests that the BRS may not be universally applicable across different cultures. Additionally, existing studies have shown that the factor structure of the BRS varies when translated into different languages and applied in various countries (Fung, 2020; Jacobs & Horsch, 2019; Konaszewski et al., 2020; Martins Barroso, 2021). Therefore, it is essential to verify measurement invariance when using the BRS in specific cultural contexts.

Author Contributions

Conceptualization: ZM; Data curation: ZZ, ZM; Formal analysis: ZM; Funding acquisition: ZM; Investigation: ZM; Methodology: ZM; Project administration: ZM; Writing - original draft: ZZ, ZM; and Writing - review & editing: ZM.

Declaration of Conflicting Interests

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Ethical Approval

The data used in our study were secondary data that were authorized by the COVIDiSTRESS II Project (10.1038/s41597-022-01383-6). Ethical approval for this project was obtained at the University of Salford (UK), as well as local ethical approval where required. This study complied with ethics code outlined in the Declaration of Helsinki.

Transparency and Openness

The dataset used in this study is available on the Open Science Framework (OSF) at https://osf.io/36tsd/. The R code utilized for this study is accessible via the OSF at https://osf.io/hc97q/.

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Supplemental Material

Supplemental material for this article is available online.

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