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Original Research Article

Psychological Reports
0(0) 1–23
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DOI: 10.1177/00332941211029619
journals.sagepub.com/home/prx



How Czecho-Slovakia Bounces Back: Population-Based Validation of the Brief Resilience Scale in Two Central European Countries

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Abstract

Objective: In recent years, resilience has become a focus of research in the medical and behavioral sciences. The Brief Resilience Scale (BRS) was developed to assess the individual ability to recover from stress ("to bounce back") after experiencing adversities. The aim of the study was to validate the Czech and Slovak versions of the BRS.

Methods: A representative sample of the Czech and Slovak populations ($N_{CZ} = 1800$, mean age $M_{CZ} = 46.6$, $SD_{CZ} = 17.4$, 48.7% of men; $N_{SK} = 1018$, mean age $M_{SK} = 46.2$, $SD_{SK} = 16.6$, 48.7% men) completed a survey assessing their health and well-being. Several confirmatory factor analysis (CFA) models of the BRS were compared to find the best fit. Cronbach's alpha and McDonald's omega coefficients of reliability were evaluated. Convergent validity was assessed by correlating resilience (BRS), physical and mental well-being (SF-8) and psychopathology symptoms (BSI-53). Differences in gender and age groups were appraised.

Results: A single-factor model with method effects on the reverse items was evaluated to best fit the data in both the Czech and Slovak samples ($\chi^2_{CZ}(6) = 39.0$, $p < 0.001$, $CFI_{CZ} = 0.998$, $TLI_{CZ} = 0.995$, $RMSEA_{CZ} = 0.055$, $SRMR_{CZ} = 0.024$; $\chi^2_{SK}(6) = 23.9$, $p < 0.001$, $CFI_{SK} = 0.998$, $TLI_{SK} = 0.995$, $RMSEA_{SK} = 0.054$, $SRMR_{SK} = 0.009$). The reliability was high in both samples ($\alpha_{CZ} = 0.80$, $\omega_{CZ} = 0.85$; $\alpha_{SK} = 0.86$, $\omega_{SK} = 0.91$). The BRS was positively associated with physical and mental well-being and negatively associated with somatization, depression and anxiety. In both countries, a lower BRS score was associated with higher age. Czech men reported significantly higher BRS scores than women. No significant difference was found in the mean BRS scores between the two countries.

Conclusion: This study provides evidence of good psychometric properties, reliability and validity of the Czech and Slovak adaptations of the BRS.

Keywords
Resilience, Brief Resilience Scale, validity, reliability, Czech, Slovak

Introduction

Over the past few decades, resilience has become a focus of research in the medical and behavioral sciences (Charney, 2004; Chmitorz, Kunzler, et al., 2018). Resilience has been defined in several ways, but generally it refers to positive adaptation or recovery from stress or severe adversity (Carver, 1997;

Schetter & Dolbier, 2011; Smith et al., 2008). The concept of resilience has been evolving from the trait-oriented to the outcome-oriented approach (Chmitorz, Kunzler, et al., 2018). The trait-oriented approach expects resilience to be a personality characteristic (Bonanno & Diminich, 2013; Connor et al., 2003; T. Q. Hu et al., 2015), while the outcome-oriented approach assumes that resilience is gained after exposure to substantial risk or adversity, meaning that mental or physical health is sustained in spite of severe stress (Chmitorz, Kunzler, et al., 2018; Kalisch et al., 2015).

Psychological resilience is receiving great international interest due to its potential impact on health and well-being, especially in relation to developing stress-related mental disorders (Chmitorz, Kunzler, et al., 2018; Friedli, 2010; Mehta et al., 2019). According to the Global Burden of Diseases, Injuries, and Risk Factors Study (Global Burden of Disease, 2018), more than 10% of the global population suffer from some mental health disorder, like depression or anxiety. The reasons for developing a mental disorder differ but sometimes involve experiencing challenging or traumatic events (Kalisch et al., 2015). One of the fundamental challenges of health systems around the world has thus become prevention of such stress-related mental disorders (Patel et al., 2018). Resilience could be the key to understanding resistance to stress and how individuals deal with various challenging experiences. To assess the policies and interventions employed to promote resilience, reliable and valid measures are needed (Windle et al., 2011).

Several scales measuring resilience have been developed recently, e.g. the Resilience Scale (RS) (Wagnild & Young, 1993), the Resilience Scale for Adults (RSA) (Friborg et al., 2003), or the Connor-Davidson Resilience Scale (CD-RISC) (Connor & Davidson, 2003). However, according to systematic reviews of these scales (Pangallo et al., 2015; Salisu & Hashim, 2017; Windle et al., 2011), most of the scales do not assess resilience as an outcome. They only provide a summary of resilience factors and personal characteristics that facilitate positive adaptation to adversities (Windle et al., 2011). The Brief Resilience Scale (BRS) developed by Smith et al. (2008) is considered to be the only measure whose aim is assessing individuals' ability to recover (or "bounce back") from stressful circumstances and thus is more closely tied to the original gist of resilience (Chmitorz, Kunzler, et al., 2018; Windle et al., 2011). On the other hand, BRS represents only one dimension of resilience and thus cannot assess the complexity of resources of protective factors and resistance to psychopathology (Windle et al., 2011).

The BRS scale has been translated and validated in several countries on various samples: a sample of university students was used in China (Lai & Yue, 2014), Brazil (Coelho et al., 2016), Mexico and Chile (Hidalgo-Rasmussen & Gonzalez-Betanzos, 2019), Malaysia (Amat et al., 2014) and Ghana (Lenz et al., 2018); healthy adult population data was used in Germany (Chmitorz, Wenzel, et al., 2018; Kunzler et al., 2018), the Netherlands (Soer et al., 2019),

France (Jacobs & Horsch, 2019), Romania (Macovei, 2015), Poland (Konaszewski et al., 2020) and Australia (McKay et al., 2021); a sample of people facing different specific health-related stressors was used for validation in the USA (Tansey et al., 2016) and Spain (Rodríguez-Rey et al., 2016). In all those studies, the BRS showed good psychometric properties. Moreover, in systematic comparisons with other resilience scales (Pangallo et al., 2015; Salisu & Hashim, 2017; Windle et al., 2011), the BRS acquired some of the highest ratings regarding reliability and validity. The authors who developed the scale (Smith et al., 2008) state that their goal was to create a scale as short as possible that would form a reliable unitary construct. The BRS thus consists of only six items, 3 positively worded and 3 negatively worded. The factor structure of the scale, however, has been repeatedly disputed: there is evidence for a one-factor structure (Lai & Yue, 2014; Rodriguez-Rey et al., 2016; Smith et al., 2008) and a two-factor structure with items divided according to positive/negative wording (Crane & Searle, 2016; Tansey et al., 2016). Some authors promote using a nested model approach to a two-factor structure, accounting for method effects (Chmitorz, Wenzel, et al., 2018; Crane & Searle, 2016; McKay et al., 2021), or a higher-order factor structure (Hidalgo-Rasmussen & Gonzalez-Betanzos, 2019).

The Czecho-Slovakian psychological community lacks an official translation and validation of the measure. The objective of this study was to adapt the BRS to Czech and Slovak languages and validate both versions of the scale. Even though the Czech and Slovak languages are very similar – they are both Slavic languages, with most dialect varieties of Czech and Slovak being mutually comprehensible – there is still need to have a validated version of the scale for each language separately. The Czech and Slovak Republics were once a united country (Czechoslovakia); thus, a complementary aim of the study is to compare the two countries and their sociodemographic groups in regard to their resilience levels. Based on previous studies (Smith et al., 2008; Smith et al, 2010), we expected that gender and age would be significantly associated with the level of resilience. We further hypothesized that there would be positive correlations between the BRS and physical and mental well-being and negative correlations between BRS and the level of psychopathology. Because of the shared history and similar socio-cultural environment of the two countries, we also expected that there would be no significant difference in their resilience levels.

Materials and methods

Participants

The Czech sample. The sample includes participants of a representative survey of the Czech population. The data collection was administered between September and October 2016 by a professional survey company on behalf of the research team. The Czech sample consisted of n = 1,800 participants, 48.7% of whom

were men; the mean age was 46.6 years and the SD = 17.4 years. The respondents were selected randomly using sociodemographic quotas based on the Czech Statistical Office data. The data can therefore be generalized to the whole Czech population as a representative survey.

The study was approved by the Ethics Committee of the Olomouc University Social Health Institute, Palacky University Olomouc (No. 2016/3).

The Slovak sample. This sample contains participants of a representative survey of the Slovak population. Data collection took place in April 2019 through a professional survey agency. Respondents were selected according to sociodemographic quotas based on data from the Statistical Office of the Slovak Republic. The Slovak sample consisted of n = 1,018 participants, 48.7% of whom were men; the mean age was 46.2 years and the SD = 16.6 years.

The study was approved by the Ethics Committee of the Olomouc University Social Health Institute, Palacky University Olomouc (No. 2019/05).

Procedure

Both samples in the current study were collected in a cross-sectional design at a single time point. Participants were invited to take part in the survey by a professional survey company operating in the Czech or Slovak Republic. Participation in the survey was voluntary and anonymous; the participants were not paid and no other incentives were provided for their participation. Professionally trained administrators conducted standardized structured face-to-face interviews with the respondents. The respondents' sociodemographic characteristics, including gender, age, marital status, education and economic activity, were collected. For the purpose of this study, only gender and age were used, because all other sociodemographic characteristics contain a large number of groups which make measurement invariance analysis non-functioning. The respondents were then asked questions about life experiences, health, lifestyle and attitudes. The relationship between resilience, health and life experiences is addressed only marginally in this study. This wide topic exceeds the scope of this study and will be addressed in future studies.

Measures

The *Brief Resilience Scale (BRS)* consists of 6 items which are rated on a 5-point Likert scale from 1 (Strongly disagree) to 5 (Strongly agree). Items 1, 3, and 5 are worded positively and items 2, 4, and 6 are reversed (Smith et al., 2008). In previous studies, the scale has rendered acceptable reliability with Cronbach's α above 0.80 (Smith et al., 2008, 2010).

The *Short Form 8 (SF-8) Health Survey* describes health-related quality of life (HRQL) through eight items. The score is summarized into a physical

component (PCS) and a mental component (MCS) (Ware et al., 2001). The summary scores refer to the respondent's perception of his/her overall physical and mental health and how it affects their daily life. The Czech version of SF-8 was validated by Bartuskova et al. (2018), and the internal consistency was excellent (Cronbach $\alpha = 0.92$). The Slovak version of SF-8 is currently in the process of validation, and its internal consistency is also excellent (Cronbach $\alpha = 0.93$).

The *Brief Symptom Inventory (BSI-53)* is a shorter version of the SCL-90 psychopathology questionnaire (Derogatis & Melisaratos, 1983). It is a self-report symptom scale consisting of 53 items describing a variety of problems and complaints. The scale is designed to measure the level of psychopathology through the individual symptom areas. The items are rated on a five-point Likert scale from 0 (not at all) to 4 (extremely). The symptoms are merged into nine symptom areas (subscales). For the purpose of this study, three subscales have been used – somatization, depression, and anxiety. The overall severity rate of psychopathology is assessed through the Global Severity Index (GSI) which is considered the best global indicator of an individual's current mental state. The Czech version of the BSI-53 was validated by Kabat et al. (2018), and the internal consistency was excellent (Cronbach $\alpha = 0.97$). The Slovak version of BSI-53 is currently in the process of validation, and its internal consistency is excellent as well (Cronbach $\alpha = 0.98$).

Translation procedure

The Czech and Slovak versions of all the scales used in this study were obtained following the back-translation procedure. As a first step, a forward translation was carried out. The original questionnaires were translated from English into Czech (or Slovak) by two independent translators specializing in translations of psychological literature. The translators' mother tongue was Czech (or Slovak). As a second step, a bilingual (English-Czech, or English-Slovak) expert panel was assembled to compare and discuss the two versions, and to eliminate differences between the translations. The panel consisted of translators and researchers from the Olomouc University Social Health Institute (OUSHI). This process resulted in one complete translated version of the questionnaires in each language. As a third step, the Czech (or Slovak) version of the instruments was translated back into English by a professional native English translator fluent in Czech (or Slovak) who had no previous knowledge of the questionnaires. The English translations were then compared to the original instruments, and inconsistencies between the original version and the back-translation were refined. The final version of the questionnaire was discussed in a focus group considering item clarity and understanding. None of the items was identified as problematic. Thus, the Czech and Slovak versions of the instruments were considered suitable for use in further research.

Statistical methods

All the statistical analyses were conducted in the R software, version 3.6.3 (R Foundation for Statistical Computing, Vienna, Austria). There were no missing values in the data. Means with standard deviations (SD), frequencies and the respective percentages were used as descriptive characteristics of the data. The focal point of this study was the validity and reliability of the Czech and Slovak version of the BRS. The factor structure was assessed using Confirmatory Factor Analysis (CFA) performed in the Lavaan package (Rosseel, 2012). The Diagonally Weighted Least Squares (DWLS) method based on the matrix of polychoric correlations was used to estimate the CFA parameters. Several measures were examined as fitting parameters of the CFA models: the Comparative Fix Index (CFI), the Tucker Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR). In line with L. T. Hu and Bentler (1999), values of CFI and TLI > 0.95, RMSEA < 0.06, SRMR < 0.08 were considered an excellent fit. A set of scaled χ^2 difference tests (Satorra & Bentler, 2001) were executed to determine the best-fitting model. The internal consistency of the BRS was evaluated using Cronbach's alpha and the McDonald omega coefficients. Convergent validity between the BRS and other health-related measures was assessed with the correlation coefficients, and discriminant validity was evaluated by comparing the correlations with the average variance extracted (AVE) score of the BRS. The measurement invariance of the final CFA model was tested to ascertain whether the BRS means could be compared between socio-demographic groups and between the two countries. The Shapiro-Wilk test and histogram visual assessment were used to evaluate the normality of the data. As the normality of the data was rejected, techniques without the normality assumption were used for comparison. The Wilcoxon rank-sum test was employed to compare the gender groups and countries, and the Kruskal-Wallis test with Dunn-Bonferroni correction for multiple group comparison was performed to compare the age groups. The significance level was set at the level of $p < 0.05$ for all statistical significance testing. In addition to the p-values, the Cohen's d effect size coefficients were evaluated. The delta sign (Δ) is applied as a label for the "difference" throughout the Results section and it is always used in the absolute (positive) value.

Results

Characteristics of the two samples

An overview of the characteristics of the two samples – Czech (CZ) and Slovak (SK) – is provided in Table 1. In both samples, around half of the participants were women (51.3%), and the mean age was $M_{CZ} = 46.4$ (± 17.4) and

Table 1. Descriptive characteristics of the Czech and Slovak samples and a comparison of the values of the BRS in the sociodemographic groups in the two countries.

	CZ				SK				Comparison of the countries[†]	
Group	n (%)	BRS mean (SD)	Floor effect (%)	Ceiling effect (%)	n (%)	BRS Mean (SD)	Floor effect (%)	Ceiling effect (%)	p-value	Effect size
Total	1800 (100)	3.02 (0.70)	0.7	0.6	1018 (100)	3.06 (0.78)	0.4	2.0	0.26	0.019
Gender										
Female	923 (51.3)	2.89 (0.71)	0.9	0.5	522 (51.3)	2.90 (0.77)	0.2	1.3	0.78	0.015
Male	877 (48.7)	3.15 (0.67)	0.5	0.7	496 (48.7)	3.23 (0.76)	0.6	2.6	0.06	0.103
Age [years]										
15–24	218 (12.1)	3.02 (0.69)	0.5	0.5	110 (10.8)	3.32 (0.77)	0.9	4.5	<0.001	0.405
25–34	287 (15.9)	3.13 (0.70)	0.3	1.0	187 (18.4)	3.19 (0.71)	0.0	1.6	0.29	0.097
35–44	354 (19.7)	3.04 (0.72)	0.6	0.3	199 (19.5)	3.18 (0.78)	0.5	2.5	0.11	0.136
45–54	279 (15.5)	3.06 (0.72)	0.7	1.1	166 (16.3)	3.10 (0.78)	0.0	1.8	0.86	0.017
55–64	274 (15.2)	2.95 (0.71)	0.7	0.0	168 (16.5)	2.91 (0.75)	0.6	1.8	0.55	0.056
65 plus	388 (21.6)	2.93 (0.67)	1.0	0.8	188 (18.5)	2.75 (0.78)	0.5	0.5	0.002	0.264

Note: [†]Wilcoxon rank-sum test.

$M_{SK} = 46.2$ (± 16.6). The mean BRS score in the CZ sample ($M_{CZ} = 3.02$) was slightly lower than in the SK sample ($M_{SK} = 3.06$).

Construct validity

Four models supported in previous studies (see e.g., Chmitorz, Wenzel, et al., 2018; Konaszewski et al., 2020; or McKay et al., 2021) were examined in the current study. First, a one-factor model which includes all the items, then a two-factor model with positive-worded and reverse items in separate factors, and finally two nested models of single-factor structures accounting for method effects in positive and reverse items were tested. Higher-order factor structures (second order hierarchical model and a bifactor model) could not be tested because in those models the covariance matrices of latent variables were not positive definite, and thus the standard errors could not be computed.

As depicted in Table 2, the best model fit was found in the single-factor models with method effects (models M3-M4) in both the CZ and SK data. In the CZ sample, the overall fit of both method effects models (models M3 and M4) was excellent, as indicated by the TLI, CFI, SRMR and RMSEA values. In the SK sample, however, only the fit of model M4 was excellent. In the CZ sample, the factor loading of item 5 ("I usually come through difficult times with little trouble") in model M3 was very low, with $\lambda = 0.29$. Its value in model M4 is higher, with $\lambda = 0.44$. The factor loadings of other items in model M4 were satisfactory, with values above 0.50, and their values were similar in both samples (see Figure 1). Given the above information, the single-factor model with method effects on the reverse items (model M4) was evaluated as the best fit to the data in both samples. Therefore, the reliability, validity and group differences were analyzed for this model only. Table 3 shows the item analysis and inter-item correlations in both countries.

Reliability

The internal consistency was measured using the Cronbach's α and McDonald's ω coefficients. Both coefficients showed good reliability of the scale, with $\alpha = 0.80$ (95% CI 0.79–0.82) and $\omega = 0.85$ in the CZ sample, and $\alpha = 0.86$ (95% CI 0.84–0.87) and $\omega = 0.91$ in the SK sample.

Convergent and discriminant validity

Correlations between the BRS and health-related measures were used to assess convergent and discriminant validity in both samples. The BRS was positively correlated with physical and mental well-being measured with the summary PCS and MCS scores of the SF-8 Health Survey scale. The BRS was negatively correlated with the subscales of somatization, depression and anxiety, and with the Global Severity Index (GSI) of the BSI-53 scale. All correlation

Table 2. Results of the CFA analysis: Fit indices and comparisons for the four models of the BRS.

		Model Fit					
Sample	BRS model	DWLS Chi-Square	CFI	TLI	RMSEA (90% CI)	SRMR	$\Delta\chi^2$ (Δdf)
CZ	M1: One factor	424.6 (df 9)***	0.975	0.958	0.160 (0.147–0.173)	0.067	280.4 (1)***
	M2: Two factors	48.9 (df 8)***	0.998	0.995	0.053 (0.040–0.068)	0.026	
	M3: One factor (method effect on positive items)	35.2 (df 6)***	0.998	0.996	0.052 (0.036–0.069)	0.022	27.0 (2)***
	M4: One factor (method effect on reverse items)	39.0 (df 6)***	0.998	0.995	0.055 (0.040–0.072)	0.024	23.5 (2)***
SK	M1: One factor	1166.1 (df 9)***	0.872	0.787	0.356 (0.338–0.373)	0.111	183.5 (1)***
	M2: Two factors	63.3 (df 8)***	0.994	0.989	0.082 (0.064–0.102)	0.015	
	M3: One factor (method effect on positive items)	54.7 (df 6)***	0.995	0.987	0.089 (0.069–0.112)	0.013	10.9 (2)**
	M4: One factor (method effect on reverse items)	23.9 (df 6)***	0.998	0.995	0.054 (0.032–0.078)	0.009	28.0 (2)***

Note: ***$p < 0.001$, **$p < 0.01$; $\Delta\chi^2$=Chi-Square Difference test compared to model M2; Δdf = difference in degrees of freedom.

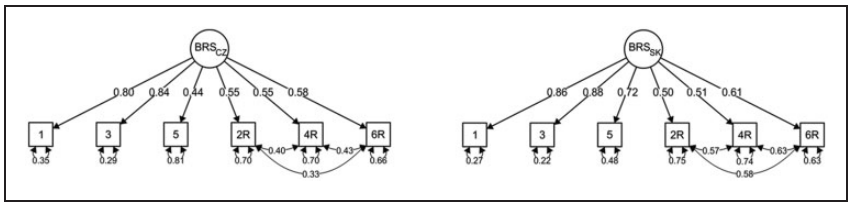

Figure 1. The best fitting CFA model: A one-factor model with method effects on reverse items (M4) on the Czech (BRS_{CZ}) and the Slovak (BRS_{SK}) sample.

coefficients were statistically significant ($p < 0.001$) in both samples, and the correlations were significantly stronger in the SK sample (see Table 4). The correlation analysis indicates sufficient convergent validity of the BRS in the CZ and SK environments.

To examine the discriminant validity of the BRS, the average variance extracted (AVE) score was evaluated and compared to the squared correlations among the scales in both samples. The AVE of the BRS reached 0.42 and 0.49 in the CZ and SK samples, respectively. None of the squared correlation coefficients of the compared scales (ranging from 0.042 to 0.094 in the CZ sample, and 0.113 to 0.182 in the SK sample) exceeded the AVE scores. Therefore, the discriminant validity of the construct was met in both samples.

Differences in BRS scores among sociodemographic groups

To assess differences between the countries and their sociodemographic groups in the BRS scores, measurement invariance of the method effects model (M4) was tested. Strong measurement invariance was found for the countries ($\Delta\chi^2(17)=71.29$, $p = 1$, $\Delta CFI = 0.010$, $\Delta RMSEA = 0.062$); therefore, the BRS means between the two samples can be compared. Furthermore, in the CZ sample, there was strong measurement invariance in gender ($\Delta\chi^2(17)=11.14$, $p = 0.849$, $\Delta CFI = 0.002$, $\Delta RMSEA = 0.034$) and age ($\Delta\chi^2(85)=56.67$, $p = 0.992$, $\Delta CFI = 0.008$, $\Delta RMSEA = 0.053$). In the SK sample, strong measurement invariance was confirmed in the age groups only ($\Delta\chi^2(85)=67.33$, $p = 0.921$, $\Delta CFI = 0.004$, $\Delta RMSEA = 0.052$). Thus, the BRS means between the age groups were compared in both the CZ and SK samples, whereas the means between the gender groups were compared in the CZ sample only (the means of the groups are presented in Table 1).

Regarding differences in the age groups, a lower BRS score was associated with higher age in both the CZ and SK samples. However, in the CZ sample the differences were found with a small effect size ($d = 0.173$) and were significant only between the age group of 25–34 years and the two oldest groups of 55–64 years ($\Delta M = 0.18$, $p = 0.042$) and over 65 years ($\Delta M = 0.20$, $p = 0.003$). In the SK sample, all age groups younger than 44 years reported significantly higher

Table 3. BRS item analysis and inter-item correlations.

BRS item	M_{CZ}/M_{SK}	SD_{CZ}/SD_{SK}	Inter-item correlations (CZ/SK)				
			Item 1	Item 2	Item 3	Item 4	Item 5
1. I tend to bounce back quickly after hard times	3.1/3.3	1.01/1.04					
2. I have a hard time making it through stressful events (R)	2.9/3.0	1.00/1.04	0.38/0.40				
3. It does not take me long to recover from a stressful event	3.1/3.1	0.98/1.03	0.62/0.70	0.43/0.43			
4. It is hard for me to snap back when something bad happens (R)	3.0 /3.0	0.99/1.02	0.44/0.42	0.51/0.61	0.43/0.43		
5. I usually come through difficult times with little trouble	3.0/3.1	0.95/0.98	0.35/0.59	0.28/0.34	0.35/0.57	0.18/0.34	
6. I tend to take a long time to get over setbacks in my life (R)	3.0 /3.0	1.01 /1.03	0.46/0.50	0.34/0.64	0.45/0.52	0.57/0.67	0.24/0.42

Note: Results from the Czech and Slovak samples are separated by a forward slash; R = reverse-coded; M = mean; SD = standard deviation.

Table 4. Nonparametric Spearman correlation coefficients between the BRS and health-related measures and their differences between the two countries.

	BRS				Comparison		
	CZ		SK		of correlations†		
	rho	(95% CI)	rho	(95% CI)	Z-test	p-value	Effect size
SF-8 Health Survey							
Physical Component Summary (PCS)	0.206	(0.16, 0.25)***	0.336	(0.28, 0.39)***	−3.580	<0.001	0.141
Mental Component Summary (MCS)	0.296	(0.25, 0.34)***	0.363	(0.31, 0.42)***	−1.915	0.028	0.075
Brief Symptom Inventory (BSI-53)							
Somatization	−0.268	(−0.34, −0.25)***	−0.393	(−0.44, −0.34)***	3.582	<0.001	0.141
Depression	−0.289	(−0.33, −0.25)***	−0.410	(−0.46, −0.36)***	3.518	<0.001	0.138
Anxiety	−0.301	(−0.34, −0.26)***	−0.407	(−0.46, −0.35)***	3.092	0.001	0.121
Global Severity Index (GSI)	−0.306	(−0.35, −0.26)***	−0.427	(−0.49, −0.39)***	3.568	<0.001	0.140

Note: ***$p < 0.001$; †Comparison of correlations between countries.

BRS scores than the two oldest groups over 55 years ($p < 0.05$ in all pairwise comparisons, with moderate effect size of $d = 0.487$). Comparing gender, Czech men reported significantly higher BRS scores than women ($\Delta M = 0.26$, $p < 0.001$, with a moderate effect size of $d = 0.379$). Overall, there was no significant difference found in the mean BRS scores between the CZ and SK samples.

Discussion

The objective of this study was to adapt the BRS scale to the Czech and Slovak languages and to assess the factor structure, reliability and validity of both versions of the scale on representative samples from both countries. A complementary aim of the study was to compare the two countries in their resilience levels.

Our results showed that the unidimensional model controlling for method effects performed better than other compared models in both countries. The model with correlated residuals of the reverse items has been previously discussed in a German population-based validation study (Chmitorz, Wenzel, et al., 2018) and in an Australian study (McKay et al., 2021). The authors of those studies have concluded that the method effects model performed significantly better than the other models and recommended its use in future studies. The previous discrepancies in the CFA results supporting different factor structures of the scale could have been caused by method effects as a consequence of varying response patterns to the positive and negative item wording. The results in both the Czech and the Slovak samples promote the notion of the BRS being a single-factor structure with correlated errors rather than a one- or two-factor structure without correlated errors. The BRS was originally introduced as a unitary construct measuring the ability to bounce back from stress (Smith et al., 2008). The positively worded items assess a quick recovering from stressful events and experiencing little distress, while the negatively worded items assess difficulties with recovering from stressful events. In fact, the positive and negative items represent semantic opposites (McKay et al., 2021). Therefore, it is disputable whether there could be two meaningful factors formed by the positive and negative items. In clinical practice, the unidimensional construct assessing the ability to recover from an illness may be more beneficial than assessing the ability to resist the illness (Kunzler et al., 2018; Salisu & Hashim, 2017; Windle et al., 2011).

The Czech and Slovak versions of the BRS were shown to be reliable using the Cronbach's α and McDonald's ω coefficients. Our results were consistent with the reliability of the original validation study (Smith et al., 2008), where alpha values ranged from 0.80 to 0.91. The German and Polish validation studies on representative national samples reported similar reliability, with $\alpha = 0.85$

and 0.88, $\omega = 0.85$ and 0.88, respectively (Chmitorz, Wenzel, et al., 2018; Konaszewski et al., 2020).

The current study renders evidence for the convergent and discriminant validity of the BRS in the Czech and Slovak adaptations. With regard to the moderate correlation coefficients, the convergent validity of the Czech and Slovak adaptations of the BRS can be viewed as mediocre. The Slovak convergence was significantly stronger than the Czech, with p-values < 0.05 but rather low effect sizes (< 0.15). From previous studies on population samples (e.g. Kyriazos et al., 2018) as well as on clinical samples (e.g. Sánchez et al., 2021) it is known that a lower BRS score is associated with worse mental health, a higher level of psychopathology and lower well-being. The positive correlation between resilience measured by the BRS and physical and mental well-being is consistent with validation studies in Germany, Poland and Australia (Chmitorz, Wenzel, et al., 2018; Konaszewski et al., 2020; McKay et al., 2021). The negative association found between the psychopathological symptoms measured by the BSI-53 scale and resilience as the ability to recover from stressful circumstances is in line with most of the validation studies of the BRS. The German validation study (Chmitorz, Wenzel, et al., 2018) found a negative relationship between the BRS score and symptoms of mental disorders. Moreover, the authors of a Spanish study (Rodríguez-Rey et al., 2016) claim that the level of resilience measured by the BRS can even predict the severity of health outcome in terms of depression, anxiety and post-traumatic stress. The results of an Australian study performed on a group of rescue workers support the notion of resilience as a construct for predicting the ability to recover from stress without developing the symptoms of mental disorders (Joyce et al., 2019). However, longitudinal studies assessing the predictive power of the BRS score on mental health in other demographic groups still need to be conducted in order to validate the effect.

Our study presented significant differences in resilience levels between age and gender groups in Czech and Slovak samples. A lower BRS score was associated with higher age groups in both countries (overall $p_{CZ}=0.026$, $d_{CZ}=0.173$; $p_{SK}<0.001$, $d_{SK}=0.487$). This is in contrast to the original study (Smith et al., 2008) as well as other studies, where higher age correlated positively with higher resilience (Rodríguez-Rey et al., 2016; Smith et al., 2010). On the other hand, German population-based studies (Chmitorz, Wenzel, et al., 2018; Kunzler et al., 2018) showed negative relationship between resilience and age, which is in line with our results. The German authors argue that this discrepancy between studies may be explained by the range of participants' age. When focusing on a narrower age group, like Smith et al. (2008) and (2010), or Rodríguez-Rey et al. (2016), the resilience might increase with age, as people experience positive adaptation to their life events. However, in representative studies like the current one, or the German studies of Chmitorz, Wenzel, et al. (2018) or Kunzler et al. (2018), the participants come from a wide age range and the ability to recover from stressful events seems to decrease with age.

Czech men reported higher resilience than women ($p < 0.001$, $d = 0.379$), which corresponds with results from other validation studies (Chmitorz, Wenzel, et al., 2018; Konaszewski et al., 2020; Kunzler et al., 2018; Rodríguez-Rey et al., 2016; Smith et al., 2008). This difference might be elucidated by biological and developmental factors affecting one's response to stress (Iimura & Taku, 2018; Verma et al., 2011), as well as distinct social roles and the higher possibility of socially desirable responses in men. The gender difference is also consistent with a higher lifetime prevalence of mental disorders related to stress in women (Riecher-Rossler, 2017). The gender difference was not assessed in the Slovak sample because the strong measurement invariance was not confirmed in it, and thus the construct cannot be considered equivalent in the gender groups.

The mean BRS score of the Czech ($M = 3.02$) and Slovak samples ($M = 3.06$) did not differ significantly between the two countries ($p = 0.26$, $d = 0.019$). However, they are at the lower end of the reported resilience levels. The range reported by Smith et al. (2008) was 3.53 to 3.98; in Germany (Chmitorz, Wenzel, et al., 2018) the mean resilience reached 3.37. Values similar to those of the Czech and Slovak samples were found in a Polish representative sample ($M = 3.03$) (Konaszewski et al., 2020) and in Spain ($M = 3.01$) (Rodríguez-Rey et al., 2016). Assuming that the BRS is predictive of the true ability to bounce back, it should be essential to keep the BRS level as high as possible. In countries like the Czech and Slovak Republics, where the mean resilience reaches a lower level, promotion of techniques that increase resilience might help people overcome adversities and recover after stress. Resilience training could also be targeted on individuals who are at a higher risk of developing stress-related mental disorders, e.g. women, people with low life satisfaction and high level of perceived stress.

Strengths and limitations

A strength of our study may be found in the representative nature of the studied samples and the large sample sizes. The results of this study will be used in subsequent research of associations between childhood trauma, insecure attachment and resilience, which seem to be essential for overall health and well-being in adulthood (Chmitorz, Kunzler, et al., 2018; Darling Rasmussen et al., 2019).

A potential limitation of the study is the cross-sectional design, which does not allow any causal relationships to be explored. Another limitation of the current study may be that there was no comparison of the BRS with other resilience measures, such as the CD-RISC (Connor & Davidson, 2003) or RS (Wagnild & Young, 1993). This was influenced by the design of the study and should be addressed in future studies. The Slovak adaptation of the SF-8 and BSI-53 scales is currently in the process of validation, which brings another limitation to this study. This limitation will be eliminated in the near future.

Conclusions

This study renders evidence of the good psychometric properties, reliability and validity of the Czech and Slovak adaptations of the BRS. The CFA confirmed the BRS as a single-factor scale with method effects. The Czech and Slovak BRS was shown to be an eligible means of assessing resilience for research purposes as well as clinical practice. The predictive power of the BRS score on mental health needs to be assessed in longitudinal studies.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by the Czech Science Foundation research project The Association of Stressful Life Events Across the Life Span, Insecure Attachment Following Childhood Trauma, and Resilience with Health (Contract No. 19-18964S).

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