



# Measuring Resilience Across Australia and Norway

## Validation and Psychometric Properties of the English Version of the Resilience Scale for Adults

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**Abstract:** Resilience has become increasingly important in clinical and health psychology, but only few scales have received good psychometric ratings for assessing various outcomes of resilience. The Resilience Scale for Adults (RSA) is one of the best psychometrically rated scales and has been validated among Norwegian samples. The purpose of this study was to explore the construct validity of the RSA in an English-speaking Australian sample and test measurement invariance between the Australian sample and a Norwegian sample. An Australian sample ( $N = 781$ ) completed the RSA, Sense of Coherence Scale (SOC-13), Patient Health Questionnaire (PHQ-9), and Generalized Anxiety Disorder Questionnaire (GAD-7). A second sample of Norwegians ( $N = 320$ ) was included in the analyses of invariance of the RSA across cultures. There were expected negative correlations between RSA and PHQ-9, and between RSA and GAD-7, but positive correlations between RSA and SOC-13. The results indicated that the six-factor measurement model of the RSA is the same in the Australian and Norwegian samples, and respondents from the two cultures understood and interpreted the items in a comparable fashion. Support was found for the cross-cultural validity of the RSA in an English-speaking Australian sample and as a valid and reliable self-report measure of protective factors.

**Keywords:** cross-cultural validation, measurement invariance, psychometric properties, resilience, protective factors

Developing and maintaining healthy mental state are crucial for positive development and adaptation throughout the life course making research on what preserves mental health important (Masten, Best, & Garmezy, 1990). One auspicious initiative is the study of resilience and how factors related to resilience may protect or promote a healthy adaptation despite threats, chronic stressors, or adverse living conditions (Reivich, Gillham, Chaplin, & Seligman, 2013). Resilience is the process of, capacity for, or outcome of successful adaptation leading to a trajectory of positive development despite significant threat or adverse circumstances (Masten et al., 1990). Proper assessment of resilience is required, and in particular, of the underpinning resources that may help turn life around and sustain recovery (Hjemdal, Roazzi, Maria da Graça, & Friborg, 2015). The number of available scales assessing various aspects or outcomes of resilience is increasing, which in a systematic review by Windle, Bennett, and Noyes (2011) counted 19. The Resilience Scale for Adults (RSA) received one of the best psychometric ratings. The RSA was originally

developed and validated in Norwegian samples (Friborg, Hjemdal, Rosenvinge, & Martinussen, 2003). Since the items were developed from all available international empirical evidence at the time (Hjemdal, Friborg, Martinussen, & Rosenvinge, 2001), the scale should be applicable in other cultures as well.

So far, the RSA has been validated in five different countries, which all support the original factor structure along with evidence of validity. Validation studies have been conducted among 363 participants in Belgium (Hjemdal et al., 2011), 308 participants in Italy (Capanna, Stratta, Hjemdal, Collazzoni, & Rossi, 2015), 499 participants in Lithuania (Hilbig, Viliūnienė, Friborg, Pakalniškienė, & Danilevičiūtė, 2015), 373 participants in Iran (Jowkar, Hjemdal, & Friborg, 2010), and 222 participants in Brazil (Hjemdal et al., 2015). A short version suited for use in epidemiological studies supported its use also among indigenous Sami people in Norway, as reported in the large SAMINOR2 study ( $N = 11,600$ ) (Friborg, Sørli, & Hansen, 2017). These relatively unequivocal findings indicate potential qualities of the

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Sørлие, & Hansen, 2017). These relatively unequivocal findings indicate potential qualities of the items of the RSA applicable across many different countries. In the present study, we examined the cross-cultural validity of the RSA in an Australian compared to a Norwegian sample.

### **General description of the RSA**

The RSA was developed following a review of contemporary studies that assembled all available empirical papers identifying a list of about 15 groups of resilience factors (Hjemdal et al., 2001). Among the 15 groups of resilience factors, Hjemdal et al. (2001) identified three overarching protective factors that also converged well with reports by other resilience researchers (Garmezy, 1974, 1987; Masten, Best, & Garmezy, 1990). The three overarching factors were, personal positive disposition or capacity, supportive and cohesive family milieu, and access to external support systems outside the family. Following the seminal work with the RSA, it has undergone several revisions to fine-tune the factorial and structural validity (Friborg, Hjemdal, Martinussen, & Rosenvinge, 2009). The current scale consists of 33 items assessing six resilience factors namely, *perception of self*, *planned future*, *social competence*, *structured style*, *family cohesion*, and *social resources*.

*Perception of self (PS)* assesses a basic trust or confidence in one's own ability to solve, manage or cope well with dire or adverse life events. *Planned Future (PF)* assesses a positive outlook on one's own future, a preference for making plans and formulate clear future goals, and belief in success. *Social competence (SC)* asks for the ability to engage socially and create friendships, feel at ease in social settings and flexibility in social interactions. Social competence is associated with developing and maintaining social relations and social networks, which may expand sources of social support (Werner & Smith, 1992). *Structured Style (SS)* assesses goal orientedness, preference for establishing routines, planning ahead, and for approaching tasks in an organized manner. *Family Cohesion (FC)*

assesses shared familial values, shared familial optimistic view of future, family loyalty and mutual appreciation. *Social Resources (SR)* asks whether other people outside the family (e.g., friends) are available and may provide encouragement and assistance if needed. The RSA is a copyrighted instrument that the authors grant permission to use following a request.

### **Validity of the RSA**

People scoring high on the RSA seem to be more stress-tolerant, as for example a prospective study on stressful life events showed (Hjemdal, Friborg, Stiles, Rosenvinge, & Martinussen, 2006). Individuals reporting less resilience resources develop more psychiatric symptoms following stressful life events than those having more resilience, establishing predictive validity of the RSA. The RSA has been cross-validated and compared with measures of personality (Big Five/5PFs), cognitive abilities (Raven's Advanced Matrices, Vocabulary, Number series), and social intelligence (Friborg, Barlaug, Martinussen, Rosenvinge, & Hjemdal, 2005). Findings from the study supported the convergent and discriminant validity of the RSA, and thus the inference that individuals scoring high on this scale are psychologically healthier, better adjusted, and thus more resilient (Friborg et al., 2005). The RSA also differentiated between patients and healthy control respondents in a prospective study separated by four months. Convergent validity was supported by positive correlations between RSA subscales and the Sense of Coherence Scale (SOC). Findings supported the RSA as a valid and reliable measurement to assess the presence of protective factors important to regain and maintain positive mental health (Friborg et al., 2003). Anyan et al. (2017) found that the direct relationship between anxiety and depressive symptoms, and the indirect relationship between stressful negative life events and depressive symptoms were less strong for more resilient than less resilient subjects, both in Australian and Norwegian samples. Resilience resources thus act as protective factors and do so across countries.

## Testing of cross-cultural invariance

Examination of *measurement invariance* is one of the best methods for investigating whether an instrument measures the intended latent construct equivalently across contexts or cultural groups (Chen, 2007). The analysis can pinpoint any sources of differences across a hierarchy of levels that range from weak to strict in terms of invariance namely:

- i. Equal factor structure (configural invariance – basic, very weak requirement)
- ii. Equal factor loadings (metric invariance – weak requirement)
- iii. Equal latent intercepts (scalar invariance – strong requirement)
- iv. Equal latent error terms (strict factorial invariance – very strict requirement)

All tests should minimally support *configural invariance*, which simply examines if the same factor model may be assumed across Australia and Norway. Support of configural invariance indicates that similar latent constructs have been measured in both countries. The factor loadings may still differ (Chen, 2007), which the next test, *metric invariance*, will detect. It examines whether the factor loadings are equal in both samples from Australia and Norway. This is the most important test as it indicates whether a linear increase in the summated raw score measures a comparable increase in the latent construct across samples (Byrne, 2013; Chen, 2007). If supported, samples from both Australia and Norway interpret scale items similarly; hence, simple regression analyses based on raw scores may be used to conclude about cultural differences also on a latent trait score level.

A stricter and often unrealistic invariance requirement is *scalar invariance*, which requires equal latent intercepts, or equal item thresholds for variables having ordered categories (Millsap & Yun-Tein, 2004). If supported, respondents in both Australia and Norway use the same starting point (intercept) for scaling their responses. In practise, they use the ordinal response categories comparably. The strictest requirement is *strict factorial invariance*, which additionally require all error variances to be equal, or that all item

reliabilities are equal between the groups (Chen, 2007; van de Schoot et al., 2012). These two latter requirements, and in particular the last, are very seldom supported (Chen, 2007). Lack of strict factorial invariance is not necessarily problematic as the latent construct may still be validly compared between groups, but with different degrees of measurement precision; hence, partial support of *scalar* or *strict factorial* invariance would be acceptable (Byrne, 2013).

## **Hypotheses**

We expected to replicate the six-factor structure of the RSA in the Australian and Norwegian sample (support of configural invariance), as well as observing comparable factor loadings in both groups (support of metric invariance). We did not expect full scalar (equal intercepts) nor strict factorial invariance (equal residuals) as this is seldom supported (Chen, 2007).

Support of the construct validity of the RSA was expected by showing significantly negative correlations with measures of symptoms of depression and anxiety, and significantly positive correlations with the Sense of Coherence scale, which measures general adaptation ability, meaning and purpose in life (Antonovsky, 1987, 1993, 1996). Given adequate support of measurement invariance, these observed correlations were expected to be comparable between participants in Australia and Norway.

## **Method**

### ***Participants***

The Australian sample comprised students of the Australian National University (ANU), nationwide online samples represented by age, gender and location from the Online Research Unit agency, and waiting passengers at bus stops in Canberra. Three hundred and seventy-five were males, 405 were females and one reported 'other' as gender. Two hundred and two (about 26%) were aged between 18 – 25 years, 126 (about 16%) were aged between

26 – 30 years, and 453 (58%) were aged 31 years or more. Since only one respondent reported ‘other’ as gender in the Australian sample, this was not included when investigating gender differences. Participants in the Norwegian sample were students at the Norwegian University of Science and Technology (NTNU). Their age ranged from 17 to 33 years ( $M = 18.99$ ,  $SD = 2.77$ ). One hundred and seventy-five were females and 143 were males and two did not report gender. The two participants were not included when investigating gender differences.

### ***Procedure***

The Regional Committee for Medical Research Ethics (REK) in Norway and the Human Research Ethics Committee of the ANU granted ethics approval for this study. In the current study, the Norwegian version of the Resilience Scale for Adults was translated to English to be used by the Australian samples. The translation was undertaken by two independent bilingual persons with good knowledge of resilience and psychology, and then back translated by two new independent bilingual persons with the same skill set. Three English native speakers were then asked to go through it for comprehensibility. Informed consent was sought by first giving out an information sheet which also stated that a completed and returned survey questionnaire constituted consent.

### ***Instruments***

#### ***Resilience scale for adults (RSA)***

The RSA (Friborg et al., 2003; Hjemdal et al., 2001) is a 33-item self-report scale, consisting of six factors for measuring resilience (protective factors) to psychosocial adversities among adults. The RSA has been found to have cross-cultural validity (Hjemdal et al., 2011; Hjemdal et al., 2015). It uses a 7-point semantic differential scale format in which each item has a negative and a positive attribute at each end of the scale continuum (Friborg, Martinussen, & Rosenvinge, 2006). Half of the items are reversely scored in order to reduce



acquiescence bias. Higher scores indicate higher levels of resilience protective factors. In the present study, Cronbach's alpha for the Australian and Norwegian samples were *RSA total* (Aus:  $\alpha = .93$ ; Nor:  $\alpha = .89$ ), *Perception of self* (Aus:  $\alpha = .82$ ; Nor:  $\alpha = .73$ ), *Planned future* (Aus:  $\alpha = .81$ ; Nor:  $\alpha = .74$ ), *Social competence* (Aus:  $\alpha = .76$ ; Nor:  $\alpha = .73$ ), *Family cohesion* (Aus:  $\alpha = .84$ ; Nor:  $\alpha = .84$ ), *Social resources* (Aus:  $\alpha = .86$ ; Nor:  $\alpha = .82$ ) and *Structured style* (Aus:  $\alpha = .50$ ; Nor:  $\alpha = .65$ ).

### ***Sense of coherence (SOC)***

The SOC – 13 (Antonovsky, 1993) is a brief report of the SOC–29 that measures general positive intrapersonal adjustments important for preserving good mental health. There are three underlying components that comprise Sense of coherence namely, *Comprehensibility* (cognitive component), *Manageability* (Instrumental/behavioural component) and *Meaningfulness* (motivational component) (Antonovsky, 1987, 1996). According to Antonovsky (1987, 1996). If a person understands what is happening to him (comprehensibility), believes that the resources to cope are available to do something (manageability) and is motivated to cope (meaningfulness), s/he will have more strength to resist the stressor and be able to cope. The SOC – 13 uses a 7-point semantic differential scale with positive and negative attributes at each endpoint of the items. In the present study, Cronbach's alpha for the Australian sample was  $\alpha = .84$

### ***Patient health questionnaire (PHQ – 9)***

The PHQ-9 (Kroenke, Spitzer, & Williams, 2001) is a nine-item self-report measure that assesses the frequency of depressive symptoms over the past two weeks. All items are answered using a 4-point Likert-type scale format ranging from 0 (*not at all*) to 3 (*nearly every day*) with total scores from 0 to 27. Higher scores indicate more depressive symptoms reported by the participants. The PHQ-9 is commonly used for screening and diagnosis, as

well as selecting and monitoring treatment (Kroenke et al., 2001). In the present study, Cronbach's alpha for the Australian sample was  $\alpha = .92$ .

### ***Generalized Anxiety Disorder (GAD – 7)***

The GAD–7 (Kroenke et al., 2001; Spitzer, Kroenke, Williams, & Löwe, 2006) is seven-item self-report measure that assesses anxiety related symptoms in primary care. All items are answered using a 4-point Likert-type scale format ranging from 0 (*not at all*) to 3 (*nearly every day*) with total scores from 0 to 21. Higher scores indicate more anxiety symptoms reported by the participants. In the present study, Cronbach's alpha for the Australian sample was  $\alpha = .92$ .

### **Statistics**

SPSS 24.0 was used for descriptive statistics and correlational analyses, while testing of measurement invariance was conducted in R version 3.4.1 (R Core Team, 2015), using package LAVAAN (Rosseel, 2012). We considered a  $p$ -value of  $\leq .01$  necessary for the six cross-sample comparisons, one for each RSA subscale. The internal consistency was examined with Cronbach's alpha (which assumes *tau*-equivalence) and Raykov's rho (which accepts differences in *tau*, factor loadings) (Raykov, 2001). Since the RSA scores were non-normally distributed (Australia: Mardia's multivariate skewness = 154.77,  $p < .001$ ; Mardia's multivariate kurtosis = 115.48,  $p < .001$ ; Norway: Mardia's multivariate skewness = 232.22,  $p < .001$ ; Mardia's multivariate kurtosis = 36.04,  $p < .001$ ), the unweighted least squares (ULS) estimator was preferred as the RSA variables were treated as ordinal scores (Brown, 2015; Forero, Maydeu-Olivares, & Gallardo-Pujol, 2009; Li, 2016). The ULS estimation procedure adjusting for non-normal means and variances (i.e., ULSMV) was used since it produces less biased parameters, standard errors and goodness-of-fit measures than maximum likelihood (ML) or the diagonal weighted least square estimator (DWLS) (Forero et al., 2009). In case of non-convergence, the DWLS was preferred.

Measurement invariance was tested using the procedure proposed by Millsap and Yun-Tein (2004) for ordered-categorical measures with theta parameterization. Model fit was evaluated with the following indices: Standardized Root Mean Square Residual (SRMR) (Browne & Cudeck, 1993) and Root Mean Square Error of Approximation (RMSEA) (Hu & Bentler, 1999) values less than .08, and values equal to or less than .06 respectively, a Comparative Fit Index (CFI) and a non-Normed Fit index (NNFI; aka TLI) greater than .95 (Hu & Bentler, 1999). The analyses were performed using data from Australian and Norwegian respondents.

Configural invariance was tested first, which also represented the baseline model for the subsequent and more restrictive models. Metric invariance was tested by constraining all factor loadings as equal across groups. Next, we constrained the item thresholds as equal across the groups to test scalar invariance. Since full scalar invariance is seldom supported, non-invariant thresholds with high modification indices were identified, thus improving model fit significantly if freed. Strict invariance was tested by constraining all item residual variances as equal across groups. Again, the modification indices were used to identify residual variances that could be relaxed.

As the increasingly restrictive models estimate the same parameters as the unconstrained models, change in model fit was examined with the chi-square difference test; however, since the ULSMV method is not distributed as chi-square, we used a scaled difference test as described by Satorra (2000) and, Satorra and Bentler (2010). In accordance with Chen (2007), we additionally examined a change of  $\geq -.010$  in CFI, and  $\geq .015$  in RMSEA or a change of  $\geq .030$  in SRMR as indicating noninvariance when testing weak invariance. For testing strong and strict, we used the same changes in values for CFI and RMSEA, supplemented by a change of  $\geq .010$  in SRMR as indicating noninvariance.

## **Results**

### **Mean differences in RSA scores across countries and gender**

Table 1 presents the means, standard deviations and reliability estimates of the RSA with subscales. The following three subscales of the RSA had significantly higher sum scores in the Norwegian compared to the Australian sample: *social competence*, *family cohesion* and *social resources*.

*[Kindly insert Table 1 here]*

In the Australian sample, gender differences in two of the RSA subscales emerged, indicating that males reported significantly higher perception of self than females ( $M = 5.00$  vs  $M = 4.82$ ) ( $t = 2.28, p = .023$ ), whereas females reported higher social resources than males ( $M = 5.39$  vs  $M = 5.20$ ) ( $t = 2.61, p = .009$ ). All input data as well as the results are provided in the Electronic Supplementary Material, ESM 1.

### **Psychometric characteristics of the RSA factor model**

The original six-factor structure fit reasonably well in the Australian and the Norwegian sample (M1a and M1b, Table 2). Form invariance (M2) was adequate as the equivalent six-factor model in both samples with identical factor patterns had acceptable fit in terms of the RMSEA index.

*[Kindly insert Table 2 here]*

Table 1

*Table of Means, Standard deviations, Test Score Reliability and Pearson's Correlation between RSA scores*

Variable	Australia <i>n</i> = 781		Norway <i>n</i> = 320		<i>g</i>	Reliability Australia			Correlation coefficients						
	<i>Mean</i>	<i>SD</i>	<i>Mean</i>	<i>SD</i>		$\alpha$	$\rho$	1	2	3	4	5	6	7	
1 RSA Total	4.93	0.90	5.31	0.68	-.50***	.93			.83	.81	.75	.81	.86	.57	
2 Perception of self	4.91	1.13	4.83	1.06	.07	.82	.83	.68		.75	.57	.55	.58	.43	
3 Planned future	4.93	1.16	4.96	1.16	-.03	.81	.81	.67	.45		.48	.53	.58	.62	
4 Social competence	4.56	1.12	5.48	0.93	-.93***	.76	.77	.65	.42	.36		.46	.57	.29	
5 Family cohesion	5.05	1.19	5.34	1.14	-.25***	.84	.84	.69	.27	.24	.22		.75	.34	
6 Social resources	5.29	1.14	6.03	0.82	-.80***	.86	.87	.76	.32	.35	.45	.58		.40	
7 Structured style	4.78	1.03	4.66	1.25	.10	.50	.52	.45	.09	.41	.12	.24	.22		

*Note:* \*\*\*  $p < .001$ ,  $g$  = Hedge's  $g$  (effect size),  $\alpha$  = Cronbach's alpha,  $\rho$  = Raykov's rho based on congeneric scores. Correlation coefficients between the RSA subscales are shown below the diagonal for Norwegian samples and above the diagonal for Australian samples. Correlations  $\geq .12$  are significant at  $p < .05$ , and above  $> .22$  at  $p < .01$

Table 2

Evaluations of measurement invariance between Australian and Norwegian samples

Model	Type of test	Compared with	$\chi^2$	$\chi^2_{scaled}$	$df$	$RMSEA$	$CFI$	$TLI$	$SRMR$	$\Delta df$	$\Delta \chi^2_{scaled}$	$\Delta CFI$	$\Delta RMSEA$	$\Delta SRMR$
M1a	Australia		2090.723	2678.326	480	.066	.972	.969	.069					
M1b	Norway		952.975	950.966	480	.056	.950	.945	.073					
M2	Configural invariance		3043.699	3218.075	960	.065	.969	.966	.070					
M3	Weak invariance	M2	3391.218	2826.813	987	.058	.964	.962	.073	27	22.653	-.005	-.007	.003
M4	Strong invariance	M3	6385.996	3901.128	1146	.066	.922	.928	.075	159	601.20***	-.042	.008	.002
M4a	Partial strong invariance	M3	4337.988	2930.025	1119	.054	.952	.955	.074	132	185.02**	-.012	-.004	.001
M5	Strict invariance	M4a	6334.036	3231.203	1152	.057	.923	.930	.078	33	84.315***	-.029	.003	.004
M5a	Partial strict invariance	M4a	5264.865	2847.028	1146	.052	.939	.944	.077	27	34.729	-.013	-.002	.003

Note: \*\*\* $p < .001$ .  $\chi^2$  = Chi-square statistic;  $\chi^2_{scaled}$  = corrected by Satorra and Bentler (2010) scaling method;  $df$  = degrees of freedom;  $RMSEA$  = Root Mean Square Error of Approximation;  $CFI$  = Comparative Fit Index;  $TLI$  = Tucker Lewis Index;  $SRMR$  = Standardized Root Mean Square Error of Approximation;  $\Delta$  = Change in statistical values.

### **Weak (Metric) Invariance**

The baseline model (M2) was compared to a model constraining the factor loadings equally across both groups (M3), thus testing the important assumption of metric invariance. The worsening of fit was not significant; hence, both models were equivalent. The standardized factor loadings are presented in Table 3.

### **Strong (Scalar) Invariance**

The fit of model M4 (equal item intercepts) was significantly worse than model M3 (allowing different intercepts) as expected; hence, not supporting strong invariance. The worsening in fit was minor with regard to  $\Delta$ RMSEA of .008 and  $\Delta$ SRMR of .002, but more pronounced in  $\Delta$ CFI of -.042. Moreover, the  $\chi^2$  difference test was significant. Lack of invariance in the latent intercepts involved three *social competence* (SC) items, two *family cohesion* (FC) items and four *social resources* (SR) items; hence, partial scalar invariance was supported. These item intercepts were kept free in the subsequent invariance models.

### **Strict Invariance**

As expected, constraining all error variances equal (M5) resulted in a significant worsening of fit compared to model M4 (free error variances); hence, full support of strict invariance was not evident. Six residual variances (M5a) needed to be freed in order to produce comparable fitting models, (i.e., a non-significant difference). All input and output of analyses are provided in the Electronic Supplementary Material, ESM 2 for Models M1a, M1b, M2 and M3, and in ESM 3 for Models M4, M4a, M5 and M5a.

### **Validity of the RSA**

As expected the RSA total score correlated significantly negatively with measures of generalized anxiety symptoms ( $r = -.50, p < .01$ ), depressive symptoms ( $r = -.54, p < .01$ ) and positively with SOC ( $r = .67, p < .01$ ). The subscales of the RSA also correlated significantly

positively with SOC (ranging from  $r = .36$  to  $.70$ ). Conversely, the RSA subscales correlated significantly negatively with measures of generalized anxiety symptoms (ranging from  $-.20$  to  $-.57$ ) and depressive symptoms (ranging from  $-.27$  to  $-.57$ ).

*[Kindly insert Table 3 here]*



Table 3  
Standardized Factor Loadings in Australian and Norwegian samples

Items	Australia (n = 781)						Norway (n = 320)					
	1	2	3	4	5	6	1	2	3	4	5	6
PS 1	.60						.46					
PS 2	.78						.79					
PS 3	.64						.60					
PS 4	.78						.57					
PS 5	.70						.56					
PS 6	.70						.38					
PF 1		.71						.57				
PF 2		.77						.79				
PF 3		.81						.57				
PF 4		.73						.63				
SC 1			.49						.49			
SC 2			.41						.46			
SC 3			.72						.61			
SC 4			.68						.60			
SC 5			.77						.55			
SC 6			.67						.63			
FC 1				.59						.64		
FC 2				.80						.59		
FC 3				.74						.76		
FC 4				.79						.74		
FC 5				.80						.72		
FC 6				.72						.60		
SR 1					.73						.47	
SR 2					.79						.76	
SR 3					.65						.58	
SR 4					.59						.53	
SR 5					.82						.83	
SR 6					.77						.63	
SR 7					.80						.62	
SS 1						.31						.69
SS 2						.41						.34
SS 3						.74						.76
SS 4						.59						.30

Note: PS = Perception of self, PF = Planned future, SC = Social competence, FC = Family cohesion, SR = Social resources, SS = Structured style

## Discussion

The primary aim was to investigate the measurement invariance of the *Resilience Scale for Adults* (RSA) by examining if the underlying latent trait is comparably measured in an Australian as in a Norwegian sample. The present study confirmed the six-factor measurement model of the RSA, as in prior studies (Hjemdal et al., 2011; Hjemdal et al., 2015), thus supporting form invariance. A particular important test is metric invariance (equal factor loadings), which the current analysis also supported. As expected, scalar and strict invariance were partially supported.

The observed form invariance indicates that respondents in both countries conceptualize resilience along the same six dimensions. The similar construct validity coefficients in both countries reinforce this conclusion. The six-factor model of the RSA has been widely tested in Norwegian samples and consistently replicated (Hjemdal et al., 2006). The degree of misspecification as assessed by the RMSEA was acceptable in both countries, yet slightly worse in the Australian compared to the Norwegian sample, which may relate to the presence of high non-normality in the Australian data.

The most important test of measurement invariance is metric invariance (comparable factor loadings), which examines whether respondents from two different cultures understand, or interpret, the items in a comparable fashion. Support of metric invariance is important since it implies that a linear increase in the summated raw scores measure a comparable increase in the latent resilience scores across Australia and Norway. As expected and in line with previous findings by Hjemdal et al. (2015), full metric invariance was supported. However, metric invariance was not fully supported in an earlier study (Hjemdal et al., 2011) comparing a Norwegian and Belgian samples, as one of the six factors (structured style) had variant loadings. In the current study though, respondents in both countries interpreted all items similarly, implying that simple regression analyses based on

raw scores may be used to predict comparable changes in criterion-related outcome variables across Australia and Norway.

As expected, full invariance in the item thresholds was not supported, which was of less concern. Moreover, as 24 of 33 items were invariant, the partial support was quite good. These item thresholds indicate where the respondents place themselves on the latent trait Y-axis for individuals being average on the factor (i.e., factor mean = 0). Respondents in both countries hence use the same starting point (or intercept) for scaling their responses. In practise, they used the same ordinal ranking of the response categories for most of the RSA items, which further reinforces the cross-cultural validity of the scale. This finding is also in line with a prior Norwegian-Brazilian cross-cultural validation study by Hjemdal et al. (2015).

For the non-invariant items, the respondents in Australia placed themselves higher on the latent intercept in seven items, meaning that a higher observed score is needed to reflect a higher latent trait score. Whereas for the other two items, Norwegian respondents placed themselves only slightly higher on the latent intercept. Our conclusion is that, on average, Australian and Norwegian respondents vary slightly in the probability of endorsing different ordinal responses categories for some scale items when equated on the underlying factor score. Comparisons of mean subscale scores between the countries may thus be slightly biased.

The lack of full scalar invariance is not unusual as it is very seldom supported (Chen, 2007). Future studies are required by using differential item functioning (DIF) in a MIMIC model to explore the reasons for the differences on a construct level. A special feature of MIMIC models is that it can control the possible confounding effects of other variables and can also test for group differences in latent factor mean scores while taking into account DIF in the indicators (Brown, 2015).

There were gender differences in both samples. In the Norwegian sample, gender differences were found for three factors namely *Social resources*, *Structured styles* and *Perception of self*, with females scoring higher on the first two, and males on the last one. In the Australian sample, females scored marginally higher on *Social resources*, but lower on *Perception of self* than males. These differences may be scale-specific since the overall levels of resilience were unrelated to gender differences. The explanation may be that females are more socially sensitive and better skilled in using social support while males feel personally competent, developing their levels of resilience through internal (personal) resources than external (social) resources (Friborg et al., 2003, 2009; Hjemdal et al., 2011).

The total score reliability was very good in both groups, being .93 and .90 in the Australian and Norwegian samples, respectively. For the subscales, Cronbach's alpha ranged from .50 to .86, and .67 to .84 in the Australian and Norwegian samples, respectively. The true scale reliability estimates based on congeneric scores were slightly higher, as is expected when estimating true score variance based on free rather than fixed factor loadings. The factor *Structured Style* had the lowest score reliability estimate in both countries, while *Social Resources* was most reliable in the Australian sample and *Family Cohesion* was most reliable in the Norwegian sample.

The construct validity of the RSA was supported in the Australian sample as the RSA total score correlated significantly negatively with measures of generalized anxiety symptoms (GAD – 7) and depressive symptoms (PHQ – 9), but significantly positive with sense of coherence (SOC – 13). These correlations are consistent with previous studies by Hjemdal et al. (2011) and Hjemdal et al. (2015). The results further show that resilience is a construct that represent the presence of protective resources associated with good mental health, providing protection against psychiatric symptoms (Hjemdal et al., 2006). Among an Australian sample, a study by Anyan et al. (2017) found resilience to be a protective factor

with buffering effects against symptoms of anxiety and depression. The RSA subscales also correlated significantly positively with SOC, but negatively with GAD – 7 and PHQ – 9, which were between moderate and strong.

There were limitations to the present study, some of which offer potential avenues for further investigations. A limitation of the present study was the age bracket between the countries, as the mean age in the Norwegian sample was 19 years, whereas more than half of the Australian respondents (58%) were aged 31 years and above. It is recommended in future studies to investigate within-person changes over time in a measurement invariance framework since resilience is conceptualized as both a process and an outcome. The Cronbach's alpha for the *structured style* subscale was low for both samples (Aus:  $\alpha = .50$ ; Nor:  $\alpha = .65$ ). The evaluation of measurement equivalence in the present study related to the scores in the nomological network of RSA in the current study. Therefore, the generalizability of the pattern of mean differences between our samples will be limited. It is recommended that future studies investigate and expand on replicability with other samples. The RSA will benefit from future studies testing its reliability and validity in Asian, African and other cultures.

### ***Conclusions***

In conclusion, the present study supports the cross-cultural validity of the English version of the RSA, as validated in an Australian sample. The six-factor structure of the RSA was confirmed, also showing similar patterns of intercorelations as previously reported studies. Most importantly, it was confirmed that respondents from the two different countries understood and interpreted the RSA items in a comparable fashion. This implies that a linear increase in the summated raw scores measure an equivalent increase in the latent resilience scores across Australia and Norway. Hence, simple regression analyses based on raw scores may be used to predict comparable changes in criterion-related outcome variables as well as

to conclude about cultural differences on a latent trait score. Overall, the RSA is an instrument with good psychometric properties for measuring resilience protective resources. It is suited for use in clinical and health research in assessing individuals' resilience resources for positive development and adaptation as well as promoting positive mental health.

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