

Adaptation of a Chinese Version of the Relational Needs Satisfaction Scale Based on Item Response Theory Among Chinese Adults Aged 18–30

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Purpose: The satisfaction of relational needs is an important indicator of the quality of interpersonal relationships, but few studies on this topic have been conducted in China. The Relational Needs Satisfaction Scale (RNSS) was developed and used in three countries.

Patients and Methods: In this study, the scale was standardized. A total of 2136 Chinese adults aged 18–30 years were recruited to complete the RNSS-Chinese (RNSS-C) and the Satisfaction with Life Scale (SWLS) online, and classical test theory and item response theory (IRT) were used to analyze the psychometric characteristics of the RNSS-C. The measurement invariance of the Chinese and Czech RNSSs was analyzed.

Results: (1) The RNSS still has good reliability (Cronbach's $\alpha = 0.935$) and validity ($CFI=0.948$, $TLI=0.940$, $RMSEA=0.049$, and $SRMR=0.032$) in China. (2) The RNSS-C revealed differences in the perceptions of relational needs construct between the two groups ($\Delta CFI=0.014>0.01$).

Conclusion: These findings contribute to a deeper understanding of the cultural factors that shape interpersonal relationships and satisfaction in China.

Keywords: relational needs satisfaction scale, item response theory, cross culture, measurement invariance

Introduction

Relational needs refer to individuals' needs for interpersonal interaction and contact,¹ which are present throughout the human life course and can be satisfied only in interpersonal relationships.² The relational needs model, which is based on attachment theory, object relations theory, and ego psychology, emphasizes the need for interpersonal relationships as a primary human motivation.^{3–6}

The lack of relational needs may be experienced as “emptiness, longing, or nagging loneliness”,^{2,7} and if relational needs remain unmet, the person may experience frustration and anger, leading to depression and loss of hope. Persistent dissatisfaction with relational needs may manifest as negative beliefs about oneself, others, and life.⁸ Erskine et al² suggested that the lack of satisfaction of relational needs may manifest in feelings of loneliness, which is associated with depression and various other mental illnesses,⁷ such as alcohol addiction, drug use, child abuse, sleep problems, suicide, and Alzheimer's disease.⁹ Loneliness and social isolation are also risk factors for death.¹⁰ Previous studies have shown that both adult and elderly populations in China exhibit high levels of loneliness.^{11,12} These problems are also related to physical diseases such as diabetes, autoimmune diseases, cardiovascular diseases, and cancer.⁹ Loneliness is also related to negative prosocial tendencies,¹³ which have an impact on the mind and body.¹⁴

There are numerous scales that measure the concept of relationship satisfaction, but most of them focus on overall satisfaction in the relationship rather than on satisfaction with individual relationship needs. For example, Hendrick¹⁵ developed the seven-item Relationship Assessment Scale (RAS) to measure general relationship satisfaction in intimate relationships. The Barrett-Lennard Relationship Inventory (BLRI) is another well-known instrument based on Rogers'¹⁶

theory about the necessary conditions for therapeutic change.¹⁷ It measures the level of respect and empathic understanding as well as the unconditionality of respect and congruence. Another measure is the Interpersonal Needs Questionnaire (INQ), which is based on the theory of interpersonal suicide¹⁸ and measures frustrated belonging and perceived burden.

Only a few scales currently focus on specific relationship needs. Banai et al¹⁹ developed an instrument called the Self-Object Needs Inventory (SONI) to measure self-object needs on the basis of Kohut's^{6,20,21} theory. However, the SONI measures the intensity of needs rather than the degree of satisfaction of relational needs.

To address the abovementioned shortcomings, Žvelc et al²² developed the Relational Needs Satisfaction Scale (RNSS) on the basis of Erskine's theory of relational needs. The RNSS is divided into five dimensions: authenticity, support and protection, having an impact, shared experience, and initiative from others. Of these, (1) the authenticity dimension describes the need to remain authentic in relationships with others, for example, "I do not have to pretend with people who are important to me." (2) The support and protection dimension relates to the experience of having someone who can be sought out for help, protection, and support when suffering, for example, "I have someone strong, stable, and protective whom I can count on." (3) The having an impact dimension refers to a person's need to feel that they have an impact on others, and the satisfaction of this need is related to the acceptance of one's advice or ideas by others, eg, "Others often take my advice to heart." (4) The shared experience dimension describes the experiences of people in one's life with whom one has similar interests and experiences, eg, "There are people in my life who have similar experiences to me." (5) The initiative from the other dimension relates to the willingness of others to do things for one when one has not asked them to, eg, "Other people often help me, even when I do not specifically ask for it." The scale has been translated into three versions (Slovenian,²² Turkish,²³ Czech²⁴) and all have shown good reliability.

In the original RNSS, the research team first determined through factor analysis that the RNSS includes five main dimensions of relationship needs: authenticity, support and protection, having an impact, shared experience, and initiative from the other. Exploratory factor analysis was subsequently conducted on the RNSS in nonclinical adult samples to examine its internal structural consistency and reliability, and to confirm the factor structure of the scale. Through correlation analysis with other psychological measurement tools, such as attachment style, self-compassion, emotional well-being, and life satisfaction, the results revealed that the RNSS was significantly correlated with other measurement tools in the expected direction, thus verifying its criterion validity. In addition, the original RNSS study also compared the fit of different models (such as the five-factor correlation model, hierarchical model, and one-dimensional model) through confirmatory factor analysis (CFA) and confirmed that the five-factor structure and hierarchical model of the RNSS have good fit, further supporting the internal structural validity of the scale.²²

Relational needs satisfaction has been shown to be an important predictor of life satisfaction and well-being,²² and Erskine's relational needs theory has shown good results in counseling and psychotherapy. Since there is no Chinese instrument to measure satisfaction with specific relational needs, the present study Sinicized the RNSS developed by Žvelc et al²² with the intention of constructing a culturally appropriate relationship needs satisfaction scale for China.

The trend of economic globalization has made cross-cultural communication increasingly frequent, and the cultural differences between China and the West can make it difficult for both to communicate across cultures. For example, they may have different understandings of a certain construct, or even if they have the same understanding, they may have different perceptions of the importance of the construct; for example, one party may think it is dispensable, while the other party may believe it is pivotal. Therefore, it is necessary to compare relationship needs satisfaction in Eastern and Western cultures to understand the differences in relationship needs satisfaction in different cultures and to facilitate communication and interaction skills in people from different cultures.

Previous studies on RNSSs, although they all showed good psychometric properties, were performed on the basis of classical test theory (CTT). Although CTT has the advantages of being easy and practical to implement, it still has many shortcomings, such as the results being valid only for the current sample group; the ability indicators of the study participants not being in the same reference frame as the item difficulty indicators, which makes it difficult to compare them; and the estimation of measurement error being generalized. In contrast, item response theory (IRT) estimates of participants' ability values and item parameters do not change with changes in the sample; IRT uses a monotonically increasing nonlinear model to construct the relationship between participants' ability values and item difficulty values,

which is closer to the actual situation. Each item's contribution can be obtained by examining the amount of information, the size of each item's contribution can be obtained, and more accurate indicators can be obtained by considering the measurement error as a function of θ .²⁵ For this reason, this study analyzed the psychometric characteristics of the RNSS-Chinese (RNSS-C) based on CTT and IRT.

Materials and Methods

Participants

This study included Chinese adults aged 18–30 years and included a total of 2136 valid participants through both online and face-to-face methods. All data collection was approved by the ethical review board. Among the participants, 809 (37.9%) were men, and 1327 (62.1%) were women. The gender ratio was comparable to that of the Czech participants. The mean age was 20.59 years ($SD = 3.17$). The number of participants with an education level of high school or below was 14; 787 had completed junior college, 902 were enrolled in undergraduate programs, and 433 were graduates. There were 621 children, accounting for 29.1%, and 241 were married, accounting for 11.3%.

In addition, this study included 428 participants on the RNSS (Czech version) using data published by the author²⁴ at <https://osf.io/km9ag>. To balance the two groups of participants and considering that the Czech Republic changed from a socialist to a capitalist country in 1990, the author considered 1990 to be the turning point. Participants who were born after 1990 (ie, aged 18–30 years) and had secondary school or higher education were selected, resulting in 196 Czech Republic participants with a mean age of 23.82 years ($SD=3.62$), of whom 136 were women (69.4%), 121 had a secondary school degree (61.7%), and 75 had a university degree (38.3%).

Measures

Relational Needs Satisfaction Scale–Chinese

The original RNSS was translated and back-translated. The process was as follows: first, two psychology students were invited to independently translate the scale into Chinese, discuss the translation, and form a first draft. Then, two English professionals were asked to independently translate the scale and revise the text on the scale again on the basis of the translation results. Five adults aged 18–30 years (three men and two women) were asked to complete the revised Chinese scale, and were interviewed to confirm that their understanding of the items was not ambiguous. Finally, the scale was discussed and agreed upon by university teachers majoring in psychology, and a formal scale was produced. The items of the RNSS-C can be found in [Appendix Table 1](#).

The scale consists of 20 items in the five main dimensions of relational need, with each dimension containing four items. The items were scored on a five-point Likert scale from 1 (*totally disagree*) to 5 (*totally agree*). The Cronbach's alpha for the total scale in this study was 0.935, and the Cronbach's alphas for the dimensions were 0.805, 0.793, 0.780, 0.766, and 0.821.

Satisfaction with Life Scale

The Satisfaction with Life Scale (SWLS²⁶) is a single-dimensional scale consisting of five items that measure a person's overall perceived judgments of life satisfaction. Each item is scored on a seven-point Likert scale from 1 (*strongly disagree*) to 7 (*strongly agree*), with higher scores indicating greater life satisfaction. The Cronbach's alpha in this study was 0.836.

Previous studies have used the SWLS as a validity scale for the RNSS and have shown good validity;²² therefore, the SWLS was used as a validity scale for the RNSS-C in this study. The participants' basic information (age, gender, education, marital status, family location, and only child status), the RNSS-C, and the SWLS were combined into a comprehensive set of questionnaires. The anonymity of the study was explained to the respondents at the beginning of the questionnaire.

Data Analysis

Reliability analysis and correlation analysis under the CTT framework were performed via SPSS 25.0.²⁷ The common method bias (CMB) test, confirmatory factor analysis (CFA) and measurement invariance (MI) analysis were performed with Mplus 8.3.²⁸ The mirt package²⁹ in R software was used to fit IRT models, estimate item parameters, and plot item

characteristic curves (ICCs) and item information functions (IIFs); the test information functions (TIFs) and test reliability curves (TRCs) were plotted with the catR package;³⁰ and the effect of the differential item function (DIF) on sex was tested with the lordif package.³¹

CMB Test

Since the same measurement method probably produces common method variance (CMV) in variables that might falsely inflate or deflate observed relationships among measures, common method bias (CMB) was tested by controlling for the effects of an unmeasured latent methods factor (ULMC) method.³² All the items of the RNSS-C and SWLS are indicators of the method factor indicators to establish a bifactor model on the basis of the original trait single factor. If the original CFA model with multiple scales combined plus the method factor shows significant changes in the model fit indices, when the increase in CFI and TLI exceeds 0.1, and if the decrease in RMSEA and SRMR exceeds 0.05, serious CMB is indicated.³³

Structural Validity Analysis

To select the RNSS-C structure that best fits the Chinese cultural context and verify its structural validity, CFA was used. Although most CFA studies use the ML estimator, when the main focus is on accurately estimating factor loadings on the basis of classification data, the WLSMV estimator may be preferable.³⁴ Therefore, the WLSMV estimator was used. Previous studies have shown that the RNSS fits both the five-factor first-order model and the five-factor hierarchical model well.²² Therefore, the fit indices of the one-factor model, five-factor first-order model, and five-factor hierarchical model were compared to select the model that was most suitable for the Chinese cultural background. If CFI and TLI are greater than 0.9 and RMSEA and SRMR are less than 0.08, the model fits well overall.³⁵ For model comparison, smaller χ^2/df values, higher CFI and TLI values, and lower RMSEA and SRMR values indicate better model fit.^{36–38}

Criterion-Related Validity

To verify the effectiveness of the RNSS-C dimensions, criterion-related validity was assessed by calculating the correlation between each dimension of the RNSS-C and the total score and the SWLS.

IRT Model Fitting

IRT model fitting analysis was used to evaluate the degree of fit of the selected model to multi-level scoring data, to accurately estimate test parameters and subject abilities, and optimize the test design. RNSS-C is a multidimensional and multi-level scale. When the scale fit with a multidimensional and multi-level model, many categories may cause estimation issues. Therefore, this study followed the approach of previous research on multi-dimensional and multi-level IRT, using a single-dimensional multi-level model for fitting.^{39,40} Before performing model fitting, it is necessary to ensure that RNSS-C satisfies the assumption of local independence. Local independence was calculated via Yen's Q_3 statistic.⁴¹ The local independence assumption is satisfied if the absolute value of the residual correlation among all items is less than 0.30. Among the multilevel rating models, the commonly used IRT models are the graded response model (GRM⁴²), the generalized partial credit model (GPCM⁴³), and the generalized rating scale model (GRSM⁴⁴). In this study, the Akaike information criterion (AIC), Bayesian information criterion (BIC), and $-2 \times \text{Log-Lik}$ ($-2LL$) were used as fit indicators to compare the different IRT models. Then, the model with the best fit was selected for subsequent analysis.

Item Characteristics and Information

To depict the relationship between the participants' answers and their potential trait levels, and to evaluate the information contribution of different items in assessing participants' trait levels, an analysis was conducted on the item characteristics and information of the RNSS-C. First, item parameters were estimated on the basis of the best IRT model; then, ICCs and IIFs were plotted for each item. Second, TIFs and TRCs were plotted. Through these steps, the quality of each item and the quality of the test were assessed. DIF was used to determine systematic differences caused by group bias.⁴⁵ McFadden's⁴⁶ pseudo- R^2 method was used to test whether there was a DIF by gender on the RNSS-C. Items with an R^2 change of less than 0.02 have no DIF. Under the IRT framework, the test reliability can be calculated from the test information, and the reliability coefficient is calculated as $r_{xx} = 1 - \frac{1}{I(\theta)}$.

Measurement Invariance Analysis Across Cultures

To verify the consistency and stability of the RNSS in different cultural backgrounds and promote the accuracy and reliability of cross-cultural research, cross-cultural measurement invariance analysis was conducted. Measurement invariance analysis was carried out through multigroup confirmatory factor analysis (MCFA). The Czech and Chinese versions of the RNSS were combined and grouped. Depending on the subject of the test, the measurement invariance can be divided into four levels from low to high: (1) verifying whether the composition or pattern of the latent variable is invariant (configural invariance); (2) verifying whether the factor loading of the observed variable on the latent variable is invariant (weak invariance); (3) verifying whether the intercept of the latent variable predicting the observed variable is invariant (strong invariance); and (4) verifying whether the intercept of the latent variable predicting the observed variable is invariant (strict invariance).⁴⁷ In this study, a stepwise analysis was conducted to compare the figural invariance, weak invariance, strong invariance, and strict invariance of the Czech and Chinese versions of the RNSS. According to the method of fitting index difference to test measurement invariance, a Δ CFI value less than or equal to 0.01 indicates no difference, a Δ CFI value between 0.01 and 0.02 indicates a moderate difference, and a Δ CFI value > 0.02 indicates a significant difference.^{48,49}

Results

Descriptive Statistics

Table 1 presents a descriptive statistical analysis of the RNSS-C, SWLS, and their dimensions. The results indicated that the satisfaction level of relationship needs among Chinese adults aged 18–30 years was above average and needed to be improved.

CMB Test

The model fit indices of the one-factor model were CFI=0.948, TLI=0.940, RMSEA=0.049, and SRMR=0.032. The fit indices of the bifactor model were CFI=0.964, TLI=0.954, RMSEA=0.043, and SRMR=0.025. The increases in CFI and TLI were 0.016 and 0.014, respectively, both of which did not exceed 0.1, and the reductions in RMSEA and SRMR were 0.006 and 0.007, respectively, both of which did not exceed 0.05. Therefore, there was no significant CMB. See Figure 1. In Figure 1, the 6th factor is the SWLS.

Structural Validity Analysis

To obtain a more consistent RNSS-C structure in the Chinese context, the fit indices (χ^2 , df, χ^2 /df, CFI, TLI RMSEA, SRMR, etc.) of the three models (one-factor model, five-factor first-order model and five-factor hierarchical model) were compared, and the results are shown in Table 2. The figures of the CFA models are shown in Figures 2 and 3. The fit of the one-factor model is poor, with the CFI and TLI not reaching 0.9. The CFI and TLI of the five-factor first-order model and the five-factor hierarchical model were greater than 0.9, and the RMSEA and SRMR values of both were less than 0.08; therefore, both models fit well. The fit indices of the five-factor first-order model were better. The factor loading represents the correlation between factors and items. If the loading coefficient value between an item and a factor is too

Table 1 Criterion-Related Validity of the RNSS-C

	M	SD	1	2	3	4	5	6	7
1. RNSS-C	3.34	0.59	I						
2. Authenticity	3.91	1.13	0.850**	I					
3. Support and protection	3.44	0.81	0.851**	0.675**	I				
4. Having an impact	3.34	0.8	0.856**	0.654**	0.628**	I			
5. Shared experience	3.44	0.78	0.858**	0.644**	0.632**	0.716**	I		
6. Initiative from the other	3.39	0.69	0.646**	0.410**	0.475**	0.490**	0.460**	I	
7. SWLS	3.91	1.13	0.300**	0.276**	0.311**	0.219**	0.179**	0.247**	I

Notes: **at the 0.01 level (two-tailed), significant correlation.

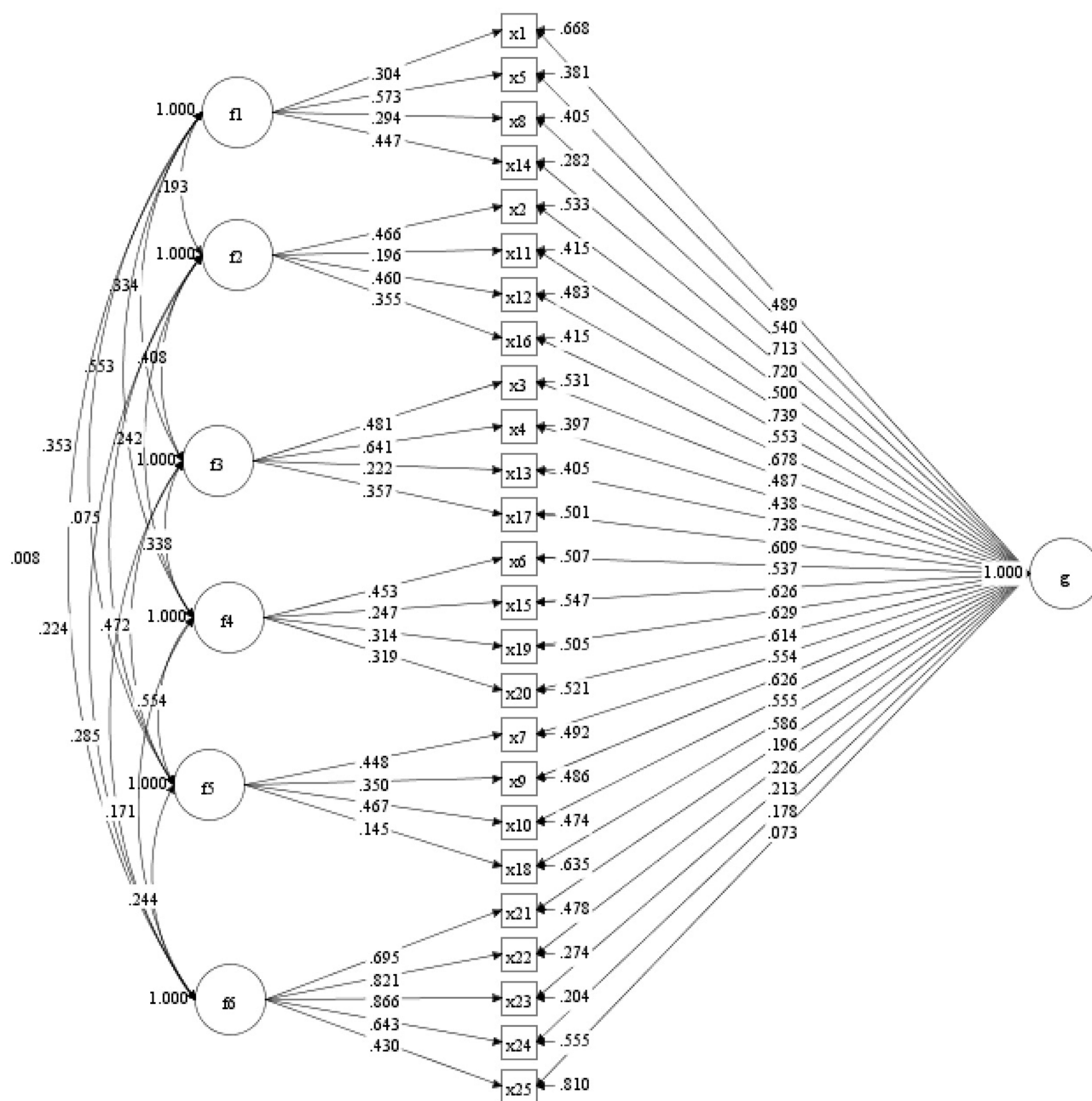


Figure 1 The bifactor model of the RNSS-C and the SWLS.

low (such as <0.4), it indicates that the relationship between the item and the factor is weak and needs to be deleted. The factor loadings of the five-factor first-order model are shown in Table 3, all of which were greater than 0.4, indicating a good factor structure.

Table 2 Fit Indices of the Two Models

	χ^2	df	χ^2/df	CFI	TLI	RMSEA	SRMR
One-factor model	2984.975	170	17.559	0.899	0.887	0.088	0.042
Five-factor first-order model	1332.472	160	8.328	0.976	0.972	0.059	0.027
Five-factor hierarchical model	1479.505	165	8.967	0.974	0.970	0.061	0.030

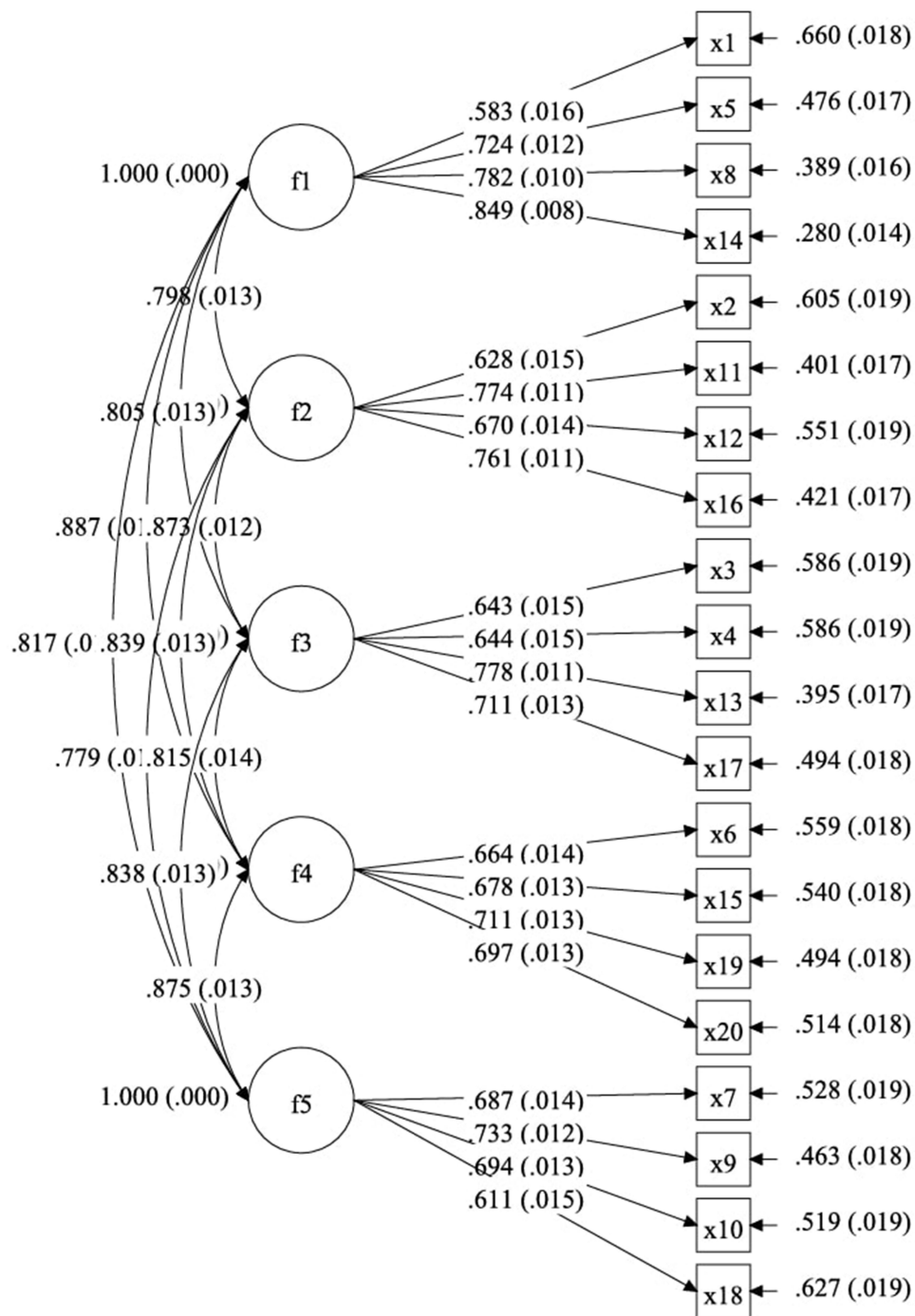


Figure 2 The five-factor high-order model of the RNSS-C.

Criterion-Related Validity

The results of the correlation analysis between the RNSS-C and the SWLS (validity scale) are shown in Table 1. The total score of the RNSS-C and the score of each dimension were significantly positively correlated with each other and with the SWLS, and the correlation coefficients were not low. Therefore, the RNSS-C has good criterion-related validity.

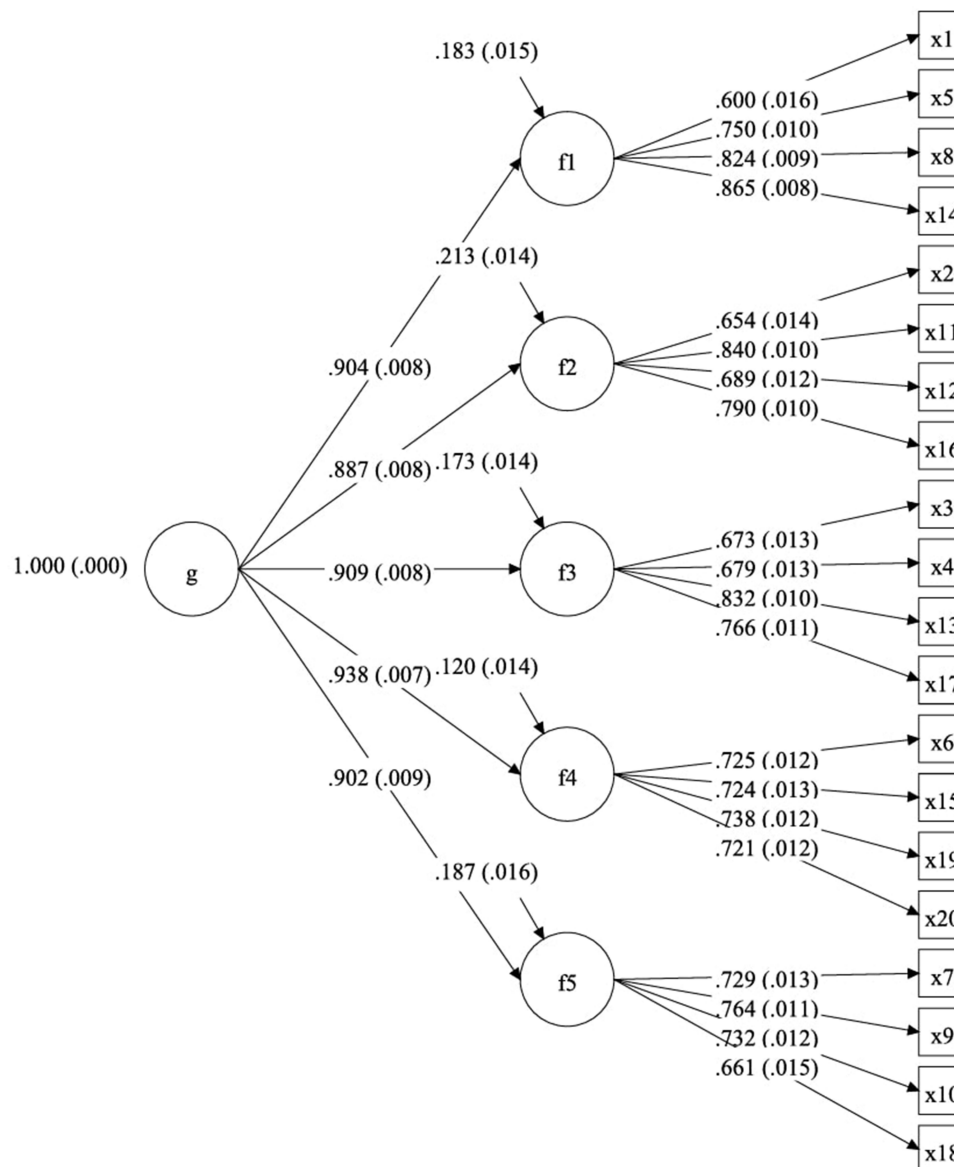


Figure 3 The five-factor hierarchical model of the RNSS-C.

IRT Model Fitting

The absolute values of the residual correlations between all the items were less than 0.30, which verified the local independence assumption.⁵⁰

The fit of the RNSS-C in the GRM, GPCM, and GRSM frameworks was compared by three indices: AIC, BIC and $-2LL$. The results are shown in Table 4. The GRM model has the highest fit. Therefore, item quality analysis of the scale was conducted under the GRM framework.

Item Characteristics and Information

The results of the item parameters estimated from the GRM model are shown in Table 3. The parameter a represents the distinguishability of the item. If its value is lower than 0.7, it indicates poor item quality; and this item could be considered to be removed.⁵¹ All the items in this study had high discrimination parameters, ranging from 1.25 to 2.22. The parameter b_i is the location parameter of the item, indicating the location of the participant scoring i on the item, and its location level increases monotonically.

Table 3 Item Parameters of the RNSS-C

Item	Dimension	RNSS-C					
		a	b ₁	b ₂	b ₃	b ₄	Loadings
1	SE	1.32	-3.13	-1.45	-0.30	2.19	0.583
2	A	1.39	-2.88	-1.26	-0.09	1.97	0.628
3	SP	1.41	-2.68	-1.28	-0.04	1.75	0.643
4	SP	1.45	-2.77	-1.06	0.33	2.21	0.644
5	SE	1.69	-2.82	-1.63	-0.32	1.73	0.724
6	HI	1.56	-3.10	-2.01	0.24	2.57	0.665
7	IFO	1.52	-3.00	-1.38	0.17	2.60	0.687
8	SE	1.93	-2.60	-1.77	-0.51	1.59	0.781
9	IFO	1.67	-2.99	-1.35	-0.18	2.04	0.733
10	IFO	1.61	-2.96	-1.53	-0.04	2.56	0.693
11	A	1.55	-2.54	-1.50	-0.25	1.83	0.775
12	A	1.69	-2.85	-1.87	-0.49	1.28	0.669
13	SP	1.64	-2.87	-1.77	-0.62	1.34	0.779
14	SE	2.22	-2.27	-1.53	-0.32	1.64	0.850
15	HI	1.44	-2.89	-1.85	-0.07	2.30	0.680
16	A	2.03	-2.63	-1.49	-0.30	1.33	0.761
17	SP	1.64	-2.79	-1.88	-0.13	1.94	0.711
18	IFO	1.25	-3.09	-1.61	-0.56	1.24	0.610
19	HI	1.80	-2.68	-2.03	-0.57	2.23	0.713
20	HI	1.58	-2.53	-1.28	0.06	2.62	0.699

Notes: A indicates authenticity, SP indicates support and protection, HI indicates having an impact, SE indicates shared experience, and IFO indicates initiative from the other.

Table 4 Fit Analysis of the Scales in the IRT Framework

Model	AIC	BIC	-2LL
GRM	95,978.22	96,544.89	95,778.22
GPCM	96,141.63	96,708.30	95,941.62
GRSM	97,213.55	97,457.22	97,127.54

The ICCs of the 20 items are shown in [Appendix Figures 1–20](#). The IIFs of the 20 items are shown in [Figures 4–8](#). As shown in the ICCs in [Appendix Figure 1](#), the response probability distribution of each item option was reasonable, while option 2 of item 19, at both high and low levels, almost overlapped with the response probability curves of the other options.

In [Figure 4](#), among the four items in the authenticity dimension, item 16 provided the most information at $-3 < \theta \leq 2$ and the least information at $\theta > 2$. All the items provided more information at the medium θ level, and the amount of information at $\theta = 3$ was greater than that at $\theta = -3$.

As indicated by the information curves of each item in the support and protection dimension of [Figure 5](#), items 13 and 17 provided almost equal amounts of information at $-4 < \theta \leq 2$, which was greater than the information provided by items 3 and 4 at this level. However, items 3 and 4 provided more information at $\theta > 2$ than did item 13.

For the impact dimension shown in [Figure 6](#), the information curves of items 6, 15 and 20 were similar. It tended to be more informative at the moderate level and less informative at the extreme level, but item 19 had a more volatile information curve with a clearly low peak at $0 < \theta \leq 1$.

In the information curve of the shared experience dimension in [Figure 7](#), the information provided from low to high was item 1, item 5, item 8 and item 14.

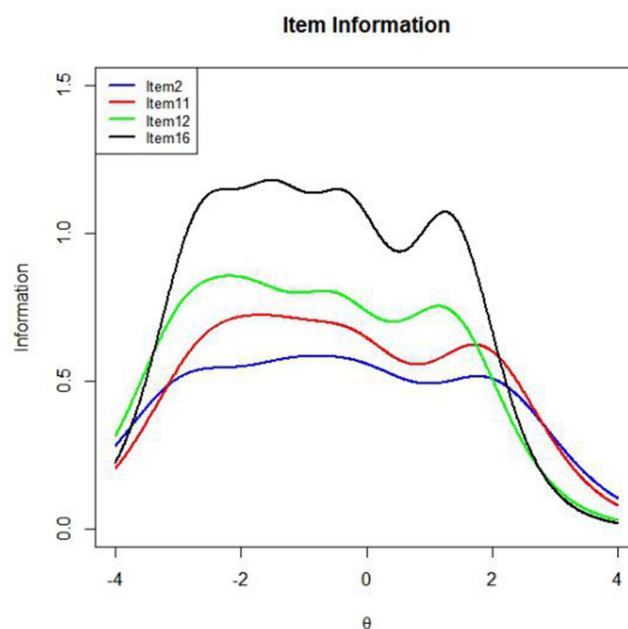


Figure 4 The item information curve of the authenticity dimension.

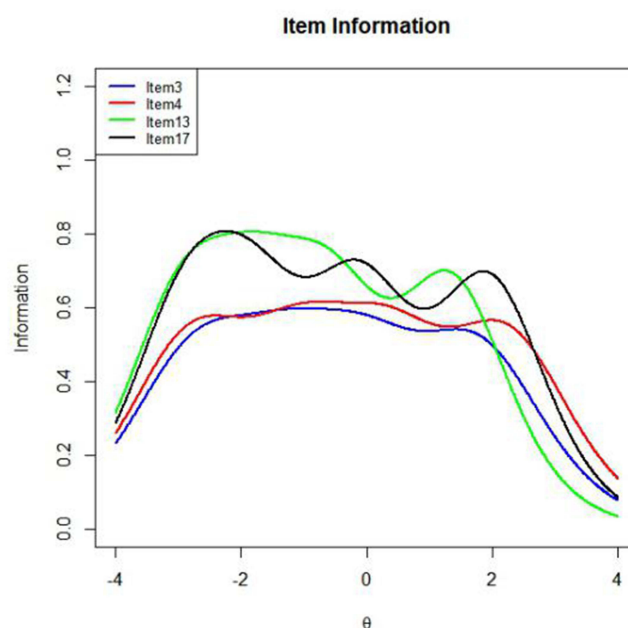


Figure 5 Item information curve of the support and protection dimension.

In the information curve of initiative from the other dimension in Figure 8, all the items tended to be high in the middle and low on both sides. The information values provided by items 7, 9 and 10 were similar and greater than those provided by item 18.

The TIF and TRC of RNSS-C are shown in Figure 9. As indicated by the TIF curves, the low θ and high θ levels provided less information than the medium θ levels did; ie, the test was less accurate. According to the TRC curve, the reliability of the test was greater than 0.8 for the low θ and medium θ levels, and there was a significant decrease in the reliability of the test at values between 0.5 and 0.7. Most of the participants had θ values distributed between -3 and 3 , so the number of participants with $\theta > 3$ was small, which hardly attenuated the test.

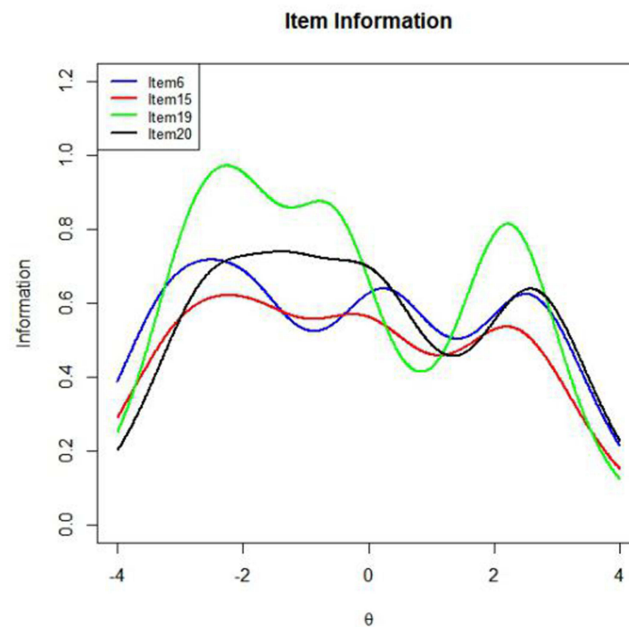


Figure 6 Item information curve of having an impact dimension.

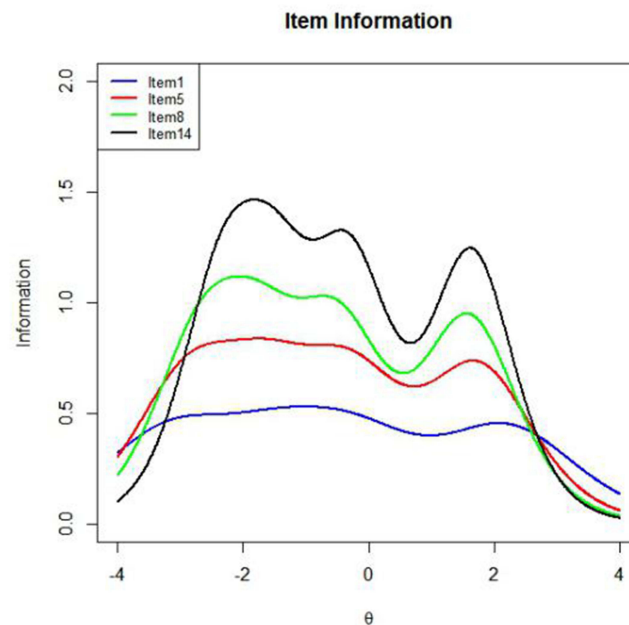


Figure 7 Item information curve of the shared experience dimension.

Although no difference in item functioning on the RNSS by gender was found in the previous study, whether findings consistent with those of the previous study could be obtained in the present study was uncertain due to the different cultural backgrounds. Therefore, in the present study, the difference in item functioning on the scale by gender was examined. The results revealed that there was no DIF for the 20 items of the RNSS-C.

Measurement Invariance Analysis Across Cultures

To examine whether the RNSS-C has cross-cultural measurement invariance with the Czech version of the RNSS-C, the data from the RNSS-C and the Czech group were analyzed separately. The results are shown in Table 5.

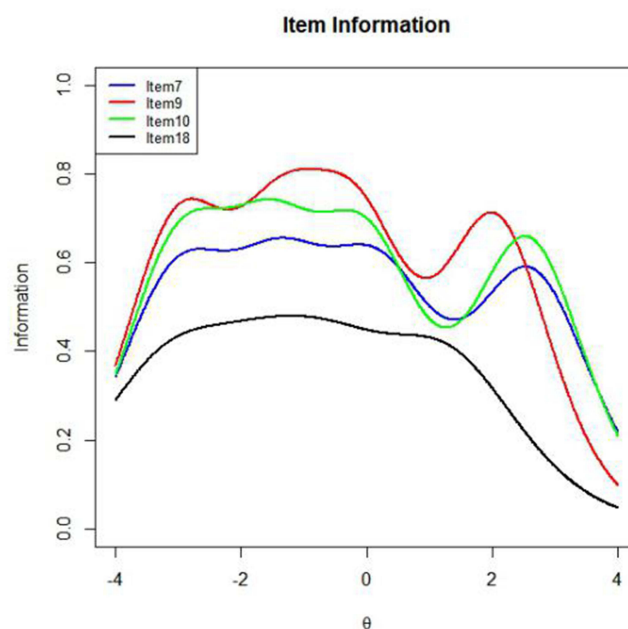


Figure 8 The item information curve of the initiative from the other dimension.

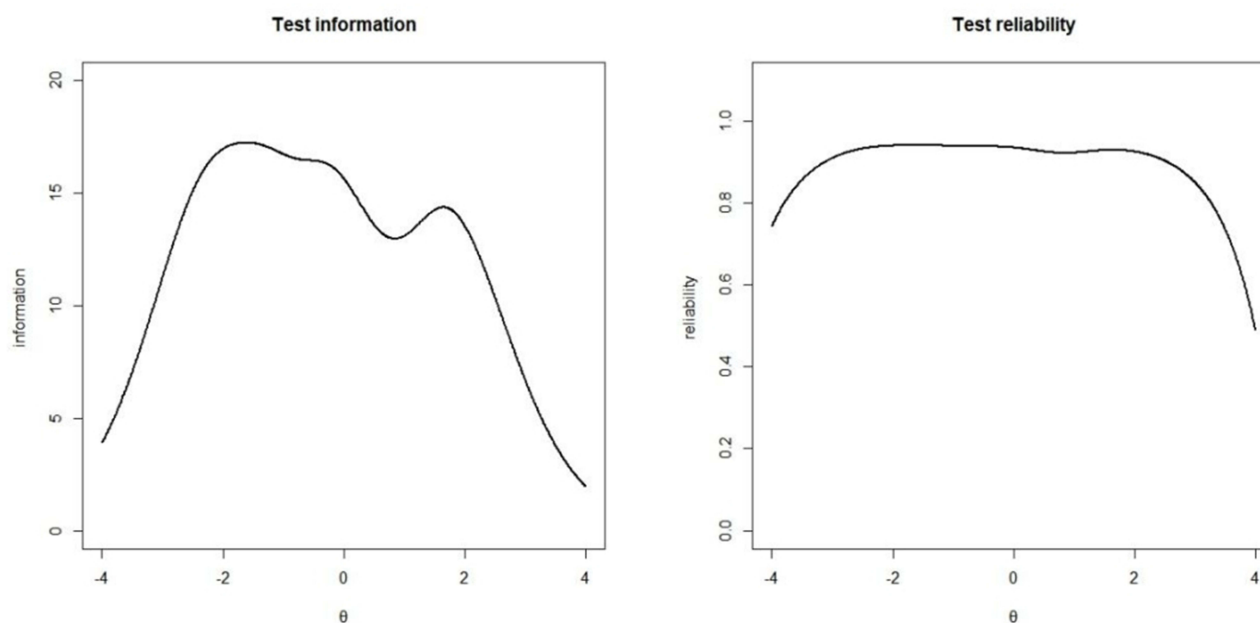


Figure 9 TIF and TRC curves of the RNSS-C.

As shown in Table 5, for the RNSS-C, the configural invariance model (Model 1) had good fit indices, indicating that the RNSS-C had the same five-factor structure in the Chinese and Czech groups and that the indicator variables linked to each factor were the same, satisfying the prerequisites for subsequent invariance analysis. In the weak invariance model (Model 2), the difference between each fit index and the structural invariance model is large compared with $\Delta CFI=0.011>0.01$, indicating that weak invariance is not valid. Therefore, the partial weak invariance model (Model 2a) is constructed, and the difference in the model fit index $\Delta CFI=0.014>0.01$; thus, partial weak invariance is also not valid. Therefore, no subsequent strong invariance analysis could be performed.

Table 5 Cross-Cultural Measurement Invariance Fit Indices for the RNSS-C

Model	χ^2	df	CFI	TLI	RMSEA	$\Delta\chi^2$	Δdf	ΔCFI	$\Delta RMSEA$
Model 1	1294.526	320	0.955	0.947	0.051	—	—	—	—
Model 2	1561.690	335	0.944	0.936	0.056	267.164	15	-0.011	0.005
Model 2a	1619.658	337	0.941	0.933	0.057	325.132	17	-0.014	0.001

Notes: Model 1 is the configural invariance model, Model 2 is the weak invariance model, and Model 2a is the partial weak invariance model.

Discussion

Evaluation of the Quality of the RNSS-C

The RNSS-C had good reliability and validity, which was consistent with previous western studies.²⁴ In the structural validity analysis, previous studies showed that the five-factor hierarchical model was superior to the five-factor first-order model, whereas in this study, the latter model was found to be more suitable for the Chinese population sample.²² A high-quality model should possess excellent fitting capabilities while striving for simplicity; therefore, we selected the more concise model (five-factor first-order model) for more effective practical application when both the first-order model and the second-order model exhibited good fitting performance.

Second, this study analyzed the quality of the RNSS-C under the IRT framework. All the items had good discrimination and location parameters, and there was no DIF on gender. According to the ICCs and IIFs, there was no difference between option 2 for item 19 and the other four options, and item 1 and item 18 provided less information; ie, the quality of these three items was poor.

Measurement Invariance

The cross-cultural measurement invariance results revealed that the RNSS-C met the requirements for configural invariance only. This finding revealed that there are some differences between the Chinese and Czech participants, which may be due to the following factors: (1) The authenticity dimension of the RNSS-C emphasizes the need to be truthful in the relationship with others, which requires not concealing information or retreating from communication with others, and the good or bad side should be completely displayed in front of others. The emphasis on authenticity in the RNSS-C aligns with Western ideals of open communication and honesty. However, in Chinese culture, where reserve and harmony are highly valued, individuals may be more inclined to maintain a certain level of discretion in their interactions, particularly in avoiding direct confrontation or revealing personal weaknesses. This cultural tendency may account for the observed differences in how authenticity is perceived and expressed. (2) Similarly, when facing pain, Westerners tend to share their troubles with others, whereas Chinese people believe that “self-help is better than help from others”. There are also some Chinese individuals who think that an individual should “depend only on oneself”, so the score of the support and protection dimension is significantly lower in the Chinese group. (3) In Chinese culture, collectivism and social harmony are paramount, prompting individuals to prioritize consensus-seeking in communication and deeply value the sentiments and feedback of their counterparts. As a result, when Chinese people express their ideas or suggestions, they inherently anticipate being esteemed and embraced by others, reflecting a stronger need for perceived influence. Conversely, Western cultures, exemplified by many European nations such as the Czech Republic, embrace individualism and free will, where communication is seen as an arena for idea exchange, unfettered by the sole pursuit of validation or adoption. Consequently, differences in communication objectives and anticipations underpin potential variations in impact scores between the Chinese and Czech groups. (4) Shared experience emphasizes similar experiences between individuals and others.⁵² China has a vast territory and an imbalance in both economic development and educational resources; thus, adults generally move away from their hometowns to study or earn a living. In remote areas, individuals are surrounded by relatively few people with similar growth experience, so the shared experience score is significantly lower in the Chinese group. (5) Since Western culture places more emphasis on independence, that is, doing things by oneself, when someone helps an individual without request, it can greatly improve

the individual's satisfaction with the relationship. Therefore, the initiative score for the Czech group is significantly greater than that for the Chinese group.

The scale was originally developed in English²² and was translated into Czech and Chinese. Therefore, the differences reflected by the participants from China and the Czech Republic on this scale may be attributed not only to cultural differences but also to semantic differences arising from translation.

Limitations and Future Directions

The TRC and TIF curves of the RNSS-C indicate low information and reliability at extreme θ values. Therefore, whether the results of the RNSS-C can be replicated in clinical studies should be investigated in the future via clinical samples.

Only adults aged 18–30 years were studied in this study, without considering the negative consequences that both middle-aged and elderly individuals, as well as adolescents, may face when their interpersonal relationships are not satisfied. For middle-aged and elderly people, good interpersonal relationships can improve subjective well-being and reduce anxiety and depression in middle-aged and elderly people;⁵³ inadequate interpersonal relationships may lead to more loneliness, less social participation, and more mental health problems such as depression and anxiety, affecting their quality of life.⁵⁴ For adolescents, inadequate interpersonal relationships may lead to academic performance decline, self-esteem damage, social barriers, and behavioral problems, which have long-term adverse effects on their growth and development.⁵⁵ Therefore, future research should pay more attention to people aged 10–17 years and middle-aged and elderly individuals and comprehensively understand and improve their interpersonal relationship status through relationship needs satisfaction research.

Conclusions

In this study, the RNSS-C was analyzed in a sample of Chinese adults aged 18–30 years, based mainly on CTT and IRT. The measurement invariance in the Chinese and Czech groups of the RNSS-C across cultures was analyzed. The results indicated the following.

1. In the Chinese cultural context, the RNSS-C has good reliability and validity, but individual items have poor item quality under the IRT framework.
2. There are differences in the two groups' (China and Czech Republic) perceptions of the constructs of relationship needs.

Data Sharing Statement

Readers can ask the authors for the data and material involved in this article.

Ethics Approval and Informed Consent

The questionnaire and methodology for this study were approved by the Research Center of Mental Health of Jiangxi Normal University (Ethics approval number: HM20210960010). The participants provided written informed consent. Our study complies with the Declaration of Helsinki.

Consent for Publication

All the authors have approved this manuscript for publication.

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Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

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Disclosure

The authors report no conflicts of interest in this work.

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