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Reliability and Validity Evaluation of the RAT-43 Psychological Resilience Scale in Chinese Adolescents

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Abstract:

Introduction: Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Vitae sapien pellentesque habitant morbi tristique senectus et netus. Dignissim cras tincidunt lobortis feugiat vivamus at augue eget arcu. At risus viverra adipiscing at in. Cras semper auctor neque vitae tempus quam. Sed cras ornare arcu dui. Turpis massa sed elementum tempus. Risus commodo viverra maecenas accumsan lacus vel facilisis volutpat est. Dictum non consectetur a erat nam at. Lorem mollis aliquam ut porttitor leo. Egestas sed sed risus pretium quam.

Objectives: To assess the level of psychological resilience among Chinese college students, this study introduces the Resilience Assessment Tool 43 (RAT-43), developed by Amalia bt Madihie and Siti Norazilah Mohd Said. Based on the "Magic Box Model" [2], the tool encompasses five dimensions: foundation, belonging, learning, coping, and core self, and has demonstrated good reliability and validity in countries such as Malaysia and Iran (Amalia, 2017). However, the applicability of RAT-43 in the Chinese college student population has not been thoroughly investigated.

Methods: Therefore, this study, using a sample of college students from Guizhou, employs a questionnaire survey method, combined with exploratory factor analysis and confirmatory factor analysis, to examine the structural validity of RAT-43 in the Chinese cultural context.

Results:Cronbach's α coefficient and test-retest reliability are used to assess its internal consistency and stability.The results indicate that RAT-43 demonstrates good applicability among Chinese college students and can effectively assess psychological resilience levels.

Conclusions: This finding not only fills the gap in research on the applicability of RAT-43 in the Chinese cultural context but also provides a scientific basis for mental health education in higher education. By understanding students' psychological resilience levels, educators can develop more targeted intervention measures to help students enhance their mental health and overall adaptability, thereby better coping with academic pressures and life challenges.

Keywords: Psychological Resilience Evaluation Adolescents

1. Introduction

The concept of psychological resilience was first introduced by Rutter in the 1970s. Through his research on children deprived of maternal care, Rutter observed that some children still exhibited positive psychological development and adaptive abilities. This phenomenon suggested the existence of certain protective factors in the process of child development [4]. Other researchers became interested in this observation and began to explore the role of these protective factors. These factors were subsequently applied to recommendations for interventions in child development, gradually leading to the development of research on psychological resilience. Psychological resilience refers to

the ability to adapt in the face of tragedy, trauma, adversity, difficulties, and prolonged significant life stressors [5] . Due to cultural differences, this term has been translated into Chinese as "recovery ability," "psychological toughness," or "psychological resilience"[6].

With the increasing emphasis on mental health education for students at all levels in China, exploring the dimensions of adolescent mental health has become a responsibility and task for many researchers. Today, education not only focuses on the development of morality, intelligence, physical fitness, aesthetics, and labor skills but also pays close attention to the state of mental health education. According to survey data from the Chinese Psychological Society and the Ministry of Education in 2021, approximately 40% of college students reported experiencing varying degrees of psychological stress, and 29% considered their mental health to be poor. In a follow-up survey conducted in 2022, the prevalence of mental health issues remained high, with 45% of students reporting feelings of anxiety, particularly during exam periods. Multiple studies have identified academic pressure, family financial status, lack of social support, and insufficient mental health knowledge as significant factors affecting the mental health of college students (China National Mental Health Report, 2021–2022).

Existing research indicates a positive correlation between psychological resilience and mental health among college students. That is, higher levels of psychological resilience are associated with better mental health [7]. Psychological resilience is also positively correlated with positive emotions and overall well-being [8]. Studies have shown that when an individual's level of psychological resilience declines, their cognitive abilities are affected, and their perceived social support decreases[9]. As a protective factor for mental health, psychological resilience helps individuals enhance self-awareness, boost self-confidence, achieve autonomy and personalized development, reduce the impact of negative emotions, and lower the risk of psychological disorders.

Research on psychological resilience inevitably involves the refinement of study subjects, such as exploring the mechanisms of psychological resilience in college students, the elderly, and individuals with occupational injuries. In the Chinese context, college students facing increasing employment pressure and individuals with severe suicidal tendencies may become new research focuses. Research on psychological resilience also helps schools better understand students' adaptive abilities, thereby promoting the continuous improvement of teaching quality.

2. Objectives

The Resilience Assessment Tool 43 (RAT-43), developed by Amalia bt Madihie and Siti Norazilah Mohd Said, is based on the "Magic Box Model"[2] , a framework for psychological resilience. RAT-43 consists of 43 items covering five dimensions: foundation, belonging, learning, coping, and core self. The tool has demonstrated good reliability and validity among Malaysian adolescents (Amalia, 2017) and has been validated in countries such as Iran, Brazil, Turkey, and Italy. However, there is a lack of research on the applicability of RAT-43 among Chinese college students. This study, using a sample of college students from Guizhou, tests and analyzes the reliability and validity of RAT-43 in this population, aiming to fill this research gap and provide a scientific basis for assessing psychological resilience among Chinese college students.

In the specific research, we will employ a questionnaire survey method to collect data on psychological resilience from college students in Guizhou and conduct comparative analyses with mental health scales. Exploratory factor analysis and confirmatory factor analysis will be used to examine the

structural validity of RAT-43 in the Chinese cultural context. Additionally, Cronbach's α coefficient and test-retest reliability will be utilized to assess the internal consistency and stability of the tool. Through this study, we aim to validate the applicability of RAT-43 among Chinese college students and provide reliable tools and methods for subsequent research on psychological resilience. Furthermore, the findings will help mental health educators in higher education institutions better understand students' levels of psychological resilience, develop effective intervention measures, and enhance students' mental health and overall adaptability.

3. Methods

We used a participant information collection form to gather demographic data. The informed consent form included basic information about the survey, the approximate duration required to complete the questionnaire, potential risks or discomfort that participants might encounter, and sufficient details to allow participants to voluntarily decide whether to continue their participation in the study.

Participants were selected from college students enrolled between 2022 and 2024 at universities in Guizhou. The sample size for this study was estimated based on a rule of thumb that the sample size should be 5–10 times the number of items on the scale [10], and not less than 200 [11]. Therefore, the inclusion criteria for the study were as follows:（a）Aged 18–25 years.（b）Able to complete the questionnaire survey or online questionnaire survey.The sample size included 123 male and 112 female participants.

The study employed the Resilience Assessment Tool (RAT-43) developed and revised by Amalia Madihie, Salmah Mohamad Yusoff, Jamayah Saili, and Siti Norazilah Mohd Said,. RAT-43 consists of 43 items scored on a 7-point Likert scale ranging from “very untrue of me” to “very true of me.” The total score ranges from 25 to 175, and the scale includes six structural dimensions （Amalia bt Madihie 2017）:Basics (Items 1–9), Belonging (Items 10–21), Learning (Items 22–28), Coping (Items 29–37), Core Self (Items 38–43).

3.1 Translation of RAT-43 into Chinese

The Brislin back-translation model was used to translate RAT-43 into Chinese [12]. The process included English-to-Chinese Translation: Conducted independently by the researchers and a master's student in psychology.

Comparison a teacher with bilingual proficiency in Chinese and English and a background in psychological counseling compared the two translations.

Back Translation include two other individuals with strong language skills, unaware of the RAT-43, translated the Chinese version back into English.

Final Comparison following step 2, adjustments were made until there were no significant differences between the back-translated version and the original RAT-43 in terms of content, semantics, format, and application. This resulted in the preliminary Chinese version of RAT-43 (Version 1).

The researchers then invited five psychology teachers with bilingual proficiency to evaluate each item's language clarity, simplicity, and cultural relevance in the Chinese context. Language consistency and cultural relevance were scored on a 4-point scale (1 = highly inconsistent, 4 = highly consistent). Both scores for RAT-43 (Version 1) were 4.0, indicating high consistency in language and cultural meaning with the original RAT-43.

To evaluate content validity, a 4-point scale was used (1 = "very irrelevant," 4 = "highly relevant") to assess how well each item reflected the dimensions of resilience in RAT-43 for college students. Higher scores indicated better content validity. The results showed item-level content validity of 0.800–1.000 and scale-level content validity of 0.987 for RAT-43 (Version 1).

3.2 Reliability and Validity Testing of the Chinese RAT-43

Statistical analysis was conducted using SPSS 21.0, including descriptive statistics, item analysis, exploratory factor analysis (EFA), and reliability and validity testing. For item and reliability analysis of the RAT-43, internal consistency indicators such as Cronbach's α and split-half reliability coefficients were calculated. Typically, a Cronbach's α above 0.4 is considered reliable, above 0.5 is more reliable, and above 0.7 indicates high reliability.

In EFA, the principal component analysis method was used for factor extraction, with varimax rotation. Items with factor loadings below 0.4 or cross-loadings were gradually removed, and factor analysis was repeated while considering the meaning of each item [10]. A Kaiser-Meyer-Olkin (KMO) value above 0.800 indicated suitability for factor analysis.

Structural validity was evaluated by analyzing the correlation between each dimension score and the total score, as well as the correlation between different dimensions, to assess the discriminant validity of the questionnaire.

Confirmatory factor analysis (CFA) was conducted using AMOS 21.0 to calculate various fit indices, including χ^2/df, RMSEA, GFI, and AGFI.χ^2/df: Measures model fit, with recommended values ≤5. For sample sizes above 200, this criterion can be relaxed.RMSEA recommended value ≤0.08.RMR: Should be below 0.05.GFI and IFI: Should exceed 0.90.TLI: Should also exceed 0.90.If χ^2/df is below 3.00, RMSEA is close to 0, RMR is less than 0.05, GFI exceeds 0.90, and TLI exceeds 0.90, the model is considered to have a good fit (Hou Jietai, 2021).

4. Results

4.1 Demographic Information and Psychological Resilience Levels of College Students

A total of 434 copies of the Chinese version of the RAT-43 questionnaire were distributed, and all 434 were validly collected, achieving a 100% effective response rate. The included participants ranged in age from 16 to 25 years. Among them, 156 students (36%) had a high school or vocational school education, while 278 students (64%) had a college-level education.

Figure 1: The general information of adolescents （*n* = 434）

Variable	Category	*n*（%）
Gender	Male	213（49%）
	Female	221（51%）
Education Level	High School or Vocational School	156（35.9%）
	College or Undergraduate	278（64.1%）

Ethnicity	Han	312（71.79）
	Minority	122（28.21）
Age	16-18	108（24.79%）
	18-25	326（75.21%）

The critical ratio (CR) values for each item ranged from 0.893 to 2.411, with statistically significant differences ($P < 0.001$). Based on the correlation coefficients between each item and the total score, the discrimination indices were between 0.120 and 0.573, all of which reached significant levels ($P < 0.01$). Given that the discrimination indices of items 6, 16, and 26 were below 0.2, and Cronbach's α significantly increased after deleting these items, they were removed from the final analysis.

4.2 Structural Validity of the Chinese Version of RAT-43

4.2.1 Exploratory Factor Analysis

An exploratory factor analysis (EFA) was performed on the remaining 30 items of the scale. Bartlett's test of sphericity was significant ($\chi^2 = 9644.138$, $P < 0.001$), and the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.956, indicating the data were highly suitable for factor analysis(Figure 2).

Figure 2: KMO and Bartlett test

KMO Value		0.956
Bartlett's Test of Sphericity	Approx. Chi-Square	9644.138
	df	630
	p -value	0.000

After multiple rounds of EFA, the revised scale retained 34 items and extracted four factors (with eigenvalues greater than 1), accounting for 60.253% of the cumulative variance. Based on the structural dimensions of the original RAT-43 scale, the factors were named as follows: Factor 1 - Basic, Factor 2 - Belonging, Factor 3 - Learning, and Factor 4 - Coping (Figure 3).

Figure3: The exploratory factor analysis results of the Chinese version of RAT-43

Principal Component	Eigenvalue	Variance Contribution Rate (%)	Cumulative Contribution Rate (%)
Factor 1	15.838	17.692	17.692
Factor 2	2.022	14.6	32.292
Factor 3	1.573	12.253	44.544

Principal Component	Eigenvalue	Variance Contribution Rate (%)	Cumulative Contribution Rate (%)
Factor 4	1.159	9.172	53.716
Factor 5	1.099	6.537	60.253

The results of the EFA confirmed the appropriateness of extracting four factors in the Chinese version of RAT-43, consistent with its original theoretical structure.
In summary, the KMO value of 0.956 and Bartlett's test result ($\chi^2 = 9644.138$, $P < 0.001$) demonstrated excellent suitability for factor analysis. This suggests that the revised Chinese version of the RAT-43 has good structural validity（Figure4）.

Figure 4:Cronbach's Reliability Analysis

Number of Items	Sample Size	Cronbach α Coefficient□
43	434	0.906

Figure 5: Component analysis of the RAT-43's 5 factors and 34 items China's college students

（n＝434）

Name	Factor Loadings					Communalities (Common Factor Variance)
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	
5.I practice a healthy diet.	0.136	0.189	0.144	0.795	0.022	0.707
6. I exercise and obtain fresh air.	0.078	0.335	0.059	0.774	0.047	0.722
7.I usually have enough sleep.	0.135	0.086	0.256	0.691	0.261	0.636
8.Play or fun activity is part of my life.	0.304	0.195	0.383	0.455	-0.018	0.485
10. I have a group of people who accept me.	0.358	0.114	0.589	0.309	0.154	0.608
13.I have at least one in my life who have a close and healthy relationship.	0.165	0.071	0.743	0.114	0.195	0.635

14.I am capable in maintaining a healthy relationship.	0.251	0.164	0.672	0.195	0.207	0.622
15.I have a social network (i.e.: friends, teachers, and society) who supported me.	0.11	0.423	0.562	0.184	0.29	0.624
16.I try to be with people who I can count on.	0.225	0.253	0.696	0.026	0.156	0.625
17.I try to take my responsibilities at school, home or in my community.	0.328	0.45	0.494	0.178	-0.151	0.609
18.I have a good memory of the past.	0.187	0.532	0.279	0.138	0.35	0.537
19.I know my family history.	0.146	0.606	0.265	0.236	0.058	0.517
20.I like to try some new experience.	0.338	0.576	0.269	0.093	-0.144	0.548
21.I can be friend and hangout with anyone.	0.186	0.605	0.128	0.235	0.27	0.545
23.I have a good relationship with teacher/mentor as well as other staffs.	0.449	0.278	0.448	0.297	0.071	0.573
24.I think about my future plan.	0.56	0.405	0.127	0.216	-0.235	0.596
25.I like to plan what I want to do every day.	0.385	0.555	0.074	0.393	0.003	0.617
26.I am proud of my previous achievements.	0.405	0.557	0.186	0.08	0.198	0.554
27.I know and understand my emotion.	0.422	0.493	0.261	0.177	0.058	0.524
28.I have social skill.	0.395	0.503	0.322	0.205	0.118	0.568
29.I usually respect rules and limitations.	0.569	0.213	0.409	0.111	0.148	0.571
30.I try to be brave.	0.68	0.291	0.183	0.059	0.142	0.605
31.I am good in problem solving.	0.454	0.525	0.107	0.177	0.237	0.58

32.I have someone to help me in see thing in a different perspective.	0.436	0.485	0.208	0.089	0.388	0.627
33.I try to involve myself with club and activity after school during weekends or holidays.	0.182	0.653	0.081	0.352	0.193	0.628
34.I am good in calming myself when needed.	0.619	0.364	0.08	0.299	0.158	0.636
35 I believe that there is always hope in life.	0.733	0.2	0.182	0.17	0.26	0.707
36 I have someone if I am not happy.	0.256	0.226	0.34	0.116	0.646	0.663
37 I am good in making jokes in certain situations.	0.307	0.272	0.339	-0.012	0.361	0.413
38 I have hope for future.	0.738	0.197	0.226	0.23	0.309	0.783
39 I try to understand myself.	0.647	0.253	0.234	0.099	0.297	0.636
40 I can understand other's feeling.	0.652	0.159	0.356	0.144	0.209	0.641
41 I try to hold my own responsibility(ies).	0.647	0.28	0.384	0.077	0.044	0.653
42 I have someone in life to help me to understand my strengths.	0.438	0.376	0.355	0.122	0.387	0.623
43 I can ask for help if needed.	0.386	0.056	0.267	0.241	0.627	0.675
Using Varimax Rotation Method						

A confirmatory factor analysis (CFA) of the five-factor structure of the revised RAT-43 scale was conducted using AMOS 21.0. The results (Figure 1) were as follows: $\chi^2 = 1738.884$, df = 521, $\chi^2/df = 3.338$. The fit indices were: GFI = 0.874, CFI = 0.864, IFI = 0.864, PGFI = 0.704, and RMSEA = 0.073. These findings indicate an acceptable model fit.

5. Discussion

This study represents the first application of the RAT-43 questionnaire among Chinese adolescents. Through item analysis and exploratory factor analysis (EFA) of 434 valid questionnaires, 34 items were retained, encompassing four factors: Basic, Belonging, Learning, and Coping, which are largely consistent with the structure and classification of the original scale. The revised RAT-43 questionnaire

demonstrated high internal consistency and split-half reliability, with internal consistency coefficients being higher for the Basic and Coping factors and acceptable for the Belonging and Learning factors. Discriminant validity analysis showed high correlations between each factor and the total score, while correlations among the factors were low, indicating good discriminant validity. The different factors in the revised RAT-43 questionnaire reflect various dimensions of psychological resilience. Validity analysis using the psychological resilience levels of Chinese adolescents as a criterion indicated that the revised scale had sufficient external validity. Confirmatory factor analysis (CFA) further confirmed that the revised scale exhibited good factor model fit and is suitable for use among Chinese adolescents.

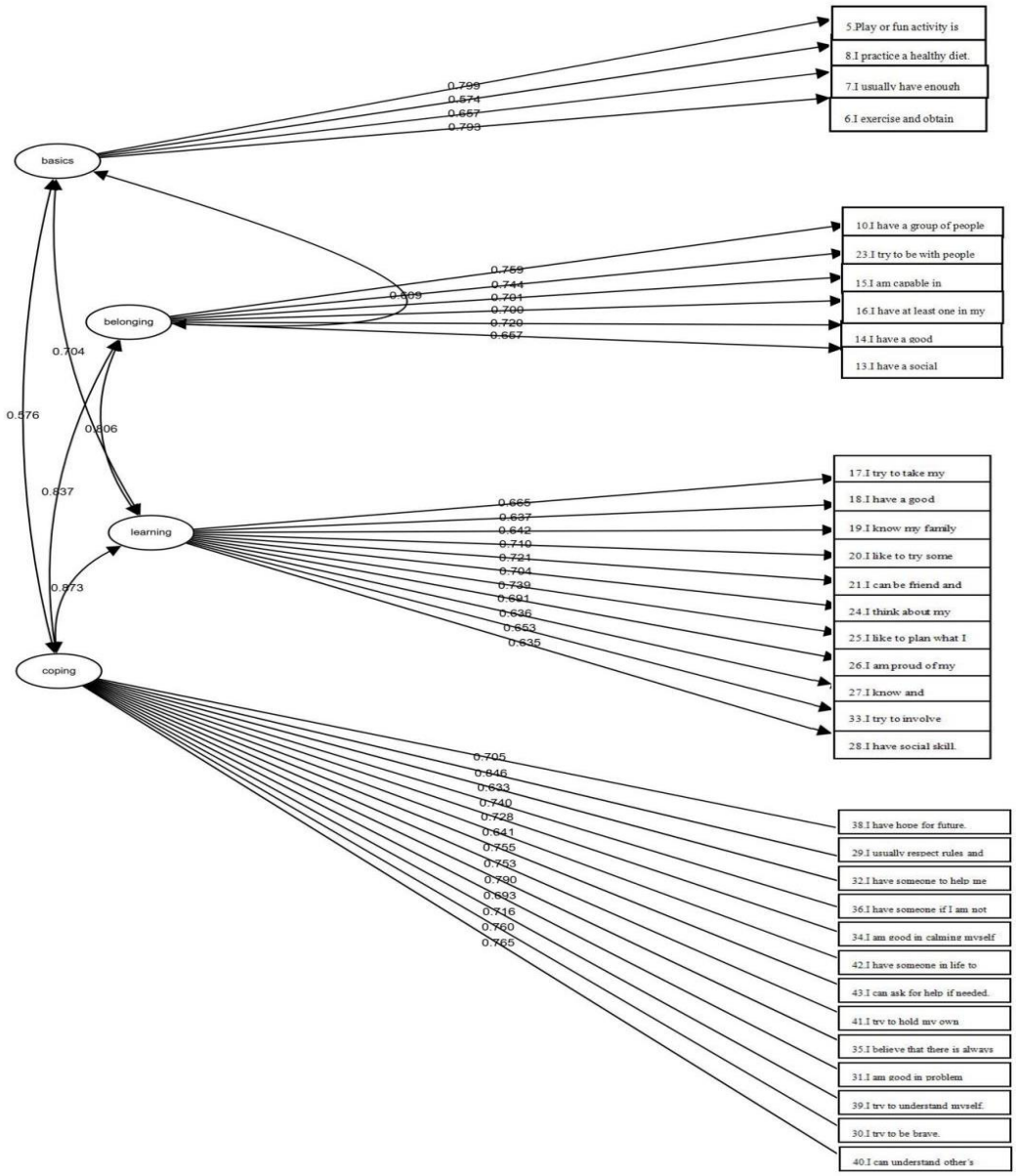

Figure 6：Structural Validity of the Revised RAT-43 in Adolescents: A Confirmatory Factor Analysis

It is important to note that in the Chinese version of the RAT-43, the "Core Self" dimension incorporates items 38–43 from the "Coping" dimension, while the following items were excluded: item 1 ("I have enough home facility"), item 2 ("I have enough money to live on"), item 4 ("I have transportation to go anywhere"), item 9 ("I do not always have the experience of being isolated by others or being prejudiced against me"), item 11 ("I know spiritual beliefs make me stronger"), and item 12 ("I have people around me who are good influence on me").

On one hand, Chinese high school and university students typically live on campus, sharing dormitories with 4–6 people per room. In collectivist cultures, individuals tend to maintain a heightened sense of vigilance toward the potentially unethical behavior of group members. This internal group vigilance may lead to behaviors such as exclusion or isolation of members who deviate from group norms (Liu, 2019). Moreover, public transportation is convenient, and very few students own private vehicles. Additionally, in the process of adaptive coping, Western individuals emphasize their own impact (e.g., spiritual strength) on the external environment, whereas Eastern individuals are more inclined to adapt by changing themselves (e.g., goals, behaviors) to fit the environment (Almanasreh, E., 2022). Therefore, through cultural adaptation, item 22 ("I have people around me who are good influence on me") and item 37 ("I am good in making jokes in certain situations") from the "Learning" dimension were removed.

In the Chinese context, core self-evaluation is an important internal factor influencing coping ability. The elements of core self-evaluation directly impact individuals' behavioral patterns and outcomes when facing stress and challenges. Therefore, including the "Core Self" items (38–43) as a key subdimension for measuring or explaining coping ability is more aligned with reality. In this study, the "Core Self" items for adolescents (38–43) were incorporated into the semantically broader "Coping" dimension.

It should also be noted that the Chinese version of the RAT-43 does not contain reverse-scored items, which poses a potential risk of information bias in its application. The limitations of this study include the fact that the sample was drawn from a cohort population, with Guizhou adolescents being the main inclusion criterion. Consequently, adolescents registered in Guizhou Province accounted for a relatively high proportion of the sample (nearly 80%), which may somewhat limit the generalizability of the results. Additionally, due to the large sample size and the lengthy cohort questionnaire, it was difficult to conduct a retest, resulting in a lack of test-retest reliability analysis. Moreover, the revised scale requires further validation in larger samples.

In summary, the Chinese version of the RAT-43 demonstrates good reliability and validity. It provides a comprehensive and accurate assessment of psychological resilience levels among Chinese adolescents and offers a theoretical foundation for mental health educators to design targeted psychological resilience interventions.

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